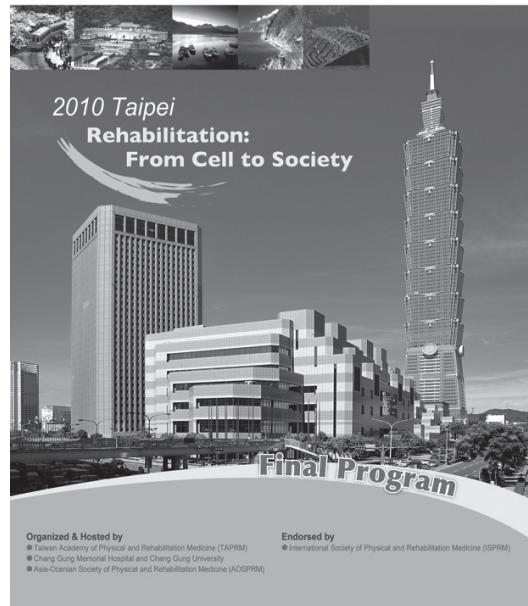


ABSTRACTS



Second Asia–Oceanian Conference of Physical and Rehabilitation Medicine

APRIL 29–MAY 2, 2010, TAIPEI



WELCOME TO TAIPEI

Dear Colleagues,

On behalf of the Organizing Committee, it is our greatest honor to have you here in Taipei to attend the 2nd Asia-Oceanian Conference of Physical and Rehabilitation Medicine (2nd AOCPRM). The conference will be held from April 29th to May 2nd of 2010 in the Taipei International Convention Center.

The theme of our conference is “Rehabilitation: “From Cell to Society”. We have invited reputable speakers from all over the globe to cover the hottest topics in modern physical and rehabilitation medicine. Numerous workshops will be organized to offer hands on practice in soft tissue ultrasound examinations, shockwave therapy, and in the fabrication of ankle-foot-orthosis.

As you may know, Taipei is famous for its inexpensive but high quality electronic products, and the adventurous night markets. Taipei is also well known for its 101 building, one of the world’s renowned skyscrapers. Therefore, I strongly advise you to take the opportunity to tour around Taipei and experience the unique fusion of Chinese - Western cultural lifestyle that Taipei has to offer.

If you need any further assistance from us, please do not hesitate to let us know. It is our obligation to ensure that your stay in Taipei will be an enjoyable one. Thank you very much!

Sincerely yours,

Simon FT Tang

Chairman of the Organizing Committee

The 2nd AOCPRM Meeting in Taipei, 2010

THURSDAY, APRIL 29, 2010**09.00–17.00**

ESPRM-AOSPRM Collaborative Program of ICF – International Classification of Functioning, Disability and Health

Implementation of ICF in Rehabilitation Medicine from the ISPRM Perspective	Gerold Stucki
Measurement Tools	Alarcos Cieza
Overview and Updates on ICF Core Set Development	Alarcos Cieza
ICF-based Strategy for Return-to-work after Medical Rehabilitation	Christoph Gutenbrunner
The Study of ICF Core-set Validation in Twelve Diseases in China	Tao Xu
ICF and the Evaluation of Persons with Walking Abnormalities in Clinical Settings	Alain Delarque
The European Experience of Using ICF in Research	Alarcos Cieza
Asian-European Interaction: ICF and AOCPRM-ESPRM Cooperation	Alessandro Giustini

FRIDAY, APRIL 30, 2010**08.30–10.00**

Keynote Speech

The Philosophy of Rehabilitation, from Cell to Society	Gerold Stucki	<i>KS 01-01</i>
Complex Regional Pain Syndrome (CRPS): Evaluation and Treatment	Martin Grabois	<i>KS 01-02</i>

10.30–17.00

Musculoskeletal Disorders: Musculoskeletal Ultrasonography

Role of Elastography in Neuromusculoskeletal Ultrasound	Gi-Young Park	<i>0430A1</i>
Elastography of Plantar Soft Tissue Properties	Chih-Chin Hsu	<i>0430A2</i>
Application of Ultrasound in Sports Injuries	Yi-Pin Chiang	<i>0430A3</i>
Non-invasive Measurement of Vessels Mechanical Properties	Yio-Wha Shau	<i>0430A4</i>
Rehabilitation Potentials Following Foot Drop Among Leprosy Cured Patients	Ajit Kumar Varma	<i>0430E1FP</i>
The Prevalence of Musculoskeletal Disorders in the Textile Occupation, Thailand	Petcharat Keawduangdee	<i>0430E2FP</i>
Functional Outcomes of Major Lower Limb Amputation 1994–2006: A Modern Series	Jane Wu	<i>0430E3FP</i>
Effects of Disc Degeneration and Muscle Dysfunction on the Cervical Spine Stability: From in Vitro Study Using Porcine Model	Chih-Hsiu Cheng	<i>0430E4FP</i>
Nitric Oxide Concentrations in CSF are Possible Predictors of Postoperative ADL Improvement in Lumbar Canal Stenosis	Shinji Kimura	<i>0430E5FP</i>
Paradigm Shift in the Management of Back Pain	M. Taslim Uddin	<i>0430E6FP</i>
Effect of Taping for Patients with Lateral Epicondylitis and Motion Tracking on Elbow Tissue from Ultrasonic Image Sequence	Pei-Chun Hsieh	<i>0430E7FP</i>
Ultrasound-guided Injection Therapy for Frozen Shoulder	Sheng Bi	<i>0430E8FP</i>
Comparison of Elastography and Gray-scale Ultrasonography in Diagnosing Small Full-thickness Supraspinatus Tendon Tear	Giyong Park	<i>0430E9FP</i>

15.30–17.00

Interventional Rehabilitation

An interventional PM&R Approach to Spinal Pain: Evidence-based Approach and Beyond	David Cifu	<i>0430J1</i>
Ultrasound Diagnosis and New Treatment in Adhesive Capsulitis (Frozen Shoulder)	Gi-Young Park	<i>0430J2</i>
Ultrasound Guided Injection Treatments in Rehabilitation Medicine	Carl PC Chen	<i>0430J3</i>
New Advances in Therapeutic Ultrasound	Wen-Shiang Chen	<i>0430J4</i>
Extracorporeal Shock Wave Therapy on Rehabilitation of Tendinopathy	Mao-Hsiung Huang	<i>0430J5</i>
The Science of Intravascular Laser Irradiation of Blood (ILIB) and Its Applications	Tien-Yow Chuang	<i>0430J6</i>

10.30–12.00

Brain Disorders: Traumatic Brain Injury

Event-related Potentials and Dual Sensory Impairment (DSI) in TBI	Henry Lew	<i>0430B1</i>
Traumatic Brain Injury (TBI) Research in Taiwan	Wen-Ta Chiu	<i>0430B2</i>

Neuroprotection Strategies in Experimental Traumatic Brain Injury	Szu-Fu Chen	0430B3
Effect of Noise on Retention and Transfer of a Spatial Memory Task in Unequal Context in Male Rats: A Behavioral Review	Mohammad Ali Gheraat	0430B4FP
Effect of Hyperbaric Oxygenation (HBO) on Unilateral Spatial Neglect (USN) Induced by Traumatic Brain Injury	Jinglong Liu	0430B5FP
Analysis of Influence Factors of Cognitive Impairment Following First Onset of Stroke	Xiquan Hu	0430B6FP

13.30–15.00

Brain Disorders: Neural Plasticity & Cognition

Cognitive Component of Tai Chi Chuan: A fMRI Study	Chetwyn Chan	0430F1
How Valid is the Broken Mirror Theory of Autism	Ya-Wei Cheng	0430F2
Cognitive and Neuroimage Assessment and Human Cognitive Rehabilitation	Yuejia Luo	0430F3
Representation of Tactile Motion in the Primary Somatosensory Cortex: A Psychophysical and Neurophysiological Study	Yu-Cheng Pei	0430F4
Reveal the Neural Mechanism and the Property of Pure Alexia for Chinese Characters by Using Neuroimaging Techniques and Cognitive Neuropsychological Tests	Chunlei Shan	0430F5FP
The Effects of Basal Ganglia Stroke on Implicit Learning	Zhongli Jiang	0430F6FP
Cognitive Flexibility in Children with Learning Disability	H.S. Somashekara	0430F7FP

15.30–16.00

Development of Physical and Rehabilitation Medicine in Aisan and Oceanian Region

Development of Physical and Rehabilitation Medicine in Taiwan	Simon Fuk-Tan Tang	0430K1
The Development of Rehabilitation Medicine in the Philippines: Our Work, Mission and Vision	Reynaldo Rey Matias	0430K2
Development of Physical and Rehabilitation Medicine in Mongolia	Baljinnyam Avirmed	0430K3
History of Development of ISPRM: Review of the Challenges	John Melvin	0430K4

10.30–17.00

Brain Disorders: Stroke

Depression and Anxiety in the Hemiplegic	Jorge Lains	0430C1
Mirror Neuron System in the Pre-motor Cortical Area: A RCT in the Post-acute Stroke Arm Rehabilitation. Preliminary Report	Marco Franceschini	0430C2
Effectiveness of Ultrasound Guided Botox Injection on Balance in Post-stroke Patients with Lower Extremities Spasticity	Zulin Dou	0430C3
Massage Therapy in Depressed People: A Meta-Analysis of Clinical Trials	Wen-Hsuan Hou	0430C4
Power Rehabilitation, Principle and Method	Tkahito Takeuchi	0430G1
Functional Electrical Stimulation Improves Functional Recovery of the Upper Extremity of Subjects with Acute Stroke: A 6 Months Follow-up Study	Tiebin Yan	0430G2
Evidence-based Stroke Rehabilitation?	Keh-Chung Lin	0430G3
Facilitating Motor Performance Through External Cueing for People with Parkinson's Disease	Hui-Ing Ma	0430G4
Physical Findings, Sonography and Shoulder Pain of Hemiplegic Shoulders in Acute Stroke Patients during Rehabilitation	Yu-Chi Huang	0430G5
Effects of Motion Control Shoe on the Kinematic, Kinetic and Motor Control of the Leg During Running	Gabriel Y.F. Ng	0430L1
The Role of Imagery in Constraint-induced Movement Therapy	Karen Liu	0430L2
Use of Proprioceptive Stimulation in Stroke Rehabilitation	Sang-I Lin	0430L3
Cortical Reorganization Induced by Body Weight-supported Treadmill Training in Individuals with Stroke	Ray-Yau Wang	0430L4
Integrity of the Corticospinal Tract Predicts Motor Recovery in Stroke: Diffusion Spectrum Imaging Studies	Pei-Fang Tang	0430L5
Telerehabilitation in Subjects with Subacute Stroke	Kwan-Hwa Lin	0430L6
Effects of Sit-Stand-Sit Strategies on Postural Stability in Stroke Patients	Ta-Sen Wei	0430D1
Robotic-assisted Therapy of Paretic Upper Limb for Chronic Stroke	Pai-Yin Chen	0430D2FP
Correlation Factors of the Health-related Quality of Life in Patients with Chronic Aphasia Due to Stroke	Lochia Chang	0430D3FP
Correlation of Stroke-onset Severity with Health Status, Quality of Life and Family Impact in Patients with Ischemic Stroke	Ru-Lan Hsieh	0430D4FP
Comparison of Intramuscular Botulinum Toxin Type A Injection and Percutaneous Muscular Branch Block of the Tibial Nerve for Reducing Ankle Plantarflexor Spasticity: A Randomized Clinical Trial	Jau-Jia Lin	0430D5FP

That Using Computer Exercise Upper Limb of the Ischemic Stroke Patients Observe the Changes of Brain Functional Magnetic Resonance Imaging	Jin Chen	0430D6FP
The Effect of Rehabilitative Training on Brain Functional Reorganization in Patients with Cerebral Infarction by fMRI: A Longitudinal Study	Xiquan Hu	0430D7FP

13.30–17.00*Cardiopulmonary Rehabilitation and Obesity*

Schedule of Cardiac Rehabilitation	Farzaneh Torkan	0430H1
Exercise Prescription and Thrombogenesis	Jong Shyan Wang	0430H2
Benefits of Phase 2 Cardiac Rehabilitation in Patients with Myocardial Infarction	Ssu-Yuan Chen	0430H3
CARES THAI Actions: Preventive and Rehabilitative Program for Cardiac and High Risk Factors Patients	Piyanuj Ruckpanich	0430H4
To Facilitate Return to Work Through Cardiac Rehabilitation	Leonard S.W. Li	0430H5
Phase 2 Cardiac Rehabilitation Improves Aerobic Capacity of Heart Transplantation Recipients at One Year After Surgery	Ssu-Yuan Chen	0430M1FP
Study of Physiological Ischemic Exercise Training on Circulating Epcps and Neovasculation in Pathological Myocardial Ischemia Animals in Vivo	Chun-Xiao Wan	0430M2FP
Electrical Stimulation in Patients with Severe Chronic Heart Failure.	Masahiro Kohzuki	0430M3FP
The Effects of Phase 2 Cardiac Rehabilitation Program on Health-related Quality of Life Among Heart Transplantation Recipients	Chen-Jung Hsu	0430M4FP
The Effect of Isometric Exercise on Human Coronary Collateral Function During Acute Coronary Occlusions	Xiao Lu	0430M5FP
Is Horseback Riding More Effective Than Horse Riding Robot for Physical Exercise?: Heart Rate Monitoring, Caloric Consumption, 2D Motion Analysis and Surface EMG Monitoring	Naohisa Kikuchi	0430M6FP
Effectiveness of Breathemax Breathing Device on Airway Secretion Clearance in Patients Dependent on Mechanical Ventilation	Sujittra Kluayhomthong	0430M7FP
Effect of Phase Ii Cardiac Rehabilitation After Coronary Artery Bypass Graft: A Comparison of Quality of Life, Peak V_2 and Functional Aerobic Impairment.	Po-Chin Strong	0430M8FP
Nos-3 Effected on the Pulmonary Arterial Pressure and Alleviated the Pulmonary Small Arterial Remodeling in Chronic Hypoxic Hypercapnic Rats by Kallikrein	Xiaotong Wang	0430M9FP

13.30–17.00*Cross-Strait Session*

Development of Rehabilitation Services for Child Cerebral Palsy in China	Xiaojie Li	0430I1
Neural Function Information Detection and Rehabilitation Engineering	Jue Wang	0430I2
The Theory and Approach of Disability Classification and Evaluation Based on ICF model	Zhuoying Qiu	0430I3
Analyses of Clinical Assessment of Unilateral Neglect after Stroke	Wei-qun Song	0430I4
Applied Research of Exercise Therapy in Complications of Diabetes	Zhongli Jiang	0430I5
The Effects of Angelica Sinensis Injection on the Neuronal Metabolites and Blood Flow Speed within Reperfusion Following the Ischemic Cerebral Injury in Rats	Wei-Jing Liao	0430I6
Mental Health Status of the Parents of Cerebral Palsy Children and its Relationship with Personality Traits	Zhihai Lu	0430N1FP
CCK-8 Prevents Glutamate-Induced Apoptosis in Cultured Cortical Neurons Via Up-regulation of Bcl-2/Bax Ratio and Down-Regulation of Caspase-3	Jiangbao Zhou	0430N2FP
Protective Effect of BDNF to Newborn Rats with Hypoxie-ischemic Brain Damage	Jiangbao Zhou	0430N3FP
Morphine Preconditioning Induces Delayed Neuroprotection Against Glutamate-Induced Excitotoxicity	Qing Shang	0430N4FP
Clinical Comparative Study on Acupuncture and Swallowing Training for Treating Dysphagic Patients with Stroke	Pande Zhang	0430N5FP
Application of Network Thinking and Network Analysis on Meridian Researches	Feng Lin	0430N6FP
Postischemic Wheel Running Increased Neurogenesis in the Subventricular Zone of Adult Rats With Local Cerebral Infarction	Xiquan Hu	0430N7FP
Study on Auditory Semantic Priming Effects in Aphasia Patients	Zhongli Jiang	0430N8FP
Dysfunction of the Mitochondria in the Cerebrum of Mice Induced by Chronic Hypoxic Hypercapnia	Xiaotong Wang	0430N9FP
Study on the Therapeutic Effects of Chinese Traditional Manipulation Combined with Lumbo-Dorsal and Abdominal Muscle Exercise in Treating Waist Sports Injuries	Zhang Hong	0430N10FP

SATURDAY, MAY 1, 2010**08.30–10.00***Keynote Speech*

Postural Motor Control: What We Learned from Animal Model and Its Relevance for Human	Tatian Deliagina	KS 02-01
Application of rTMS and tDCS in Rehabilitation after Brain Damage	Yung-Zu Huang John Rothwell	KS 02-02

10.30–17.00*Brain Disorders: Sensory-Motor Control*

Biophysics of Assessment of Human Motor Control by Surface Polyelectromyography	Art Sherwood	0501A1
Motor Control Modification in Humans after SCI	Barry McKay	0501A2
Correlation of Motor Control in the Supine Position and Assistive Device Used for Ambulation in Chronic Incomplete Spinal Cord-injured Persons	Simon Fuk-Tan Tang	0501A3
Neurophysiology of the Human Spinal Cord Tested by Lumbosacral Evoked Potentials, the H reflex and Posterior Root-muscle Reflexes	Karen Minassian	0501A4
Human Neural Control of Posture: Modifications of Lumbar Posterior Root-muscle Reflexes	Ursula Hofstoetter	0501D1
Neuroimaging Assessment of Human Spinal Cord White and Grey Matter	Spyros Kolias	0501D2
Transitory Human Paraplegia	Vedran Deletis	0501D3
The Neurophysiology of Human Locomotor Training	Keith E Tansey	0501D4
The Effect of Peripheral Nerve Lesion upon Postural Control	Justin Bown	0501H1
Novel Access to the Human and Animal Locomotor Circuitry	Yury Gerasimenko	0501H2
Transformation of Nonfunctional Spinal Circuits Into Functional and Adaptive States in Paralyzed Rats	Gregoir Courtine	0501H3
Human Motor Control and Recovery of the Motor Functions after CNS Lesions	Milan Dimitrijevic	0501H4

10.30–15.00*Spinal Cord Disorders*

Acute Spinal Cord Injury: Advancements in Basic Science Research and Clinical Care	Chi-Tsou Huang	0501B1
What We Learnt from Management of Spinal Cord Injury Post Sichuan Earthquake – 2 year Experience	Jianan Li	0501B2
Bowel Management in SCI patient: From Research to Real World.	Apichana Kovindha	0501B3
Brindley's Technique for the Treatment of Bladder Dysfunction Post Spinal Injury Injure	Mou-Wang Zhou	0501B4
Neurogenic Bowel Dysfunction in Patients with Spinal Cord Injury	Chin-Wei Liu	0501B5
The High-sensitivity C-reactive Protein in Patients with Chronic Spinal Cord Injury	Chun-Chiang Huang	0501E1
International Perspectives of Spinal Cord Injury – Clinical Care	Xianghu Xiong	0501E2
PET in Assessing Brain Plasticity among People with Spinal Cord Injury	Yen-Ho Wang	0501E3
Effects of Electrical Stimulation of Pudendal Nerves on Bladder Voiding Function in the Spinal Cord Injured Rat	Yin-Tsong Lin	0501E4FP
Changes of Physical Abilities, Quality of Life, Incidences of Complications and Falls in Patients with Chronic Spinal Cord Injury 6 Months After Discharge: A Preliminary Study	Jiraporn Wannapakhe	0501E5FP
An Overview of the Stem Cells in the Management of Spinal Cord Injury	Farooq Rathore	0501E6FP
A Initial Study on Brain fMRI of Spinal Cord Injury Patients	Lijuan Ao	0501E7FP
The International Spinal Cord Injury Core Data Set: Experience of a Non-model System Hospital	Julia Patrick Engkasan	0501E8FP
Quantitative Analysis of Bladder Compliance in Subjects with Neurogenic Bladder Voiding Dysfunction after Spinal Cord Injury	Su-Ju Tsai	0501E9FP

15.30–17.00*Assessment, Evaluation and Diagnosis*

Innovation in Assessing Balance Function in Patients with Stroke: A Set of Functional-hierarchy Short Forms and Computerized Adaptive Test	Wen-Hsuan Hou	0501I1FP
Does Marathon Running Cause Chronic Degenerative Lesions of the Knee?: An Ultrasonographic Study in Long-distance Runners	Min-Hsin Lai	0501I2FP

Influence of Chin-tuck Maneuver on Temporal and Kinematic Characteristics in Normal Swallowing	Ja-Ho Leigh	050113FP
New Portable System for Comprehensive Measurement of Spasticity Encompassing Electrophysiologic, Kinematic and Biomechanical Aspects in Stroke Patients	Jeong Hwan Seo	050114FP
Technical Validity and Reliability of Objective Measurement in Swallowing Kinematic Analysis	Seongmin Chun	050115FP
Functional Assessment of Balance in Early Stages of Multiple Sclerosis	Raabea Aryan	050116FP
Developing Who ICF Core Sets for Subacute Stage of Spinal Cord Injury in Taiwan	Chin-Wen Wu	050117FP
The Prognostic Role of the Modified Rankin Scale on Survival in Patients with Stroke	Hsi-Ting Chiu	050118FP
Early Changes of Knee Joint Movement in People with Knee Osteoarthritis During Gait; A Motion Analytic Study with Point Cluster Technique	Masami Akai	050119FP

10z30–12.00*Pain Management: Part 1*

Rehabilitation of Muscle Injuries in Sports	Walter Frontera	0501C1
Current Concepts in Musculoskeletal Pain, Mobility and Gender	Mark Young	0501C2
Phantom Pain in Amputees	Parviz Mojgani	0501C3
Acupuncture and Myofascial Trigger Points-human Study	Li-Wei Chou	0501C4
Effect of Neuromuscular Blocking Agent on the Spontaneous Electrical Activity in a Myofascial Trigger Spot of Rabbit Skeletal Muscle	Shu-Min Chen	0501C5

13.30–15.00*Musculoskeletal: Osteoarthritis & Osteoporosis*

Physical Exercise and the Osteocyte Osteogenic Response	Jorge Lains	0501F1
The Role of Exercise in Osteoarthritis (OA) of the Knee	Angela B.M.Tulaar	0501F2
Exercise to Maximize Peak Bone Mass and Minimize Bone Loss	Sukajan Pongprapai	0501F3
Headache Due to C2 Sensory Radiculopathy	Juan Mauel Guzman Gonzalez	0501F4
Cervical Radiculopathy Induced Neck Pain	Kamyar Akrami	0501F5
Management of Cervicalgia in the Middle Aged	Chih-Wei Chou	0501F6

15.30–17.00*Pain Management: Part 2*

Current Advance in Myofascial Pain	Chang-Zern Hong	0501J1
Diagnosis and Treatment for Myofascial Pain Syndrome of the Upper Back Muscles	Baljinnyam Avirmed	0501J2
The Link Between Immobility and Microgravity Low Back Pain	Reynaldo Rey Matias	0501J3
Approach to Mechanical Low Back Pain	Ahmad Raeissadat	0501J4
Local Treatment of Myofascial Pain: NSAID Patches	Lin-Fen Hsieh	0501J5
Laser Treatment for Myofascial Trigger Points	Kai-Hua Chen	0501J6

13.30–15.00*Rehabilitation Technology and Engineering*

Application of a Cycling Wheelchair to the Patients with Gait Disturbance	Yasunobu Handa	0501G1
Functional Electrical Stimulation Cycling Exercise	Shih-Ching Chen	0501G2
The Development of New Intelligent Comprehensive Interactive Care (ICIC) System for Elderly Care	Alice M.K. Wong	0501G3
Cortical Activation During Robot-aided Rehabilitation	Futoshi Wada	0501G4

15.30–17.00*Prosthetic and Orthotics*

Influence of the Level of Amputation on Survival Advantage and Functional Performance in Elderly Amputees	Takaaki Chin	0501K1
Lower-limb Prosthetics: Previous Research and Future Development	Winson Lee	0501K2
The Effect of Rigid vs. Flexible Spinal Orthosis on the Clinical Efficacy and Acceptance of the Patients with Adolescent Idiopathic Scoliosis	Man Sang Wong	0501K3
Application of Ankle-foot Orthoses Following Stroke: Update and Future	Chih-Kuang Chen	0501K4
Orthotic Management of Myelodysplasia	Moon Suk Bang	0501K5
Rehabilitation and Assistive Technology	Eric Tam	0501K6

SUNDAY, MAY 2, 2010**08.30–10.00***Keynote Speech*

Rehabilitation of Combat-Injured Polytrauma (TBI, Amputation and SCI): The U.S. Veterans Health Administration Experience	David Cifu	KS 03-01
Recent Advancement and Management of Spasticity	Anthony Ward	KS 03-02

10.30–15.00*Brain Disorders: Spasticity*

Severe Spasticity (ITB therapy)	Zampolini Mauro	0502A1
Evaluating Functional Outcomes after the use of Botulinum Toxin for Spasticity Post Acquired Brain Injury: An Australian Experience	John Oliver	0502A2
Botulinum Toxin and Intrathecal Baclofen: Concurrent or Sequential Therapies?	Gerard Francisco	0502A3
The Application of Motor Control Assessment in Patients with Spasticity	Simon Fuk-Tan Tang	0502A4
Treatment of Early Post-stroke Upper Limb Spasticity in Asian Patients: Results of a Prospective, Multicentre, Randomized, Double-blind, Placebo-controlled Trial of Botulinum Toxin A Injection	Kong Keng He	0502E1
Comprehensive Management of Spasticity in Cerebral Palsy	Moon Suk Bang	0502E2
Neurophysiological Monitoring of Intrathecal Baclofen Delivery for Control of Spasticity	Dobrivoje Stokic	0502E3
EMG Patterns Induced by Different Angular Velocity in Stroke Patients with Ankle Spasticity	Ta-Sen Wei	0502E4

15.30–17.00*Rehabilitation Technology and Engineering, Geriatric Rehabilitation, Complementary and Alternative Medicine*

Application of Surface Eeg-Based Brain-Machine Interface (BMI) to Rehabilitation Practice	Meigen Liu	050211FP
Can Transcranial Direct Current Stimulation (TDCS) Modify the Resting-state Functional Connectivity of the Motor Cortex?: A Proof of Concept fMRI Study	Gad Alon	050212FP
Efficacy of a Computerized Assessment and Training System for Chronically Dizzy Patients	Chung-Lan Kao	050213FP
Functional Electrical Stimulation to Dorsiflexors and Plantar Flexors During Gait to Improve Walking in Adults with Chronic Hemiplegia	Gad Alon	050214FP
The Effect of Newly-Designed Dynamic Cushion System on Deep Tissue of Human Buttock: A 3D Finite Element Analysis	Shih-Cherng Lin	050215FP
Intensive Training of Chronic Stroke on a Motorized Cycle Combined with Functional Electrical Stimulation (FES): Effect on Locomotion	Gad Alon	050216FP
Malnutrition and Rehabilitation Outcome of Disuse Syndrome: A Retrospective Cohort Study	Hidetaka Wakabayashi	050217FP
Performance on Hornsby Disc Test Predicts Rehabilitation Potential in Cognitively Impaired Elders	Jan Yueh-Chen Hong	050218FP
Walking and Balance Performance in Exercise, Lifestyle Active and Inactive Elderly	Thiwaporn Thawee-wannakij	050219FP

10.30–12.00*Brain Disorders: Speech & Swallowing*

New development in Dysphagia Evaluation	Tai Ryoan Han	0502B1
Effects of Pneumatic Dilation on Cricopharyngeal Function in Patients with Achalasia	Zulin Dou	0502B2
Evaluation and Management in Irradiated NPC Patients with Dysphagia	Tyng-Guey Wang	0502B3
Speech and Language Problems in Preschool Children in Taiwan	Pao-Chuan Torng	0502B4
Recent Trends and Tools in the Assessment of Aphasia in Taiwan	Lu Lu	0502B5
Lingual Kinematics When Speaking at a Fast Rate in Dysarthric and Nondysarthric Individuals Post Stroke	Yea-Tzy Chen	0502B6

13.30–15.00*Molecules Biology*

The Effects of Ultrasound on Tendon Cells	Wen-Chung Tsai	0502F1
Proteomic Research in Ageing and Rehabilitation Medicine	Carl P.C. Chen	0502F2
The Effects of Physical Agents on Musculoskeletal Cells	Chia-Hsin Chen	0502F3
Caveolin-1 Deficiency Reduces Early Brain Injury After Experimental Intracerebral Hemorrhage	Che-Feng Chang	0502F4FP

The Cross-talk Between Transforming Growth Factor-beta1 and Ultrasound-induced Matrix Catabolism During Mechanotransduction of Rat Tenocytes	Yuan-Hung Chao	0502F5FP
Living Muscle Tissues Imaging with Autofluorescence by Using Two Photon Laser Excitation Microscopy (TPEM)	Chien-Cheng Chen	0502F6FP

15.30–17.00*Education and Ethics in Rehabilitation*

Evolving Medical Board Certification in the United States	Joel A. DeLisa	0502J1
Strategies for Undergraduate Education in PRM	John Melvin	0502J2
Submission and Publication of Scientific Articles in Rehabilitation Medicine	Gunnar Grimby	0502J3
Title Missing	Marta Imamura	0502J4
Education and Training of PM & R Professionals in Mainland China	Dahong Zhuo	0502J5
Resident Training of PM & R in Taiwan	Alice MK Wong	0502J6
Older People's Acceptance of Falls Prevention Education	Moreena Kwa	0502J7FP
Rehabilitation Doctors' Attitudes Towards Ethics Issues	Julia Patrick Engkasan	0502J8FP

10.30–12.00*Electrodiagnosis*

Pitfalls and Pearls in Nerve Conduction Study and Needle EMG	Shin J. Oh	0502C1
Peripheral Nervous System Electrophysiology: Reporting Procedures, and Pitfalls	Gulseren Akyuz	0502C2
Post Polio: Etiology, Diagnosis and Treatment	Gunnar Grimby	0502C3
Peripheral Nerve Electrodiagnosis in Rehabilitation Medicine	Zongyao Wu	0502C4
On-nerve Needle Nerve Conduction Study: Histological Basis of NCS, Conversion Factor, and Its Clinical Relevance	Shin J. Oh	0502C5

13.30–15.00*Pain Management: Part 3*

Pain Management	Marta Imamura	0502G1
The Application of Surface Electromyography on Treating Lumbar Disc Herniation	Jingsong Mu	0502G2FP
Effect of Sitting Postures on Lumbar Multifidus and Internal Oblique Fatigue	Pattanasin Areudomwong	0502G3FP
Increased Both Contractile Subunit Protein Phosphorylation Signaling and Endplate Noise Prevalence in Myofascial Trigger Spots of Rabbit Skeletal Muscle	Ta-Shen Kuan	0502G4FP
Comparison of Mire and Traditional Physical Therapy for the Inhibition of the Irritability of Myofascial Trigger Spot of Rabbit Skeletal Muscle	Wei-Chih Lien	0502G5FP
The Characteristics of Polysomnographic Findings Among the Patients with Chronic Neck-shoulder Pain	Hung-Shen Chen	0502G6FP
The Immediate Effects of A Single Thoracic Manipulation on Cervical Range of Motion and Pain in Patients with Chronic Mechanical Neck Pain: A Randomized Controlled Trial	Thavatchai Suvarnnato	0502G7FP
Intra-Articular Botulinum Neurotoxin Type a for Advanced Knee Osteoarthritis	Chen-Liang Chou	0502G8FP
Occipital Nerve Stimulator Therapy for a Refractory Cervicogenic Headache	Linqiu Zhou	0502G9FP

15.30–17.00*Pain Management: Part 4*

Pictorial Guides to Myofascial Pain	Yoon Kyoo Kang	0502K1
Various Interventions in Myofascial Pain	Angela B.M. Tulaar	0502K2
Pathophysiology of Myofascial Trigger Point	Ta-Shen Kuan	0502K3
Diagnostic Ultrasound to Myofascial Trigger Point and Taut Band	Hsin-Shui Chen	0502K4
Three-dimensional Real Time Sonographic Morphologic Assessment of Human Myofascial Pain During Needling: Demonstration of a Pilot Study	Hung-Jih Hsu	0502K5
Myofascial Trigger Points in the Early Life	Mu-Jung Kao	0502K6

10.30–17.00*Pediatric Rehabilitation*

GABAA Receptor Expression in Patients with Spastic Cerebral Palsy	Chang-Il Park	0502D1
Longitudinal Studies on the Developmental Functions and Clinical Variables in Children Born with Prematurity	Suh-Fang Jeng	0502D2
Advances in Measurement Methods for Children with Developmental Delay in Taiwan	Hua-Fang Liao	0502D3
Advances in the Application of Botulinum Toxin in Pediatric Rehabilitation	Jeng-Yi Shieh	0502D4
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Practice Pattern Groups in the Pediatric Inpatient Physical Therapy Programs: Preliminary Study	Hsu-Fan Chang-Chien	0502L6FP
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Group-based Physical Therapy Early Intervention for Infants with Developmental Delay: Two Case Reports	Szu-Chieh Lee	0502L8FP

PRE-CONFERENCE WORKSHOP (APRIL 29, 2010)

0429WS4

IMPLEMENTATION OF ICF IN REHABILITATION MEDICINE FROM THE ISPRM PERSPECTIVE***Gerold Stucki***^{1,2,3,4}*¹Department of Health Sciences and Health Policy, University of Lucerne and SPF, ²Swiss Paraplegic Research (SPF), ³ICF Research Branch, WHO FIC CC Germany (DIMDI) at SPF (Switzerland) and ⁴IHRS, Ludwig Maximilian University (Germany)*

The health sector employs four strategies: prevention, cure, support and rehabilitation. The International Classification of Functioning, Disability and Health (ICF) is the basis for the conceptualization of the rehabilitation strategy and is of relevance for curative, preventive and supportive health strategies. The ICF and the ICF-based conceptualization of the rehabilitation strategy are again the basis for the organization of human functioning and rehabilitation research in distinct scientific fields and the development of research capacity with respect to academic training programs, interdisciplinary university centres and national/international collaboration networks. Along with these conceptual developments, there is a wide range of activities in the development of practice tools and applications of the ICF throughout the rehabilitation world. First of all, the ICF can serve as reference for the comparison, selection and further development of existing measures of human functioning. The mapping of measures can now rely on established linkage rules. The development of minimal standards for the assessment and reporting of functioning based on the ICF as a reference has made progress over the last years in cooperation between ISPRM, the ICF Research Branch WHO CC FIC (DIMDI), and WHO. The Brief ICF Core Sets are the standards for reporting and planning of studies as well as for clinical encounters. The Comprehensive ICF Core Sets are the standards for multi-disciplinary assessments for example in the context of rehabilitation medicine. Another important development is the operationalization of ICF qualifiers as a means to directly applying the ICF in clinical practice and research. Under the leadership of the Functioning and Disability Reference Group (FDRG) of the WHO Family of International Classification (WHO-FIC) network, a task force is coordinating the further development of coding rules and specific measurements related to one ICF or more ICF categories.

0429WS4

GETTING TO KNOW ICF, MEASUREMENT TOOLS, OVERVIEW AND UPDATES ON ICF CORE SET DEVELOPMENT***Alarcos Cieza****Institute for Health and Rehabilitation Sciences, Research Unit for Biopsychosocial Health (Germany)*

Functioning and disability are key concepts in the practice of rehabilitation medicine [8]. Thus, the implementation of approaches that describe, assess and evaluate functioning and disability of persons with health conditions in rehabilitation appears to be a priority and presumably will remain so for years to come. The International Classification of Functioning, Disability and Health (ICF) [21], approved by all member states of the World Health Assembly in 2001, is the current agreed-on classification that contains the whole universe of meaningful units necessary to describe the experiences of people in relation to functioning, disability and health. These meaningful units contained in the ICF are called ICF categories and are the units of the classification. There are different challenges when applying the ICF in rehabilitation. One of them is the development of international standards and methodological approaches to facilitate its implementation. The objective of the talks “Overview and updates

on ICF Core Set development” and “Measurement tools” is to present different approaches to address that challenge. The current state of the development of ICF Core Sets as well as their areas of use will be presented. The ICF Core Sets are international standards based on a sound, evidence-based and consensus-driven process involving experts from all over the world. ICF Core Sets have been developed for a number of specific health conditions. In addition, a Generic ICF Core Set that allows the comparison of functioning and disability across health conditions and health-care contexts and that can be applied in the general population is under development. It is also possible to develop measurement standards based on the ICF Core Sets. The corresponding methodological approach will be introduced. It has been developed based on Rasch analyses to identify those ICF categories of a determined ICF Core Set which differentiate among patients with different levels of functioning and disability and that, on the basis of which, a summary score can be created. Based on this methodology clinicians will not only rely on profiles of functioning, which are the starting point for planning treatment, but also on summary scores, which will allow them to estimate the overall level of functioning of patients, to monitor disease and rehabilitation management, and to follow patients along the continuum of care and over a life span. A new methodology developed to construct interval scales for specified ICF categories by integrating items from a variety of patient-oriented instruments will also be shown. This methodology allows the estimation of the value on the ICF qualifier, which is the reference rating scale proposed by WHO to rate the level of a problem in a determined ICF category. It represents a new development in how to measure single ICF categories in a sound way and provides the principles to use the ICF qualifier as a reference metric for instruments that are already used in clinical practice.

0429WS4

ICF-BASED STRATEGY FOR RETURN-TO-WORK AFTER MEDICAL REHABILITATION***Christoph Gutenbrunner****Department for Rehabilitation Medicine, Hannover Medical School (Germany)*

Purpose: Return-to-work rates after medical rehabilitation still are unsatisfactory. Studies show, that they amount only around 55 and 75%. In order to increase return-to-work rates after rehabilitation model for appropriate measures has been developed based on the ICF-model and driven by results of the literature. Two of such strategies are evaluated in pilot studies. **Materials and Methods:** The literature has been reviewed in order to identify barriers for return-to-work after acute disease and in chronic conditions. Additionally studies aiming at an improvement of return-to-work after rehabilitation have been included. In a second step the identified factors were classified according to the dimensions of the ICF. Using the ICF-models strategies for new elements for rehabilitation interventions were identified. Two of the strategies were implemented and evaluated in pilot studies. **Results:** The most relevant barriers for return-to-work identified were psychosomatic comorbidities, lack of motivation and empowerment, insufficient coping strategies, payment of pensions during rehabilitation, lack of communication between rehabilitation and vocational doctors, and insufficient focussing of rehabilitation measures on the requirements of the work place. They can be classified according to the ICF-model mainly as personal and environmental factors. Most important strategies have to overcome the gap between these contextual factors and rehabilitation measures. Two strategies result: the first one aiming at strengthening personal resources of the individual, the second on aiming at focussing all rehabilitation measures to the requirements at the work place including the linking of rehabilitation and occupational activities. After implementing the first strategy in a German

rehabilitation centre, the motivation has been improve significantly compared to a control group. The second approach led to a significant reduction of sick-leaf days compared to a historical control. **Conclusion:** Using a systematic approach based on results of the literature and the ICF-model relevant strategies to increase return-to-work rates could be identified. The implementation of two of these strategies already improved the situation. Based on the conceptual work further strategies should be derived and evaluated.

0429WS4

VALIDITY STUDY OF THE ICF CORE SET IN CHINA

Tao Xu¹, Xiaolin Huang¹, Tiecheng Guo¹, Tiebin Yan², Guangxu Xu³, Tong Wang³, Xiquan Hu⁴

¹Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, ²Sun Yat-sen University, The Second Affiliated Hospital, ³The First Affiliated Hospital of Nanjin Medical University and ⁴The Third Affiliated Hospital of Sun YatSen University (China)

Purpose: To study the validity of the ICF Core Set for 10 of 12 different health conditions in Chinese patients and to identify candidate categories for brief ICF Core Set to be used in China. **Materials and Methods:** This study was a part of the ICF Core Sets multicenter international validation study. It was conducted in 39 different countries and coordinated by the ICF research branch of the WHO collaborating centre for the Family of International Classifications at the Ludwig-Maximilians-University in Munich. This cross-sectional multicenter study involving 10 study centers in China with patients under 10 different health conditions including breast cancer, depression, diabetes mellitus, chronic ischaemic heart disease, low back pain, osteoarthritis, obesity, obstructive pulmonary diseases, stroke and osteoporosis. The comprehensive ICF Core Set of 10 different health conditions were filled in by health professionals. The patients reported their health-related quality of life in the Medical Outcome Study Short Form 36 (SF-36), the Self-administered Comorbidity Questionnaire (SCQ, Sangha, 2003) and condition specific health-status measures such as heart disease health-related quality of life questionnaire (MACNEW) for CIHD patients. Descriptive statistics was used to describe the study population as well as to examine the frequency of patients' problems in each specific health condition and to examine the frequency of patients problems in subsets including socio-economic factors (age, gender and other variables), disease characteristics (disease severity and activity), disease duration, comorbidities etc. Factor analysis and Spearman correlation were performed to test the validity of comprehensive ICF Core Set. The brief ICF Core Set for Chinese patients with CIHD and stroke were developed by using patients interview combined expert's questionnaire investigation. Cronbach, Kendall's W and Spearman correlation were used to test the reliability and validity of the brief ICF Core Set. All analysis was performed with SPSS 11.0 for Windows. **Results:** 913 participating Chinese patients under 10 different health conditions were recruited including 175 breast cancer, 48 depression, 215 diabetes mellitus, 74 chronic ischaemic heart disease, 31 low back pain, 56 osteoarthritis, 83 obesity, 72 obstructive pulmonary diseases, 129 stroke, 30 osteoporosis patients. Those health conditions with sample size over 50 patients were selected for further statistics analysis. Thus the validity of the ICF Core Set for 7 health condition such as osteoarthritis were examined finally. The brief ICF Core Set for Chinese patients with CIHD and stroke have good reliability and validity, the categories of them showed considerable similarity to the previously proposed brief ICF core set. Some discriminatory categories could be elucidated socio-economic factors (age, gender and other variables), disease characteristics (disease severity and activity), disease duration, and comorbidities, etc. **Conclusion:** The present study served as a contribution to the ongoing development of the Brief ICF Core Set for several health condition developed by the ICF research branch of WHO. An ultimate aim is to provide tools that can be applied to describe patients from all over world and that

can be used to compare the level of functioning and disability of the study populations across the studies. The present result should be compared to the results from other countries.

0429WS4

EVALUATION OF PATIENTS WITH GAIT ABNORMALITIES IN PRM SETTINGS BASED ON ICF

Alain Delarque¹, Laurent Bensoussan¹, Jean-Michel Viton¹

¹University Hospital of Marseille (France)

Purpose: Assessment of patients with gait abnormalities in physical and rehabilitation medicine settings. **Materials and Methods:** Clinical examination based on the International Classification of Functioning, Disabilities and Health. Body structure, activities and participation, and environmental factors (physical and human factors) must all be assessed. Qualitative and quantified assessments of gait are part of the activity and participation evaluation. Scales are also used to assess gait activities. **Results:** Our programme leads to understand the underlying mechanisms and the aetiology of the disorders, to obtain quantified gait parameters, to define suitable therapeutic methods, and to follow the course of the disease. **Conclusion:** Clinical evaluation based on ICF leads to improving quality of life.

0429WS4

ICF AND AOCPRM-ESPRM COOPERATION

Alessandro Giustini

Scientific Director Rehabilitation Hospital San Pancrazio (Italy)

To support and develop a truly international cooperation between Europe and Asia-Oceania in rehabilitation, agreeing on a common language and education are essential. Of course the individual socio-political cultural and financial circumstances in each region and country also play a role in developing such international cooperation, especially when national and international health policymakers are involved. The World Health Organisation's ICF is an effective tool for representing various health conditions and disability. The ICF takes into account not only the bio-medical aspects of a health condition, but also the functioning of the individual and other factors. The ICF can also serve as the framework for policy and interventions. The international exchange of scientific information and experience about ICF application as well as a common ICF educational platform (not only for PMR doctors, but also for all rehabilitation professionals) are essential to facilitating the use ICF in rehabilitation. National and international societies (AOSPRM and ESPRM) and scientific events could be used as a vehicle for supporting international cooperation by providing the opportunity to exchange knowledge and experience. The ICF Workshop at the AOCPRM meeting in Taipei takes a big step toward achieving this endeavour.

0429WS4

GETTING TO KNOW ICF

Melissa Selb

Swiss Paraplegic Research (Switzerland)

Purpose: 1. To get to know the ICF model hands-on (with exercises); 2. To acquire basic knowledge of ICF for applying in various settings. **Materials and Methods:** PowerPoint presentation and exercises (paper hand-outs) incl. paper copies of the ICF book. **Conclusion:** The ICF provides an effective framework for evaluating patients in the rehab setting as well as for determining appropriate interventions. The ICF Training will address the following points: 1. Structure and framework of the ICF; 2. ICF categories and how to use them in describing patients (with exercise); 3. ICF qualifiers and how to use them in describing the extent/severity of functioning (with exercise); 4. Creating a categorical profile.

KEYNOTE SPEECH (APRIL 30, 2010)

KS01-01

THE PHILOSOPHY OF REHABILITATION, FROM CELL TO SOCIETY

Gerold Stucki^{1,2,3,4}

¹Department of Health Sciences and Health Policy, University of Lucerne and SPF, ²Swiss Paraplegic Research (SPF), ³ICF Research Branch, WHO FIC CC Germany (DIMDI) at SPF (Switzerland) and ⁴Switzerland and at IHRS, Ludwig Maximilian University (Germany)

With the International Classification of Functioning, Disability and Health (ICF) the World Health Organization (WHO) has prepared the ground for a comprehensive understanding of Human Functioning and Rehabilitation Research integrating the biomedical perspective on impairment with the social model of disability. This poses a number of old and new challenges regarding the enhancement of adequate research capacity. The approaches will be summarized to address these challenges with respect to three areas: the organization of Human Functioning and Rehabilitation Research into distinct scientific fields, the development of suitable academic training programs and the building of university centres and collaboration networks.

KS01-02

COMPLEX REGIONAL PAIN SYNDROME (CRPS): EVALUATION AND TREATMENT

Martin Grabois

Physical Medicine and Rehabilitation, University of Texas Health Science Center, Houston (United States)

This topic is widely discussed and diagnosed. It is vital to understand the pathophysiology of CRPS if one is to understand its evaluation and treatment. This will address in detail with multiple possible theories addressed. The evaluation and its classification have recently been updated. A more comprehensive and specific classification will be presented based on recent research for utilization in the clinical and research diagnosis of CRPS. The treatment of CRPS is in evolution with new proposed treatments which have questionable effectiveness and cost efficacy. This program will address the evidence basis studies on treatment especially based on the proposed pathophysiology of CRPS. New treatments will be explored and critiqued. The educational objectives of this symposium are that on the completion of this activity, the participants will be able to: 1) understand the recent research in the area of CRPS; 2) understand how recent research is changing clinical practice of CRPS; 3) understand the current etiology of CRPS; and 4) understand the current concepts of evaluation and treatment of CRPS.

ORAL PRESENTATIONS (APRIL 30, 2010)

Musculoskeletal Disorders: Musculoskeletal Ultrasonography

0430A1

ROLE OF ELASTOGRAPHY IN NEUROMUSCULOSKELETAL ULTRASOUND***Gi-Young Park****Department of Rehabilitation Medicine, Catholic University of Daegu School of Medicine (Republic of Korea)*

Tissue hardness, the elasticity of the tissue identified on palpation, that is, deformability of the tissue, is determined by the structure and composition of the tissue. Tissue elasticity imaging consists of either an image of estimated elastic modulus or an image of strain in response to external force. The principles of tissue elasticity imaging are as follows. First, tissue compression produces strain and displacement within the tissue. Secondly, Strain is smaller in harder tissue than in softer tissue. Thirdly, we can estimate tissue hardness by measuring the tissue strain induced by compression. Many methods for tissue elasticity imaging are based on static tissue compression, which measure the strain distribution inside a body produced by relaxing or compressing a tissue. Therefore, tissue elasticity imaging does not directly represent tissue elasticity but, rather, tissue displacement and strain. Diverse modalities may be used for tissue elasticity imaging, the most powerful being magnetic resonance elastography. Ultrasound elastography imaging is possible for the evaluation of nearly every tissue and is one of the useful methods to quantify the strain of soft tissue. As conventional ultrasonographic examination, freehand manipulation of the transducer and real-time visualization are required for a practical system of ultrasound elastography. Commercial ultrasound scanners already offered real-time elastography and more to follow. Ultrasound elastography provides information of tissue hardness, in addition to shape or vascularity, which is obtained with conventional ultrasonography. In clinical practice, ultrasound elastography is not used independently but as a supplementary role for conventional ultrasonography. In the technical aspects of ultrasound elastographic examination, high quality of ultrasound elastographic imaging is obtained with the transducer and lesion perpendicular to gravity and light contact using transducer that does not distort the lesion. When excessive compression is applied, a false-negative finding may be observed because relations of nonlinear properties of tissue elasticity are changed. When using ultrasound elastography, it is necessary to include a sufficient area of surrounding normal tissue in the region of interest (ROI) correctly to determine the difference in hardness of the lesion compared with the normal area. In color-scale elasticity images, the scale ranged from purple for tissue with greatest strain (softest tissue) to red for those with no strain (hardest tissue). Green indicated average strain in the ROI. These color-scale elasticity images are superimposed on the corresponding B-mode images so that the ultrasonographer can easily recognize the relationship between strain distribution and the lesion on B-mode images. Ultrasound elastography has potential for enhancing the specificity of ultrasound and mammography for breast cancer detection. Lesions in the prostate, thyroid, pancreas, and lymph nodes have been effectively imaged using ultrasound elastography. The technique may also be possible in the evaluation of diffuse liver disease including cirrhosis and transplant rejection. Tissue elasticity not only varies among different tissues, such as muscle, tendon, and nerve, but seems to reflect disease-induced changes in tissue properties. Therefore, ultrasound elastography is expected as means for providing novel diagnostic information for musculoskeletal disease since the tissue hardness is closely related to its pathology.

Tendons are particularly suitable for ultrasonographic examination. The dynamic imaging of ultrasonography can be used to assess the level of tendon subluxation, and determine the severity of a tendon injury, either partial or complete. We compared ultrasound elastographic findings with gray-scale ultrasonographic findings and evaluated the diagnostic value of ultrasound elastography for detecting small full-thickness supraspinatus tendon tear. Ultrasound elastography was obtained using free hand manipulation. For color-scale elastography, the diagnostic criterion indicative of the full-thickness tendon tear included a lesion with even elastic pattern (diffuse purple or mixed purple, blue or green) involving the full-thickness of supraspinatus tendon. Single-contrast shoulder arthrography was performed by the physiatrist and used as the reference standard for the full-thickness tendon tear. Our results indicate that ultrasound elastography showed higher accuracy than gray-scale ultrasonography in the diagnosis of small full-thickness supraspinatus tendon tear. Therefore, ultrasound elastography should be considered as an additional ultrasonographic method for evaluating small full-thickness supraspinatus tendon tear. Myofascial pain syndrome is a common type of musculoskeletal pain and characterized by trigger points, which are defined as hyperirritable spots within taut bands of skeletal muscle fibers. Myofascial taut band is considered a shortened or contracted muscle fiber band with increased muscle tone. Therefore, myofascial taut band have its higher stiffness compared to the surrounding muscle fiber. Magnetic resonance elastography is a non-invasive MR-based phase contrast imaging technique to image difference in tissue stiffness. Its findings suggest that the stiffness of the taut bands in patients with upper trapezius myofascial pain may be 50–100% greater than that of the nearby surrounding involved muscle or the controls. It may have a potential for objectively characterizing myofascial taut bands that have been detectable only by the clinician's palpation. Ultrasound elastography also showed increase of stiffness in the taut band region of the affected upper trapezius muscle relative to that of the unaffected side in patients with myofascial pain syndrome. In the evaluation of peripheral nerve injury, ultrasound elastography is important not only to appreciate the lesions but also to give more information about the entire nerve structure involved in trauma. In a case with median sensory neuropathy after carpal tunnel steroid injection, focal hyperechoic area in the damaged median nerve was revealed on gray-scale ultrasonography. Ultrasound elastography showed that the stiffness of focal hyperechoic area in the median nerve (red on color-scale elastography) was greater than that of the surrounding nerve tissue (green on color-scale elastography). At 6 months after injection, previous focal hyperechoic area in the median nerve disappeared and showed normal nerve echogenicity on follow-up ultrasonography. In addition, even stiffness of the median nerve (green on color-scale elastography) was noted on follow-up ultrasound elastography. This means that it changed from hard abnormal tissue to soft normal nerve tissue. Therefore, ultrasound elastography can provide the precise information about serial structural changes of the injured peripheral nerve. Ultrasound elastography may have potential for assessing the nature and consistency of lesions including hemorrhage, infection, edema, cyst, lipoma, and tumor. Recent study suggests that ultrasound elastography may be useful in monitoring the severity of lymphedema. I consider that ultrasound elastography can provide us with more information in order to get a precise diagnosis of neuromusculoskeletal disorders. However, ultrasound elastography is recommended as a mean of assessment to complement the conventional ultrasonographic method. It is expected to be a new ultrasonographic technique for the diagnosis of neuromusculoskeletal disease such as tendon tear, nerve injury, myofascial pain syndrome, and lymphedema etc. It may be widely used in the field of neuromusculoskeletal disease for the near future.

0430A2

ELASTOGRAPHY OF PLANTAR SOFT TISSUE PROPERTIES*Chih-Chin Hsu¹, Wen-Chung Tsai², Simon Fuk-Tan Tang²*¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital and ²Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital (Taiwan)

The plantar soft tissue, located beneath the calcaneus and metatarsals, is subject to repeated load bearing and functions as an efficient shock absorber during walking and running. It contains organized fibrous compartments that retain the adipose tissue. The fibrous septa extending from the skin to the perichondrium is organized into superficial small chambers, the microchamber, and greater chambers, the macrochamber, situated deep in the small chamber stratum. There is increasing interest in measuring the plantar soft tissue mechanical properties, which provide not only information regarding the material itself but also indicate the presence of a disease. Elastic modulus (E), representing tissue stiffness, and energy dissipation ratio (EDR), representing tissue energy absorption, are parameters frequently used in describing linear and non-linear tissue properties, respectively. In our previous observations, the plantar soft tissue thickness, E and EDR increased in the aging process. The tissue properties are also velocity dependent, which character is not seen in elderly individuals. The above tissue properties changes may be responsible for easy feet pain in aging persons. The diabetic plantar soft tissue has absorbed higher energy than healthy subjects. This phenomenon may contribute to the development of foot ulcers in diabetic patients. Elastography is a non-invasive method to detect stiffness or strain images of soft tissues in response to external disturbance. It is, therefore, considered to be an ideal examination to detect inhomogeneous plantar soft tissue properties. Microchambers tissue properties and physiological functions are thought to be different from those of macrochambers owing to the different structures. The stiffness of the two different layers in heels in healthy young subjects has been quantified. The tissue stiffness of the microchamber is nearly 10 times of that in the macrochamber. The macrochamber plays a major role in the heel-pad tissue resiliency, i.e., the ability of the tissue to recover its shape after deformation caused by compression. This layer may be responsible for the cushioning effect in the heel pad during walking. The microchamber seems to function as an inherent heel cup that maintains most of the macrochamber layer beneath the calcaneus and prevents excessive macrochamber layer deformation. Heel pad tissue properties are altered heterogeneously in people with diabetes. Increased macrochambers but decreased microchambers stiffness may cause diminished cushioning capacities in diabetic heels.

0430A3

APPLICATION OF ULTRASOUND IN SPORTS INJURIES*Yi-Pin Chiang*

Department of Rehabilitation Medicine, Mackay Memorial Hospital (Taiwan)

High-frequency high-resolution ultrasound has been widely used in the past decade for the musculoskeletal injury. With higher frequency of the transducers and advanced processing speed of the machines, superficial structures could be clearly seen under the real-time ultrasound scanning. The A4 size or pocket-sized portable ultrasound machine are available now. It is very convenient to bring the machine to the field to scan for the sports injury. Application of ultrasound to sports injury may include detection and localization of the lesions, clarify the staging and severity of the injury, and help in setting the program for treatment and rehabilitation. Superficial muscles, tendons, ligaments, bursae and superficial bony structures are easily depicted in the ultrasound. Panoramic view yields wider vision of the lesions and facilitates the understanding of ultrasound images. A dynamic study of ultrasound to the lesions is very important in sports medicine. With dynamic scanning, interaction of

lesion to the surrounding structures could be demonstrated so that the function of the lesion could be understood. Ultrasound-guided aspiration for the hematoma in the injured muscles can be immediately applied in the field to get better outcome. **Conclusion:** Ultrasound is a very convenient and useful tool for sports injury.

0430A4

NON-INVASIVE MEASUREMENT OF VASCULAR MECHANICAL PROPERTIES*Yio-Wha Shau, Sun-hua Pao*

Industrial Technology Research Institute (Taiwan)

Dynamic imaging of ultrasonography provides a convenient real-time diagnostic tool for clinical research. A novel interactive image analysis technique has been developed to quantify the biomechanical properties of blood vessels in-vivo. Automatic edge-detection techniques of vascular walls and the depth compensation of ultrasound image were implemented. The M-mode images were used to evaluate the vascular energy dissipation ratio (EDR) with a higher spatial resolution. Also, the sequential B-mode images offer the vascular stiffness in different radial direction. We also developed a non-invasive technique to detect the change of intima-media thickness (IMT) at common carotid artery (CCA). With the lumen pressure measured at brachial artery (BA), the CCA relative stiffness between the intima-media and the adventitia could be calculated. Our present method discloses a non-invasive method to evaluate the arterial stiffness index of normalized thickness from its longitudinal scanning. Both the arterial strain and intima-media thickness (IMT) can be detected quickly with high repeatability and reproducibility. The IMT on common carotid artery of DM (diabetes mellitus) patients ($n=28$) was 0.52 ± 0.18 mm and slightly larger than that of the normal control ($n=36$) ($p<0.0001$). The stiffness of normalized thickness in DM patients was also higher than that of the normal group ($p<0.001$). The stiffness of normalized thickness can distinguish the DM patients from CAD patients even if their artery had the similar stiffness β or incremental stiffness. The present invention is suitable for screening the coronary artery disease (CAD) or the disorder of metabolism.

0430E1FP

REHABILITATION POTENTIALS FOLLOWING FOOT DROP AMONG LEPROSY CURED PATIENTS*Ajit Kumar Varma¹, Akshay Kumar Sinha², Arun Kumar³, Naresh Prasad*¹Patna Medical College (India)

Purpose: Foot problems in leprosy subjects are of major concern. Leprosy neuritis affects nerves where they are close to the skin and pass through a narrow fibro-osseous canal. In the leg this involves the lateral popliteal nerve at the neck of the fibula which leads to foot drop, and the posterior tibial nerve in the tarsal tunnel which produces anaesthesia of the sole. Resultant effect is a high stepping gait. The purpose is to achieve heel to toe gait and thereby improving the walking pattern among the leprosy cured patients. **Materials and Methods:** 20 cases of Foot drop were selected for the reconstructive surgery procedure who fulfilled the selection criteria. Muscle charting and other routine investigations were done besides the sensory evaluation. Routine pre-operative vigorous exercise therapy was given for a minimum of two weeks to strengthen the Tibialis Posterior tendon. The Post operative tendon training exercise therapy was started after the third week of operation. A four week schedule rehabilitation module was vigorously applied to all patients. MCR foot orthoses was supplied to them to protect their feet while their walking after the completion of tendon training exercises. **Results:** All patients reported for their follow up at the end of 3rd and 6th months. Foot pressure image pattern in preoperative and postoperative were compared over different time duration. The heel to toe gait pattern was achieved in 80% of the cases. Recurrent inversion was evident in one case only. Mean active dorsiflexion was more

than 20 degree. **Conclusion:** Tibialis posterior transfer with open elongation of tendo Achillis gives excellent results in foot drop due to leprosy neuritis. Immobilisation for three weeks in a plaster cast in maximum dorsiflexion is sufficient, with full weight-bearing and active plantar flexion starting six weeks after operation. Results are quite encouraging. As it brings improvement in their walking pattern and thereby the quality of life, the rehabilitation plan should be encouraged among Leprosy cured patients.

0430E2FP

THE PREVALENCE OF MUSCULOSKELETAL DISORDERS IN THE TEXTILE OCCUPATION, THAILAND

Petcharat Keawduangdee¹, Rungthip Puntumethak², Yodchai Boonphakop², Sawitri Wanpen²

¹Physical Therapy Program, Graduate School, Khon Kean University and ²Back, Neck and Other Joint Pain Research Group, Khon Kean University (Thailand)

Background: Work-related musculoskeletal disorders are the common health problems which can make people discomfort during doing activity or during working and could affect the quality of their life, family and society. It can arise in every occupation especially in the industries and also involved in textile occupation, too. The knowledge of prevalence of musculoskeletal disorder is an important basic information and can be a potential practical guidance to prevent musculoskeletal disorders which will be a good effect for people and economy in their country. **Purpose:** To examine prevalence of musculoskeletal disorders in the textile occupation in Khon Kean, Thailand. **Materials and Methods:** Three hundred and fifty-five workers of several divisions of the textile industry were participated in this study. The participants were asked to fill out the Standard Nordic Questionnaire in Thai version. **Results:** This study found that the top three of the most prevalence of joint pain in seven days were shoulder pain (40.58%, 95% CI 35.37–45.79), low back pain (36.95%, 95% CI 31.80–42.10) and hip pain (33.83%, 95% CI 28.75–38.90), respectively. The top three of the most prevalence of joint pain in twelve months were low back pain (34.23%, 95% CI 29.11–39.36), shoulder pain (33.43%, 95% CI 28.37–38.49), and hip pain (29.39%, 95% CI 24.45–34.33), respectively. And the top three of the most disability which affected by pain were low back pain (28.31%, 95% CI 23.44–33.18), hip pain (22.92%, 95% CI 18.40–27.43), and shoulder pain (22.02%, 95% CI 17.57–26.48), respectively. **Conclusion:** The findings of the study demonstrated that low back pain was the most frequent problem that was found in the textile industrial workers and could make them absent from work. Therefore it would be worth to further investigate the risk factors of this problem in the textile industrial workers in order to prevent them suffering from the disorder.

0430E3FP

FUNCTIONAL OUTCOMES OF MAJOR LOWER LIMB AMPUTATION 1994–2006: A MODERN SERIES

Jane Wu, Peter Chan

Department of Rehabilitation, Prince of Wales Hospital (Australia)

Purpose: To describe the outcomes with major lower limb amputation in one institution in terms of morbidity, rehabilitation potential, discharge destination and function. **Materials and Methods:** The medical records of all consecutive patients who underwent major lower limb amputations at Prince of Wales Hospital (POWH) between 1994 and 2006 were examined and demographic and clinical data were extracted. Those who were had toe and partial foot amputations or multiple limb loss were excluded for this analysis. Ethics approval was obtained. **Results:** During a 12-year period, 215 major lower extremity amputations were performed on 208 patients. This

cohort consisted of 139 men (64.7%) and 76 women (35.3%). The average age was 70 years (SD 15.5) with a range of 17 to 95 years. In this series of patients, 182 of them (85%) were single amputees and the remainder bilateral amputees (15%). Most amputations were performed for indications related to ischaemia secondary to vascular insufficiency with or without diabetes (76.3%). Other indications included trauma (4.7%), infection (9.3%) and tumor (9.8%). The median length of stay in the acute ward is 32 days (mean 44 days, range 4 to 212 days). Significant wound infection (those requiring antibiotics) occurred in 64 (29.8%) of amputations. Significant wound breakdown requiring re-operation occurred in 23%. Seven (3.3%) patients developed thromboembolism during hospitalization. The mortality rate during admission was 11.6%. Of the 190 patients who survived their acute admission, 135 patients (71%) were assessed by a rehabilitation physician to have rehabilitation potential. Fifty-five patients (29%) were transferred to nursing homes straight after medical stabilisation without having rehabilitation. The subgroup selected for inpatient rehabilitation at POWH ($n=112$) are further analysed for their rehabilitation outcomes. The median length of stay in rehabilitation is 44 days (range 6–176 days). The outcomes of inpatient rehabilitation of amputees are very pleasing: 79% are able to be discharged home and 9% to a hostel; only 12% required nursing placement after a period of rehabilitation. In this group, 44% achieved community ambulation with a prosthesis, 20% achieved household ambulation with a prosthesis, 12% used a prosthesis to transfer or exercise only, 24% was wheelchair bound and not able to use a prosthesis. Eight-one percent of the patients were prescribed a definitive prosthesis as part of their rehabilitation programme. **Conclusion:** Major lower limb amputations continue to give rise to extensive length of stay and perioperative morbidity and mortality in the patient population with peripheral vascular disease as the major indication for such operation. Nearly one third have no rehabilitation potential post-amputation. Those that are accepted into rehabilitation do well in terms of their functional outcomes with the vast majority achieving independent mobility and self-care.

0430E4FP

EFFECTS OF DISC DEGENERATION AND MUSCLE DYSFUNCTION ON THE CERVICAL SPINE STABILITY – FROM IN VITRO STUDY USING PORCINE MODEL

Chih-Hsiu Cheng¹, Pei-Jing Chen², Ya-Wen Kuo², Jaw-Lin Wang²

¹Department of Physical Therapy, Chang Gung University and ²Institute of Biomedical Engineering, National Taiwan University (Taiwan)

Purpose: This in vitro biomechanical study was to investigate the interactive effects of the degenerative spinal column (disc degeneration) and degenerative spinal muscles (muscle dysfunction) on the cervical spine stability. **Materials and Methods:** Nine cervical spines (C2–T1, length: 14.9 ± 0.8 cm) from 6-month-old swine were used. The in vitro flexibility test was applied to examine the stability of all specimens under five simulated muscle recruitment conditions before and after experiment-induced disc degeneration. The mechanically simulated cervical muscles were paired sternocleidomastoid (SCM), splenius capitis (SPL), and semispinalis capitis (SSC). The five patterns of muscle recruitments included: no muscle recruitment, normal muscle recruitment, and SCM/SPL/SSC muscle dysfunctions. The untreated intervertebral disc was regarded to be intact spinal column, and the degenerated disc in this study was simulated by the surgical nucleotomy at the C5–C6 and C6–C7 levels. Neutral zone (NZ) and range of motion (ROM) was measured from the load-displacement curve in the sagittal plane to determine the spinal stability. **Results:** The results showed that: 1) the NZ and ROM of both intact and degenerative spinal columns were greatest under no muscle recruitment, followed by SSC dysfunction, SCM dysfunction, SPL dysfunction, and were smallest under normal muscle recruitment; and 2) the NZ and ROM showed no significantly difference between intact and degenerative spinal columns under muscle recruitment conditions.

Conclusion: The main findings of this study were: 1) the normal recruitment of cervical muscles strongly maintains the stability of both intact and degenerative spinal columns; 2) the muscle dysfunctions did not further deteriorate the stability of degenerative spinal column; and 3) the three muscle dysfunctions showed different degrees of inefficiency in stabilizing the spine compared with the normal muscle recruitments. Accordingly, the muscle dysfunction is a more crucial factor than the disc degeneration that causes the spinal instability. This study suggested that the clinicians should emphasize the muscle training or education to improve the spinal stability in elderly with spinal degeneration.

0430E5FP

NITRIC OXIDE CONCENTRATIONS IN CSF ARE POSSIBLE PREDICTORS OF POSTOPERATIVE ADL IMPROVEMENT IN LUMBAR CANAL STENOSIS

Shinji Kimura¹, Kana Aoki¹, Noboru Hosaka², Hiroshi Denda³, Naoto Endo³, Mikio Muraoka⁴

¹Rehabilitation center, Niigata Univ. Medical and Dental Hospital, ²Dept. of Orthopedic Surg., Niigata Rousai Hospital, ³Dept. of Orthopedic Surg., Niigata University and ⁴Dept. of Rehabilitation, Kameda-Daiichi Hospital (Japan)

Purpose: Nitric oxide (NO) facilitates transmission of nociceptive signals in the spinal cord of animals. We reported that the concentration in preoperative CSF NO metabolites (NO₂⁻ and NO₃⁻: NO_x) are quantitative predictors of postoperative pain relief in degenerative lumbar diseases (DLD). Furthermore, the NO_x in patients with spinal cord injury correlates with neurologic severity and neurologic recovery rate postoperatively, or with conservative treatment. The purpose of this study was to examine whether the preoperative concentration of NO_x predict the postoperative improvement of ADL (activities of daily living) in lumbar canal stenosis (LCS). **Materials and Methods:** The LCS group comprised of 55 patients (27 males, 28 females, age: 50–84 years). The surgical procedures comprised of laminectomies ($n=51$) and fenestrations ($n=4$). The concentration of NO_x in CSF was measured based on the Griess method. The pre- and postoperative pain-related Japanese Orthopaedic Association score (JOA) (low back pain, leg pain, gait abnormality, and sensory disturbance, total 11 points), and ADL-related JOA (disabilities when rolling over, standing up, vending forward to wash the face, continuous standing, long standing sitting, lifting the heavies, gait, total 14 points) were examined. The statistical correlations were examined between the preoperative concentration of NO_x and the Hirabayashi's recovery rate of pain-related JOA and ADL-related JOA at postoperative month 7. Hirabayashi's recovery rate was calculated according to the formula $(\text{post JOA} - \text{pre JOA}) / (11 \text{ or } 14 - \text{pre JOA}) \times 100 (\%)$. **Results:** Hirabayashi's recovery rate of pain-related JOA and ADL-related JOA was 49 ± 4 (means \pm SE) %, 55 ± 6 %, respectively. There was a significant negative correlation between preoperative NO_x ($8.3 \pm 0.8 \mu\text{M}$ in average) and Hirabayashi's recovery rate of Pain JOA ($r = -0.42, p < 0.005$) and ADL-related JOA ($r = -0.4, p < 0.01$). **Conclusion:** The data in this study suggest a close relationship between the pain relief and ADL improvement in LCS. In conclusion, the preoperative NO_x would be possible predictors of postoperative ADL improvement in LCS.

0430E6FP

PARADIGM SHIFT IN THE MANAGEMENT OF BACK PAIN

M Taslim Uddin

Department of Physical Medicine and Rehabilitation, BSM Medical University (Bangladesh)

Back pain is the fifth most common reason for physician visits. About nine out of ten adults experience back pain at some point in their life, and five out of ten working adults have back pain every

year. In up to 85% of people with low back pain, despite a thorough medical examination, no specific cause of the pain can be identified. For 90% of people, even those with nerve root irritation, their symptoms will improve within two months no matter what treatment is used, even if no treatment is given. The trend of practice was prescribing bed rest for days together and this long period of inactivity further aggravated the situation. Earlier topics on back pain shows requesting of number of investigations; which may not be appropriate at the stage and state of the disease. Now the approach is changed and literatures are in favour of treating back pain keeping the patient active. This saves working hours and potentiates patient's functional abilities. Back pain in special situations like pregnancy, chronic kidney disease or in some other situations need special attention. This article high lights overview of the problem with graded approaches of evaluation and management.

0430E7FP

EFFECT OF TAPING FOR PATIENTS WITH LATERAL EPICONDYLITIS AND MOTION TRACKING ON ELBOW TISSUE FROM ULTRASONIC IMAGE SEQUENCE

Pei-Chun Hsieh, Shu-Min Chen, Jin-Wen Lei, Hsiu-Yun Hsu

Department of Physical Medicine and Rehabilitation, National Cheng Kung University, Tainan (Taiwan)

Purpose: Kinesio tape is an alternative treatment in many musculoskeletal disorders, and its effect on lateral epidondylitis has been inconclusive. This pilot study was aimed to investigate the effect of Kinesio-tape as a treatment method for patients with lateral epidondylitis. **Materials and Methods:** In this study, Kinesio-Tape® (Kinesio Tex Tape, made in Japan) was applied on patients with lateral epidondylitis. Fourteen patients were recruited. The exclusion criteria were as following: subjects with cervical radiculopathy, with skin lesion or wound in the forearm, and impaired cognitive function. The subjects were divided into two groups; one was treated with Kinesio-tape (experimental group), and the other one was treated with ordinary commercialized 3M tape (control group). The kinesio-tape was applied as Kase method on extensor carpi radialis muscle and was left on for 24 hours. The evaluation tools were both clinical and ultrasonic assessments. The clinical parameters, including visual analogue scale (VAS), pressure pain threshold (PPT) & maximal pain tolerance (MPT) and grip power (GP), were recorded and analyzed. There were nine subjects in the Kinesio tape group originally. Only six out of nine subjects were evaluated based on the clinical parameters, the other three subjects were excluded due to diverse baseline condition. The Dynamic ultrasonic series of the elbow was recorded, and the motion tracking, which was based on optical flow method, was conducted meanwhile. The obvious perimysium, which was hyperechoic on sonogram, was used as a landmark to estimate the motion of muscle. Three subjects were excluded from the Kinesio tape group in statistic analysis due to poor image quality on sonogram. The proposed method of two stages MFBM (MultiFeature Block Matching) with Kalman prediction was used to perform motion tracking from 3D (2D+t) muscular ultrasound images. The motions with and without Kinesio-Taping were compared. The above data were collected at the following time points: pretreatment, immediately after application of tape, 24-hour-application before removal of the tape, and 24-hour-application after removal of the tape. **Results:** It was found that the mean VAS decreased, and the mean pain threshold increased in both Kinesio-tape group and 3M tape group immediately after treatment and 24 hours after treatment. The mean grip power had little change in Kinesio-tape group, but increased in the 3M tape group. The motion of muscle on the ultrasonic images decreased in both kinesio-tape & 3 M tap group, especially in the 3M tape group. **Conclusion:** Both Kinesio-tape and 3M tape have therapeutic effects on the patients with lateral epidondylitis both subjectively and objectively. There were no significant differences in these effects between the Kinesio-tape & 3M tape groups. A placebo effect of the tape could

be observed. Regardless, the findings in motion of muscle in both groups showed some restricted movement. More limitation of 3M tape than Kinesio-tape was proposed based on ultrasonic tracking analysis in our study. Further studies were required to provide more comprehensive evaluation to concur the effect of Kinesio-tape as a treatment on patients with lateral epicondylitis.

0430E8FP

ULTRASOUND-GUIDED INJECTION THERAPY FOR FROZEN SHOULDER

Sheng Bi, Yu-kun Luo, Jun Li

The Chinese PLA General Hospital (China)

Purpose: Frozen shoulder is a common disease in the elderly. The main lesions are long head biceps tendon, subacromial bursa, rotator cuff and coracohumeral ligament and the long head of biceps tendon lesions are the most common. Painful period of treatment are treat by oral medication, physical therapy, manipulation and injection. Adhesion period of treatment follows the way lysis, joint capsule expansion and arthroscopic release. Self-limited remission last for 1.5–2 years. This study reported the use of ultrasound-guided injection of frozen shoulder treatment. **Materials and Methods:** Twenty-two patients, 4 men and 17 women, aged 42–76 years, mean age 56.3 ± 10.0 jointed the study. The shortest duration was 10 days, and the longest was up to 3 years. Clinical manifestations were shoulder pain and restricted the range of motion. Treatment was in the ultrasound-guided injection of triamcinolone acetonide 40 mg, 2% lidocaine hydrochloride 5 ml. Prior to clinical evaluation for the treatment, VAS score and Constant & Murley shoulder function scores were carried out. Re-assessment was completed in 7–14 days after treatment. Two patients were dropped out and 19 patients were completed the assessment. Paired t test was carried out before and after treatment. **Results:** VAS score was 7.0 ± 1.9 before treatment, 3.4 ± 2.6 after treatment ($p < 0.01$). Constant & Murley shoulder joint function score was 34.6 ± 12.7 before treatment, 44.4 ± 13.7 after treatment ($p < 0.01$). **Conclusion:** Ultrasound-guided therapy has the following advantages of precision-guided visualization of invasive treatment, diagnosis and treatment can be conducted concurrently, green therapy, no radiation side effects and significantly reduce drug use. Therefore, patients in this group were to obtain a more desired effect.

0430E9FP

COMPARISON OF ELASTOGRAPHY AND GRAY-SCALE ULTRASONOGRAPHY IN DIAGNOSING SMALL FULL-THICKNESS SUPRASPINATUS TENDON TEAR

Gi-Young Park, Jeong-Gu Won

Department of Rehabilitation Medicine (Republic of Korea)

Purpose: To compare elastographic findings with gray-scale ultrasonographic findings and to evaluate the value of elastography as a diagnostic method for detecting small full-thickness supraspinatus tendon tear. **Materials and Methods:** Ultrasonography of the shoulder was performed in 48 patients (32 females and 16 males; mean age 58 years; age range, 40–82 years) who showed symptoms of unilateral shoulder pain. A physiatrist performed the gray-scale ultrasonography and elastography together and made the real-time ultrasonographic diagnosis. Elastography was obtained using free hand manipulation. For color elastography, the criterion indicative of the full-thickness tear included a lesion with even elastic pattern (diffuse purple or mixed purple, blue or green) involving the full-thickness supraspinatus tendon. Single-contrast arthrography was performed by the physiatrist and used as the reference standard for the full-thickness supraspinatus tendon tear. The definitive diagnosis of full-thickness supraspinatus tendon tear was made if the contrast medium was leaked out from the glenohumeral joint to the subacromial subdeltoid bursa. **Results:** The mean length of the

full-thickness supraspinatus tendon tear was 9.1 mm on gray-scale ultrasonography. Arthrography revealed 14 full-thickness tears, 7 partial-thickness tears, and 27 shoulders without tear. In the 14 small full-thickness tear identified by arthrography, gray-scale ultrasonographic diagnosis was correct in 7 (50.0%), and elastographic diagnosis in 12 (85.7%) shoulders. In the 7 partial-thickness tear and 27 no tear identified by arthrography, gray-scale ultrasonographic diagnosis was correct in 28 (82.4%), and elastographic diagnosis in 29 (85.3%) shoulders. Gray-scale ultrasonography showed sensitivity, specificity, accuracy, positive predictive value, and negative predictive value for small full-thickness supraspinatus tendon tear of 50.0%, 82.4%, 72.9%, 53.8%, and 80%, respectively, and elastography 85.7%, 92.9%, 85.4%, 66.7%, and 93.3%, respectively. **Conclusion:** Our results indicate that elastography was more accurate than gray-scale ultrasonography in the diagnosis of small full-thickness supraspinatus tendon tear. Therefore, elastography should be considered as an additional ultrasonographic method in diagnosing small full-thickness supraspinatus tendon tear.

Interventional Rehabilitation

0430J1

AN INTERVENTIONAL PM&R APPROACH TO SPINAL PAIN: EVIDENCE-BASED APPROACH AND BEYOND

David X. Cifu

Center for Rehabilitation Sciences and Engineering, Virginia Commonwealth University (United States)

Purpose: To provide an overview of the interventional physiatric approach to acute and chronic spinal pain utilized by an academic tertiary care center in the United States, with particular emphasis on the evidence-based underpinnings of the approach. Also reviewed will be the current resident and fellowship training program activities in interventional pain management employed at our University. **Materials and Methods:** Didactic lecture with Powerpoint presentation and fluoroscopic video presentation. **Results:** This presentation will be appropriate for the novice and intermediate-level clinician in PM&R and pain management, introducing a clinical management paradigm for the common spinal pain conditions that may be amenable to therapeutic injections and procedures and ongoing research protocols and findings. **Conclusion:** This presentation will offer cutting edge information on interventional pain management care that will be of practical use to attendees.

0430J2

ULTRASOUND DIAGNOSIS AND NEW TREATMENT IN ADHESIVE CAPSULITIS (FROZEN SHOULDER)

Gi-Young Park

Department of Rehabilitation Medicine, Catholic University of Daegu School of Medicine (Republic of Korea)

Adhesive capsulitis of the shoulder is an insidious, painful condition that results in a gradual restriction of movements. Adhesive capsulitis is a poorly understood musculoskeletal disease that can be disabling. Despite extensive studies, the etiology is still unknown. It is characterized by a spontaneous onset of shoulder pain accompanied by progressive limitation of both active and passive glenohumeral joint movements, especially external rotation. The natural history of the disease is characterized by three distinct phases: freezing or painful, frozen or stiff, and resolution or thawing. The diagnosis of adhesive capsulitis is based on a thorough history taking and careful physical examination and is one of exclusion from other painful conditions of shoulder. In the early painful stage, it can be difficult clinically to differentiate adhesive capsulitis from other causes of chronic shoulder pain including

rotator cuff tear, shoulder impingement, and subacromial subdeltoid bursitis. Accurate diagnosis is important for effective treatment, as up to 50% patients will not have their full range of movement at long-term follow-up. Physical examination is characterized by the painful loss of both passive and active range of shoulder motions. Arthrography has been considered the imaging technique of choice for the diagnosis of adhesive capsulitis, demonstrating reduction of joint volume less than 10 ml, obliteration of the axillary recess, and irregularities of a capsular insertion at the humeral anatomical neck. Magnetic resonance (MR) imaging and MR arthrography may be useful in the diagnosis of adhesive capsulitis. MR imaging findings are reported, including thickening of the joint capsule in the axillary recess and the presence of inflammatory tissue at the rotator cuff interval that enhances after gadolinium enhancement. The characteristic findings of MR arthrography include thickening of the coracohumeral ligament and the joint capsule in the rotator cuff interval. However, they are not routinely needed for the diagnosis of adhesive capsulitis. Ultrasonography of the shoulder is one of the most common examinations performed in musculoskeletal disorders. Ultrasonography for adhesive capsulitis can provide an early accurate diagnosis, allowing an effective treatment plan. The limited supraspinatus tendon movement during dynamic examination is described as a sensitive and specific sign of adhesive capsulitis. Additional ultrasonographic signs include fluid collection within the sheath of the long biceps tendon and hypoechoic soft tissue around the long biceps tendon and the subacromial subdeltoid bursa. Increased vascularity and hypoechoic change within the rotator cuff interval on gray-scale and color Doppler ultrasonography are useful findings for the ultrasonographic diagnosis of adhesive capsulitis. Coracohumeral ligament is thickened and shortened due to fibroblastic proliferation in adhesive capsulitis, restricting external rotation of shoulder. Ultrasonography is a useful imaging modality for coracohumeral ligament depiction. The thickness of the coracohumeral ligament is significantly greater in adhesive capsulitis than in the asymptomatic and painful shoulders. A thickened coracohumeral ligament is highly suggestive of adhesive capsulitis. Two anatomic reference points taken on ultrasonography are used to measure shoulder external rotation: the coracoid process and the lesser tuberosity of the humerus. The distance between two points is measured using ultrasonography at the end range of active external rotation in the symptomatic and asymptomatic shoulders. The ultrasonographic distance of the asymptomatic shoulder is significantly greater than that of symptomatic shoulder. Ultrasonography is recommended as a diagnostic tool to measure the degree of restriction of shoulder movement in patients with adhesive capsulitis. The long period of shoulder pain and disability has been the reason for many different types of treatment. The importance of stage of disease in treatment selection may reflect the mixed results in the clinical trials. According to different distinct stages, non-operative treatments such as anti-inflammatory medication, physical therapy including therapeutic exercise, mobilization and stretching, translational manipulation, intra-articular corticosteroid or sodium hyaluronate injection, suprascapular nerve block, hydraulic distention arthrography, and combination treatment etc, have been performed with good results. Treatments including manipulation under general anesthesia, arthroscopic capsular release, and open surgical capsular release are recommended for the patients who do not respond to or who demonstrate little improvement after adequate conservative treatment. For patients who are unable to tolerate the pain and disability associated with the disease, manipulation under anesthesia is the most reliable treatment to improve the range of movement. It is recommended if the functional disability persists in spite of adequate non-operative treatment for six months. Reported complications associated with manipulation under general anesthesia include fracture of the humerus and iatrogenic, intra-articular shoulder lesions. Patients with refractory adhesive capsulitis typically suffer from significant pain and progressively diminishing shoulder function. Serial hydraulic distention with intra-articular steroid injection is performed using arthrography before the point of capsular rupture. Thereafter, capsular stretching is done using Cyriax's technique. Capsular stretching is not manipulation but rather mobilization. In this way, the axillary

recess of the capsule, where most of the adhesions lie, is elongated. The axillary recess is usually ruptured on arthrography after the procedure. All patients improve significantly in the outcome measures including passive range of shoulder motions, visual analog pain score, and Cyriax stage of adhesive capsulitis after the treatment. The treatment is well tolerated in the patients, and no complications are noted. Capsular stretching in combination with serial hydraulic distention is shown to be efficacious in the treatment of refractory adhesive capsulitis and to present a low risk of iatrogenic injury. When selecting the treatment for adhesive capsulitis, it is extremely important to consider the patient's symptoms and stage of the disease because each patient's treatment should be individualized and tailored appropriately to patient's needs.

0430J3

ULTRASOUND GUIDED INJECTION TREATMENTS IN REHABILITATION MEDICINE

Carl P.C. Chen, Simon Fuk-Tan Tang

Department of Physical Medicine & Rehabilitation, Chang Gung Memorial Hospital (Taiwan)

Ultrasound has been proven to be radiation-free, easy-to-use imaging tool in diagnosing soft tissue lesions and in performing ultrasound guided injections. Our previous studies have documented that ultrasound can be applied in performing ultrasound guided subacromial bursitis injections and aspirations in treating patients with shoulder impingement syndrome. Ultrasound can also be applied in performing accurate sacral hiatus epidural spine injections. Under ultrasound guidance, the advancing motion of the needle can be observed as continuous and real-time images. The significant improvements in shoulder pain and range of motion after ultrasound-guided injection may be clear clinical evidence that a higher volume of steroid-lidocaine suspension can be accurately infiltrated into the lesion site as compared with the conventional blind injection technique. In sacral hiatus epidural injections, 100% accuracy in caudal needle placement into the caudal epidural space under ultrasound guidance was confirmed by contrast dye fluoroscopy. Our latest study has also shown that ultrasound may also be used in judging for the feasibility of caudal epidural injections. Anatomic variations of the sacral hiatus can be clearly observed using ultrasound. Sonographic images indicating a closed sacral canal and sacral diameter of less than 1.5 mm may suggest higher incidence of failed caudal epidural injection. As a result, ultrasound may be used as an adjuvant tool in caudal needle placement. It takes approximately 2 hours of training time for an inexperienced physician to learn the ultrasound guided injection technique. It is highly recommended as one of the effective treatment options for physiatrists in treating patients with soft tissue lesions and low back pain syndromes.

0430J4

NEW ADVANCES IN THERAPEUTIC ULTRASOUND

Wen-Shiang Chen

Department of Physical Medicine & Rehabilitation, National Taiwan University Hospital (Taiwan)

Diagnostic ultrasound in medicine is now quite commonplace especially with the introduction of small, portable system and advanced imaging capability. Traditionally, therapeutic ultrasound is daily used in the rehabilitation department as a physical modality. However, in these years ultrasound has evolved beyond the realms of imaging and physical therapy, with methods and applications extending to novel therapeutic and surgical uses. This general review will introduce the basics of therapeutic ultrasound, new applications including tissue ablation (high-intensity focused ultrasound), site-specific gene transfection/drug delivery, extracorporeal lithotripsy, enhancement of tissue repair, as well as future challenges of therapeutic ultrasound.

0430J5

EXTRACORPAL SHOCK WAVE THERAPY ON REHABILITATION OF TENDINOPATHY***Mao-Hsiung Huang****Department of Physical Medicine and Rehabilitation, Kaohsiung Medical University Hospital (Taiwan)*

Purpose: To introduce the therapeutic effects of extracorporeal shock wave therapy (ESWT) on tendinopathy. **Materials and Methods:** To summarize the update pathological findings and pathogenesis of tendinopathy, and their related managements. Besides, the biomechanisms of ESWT and their clinical application on the tendinopathy were also introduced. **Results:** The histopathologic changes of tendinopathies include degeneration, isorganization of collagen fibers, increase cellularity, minimal inflammation, imbalance between protective/regenerative changes and the pathologic response tendon overuse. The most important factors implicated in chronic tendinopathy were age and blood supply. The nonsurgical treatment of tendinopathy included nonsteroid anti-inflammatory drugs, exercise-based physical therapy, physical modalities, corticosteroid injection, Glyceryl trinitrate patched growth factor treatment, and ESWT. From the recent studies showed that ESWT is an effective adjuvant therapy for chronic tendinopathy. **Conclusion:** ESWT is dose dependent on the pathological changes of tendinopathy for rehabilitation of tendinopathy.

0430J6

THE SCIENCE OF INTRAVASCULAR LASER IRRADIATION OF BLOOD (ILIB) AND ITS APPLICATIONS***Tien-Yow Chuang****Department of PM&R, Taipei Veterans General Hospital and National Yang-ming University (Taiwan)*

Purpose: ILIB is a relatively new and controversial therapeutic option used to relieve pain and inflammation and promote wound healing. This study aimed to investigate the effect of intravascular low level laser therapy on mitochondrial function, ATP producing, lipid peroxidation and antioxidative capacity. **Materials and Methods:** This was a prospective, intrinsically controlled study measuring base-line and post-intravascular low level laser therapeutic responses. We measured mitochondrial DNA copy number from leucocytes, intracellular ATP in white blood cells (WBCs), malondialdehyde (MDA) in blood serum, and total antioxidant capacity (TOA) of blood serum. **Results:** Across all night participants, pre- and post-evaluation showed significant difference ($p < 0.05$) including the items: mitochondrial DNA copy number from leucocytes, intracellular ATP in white blood cells, malondialdehyde (MDA) in blood serum, and total antioxidant capacity (TOA) of blood serum. **Conclusion:** This study showed that mitochondria are sensitive to irradiation with monochromatic visible and near infrared (IR) light.

Brain Disorders: Traumatic Brain Injury

0430B1

EVENT-RELATED POTENTIALS AND DUAL SENSORY IMPAIRMENT (DSI) IN TBI***Henry L. Lew****Harvard Medical School, and VA Boston Healthcare System (United States)*

Purpose: To determine the prevalence of dual sensory impairment (DSI), its clinical characteristics, methodology for evaluation, and its influence on rehabilitation outcome. **Materials and Methods:** Using the following measurement tools: 1) Auditory and Visual

Event Related Potentials (ERPs), 2) Auditory Brainstem Responses (ABR), 3) Pure Tone Audiometry, and 4) Behavioral Optometry, we studied the prevalence of auditory and visual impairments in patients with TBI. We also evaluated the influence of dual sensory impairment (DSI) on rehabilitation outcome measures (FIM). **Results:** DSI is quite common in patients with severe TBI. It is also negatively associated with functional improvements during the inpatient rehabilitation process. **Conclusion:** Effective communication is essential for successful rehabilitation. Clinicians need to be cognizant of, and proactively accommodating for sensory impairments in patients with TBI.

0430B2

TRAUMATIC BRAIN INJURY (TBI) RESEARCH IN TAIWAN***Wen-Ta Chiu****Taipei Medical University (Taiwan)*

Traumatic brain injury (TBI) is a major cause of disability and death in Taiwan. For the past 22 years, we have conducted a series of four-step researches. The first was an epidemiological study with TBI registry in 55 hospitals in Taiwan with data bank of more than 174,326 TBI cases from 1987 to 2009. The second was an interventional study showing prevention effect of motorcyclists' helmets. The helmet use law of motorcyclists has been enforced in Taiwan since June 1st, 1997. After the law enforcement, the number of TBI-related deaths has been decreased by 38%. After the law has been implemented for a decade, 3000 people were saved every year that changed the injury deaths from the third leading cause of deaths in 1996 to the sixth in 2008. The third was clinical researches which included international collaborative studies, including Cooperation with U. of Pittsburgh group, NIH (US), Isreal and Sweden to the study of mild TBI in the Iraq War, an international cooperation with 18 countries, QOLIBRI (Quality of Life after Brain Injury), achieved a new quality of life evaluation method after TBI, which is now used in Taiwan. The fourth was the establishment of guidelines for managing patients with severe TBI in Taiwan. By the end of February 2007, we had completed a systemic literature review and published the eight-chapter guidelines for management of severe TBI. In 2008, we led the collaboration of Japan, Korea, China, Hong Kong and other Southeast Asian countries to accomplish a team work of Asian TBI Guidelines, which will serve to establish the standard treatment for TBI in Asia. In conclusion, a stepwise approach of TBI has been done in Taiwan for the past 22 years, and some good outcomes have been obtained. Further evaluation and a collaborative study with other countries are recommended.

0430B3

NEUROPROTECTION STRATEGIES IN EXPERIMENTAL TRAUMATIC BRAIN INJURY***Szu-Fu Chen****Department of Physical Medicine & Rehabilitation, Cheng Hsin General Hospital (Taiwan)*

Traumatic brain injury (TBI) triggers multiple secondary injury pathways that lead to delayed cell death and functional deficits. The delayed nature of these events provides an opportunity for therapeutic intervention aimed at either minimizing the process of progressive damage or enhancing the processes that promote recovery. Various elements have been implicated in the delayed injury biochemical cascades including inflammatory responses, oxygen free radicals, excitotoxicity, and apoptosis. In the first part of the talk I shall outline two specific components of the secondary pathogenesis of TBI – Inflammation and oxidative injury – and potential therapeutic strategies associated with each. The inflammatory response in the traumatic brain is characterized by greater disruption of the blood-brain barrier, intrathecal recruitment of neutrophils and macrophages (microglia), upregulation of adhesion molecules as well as release of

various cytokines/chemokines. The injured brain also has a muted response to oxidative stress including increased production of reactive oxygen species and impairment of the endogenous antioxidant system. These processes thus provide potential therapeutic targets to TBI, including anti-inflammatory agents and antioxidants. We shall also address questions about employing highly targeted strategies to block just one of the death related processes. Another therapeutic option may be identifying single agents that have actions on multiple secondary injury factors. In the second part of the talk I shall discuss genetic influences on outcomes following TBI. I shall present our recent work regarding caveolin-1 (Cav-1) influence on outcome following TBI using transgenic mice and discuss possible mechanisms. Cav-1 is the major structural protein of caveolae known for its role in regulating cholesterol metabolism and signalling transduction. The Cav-1 gene may affect trauma-induced neurological deficits via modulating Toll-like receptor 4/nuclear factor-kappa B signaling. I shall conclude the talk by comparing methodological differences between clinical and experimental studies. Further studies should aim to emphasis on the therapeutic window, drug pharmacokinetics/pharmacodynamics, and multi-potential strategies to better match preclinical and clinical design.

0430B4FP

EFFECT OF NOISE ON RETENTION AND TRANSFER OF A SPATIAL MEMORY TASK IN UNEQUAL CONTEXT IN MALE RATS: A BEHAVIORAL REVIEW

Mohammad Ali Gheraati^{1,2}, Leila Eidi Abarghani^{1,2}, Nasser Naghdi², Farid Rezaie Moghaddam³, Bahram Jalaei⁴

¹Sports Medicine Research Center, Medical Sciences University of Tehran, ²Pasteur Institute of Iran, Dept. of Physiology & Pharmacology, ³Medical Sciences University of Artesh and ⁴Medical Sciences University of Iran (Islamic Republic of Iran)

Purpose: Wide range of animal and human investigations has tested the neurobiological and immunological aspects of noise. But a few studies are related to behavioral characters of noise on neuromotor movements. New studies in this aspect have shown variable side effects (positive or negative) of continuous noise like cognition fatigue, over arousal, decrease in the capability of information processing (1 & 2) and in contrast positive functions like temporal coding, spatial memory performance, decision making and error detection (1, 3, 5 & 6). Also very few researches have studied the effects of continuous noise on performance and learning a motor task. To examine this aspect, we tested effects of continuous intensive noise on retention and contextual transfer of spatial memory task in adult male rats.

Materials and Methods: The natural noise was recorded in a football stadium and set in high (HI), moderate (MI), and low (LI) intensities, 86–90, 64–68, 52–54 decibels A (dBa), respectively. Rats were trained in Morris water maze (MWM) for 3-consecutive-day program and at day 4, visible and probe tests were held under the same intensities according to those own intensity in training. The retention evaluated at day 7 on the basis of prior noise intensities of any exposure situation. Also the contextual transfer test was held at day 8 after exposing to 30 min high-intensity noise. Escape latency and traveled distance were recorded and used for subsequent analysis. **Results:** Our results showed significant increases in latency and distance by increasing the noise intensity during acquisition period. Also the performance of HI group impaired significantly in retention test at high intensity. At the contextual transfer test, the results showed no significant increase except to LI group (unequal context). But the higher latency and distance was found in HI group. **Conclusion:** It can be concluded that high intensity noise has damaged the learning process. However, because the best results showed in the MI group, it can be suggested that the training at moderate intensity noise can promote the performance at the continuous high intensity noise. It may be because of the best adaptation under this intensity without interference of learning process.

0430B5FP

EFFECT OF HYPERBARIC OXYGENATION (HBO) ON UNILATERAL SPATIAL NEGLECT (USN) INDUCED BY TRAUMATIC BRAIN INJURY

Jinglong Liu

Heilongjiang Province Rehabilitation Hospital, No. 4 Ward (China)

Purpose: To evaluate the effect of Hyperbaric Oxygenation (HBO) on unilateral spatial neglect (USN) and basic activities of daily living (B-ADL) induced by traumatic brain injury. **Materials and Methods:** Sequentially access 67 traumatic brain injured patients with hemiplegia admitted to the Heilongjiang Province Rehabilitation Hospital, according with the following: first traumatic brain injury, no aphasia, no dementia and serious system disease. The age of all was between 27 and 55, and start to accept rehabilitation within 4weeks after stroke. By ‘cross-out’ test, ‘digit cancellation’ test, ‘line-bisection’, clock drawing, ‘free hand drawing’ test, are used to identify the unilateral spatial neglect. When 3 of the 5 tests are abnormal or more, we thought the patient had unilateral spatial neglect. They were classified upon admission as having USN (group A; $n=27$; 40.3% of the entire sample) or not having such disturbance (group B(control group); $n=40$; 59.7% of the sample). Both groups received standard rehabilitation treatment, including daily physiotherapy, occupational therapy, traditional Chinese medicine and other therapy according to individual needs. But the group A do some special exercises for USN, such as electronic stimulation, sensory stimulation and some occupational therapy to improve the attention to left side. The group A was randomly divided into two groups: group A1 (experimental group) (13) and A2 (observation group) (14). And group A1 was in Hyperbaric Oxygenation (HBO) synchronously, but group A2 not. The pressure of HBO was 0.12 MP and every treatment was 100 min including 20 min for increasing pressure and 20 min for decreasing pressure. the patients do treatment 2 h per day and 6 times per week. The Modified Barthel Index (MBI) was used to assess patients’ capacity in B-ADL. Assessment was done upon admission to rehabilitation and 6 weeks afterwards. **Results:** Before treatment, the patients in the experimental and observation groups (A1 and A2) scored significantly lower with MBI than those in the control group (B) ($p<0.05$). After treatments, the patients in all groups scored higher with MBI assessment after 6 weeks ($p<0.05$). However, after 6 weeks, the score with MBI assessment in the observation group (A2) was lower than the control group, but no significant difference ($p>0.05$), and there was no significant difference between the experimental group and the control group ($p>0.05$). But there was significant difference between the experimental group and the observation group ($p<0.05$). **Conclusion:** Most USN had significant impact on the recovery of the independent living of traumatic brain injured patients. The rehabilitative intervention for USN may improve ADL performance of traumatic brain injured patients with USN. And with HBO, outcome maybe better. The reason maybe that because of the abroad effect of HBO on brain, metabolism of other areas in brain were also improved, and the outcome maybe a comprehensive effect. So it is better than single or local stimulation treatment for USN.

0430B6FP

ANALYSIS OF INFLUENCE FACTORS OF COGNITIVE IMPAIRMENT FOLLOWING FIRST ONSET OF STROKE

Xi-Quan Hu, Yue Lan, Hai-Qing Zheng, Jin-Lin Zheng, Ying-Bei Chen

Department of Rehabilitation Medicine, The Third Affiliated Hospital of Sun Yat-Sen University (China)

Purpose: To explore the influence factors of cognitive impairment following first onset of stroke, in order to predict the existence of cognitive impairment in patients with stroke and help for future clinical

cal intervene. **Materials and Methods:** 364 survivors of first onset of stroke were evaluated by the mini-mental state examination (MMSE) in this study. Data were collected on age, gender, education level, location of brain lesion, diagnostic stroke subtype and so on. Logistic regressions analyzing is used to determine those factors that could predict cognitive impairment of stroke patients by MMSE assessment scores. **Results:** The factors including location of brain lesion, area of the lesion, high homocysteine, side of the lesion, complications, education level and age can join in the logistic regression analysis format. The R of the format is 0.849 and these seven factors can explain 72.1% variation of the scores of MMSE. **Conclusion:** The logistic regression analysis revealed that location of brain lesion, area of the lesion, high homocysteine, side of the lesion, complications, education level and age were predictors of the cognition function assessment of stroke patients. The prevalence of cognitive impairment can be mainly influenced by these factors.

Brain Disorders: Neural Plasticity and Cognition

0430F1

COGNITIVE COMPONENT OF TAI CHI CHUAN – A FMRI STUDY

Chetwyn C.H. Chan, Sam C.C. Chan, Gao Feng, William P.W. Chen, Kin-hung Tin

Applied Cognitive Neuroscience Laboratory, Department of Rehabilitation Sciences, The Hong Kong Polytechnic University (Hong Kong)

Purpose: The aim of the study is to gain better understand on the possible mechanisms underlying the beneficial effects of Tai Chi Chuan (TCC) on cognitive functions. **Materials and Methods:** We involved subjects with or without experience on practising TCC. The two experimental tasks were the Benton's Judgment of Line Orientation test (JLO) which measures cerebellar-cortical related visuo-spatial judgment and custom-designed motor imagery task which measures motor planning and control of the subjects. The behavioural data and BOLD responses of the brain of the subjects generated from each of the tasks were captured. **Results:** The results indicated that the TCC group did not show significant differences in the behavioural data for both tasks than the non-TCC group. The TCC group showed significant differences in BOLD responses than the non-TCC group in the neural substrates subserving the cerebellar-cortical network when performing on the JLO test. The TCC group also showed significant differences in the neural substrates which mediates motor imagery, motor planning and in particularly motor control. **Conclusion:** Practice of Tai Chi Chuan appears to exert activity-specific effect on individuals which does not seem to enhance processing speed and precision. Its effects perhaps extend from the motor system on enhancing visualization, planning and monitoring, and conflict resolution.

0430F2

HOW VALID IS THE BROKEN MIRROR THEORY OF AUTISM?

Ya-Wei Cheng

Institute of Neuroscience, National Yang-Ming University (Taiwan)

Purpose: The 'broken mirror' theory of autism, which proposes that a dysfunction of the human mirror neuron system is responsible for the core social and cognitive deficits in individuals with ASD, has received considerable attention. However, additional empirical evidence is necessary to elucidate the validity of this theory. **Materials and Methods:** In this electroencephalographic study, we examined mu suppression, as an indicator of sensorimotor resonance, concurrent with oculomotor performance when individuals with autism spectrum disorders ($n=20$) and control participants ($n=20$) either executed, observed hand actions or a moving dot. No difference in

visual attention between groups was found as indicated by fixation duration and normalized fixation number on the presented stimuli ($p=0.088$; $p=0.594$). **Results:** The mu suppression over the sensorimotor cortex was significantly affected by the experimental conditions ($F_{2,76}=10.812$, $p<0.001$), but not by group membership ($F_{1,38}=0.044$, $p=0.835$), nor the interaction between groups and conditions ($F_{2,76}=2.437$, $p=0.094$). Individuals with ASD, similarly to the controls, exhibited stronger mu suppression when watching hand actions relative to a moving dot. In addition, the mu suppression during the observation of hand actions was positively associated with the communication competence of individuals with ASD ($p=0.015$). **Conclusion:** It suggested that the functioning of the mirror neuron system might be preserved in individuals with ASD to a certain degree. Less mu suppression to action observation coupled with more communicational severity can reflect the symptom heterogeneity of ASD.

0430F3

COGNITIVE AND NEUROIMAGE ASSESSMENT AND HUMAN COGNITIVE REHABILITATION

Yuejia Luo, Xiaoxu Yang

National Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University (China)

It is very important for cognitive assessment and cognitive rehabilitation strategy from the perception, attention, memory, language intelligence and etc. in rehabilitation practice. The development of interactive multimedia computer-assisted cognitive rehabilitation strategy could help patients to improve the cognitive function more efficiently. Cognitive assessment is valuable and commonly used for screening of cognitive impairment, rating of the severity of dysfunction, and monitoring disease progression. In clinical practice, detailed cognitive assessments influence the design of cognitive rehabilitation strategy. A wide range of tools has been developed to aid the clinicians in this process, which varies from brief screening tests, neurobehavioral cognitive status examination to more comprehensive tools, such as remote neuropsychological assessments and virtual reality technology. Cognitive rehabilitation is defined as a systematic, functionally oriented service to reduce cognitive disability and improve cognitive function through 1) strengthening or reestablishing the previous learned pattern of behavior; 2) establishing the new activity patterns through compensatory mechanisms for impaired cognitive function; 3) establishing new activity patterns through external compensatory mechanisms (including individual orthosis and environmental support); 4) enabling people to adapt their impairment to improve the overall function and the quality of life. Individualized and structured cognitive rehabilitation programs are effective in facilitating recovery with cognitive dysfunction. Goal management training could improve the self-control, self-management and problem-solving abilities in intelligence disorder patients.

0430F4

REPRESENTATION OF TACTILE MOTION IN THE PRIMARY SOMATOSENSORY CORTEX: A PSYCHOPHYSICAL AND NEUROPHYSIOLOGICAL STUDY

Yu-Cheng Pei^{1,2,3}, S.S. Hsiao^{2,3}, J.C. Craig⁴, S.J. Bensmaia^{2,3,5}

¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital (Taiwan), ²Department of Neuroscience, Johns Hopkins University School of Medicine, ³Krieger Mind/Brain Institute, Johns Hopkins University, ⁴Department of Psychological and Brain Sciences, Indiana University and ⁵Department of Organismal Biology and Anatomy, University of Chicago (United States)

Purpose: The speed and direction of motion of one-dimensional edges is ambiguous because information about the motion compo-

nent parallel to their orientation is not available. To acquire a veridical direction percept, it is necessary to integrate motion information across multiple stimulus contours that differ in orientation or to rely on terminators. **Materials and Methods:** We presented gratings and plaids using the 400-probe stimulator, a tactile analogue of a visual monitor, and obtained the perceived direction of stimulus motion in human psychophysical experiment and recorded neuronal responses to stimulus motion from neurons in the primary somatosensory cortex in macaque monkey. **Results:** We found that some neurons in the primary somatosensory cortex exhibited properties characteristic of motion integrators: Analogous to visual “pattern” neurons observed in the middle temporal area, these neurons integrate motion cues from multiple contours to encode the direction of the plaid. The neuronal responses to tactile plaids are determined by the vector average of motion signals emanating from edges and terminators. **Conclusion:** Neurons in the primary somatosensory cortex encode the direction of pattern motion. The mechanism of tactile motion integration is similar but not identical to its visual counterpart.

0430F5FP

REVEAL THE NEURAL MECHANISM AND THE PROPERTY OF PURE ALEXIA FOR CHINESE CHARACTERS BY USING NEUROIMAGING TECHNIQUES AND COGNITIVE NEUROPSYCHOLOGICAL TESTS

Chunlei Shan^{1,2}, **Tong Wang**¹, **Xuchu Weng**², **Benyan Luo**³, **Zhisu Lü**³, **Xiaoyu Zhao**³, **Renjing Zhu**³, **Zhiqiang Zhang**⁴

¹Department of Rehabilitation Medicine, First Affiliated Hospital of Nanjing Medical University, ²Laboratory for Higher Brain Function, Institute of Psychology, Chinese Academy of Sciences, ³Department of Neurology, First Affiliated Hospital, College of Medicine, Zhejiang University and ⁴Department of Radiology, General Hospital of Nanjing Military District (China)

Purpose: At present, it is still uncertain of the mechanism and the property of pure alexia for Chinese characters. In this study we try to investigate the critical cortical area and neuropathway where lesions may induce pure alexia, and try to reveal the property of pure alexia for Chinese characters. **Materials and Methods:** Three right-handed patients suffering from infarctions in the territory of their left PCA were studied. JXD, who complained of deficits in recognizing and reading aloud any Chinese characters, without other language deficits, was diagnosed as pure alexia. CYH, a patient with abnormal faces and objects naming while with normal reading was classified as anomia. KY was diagnosed as left hemiparalexia (a special form of pure alexia) considering the fact that he often made mistakes in the left radical of a character when he read Chinese compound characters. For example, he read (deng 1, lamp) as (da 3, beat), read (zhi 4, order) as (tie 3, iron). All three patients accepted high spatial resolution 3D-SPGR scans. Analysis of lesion locations of JXD, CYH and KY was taken by adopting AFNI software. In the BOLD-fMRI experiments, JXD and CYH were presented with an alternation of blocks of pictures including Chinese characters, faces, and line-drawing of objects. For KY, he was presented with Chinese characters flashed either in the right visual field (RVF) or in the left visual field (LVF) while fixating continuously a permanent central cross-hair. In order to reveal the property of Chinese pure alexia, JXD was arranged to perform a series of cognitive neuropsychological tasks, including Chinese characters reading, phonological judgment, semantic judgment, identity judgment of abstract visual word representation, lexical decision, perceptual judgment of visual word appearance. **Results:** The lesion locations analysis indicated that the specific and additional lesion of pure alexic (JXD), compared to CYH and KY, was in the left lateral mid-fusiform gyrus. Splenium was an additional lesion in KY rather than in CYH. fMRI results showed characters could activate the left lateral mid-fusiform gyrus in CYH and KY,

but not in JXD. Characters in the RVF rather than in LVF induced the activations in the left lateral mid-fusiform gyrus in KY. Neuropsychological tests revealed that JXD was unable to read aloud and even to recognize the characters. Worse, he was disturbed in phonological, semantic and identity judgment tasks. However, JXD could complete the tasks of lexical decision and perceptual judgment of characters normally. **Conclusion:** Similar to the reports of pure alexia for alphabetic language, the left lateral mid-fusiform gyrus is a key area and splenium is an essential neuropathway in inducing pure alexia (or left hemiparalexia) for Chinese characters. Nevertheless, unlike those studies, the property of Chinese pure alexia is not a disturbance in visual word form processing itself, but in the connection between visual word form and its corresponding semantic and phonological information, by which the identity (abstract representation) of a Chinese character is accessed.

0430F6FP

THE EFFECTS OF BASAL GANGLIA STROKE ON IMPLICIT LEARNING

Zhongli Jiang, Jing Jin, Dianhuai Meng
Nanjing Medical University (China)

Purpose: The purpose of the present study was to gain a deeper understanding of the role of the basal ganglia in implicit learning by examining Weather Prediction Category Learning Task among patients with basal ganglia stroke. **Materials and Methods:** Seventeen patients with basal ganglia stroke contained 8 cases of left basal ganglia lesions and 9 cases of right basal ganglia lesions. Ten cases without brain damage were used as the controls. All of the subjects were tested by use of Weather Prediction Category Learning Task (WPCLT) and Wisconsin Card Sorting Test (WCST) in 3 consecutive days. **Results:** Total numbers of correct of WPCLT in 3 consecutive days were significantly lower in the patients with right basal ganglia lesions than in the controls (first day: 52.72 ± 5.57 vs. 61.85 ± 8.49 , second day: 55.83 ± 4.52 vs. 71.85 ± 10.89 , third day: 62.33 ± 7.70 vs. 80.15 ± 6.67). Total numbers of correct of WPCLT in the last day were significantly lower in the patients with left basal ganglia lesions than in the controls (65.87 ± 1.18 vs. 80.15 ± 6.67). In patients of left (0.761 ± 0.174) and right (0.799 ± 0.141) basal ganglia lesions, the learning potential of WPCLT decreased significantly in comparison with the controls (0.516 ± 0.084). In the controls, total numbers of correct of WPCLT were corrected positively with Numbers of categories completed of WCST in the second day ($p < 0.05$). Total numbers of correct of WPCLT were correlated positively with percent errors ($p < 0.05$) and numbers of categories completed ($p < 0.05$) of WCST in the third day, respectively. **Conclusion:** The implicit learning is damaged which causes impairment of the bottom-up (implicit-to-explicit) learning pattern in patients with basal ganglia lesions.

0430F7FP

COGNITIVE FLEXIBILITY IN CHILDREN WITH LEARNING DISABILITY

H.S. Somashekara, Kumar B. Radish, Jayashree S. Bhat
Kasturba Medical College (India)

Purpose: Cognitive linguistic flexibility is a measure which refers to the ability to shift cognitive linguistic set, aptitude, thought, or attention in order to perceive, process or respond to situations in different ways. It has been dichotomized into reactive flexibility and spontaneous flexibility that may be differentially impaired in persons with communication disorders. Different tasks and situations require different type of reactive shifts and presumably different underlying cognitive processes. If language and the learning difficulties are the result of slow processing speed, then the differences in cognitive flexibility measures are expected in children with learning disability in comparison with age matched peers. Hence the study

was attempted to compare the cognitive flexibility in children with learning disability and age matched typically developing children. **Materials and Methods:** Participants consisted of 12 children with learning disability and 12 age matched typically developing children in the age range of 9–10 years. Children with learning disability were formally evaluated and diagnosed based on Early Reading Skills (Ray & Potter, 1980) by an experienced speech language pathologist. The experimental set comprised of a set of 20 pictures in 4 lexical categories (fruits, stationary items, animals and body parts). Later, these words were transferred and stored in DMDX software. The stimuli was then inserted into a single sequence and presented to the participants such that four pictures of the same lexical category appeared one after another on the computer screen following one from a different lexical category. The software was programmed so that the picture stimuli were automatically displayed on the screen one by one for 2000 msec. There was 3000 msec interstimulus interval between two stimuli. Each trial consisted of the appearance of a fixation point ('+++') for 500 ms, followed by the presentation of the target word, displayed for 2000 ms. DMDX software measures the reaction time (the time interval between application of a stimulus and detection of a response) for naming the stimulus. Only the vocal responses from the participants were recorded. This was done through Check Vocal software where the stimulus spectrograph of the recorded response was shown. **Results:** Results of the independent t-test revealed statistically significant differences between the two groups for the cognitive flexibility index at $p < 0.01$. **Conclusion:** The present study investigated the cognitive flexibility in children with learning disability and typically developing children and the results revealed significant differences between the two groups for the cognitive flexibility index. The children with learning disability require more time to shift their cognitive set in response to changing stimuli when compared to typically developing normal children. The obtained results were attributed to the deficits in the attentional process and the knowledge representation yielding a prolonged cognitive block in children with learning disability.

Development of Physical and Rehabilitation Medicine in Asian and Oceanian Region

0430K1

DEVELOPMENT OF PHYSICAL AND REHABILITATION MEDICINE IN TAIWAN

Simon Fuk-Tan Tang

Department of Rehabilitation Medicine, Chang Gung Memorial Hospital and Chang Gung University (Taiwan)

The Rise of Rehabilitation Medicine in Taiwan: Since the end of Second World War, Taiwan had numerous patients with cerebral palsies and poliomyelitis. However, inadequate rehabilitation support could be offered at that time. Dr. I-Nan Lien and Dow-Chang Hsu recruited special medical personnel with experience in such fields to aid these patients. At the same time, the World Health Organization (WHO) planned to improve the quality of medical care in Asia, especially in the field rehabilitation medicine, and has offered scholarships for doctors in Asia to receive related trainings in the United States. Dr. I-Nan Lien had the opportunity to join the training course in New York University from 1967 to 1968. The Department of Physical Medicine and Rehabilitation (PM&R) in the National Taiwan University Hospital (NTUH) was originally set up in 1962. However, the rehabilitation team was not strong enough to deal with all the related problems in this field. After returning home in the summer of 1968, Dr. Lien reorganized the department with the help of Dr. Huang Chi-Chow. He recruited physical therapist, occupational therapist, speech pathologist, and prosthetist to strengthen his team. During those days, he gave lectures in the field of rehabilitation in almost every medical school in Taiwan with the

intention of introducing medical students to such medical-specialty. He established the resident training program for medical school graduates who were interested in this field. The Department of Physical Medicine and Rehabilitation at NTUH then experienced a booming growth, and became a modern rehabilitation center in the 1970's. Undoubtedly, Dr. Lien was regarded as the founder of the physical medicine and rehabilitation in Taiwan. There are approximately 785 physiatrists, 3000 physical therapists, 1800 occupational therapists, and 400 speech therapists, 200 prosthetists and orthotists on the island today. The rehabilitation medical care in Taiwan belongs to the tertiary care system. All medical center hospitals here offer high quality and international standard of rehabilitation medical care. ***Important Contributors to The Field of PM & R in Taiwan:*** Dr. Chang-Zern Hong, who was a professor at UC Irvine, went to the laboratory of Dr. David Simons for the study of myofascial pain syndrome (MPS). He has advanced researches in the mechanism of MPS, and thus became a pioneer in this field. He became the head of the Department of PM&R at National Cheng Kung University Hospital after he returned to Taiwan. His department is a leading rehabilitation center in southern Taiwan, and has certainly reached international level in terms of rehabilitation care and researches. The need of pediatric rehabilitation grew rapidly in Taiwan. Dr. Alice M.K. Wong, superintendent of Chang Gung Memorial Hospital at Tao Yuan, received four years of resident doctor training in the Department of PM&R at NTUH. She has immense interest to improve the life quality of patients with cerebral palsy by using the concept of traditional medicine and acupuncture. Such concept was also used to treat patients with neurological and musculo-skeletal related diseases. Prominent therapeutic effects have been published in renowned journals. Exercise physiology and cardiac rehabilitation was developed primarily in the sixties through the effort of Dr. Jin-Shin Lai and Dr. Chin Lan. They set up several renowned cardiopulmonary rehabilitation laboratories around the island during the past few decades. One of their most intriguing researches they discovered was that the traditional Tai-Chi boxing could improve the cardiopulmonary functions in humans and is the best exercise for Taiwanese. Electromyographic study is an important medical examination tool for physiatrists. Dr. Chein-Wei Chang, chairman of the Department of PM&R in NTUH, and Dr. Rai-Chi Chan, chairman of the Department of PM & R in Veteran General Hospital, are the leaders in this field. They have many advanced researches and certainly have brought the field of electrodiagnosis in Taiwan to a higher level. Care of patients with spinal cord injury (SCI) has also improved rapidly in Taiwan. Dr. Simon Tang, professor and program director of the Department of PM & R in Chang Gung Memorial Hospital (CGMH), and Professor Yen-Ho Wang of NTUH, are the forerunners in this field today. Dr. Tang has applied the concept of motor control to such cases, and Dr. Wang studied endocrine changes in SCI patients. Dr. Tang is also interested in promoting foot care through the applications of orthotic insoles, and has thus turned CGMH into a famous foot orthotic center in Taiwan. He also set up a well-equipped laboratory for gait analysis and motor control. Renowned journals were published from this laboratory already, and more researches are taking place presently. On the other hand, professor Liu-Ing Bib had done series of studies on the assessment and intervention for neurogenic bladder in SCI at Chung Shan Medical University Hospital. The pioneers in this field include Dr. Tyng-Guey Wang, Chih-Chin Hsu, Wen-Shiang Chen, Wen-Chung Tsai. ***Newly Discovered Rehabilitation Fields in Taiwan:*** During the past decade, the application of soft tissue ultrasound was widely used in PM&R. Soft tissue ultrasound is frequently used for clinical diagnosis and treatment plans. Soft tissue ultrasound is commonly used to help us in achieving the correct clinical diagnosis. More recently, we also develop the technique of sonoquide injection for musculoskeletal lesions. **Conclusion:** In short, physical medicine and rehabilitation in Taiwan is a fast growing field in recent years. It has become an important field of medicine here. With the combination of modern rehabilitation concepts of the western world, and traditional Chinese medicine, more medical assistance and new treatment strategies can be offered to the patients. We are confident that the standard of rehabilitation medicine will improve here in Taiwan, and more treatment plans can be innovated in the future.

0430K2

THE DEVELOPMENT OF REHABILITATION MEDICINE IN THE PHILIPPINES: OUR WORK, MISSION AND VISION***Reynaldo Rey Matias****St. Luke's Medical Center and College of Medicine (Philippines)*

Our Past embodies the ideals and aspirations of the academy from its beginnings. Our rich heritage which stems from a group of Physiatrist and Orthopaedic surgeons interested in the field organized the Philippine Society of Physical Medicine and Rehabilitation. The Society then had an active membership of less than twenty. In 1974, the organization's name was changed to the Philippine Academy of Rehabilitation medicine. Our Present is embodied in our Mission statement which are the following; to promote and advance the field of Rehabilitation Medicine in the Philippines, to elevate the standards of practice through training, education, research and service thereby improving the quality of life of the Filipino people. With the establishment of four accredited training institutions by the Philippine Board of Rehabilitation Medicine, the academy now boast of about 350 members – mostly home-grown specialist. The academy serves its members and their patients as well as other health professionals and society by fostering excellence in Physiatric practice, education, research and community service. Our Future is embodied in our Vision Statement which is to further promote and advance the field of Rehabilitation Medicine elevate its standards of practice, education, research and service thereby improving the quality of life of the Filipino people.

0430K3

DEVELOPMENT OF PHYSICAL AND REHABILITATION MEDICINE IN MONGOLIA***Avirmed Baljinnjam, Sh. Batchimeg****Department of Rehabilitation Medicine, School of Medicine, Health Sciences University of Mongolia (Mongolia)*

Rehabilitation medicine is a medical branch which is very useful in the world but in Mongolia it is a new one and less popular. The main health issues for Mongolia are chronic diseases such as hypertension, diabetes, stroke and trauma but the rehabilitation diagnosis and treatment are not properly handled. Therefore Rehabilitation medicine took up the role and tried to meet the need of this aspect of patient care. To lay the ground work it is very important to include rehabilitation in the curriculum for medical students. We started to develop this field in early 1980s; the curriculum was reviewed and revised completely in 2002. A physiatrist is required to undergo a 1-year training course in an approved program, which places the emphases of the clinical management of problems associated with disability and various musculoskeletal problems for the purpose of restoring the disabled person to his optimum level. Unfortunately we cannot work by team because lack of PT, OT and ST and all main state hospitals have very old, out of dated equipment of physical modality and which absolutely does not meet to present requirement. The major challenges of rehabilitation education in Mongolia: 1) Lack of qualified lecturers and teaching materials for the physiatrists, 2) do not have any modern equipped centre for rehabilitation medicine, 3) do not have physical, occupational and speech therapists education at the moment.

0430K4

HISTORY OF THE DEVELOPMENT OF THE ISPRM: REVIEW OF THE CHALLENGES***John L Melvin****Jefferson Medical College (United States)*

Purpose: The purpose of this presentation is to enable those leading or developing Physical and Rehabilitation Medicine organizations to identify the challenges they may need to overcome. **Materials and**

Methods: The author presents information from his experiences as chair of the International Task Force that organized the development of the International Society of Physical and Rehabilitation Medicine (ISPRM), as the Founding President of the ISPRM and as advisor to the succeeding presidents of the ISPRM. **Results:** The history of the ISPRM can be divided into its 1) formative, 2) early operational, 3) programmatic and 4) future evolutionary periods. The challenges in each phase have similarities but require strategies consistent with the different phases of the ISPRM's development. The formative period of the ISPRM was one of dreams and diplomacy associated with substantial efforts from those committed to forming the ISPRM. The plan was to form the ISPRM through a merger of the International Federation of Physical Medicine and Rehabilitation and the International Rehabilitation Medicine Association. These organizations differed in their membership, finances and programs. The formative period of the ISPRM was from 1992 to 1999 during which the International Task Force addressed a number of challenges. 1) The first challenge was to create a vision of the ISPRM that the members and leaders of both organizations could accept. 2) A second challenge was to identify categories of membership; 3) a third was to allocate the disparate resources of the two organizations; 4) a fourth was to identify effective leaders; 5) and a fifth was to develop the documents that defined the merger and those that would be the basis for the ISPRM's future operations. The final challenge was to convince the boards of the IFPM&R and IRMA to accept their dissolution and the establishment of a new organization. The early operational period of the ISPRM was one focused largely on developing the operational infrastructure of the ISPRM. I consider this phase of the ISPRM to have been from 1999 to 2008. The leadership of the ISPRM during this period devoted most of their time to its operations and proportionately less to its programs. The challenges were similar to the earlier period, but in a different context. They included: 1) Continued focus on the primary purpose of the ISPRM, in particular whether it mostly served societies or individual members; 2) the definition of members; 3) struggles to obtain sufficient resources; 4) identification of leaders to replace those who founded the ISPRM; 5) continued refinement of the By-Laws and Policies and Procedures to improve the ISPRM's operations; 6) and expansion of the infrastructure sufficient to provide programmatic support capacity including a central office. The programmatic period of the ISPRM is from 2008 to the present. It represents progression from a major preoccupation with operational issues to supporting programs for the support of the ISPRM's mission. These include ever improving Congresses, website support for members, exchange programs and substantive contributions to World Health Organization programs. Challenges remain in 1) defining the relationships of the ISPRM to other international PRM organizations; 2) the definition of members; 3) obtaining resources to support expanded potential programs; 4) identifying leaders to implement more and larger programs; and 5) modifications in operations and its related documents to improve the effectiveness of the ISPRM. The future evolutionary period of the ISPRM represents its maturation into a contributing organization to its members and to society. There are significant challenges associated with this evolution. They include: 1) sufficient voluntary leadership; 2) adequate economic resources; 3) an expanded and supported central office; 4) further refinement of membership categories; 5) relationships with regional PRM societies, 6) interfaces with PRM journals; and (7) expanded involvement in UN and Who programs. **Conclusion:** The ISPRM has had significant success but has far to go to meet its full potential. All associated with it will need to devote effort towards overcoming its current and future challenges.

Brain Disorders: Stroke

0430C1

DEPRESSION AND ANXIETY IN THE HEMIPLEGIC***Jorge Lains***

Abstract missing.

0430C2

MIRROR NEURON SYSTEM IN THE PRE-MOTOR CORTICAL AREA: A RCT IN THE POST-ACUTE STROKE ARM REHABILITATION

Marco Franceschini

Neuro-Rehabilitation Department, IRCCS San Raffaele (Italy)

Purpose: Recent studies demonstrated the presence in the human pre-motor area of mirror neurons with the property to discharge during the observation of hand/arm actions. The aim of the research was to evaluate if the observation of arm actions may constitute an alternative rehabilitation strategy in post-acute stroke patients. **Materials and Methods:** A RCT included 102 patients (53 patients in the experimental group (EG), 49 in the control group (CG)) at the first acute stroke (30±3 days from stroke). All subjects had received a conventional rehabilitation treatment and in addition the patients included in EG were asked to watch filmed sequences showing upper limb daily activities, while CG in addition watched a static image without animals movement. Assessments were taken with the following: Fugl Meyer, Frenchay Arm Test, Box and Block (B&B), Barthel Index and FIM. All evaluations were administered before (T0) and after the treatment (T1) and at follow-up (T2). **Results:** After adjusting for baseline scores and age, the preliminary analysis demonstrated a significant improvement in all parameters in both groups from T0 to T1 ($p<0.001$) and from T0 to T2 ($p<0.001$). Furthermore, a significant “time for treatment” effect was shown in the B&B Test, favouring an higher impact of Experimental treatment on upper limb recovery ($p<0.001$, T0 to T1, and $p=0.02$, T0 to T2, respectively). **Conclusion:** This new rehabilitation approach suggests that the stimulation of the mirror neurons may reveal useful in promoting motor dexterity recovery in the post-acute phase of stroke.

0430C3

EFFECTIVENESS OF ULTRASOUND GUIDED BOTOX INJECTION ON BALANCE IN POST-STROKE PATIENTS WITH LOWER EXTREMITIES SPASTICITY

Zulin Dou, Xiaomei Wei, Hongmei Wen, Yi Fu, Xiafei Lin

Department of Rehabilitation Medicine; The 3rd Affiliated Hospital; Sun Yat-sen University (China)

Purpose: To determine the effect of ultrasound guided botulinum toxin type A (Botox) injection on lower extremities spasticity and to discuss the quantitative postural control outcome in post-stroke patients in conjunction with an equilibrium training program after Botox injection. **Materials and Methods:** In this prospective study, Multipoint Botox injection at total dose less than 500 U was applied to tibialis posterior, flexor hallucis longus, flexor digitorum longus for each patient with foot inversion and toes flexion. An ultrasound-guided injection technique was used for these muscles. The placement of the injection needle and injection into target muscles were observed during real time. 28 post-stroke patients within 6 months were randomly divided into a treatment group and a control group, 14 subjects in each group after Botox injection. The dynamic balance training with the smart equitest balance master was used in the treatment group, traditional balance training for the control group. Both two groups received interventions 5 times per week for 40 min. Patients were assessed before and at the 4th week post-injection Botox using modified Ashworth Scale (MAS), the sensory organization test (SOT), limited of stability (LOS) and walking across test by the same balance equipment. **Results:** No complications (e.g. bleeding, infection, nerve injury and neurovascular compromise) were encountered during or immediately after any procedure. All patients responded positively to the treatment. At 4th week post-injection, a statistically significant decrease of two groups was determined in spasticity and improved in walking abil-

ity ($p<0.01$). All scores in the LOS test (EOSS, ECSS, SVSS, EPE and DCL), the step length and velocity in the walking across test and MAS score improved significantly than scores in pre-injection ($p<0.05$). Dynamic balance training in the treatment group can more significantly improve the postural control than traditional balance training in the control group. **Conclusion:** The results suggest that ultrasound-guided Botox injection is safe and that the injection technique combined with balance training strategies may get maximum effectiveness in relieving post-stroke lower extremities spasticity with foot inversion, toes flexion and is especially more beneficial for deeper muscles.

0430C4

MASSAGE THERAPY IN DEPRESSED PEOPLE: A META-ANALYSIS OF CLINICAL TRIALS

Wen-Hsuan Hou

E-Da Hospital (Taiwan)

Objective: Many modalities have been used to treat depression including pharmacotherapy and psychotherapy, but some depressed patients do not improve adequately. Massage therapy is a complementary therapy employed in reducing psychological distress with equivocal results. We systematically investigated the treatment effects of massage therapy in depressed people and incorporated data from recent studies with an aim to provide informations for clinicians. **Method:** A meta-analysis of randomized controlled trials (RCTs) of massage therapy for depressed people was conducted by using published studies found on four main electronic databases. A hand search of bibliographies of relevant papers was also conducted. Outcome measures of massage therapy were the changes in mean scores of depression scales between treatment and control groups. Trials with other interventions, combined therapy, and massage on infants or pregnant women were excluded. Two reviewers independently performed the initial screening and assessment of quality indicators with the Jadad scale. **Results:** We included 18 studies containing 831 persons out of 256 retrieved references. All trials showed positive effect of massage therapy on depressed patients. Eighteen RCTs were of moderate quality, with a mean quality score of 7.06 (SD 0.85). The pooled standardized mean differences in fixed- and random-effect models were 0.78 (95% CI 0.63 to 0.92) and 0.76 (95% CI 0.57 to 0.95), respectively. The variance between these studies revealed possible heterogeneity. **Conclusion:** Massage therapy significantly alleviates depressive symptoms. However, the use of standardized protocols of massage therapy, various depression-rating scales, and target populations in further studies is suggested.

0430G1

POWER REHABILITATION, PRINCIPLE AND METHOD

Takahito Takeuchi

International University of Health and Welfare, Graduate School (Japan)

Purpose: Introduction of new method of rehabilitation, its principle and technology. **Objective:** Old stroke patient and geriatric care-needed people. **Principle:** Power rehabilitation has been developed for the fragile elderly people to improve their physical activity. The decline of activity with aging is due to not loss of muscle strength but loss of generating “Power” of activity. And the loss of power is due to some inactive muscle in cooperative movement. Power rehabilitation is the training system making the inactive muscle to cooperative active condition using weight-stag muscle training machines. The mechanical machine is useful to keep the axis of movement constant, and to be able precise control of load. **Method:** Major movement of whole body are exercised by six type machine. And on each machine, the patient practices 30 movements (10-10-10). The load with weight-stag are between 10–12 level of Borg’s

RPE (rating perceived exertion). Standard program is 12 weeks with 2 exercises each week. The case of simple aging care needed people, old stroke, Parkinson disease will be shown by DVD. **Results:** It has many kind of effect on physical activity, apathy and depression and life style. **Conclusion:** Power rehabilitation is effective on improvement of physical-psychological activity of elderly people.

0430G2

FUNCTIONAL ELECTRICAL STIMULATION IMPROVES FUNCTIONAL RECOVERY OF THE UPPER EXTREMITY OF SUBJECTS WITH ACUTE STROKE: A 6 MONTHS FOLLOW-UP STUDY

Tiebin Yan¹, Zinlin Lin²

¹Department of Rehabilitation Medicine, Sun Yat-sen Memory Hospital, Sun Yat-sen University and ²Department of Rehabilitation Medicine, The 5th Affiliated Hospital, Sun Yat-sen University (China)

Purpose: To investigate whether functional electrical stimulation (FES) could improve the functional recovery of the affected upper extremities of patients with first acute stroke and whether its effectiveness could last for 6 m after finishing the treatment. **Materials and Methods:** Forty-six patients with first acute stroke were recruited and randomly assigned after stratification by a computer program into 2 groups, FES group or control one. Thirty-seven completed the study. Among them, 19 were in the FES group with 11 males and 8 females, aged 62.2 ± 8.7 years, 43.5 ± 25.2 days post stroke, 13 with ischemia and 6 with hemorrhage. Eighteen in the control group with 11 males and 7 females, aged 66.0 ± 9.6 years, 41.3 ± 26.5 days post stroke, 12 with ischemia and 6 with hemorrhage. All patients received standard rehabilitation program. Patients in the FES group received functional electrical stimulation with the parameters at 30 Hz, 0.2 ms pulse width and for 5 s each on and off time. The treatment was 30 min at each session, once a day for 5 days each week, and lasted for 3 weeks or 15 sessions. Measurements included modified Ashworth spasticity scale (MAS), the upper section of Fugl-Meyer motor assessment (FMA), manual muscle testing (MMT), as well as Modified Barthel Index (MBI). They were measured before treatment, at the end of the 2nd and 3rd week treatment and at the 1st, 3rd, 6th month post-treatment. All data were analyzed with SPSS version 15.0, the statistical significance was set at the 5% level. **Results:** No significant difference was found at the baseline between the two groups before treatment. After 2 week treatment, significant difference was found only in the score of FMA between 2 groups. After 3 week treatment, however, significant improvements were found in the scores of FMA, MAS, MMT in patients in the FES group when compared with the control one ($p < 0.05$). During the follow-up, significant differences were also found in the scores of FMA, MBI, MAS, MMT at the 1st month post-treatment between 2 groups ($p < 0.05$) and were further demonstrated significant difference in the scores of MMT, MBI, FMA at the 3rd month post-treatment ($p < 0.05$). At the 6th month post-treatment, the scores of MBI, FMA in the FES group were also significantly higher than those of the control group ($p < 0.05$). **Conclusion:** Three weeks of FES treatment on the affected upper extremity of patients with acute stroke improved the motor function of the patients and the effectiveness lasted for at least 6 months after finishing the treatment.

0430G3

EVIDENCE-BASED STROKE REHABILITATION?

Keh-Chung Lin

School of Occupational Therapy, National Taiwan University College of Medicine (Taiwan)

This presentation highlights several areas of advances in evidence-based stroke rehabilitation in Taiwan. Growing evidence of randomized controlled trials showed treatment-specific efficacy of constraint-induced therapy and bilateral arm training aimed to

improve motor and functional outcomes based on the International Classification of Functioning, Disability and Health (ICF). In addition, clinimetric research showed the responsiveness and clinically important change of test instruments commonly used for measuring motor function and quality of life after stroke. Use of regression analysis has revealed predictors of treatment outcomes important for prognostic consideration in stroke rehabilitation. Implications of the findings for practice and directions of further work will be discussed. Continued research will contribute to the translation of movement science and clinical neurosciences to evidence-based stroke rehabilitation.

0430G4

FACILITATING MOTOR PERFORMANCE THROUGH EXTERNAL CUEING FOR PEOPLE WITH PARKINSON'S DISEASE

Hui-Ing Ma

Department of Occupational Therapy, National Cheng Kung University (Taiwan)

Purpose: The purpose of this presentation is to review research evidence on the effects of external cueing on motor performance in people with Parkinson's disease (PD), and to report research conducted by the presenter related to the use of virtual reality to provide external cueing in PD. **Materials and Methods:** Experimental research has been conducted on the effects of visual and auditory cueing in people with PD. In addition, virtual reality has been used to provide virtual moving targets to facilitate motor performance in this population. **Results:** Research shows positive results for the use of external cueing for people with PD, including the cueing provided in virtual reality. **Conclusion:** The findings support providing external cueing to people with PD and provide direction for future design of virtual reality program to improve motor performance for this population.

0430G5

PHYSICAL FINDINGS, SONOGRAPHY AND SHOULDER PAIN OF HEMIPLEGIC SHOULDERS IN ACUTE STROKE PATIENTS DURING REHABILITATION

Yu-Chi Huang, Pei-Jung Liang, Ya-Ping Pong, Chau-Peng Leong

Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital-Kaohsiung Medical Center (Taiwan)

Objective: Physical and sonographic evaluation of hemiplegic shoulders in acute-stroke patients and correlation between the physical/sonographic findings and early-onset hemiplegic shoulder pain (HSP), which play an important role in hemiplegic shoulder pain and may impede rehabilitation. **Subjects:** Acute stroke patients with hemiplegic shoulders. **Materials and Methods:** The following characteristics of recruited acute stroke patients were recorded: age, gender, height, body weight, side of hemiplegia, type and duration of stroke, Brunnstrom stage, subluxation, and degree of spasticity of the upper extremity. On the basis of the Brunnstrom motor recovery (BMR) stages of hemiplegic shoulders, subjects were assigned to poor motor function (PMF) and good motor function (GMF) groups. In a pilot study ($n=34$), shoulder sonography was performed at admission and 2 weeks after rehabilitation for each patient. In the following study ($n=57$), more detail physical findings and sonography of hemiplegic shoulders at admission, and before discharge were compared, and the relationship between the physical/sonographic findings of hemiplegic shoulders and HSP was analyzed. **Results:** In a pilot study ($n=34$), shoulder musculoskeletal sonography revealed soft-tissue injury in 7 patients (33%) and 15 patients (71%) in the PMF group at admission and 2 weeks after rehabilitation, respectively ($p < 0.05$), and in 4 patients (31%) in the GMF group both at admission and 2 weeks after rehabilitation. In the following study ($n=57$), the PMF and GMF groups differed significantly in prop-

rioeption, spasticity, subluxation, and shoulder rotation ($p < 0.05$). Frequency of abnormal sonographic findings and shoulder pain and VAS score of HSP before discharge were significantly higher in the PMF group ($p < 0.05$) than in the GMF group. BMR stages, shoulder motion, subluxation, and abnormal sonographic findings of hemiplegic shoulders were moderately correlated to VAS scores of HSP ($r = 0.34-0.65$; $p < 0.01$). **Conclusion:** Acute stroke patients with poor upper limb motor function are more prone to soft-tissue injury of the shoulder during hospitalization. The frequency of shoulder soft tissue injuries (85%) and early-onset HSP (67%) was significantly higher in the PMF patients with impaired sensation, spasticity, subluxation, and restricted rotation of the hemiplegic shoulder before discharge. BMR stages, limited rotation, subluxation, and abnormal sonographic findings of hemiplegic shoulders were associated to HSP severity in acute stroke.

0430L1

EFFECTS OF MOTION CONTROL SHOE ON THE KINEMATIC, KINETIC AND MOTOR CONTROL OF THE LEG DURING RUNNING

T.H. Cheung¹, Gabriel Y.F. Ng²

¹Clinical Associate, ²Chair Professor, Department of Rehabilitation Sciences, Hong Kong Polytechnic University (Hong Kong)

Purpose: Motion control footwear is a shoe design that aims at reducing rearfoot pronation so as to minimize pronation related running injuries. Although this technology is not new, there is no consensus on its clinical efficacy. This study was therefore conducted to examine the effects of motion control footwear on the foot kinematics and kinetics and lower limb muscle control in people with rearfoot over-pronation problem. **Materials and Methods:** Four experiments were done to compare the motion control footwear with normal cushion footwear in recreational runners with excessive rearfoot pronation problem during running. The parameters being studied included rearfoot movements and plantar loading pattern before and after a 1.5 km running bout and then the shank and quadriceps muscle activity during a 10 km fatigue running bout. **Results:** The data revealed that the subjects had a reduction of maximum rearfoot pronation when wearing the motion control footwear and the effect persisted even after muscle fatigue. There was a more balanced plantar loading force distribution under the foot in the motion control footwear as compared with the neutral cushioned footwear running condition. Surface electromyographic testing of the lower limb muscles revealed that motion control footwear could provide a more favorable running condition in terms of higher resistance towards muscle fatigue, more stable activation of the shank stabilizing muscles as well as enhancing the temporal activation of patella stabilizers. **Conclusion:** These findings are suggestive of the importance of appropriate selection of running shoes in people with excessive rearfoot pronation. In light of the lower limbs resembling a close kinetic chain arrangement during running, the effects of footwear may not be limited to the foot structures but it also affects the more proximal muscles thus having a potential influence on the control of the proximal joints.

0430L2

THE ROLE OF IMAGERY IN CONSTRAINT-INDUCED MOVEMENT THERAPY

Karen P.Y. Liu¹, Y.M. Wong², M.L. Yuen³, T. Leung³, C. Sum³, V. Mok⁴, C.M. Lum⁵, M.C.C. Kuo¹, C.C.H. Chan¹, K.H. Chan¹

¹Applied Cognitive Neuroscience Lab, Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, ²SAHK, ³Occupational Therapy Department, Shatin Hospital, ⁴Department of Medicine and Therapeutics, The Chinese University of Hong Kong and ⁵Medical and Geriatric Unit, Shatin Hospital (Hong Kong)

Background and Purpose: In this paper, a review of the use of mental imagery and constraint-induced movement therapy (CIMT) for people with stroke will be presented. The role of imagery in CIMT is proposed. Associated with it, a series of studies conducted in both adults with stroke and children with cerebral palsy will be presented.

Study One: Materials and Methods: In the first study on adults with stroke, a randomized clinical trial is being conducted. Up to now, a total of 9 subjects were recruited in the imagery plus constraint-induced movement therapy (imagery+CIMT) group and 6 in the control group receiving conventional occupational therapy+CIMT. All programs have duration of 2 weeks for 5 times a week. Data on upper limb motor functions and daily task performance were recorded before and after the programs, and at 2 month follow-up time. **Results:** Subjects had a mean age of 61.67 (SD=11.69). Reviewing the raw data showed that there was better improvement in all measures in the imagery+CIMT group than the control group. Repeated measure ANOVA showed that the group receiving imagery+CIMT had better significant improvement in the upper limb function of the Fugl Meyer Assessment FMA ($F = 3.45$, $p < 0.05$), but not for the Action Research Arm Test ARAT. No significant difference was found in the subjective report using the Motor Activity Log MAL and the Lawton Instrumental Activities of Daily Living scale.

Study Two: Materials and Methods: In this study, 10 children with cerebral palsy (CP) with a mean age of 13.6 years (age 9 to 18 years) were involved. A within-subjects design was used with children acting as their own controls. The study was scheduled at three-week intervals. All children underwent conventional occupational therapy (OT) and imagery+CIMT program. Both programs lasted for three weeks. Each program was followed by a three-week no-treatment period to measure carry-over effect. Upper limb subtests of the Bruininks-Oseretsky Test of Motor Proficiency, the Jebsen-Taylor Test of Hand Function, the Caregiver Functional Use Survey, a hand dynamometer, pinch gauge, and modified Ashworth scale were used for evaluation. All children were assessed for five times at 3-week interval: once before and twice after the conventional OT; and twice after the imagery+CIMT at 1 week and at 3 weeks. **Results:** The results indicated that children showed significant improvements in upper limb coordination, speed and dexterity, functional use of upper limb and hand strength after receiving the imagery+CIMT program and these gains sustained for at least 3 weeks post treatment. Children also demonstrated significant positive changes in upper limb coordination, speed and dexterity and functional use of upper limb following the OT program, but carry over effect was relatively weak on the whole.

Study Three: Materials and Methods: Event-related potential (ERP) technique was used for this study. Two children with hemiplegic cerebral palsy (aged 9 male and female; normal intelligence) received imagery+CIMT were recruited. Prior to the treatment and after the 3-week treatment period, the children participated in event-related potential (ERP) sessions with finger-tapping tasks. **Results:** Both cases exhibited improved in reaction time in both right and left hand tasks post 3-week treatment period. The improvement was larger in the affected left hand (733 ms to 659 ms and 1104 ms to 1051 ms) than the right unaffected hand (583 ms to 573 ms and 894 ms to 882 ms). Improved accuracy rates in affected hand were also demonstrated in both cases post-treatment (79% to 89% and 89% to 94%). Visual inspection of the ERP waveform showed fewer abruptnesses in post-treatment data. Topographical maps showed that in centro-parietal regions, patterns shifted from central and left-lateralized to more central and right-lateralized. **Conclusion:** CMIT has been shown to be a useful method in improving function for people with hemiplegia. Evidence also shows the advantage of using mental imagery as a strategy to understand and plan for solutions to copy with own problems. The results of this series of studies suggest a trend of better improvement in the imagery+CIMT group. Rather than a larger part of the brain regions recruited during the motor task, the patterns are more discrete and lateralized after treatment. These results suggest that improvements gained could be explained by cortical reorganization.

0430L3

USE OF PROPRIOCEPTIVE STIMULATION IN STROKE REHABILITATION**Sang-I Lin¹, Pei-Yi Lin², Li-Ju Hsu¹, Jia-Jin Chen²**¹Department of Physical Therapy and ²Institute of Biomedical Engineering, National Cheng Kung University, Tainan (Taiwan)

Purpose: The purposes were to determine the effect of proprioceptive stimulation induced by mechanical vibration and repetitive passive joint motion on movement control in patients with stroke. **Materials and Methods:** *Part I.* Stride characteristics and muscle activation patterns during walking with and without vibration to the unaffected Achilles tendon were compared. *Part II.* Sensorimotor function and the cortical activation during leg cycling were compared before and after 1-month training of active-arm (control group) and passive-leg (passive group) cycling. **Results:** *Part I.* Vibration resulted in significantly longer single stance time of the unaffected limb and greater activation of the tibialis anterior of the affected limb during initial double and single support phases. *Part II.* While the passive group had significant increase in the activation of bilateral sensorimotor cortex, and unaffected premotor and supplementary motor cortices, the control group only gained in the activation of bilateral sensorimotor cortex. Furthermore, the passive group also showed significant improvement in ankle dorsiflexion strength and joint position sense, but not the control group. **Conclusion:** Proprioceptive stimulations, even induced passively, could lead to changes in movement control in patients with stroke and thus have the potential to be used in stroke rehabilitation.

0430L4

CORTICAL REORGANIZATION INDUCED BY BODY WEIGHT-SUPPORTED TREADMILL TRAINING IN INDIVIDUALS WITH STROKE**Yea-Ru Yang, I-Hsuan Chen, Ray-Yau Wang**

Department of Physical Therapy and Assistive Technology, National Yang-Ming University (Taiwan)

The body weight support treadmill training (BWSTT) has been suggested as an effective intervention to improve balance, motor and gait performance for individuals with stroke. It consists of an overhead suspension system and harness to support partial body weight of patients while walking on the treadmill. The theoretical background of BWSTT relies on the concept of central pattern generators and the task-specific repetitive treatment in gait rehabilitation after stroke. Although some studies suggested that improvement in motor performance is related to cortical reorganization, the cortical reorganization induced by BWSTT remains unclear. We investigated the effects of BWSTT on motor performance and corticomotor activity elicited by the transcranial magnetic stimulation in 14 subjects with chronic stroke. Seven participants received general physical therapy, and others received additional BWSTT for 4 weeks. We found additional BWSTT improved gait performance and corticomotor activity of the affected hemisphere. In another study, we compared corticomotor changes induced by BWSTT in individuals with short (<6 months) or long (12 months) poststroke duration. Subjects in each short and long duration groups were randomly assigned to either the experimental or control groups. Subjects participated in BWSTT for 4 weeks in the experimental groups and in the general exercise program for 4 weeks in the control group. The 4-week BWSTT resulted in a decrease of motor threshold and an increase of map size for abductor hallucis in subjects with short duration, whereas only the expansion of the map size was noted in subjects with long duration. However, improvement of motor control occurred both in subjects with short and long post stroke duration after BWSTT. In conclusion, the BWSTT can facilitate cortical reorganization and such treatment-induced cortical reorganization is influenced by the poststroke durations.

0430L5

INTEGRITY OF THE CORTICOSPINAL TRACT PREDICTS MOTOR RECOVERY IN STROKE: DIFFUSION SPECTRUM IMAGING STUDIES**Pei-Fang Tang^{1,2}, Yi-Hsin Ko¹, Zheng-An Luo¹, Jiann-Shing Jeng³, Miao-Chi Lo⁴, Shen-Hsing A. Chen^{5,6}, Ming-Jang Chiu³, Chein-Wei Chang^{7,8}**¹School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University, ²Physical Therapy Center, National Taiwan University Hospital, ³Department of Neurology, National Taiwan University Hospital, ⁴Center for Optoelectronic Biomedicine, College of Medicine, National Taiwan University, ⁵Department of Psychology, National Taiwan University (Taiwan), ⁶Division of Psychology, Nanyang Technological University (Singapore), ⁷Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital and ⁸Department of Medical Imaging, National Taiwan University Hospital (Taiwan)

Purpose: Previous studies using the region-of-interest approach of diffusion tensor imaging have shown relationships between structural integrity of certain white matter regions and general motor recovery after stroke. It remains unclear whether the motor recovery of affected upper and lower extremities can be separately predicted by integrity indices of the corticospinal tract (CST). We investigated the longitudinal changes of structural integrity of the CST fibers corresponding to the motor control of the affected upper and lower extremities, and the relationships between early integrity indices and time-related changes of these indices with corresponding later motor outcomes. **Materials and Methods:** Diffusion spectrum imaging (DSI) and motor assessments of the affected upper and lower extremities were performed on the 30th (D30), 90th (D90), and 180th (D180) days in 6 patients with mild to moderate subcortical ischemic stroke. We used tract-specific analysis to derive generalized fraction anisotropy (GFA) and relative GFA (rGFA) values of the CSTs corresponding to upper and lower extremity control at the posterior limb of the internal capsule (PLIC). **Results:** There was a significant improvement in Fugl-Meyer upper extremity motor score (FMAUE) ($p=0.028$), borderline improvement in Fugl-Meyer lower extremity motor score (FMALE) ($p=0.068$), but no significant changes in GFA and rGFA values ($p \geq 0.45$) across the three time points. The rGFA values of the upper and lower extremity-related CSTs (rGFAPLIC-UE and rGFAPLIC_LE) on D30 were significantly correlated with FMAUE and FMALE on D180 ($rs = -0.845$, $p = 0.034$ for both), respectively. **Conclusion:** Our results suggest that in mild to moderate stroke, the integrity indices of the affected CSTs undergo negligible changes after D30; and rGFAPLIC-UE and rGFAPLIC_LE on D30 can predict long-term recovery on FMAUE and FMALE, respectively.

0430L6

TELEREHABILITATION IN SUBJECTS WITH SUBACUTE STROKE**Kwan-Hwa Lin¹, Jin-Shin Lai², Jer-Junn Luh¹, Shih-Ching Chen³, Wen-Tzeng Huang⁴, Chin-Hsing Chen⁵, Yuan-Jen Chang⁵, Shang-Ming Yu⁶**¹School and Graduate Institute of Physical Therapy, National Taiwan University; Taipei; ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital, Taipei; ³Department of Physical Medicine and Rehabilitation, Taipei Medical University, Taipei; ⁴Department of Computer Science and Information Engineering, Minghsin University of Science and Technology, Hsinchu; ⁵Department of Information Management, Central Taiwan University of Science and Technology, Taichung; ⁶Institute of Electrical Control Engineering, National Chiao Tung University Taichung (Taiwan)

Purpose: Telerehabilitation is the delivery of <http://en.wikipedia.org/wiki/Physical_medicine_and_rehabilitation>rehabilitation

service via <http://en.wikipedia.org/wiki/Telecommunication_network>telecommunication networks. Since 1998, telerehabilitation has been applied to patients, such as stroke, brain injury and orthopedic patients, living in their own home from a remote provider.¹ Previous studies demonstrated the feasibility of using the web-based telerehabilitation to improve upper extremity function in chronic post-stroke patients.^{2,3} However, less attention paid to the remote training of standing balance in patients with subacute stroke. The main purposes of the study were to set up the remote control programs for telerehabilitation, and to examine the training effect on balance in subjects with subacute stroke. We hope the method of telerehabilitation would be modified and applied to subjects living in nursing home in the future. **Materials and methods:** This was a randomized clinical trial for subjects from Outpatient Clinic of Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (NTUH) and Taipei Medical University Hospital (TMUH). Twenty one subjects with subacute stroke (less than 6 months post-stroke) participated this study. They were recruited into experimental group (i.e., telerehabilitation training group; Tele group) and control group (i.e., conventional balance training) in randomized order. Patients received 30 minutes training twice a week for 4 weeks. The telerehabilitation training was conducted via on-line internet FLASH system, and the physical therapist instructed the 30 min exercise programs to the patients about 200 meters away with microphone and webcam (Logitech) setup which allowed the tele-monitoring of the therapeutic sessions. The telerehabilitation system comprised two computers, one for patients located at a laboratory room of NTUH and the second one for a therapist at School of Physical Therapy, NTU. The server for the data collection was at Central Taiwan University of Science and Technology, Taichung. The system design included the input recording devices, user interface, and software design. The on-line input recording devices included an oximeter for heart rate and SpO₂ saturation monitor, as well as a multifunction data acquisition product (USB-6008, NI, USA) for range of motion measurement. The user interface included rehabilitation education on fall prevention, on-line physical therapy, and on-line physical assessment/recording. The on-line physical assessment included user questionnaire, Simplified Berg balance scale (S-BBS) and the Borg scale. The software design included the therapeutic exercise programs and the 3D games for subject to have off-line practice. The off-line outcome measures for pre- and post-training included Berg balance scale (BBS) and Activities-specific Balance Confidence (ABC) scale. **Results:** The mean age of Tele group ($n=10$) was 61.8 years old with 5-left and 5-right hemiparesis. The mean age of Ctrl group ($n=11$) was 59.2 years old with 4-left and 7-right hemiparesis. There were no significant differences between two groups on basic data. The on-line recording indicated that the training heart rate was within safety range (less than 60% maximal heart rate) and the Borg scale was from mild to somewhat hard. The SpO₂ was all above 90% during training session. The elbow flexion/extension recording helped the monitor of the joint angle during training. From questionnaires, most the subjects satisfied with the telerehabilitation systems. The outcome measures including the S-BBS, BBS and ABC in each group showed significant improvement post-training in both groups. However, there were no significant differences between two groups.

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0430D1

EFFECTS OF SIT-STAND-SIT STRATEGIES ON POSTURAL STABILITY IN STROKE PATIENTS

Ta-Sen Wei^{1,2}, Liang-Wey Chang¹

¹Institute of Biomedical Engineering, College of Medicine and College of Engineering, National Taiwan University and ²Department of Physical Medicine and Rehabilitation, Changhua Christian Hospital (Taiwan)

ment of Physical Medicine and Rehabilitation, Changhua Christian Hospital (Taiwan)

“Sit to stand” and “Stand to sit” (Sit-Stand-Sit) are daily and domestic functional activities. Postural stability during Sit-Stand-Sit transitional movement draws great clinical attention in patients with strokes who are considered as high risk group of falling with subsequent injuries. Sit-Stand-Sit is a common therapeutic exercise implemented by therapists in rehabilitation training and requires delicate skills that involve coordinated head-trunk-limb movements, adequate muscle strength, and well-controlled balance. It is crucial to determine appropriate transition strategies in patient’s Sit-Stand-Sit for safe movement. Depending on severity of hemiplegia, level of spasticity and weakness, positioning of trunk-limb segment, and height of chair; stroke patients with functional limitation usually develop different compensatory strategies in ADL to accomplish these tasks. Biomechanical studies provide useful information of joint moment, rate of rise in force, asymmetry of vertical force and COP displacement at different foot positions, arm placements and chair heights (the determinants) during Sit-Stand-Sit. Loading asymmetry is often found before seat-off and after seat-on in Sit-Stand-Sit tasks. Positioning the affected foot behind reduces the asymmetry, while the unaffected foot behind increases the asymmetry. The sitting-down movement is carried out by a stereotyped motor strategy characterized by an activated gastrocnemius muscle coupled with deactivation of the erector spinae muscles. As well as producing a transient center of pressure displacement in the forward direction, it also synchronously unlocks the trunk and prevents a fall backward. Our study shows that altering arm placement does not significantly influence the leg load sharing strategy and sitting impact forces during stand-to-sit. The leg load sharing strategies are ruled by the preferred use of the non-paretic side and the favored leg position for the biomechanical load. Placing the non-paretic leg posteriorly reduces the impact of stand-to-sit because of the advantage of the preferred use together with the favored leg position. Since the paretic leg is incapable of modulating the sitting-down process, placing the paretic leg posteriorly induces notably greater sitting impact forces compared with the counter-leg placement. From strength-training point of view, placing the paretic leg posterior would facilitate exertion of the paretic leg. Full knowledge of Sit-Stand-Sit determinants could improve strategies for daily performance and rehabilitation of these tasks and decrease the incidence of falls in stroke patients.

0430D2FP

ROBOTIC-ASSISTED THERAPY OF PARETIC UPPER LIMB FOR CHRONIC STROKE

Pai-Yin Chen¹, Shu-Min Chen¹, Pin-Cheng Kung², Ming-Shaung Ju², Chou-Ching K. Lin³

¹Dept. of Physical Medicine and Rehabilitation, National Cheng Kung University Hospital, ²Dept. of Mechanical Engineering, National Cheng Kung University and ³Dept. of Neurology, National Cheng Kung University Hospital (Taiwan)

Purpose: Robotic-assisted therapy has been used to assist rehabilitation of paretic upper limb after stroke in the past decade. We intended to evaluate the effects of robotic-assisted therapy for chronic stroke patients with paretic upper limb. **Materials and Methods:** We included six outpatients with chronic hemiparesis after stroke. The inclusion criteria were 1) stable medical condition; 2) an interval of at least 1 year from the stroke onset, 3) intact cognition to follow instruction; 4) Brunnstrom stage III of the affected limb at least. For each patient, the paretic upper limb was treated with robotic-assisted therapy, 50 min per session, two sessions per week, for four months. All of the subjects were also engaged in conventional rehabilitation program. The upper limb motor function of the subjects was assessed objectively by Brunnstrom Stage, Modified Ashworth Scale (MAS), Fugl-Meyer assessment (FMA), and integration of absolute deviation of torque (IADT). On the basis of the previous study, the IADT index could quantify the pronation/supination torque trajectory and

the paretic upper limb generated a larger pronation/supination torque and a larger IADT value, which could be a quantitative evaluation of abnormal synergy. The assessments were performed before the therapy (T0), at the end of therapy (T1), and four months after the end of therapy (T2). The rehabilitation robot was developed in our previous study for neuro-rehabilitation of upper limb and was designed to perform a two-dimensional motion on the transverse plane. Four directions of rectilinear tracking movements were designed for treatments with the rehabilitation robot. The patient faced a screen that provided visual feedback of two icons. One icon represented the target position, and the other represented the actual position of the patient's wrist. Patient was asked to track the target and to keep the error as small as possible. Each movement was repeated six times. During the tracking movements, the robot applied resistant force, 30% of maximum voluntary contraction, along a direction tangent to the trajectory of moving direction. **Results:** Subjects showed significant improvement in FMA and IADT after robotic-assisted therapy from T0 to T1 (mean increase in FMA of 8.5, $p<0.05$; mean decrease in IADT of 26.64, $p<0.01$) and to T2 (mean increase in FMA of 6.0, $p<0.05$; mean decrease in IADT of 12.31, $p<0.01$). The effects in FMA sustained longer from T1 to T2 ($p=0.224$) than in IADT ($p<0.05$). We found no differences in Brunnstrom stage from T0 to T1 and to T2. MAS decreased after robotic-assisted therapy from T0 to T1 ($p=0.046$), but there was no difference from T0 to T2. **Conclusion:** Robotic-assisted therapy improves motor function and decrease abnormal synergy pattern of the paretic upper limb in chronic stroke patients, and the effects can sustain 4 months after therapy. There is a trend that robotic-assisted therapy can decrease spasticity during the treatment course. This study is limited by the small sample size and the lack of a control group.

0430D3FP

CORRELATION FACTORS OF THE HEALTH-RELATED QUALITY OF LIFE IN PATIENTS WITH CHRONIC APHASIA DUE TO STROKE

Lochia Chang¹, Lu Lu²

¹Graduate Program of Speech Therapy, Taipei Municipal University of Education, ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: To investigate the correlation between chronic aphasic patients' health related quality of life and several possible variables. **Materials and Methods:** 26 stroke patients with aphasia were recruited in this study. The inclusion criteria were more than 6 months post onset, fair auditory comprehension (scored 5/10 or above in the comprehension subtest of Western Aphasia Battery) and minimal motor disability. The Chinese version of The Stroke and Aphasia Quality of Life Scale-39 (SAQOL-C) and the Burden of Stroke Scale (BOSS) were used for assessment of their HRQOL. The Western Aphasia Battery (WAB), the Communicative Effectiveness Index (CETI), and the Beck Depression Inventory-Second Edition (BDI-II) were used to assess their severity of language impairment, functional communication ability, and degree of depression respectively. Stroke-related variables such as time post-onset, type of stroke and number of co-morbid diseases were also collected. **Results:** Patients with more severe language impairment or higher communication disability reported significantly poorer total HRQOL on the SAQOL-C, and perceived greater difficulties in communication and social relationships on the BOSS. However, it was not correlated with the subjects' psychological distress. People with higher depression perceived more trouble in the energy subscale of SAQOL-C. People with more co-morbid diseases also perceived more trouble in the energy subscale of SAQOL-C and had poorer total HRQOL and more cognition associated psychological distress. **Conclusion:** Our results were consistent with the fact that the health related quality of life is a multi-facet concept and could be affected by many variables including the severity of the patient's impairment, functional level, and other personal factors.

0430D4FP

CORRELATION OF STROKE-ONSET SEVERITY WITH HEALTH STATUS, QUALITY OF LIFE AND FAMILY IMPACT IN PATIENTS WITH ISCHEMIC STROKE

Ru-Lan Hsieh^{1,2}, Ching-Shiang Tseng¹, Shi-Chin Chen², Ling-Yi Wang³, Wen-Chung Lee³

¹Department of Physical Medicine and Rehabilitation, Shin Kong Wu Ho-Su Memorial Hospital, ²School of Medicine, College of Medicine, Taipei Medical University and ³Graduate Institute of Epidemiology, College of Public Health, National Taiwan University (Taiwan)

Purpose: To study the correlation of stroke-onset severity with health status and quality of life (QoL) in patients with ischemic stroke and their family impact at the acute stroke stage. **Materials and Methods:** Stroke-onset severity was evaluated with the National Institute of Health Stroke Scale (NIHSS) within 6 hours of stroke onset. Patients whose condition was stable and suitable for a rehabilitation program within 2 weeks after stroke were included. Health status was evaluated based on the International Classification of Functioning, Disability and Health. It included 1) body structure and function: Mini-Mental State Examination for cognition, Fugl-Meyer scores for upper extremity motor function, Wolf Motor Function Test for upper extremity function, balance performance test for balance; 2) activities and participation: Frenchay Activities Index for activity, Rivermead Mobility Index for mobility, Functional Independence Measure for functional independence; 3) personal factors: Geriatric Depression Scale and Hospital Anxiety and Depression Scale for emotion; and 4) environmental factors: family supporting system. Family impact was evaluated by Caregiver Strain Index for caregiver's strain, visual analog scale for family burden. QoL was evaluated with the Stroke Impact Scale. The correlation of stroke-onset severity with health status and QoL of stroke patients and family impact at the acute stage of stroke was assessed. **Results:** We enrolled 95 patients, 55 men and 40 women. Stroke-onset severity was significantly negatively correlated with attention (correlation coefficient: -0.30), upper limb motor performance (correlation coefficient: -0.24 to -0.34) and functional performance (correlation coefficient: -0.21 to -0.60), mobility (correlation coefficient: -0.28), and QOL (correlation coefficient: -0.23 to -0.51) at the acute stage of stroke. A significant positive correlation was noted between stroke-onset severity and anxiety (correlation coefficient: 0.22) and depression (correlation coefficient: 0.27) in stroke patients, and family burden (correlation coefficient: 0.27). **Conclusion:** Stroke-onset severity correlated with health status and QoL in patients with stroke at the acute stage. The lesser the stroke-onset severity, the better the attention, upper limb motor performance and functional performance, mobility, functional independence, and QoL. The greater the stroke-onset severity, the more depression and anxiety in patients, and the more family impact.

0430D5FP

COMPARISON OF INTRAMUSCULAR BOTULINUM TOXIN TYPE A INJECTION AND PERCUTANEOUS MUSCULAR BRANCH BLOCK OF THE TIBIAL NERVE FOR REDUCING ANKLE PLANTARFLEXOR SPASTICITY: A RANDOMIZED CLINICAL TRIAL

Jau-Jia Lin¹, Hsiao-Yun Chang², Wei-Wen Chen³, Su-Ju Tsai⁴, Tzer-Bin Lin⁵

¹Department of Physical Medicine and Rehabilitation, Chung Shan Medical University Hospital, ²School of Physical Therapy, Chung Shan Medical University, ³Department of Physical Medicine and Rehabilitation, Chung Shan Medical University Hospital, ⁴Depart-

ment of Physical Medicine and Rehabilitation, Chung Shan Medical University Hospital and ³Department of Physiology, Chung Shan Medical University (Taiwan)

Purpose: To compare the efficacy of intramuscular botulinum toxin type A (BTX-A) and muscular branch block of the tibial nerve with phenol (Phenol) for the treatment of ankle plantarflexor spasticity. **Materials and Methods:** Thirty hemiplegic patients with ankle plantarflexor spasticity at least 2 in modified Ashworth Scale and 15 degree difference in Tardieu scale were randomly assigned to receive a single treatment of 100 mouse units (MU) of BTX-A injected into the calf muscles or to receive a muscular branch block of the tibial nerve with 5% phenol. Sixteen were in the BTX-A group and fourteen in the Phenol group. One patient in BTX-A group was excluded because she underwent intrathecal baclofen pump trial during the study period. Objective evaluations included Tardieu scale, modified Ashworth scale and 6 minute walk test were assessed at baseline, at weeks 2, 4, 8, and 12. **Results:** At follow-up, significant improvement ($p < 0.05$) in the modified Ashworth score and Tardieu scale for dorsiflexion was observed in both groups. When those variables were compared between the two groups, the changes in the modified Ashworth score and Tardieu scale at weeks 2, 4, 8, and 12 were not significantly different ($p > 0.05$). There was significant improvement ($p < 0.05$) in the walking speed and step length at all measured points in the Phenol group and weeks 2, 12 in the BTA group. However, walking speed was returned to baseline at Weeks 4, 8 and step length was also returned at weeks 4 in the BTA group. **Conclusion:** We conclude that intramuscular botulinum toxin type A injection and muscular branch block of the tibial nerve with phenol are both effective in reducing ankle plantarflexor spasticity.

0430D6FP

THAT USING COMPUTER EXERCISE UPPER LIMB OF THE ISCHEMIC STROKE PATIENTS OBSERVE THE CHANGES OF BRAIN FUNCTIONAL MAGNETIC RESONANCE IMAGING

Jin Chen¹, Feifei Yang², Yongmei Li³, Gang Lu⁴, Qi Li⁵, David Yao⁶, Lijuan Ao⁷

¹Department of Rehabilitation, the Second Affiliated Hospital of Kunming College, ²Department of Radiation, the Second Affiliated Hospital of Kunming College, ³Department of Rehabilitation, the Second Affiliated Hospital of Kunming College (China), ⁴The Chinese University of Hong Kong, Prince of Wales Hospital, ⁵Hong Kong University, ⁶The Chinese University of Hong Kong (Hong Kong) and ⁷Department of Rehabilitation, the second Affiliated Hospital of Kunming College (China)

Purpose: To observe the changes of brain functional Magnetic Resonance Imaging (fMRI) between computer exercising before and after of the cerebral arterial thrombosis in patients. **Materials and Methods:** From Nov 2007 to May 2008, We chose 10 patients with ischemic stroke, giving them computer training (E-link E4000 equipment), training 6 weeks, choosing six different games ,about 45 minutes every time, every week used the same game ,according the subject's result to adjust the game's difficulty, speed and load. training contents included flexion and extension of shoulder-elbow and wrist, pronation and supination of forearm, side pinch of fingers. Evaluating upper limb function (Functional seven levels with stroke, Fugl-Meyer, Modify Barthel index (MBI)) and fMRI with a 1.5T scanner was performed at the time of the subjects attempting sequential flexion and extend wrist at pre-treatment, post-treatment. **Results:** Before training, on fMRI, the activated regions were in the contralateral primary sensorimotor cortex (SMC) and ipsilateral homonymy cerebellum during the nonparetic wrist movement, the subjects showed scattered activity in the contralateral primary sensorimotor cortex (SMC) which is weaken, the homonymy SMC and SMA which are increased during the paretic wrist movement. After training, the activated regions were more than before train-

ing during the nonparetic wrist movement, including contralateral primary sensorimotor cortex (SMC) and limbic system. During the paretic wrist movement, activated regions were mainly in the contralateral and ipsilateral SMC, SMA, contralateral primary sensorimotor cortex and contralateral parietal lobule are increase than before. After training, the upper limb functional assessments have significant improved ($p < 0.01$). **Conclusion:** Using computer exercise can improve the upper limb function of stroke, and its mechanism promotes brain functional reorganization.

0430D7FP

THE EFFECT OF REHABILITATIVE TRAINING ON BRAIN FUNCTIONAL REORGANIZATION IN PATIENTS WITH CEREBRAL INFARCTION BY FMRI: A LONGITUDINAL STUDY

Xi-Quan Hu¹, Ya-Dan Zheng¹, Rui-Shu Jiang¹, Zhuang Kang²

¹Department of Rehabilitation Medicine, the Third Affiliated Hospital of Sun Yat-sen University and ²Department of Radiology, the Third Affiliated Hospital of Sun Yat-sen University (China)

Purpose: To explore the effect of rehabilitative training on brain functional reorganization in patients with cerebral infarction. **Materials and Methods:** 16 patients within 3 months after subcortical infarct were assigned to rehabilitation group ($n=10$) or control group ($n=6$). The rehabilitation group received 4 weeks rehabilitative training section and the control group did not in this research. All patients were assessed by fMRI scanning and Fugl-Meyer motor assessment (FMA), Modified Barthel Index (MBI) and the Moter assessment scale (MAS) prior to and following the section. All patients received fMRI scanning during passive movement at both affected and unaffected wrested separately clenching. Brain functional mapping was acquired with SPM2, and different activation patterns of brain were compared between both groups. The volume and intension of M1 activation were calculated, and the relationship between laterality index (LI) and motor function was examined. **Results:** 1).The scores of motor function assessment in the rehabilitative training group were significantly better than the control group. 2).The first fMRI before rehabilitative training showed an early general hyperactivation when the affected hand was moved in bilateral brain. 3).M1 activation moved from an early contralesional hyperactivation to a later ipilesional hyperactivation. 4).There were positive correlation between LI (M1) and FMA, MAS changes($r=0.917$, $r=0.949$). **Conclusion:** The rehabilitative training can promote the motor function recovery and induce brain functional reorganization. Activation of M1 regions are associated with motor function recovery.

Cardiopulmonary Rehabilitation and Obesity

0430H1

SCHEDULE OF CARDIAC REHABILITATION

Farzaneh Torkan¹, Laleh Hakemi²

¹Chair of Physical Medicine & Rehabilitation Medicine, NIOC Subspecialty Hospital and ²Internal Medicine Specialist, NIOC Subspecialty Hospital (Islamic Republic of Iran)

Cardiovascular disease especially coronary heart disease is a major problem in many countries. The incidence of cardiovascular disease has changed dramatically in Iran. Now, coronary heart disease is the most common and serious problem (Iranian Heart Journal 2004). Post myocardial infarction survivors suffer a re- infarction 5 times the healthy population. Secondary prevention protocols can help the patients to live healthier with fewer morbidity and mortality. Cardiac rehabilitation decreases coronary heart disease mortality for nearly 26%. Cardiac Rehabilitation program consist of: 1) inpatient programs with an early assessment for risk factor management and mobilization, 2) transition cares and discharge planning

design for daily activities like driving, lifting, sexual activity and so on, 3) out-patient rehabilitation and secondary prevention, the patients are assessed for risk factors and they will be divided into different categories. Necessary interventions for minimizing the effects of risk factors explained to patients such as non pharmacologic interventions or a healthier life style (quitting tobacco use, healthier diet, regular physical activity, weight management, stress reduction). In this stage, the patients undergo medical evaluation and exercise testing and based on the results, exercise plan is prescribed and ECG monitoring and medical supervision applied when indicated. Appropriate equipment, staffing and safety measures help minimizing the rehabilitation programs and in Iran, qualified physiatrists, nurses, physiotherapists, nutritionists, psychologists work as a group. In Tehran, in a study on 2137 subjects (35–65 years), the prevalence of cardiovascular risk factors is as follows: Hypertension 31.3%, Isolated systolic hypertension 8.2%, Smoking 13.3%, borderline high total cholesterol 34.3%, high total cholesterol 27.4%, borderline-high LDL 28.4%, high LDL cholesterol 21.2%, low HDL 5.8%, borderline high triglyceride 4.7%, diabetes mellitus 9.2%, overweight 39.8%, obesity 23.4%, and lack of leisure time physical activity 88.9% (Oraini et al). Our future direction is making our efforts for changing life style habits in the population for primary prevention, on the other hand we have to expand cardiac rehabilitation centers, and education of the staff; also we ought to try our best to account the insurance companies for supporting primary prevention protocols in high risk individuals. Researches in Iran, is under optimal however, have important results in organization of secondary prevention strategies. The effectiveness of secondary prevention measures, the costs of disease and its consequences compared to the costs of prevention, the KAP analysis on the target population can help a fruitful organization. In a study on 118 coronary artery disease patients in Shahid Rajaei Hospital, after the monitoring period, BMI, weight, waist circumference, and waist to hip ratio decreased ($p < 0.001$) however, these indices returned to the pre rehabilitation period after 12 months (Masoumi 2005). In another study on 8 weeks exercise rehabilitation on 100 patients (Farahani 2003), 10% increase in METs was noticed compared to pre exercise situation ($p = 0.001$), also a 6% decrease in resting heart rate and 18% increase in maximal attainable heart rate were noticed. Also a slight decrease in systolic blood pressure and improvement in lipid profile were occurred.

0430H2

EXERCISE PRESCRIPTION AND THROMBOGENESIS

Jong-Shyan Wang

Graduate Institute of Rehabilitation Science, Chang Gung University (Taiwan)

Lifestyle habits, such as exercise, may significantly influence risk of major vascular thrombotic events. The risk of primary cardiac arrest has been shown to transiently increase during vigorous exercise, whereas regular moderate-intensity exercise is associated with an overall reduced risk of cardiovascular diseases. What are the mechanisms underlying these paradoxical effects of vigorous exercise versus exercise training on thrombotic modification? This investigation analyzes research regarding effects and their underlying mechanisms of acute exercise, endurance training, and deconditioning on platelets, coagulation, and fibrinolysis. Evidence suggests that (i) light, acute exercise ($\leq 49\% \text{VO}_{2\text{max}}$) does not affect platelet reactivity and coagulation and increases fibrinolytic activity; (ii) moderate, acute exercise ($50\sim 74\% \text{VO}_{2\text{max}}$) suppresses platelet reactivity and enhances fibrinolysis, which remains unchanged in the coagulation system; and, (iii) strenuous, acute exercise ($\geq 75\% \text{VO}_{2\text{max}}$) enhances both platelet reactivity and coagulation, simultaneously promoting fibrinolytic activity. Therefore, moderate exercise is likely a safe and effective exercise dosage for minimizing risk of cardiovascular diseases by inducing beneficial anti-thrombotic changes. Moreover, moderate-intensity exercise training reduces platelet reactivity and enhances fibrinolysis at rest, also attenuating enhanced platelet re-

activity and augmenting hyper-fibrinolytic activity during strenuous exercise. However, these favorable effects of exercise training on thrombotic modification return to a pre-training state after a period of deconditioning. These findings can aid in determining appropriate exercise training to prevent early thrombotic events and further hinder the cardiovascular disease progression.

0430H3

BENEFITS OF PHASE 2 CARDIAC REHABILITATION IN PATIENTS WITH MYOCARDIAL INFARCTION

Ssu-Yuan Chen¹, Bai-Chin Lee², Mao-Yuan Marine Su³, Ching Lan¹, Hsiu-Ching Hsu², Wen-Yih Issac Tseng³, Ming-Fong Chen², Jin-Shin Lai¹

¹Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital and National Taiwan University College of Medicine, ²Department of Internal Medicine, National Taiwan University Hospital and National Taiwan University College of Medicine and ³Department of Medical Imaging, National Taiwan University Hospital and National Taiwan University College of Medicine (Taiwan)

Purpose: The purpose of this study was to determine the benefits of phase 2 cardiac rehabilitation in patients with myocardial infarction including myocardial perfusion reserve (MPR) in the remote and infarcted myocardium and plasma levels of angiogenic cytokines.

Materials and Methods: Thirty-nine postinfarction patients were recruited for this study and randomly assigned to a training group ($n=20$) or a non-training group ($n=19$). Those in the training group participated in a 3-month cardiac rehabilitation training program at an exercise intensity of 55% to 70% of peak oxygen uptake ($\text{VO}_{2\text{max}}$); those in the non-training group continued their usual lifestyle. Nineteen age-, weight-, and height-matched subjects without cardiovascular risk factors were selected as healthy controls. Main outcome measurement included peak $\text{VO}_{2\text{max}}$, MBF by cardiac magnetic resonance imaging, and plasma levels of stem cell factor (SCF), stromal-derived factor-1 (SDF-1), and vascular endothelial growth factor (VEGF). **Results:** After myocardial infarction, a reduction in perfusion reserve was seen not only in the infarcted myocardium, but also in the remote myocardium. The postinfarction patients had higher plasma levels of VEGF and SDF-1 comparing with the healthy controls at baseline. In the training group, the post-training MPR increased in both remote and infarcted myocardium while VEGF and SDF-1 decreased. The exercise capacity increased to the same level as in healthy controls. The change in exercise capacity significantly correlated with the change in MPR in the remote myocardium. In the non-training group, exercise capacity, MBF, and cytokines were unchanged. **Conclusion:** Phase 2 cardiac rehabilitation improves perfusion reserve in both infarcted and remote myocardium, increases exercise capacity, and decreases circulating angiogenic cytokines.

0430H4

CARES THAI ACTIONS: PREVENTIVE AND REHABILITATIVE PROGRAM FOR CARDIAC AND HIGH RISK FACTORS PATIENTS

Pravitt Tanprasert, Rapeephon Kunjara, Sukajan Pongprapai, Piyonuj Ruckpanich, Khunyong Mallika Wannakrairot, Visal Kantaratanakul, Patrawut Intarakamhaeng, Rukfun Sawadpanich

Cardiac Rehabilitation Center, Perfect Heart Institute, Piyavate Hospital (Thailand)

Purpose: 1) To do the registry collection of multi-center cardiac rehabilitation program in Bangkok, Thailand. 2) To evaluate the effects of CARES THAI Action program for the cardiac and risk factors patients. 3) To expand the usefulness of CARES THAI Action program in other cardiac rehabilitation program. **Materials and**

Methods: This is an observational prospective study being conducted in 9 Cardiac rehabilitation programs in Bangkok. Two hundred participants who are eligible to enroll in the study are either cardiac patients with the diagnosis of Acute coronary syndrome (ACS), post Percutaneous Coronary Intervention (PCI), post Coronary Artery Bypass Graft (CABG), Congestive Heart Failure (CHF) or High Risk Factors Group. All of the participants will use data collection of CARES THAI Actions program to evaluate their risk profile, food questionnaire and exercise questionnaire. Vital sign, body composition and blood chemistry are also collected pre and post intervention. The total follow up period are 4 times during one year period and can be done by telephone follow up during 2nd and 3rd visit. **Results:** This is a preliminary report of the study. During the time frame from January 2009 to January 2011. Up to November 2009, 81 participants are enrolled. Majority of participants are post revascularization (37% and 33% from post CABG and post PCI, respectively). Others are risk factors (18%), ACS (9%) and CHF (3%). Male are predominate (62%) and more likely to smoke and have higher body weight compare to women. The analysis of the of the complete follow up participants will be analyzed and present in the conference. **Conclusion:** This preliminary report represents the pictures of Thai cardiac and high risk factors patients who are enrolled in Cardiac Rehabilitation Program in 9 participating hospitals in Bangkok. When the data collection is completed, we will able to evaluate the usefulness and benefit of CARES THAI Actions program, then able to convince implication of the cardiac rehabilitation program in all cardiac center hospital nation wide.

0430H5

TO FACILITATE RETURN TO WORK THROUGH CARDIAC REHABILITATION

Leonard S.W. Li

Division of Rehabilitation Medicine, University Department of Medicine, Tung Wah Hospital and University of Hong Kong (Hong Kong)

Purpose: Cardiac rehabilitation has 2 important aspects. One is to achieve secondary prevention to reduce the morbidity and mortality related to the cardiac impairment. Another aspect is to enhance functional status of cardiac patients. Return to work after a cardiac rehabilitation program is one of the important indicators for the successfulness of the program. **Materials and Methods:** Work assessment and training is part of the components at the cardiac rehabilitation centre of Tung Wah Hospital. Work hardening or retraining is individualised according to the cardiac function, patient's previous work history and education level. The status of work after cardiac rehabilitation was collected together with the exercise capacity, risk factors and psychosocial status at the centre. The rate of and factors influencing return to work were analysed statistically. **Results:** The rate of return to work after cardiac rehabilitation could be around 90% after one year time if appropriate assessment, training or retraining program was offered. The single important factor affecting the return to work after a cardiac event is the exercise capacity. The return rate was poor if the exercise capacity was 4METs or less in both young and elderly. **Conclusion:** Vocation aspect for patients with cardiac disease should be addressed in a cardiac rehabilitation program, which can achieve good results to facilitate patients safely return to work.

0430M1FP

PHASE 2 CARDIAC REHABILITATION IMPROVES AEROBIC CAPACITY OF HEART TRANSPLANTATION RECIPIENTS AT ONE YEAR AFTER SURGERY

Ssu-Yuan Chen^{1,2}, Ching Lan^{1,2}, Jin-Shin Lai^{1,2}, Chen-Jung Hsu^{1,5}, Nai-Kuan Chou^{3,4}, Shoen-Shen Wang^{3,4}

¹Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital, ²Department of Physical Medicine and

Rehabilitation, National Taiwan University College of Medicine, ³Department of Surgery, National Taiwan University Hospital, ⁴Department of Surgery, National Taiwan University College of Medicine and ⁵Department of Physical Medicine and Rehabilitation, Miao-Li Hospital Department of Health (Taiwan)

Purpose: Few studies have evaluated benefits of cardiac rehabilitation (CR) among Asian heart transplantation recipients (HTR). The aim of this study was to examine the effects of post-operative phase 2 CR on aerobic capacity among Asian HTR at one year after transplantation. **Materials and Methods:** The study assessed 42 clinically stable HTR at one year (12 ± 2 months (mean \pm SD)) after heart transplantation. The training group included 28 HTR (age: 49 ± 15 years; male/female: 22/6) who had participated in the postoperative phase 2 CR (31 ± 13 weeks, 3 days/week). The control group included 14 HTR (age: 46 ± 16 years; male/female: 11/3) who had not participated in outpatient CR. A graded bicycle exercise test with breath-by-breath respiratory gas analysis was conducted to assess the aerobic capacity and cardiorespiratory response to exercise of the study subjects. The Wilcoxon rank-sum test was used to analyze the differences between groups. **Results:** At peak exercise, the training group exhibited significantly higher oxygen uptake (20.1 ± 4.7 vs 16.8 ± 4.2 mL \cdot kg $^{-1}$ \cdot min $^{-1}$, $p=0.047$), work rate (110 ± 37 vs 82 ± 29 watts, $p=0.010$), heart rate (141 ± 21 vs 125 ± 18 beat \cdot min $^{-1}$, $p=0.044$), and minute ventilation (62.5 ± 15.8 vs 51.2 ± 12.9 L \cdot min $^{-1}$, $p=0.021$) than respective values of the control group. At the ventilatory threshold, the training group also showed significantly higher oxygen uptake (14.4 ± 3.6 vs 11.6 ± 3.2 mL \cdot kg $^{-1}$ \cdot min $^{-1}$, $p=0.003$), work rate (62 ± 24 vs 44 ± 22 watts, $p=0.006$), and minute ventilation (33.4 ± 8.8 vs 27.1 ± 8.5 L \cdot min $^{-1}$, $p=0.009$) than the control group. **Conclusions:** At one year after heart transplantation, HTR who had participated in phase 2 CR displayed significantly higher aerobic capacity than those who did not receive phase 2 CR. The postoperative phase 2 CR is effective for Asian HTR in improving aerobic capacity at one year after transplantation.

0430M2FP

STUDY OF PHYSIOLOGICAL ISCHEMIC EXERCISE TRAINING ON CIRCULATING EPCS AND NEOVASCULATION IN PATHOLOGICAL MYOCARDIAL ISCHEMIA ANIMALS IN VIVO

Chunxiao Wan^{1,2}, Chengjian Yang¹, Jianan Li², Jing Xu³

¹Wuxi No. 2 people's hospital, affiliated with Nanjing Medical University, ²Nanjing Medical University and ³Nanjing Traditional Medicine University (China)

Purpose: This study is to investigate the benefits of the physiological ischemic exercise training on endothelial progenitor cells (EPCs) and also the identification of EPCs mobilisation in rabbits with pathological myocardial ischemia (MI). **Materials and Methods:** Thirty-six adult male Zealand rabbits were used for the investigation and were randomly grouped into four groups: Group A had neither physiological ischemic exercise (IE) training nor myocardial ischemia (MI) and served as a control group; Group B underwent IE only; Group C underwent MI only; and Group D underwent both IE and MI. Physiological ischemic exercise was induced by electrical stimulation (40% maximum current strength, 1 ms, 40 Hz) for 4 min twice a day, 5 days a week, for 4 weeks. Pathological MI was induced by left ventricular branch intermittent occlusion for 2 min twice a day, also for 4 weeks. EPCs in circulation were quantified by fluorescence-activated cell sorter (FACS) analysis (FACS) for rabbits at the end of the four-week-experiments. Capillary densities in ischemic heart tissues were also counted for all groups. **Results:** The numbers of CD34+/FLK-1+ cell in peripheral blood of trained rabbits in group B, C and D were 3.8 \pm 0.6 fold increase, 6.1 \pm 2.8 fold increase and 6.9 \pm 1.7 fold increase, respectively with respect to the control group. Neovascularization as assessed by a capillary density in ischemic myocardium which elevated accompanied with EPCs were found to be 326 \pm 76 in Group A, 327 \pm 59 in Group

B, 516 ± 77 in Group C, and 824 ± 106 ($/\text{mm}^2$) in Group D at the end of the experiments for all groups respectively. **Conclusion:** Endogenous EPCs were increased significantly with physiological isometric exercise training in rabbits with MI, and homed to the injure heart fraction for protection by angiogenesis.

0430M3FP

ELECTRICAL STIMULATION IN PATIENTS WITH SEVERE CHRONIC HEART FAILURE

Masahiro Kohzaki, Makoto Nagasaka, Osamu Ito, Nobuyoshi Mori, Sakata Keiko, Fumika Suzuki, Satoru Ebihara

The Department of Int Med and Rehabilitation Science, Tohoku University Graduate School of Medicine (Japan)

Purpose: The exercise training has been shown to improve the functional capacity, quality of life and also the patterns of strength muscles in patients with chronic heart failure (CHF). Most of actual training types, however, are based on the systemic exercises resulting in increased cardiac workload. This could lead to onset of life-threatening side effects such as fatal dysrhythmias. Moreover, most of patients with CHF have low exercise tolerance and poor motivation to exercise. **Materials and Methods:** Low-frequency electrical stimulation (ES) has been shown to increase oxidative capacity in the skeletal muscle fibers, to enhance muscular regeneration and to prevent atrophy. We aimed to evaluate the possible benefit of ES in patients with mild to severe CHF, and to compare the results with the conventional bicycle training. **Results:** In our data, 6 weeks ES (60 min/day) of quadriceps and calf muscles of both legs significantly improved muscle strength and blood flow in patients with advanced CHF. Moreover, a similar improvement of exercise capacity in patients with CHF can be achieved either by aerobic bicycle training or by local ES of the strength muscles of the lower limbs in patients with mild to moderate CHF. **Conclusion:** Although the effectiveness of conventional exercise protocols in cardiovascular rehabilitation is beyond doubt, the safety and easy application of ES could be of great benefit in the rehabilitation of patients with CHF, especially those with a severe grade of the disease. Future studies should also address the possibility of combining ES with some type of classical exercise training.

0430M4FP

THE EFFECTS OF PHASE 2 CARDIAC REHABILITATION PROGRAM ON HEALTH-RELATED QUALITY OF LIFE AMONG HEART TRANSPLANTATION RECIPIENTS

Chen-Jung Hsu^{1,2}, Ssu-Yuan Chen^{1,3}, Ching Lan^{1,3}, Shu-Fang Hsiao^{1,3}, Jin-Shin Lai^{1,3}, Nai-Kuan Chou^{3,4}, Shoen-Shen Wang^{3,4}, Syi Su⁵

¹Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital, ²Department of Health, Miao-Li Hospital, ³National Taiwan University College of Medicine, ⁴Department of Surgery, National Taiwan University Hospital and ⁵Institute of Health Care Organization Administration, College of Public Health, National Taiwan University (Taiwan)

Purpose: There are few studies about the exercise benefits to health-related quality of life (HRQoL) among Asian heart transplantation recipients (HTR) in the early postoperative period. The aim of this study was to examine the effects of an early post-operative phase 2 cardiac rehabilitation program (CRP) on HRQoL among Asian HTR. **Materials and Methods:** The study included 45 clinically stable HTR (age: 47 ± 14 years (mean \pm SD); Male/Female: 36/9) who started phase 2 CRP within 6 months after surgery (time post-transplant: 70 ± 33 days) and completed the supervised exercise training program (3 days/week, 42 days at least). Each training session comprised 5–10 min of warm up, 25–30 min of cycling or

treadmill walking, and 10 min of cool down. The exercise intensity was set at 50–80% of peak oxygen uptake ($\text{VO}_{2\text{peak}}$) according to patient's condition. The HRQoL of the study subjects was evaluated by the SF-36 questionnaire at baseline and after CRP. **Results:** After CRP (training duration: 80 ± 24 days), the HTR had significantly higher SF-36 scores in physical functioning (59.7 ± 18.9 to 77.0 ± 14.0 , $p < 0.0001$), physical role (21.1 ± 34.1 to 38.3 ± 37.9 , $p = 0.0496$), bodily pain (57.4 ± 24.3 to 73.6 ± 21.5 , $p = 0.0011$), social functioning (63.6 ± 23.4 to 72.8 ± 22.1 , $p = 0.0147$), emotional role (59.2 ± 43.7 to 76.3 ± 37.4 , $p = 0.0464$) and mental health (67.1 ± 17.9 to 73.4 ± 14.6 , $p = 0.0137$). **Conclusion:** The HRQoL of our HTR significantly improved after the early post-operative phase 2 CRP. The phase 2 CRP might have the possible benefit to improve HRQoL in Asian HTR during the early post-operative phase.

0430M5FP

THE EFFECT OF ISOMETRIC EXERCISE ON HUMAN CORONARY COLLATERAL FUNCTION DURING ACUTE CORONARY OCCLUSIONS

Xiao Lu¹, Jianan Li¹, Song Lin²

¹The First Affiliated Hospital of Nanjing Medical University and ²Nanjing First Hospital (China)

Purpose: The purpose of this study using the acute coronary occlusion model in patients with stable coronary artery disease (CAD) was to directly measure the effect of isometric exercise on collateral blood flow. **Materials and Methods:** Patients with one-vessel CAD (18) underwent routine percutaneous transluminal coronary angioplasty were assigned to isometric exercise group (10 patients) and control group (8 patients). Patients in isometric exercise group did isometric handgrip exercise (50% maximal voluntary contraction) during 1 min coronary balloon occlusion while patients in control group remain at rest during coronary occlusion. Collateral flow index (CFI) was determined before and at the end of 1 min coronary occlusion in both groups. CFI expressing collateral flow relative to normal antegrade flow was determined by simultaneous coronary occlusive pressure (Poccl), mean aortic pressure (Pao) and central venous pressure measurements (CVP): $\text{CFI} = (\text{Poccl} - \text{CVP}) / (\text{Pao} - \text{CVP})$. Heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure were also recorded before and at the end of coronary occlusion. **Results:** In isometric handgrip exercise group, the difference values of CFI (CFI at the end of coronary occlusion – CFI before coronary occlusion) were significantly higher than those in the control group (0.09 ± 0.07 vs 0.03 ± 0.02 , $p < 0.05$). The difference values of DBP (DBP at the end of coronary occlusion – DBP before coronary occlusion) were also significantly higher than those in the control group (4.25 ± 7.74 vs -2.5 ± 4.07 , $p < 0.05$). The difference value of HR and SBP tended to be higher in isometric handgrip exercise group than those in control group (HR 4.25 ± 5.87 vs -1 ± 4.1 , $p > 0.05$; SBP: 4.37 ± 5.45 vs -0.25 ± 3.54 , $p > 0.05$). **Conclusion:** Isometric exercise among patients with CAD induces an overall increase in coronary collateral flow during acute vessel occlusion. The effect of which is statistically more relevant than that of collateral flow enhancement due to the occlusion itself.

0430M6FP

IS HORSEBACK RIDING MORE EFFECITVE THAN HORSE RIDING ROBOT FOR PHYSICAL EXERCISE?: HEART RATE MONITORING, CALORIC CONSUMPTION, 2D MOTION ANALYSIS AND SURFACE EMG MONITORING

Naohisa Kikuchi^{1,3}, Kazuya Mizuochi¹, Hidetaka Wakabayashi², Kaoruko Takada², Hironobu Sashika², Takuya Ikeda³

¹Department of Rehabilitation, Yokohama City University Hospital, ²Dept. of Rehabilitation, Yokohama City University Medical Center and ³Crane Sports Medical Research Center for Horseback Riding (Japan)

Purpose: To determine effectiveness of horseback riding for physical exercise and compare effectiveness with horseback riding robot, we studied by heart rate monitoring, caloric consumption measurement, 2D video motion analysis and surface EMG monitoring. **Materials and Methods:** Participants were 7 volunteers without any cardiopulmonary, neurological and musculoskeletal diseases. They were expert horseback riders in the private riding club (3 males and 4 females, 27–44 years old). For studying cardio-respiratory fitness, we measured horseback riding each 2 times in the training class for 45 min. We measured heart rate monitoring and caloric consumption by the monitor RS 400 (Polar Company). For 2D video motion analysis and surface EMG monitoring, we measured horseback riding each 2 times at the horse walking speed for straight 5 m distance. We recorded from the side by the high-speed monochrome video camera, and we put the 1 cm square markers on human shoulder, lower lumbar, major trochanter, knee, ankle and horse top tale. Then we calculated the data by Dipp-Motion 2D (Ditect Company), then we looked rhythm in riding and measured total quantity of motion in each body part. As for surface EMG monitoring (Nihon Koden Company), we put the electrodes on lower para-vertebral, medial gluteus, quadriceps femoris and gastrocnemius muscles, and then we synchronized with 2D video motion analysis. All of these studies, we compared real horseback riding with the horseback riding robot 'JOBA' (Panasonic Company). **Results:** Average heart rate was 123.3 ± 9.3 in the horseback riding vs. 91.8 ± 9.3 in the robot riding. Heart rate monitoring in the horseback riding showed 100–130 per min, this data suggests that horseback riding is suitable for aerobic exercise. Average caloric consumption was 430.0 ± 81.1 kcal in real horseback riding vs. 224.4 ± 63.6 kcal in horseback robot riding for 45 min exercise, this data shows that horseback riding in the training class is enough for proper energy consumption. 2D video motion analysis showed horseback robot riding is more rhythmic than real horseback riding. But unnecessary motion of lower extremities was observed in horseback robot riding more than real horseback riding. And total quantity of lower extremities movement in real horseback riding is smaller than in horseback robot riding. This data suggests that element of isometric muscle exercise is more than that of eccentric exercise. And surface EMG showed that real horseback riding made higher voltage than horseback robot riding especially in paravertebral and quadriceps femoris muscles. **Conclusion:** Horseback riding is suitable for aerobic exercise. And 2D video motion analysis and surface EMG showed that horseback riding is also effective for muscle strengthening in trunk and lower extremities. Also horseback riding is more effective for physical exercise than horseback riding robot. From this study, we concluded that horseback riding is effective for physical exercise as cardiopulmonary fitness and muscle strengthening exercise.

0430M7FP

EFFECTIVENESS OF BREATHEMAX BREATHING DEVICE ON AIRWAY SECRETION CLEARANCE IN PATIENTS DEPENDENT ON MECHANICAL VENTILATION

Sujittra Kluyahomtho¹, Chulee U Jones¹, Wilaiwan Khrisanapan², Seksan Chaisuksan³

¹Department of Physical Therapy, Faculty of Associated Medical Sciences, Khon Kaen University, ²Department of Physiology, Faculty of Medicine, Khon Kaen University and ³Division of Medicine, Khon Kaen Hospital (Thailand)

Background: Bronchial mucociliary clearance is impaired in patients receiving mechanical ventilation and this leads to stasis of the mucus in the airway. Impaired clearance of mucus can result in a vicious cycle of colonization with pathogenic organisms that further increases sputum production. A new breathing device (BreatheMAX) provides an oscillating flow of humidified air that may increase clearance of mucus. **Purpose:** To determine the effects of BreatheMAX on secretion clearance in intubated patients dependent on mechanical ventilation. **Materials and Methods:** Six

male patients (aged 16–75 yrs) who could breathe spontaneously for at least one minute and were receiving standard chest physiotherapy were randomly assigned to a cross-over study consisting of 2 treatment conditions: test and sham. They received either test or sham treatment in the first round and vice versa in the second round. In the test treatment the patients performed spontaneous deep breathing against a resistance equal to 20% of their peak inspiratory pressure with a steady inspiratory flow for 6–10 breaths/set, 10 sets/day with 1 min rest between sets. In the sham treatment the protocol was the same but there was no inspiratory load, oscillation or humidification of the air. The mucus secretions were collected for 3 hours before and after treatment and are reported as clearance rate of wet weight (g/h), volume (ml/h) and percentage change (%) before and after the treatment. Oxygen pulse saturation (SpO₂), heart rate (HR) and respiratory rate (RR) were monitored while using the BreatheMAX. **Results:** The results showed that the test but not sham treatment significantly increased the mucus clearance rate both by wet weight and volume after using the BreatheMAX compared to before treatment. The changes in mucus secretion clearance rates after treatment were by wet weight, 2.9 ± 2.5 g/h for test and -0.3 ± 1.2 g/h for sham ($p < 0.05$), and by volume, 2.7 ± 2.2 and -0.4 ± 1.1 ml/h ($p < 0.05$) for test and sham, respectively. The average percentage changes of mucus clearance rate were also significantly different ($p < 0.05$) between the test and sham treatment by wet weight (658 % vs -5.8 %) and by volume (628 % vs -4.6 %). SpO₂, HR, and RR did not change while breathing with the BreatheMAX. **Conclusion:** The BreatheMAX breathing device is safe to use with intubated patients, and is an effective technique for increasing mucus secretion clearance. BreatheMAX can be used alone or as an adjunct to standard chest physiotherapy to enhance the clearance of secretions.

0430M8FP

EFFECT OF PHASE II CARDIAC REHABILITATION AFTER CORONARY ARTERY BYPASS GRAFT: A COMPARISON OF QUALITY OF LIFE, PEAK VO₂, AND FUNCTIONAL AEROBIC IMPAIRMENT

Po-Chin Strong¹, Ko-Lun Tsai¹, Yi-Chieh Chou¹, Si-Huei Lee¹, Su-Ying Hung¹, Chen-Liang Chou^{1,2}, Shun-Ping Cheng³, Cheng-Ming Chiu⁴

¹Department of Physical Medicine and Rehabilitation, Taipei Veterans General Hospital, ²Department of Physical Medicine and Rehabilitation, School of Medicine, National Yang-Ming University, ³Department of Health at Lo-Sheng Sanatorium and ⁴Department of Physical Medicine and Rehabilitation, Far Eastern Memorial Hospital (Taiwan)

Purpose: To evaluate the relationship of the quality of life (QOL) and physical fitness of patients before and after the phase II cardiac rehabilitation following coronary artery bypass graft (CABG). **Materials and Methods:** From May 2005 to October 2009, 15 patients underwent CABG and post-operative phase II cardiac rehabilitation were enrolled in this study. We used WHOQOL-BREF (Taiwan) to evaluate the quality of life, VO₂ peak and functional aerobic impairment (FAI) to evaluate physical fitness. We applied Wilcoxon signed rank sum test to analyze the relationship among them. **Results:** Patients underwent phase II cardiac rehabilitation have significant increases in physical fitness (VO₂ peak: 17.90 ± 3.57 vs. 21.91 ± 4.97 ml/kg/min, $p = 0.027$; FAI: 21.60 ± 13.69 vs. $12.33 \pm 14.08\%$, $p = 0.043$). But their QOL showed no significant improvement (Domain 1-physical domain: 46.87 ± 12.14 vs. 50.47 ± 13.83 , $p = 0.370$; Domain 2-psychological domain: 60.60 ± 18.81 vs. 59.40 ± 14.54 , $p = 0.634$; Domain 3-social relationship domain: 62.13 ± 14.28 vs. 63.60 ± 13.51 , $p = 0.523$; Domain 4-environment domain: 72.93 ± 21.21 vs. 76.3 ± 18.60 , $p = 0.135$). **Conclusion:** Based on the results of our study, the patients after CABG should receive phase II cardiac rehabilitation to improve their physical fitness. However, the improvement in physical fitness doesn't correlate with patients' subjective awareness of QOL. Thus, in addition to

phase II cardiac rehabilitation, more emphasis should be put upon psychosocial therapy, family/peer group support, and environmental modification.

0430M9FP

NOS-3 EFFECTED ON THE PULMONARY ARTERIAL PRESSURE AND ALLEVIATED THE PULMONARY SMALL ARTERIAL REMODELING IN CHRONIC HYPOXIC HYPERCAPNIC RATS BY KALLIKREIN

Xiaotong Wang¹, Hanwen Yang¹, Lu Jin¹, Yinhua Liu¹, Hai Yuan¹, Yi Zhuge²

¹Wenzhou Medical College and ²Quzhou College (China)

Purpose: To observe the change of pulmonary arterial pressure and the pulmonary small arterial remodeling in chronic hypoxic hypercapnic rats by the Kallikrein. **Materials and Methods:** Thirty male Sprague-Dawley rats were randomly divided into three groups: control group (NC group, $n=10$), hypoxic hypercapnic group (HH group, $n=10$), hypoxic hypercapnia + Kallikrein group (HC group, $n=10$). The mPAP was measured by external jugular vein cannula, the expression of endothelial NOS-3 (NOS-3) in pulmonary arterioles and bronchus was detected by immunohistochemistry and RT-PCR. **Results:** 1) Compared with the HH group, the value of mPAP and RV/(LV+S) in the NC group and HC group was significantly lower ($p<0.01$), and those in HC group were higher than those in NC group ($p<0.01$). The value of mCAP was not significantly different among the three groups ($p>0.05$). 2) The value of WA/TA (vessel wall area/total area) and PAMT in HH group was significantly higher than those in the NC group and HC group ($p<0.01$). And compared with NC group, the value of WA/TA and PAMT in HC group was not significantly different ($p>0.05$). 3) With the method of immunohistochemistry, the expression of NOS-3 in pulmonary arterioles and bronchus in HH group was significantly lower than those in the HC and NC groups. 4) The expression of NOS-3 mRNA in HC group and NC group was significantly higher than that in the HH group ($p<0.01$), and in the HC group it was lower than the NC group ($p<0.01$). **Conclusion:** Activation of NOS-3 by kallikrein has decreased mPAP and alleviated vascular remodeling in anoxia and hypercapnia rats.

Cross-Strait Session

0430I1

DEVELOPMENT OF REHABILITATION SERVICES FOR CHILD CEREBRAL PALSY IN CHINA

Xiaojie Li

Prevention, Treatment and Rehabilitation Center for Child Cerebral Palsy of Heilongjiang Province (China)

Objective: To summarize and discuss Chinese rehabilitation services for children with cerebral palsy, identify the characteristics and shortcomings and explore the direction of development, the correct ways and methods in the future. **Methods:** The following were summarized and discussed as the basic situation of the child cerebral palsy, the history of setting up the first rehabilitation center, the basic situation of the rehabilitation and services, the situation of the professional team, the situation of the education and training, the academic organizations and conferences and the questions and challenges through the questionnaires, investigations and a large number of the references. **Results:** The incidence of CP was 1.8–4% and the prevalence of CP in 1–6 years was 1.92%. The types of CP is divided into spastic, dyskinetic, rigid, ataxia, hypotonic and mixed types currently. The first rehabilitation center for CP children was set up in 1987. There are three ways of the rehabilitation and services and the two types

of techniques and methods applied as Modern Rehabilitation Medicine (MRM) and the Traditional Chinese Rehabilitation Medicine (TCRM). It clearly shows the team is lacking of the professionals with the background of rehabilitation medicine and the highly educated persons. Rehabilitation therapy education for undergraduate student has been started for nearly 10 years, and it was developed quickly in recent years. TCM education has been long history and there is a large number of the TCMT education existed. There are three main organizations for children rehabilitation in China and the national conference was held every two years. **Conclusion:** Although the rehabilitation and the services have made great achievements, it is still a distance between China and developed Countries and a lot of questions and challenges we have to face.

0430I2

NEURAL FUNCTION INFORMATICS AND REHABILITATION ENGINEERING

Jue Wang, Mingming Zhang

The Key Laboratory of Biomedical Information Engineering of Ministry of Education, Institute of Biomedical Engineering, School of Life Science and Technology, Xi'an Jiaotong University (China)

Purpose: This paper discusses the inner link between the Neuro-Functional Informatics (NFI) and the Rehabilitation Engineering (RE). It probes the role of NFI research in promoting the RE and the requirements of RE on NFI research. **Materials and Methods:** The paper analyzed the inner link of NFI and RE by comparing their definition, study object and study scope. It introduces the model of Neural Function Information Transfer and Processing, Human Activity Assistive Technology Model, Medical Model of Assistive Technology, and “Five Satisfaction” principle in Assistive Technology Industry. **Results:** It forms a system that combines the research on Neuroscience, rehabilitation engineering with clinic rehabilitation treatment closely. As a sample, the paper discusses that a neuro-information feedback (NFB) system is applied to treat the children with attention deficit hyperactivity disorder (ADHD). Finally, it discussed the ten frontiers which would be broken in the Rehabilitation Engineering Research in China. **Conclusions:** RE needs to be supported by NFI achievement and makes NFI research to be much significant and valuable on clinic rehabilitation. It is believed that the understand to the mechanism of Neuro-functional information generation, transfer and processing will open new ways and raise new methods for clinic rehabilitation intervention and evaluation. It promotes also that new generation products on rehabilitation engineering and assistive technology come into being. **Acknowledgement:** This work is supported by National Science Foundation of China, (Grant No. 30670660) and by “863” project plan, China (Grant No.2006AA04Z370).

0430I3

THE THEORY AND APPROACH OF DISABILITY CLASSIFICATION AND EVALUATION BASED ON ICF MODEL

Zhuoying Qiu

Research Institute of Rehabilitation Information, China Rehabilitation Research Center (China)

Purpose: To explore the classification and evaluation of disability based on ICF approach. **Materials and Methods:** Frameworks of theory of disability classification based on ICF approach and psychological measurement, and disability evaluation and tools. **Results:** A model and classification of disability based on ICF had been developed. The characteristics of disability evaluation and tools had been discussed. The implementation modular of classification and evaluation of disability had been developed using ICF approach. **Conclusion:** This research discussed the theory and approach of functioning and disability of ICF in which a framework

of disability consisted of body function and structure, activity and participation, and environment. ICF had been recognised as international standard of disability statistics and fundamental of the sciences of functioning. It has significances for the countries to develop a adaptive framework and evaluation system of disability for the implementation of UN Convention on the Rights of Persons with Disabilities, World Health Assembly resolution WHA58.23 on disability, including prevention, management and rehabilitation, and the development and implementation of the laws and policies. This research proposed a framework and classification of disability based on ICF, analysed the evaluation and standardized procedures of disability, and discussed the development of disability standard and evaluation system applied in different sectors in which a common framework based on ICF had been adopted and a data interface had been recommended for different purposes.

043014

ANALYSIS OF CLINICAL ASSESSMENT OF UNILATERAL NEGLECT AFTER STROKE

Wei-qun Song

Department of Rehabilitation Medicine, Xuanwu Hospital, Capital Medical University (China)

Purpose: The purpose of this study is to investigate unilateral neglect patients, performance in line bisection and line cancellation tasks. **Materials and Methods:** We retrospectively analyzed the unilateral neglect patients, performance in line bisection and line cancellation tasks before and after rehabilitation treatment. **Results:** Before treatment, statistical analyses revealed the patients, performance in line cancellation and line bisection did not differ from each other ($p=0.902$). After treatment, statistical analyses revealed a significant difference between the two tasks ($p=0.007$). With line bisection only, we detected 29/30 (97%) patients with neglect; with line cancellation only, we detected 22/30 (73%) patients with neglect. **Conclusion:** As the performance of unilateral neglect patients improved, patients have revealed difference between the performance in line bisection and in line cancellation. One test alone would miss more subjects with neglect. That is to say, combination of the two tests was more sensitive than any single test alone.

043015

APPLIED RESEARCH OF EXERCISE THERAPY IN COMPLICATIONS OF DIABETES

Zhongli Jiang

Department of Rehabilitation Medicine, First Affiliated Hospital of Nanjing Medical University (China)

Purpose: 1) To explore the effects of exercise on pancreatic β -cell function and islet morphology and cadual nerve conduction velocity in streptozotocin-induced diabetic rats. 2) To investigate effects of different intensity exercises on the expressions of HSP72 mRNA and myocardial apoptosis in type 2 diabetic rats. **Materials and Methods:** 1) Twelve diabetic rats induced by streptozotocin (STZ, 55mg/kg) were divided into diabetic exercise group (DE, $n=6$) and diabetic sedentary group (DS, $n=6$). Twelve SD rats with euglycemia were randomly divided to control exercise group (CE, $n=6$) and control sedentary group (CS, $n=6$). The exercise rats were forced to swim 60 min/day with 5days/week for 8 weeks. At the end of the experiment, blood glucose, serum insulin (INS), pancreatic insulin contents and muscle NT-3 levels were determined by RIA and pancreatic islet morphology was evaluated by Image-Pro Plus 6.0. The cadual nerve conduction velocity (CNCV) in all rats was evaluated before and after 8 weeks. 2) Thirty six of male SD rats were divided into diabetic rats (DFM, $n=18$) and control rats (CFM, $n=18$). The diabetic rats were randomly divided into non-exercise group (DRN), high-exercise group (DRH) and low-exercise group (DRL). The control rats were randomly divided into non-exercise

group (CRN), high-exercise group (CRH) and low-exercise group (CRL). The rats with exercise training were forced to run on treadmill for 8 weeks. The expressions of HSP72 mRNA in cardiac muscle were determined by RT-PCR and myocardial apoptosis were observed with Tunel staining. **Results:** 1) Blood glucose in diabetic rats were higher than that in rats with euglycemia ($p<0.05$). Blood glucose in DE decreased significantly after 8 weeks exercise in comparison with baseline ($p<0.05$). After an 8-week study, the levels of INS in serum and pancreas were significantly higher in DE than in DS ($p<0.05$). Pancreatic islet morphology showed that the size of islets and the number of islets significantly increased ($p<0.05$) and Shape Factor (SF) decreased ($p<0.05$) in DE compared with DS. The CNCV slowed remarkably in all diabetic rats and significantly increased after 8 weeks of exercise training. Muscle NT-3 levels were significantly lower in DS than in other 3 groups. Muscle NT-3 levels were correlated positively with CNCV values ($r=0.407$, $n=31$, $p<0.026$). 2) The expressions of HSP72 mRNA in cardiac muscle of diabetic rats were significant lower than that in control rats. The expressions of HSP72 mRNA in CRL and DRL were significantly higher than that in CRN and DRN. The expressions of HSP72 mRNA in CRH and DRH were significantly lower than that in CRN and DRN. Apoptosis index (AI) of cardiac muscles in DRN and DRH were significantly higher than that in CRN and CRL. Myocardial AI in DRL was significantly higher than that in CRL. There was significantly negative correlation between expressions of HSP72 mRNA and AI of cardiac muscles in DRL and DRN, which was not observed in DRH and DRN. **Conclusion:** 1) Exercise training not only increases insulin secretion capacity and ameliorates pancreatic islet morphology, but also improves CNCV which is associated with increase of muscle NT-3 in STZ-induced diabetic rats. 2) Low-intensity exercises increase expressions of HSP72 mRNA and inhibit apoptosis rates of cardiac muscles in type 2 diabetic rats, which play an important role of protection from diabetic cardiomyopathy.

043016

THE EFFECTS OF ANGELICA SINENSIS INJECTION ON THE NEURONAL METABOLITES AND BLOOD FLOW SPEED WITHIN REPERFUSION FOLLOWING THE ISCHEMIC CEREBRAL INJURY IN RATS

Wei-jing Liao¹, Yun-huang Yang², Wan-tong Yang¹, Li-yun Li², Mai-li Liu²

¹Zhongnan Hospital of Wuhan University and ²Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences (China)

Purpose: To investigate the effects of Angelica sinensis injection on the neuronal metabolites and blood flow speed within reperfusion in the ischemic cerebral injury in rats. **Materials and Methods:** Sixty-nine male Sprague Dawley rats with an average body weight of 160 ± 10 g (mean \pm SD) were used, and were randomly divided into three groups: group A rats ($n=4$) underwent sham operation, group B ($n=30$) underwent an operation of ischemic brain injury, group C rats ($n=35$) underwent the same operation and received the treatment of Angelica sinensis injection (5 g/kg weight, i.p). The right middle cerebral artery occlusion (MCAO) of both group B and group C rats was induced by 5/0 nylon suture for 2 hours. The reperfusion was conducted for four hours and six hours respectively following MCAO. T2 weighted-imaging (T2WI) and 1H magnetic resonance spectroscopy (1H MRS) were performed, to study the changes of the imaging and the neuronal metabolites N-acetyl aspartate (NAA), creatine/phosphocreatine (Cr/PCr) and choline (Cho) following cerebral ischemia. The changes of blood flow speed were measured by laser Doppler flowmetry. The surface vascular density in right hemisphere were calculated. **Results:** The hyperintense signals and volume in the right cerebrum in group C were decreased compared to that of the group B, the T2 values were decreased, and the level of NAA increased, the ratio of Cr/NAA and Cho/NAA decreased. The blood flow speed in group C were improved. The length of brain

surface vessels in group C increased. **Conclusion:** The Angelica sinensis injection enhanced the blood circulation in the ischemic brain, improved the neuronal metabolisms.

0430N1FP

MENTAL HEALTH STATUS OF THE PARENTS OF CEREBRAL PALSY CHILDREN AND ITS RELATIONSHIP WITH PERSONALITY TRAITS

Zhimei Jiang^{1,2}, Fengming Xiao^{1,2}, Zhihai Lu^{1,2}, Wei Pang^{1,2}, Lan-Min Guo^{1,2}

¹Department of Development and Behavior Pediatrics, The 3rd Affiliated Hospital of Jiamusi University and ²The Laboratory of Child Neurological Rehabilitation of Jiamusi University (China)

Purpose: To explore mental health status of the parents of cerebral palsy children and its relationship with personality traits. **Materials and Methods:** 128 parents of cerebral palsy children and 128 normal parents were tested with the domestic popular questionnaires, including Symptom Check-List 90 (SCL-90), Eysenck Personality Questionnaire. Data were analyzed by *t*-test and multiple regression analysis with SPSS13.0. **Results:** Comparing the score of mental health status with that of the parents of healthy children, the parents of cerebral palsy children had much higher SCL-90 subscales on somatization, obsession, depression, anxiety, paranoid ($p < 0.01$). The personality traits mainly include internalizing behaviors ($p < 0.05$) and neuroticism ($p < 0.01$). **Conclusion:** There are mental health problems in the parents of cerebral palsy children. The personality traits of the parents of cerebral palsy children, especially neuroticism, have effects on their mental health.

0430N2FP

CCK-8 PREVENTS GLUTAMATE-INDUCED APOPTOSIS IN CULTURED CORTICAL NEURONS VIA UP-REGULATION OF BCL-2/BAX RATIO AND DOWN-REGULATION OF CASPASE-3

Jiangbao Zhou, Huichun Zhang

Children's Hospital of Chongqing Medical University (China)

Purpose: To investigate the effects of cholecystokinin octapeptide (CCK-8) on glutamate-induced cell apoptosis in cultured cortical neurons and explore the mechanisms. **Materials and Methods:** Cultured rat cortical neurons at culture days 8 to 9 were incubated with 50 $\mu\text{mol/l}$ glutamate for 30 min, with or without pre-incubation with CCK-8 (1 $\mu\text{mol/l}$ for 24 h). Neuronal viability were determined by the colorimetric MTT (3-[4,5-dimethylthiazol-2-yl]2,5-diphenyl tetrazolium bromide) assay. Apoptosis was first analyzed with acridine orange and ethidium bromide stain under fluorescence microscope, then confirmed by terminal deoxynucleotidyl transferase-mediated nick end labeling (TUNEL) method. The expressions of Bcl-2 family protein and Caspase-3 in cortical neurons were detected by immunohistochemistry and immunofluorescence, respectively. **Results:** There was obvious apoptosis phenomenon induced by 50 $\mu\text{mol/l}$ glutamate, the morphological changes of neuronal apoptosis, such as membrane shrinkage, neurite fragmentation, and karyopyknosis, can be observed under fluorescence microscope. The apoptosis rate was lower in neurons preconditioned with CCK-8 before the glutamate injury ($3.87 \pm 1.04\%$) than that of the glutamate injury alone ($17.53 \pm 2.93\%$, $p < 0.05$). Pretreatment with CCK-8 for 24 h was significantly improved glutamate-induced suppression of cell viability. Pretreatment with CCK also completely reversed the suppression of Bcl-2 expression, and significantly inhibited Bax overexpression and Caspase-3 activation induced by glutamate ($p < 0.05$). **Conclusion:** CCK-8 pretreatment could inhibit neuronal apoptosis induced by glutamate in cultured cortical neurons, and the mechanisms may be associated with up-regulation of Bcl-2/Bax ratio and down-regulation of Caspase-3.

0430N3FP

PROTECTIVE EFFECT OF BDNF TO NEWBORN RATS WITH HYPOXIE-ISCHEMIC BRAIN DAMAGE

Jiangbao Zhou, Xiaoxiao Xu

Children's Hospital of Chongqing Medical University (China)

Purpose: Studies of brain-derived neurotrophic factor (BDNF) on neonatal rat hypoxic-ischemic brain damage (hypoxic-ischemic brain damage, HIBD) and its possible mechanism, provide the basis For the treatment of hypoxic-ischemic brain injury and its related diseases. **Materials and Methods:** two hundred and fifty-six 7-day-old Wistar rats were randomly divided into four groups: normal control group ($n = 64$) A; HIBD model group ($n = 64$) B; Early injection group ($n = 64$, C); after surgery group ($n = 64$, D), every group respectively divided into 1 day, 3 days, 5 days, 7 days four time points ($n = 8$). The expression of Trk-B and P75 in Hippocampus was examined with immunohistochemical staining and real-time PCR. **Results:** compared with A, B, the two groups after injection of BDNF, C, D groups at four time points showed Trk-B levels were significantly elevated, p75 expression levels decreased, the most significant change in C group – the difference was statistically significant ($p < 0.05$). D group and A, B there was a marked change in the two groups, the difference was statistically significant ($p < 0.05$), but of which the most significant change in C group. The performance of real-time fluorescence quantitative PCR for the C, D compared with groups A, B, Trk-B gene expression levels increased, p75 gene expression level decreased, the most obvious changes in group C, and the same trend of changes in immunohistochemistry. **Conclusion:** Injection of BDNF in advance plays an important role to improve the prognosis of HIBD; after injection may improve the prognosis HIBD; but BDNF in advance to give the prognosis of HIBD more effective than after injection; The possible mechanism is that BDNF-induced Trk-B can be produced in advance and suppress the expression of p75, thus play a role by increasing the expression of Trk-b levels and reduce the expression level of p75.

0430N4FP

MORPHINE PRECONDITIONING INDUCES DELAYED NEUROPROTECTION AGAINST GLUTAMATE-INDUCED EXCITOTOXICITY

Huichun Zhang¹, Jiangbao Zhou², Qing Shang³

¹The Rehabilitation Medicine Center, Children's hospital of Zhengzhou, ²Department of Rehabilitation Medicine, Children's hospital of Chongqing Medical University and ³The Rehabilitation Medicine Center, Children's hospital of Zhengzhou (China)

Purpose: To investigate the effects of morphine preconditioning on glutamate-induced cell injury in cultured cortical neurons and explore the mechanisms. **Materials and Methods:** Cultured rat cortical neurons at culture days 8 were incubated with morphine at 0.1–100 $\mu\text{mol/l}$ for 30 min. They were then kept in morphine-free culture for 24 h before they were subjected to 200 $\mu\text{mol/l}$ glutamate for 6 h. Naloxone (a non-type-selective opioid antagonist, 50 $\mu\text{mol/l}$) were present during the period from 30 min before the addition of morphine to the end of morphine pretreatment (total of 1 h). After being damaged in glutamate for 6 h, they were fixed for morphologic examination and neuronal viability were determined by the colorimetric MTT (3-[4,5-dimethylthiazol-2-yl]2,5-diphenyl tetrazolium bromide) assay. The expressions of Bcl-2 family protein and cytochrome c in cortical neurons were detected by immunohistochemistry. **Results:** The cell viability was significantly higher in cortical neurons preconditioned with morphine ($\geq 0.5 \mu\text{M}$) before glutamate-induced excitotoxic injury (0.377 ± 0.009 at 0.5 μM morphine) than that of the glutamate-induced excitotoxic injury alone (0.362 ± 0.008 , $p < 0.05$). This morphine preconditioning-induced neuroprotection was abolished by naloxone. Pretreatment with

morphine completely reversed the suppression of Bcl-2 expression, and significantly inhibited Bax overexpression and cytochrome c release induced by glutamate ($p < 0.05$). **Conclusion:** morphine preconditioning induced delayed neuroprotection (from hours to days after morphine exposure) inhibit neuronal apoptosis induced by glutamate in cultured cortical neurons, and the mechanisms may be associated with up-regulation of Bcl-2/Bax ratio and inhibiting cytochrome c release.

0430N5FP

CLINICAL COMPARATIVE STUDY ON ACUPUNCTURE AND SWALLOWING TRAINING FOR TREATING DYSPHAGIC PATIENTS WITH STROKE

Pande Zhang¹, Huichang Zhou¹, Hong Yao²

¹Department of Rehabilitation, The First people's Hospital of Foshan and ²Guangzhou Medical College (China)

Purpose: To compare the effect of acupuncture and swallowing training on dysphagic patients with subacute stroke. **Materials and Methods:** One hundred and thirty-two subacute stroke patients who were hospitalized, included 73 males, 59 females, with mean age of 67.9 ± 9.0 years, 26 cerebral hemorrhage patients, 106 cerebral infarct patients, were participated in the study. Patients were divided into 3 groups: Swallowing training group (ST, $n = 53$), were treated with swallowing training, included thermal-tactile stimulation, deglutition organ exercise and food swallowing training. Acupuncture group (AP, $n = 48$), were treated with acupuncture that was given at Fengchi (GB20), Lianquan (RN23), Bailao (EX-HN15), Jinjing (EX-HN12) and Yuye (EX-HN13). Control group (CG, $n = 31$). The therapies were once a day, 6/week. Before and after the treatment regimen, the patients were evaluated with Water-Swallow Test, "Any Two" test and monitoring the arterial oxygen saturation (SpO_2) by pulse oximetry. **Results:** ST and AP groups showed improvement in Water-Swallow Test, Any Two test after the treatment regimen ($p < 0.001$), and were better than control group ($p < 0.05$). No significant difference existed between ST and AP group. The average decrease in SpO_2 during water-swallow was under 2%. After the treatment regimen – base SpO_2 and post-water swallow SpO_2 of ST group were higher than control group ($p < 0.001$). The post-water swallow SpO_2 of AP group were higher than control group ($p < 0.05$), no differences at base SpO_2 . **Conclusion:** Acupuncture and swallowing training is effective for dysphagic stroke patients, there effectiveness is not significantly different. Aspiration cannot be predicted based on decrease in SpO_2 .

0430N6FP

APPLICATION OF NETWORK THINKING AND NETWORK ANALYSIS ON MERIDIAN RESEARCHES

Feng Lin, Zhongli Jiang

Department of Rehabilitation Medicine, Nanjing Medical University (China)

Purpose: By network thinking, structure of an object is represented by a network composed of nodes (building elements of the object) and lines (relations between the building elements). Network analysis is a set of theories, approaches and tools based on the network thinking. By analyzing relations between elements, the network analysis is available for interpreting the object's structure, function and evolution. The present study is to explore a complex network analysis of the meridian system. **Materials and Methods:** A meridian network was constructed by 362 acupoints (nodes) and 488 connections (lines) amongst them, selecting the acupoints according to the channel and the crossing points. The acupoints and channels were selected from records in the following documents: Science of Acupuncture Points (Yang Jiashan), Modern Researches and Practices of Acupuncture and Moxibustion (Guo Changchun, Zhang Li and

Ma Hui) and Chinese Acupuncture and Moxibustion Prescription (Zhong Chongyang and Cheng Lihong). The network was visualized by Pajek1.25. The density, connectivity, average shortest path length and degree distribution were measured by Pajek1.25 and Matlab7.0. **Results:** The visualization showed a complex network of meridian system. The Density was 0.0037 and there were no unreachable acupoints. The average shortest path length was 26. The input degree distribution followed a power-law with an exponent of 2.57 (R^2 was 0.9964), suggesting a scale-free structure in meridian network. **Conclusion:** Meridian can be represented by a complex network composed of acupoints and channels, which was characterized by connectivity and scale-free property. The perspective of this study is to select acupoints for different diseases by using complex network analysis. Network thinking and its methods are forming a paradigm for meridian researches. Such paradigm is expected to exert profound influences on the understanding of the essence of the meridian system and on the clinical practices of acupuncture and moxibustion.

0430N7FP

POSTISCHEMIC WHEEL RUNNING INCREASED NEUROGENESIS IN THE SUBVENTRICULAR ZONE OF ADULT RATS WITH LOCAL CEREBRAL INFARCTION

Xi-Quan Hu¹, Jie Fang¹, Hai-Qing Zheng¹, San-Qiang Pan²

¹Department of Rehabilitation Medicine, the Third Affiliated Hospital of Sun Yat-Sen University and ²Department of Anatomy Medical College of Jinan University (China)

Purpose: To explore that the postischemic wheel running excise might play activating role in promoting the subventricular zone neurogenesis and improving the neural function in adult rats with local cerebral infarction. **Materials and Methods:** A cortical infarct was induced by ligating the left middle cerebral artery to the striatal branches in total sixty-four adult Sprague-Dawley rats, which were further randomly divided into two groups. The control group rats ($n = 32$) were housed in standard case without any excise. The training group ($n = 32$) were taking wheel running excise everyday for total three weeks. The rats were sacrificed on 3rd, 7th, 14th, 21th day and the neurological severity scores (NSS) was examined for evaluating the neural function, as well as the generation of neurogenesis in the subventricular zone were studied with the cell specific marker Ki-67. **Results:** Though proliferating cells in the subventricular zone were observed in both control group and training group, which showed the highest signal on the 7th day after ischemic, the number of Ki67 positive cells in subventricular significantly increased in training group in comparison with those in control group, on the 14th and 21th day after ischemic ($p < 0.05$). Furthermore, the neurological severity scores in the training group showed more quick declination as compared to those in control group from 7th day after ischemic. **Conclusion:** Our results suggested that postischemic wheel running might promote the proliferation of neurogenesis in subventricular, implicating that exercise could play important role in the recovery of neural function in adult rats with local cerebral infarction.

0430N8FP

STUDY ON AUDITORY SEMANTIC PRIMING EFFECTS IN APHASIA PATIENTS

Zhongli Jiang, Shujing Li, Ying Li

Nanjing Medical University (China)

Purpose: The purpose of this study was to explore the characteristics of semantic priming effects in Chinese words with different association strength in patients with aphasia by auditory stimulation. **Materials and Methods:** Stimulus-response word pairs with different association strength including strong, moderate, weak, and no association categories were chosen from word association

thesaurus as experiment materials. Both patients with aphasia ($n=11$) and normal subjects ($n=16$) were requested to finish an auditory lexical decision task for target words. Semantic priming effects were investigated by means of measuring reaction time (RT) and error rate of each word-pair. **Results:** In patients with aphasia and normal subjects, the mean RTs were significantly shorter in strong, moderate and weak association strength words than in no association strength words ($p<0.05$). In strong, moderate and no association strength words the mean RTs were no significantly differences between two groups. In the weak association strength words mean RTs were longer in patients with aphasia than in normal subjects ($p<0.05$). In two groups, mean error rates were significantly less in strong, moderate and weak association strength words than in no association strength words ($p<0.05$). In strong association strength words, mean error rates were significantly higher in patients with aphasia than in normal subjects ($p<0.05$). In moderate, weak and no association strength words, there were no significantly differences between two groups. **Conclusion:** The patients with aphasia follow gradient of the association strength words like normal subjects and have semantic priming effects in the strong, moderate association strength words. These results suggest that speech therapist may choose vocabularies with strong and moderate associated strength words as training materials and help patients with aphasia to achieve the desired goal of speech rehabilitation.

0430N9FP

DYSFUNCTION OF THE MITOCHONDRIA IN THE CEREBRUM OF MICE INDUCED BY CHRONIC HYPOXIC HYPERCAPNIA

Xiaotong Wang, Bin Wu, Hanwen Yang, Lu Jin
Wenzhou Medical College (China)

Purpose: To explore the influence of mitochondria in the cerebrum of the mice induced by chronic hypoxic hypercapnia. **Materials and Methods:** Thirty male C57BL/6 mice were randomly divided into two groups: hypoxic hypercapnia 4-week experiment group and normal control group. Experiment group was exposed to 9%–11% O₂ and 5%–6% CO₂ eight hours a day for four weeks. The concentration of ATP, ADP and AMP was measured by HPLC. The changes of the ultramicrostructures in the mitochondria of the cerebrum were observed by the transmission electron microscope. The membrane potential of the mitochondria was observed by the confocal and the intensity was measured by spectrophotofluorometry respectively. The activity of the COX I and III in the mitochondria and the density of the SOD and GSH in the tissue of the cerebrum were measured by spectrophotofluorometry. **Results:** Compared with the normal group, the concentration of the ATP and AMP of mice was lower respectively ($p<0.001$), the ultramicrostructures were abnormal and the density of the membrane potential was decreased by the confocal, the activity of the COX I and III in the mitochondria of the cerebrum and the density of the SOD and GSH was decreased significantly ($p<0.01$) in the cerebrum tissue in the experiment group respectively. **Conclusion:** Under the condition of exposure to chronic hypoxic hypercapnia, the changes of the function of the mitochondria in the cerebrum may have taken. Free radicals (ROS) reaction may contribute to the biological dysfunction of mitochondria.

0430N10FP

STUDY ON THE THERAPEUTIC EFFECTS OF CHINESE TRADITIONAL MANIPULATION COMBINED WITH LUMBODORSAL AND ABDOMINAL MUSCLE EXERCISE IN TREATING WAIST SPORTS INJURIES

Zhang Hong, Zhang Guohui, Zhang Guangyuan, Zhao Qian

Yueyang Hospital Affiliated to Shanghai University of Traditional Chinese Medicine (China)

Objective: To observe the therapeutic effects of Chinese Traditional manipulation combined with lumbodorsal and abdominal muscle exercise in treating waist sports injuries in athletes. **Methods:** Firstly, normal values of the ratio between lumbodorsal muscle strength and abdominal muscle strength (F/E) and the peak torque (PT) of lumbodorsal and abdominal muscle were tested in 30 athletes without lowback pain by a Biodex dynamometer (Biodex-System 3, Biodex Medical Systems, Inc., USA). Secondly, 60 athletes with low back pain were randomly divided into two groups. Chinese traditional manipulation combined with lumbodorsal muscle exercise were performed in the control group. Chinese Traditional manipulation combined with lumbodorsal and abdominal muscle exercise were performed in the experimental group, which the ratio (F/E) less than the normal value was considered as weakness of lumbodorsal muscle strength and the main prescription was to exercise lumbodorsal muscle, while the ratio more than the normal value was considered as weakness of abdominal muscle strength and the main prescription was to exercise abdominal muscle. On the other hands, the peak torque (PT) less than the normal value was considered as weakness of lumbodorsal or abdominal muscle and the exercise of relevant muscle group should be reinforced. The treatment course was 4 weeks with 3 times treatments in one week. The treatment included Chinese traditional manipulation therapy about 20 min and exercises about 20 min. The VAS pain score, JOA score, and isokinetic muscle strength were performed before and after the treatment. **Results:** The athletes with low back pain in the two groups underwent 4 week's Chinese traditional manipulation therapy and relevant functional exercise. After treatment, the VAS pain score apparently decreased, but there was no significant difference between the two groups; JOA score was apparently higher, which in the experimental group was higher than that in normal groups. The normal value in athletes of the ratio between lumbodorsal muscle strength and abdominal muscle strength (F/E) was 56.99 ± 8.07 in 60°/s. The ratio of athletes with low back pain was higher than that of health athletes. After 4 week's treatment, it significantly decreased in the two groups, but more in the experimental group; PT (peak torque), PT/BW (peak torque/body weight), AP (average peak) and TW (total work) of athletes with low back pain was lower than that of health athletes, which increased after treatment; PT, PT/BW, TW value of lumbodorsal muscle and TW value of abdominal muscle in the experimental group were close to normal level after the treatment, which was a significant difference compared to the control group. **Conclusion:** Chinese traditional manipulation combined with lumbodorsal and abdominal muscle exercise could apparently relieved the pain degree, ameliorate the clinical signs and life quality of the patients, improve flexors/extensors ratio, increase the muscle strength of athletes with low back pain.

KEYNOTE SPEECH (MAY 1, 2010)

KS02-01

POSTURAL MOTOR CONTROL: WHAT WE LEARNED FROM ANIMAL MODEL AND ITS RELEVANCE FOR HUMAN***Tatiana G. Deliagina****Department of Neuroscience, Karolinska Institute, SE-17177 (Sweden)*

Maintenance of the basic body posture – upright in humans and dorsal-side-up in quadrupeds – is a vital motor function. It is non-volitional activity, based on the in-born neural mechanisms. Inability to maintain the upright body posture and equilibrium is one of the major motor disorders following traumatic spinal cord injury (SCI). Selection of appropriate rehabilitation strategies for SCI-caused postural deficits depends largely on an elucidation of the relative contribution of spinal and supraspinal mechanisms to the control of posture. This question is difficult to address in human subject due to methodological restrictions. By contrast, animal models give a unique opportunity for deep analytical studies of postural system. We believe that the basic principles of organization and operation of the postural system were kept in evolution, and that the results obtained in animal models are also relevant for humans. The postural system stabilizing body orientation in the frontal plane, as well as the corresponding spinal and supraspinal networks were studied in two mammals (rabbit and cat). Experiments on intact animals, on decerebrated preparations, and on SCI-subjects led to the following conclusions: (i) The lateral stability of the anterior and posterior parts of the body is maintained by two independent sub-systems driven by somatosensory inputs from the corresponding limbs. The reflex mechanism of an individual limb generates a part of the corrective response to postural perturbation; another part is produced on the basis of crossed influences. (ii) A number of motor centers (including motor cortex, brainstem and spinal cord) participate in stabilization of trunk orientation in the frontal plane. Each of them operates on the feedback principle and generates corrective motor commands if the trunk orientation is perturbed. The integrity of pathways located in the ventral funiculi of the spinal cord is critically important for the operation of this system. (iii) The spinal cord contains neuronal networks underlying spinal postural limb reflexes, which contribute to trunk stabilization in intact animals. In acute spinal animals, these networks can be activated by electrical and pharmacological stimulation, suggesting that normally (in intact animals) these networks are activated by the tonic supraspinal drive. (iv) Over time, the spinal networks, deprived of supraspinal influences, undergo considerable changes. As a result, the factors, which restore postural limb reflexes in the acute state, become less effective. The goal of future studies is to find the factors which, when regularly applied in the spinal animal, will increase the efficacy of spinal postural reflexes to such a level that they will be able to cause significant postural corrections and to maintain the lateral stability of the body. Relevance of the obtained data for better understanding of postural function and dysfunction in humans will be discussed.

KS02-02

APPLICATION OF RTMS AND TDCS IN REHABILITATION AFTER BRAIN DAMAGE***Ying-Zu Huang¹, John Rothwell²****¹Department of Neurology, Chang Gung Memorial Hospital and Chang Gung University College of Medicine (Taiwan) and ²Sobell Department of Motor Neuroscience and Movement Disorders, Institute of Neurology, University College London (United Kingdom)*

Purpose: Recovery of patients after stroke depends to a large extent on modifications in behaviour that allow patients to achieve goals in ways that are different to those they used prior to the stroke. However, it is increasingly recognised that there is considerable potential for plastic reorganisation of neural connections in the brain to restore function to the extent that patients' movements are restored to relatively normal levels. Brain stimulation, e.g. rTMS and tDCS, may be able to play a useful role in this process of restorative neurology. **Materials and Methods:** A number of studies have been performed to test whether a single or multiple sessions of rTMS/tDCS to the motor cortex can improve recovery of arm and hand function in the acute and chronic phases after stroke. Two approaches have been used: in the first an excitatory protocol is applied to the affected hemisphere in order to increase its contribution to recovered movements; in the second, inhibitory protocol is applied to the non-stroke hemisphere in an attempt to prevent it inhibiting activation of the stroke hemisphere and again improve involvement of the stroke hemisphere in movement (inter-hemispheric competition). **Results:** Single session studies in which motor performance of patients has been examined before and after rTMS have generally shown a 10% or so improvement compared to a placebo rTMS in chronic patients; there have been no single session studies in acute cases given the day to day variation in their symptoms. Daily treatments for one or two weeks have also been applied in order to give an effect that might last days or months. Both chronic and acute studies have been successful with 10–20% improvement in hand and arm function lasting several weeks after the stroke. However, far more work needs to be done to define exactly what parameters of stimulation are optimal for individual patients, as well as to define the best time post-stroke in which this type of therapy might be most effective. There have also been similar investigations in a small number of studies on aphasia. These have followed a similar logic of interhemispheric competition. Thus, fMRI work suggests that patients who recover speech best activate the left hemisphere during speech tasks whereas those with worse recovery tend to activate the right hemisphere. Thus, rTMS and tDCS interventions have tended to apply inhibitory conditioning to the overactive right hemisphere in an attempt to increase function in the left and promote recovery. **Conclusion:** So far, it seems as if there may be some benefit in some patients, but since only small numbers of subjects have been studied so far more work needs to be done before any definitive conclusions can be drawn.

ORAL PRESENTATIONS (MAY 1, 2010)

Brain Disorders: Sensory-Motor Control

0501A1

BIOPHYSICS OF ASSESSMENT OF HUMAN MOTOR CONTROL BY SURFACE POLYELECTROMYOGRAPHYArthur M. Sherwood*National Institute on Disability and Rehabilitation Research (NIDRR), U.S. Department of Education (United States)*

Although not feasible for routine clinical use, the most direct measure of motor control would be to monitor the activity of the spinal motor neurons. However, surface electromyography or recording of the electrical activity arising from the muscles and driven by those motor neurons, is a practical way of gaining insights into the activity of the motor control of nervous system as the basis for functional assessment of neurocontrol of movement, in other words functional EMG (fEMG). In the case of fEMG, emphasis is placed on broad representation of motor activity, with less concern about the selectivity of the recording motor units; thus, surface electrodes are used to detect the activity to be monitored. The characteristics of the surface EMG signal are determined by the biophysics of the recording situation, determined predominantly by the amount [degree?] of tissue depolarized (a function of both the size of the muscle and the imposed firing rate), and 2) the distance from the muscle to the recording electrode. The analysis also reveals that the frequency characteristics of the recorded signal are determined by the conduction velocity in the tissue and the distance from the muscle to the electrode. Thus, the depth of the muscle beneath the skin, and placement of the electrode on the skin are major determinants in establishing the amplitude and frequency characteristics of the signal. The surface electromyographic (sEMG) signal can therefore be considered to represent the summation of activity of the muscle recorded, or pooled firing rate (PFR), an indication of the strength of activation of that one muscle. Given that muscles do not act in isolation, and considering that the elementary functional units of living things are synergies, which is a functional grouping of structural elements together temporarily constrained to act as a single coherent unit, the information from just one muscle group is insufficient to characterize motor control. Rather, it is necessary to document the activity of multiple muscles. fEMG offers the most direct, feasible measure of motor control to the extent that it quantitatively represents the activity of the central nervous system, called the pooled firing rate (PFR). The key problem in taking this approach is therefore to derive the best estimate of the PFR from the fEMG signals. However, while the biophysics of the situation dictate that, if the PFR (underlying neural activity) is known, the fEMG signals created can be computed to the degree of accuracy that the muscle geometry is known, but the converse is not true, if the fEMG is measured, one cannot automatically know the PFR that generated that data. The ill-posed nature of the inverse problem of inferring the source has not kept electrophysiological techniques from finding utility in non invasive studies of motor control in humans and its application in medical practice. By adding a priori information, it is possible to utilize these surface potentials for monitoring and assessment of motor functions of the CNS, in practical medical terms in diagnostic evaluation of motor disorders. Functional electromyography relies on the motor act as its organizing framework, and seeks to document activity in as many muscle groups as practical. In fEMG, emphasis is placed on broad representation of motor activity, with less concern about the selectivity of the recordings; thus, surface electrodes are used to detect the activity to be monitored.

0501A2

MOTOR CONTROL MODIFICATIONS CAUSED BY SCIBarry McKay*Norton Neuroscience Institute, Louisville (United States)*

The control of movement, or motor control, occurs when the central nervous system (CNS) integrates voluntary, reflex, and automatic activity with internal and external feedback signals to accomplish a motor task. This motor act is generated in the form of spatiotemporally organized output to muscles that contract and, within constraints imposed by the skeletal system, cause movement to occur (1). The performance of this motor act requires the coordination of neck, trunk, and proximal and distal limb muscles innervated from multiple motor nuclei of the spinal cord (2, 3). Some often-repeated tasks may call upon organizational synergies that arose because of the need to coordinate and exploit enormous numbers of degrees of freedom in complex motor systems. For example, synergistic organization functions in the performance of whole-limb extension for standing and leaning forward and backward or reaching for an object or whole-limb flexion for stepping or bringing an object toward the body (4). Traumatic injury to the spinal cord disrupts CNS organization, altering synaptic connectivity and synergistic coordination within neuronal networks needed for the performance of such motor acts. The resulting spatiotemporal disorganization manifests as spastic paresis with wide-spread, “muscle overactivity” (5). For example, after SCI, the attempt to perform a unilateral single-joint task such as ankle dorsiflexion may activate the whole-limb flexion synergy. Or, CNS control may be so disrupted as to bring only diffuse, bilateral activation of spinal motor neurons, or no motor output at all. To assess the degree of motor control disruption caused by SCI in an individual, it is valid and beneficial to measure the ability of the CNS to produce this spatiotemporally organized output by recording multi-muscle surface EMG (sEMG) during attempts to perform selected motor tasks under carefully controlled conditions. This can be done using the Brain Motor Control Assessment (BMCA) protocol of standard volitional and reflex motor tasks (1). The degree of disruption that results from SCI ranges from minimal to severe and can be quantified by comparing the spatiotemporal output patterns produced in response to the simple volitional tasks of the BMCA by persons with SCI to those recorded from non-injured subjects. The degree of the damage-induced disruption can then be calculated from the sEMG using a vector-based analysis tool (6). Within a group of 97 persons with SCI, recorded in Vienna, Austria, this tool showed that, across distinct qualitatively-determined categories of disordered patterns, there was a continuous distribution of control disruption (7), in contrast to the categorical distribution suggested through the use of current clinical scales such as the American Spinal Injury Association Impairment Scale (8). When severe SCI brings clinically complete paralysis, other neurophysiological parameters derived from the BMCA can be used to describe conduction across the lesion. For example, the ability to induce muscle activation caudal to the injury by performing strong voluntary contractions of muscles rostral to the lesion. Such tasks as neck flexion and Jendrassik reinforcement maneuvers can increase the central state of motor excitability and induce motor unit discharging in paralyzed muscles caudal to the lesion (9–11). Similarly, the ability to decrease the central state of motor excitability can be measured as a volitionally-induced decrease in cutaneous reflex withdrawal from plantar surface stimulation (10–12). With even less translesional conduction, the presence of sustained responsiveness to vibration (13–15) or the multi-muscle distribution of responses to tendon taps (16) offer evidence of translesional conduction. Taken together, recording the amount and spatiotemporal distribution of spinal motor output produced in response to the BMCA’s motor tasks can provide a functional EMG measure of motor control after SCI.

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0501A3

CORRELATION OF MOTOR CONTROL IN THE SUPINE POSITION AND ASSISTIVE DEVICE USED FOR AMBULATION IN CHRONIC INCOMPLETE SPINAL CORD-INJURED PERSONS

Simon Fuk-Tan Tang

Department of Physical and Rehabilitation Medicine, Chang Gung memorial hospital and School of Medicine Chang Gung University (Taiwan)

Ambulation is an important part of neurorehabilitation. How to assess and predict ambulatory outcome is utmost important. To evaluate the relationship between neurocontrol patterns evoked by lower limb movement in the supine position and the assistive device used for ambulation in chronic incomplete SCI persons, 15 neurologically healthy and 36 incomplete SCI persons were recruited. Surface EMG (SEMG) was recorded from bilateral quadriceps, adductors,

hamstrings, anterior tibialis and triceps surae muscles. SEMG patterns of activities recorded in the supine position during volitional, unilateral, multi-joint (hip/knee flexion and extension) movement attempts were characterized, divided into seven groups and compared with the subjects' self-selected ambulation device. The neurological patterns recorded in the supine position correlated well with the SCI subjects ambulatory assistive device. Marked decreases in motor unit output and/or loss of motor organization were found in the nonambulatory group. Coactivation of proximal muscles, poor timing of muscle activity, and radiation of activity into contralateral muscles were noted in subjects who required a walker or crutches.

0501A4

NEUROPHYSIOLOGY OF THE HUMAN SPINAL CORD TESTED BY LUMBOSACRAL EVOKED POTENTIALS, THE H REFLEX, AND POSTERIOR ROOT-MUSCLE REFLEXES

Karen Minassian^{1,2}, Ursula S. Hofstoetter^{1,2}, Winfried Mayr², Frank Rattay¹, Milan R. Dimitrijevic^{1,3,4}

¹Institute of Analysis and Scientific Computing, Vienna University of Technology, ²Center for Medical Physics and Biomedical Engineering, Medical University of Vienna (Austria), ³Department of Physical Medicine and Rehabilitation, Baylor College of Medicine, Houston (United States) and ⁴Foundation for Movement Recovery (Norway)

Purpose: The present work describes electrophysiological methods for assessing conduction and processing functions of spinal neuronal circuits in spinal cord injured humans. **Lumbosacral evoked potentials (LSEP):** Electrical stimulation of primary afferents within the tibial nerve in humans elicits the H reflex that is electromyographically recorded from the calf muscle. The neuronal activity along the reflex pathway can be recorded by surface electrodes placed over the low thoracic and lumbosacral spine as LSEPs. The waveforms of the LSEPs reflect peripheral and central generators. Responses recorded over the vertebral levels L2, L4 and S1 are double peaked. The first negative peak (R-wave) is generated by afferent impulses in the posterior roots, while the second negative peak (A-wave) is the reflex outflow through the motor axons in the anterior roots. A stationary wave (S-wave) is recorded from the T12-electrode, generated by activity of dorsal horn interneurons trans-synaptically depolarized by the afferent input. LSEPs can be interpreted as electro-neurograms and are testing whether the input to and output from the S1 spinal cord segment is preserved and whether the afferent input depolarizes neurons in the dorsal horn gray matter of the spinal cord. **The Hoffmann reflex (H reflex):** The H reflex is due to activation of low-threshold, large-diameter group-Ia muscle spindle afferents within the tibial nerve and the subsequent recruitment of motoneurons through mono-/oligosynaptic connections in the ventral horn of the spinal cord. The H reflex of triceps surae tests the preservation of the corresponding stretch reflex arc. Assessment of the functional condition of the spinal cord can be extended to numerous other neuronal pathways that are acting upon the H reflex by employing conditioning-test paradigms. Changes in H reflex amplitude following a conditioning stimulus assess post-synaptic events or changes in presynaptic inhibition acting on Ia afferent terminals. One example is the demonstration of disynaptic Ia inhibitory pathways by a decrease of the H reflex size when the common peroneal nerve is electrically stimulated. Likewise, assessment can be extended to spinal pathways influencing the monosynaptic reflex gain by volitional motor tasks. **Posterior root-muscle reflexes (PRM reflexes):** PRM reflexes are spinal reflexes elicited in large-diameter afferents within the posterior roots and are electromyographically recorded as compound muscle action potentials from the homonymous muscles (2). We have recently described a non-invasive method for the transcutaneous elicitation of PRM reflexes via surface electrodes attached over the back and the abdomen (3). A single pulse applied at the T11-T12 interspinous space elicits monosynaptic PRM reflexes in multiple lower limb muscles in subjects with intact nervous system in supine

(3) or standing position (1). Electrophysiological similarities between the PRM reflex and the H reflex allow to extend H reflex studies of a single muscle to the assessment of synaptic transmission of two-neuron reflex arcs at multiple segmental levels simultaneously under different conditioning influences (1). The transcutaneous technique and epidural spinal cord stimulation (SCS) stimulate similar neuronal structures, i.e., large-diameter afferents of multiple cord segments. Hence sustained transcutaneous SCS can open new avenues as a neuromodulation technique. In a pilot study we combined transcutaneous SCS with assisted treadmill stepping in subjects with complete and incomplete SCI. We found effects of transcutaneous SCS on the activity of multiple motoneuron pools throughout the lower limbs. These widespread effects strongly suggested that the tonic transcutaneous SCS delivered from a single site enhanced the activity of locomotor-related circuits inherent to the human lumbar spinal cord. **Conclusions:** The above presented, non-invasive neurophysiological methods provide information on both main function of the spinal cord, i.e. its conducting and processing capacities.

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0501D1

HUMAN NEURAL CONTROL OF POSTURE: MODIFICATIONS OF LUMBAR POSTERIOR ROOT-MUSCLE REFLEXES

Ursula S. Hofstoetter^{1,2}, **Karen Minassian**^{1,2}, **Winfried Mayr**², **Frank Rattay**¹, **Milan R. Dimitrijevi**^{3,4,5}

¹Institute of Analysis and Scientific Computing, Vienna University of Technology and ²Center for Medical Physics and Biomedical Engineering, Medical University of Vienna (Austria), ³Department of Physical Medicine and Rehabilitation, Baylor College of Medicine, Houston (United States), ⁴Institute of Clinical Neurophysiology, University Medical Center Ljubljana (Slovenia) and ⁵Foundation for Movement Recovery (Norway)

Purpose: The maintenance of body posture in humans during the execution of postural and volitional tasks relies on dynamically adjusted, continuous motor coordination. The goal of the present study was to test the underlying sensory-motor control mechanisms by assessing task-dependent modifications of short-latency spinal reflexes associated with tonic and phasic motor activities. The originality of the study lies in analyzing monosynaptic spinal reflexes of several lumbar spinal cord segments in healthy adult subjects simultaneously elicited by electrical posterior root-stimulation and in testing their modifications during the execution of well controlled and coordinated postural and volitional multi- and single joint (i.e., multi- and oligosegmental) movements. **Materials and Methods:** A novel, non-invasive method of transcutaneous spinal cord stimulation was used to simultaneously elicit monosynaptic posterior root-muscle (PRM) reflexes – named according to the sites of their initiation and their detection by surface electromyography – in multiple thigh and leg muscle groups bilaterally in subjects with intact nervous system functions (1, 2). PRM reflexes were used to assess the modification of synaptic transmission at several segmental levels simultaneously with the subjects (i) in upright standing position, performing unilateral dorsal and plantar flexion while standing on the contralateral lower limb as well as while leaning forward and backward at the ankle; and (ii) in supine position, isometrically lifting one of the extended lower limbs at the hip; and just before the execution of a fast withdrawal movement, i.e., during the preparatory phase of the movement. **Results:**

We have demonstrated that PRM reflexes were modulated in the flexor and extensor muscle groups of the lower limbs to meet the functional requirements of the motor tasks and at the same time to counteract perturbation of equilibrium. In particular, the excitability of motoneurons associated with muscles that were quiescent during a specific task was inhibited. Moreover, modifications of motoneuronal excitability took place even before the execution of the motor tasks. **Conclusion:** The presented approach opens a new avenue for non-invasively investigating how motor control is triggered and maintained by spinal cord networks in subjects with intact or altered nervous system functions. Expanding the knowledge about the interaction between segmental reflex organization and automatic postural capacities will be crucial in designing new and adjusting already available rehabilitation strategies for restoration of locomotor functions in people with neurological disorders. Moreover, it will help advancing our understanding of how to maintain intact motor control functions and prevent postural disturbances.

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0501D2

NEUROIMAGING ASSESSMENT OF HUMAN SPINAL CORD WHITE AND GREY MATTER

Spyros S. Kollias

Institute of Neuroradiology, University Hospital of Zurich (Switzerland)

The past ten years have witnessed a revolution in the diagnosis and management of spinal disorders. MR imaging has quickly emerged as the study of choice for virtually all disorders of the spine. With the inherent contrast sensitivity, the high spatial and temporal resolution, the multiplanar sampling of anatomy, the reliable differentiation between normal and pathologic tissue and the lack of irradiation hazards of MR, the morphology of the spinal cord, and nerve roots but also of the vertebrae, intervertebral disk, epidural space, can be visualized with striking clarity. The use of paramagnetic contrast agents became well established in a variety of disorders allowing definition of abnormal vessels, leptomeninges, and disrupted blood-cord barrier. State-of-the-art MR has increased the specificity of diagnosis of spinal disease, aided earlier diagnosis of spinal lesions and increased the anatomical precision of disease localization. It is now possible to diagnose processes that were previously only inferred from imaging studies. Diagnostic innovations have been followed by considerable therapeutic advances. But also therapeutic advancements particularly in the field of regeneration of the neural tissue in spinal cord injury are driving technological developments in imaging. Despite this progress, the modality remains in an evolution stage, with almost unlimited room for improvement. New imaging methodologies have been developed over the last years that are used to clarify not only morphological changes but also the physiology and pathophysiology of neural tissue. High-resolution Magnetic Resonance (MR), diffusion-weighted (DWI) and diffusion-tensor (DTI) imaging, functional MR imaging (f-MRI) and MR spectroscopy (MRS) have evolved into important research tools for examining the structural and functional nature of neurological pathology, in both animal and human tissue. Applications in the brain have already gained widespread clinical acceptance however, imaging the spinal cord places additional demands on imaging, due to its fine structure and its elasticity, the requirement for high in-plane resolution and avoidance of artefacts arising from cord and CSF motion, respiratory motion, and swallowing. Optimization and application of these non-invasive MR techniques on studying the human spinal cord can potentially provide new morphological, physiological and functional information in vivo and eventually, important insight into a variety of disease processes affecting the

spinal cord and its functional recovery after injury improving the specificity of conventional imaging approaches. Presently, application of advanced imaging methodologies for in vivo imaging of the human spinal cord gain widespread acceptance for potential use in clinical studies. These include high resolution differentiation between spinal cord grey and white matter using high field (3-T) MR systems, evaluation of microstructural changes in the integrity of white matter using DTI, mapping functional activity of the spinal sensorimotor neurons using fMRI, as well as metabolic imaging of the spinal cord tissue using MR spectroscopy. First clinical applications in patients with demyelinating disease, (i.e., multiple sclerosis), spinal cord injury (SCI), neoplastic processes etc, indicate that these techniques provide better demonstration of the structural damage and understanding of its functional consequences and its evolution in the human spinal cord. Quantitative imaging parameters can be used as surrogate markers of disability for determining prognosis and for following up rehabilitation and pharmacologically induced recovery. With the progression of regeneration enhancing treatment for spinal cord injury form basic research to patient trials, these new diagnostic tools for the clinical assessment, including prognosis and post-treatment follow-up, become of utmost importance for assessing with increased specificity and sensitivity the structural, physiological and functional status of the human spinal cord in vivo and in the clinical setting. It must be always remembered, however, that the body has a limited range of responses to an apparently infinite variety of insults from infectious, inflammatory, traumatic, and neoplastic entities. Images are often sensitive but not specific, and a logical pathologic differential diagnosis must be given. Further, many morphologic derangements can be demonstrated in asymptomatic individuals, which further complicates the concept of abnormality. In certain situation there may only be a moderate correlation between the imaging evidence of morphologic alteration and the presence of symptoms. These facts emphasize that we need to concentrate more effort on determining the significance of the morphological changes we can now so exquisitely demonstrate, and the central importance of both the clinical and electrophysiological evaluation in the work-up of patients with spine disorders. Imaging is an intermediate test that must be integrated into, rather than isolated from, the clinical and neurophysiological evaluation. The management of patients with spinal disorders must begin and end with a thorough clinical assessment and imaging findings must be correlated and validated with clinical and electrophysiological parameters.

0501D3

TRANSITORY HUMAN PARAPLEGIA

Vedran Deletis

Institute for Neurology and Neurosurgery, Roosevelt Hospital (United States)

Surgically induced transient paraplegia: During surgery for intramedullary spinal cord tumors in the thoracic region, MEPs in the TA muscles will frequently disappear while the D wave remains unaffected. All patients demonstrating this finding during surgery wake up paraplegic (or monoplegic if the TA MEPs disappear in one leg). In patients in whom we have observed this phenomenon, motor strength is typically recovered in a few hours to a few days following surgery. No permanent motor deficits have been observed (1, 2). With almost all cases of transient paraplegia, the first changes are seen in the MEPs and not in the parameters of the D wave. This gives the surgeon a warning sign and a window of time to plan to end the tumor removal. This is a critical point for intraoperative planning of the extent of tumor removal. If changes in the MEPs do not appear, tumor removal can proceed until a gross total resection is accomplished without the patients having permanent motor deficits postoperatively. **Neurophysiological Basis for Surgically Induced Transient Paraplegia:** Taking into account the previous evidence that the generation of muscle MEPs involves more than just the CT, activation of the CT and other descending systems within the spinal cord is necessary. We speculate that the propriospinal (diffuse) system of the spinal cord is activated by CT axons that are linked via synaptic connections to the propriospinal system

within the spinal cord. In the case of surgically induced transient paraplegia, this system is temporarily compromised by selective surgery while the CT is left intact. After the patient wakes up, other descending systems compensate for the lack of propriospinal tonic influence on α -motoneurons. This results in the fast recovery of these patients. This suggested mechanism is speculative but from a prognostic and pragmatic point of view is critical because it correlates extremely well with clinical outcome. Comparatively, if the CT tract is damaged during surgery (complete loss of D wave or decrement of the amplitude compared with the baseline of more than 50%), a permanent motor deficit is expected (3). Combining the information about the D wave and about the muscle MEPs during surgery for intramedullary spinal cord tumors makes this surgery safer, changes the intraoperative strategy, and significantly diminishes the occurrence of postoperative deficits.

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0501D4

THE NEUROPHYSIOLOGY OF HUMAN LOCOMOTOR TRAINING

Keith E. Tansey

Spinal Cord Injury/Neurology & Physiology, Shepherd Center/Emory University (United States)

Purpose: The goal of the research to be presented is to localize and characterize the neural plasticity associated with locomotor training and functional recovery of gait following motor incomplete spinal cord injury in humans. The premise is that if we can understand the relationship between neurophysiology and functional capacity following injury and training we may be able to identify ways to improve upon that therapy and the recovery in our patients. **Materials and Methods:** Electrophysiological and fMRI studies on patients with spinal cord injuries will be presented and how those measures are affected by locomotor training in some of those patients will be examined. **Results:** We have demonstrated that locomotor training leads to supraspinal neural plasticity and that plasticity in the cerebellum may be best linked with functional recovery of gait. In examining spinal neural circuits after injury and training, we have found a less clear picture. Patients who recover faster over-ground walking speeds after locomotor training experience normalization of their soleus H reflexes but the opposite is seen in patients who recover only very slow over-ground gait. **Conclusion:** We have growing evidence of the neural plasticity, both supraspinal and spinal, that is associated with locomotor training following motor incomplete spinal cord injury and we can relate certain features of that neural plasticity with certain features of functional recovery in our patients. We have also identified several lines of additional investigation that need to be carried out to address the new questions raised by the research done to date.

0501H1

THE EFFECT OF PERIPHERAL NERVE LESION UPON POSTURAL CONTROL

Justin Brown

Washington University School of Medicine (United States)

While the effects upon shoulder girdle posture and dynamics are often clear when they are the result of complete proximal nerve

injuries, the effects of milder neuropathy syndromes more distal in the extremity is less well understood. Numerous animal studies have demonstrated the neurological system involved in posture to be a closed-loop system, which requires brainstem and spinal networks to process critical peripheral sensory feedback input to the CNS for its normal function. As such, diabetic neuropathy has been a useful model of an impairment of somatosensory input to this system which affects upright balance and gait. Similar research has demonstrated that the postural system is composed of at least two subsystems, one for the pelvic girdle and another for the shoulder girdle. Particular shoulder postures and dynamics have been suggested as contributing factors in the development of neuropathy syndromes of the upper extremity as they are commonly observed in those suffering from such upper extremity neuropathy syndromes. Using an infrared motion capture system we demonstrate shoulder postures and dynamics in normal and neuropathy-affected subjects, highlighting their differences. We will then demonstrate the aspects of these postures which can be induced via afferent reduction, indicating a possible reverse phenomenon – distal neuropathy resulting in proximal postural changes.

0501H2

NOVEL ACCESS TO THE HUMAN AND ANIMAL LOCOMOTOR CIRCUITRY

Yury Gerasimenko^{1,3}, Ruslan Gorodnichev², Pavel Musienko¹, Roman Seifner^{1,6}, Roland R. Roy^{3,5}, V. Reggie Edgerton^{3,4,5}

¹Pavlov Institute of Physiology and ²Velikie Luki State Academy of Physical Education and Sport (Russian Federation), ³Departments of Physiological Science, University of California, ⁴Departments of Neurobiology, University of California and ⁵Brain Research Institute, University of California (United States) and ⁶Technical University Graz Institut für Medizintechnik (Austria)

Purpose: To determine whether the spinal locomotor circuitry in non-injured humans as well as in decerebrated cats and in adult spinal cord transected rats can be activated by spinal electromagnetic stimulation (SEMS). **Materials and Methods:** In individuals with the legs placed in a gravity-neutral position a circular electromagnetic coil (70 mm) was positioned over the T11–T12, T12–L1, L1–L2, and L2–L3 vertebrae. One 10-sec train of impulses at 1, 3, 5, 10, and 20 Hz was applied to the spine at a strength ranging from 1 to 1.5 Tesla (Magstim-Rapid2 stimulator). In decerebrated cats and in spinal rats the magnetic stimulation at 3–5 Hz and strength ranging from 0.2 to 1 Tesla was used. Kinematic and EMG analysis of stepping movements during SEMS was performed. We also used computer modeling of the cat spinal cord to calculate the distribution of the electrical fields in the spinal cord in response to SEMS at different locations of the magnetic coil over the spinal cord. **Results:** SEMS at 3Hz applied to T11–T12 vertebrae at strength of 1.5 Tesla induced involuntary bilateral locomotor-like movements in the legs of some individuals. The formation of locomotor-like activity during SEMS started immediately after delivering of the first stimulus. SEMS at 1 Hz did not induce any clear, sustained locomotor-like activity in the leg muscles. Locomotor-like movements, however, were observed at 3, 5, 10, and 20 Hz. Displacement of the coil in a more caudal direction resulted in a progressive impairment of stepping performance. In decerebrated cats SEMS, both of lumbar and cervical spinal cord, could induce quadrupedal locomotion on the moving treadmill. In spinal rats SEMS induced episodes of locomotion only. However after administration of 5-HT agonist (quipazine) the facilitation of locomotion during SEMS of spinal rats was significant. **Conclusion:** We speculate that SEMS directly activates the circuitry intrinsic to the spinal cord, as suggested by the immediate response and the electrophysiological observations demonstrating an absence of strictly time-linked responses within the EMG burst associated with individual stimuli during SEMS. Based on modeling of the electrical fields in the cat spinal cord in response to SEMS, positioning of the coil over spinal cord is critical

for inducing of locomotion. The present results suggest that SEMS could be an effective, noninvasive clinical tool for facilitating the recovery of locomotion after a spinal cord injury.

0501H3

TRANSFORMATION OF NONFUNCTIONAL SPINAL CIRCUITS INTO FUNCTIONAL AND ADAPTIVE STATES IN PARALYZED RATS

Grégoire Courtine^{1,2}

¹Neurology Department, University of Zurich and ²Rehabilitation Institute for Neuroscience and Technology Zurich (RITZ) (Switzerland)

Severe spinal cord injury (SCI) permanently abolishes motor functions caudal to the lesion. In this talk, I will show that combinations of monoaminergic agonists and electrical spinal cord stimulations can acutely transform spinal networks from non-functional to highly functional and adaptive states as early as one week after a severe SCI. Specifically, using detailed kinematic, force, physiological and statistical analyses, I will demonstrate the capacity of various monoaminergic receptors and multiple sites of epidural electrical stimulations to promote unique patterns of locomotion in paralyzed rats. Next, I will demonstrate the power of these interventions to mediate the recovery of full weight bearing locomotion when combined with step training rehabilitation. Finally, I will show that limited, indirect connections between the brain and spinal locomotor circuits are sufficient to allow paralyzed rats with severe SCI to regain the capacity to walk overground when pharmacological and electrical stimulations are provided. The potential of these novel multi-pronged strategies to improve functional recovery in people with spinal cord injuries will be discussed.

0501H4

HUMAN MOTOR CONTROL AND RECOVERY OF THE MOTOR FUNCTIONS AFTER CNS LESIONS

Milan Dimitrijevic

Abstract missing.

Spinal Cord Disorders

0501B1

ACUTE SPINAL CORD INJURY: ADVANCEMENTS IN BASIC SCIENCE RESEARCH AND CLINICAL CARE

Chi-Tsou Huang

University of Alabama in Birmingham - School of Medicine (United States)

Purpose: An overview of current basic science research in acute SCI and clinical presentation of SCI from the acute to chronic stage of disease. **Materials and Methods:** Clinical experience in managing SCI patients for the last 34 years through in and out-patient setup, and study of cardiopulmonary function, nutritional requirements, and hematological abnormalities. **Results:** SCI patients have severe cardiopulmonary intolerance, low calorie requirement particularly during the first two weeks post injury, and decrease in total body red cell mass. **Conclusion:** During the acute stage of SCI, aggressive cardiopulmonary care and moderate daily calorie nutritional support should be performed. Moreover, deviations from the decline in the red cell mass should be monitored.

0501B2

WHAT WE LEARNT FROM MANAGEMENT OF SPINAL CORD INJURY POST SICHUAN EARTHQUAKE – 2 YEAR EXPERIENCE

Jianan Li, Yongqiang Li, Shouguo Liu, Mingyue Xiao, Xia Zhang, Sijin Chen, Wenchao Yi

First Affiliated Hospital of Nanjing Medical University (China)

Purpose: To review outcome of rehabilitation service for victims with spinal cord injury (SCI) from Sichuan earthquake. **Materials and Methods:** On site investigation was conducted, including interview, home visit and physical assessment. Total of 51 SCI victims aged 11 to 77 years were investigated, including 30 females and 21 males. Injury level was C7 or above in 5 cases, C8–T5 in 3 case, T6–L2 in 35 cases and L3 and below in 8 cases. Completed injuries were 22 cases and the incompleting were 29 cases. Most cases (86.3%) had internal fixation. Outcome of locomotion, ADL and complications were evaluated. **Results:** Most complications from SCI were rehabilitated, including healed pressure sore in 62.5%, relief of pains in 64.7% and healed DVT in 85.7%. But neurogenic bladder and bowel were still seen in 90% and 83% of the victims. All victims between C8 and L2 were able to walk with KAFO, but only 25% of them remained to use KAFO regularly (1 to 2 hrs per day). No people with KAFO might walk independently without supervision. Major causes of poor application with KAFO were complications/comorbidity, inconvenience, difficulty to use and poor home environment. Most victims (84%) finally used wheelchairs as their transportation tool at home and community. Only 11.8% of them resumed independent walking, who had incompleting injury or neuro-level below L3. The capacity of activity of daily living (ADL) was independent in 13.7%, partially independent in 80.4% and dependent in 5.9%. The major factors to affect independence were severe pain, unhealed fractures, pressure sore, severe depression, and/or poor motivation. In addition, most wheelchairs were not individualized and not suitable for local environment. Community service of rehabilitation is limited due to medical insurance policy and limited trained people in rehabilitation medicine. **Conclusion:** Rehabilitation for SCI from Sichuan earthquake was successful in institution settings. But long term strategy of community based rehabilitation and nursing home for completed quadriplegia patients are important.

0501B3

BOWEL MANAGEMENT IN SCI PATIENTS: FROM RESEARCH TO REAL WORLD

Apichana Kovindha

Department of Rehabilitation Medicine, Faculty of Medicine, Chiang Mai University (Thailand)

Purpose: To present bowel management in spinal cord injured patients. **Materials and Methods:** Literature review. **Results:** Most of spinal cord injured (SCI) persons experience defecation as well as urination dysfunction. Anticholinergic drugs and fluid intake restriction are prescribed to control neurogenic bladder overactivity and urinary incontinence; however, these inhibit bowel motility and cause more constipation, fecal impaction and fecal incontinence (FI). The latter is a main barrier of SCI persons' social participation. To overcome such barrier, proper bowel program and bowel care are necessary. Bowel program consists of cleansing the colon, normalizing of stool consistency with adequate fluid and fiber intakes, and stimulating evacuation of stool on a regularly scheduled basis. Chemical stimulants, taken orally or suppository or enema, are usually prescribed. Recent researches prove that digital rectal stimulation facilitating bowel evacuation in SCI patients; abdominal massage in a clockwise motion enhances bowel movement. In addition, anal stimulation with water stream was proved to shorten time needed for bowel care in SCI persons. Transanal/transrectal irrigation with up to 1.5 L of tepid water improved constipation, FI, and symptom-related quality of life much better than conservative bowel management in children and neurogenic bowel dysfunction;

and daily transrectal (electrical) bowel stimulation for 2 to 3 weeks helped improve FI and bowel function without untoward effects in children with myelodysplasia. When conservative bowel program fails, the Malone antegrade colonic enema (MACE) procedure has significant improvement in children and their parent who after years battled with constipation and fecal incontinence. In addition, neuromodulation with intravesical electrical stimulations did reduce FI but not affect bowel movement. One should notice that ideal bowel care is very different for physicians and for patients: 'ideal bowel care of physician' is defined as spontaneous or reflex defecation without enema or suppository, at least once every 2 days and within 30 min, while 'ideal bowel care of patient' is defined as lack of defecation difficulty; and, the concept of 'satisfactory' varied considerably among individuals. **Conclusion:** Bowel program should be established for each SCI patient during rehabilitation phase. In real life, a bowel care regimen and an appropriate equipment need to fit the person's long-term routine and aims at effective bowel evacuation without fecal incontinence.

0501B4

BRINDLEY'S TECHNIQUE FOR THE TREATMENT OF BLADDER DYSFUNCTION POST SPINAL INJURY INJURE

Mou-Wang Zhou

Department of Rehabilitation Medicine, Peking University Third Hospital (China)

Purpose: To report the effects of Brindley's technique for the treatment of bladder dysfunction in spinal cord injury patient and the relative experimental study. **Materials and Methods:** To review worldwide experience about Brindley's technique in the treatment of bladder dysfunction in spinal cord injury patient. A patient with C7 spine cord completely injured was treated with Brindley's technique in our department and was followed up 6 months later. For experimental study: Male SD rats were selected to do microsurgical anatomy and electrostimulation to study innervation effectiveness of the dorsal rootlets of L6–S1. **Results:** Patient could control their evacuation of urine with the system by themselves. The capacity of their bladder were increased to normal with residual volumes decreased under 50 ml and reflex incontinence abolished. Urinary tract infection and autonomic dysreflexia were not occurred post-surgery. The dilatation of the upper urinary tract improved to normal. The time of defecation reduced by used the system but reflex erection were not possible. In experimental study we found that there are different rootlets in the L6–S1 dorsal root which conduct bladder detrusor, external urethral sphincter and penis cavernous which could be distinguished by microanatomy and electrostimulation. **Conclusion:** Brindley's technique could help patient for controlling evacuation of urine, increasing the capacity of his bladder, decreasing residual volumes, urinary tract infection and autonomic dysreflexia. From the experimental study we infer that For Brindley's technique, selective dorsal rootlets deafferentation could be chose to combine with preservation of rootlets which conduct penis, so the reflex erection function could be restored and the patients' quality of life could be improved.

0501B5

NEUROGENIC BOWEL DYSFUNCTION IN PATIENTS WITH SPINAL CORD INJURY

Chin-Wei Liu¹, Chun-Chiang Huang¹, Chia-Hsin Chen¹, Tien-Wen Chen¹, Ming-Chang Weng¹, Chia-Ling Lee¹, Mao-Hsiung Huang¹

¹Department of Physical Medicine and Rehabilitation, Kaohsiung Medical University Hospital, Kaohsiung Medical University (Taiwan)

Purpose: 1) To investigate the risk factors of severe neurogenic bowel dysfunction (NBD) in persons with spinal cord injury (SCI).

2) To assess the relationship between the severity of NBD and health-related quality of life in persons with SCI. 3) To evaluate that whether functional electrical stimulation cycling exercise (FESCE) can provide benefits on SCI patients to improve their bowel condition. **Materials and Methods:** Totally, three questionnaires were used, including the Neurogenic Bowel Dysfunction Score (NBDS), the Beck Depression Inventory second edition (BDI-II), and the Short-Form 36-Item health survey (SF-36). The demographic factors, injury-related factors, and psychological factors were recorded in order to evaluate any relationships with severe NBD. In addition, the quality of life in patients with SCI would be measured and analyzed. Furthermore, FESCE was performed for patients with incomplete SCI. Patients received the FESCE thrice a week for 8 weeks. Each session lasted 30 min with warm-up and cool-down periods of 3 min. Evaluations were performed before and after 4 and 8 weeks of training. **Results:** Nearly half of the persons with SCI suffered from moderate to severe degrees of neurogenic bowel dysfunction. Patients with cervical injury, complete injury (ASIA A), or longer duration of injury (≥ 10 years) had higher risk of severe NBD. The severity of NBD was associated with the physical component summary (PCS). However, there was no significant association between the severity of NBD and mental component summary (MCS). In addition, our results revealed that some participants became much better in their bowel function after FESCE training. The frequency of their constipation and fecal incontinence were both reduced. Therefore, it will be good for us to do further exploration in this field. **Conclusion:** Level of lesion, completeness of cord injury, and longer duration of injury (≥ 10 years) were independent factors of severe NBD in persons with SCI. Moreover, the severity of NBD is associated with health-related quality of life. FESCE might be an adjuvant treatment for NBD resulting from SCI.

0501E1

THE HIGH-SENSITIVITY C-REACTIVE PROTEIN IN PATIENTS WITH CHRONIC SPINAL CORD INJURY

Chun-Chiang Huang^{1,2}, Chin-Wei Liu², Ming-Cheng Weng¹, Tien-Wen Chen¹, Mao-Hsiung Huang^{2,3}

¹Department of Physical Medicine and Rehabilitation, Kaohsiung Municipal Hsiao-Kang Hospital, ²Department of Physical Medicine and Rehabilitation, Kaohsiung Medical University Hospital and ³School of Medicine, Kaohsiung Medical University (Taiwan)

Purpose: To analyze high-sensitivity C-reactive protein (HsCRP) level and study the correlation with insulin resistance and resting metabolic rate in patients with spinal cord injury. **Materials and Methods:** Thirty-two subjects who had sustained spinal cord injuries at least 6 months before enrollment. Circulating glucose, insulin, C-reactive protein levels were measured and resting metabolic rate was evaluated by indirect calorimeter after 12-hour fasting. The homeostasis model insulin resistance index was used to evaluate insulin resistance. Insulin resistance, resting metabolic rate and C-reactive protein levels were compared between complete/incomplete patients and between paraplegic/tetraplegic patients. The subjects were then divided into three groups (C-reactive protein levels < 1 , 1 to 3 , > 3 mg/l) to compare insulin resistance and resting metabolic rate. **Results:** fifteen (46.86%) subjects had C-reactive protein levels > 3 mg/l. The C-reactive protein levels and insulin resistance did not significantly differ between complete/incomplete or between paraplegic/tetraplegic subjects. However, insulin resistance and resting metabolic rate in the high C-reactive protein group (> 3 mg/l) significantly differed from that of the other two groups. **Conclusion:** Most young and middle-aged chronic spinal cord injury patients with high C-reactive protein levels, high insulin resistance and low resting metabolic rate, and C-reactive protein levels may predict cardiovascular disease in this group.

0501E2

INTERNATIONAL PERSPECTIVES OF SPINAL CORD INJURY – CLINICAL CARE

Xianghu Xiong

Burwood Spinal Unit, Burwood Hospital (New Zealand)

Purpose: To summarise the contents and recommendations of clinical care for patients with spinal cord injuries. **Materials and Methods:** International Perspectives of Spinal Cord Injury (IPSCI) is a joint international report of WHO and International Spinal Cord Society (ISCoS). This report will reflect all aspects of spinal cord injury including global pictures of epidemiology, basic clinical research, clinical care, as well as overall rehabilitation, community reintegration and psychological and social implications. This presentation will focus on the clinical care section, outlining the state of the art as well as global practices of clinical management for patients with spinal cord injuries. This chapter will cover acute management, triage, early emergency, ICU management, as well as surgical interventions and comprehensive medical management and cares. This section will also address the early stage of comprehensive rehabilitation including mobility, activities of daily living, psychosocial rehabilitation and medical management of complications. **Results:** There are diverse clinical approaches to the care of patients with spinal cord injuries globally. Resources and systems of care are considerably different between the well resourced countries and the less resourced countries. Comprehensive and systematic approaches to clinical care of patients with spinal cord injury have been recognised as life saving, minimising the complications and morbidities, as well as improving the quality of life for patients with spinal cord injuries. Maintenance and further development of comprehensive spinal cares remain a challenge and the consistency can be an issue globally. We are also facing new challenges in health care for patients with spinal cord injuries, especially in relation to late onset health-related complications as well as ageing-related problems. **Conclusion:** There is a need to promote evidence-based medical treatments and rehabilitation guidelines. There is also a need for the less well resourced countries to catch up with provision of a systematic health care system for patients with spinal cord injuries. For the well resourced countries, maintenance and future development of best cares and rehabilitation are going to be ongoing challenges, together with managing new issues such as ageing-related clinical problems.

0501E3

PET IN ASSESSING BRAIN PLASTICITY AMONG PEOPLE WITH SPINAL CORD INJURY

Yen-Ho Wang

Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital and National Taiwan University College of Medicine (Taiwan)

Spinal cord injury (SCI) results in interruption of motor, sensory or autonomic function. It may damage descending or ascending corticospinal tracts. It leads to variable degrees of sensorimotor disability depending on the level and completeness/incompleteness of injury. Somatosensory cortical plasticity or reorganization has been observed for these patients by functional magnetic resonance imaging and transcranial magnetic stimulation. Nevertheless, the neuronal activity outcome of the plastic process is not well understood. 2-[¹⁸F]fluoro-2-deoxyglucose (18F-FDG) positron emission tomography (PET) has been shown to be able to study regional cerebral glucose metabolism, which is reported to be a measurement of regional synaptic activity. The purpose of this study is to delineate the metabolic changes in the regions of brain plasticity for patients with chronic SCI using 18F-FDG PET. In our study, brain 18F-FDG PET examination was performed for male patients with chronic SCI and age-matched male healthy volunteers without history of previous neurologic or psychiatric illnesses. Our result demonstrates that the most common areas of

increased cerebral metabolic rate for glucose (CMRGlu) are cerebellar vermis and internal capsule while the most common area of decreased CMRGlu was frontal cortex for chronic SCI patients. These CMRGlu changes may be the effects of brain plasticity after SCI.

0501E4FP

EFFECTS OF ELECTRICAL STIMULATION OF PUDENDAL NERVES ON BLADDER VOIDING FUNCTION IN THE SPINAL CORD INJURED RAT

Yin-Tsong Lin¹, Te-Son Kuo^{1,3,4}, Chih-Wei Peng², Shih-Ching Chen²

¹Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University, ²Department of Physical Medicine and Rehabilitation, Taipei Medical University and Hospital, ³Department of Electrical Engineering, National Taiwan University, ⁴Institute of Biomedical Engineering, National Taiwan University (Taiwan)

Purpose: Spinal cord injured (SCI) patients often accompanied detrusor-EUS dyssynergia (DSD) have low efficiency of micturition function, incomplete voiding, and high risk of urinary tract infection. Long-term period under this situation, it might cause ureteral edema, renal damage, and even renal failure. In our study, micro-cuff electrodes were placed on the sensory and motor branches of pudendal nerves (PUN) for the electrical stimulations study in chronic SCI rats. Functional electrical stimulation (FES) and high frequency blocking (HFB) currents were applied on PUN, sensory and motor branch respectively, to determine if PUN stimulation can improve the voiding efficiency in the SCI rat. **Materials and Methods:** Female Sprague-Dawley rats ($n=8$) were used in this experiment. After complete transection at T9–T10 of the spinal cord, the rats were treated with antibiotic for 7 days (ampicillin, im., 150mg/kg). After 6 weeks of recovery, the SCI rats were equally divided into two groups. One group was used for FES study, and the other for HFB studies. Voiding function was calculated via cystometrygrams (CMG) measurement (0.12 and 0.6 ml/min, infusion rates) to determine the stimulation effect. **Results:** In our study, low amplitude (~0.03 mA) of electrical stimulation delivered on the sensory branch of the pudendal nerve can significantly increase the voiding efficiency from 10% to 30% in SCI animals. However, high amplitude current (~0.2 mA) stimulation inhibited the contraction of the bladder. On the other hand, high frequency blocking (HFB, 10 kHz or 20 kHz) applied on the motor branch of the pudendal nerve can relax the EUS. After applying HFB on the motor branch, the CMG would keep normal pattern. Therefore, it seems like HFB did not cause any significant damage on nerve tissue. **Conclusion:** In this study, we proved FES combined with high frequency blocking technique can improve the bladder voiding function in chronic SCI rats. It is expected that our results may provide a new approach to restore efficient bladder emptying in persons with SCI.

0501E5FP

CHANGES OF PHYSICAL ABILITIES, QUALITY OF LIFE, INCIDENCES OF COMPLICATIONS AND FALLS IN PATIENTS WITH CHRONIC SPINAL CORD INJURY 6 MONTHS AFTER DISCHARGE: A PRELIMINARY STUDY

Jiraporn Wannapakhe¹, Sugalya Amatachaya¹, Wantana Siritaratiwa¹, Preeda Arayawichanon²

¹School of Physical Therapy, Faculty of Associated Medical Sciences and ²Rehabilitation Medicine, Faculty of Medicine (Thailand)

Introduction: Spinal cord injury (SCI) restricts patient's performance that results in the patients facing with a high risk of complications and falls. With inappropriate environmental conditions, patients may have to spend most time after discharge in beds or houses which may affect their levels of independence and quality of life. **Purpose:**

To evaluate the changes of physical abilities and quality of life of patients with chronic complete SCI 6 months after discharge. During this time, the study also explored incidence of complications and falls of these patients. **Materials and Methods:** The study recruited 10 chronic complete SCI with the mean age of 42.90 ± 14.02 year and post-injury time 5.56 ± 4.80 years. Their physical abilities were measured by using the Spinal cord independence measure (SCIM) and quality of life of the patients was investigated by using the WHOQOL-BREF-THAI. Incidences of complications and falls were assessed by using a questionnaire. **Results:** Physical abilities and quality of life of the patients were slightly increased (from 51.80 ± 16.04 to 52.22 ± 17.42 and from 86.90 ± 13.65 to 87.70 ± 14.38 scores for the SCIM and WHOQOL respectively). Importantly, all of them experienced complications (pressure sore, urinary tract infection, and pain) which 4 of them had to rehospitalization. In addition, 5 of them fall at least once (1–8 times). **Conclusion:** Physical abilities and quality of life of patients with chronic complete SCI 6 months after discharge were nearly unchanged. However, they had high incidences of complications and falls that required treatments. The results suggested that the follow-up time should be longer and should include the details of socioeconomic and psychological factors in order to thoroughly report effects of chronic SCI.

0501E6FP

AN OVERVIEW OF THE STEM CELLS IN THE MANAGEMENT OF SPINAL CORD INJURY

Farooq A. Rathore¹, Ali Raza¹, Tayyab Rathore²

¹Spinal Rehabilitation Unit, Armed Forces Institute of Rehabilitation Medicine and ²Medical and Regulatory Affairs, Novartis (Pvt) Ltd (Pakistan)

Purpose: To present an overview of the latest trends in the use of stem cells for the repair of the injured spinal cord. **Materials and Methods:** A literature search was carried out on Pubmed, Science direct, Springerlink, Ovid and Google scholar using Spinal cord injury, stem cells, advances, management, paraplegia, quadriplegia as the Key words. Only English language articles were retrieved and analyzed. Because the purpose of this work was essentially descriptive, no attempt was made to weight the quality of the articles that were identified. The literature comprised case reports, case series, clinical experience, original research articles, expert opinion, and literature reviews. **Results:** Spinal cord injury is a devastating neurological injury with little chances of full recovery, especially in complete lesions. Attempts to enhance recovery after spinal cord injury by stem cell transplant are a promising technique widely used in the animal models. Stem cells have been widely used in the animal models of spinal cord injury. There is evidence for some degree of recovery from spinal-cord injury in animals after experimental cell transplantation alone, or in combination with other agents. However there are important differences between the animal and human spinal cord which should be considered before reaching a conclusion. **Conclusion:** Although the exact mechanisms are not fully known a large number of spinal cord injury patients have already received transplants of stem cells and other cell types. A rigorous scientific analysis failed to demonstrate any benefit of stem cell transplant in human spinal cords in terms of improved functional outcome. A stem cell-based transplantation strategy that proves successful in human models, where mechanisms are understood and functional outcome is improved still faces practical challenges. However this is an exciting area of research in regenerative medicine which holds promise in the future.

0501E7FP

AN INITIAL STUDY ON BRAIN FMRI OF SPINAL CORD INJURY PATIENTS

Lijian Ao, Liqing Yao, Feifei Yang, Yongmei Li, Qiu Luo, Jun Li, Ying Wu

Department of Rehabilitation, the Second Affiliated Hospital of Kunming College (China)

Purpose: To obtain the brain function imaging changes in patients with spinal cord injury, to explore the brain mechanism of nerve function recovery. **Materials and Methods:** Collected 6 patients in line with international diagnostic criteria for spinal cord injury and 6 cases of healthy volunteers as controls group at Rehabilitation department of the Second Affiliated Hospital of Kunming Medical College hospital in December 2006–June 2008. Groups are accepted to the same task (passive lift his left leg, passive alternating lift his legs, imagine lift his left leg, imagine walking). Samples were MRI scanned brain disease exclusion. using GE1.5T MRI scanner for All Subjects axial T1WI and fMRI scans. Using statistical parametric mapping (SPM2) software for all subjects of the fMRI data processing analysis. To obtain brain activation maps superimposed on the Talairach standard three-dimensional template “Record activated areas in the scope and intensity of activation.” Using SPSS13.0 for Windows software between two groups activation of scope and intensity of brain functional area *t*-test to compare Different levels and positions between the similarities and differences the brain activated regions. **Results:** Test group had 3 cases A grade and 3 cases B grade; Patients compared with healthy control group differences in brain activation; The patient’s passive pairs of lower limb movement and imagination pairs of lower extremity motor brain regions no differences in expression. In the imagined movement compared with the patients and healthy people are different brain areas activated; different levels of spinal cord injury difference between the activation of brain regions and different planes of the spinal cord injury no differences in brain activation. **Conclusion:** spinal cord injury patients and the normal compared with activation of different brain regions. In the same movement and the imagined movement activated more; showed spinal cord injury patients had brain compensatory mechanisms, varying degrees of spinal cord injury compensation area may be different.

0501E8FP

THE INTERNATIONAL SPINAL CORD INJURY CORE DATA SET: EXPERIENCE OF A NON-MODEL SYSTEM HOSPITAL

Julia Patrick Engkasan, Tze Yang Chung
University of Malaya (Malaysia)

Purpose: To describe our experience of using the International Spinal Cord Injury (SCI) Core Data Set in a non-model system hospital. **Materials and Methods:** Information from all SCI patients seen in an acute tertiary hospital was collected using the International SCI Core Data Set for a period of 3 months. The International SCI Core Data Set consists of 24 variables including basic demographic characteristics, dates of admission and discharge from initial acute and rehabilitation care, cause of injury, place of discharge, presence of vertebral fractures and associated injuries, occurrence of spinal surgery, and measures of neurological and ventilator status. SCI patients who were managed by the Spinal Rehabilitation team in the wards and those attending the Spinal Rehabilitation clinic were included. In-patient data was collected by Master of Rehabilitation Medicine Trainees during their Spinal Rehabilitation rotation while the out-patient data was collected by Rehabilitation Physicians by reviewing patients’ folders from the clinic. All of them read the manual and went through the training cases. **Results:** 170 patients (19.4% in-patients, 80.6% out-patients) were included in this study. The main limitation noted when reviewing the medical folders is insufficient data. The missing information was mostly the dates of injury, acute admission and final inpatient discharge, total days hospitalization, presence of vertebral injury or associated injury, occurrence of spinal surgery and neurological examination findings. The date of final discharge after completion of rehabilitation does not necessarily reflect the length of hospital stay and duration of rehabilitation process. Some patients were referred to the Spinal Rehabilitation team months to years after the initial injury and were readmitted in our unit for active rehabilitation process. These patients are typically from out of town and did not receive in-patient rehabilitation. In this situation, another column is added to record the admission and discharged dates from our spinal

rehabilitation unit. In non-traumatic spinal cord dysfunction, it is difficult to be certain on the dates when the injury occurred because most symptoms are slowly progressive and patients’ recall may not be accurate. Also, in non-traumatic cases that involves tumors or infection; it is difficult to agree on what constitutes vertebral injury. Even when there is no fracture or dislocation, the destruction of vertebral bones by tumor or infection can be extensive leading to spinal instability. In our setting, we would like to collect additional information such as routine administration of oxygen, CPAP and tracheostomy. All the initial neurological examinations according to the American Spinal Injury Association (ASIA) guidelines were done after 72 hours. At present, only rehabilitation doctors are trained to do neurological examination according to the ASIA guidelines. **Conclusion:** Despite these difficulties, the International SCI Core Data set has made our data collection for SCI patients more systematic. We will continue to use it to develop the SCI database of this hospital. Training the Rehabilitation Medicine Trainees to use this data set will facilitate development of the country’s SCI database in the future.

0501E9FP

QUANTITATIVE ANALYSIS OF BLADDER COMPLIANCE IN SUBJECTS WITH NEUROGENIC BLADDER VOIDING DYSFUNCTION AFTER SPINAL CORD INJURY

Amy I-Hui Lin¹, Yu-Hui Huang^{1,2}, Liu-Ing Bih^{1,2}, Su-Ju Tsai^{1,2}, Tsung-Ho Ying³

¹Department of Physical Medicine & Rehabilitation, Chung Shan Medical University Hospital, ²Department of Physical Medicine & Rehabilitation, School of Medicine, Chung Shan Medical University and ³Department of Obstetrics and Gynecology, Chung Shan Medical University Hospital (Taiwan)

Purpose: To provide reference ranges for variability in bladder compliance among patients with neurogenic bladder voiding dysfunction after spinal cord injury (SCI). **Materials and Methods:** First, a total of twenty-four healthy volunteers, twelve men and twelve women with mean age of 25.2 were enrolled in this study. During the standardized procedures of urodynamic study, pairs of data on bladder volume and detrusor pressure were simultaneously recorded at five infusion stages, including at the beginning of examination, infusing at 100 ml, infusing up to half of maximum bladder capacity, infusing at initial detrusor contraction, and infusing at maximum bladder capacity. The calculation of bladder compliance was based on a theoretical equation ($\Delta V/\Delta P$). Because there is no standard, variability ranges for mean, median, interquartile range, and quartile coefficient of dispersion were calculated. Therefore, sixty-one SCI patients (mean age, 44.3 years; mean postinjury duration, 5.5 months) also received the same urodynamic procedures for calculation of bladder compliance as described above. According to the patterns of detrusor and sphincter function, they were classified into two groups: upper motor neuron neurogenic bladder (UMN-NB) in 39 patients and lower motor neuron neurogenic bladder (LMN-NB) in the remaining 22 patients. **Results:** The results with the least varied range were obtained with the following method: ΔV is the capacity change between the beginning of examination and the initial detrusor contraction and ΔP is the detrusor pressure change between the beginning of examination and the initial detrusor contraction. These values and ranges of variability are as follows in healthy volunteers and UMN-NB groups: mean value, 61 vs. 48; median value, 61 vs. 39; interquartile range, 53–68 vs. 34–63; quartile coefficient of dispersion, 0.11 vs. 0.3. Whereas there is no obvious detrusor activity on urodynamics in LMN-NB group, the least varied range was obtained with another method: ΔV is the capacity change between the beginning of examination and the half of maximum bladder capacity and ΔP is the detrusor pressure change between the beginning of examination and the half of maximum bladder capacity. **Conclusion:** The measurements of bladder compliance have variability in different urodynamic studies. Knowing the least varied range can be helpful for assessment of bladder compliance in SCI patients with neurogenic bladder voiding dysfunction.

Assessment, Evaluation and Diagnosis

050111FP

INNOVATION IN ASSESSING BALANCE FUNCTION IN PATIENTS WITH STROKE: A SET OF FUNCTIONAL-HIERARCHY SHORT FORMS AND COMPUTERIZED ADAPTIVE TESTWen-Hsuan Hou¹, Jyun-Hong Chen², Ching-Lin Hsieh³¹Department of Physical Medicine and Rehabilitation, E-Da hospital & I-Shou university, ²Department of Psychology, National Chung Cheng University and ³School of Occupational Therapy, College of Medicine, National Taiwan University (Taiwan)

Purpose: We developed a computerized adaptive testing (CAT) system and hierarchical short forms (i.e., sitting, standing, and stepping) for assessing balance function in an efficient, reliable, and valid fashion for assessing balance function of stroke patients in different clinical settings. **Materials and Methods:** The study consisted of three parts. Firstly, 764 patients were administered for a newly developed balance item pool (41 items) on the basis of pre-defined balance concepts, expert opinions, and field testing. We fit an item response theory model and a simulation study to determine the remaining 34 items with sufficient reliability and efficiency for the item bank of the Balance CAT. Secondly, we constructed 6 sets of 6-item balance short forms for each hierarchical balance stage on the basis of previous developed 34-item bank of Balance CAT. A simulation study was also used to determine the reliability and the optimal set of short forms named the Hierarchical Balance Short Forms (HBSF). Finally, we tested the CAT, HBSF, and Berg balance scale (BBS) on 85 patients to determine the concurrent validity and time needed for administration of both measures. **Results:** Seven items did not meet the model's expectations and 34 items formed the item bank of the CAT. We set 2 stopping rules (i.e., reliability coefficient >0.9 or ≤ 6 items) for the CAT. The simulation studies showed CAT and 3 short forms of HBSF had an average reliability of 0.94~0.95. The scores obtained from the CAT and 3 short forms of HBSF were all closely associated with those of the full-item set (Pearson $r = 0.91\sim 0.98$). The scores of the CAT and 3 short forms of HBSF were not only highly correlated (Pearson $r = 0.80\sim 0.91$) but also greatly reduction the average administration time (18 and 40%, respectively) with BBS. **Conclusion:** We concluded that both Balance CAT and HBSF tailored to hierarchical balance ability of stroke patients are innovated, efficient, reliable and valid in the application of different clinical settings.

050112FP

DOES MARATHON RUNNING CAUSE CHRONIC DEGENERATIVE LESIONS OF THE KNEE? AN ULTRASONOGRAPHIC STUDY IN LONG-DISTANCE RUNNERSMin-Hsin Lai, Tsung-Ying Li, Heng-Yi Chu, Shang-Lin Chiang, Shin-Tsu Chang

Department of Physical Medicine and Rehabilitation, Tri-Service General Hospital, School of Medicine (Taiwan)

Purpose: To investigate the findings in ultrasonographic studies of the knee in recreational marathon runners and determine whether long-distance running results in long-term damage of knee joints. **Materials and Methods:** Thirty non-professional marathon runners and 30 asymptomatic sedentary subjects not performing long-distance running as controls were invited to participate in an ultrasonography investigation concerning their knee joints. We evaluated lesions of menisci and femoral condylar cartilage (six-point scale), tendons (three-point scale), ligaments (three-point scale), joint effusion, and additional findings. **Results:** Five of the 35 subjects were excluded by our exclusion criteria. We analyzed the remaining 30 marathon runners and 30 healthy subjects. US findings in long distance runners' knees were effusion in 8 knees. While mixing the data from

lateral and medial femoral condyles, the grade included ranged from grade 1 to 6 in US. Cartilage thickness in long-distance runner on the femoral condyles as a median of 2.8 ± 0.2 mm were much thicker than control group. No knee showed US Baker's cyst. No adverse long-term consequences were observed in active runners. **Conclusion:** Non-physiological maximal loads secondary to the marathon race do not cause any permanent damage in the internal structures of the knee joint in individuals without significant pre-existing damage. A disposition for premature arthrosis was not registered in the population investigated. A protective value of long distance running on the internal structures of the knee joint is discussed.

050113FP

INFLUENCE OF CHIN-TUCK MANEUVER ON TEMPORAL AND KINEMATIC CHARACTERISTICS IN NORMAL SWALLOWINGJa-Ho Leigh, Byung-Mo Oh, Keewon Kim, Tai Ryoan Han

Seoul National University College of Medicine (Republic of Korea)

Purpose: The purpose of this study is to investigate kinematically influences of the therapeutic maneuver, such as chin tuck, upon the movements of the hyoid bone and the epiglottis, known as an important airway protective mechanism, in healthy subjects and to suggest the standards of effective maneuver. **Materials and Methods:** A total of 25 healthy subjects were enrolled in this study. Subjects swallowed 10 ml of diluted barium solution in a neutral, chin down and chin tuck posture, which distinguished by the effort to attach the chin to chest. Changes of initial position and movements of the fluid bolus, hyoid bone, vocal cords and epiglottis analyzed two-dimensionally using videofluoroscopic images. Both temporal and spatial variables were computed by MATLAB version 7.5.0. These variables were compared among postures. **Results:** The distance from chin to neck was distinctively shorter in chin tuck than others ($p < 0.01$). There were significant differences in the maximal horizontal displacement and maximal horizontal velocity of the hyoid bone between chin tuck posture (10.1 ± 4.1 mm, 43.9 ± 27.6 mm/s) and the neutral (12.9 ± 2.5 mm, 76.5 ± 51.3 mm/s) or chin down posture (12.1 ± 2.8 mm, 59.5 ± 47.0 mm/s; $p < 0.01$). When chin tuck was applied, the distance from epiglottic base to posterior wall also significantly reduced (18.6 ± 2.9 mm vs. 20.5 ± 2.4 mm, $p < 0.01$). The epiglottic base displaced further vertically in chin tuck (14.5 ± 4.4 mm vs. 11.7 ± 3.5 mm, $p < 0.05$) than neutral posture. Velocity of fluid bolus, displacement of vocal cords and the maximal angle of the epiglottic downward rotation were equivocal. **Conclusion:** These results substantiate alleged effects of chin tuck maneuver kinematically, which suggest effects of chin tuck posture to restrict the horizontal movement of hyoid bone and to facilitate the posterior and vertical movement of epiglottic base. Between chin down and chin tuck posture, only exact chin tuck posture can derive the significant change on spatial and temporal characteristics.

050114FP

NEW PORTABLE SYSTEM FOR COMPREHENSIVE MEASUREMENT OF SPASTICITY ENCOMPASSING ELECTROPHYSIOLOGIC, KINEMATIC AND BIOMECHANICAL ASPECTS IN STROKE PATIENTSJeong Hwan Seo¹, Myoung Hwan Ko¹, Keo Sik Kim², Chul Gyu Song²¹Chonbuk National University Medical College and ²Chonbuk National University Division of Electronics and Information Engineering (Republic of Korea)

Purpose: To introduce a new hand-driven portable system for measuring the spasticity comprehensively encompassing electrophysiologic, kinematic and biomechanical aspects and to test the

availability of the new portable system for the spasticity measurement. **Materials and Methods:** A new device was designed in order to measure the spasticity comprehensively including many aspects such as the joint angle, the angular velocity, the electromyographic signals, and force (torque). Human hand was used as a driving force to make this device small and simple. Spasticity was evaluated in the elbow of 15 stroke patients using a new portable system and the Modified Ashworth scale (MAS). Using this new device one set of 10 passive movements was conducted at 5 different angular velocities such as 60, 90, 120, 150, and 180 degree/sec. During the passive movements, the surface electromyographic data were collected from the biceps and triceps muscles. The data of joint angle and angular velocities were recorded via electric goniometer. The force (torque) on the wrist was recorded by the 2 force sensors at wrist. Velocity-dependent dynamic stretch reflex thresholds (DSRTs) were recorded. These values were used to compute tonic stretch reflex threshold (TSRT). The correlations among TSRT, area of force and the MAS were investigated. **Results:** MAS grade was distributed from 1 to 2 grade (grade 1: 40.0%, grade 1+: 33.3%, grade 2: 26.7%). TSRT values were ranged from 116.6 to 134.6. There were strong correlations between the MAS grades and the parameters of this new system: MAS and TSRT ($r=0.708$, $p=0.003$), MAS and area of torque ($r=0.669$, $p=0.006$), area of torque and TSRT ($r=0.686$, $p=0.005$). The multiple regression equation, combining TSRT and area of torque, was significant ($F=13.08$, $p=0.003$) with adjusted R^2 explaining 70.7% of the variability of MAS grade. **Conclusion:** The new system is a portable, comprehensive hand-driven spasticity-measurement system. We showed that this new system can produce objective and comprehensive data in the usual clinical settings for the measurement of the spasticity. We suggest that this new system can be used for the spasticity measurement, objectively and easily.

050115FP

TECHNICAL VALIDITY AND RELIABILITY OF OBJECTIVE MEASUREMENT IN SWALLOWING KINEMATIC ANALYSIS

Seong Min Chun, You Sun Min, Byung-Mo Oh, Tai Ryoan Han

Department of Rehabilitation Medicine Seoul National University College of Medicine (Republic of Korea)

Purpose: To assess the technical validity, inter-rater and intra-rater reliability of objective measurement in kinematic analysis of swallowing. **Materials and Methods:** Two well-trained investigators participated in a reliability study, and one of them in a validity study. To assess technical validity, we developed an instrumental model of linear and rotational movement representing physiologic movement of the hyoid and epiglottis, respectively. Still images of 6 objects and sixteen movie files of the model with different velocities were analyzed. The correlation and Bland-Altman analysis were used. Ten videofluoroscopic swallowing studies and their copies with different file names were also analysed to evaluate reliability. The intraclass correlation coefficient analysis was performed. **Results:** The correlation between measured and true values was significant ($p<0.001$). Using Bland-Altman plot, the 95% confidence interval of agreement between measured and true values ranged 0.1050~0.9632, -0.7324~1.6776 mm/sec, and -3.3441~6.1359 degree/sec for still image, linear and angular velocity, respectively. Intraclass coefficient analysis revealed high intra-rater reliability with all measured values in both raters (0.861~0.996 and 0.918~0.996 for rater 1 and 2). As for the inter-rater reliability, all variables except two (0.550 for the maximal angle of epiglottic rotation, and 0.752 for the maximal velocity of the hyoid) showed high intraclass correlation coefficient. **Conclusion:** Kinematic variables measured by swallowing motion analysis shows not only high intra- and inter-rater reliabilities, but also high technical validity.

050116FP

FUNCTIONAL ASSESSMENT OF BALANCE IN EARLY STAGES OF MULTIPLE SCLEROSIS

Raabeae Aryan¹, Mohammad Jafar Shaterzadeh Yazdi¹, Shahin Goharpey¹, Ali Asghar Arastoo¹, Naser Sharafoddinzadeh²

¹Jondishapour University of Medical Sciences, Faculty of Rehabilitation Sciences and ²Jondishapour University of Medical Sciences, Department of Neurology (Islamic Republic of Iran)

Purpose: The aim of this study was to assess balance performance in minimally impaired multiple sclerosis (MS) patients (Expanded Disability Status Scale 0–2) and to clarify differences in ability of balance between this group of patients and healthy subjects. **Materials and Methods:** Using four common functional balance tests (Berg Balance Scale, Timed Up & Go test, Modified Romberg test and Lateral Functional Reach test), 20 minimally impaired multiple sclerosis patients compared to 20 healthy subjects matching for age, gender, weight and height. **Results:** Statistically significant differences were observed in all functional balance tests ($p<0.001$). Multiple sclerosis group had poor balance performance compared to control group. **Conclusion:** Our results showed that multiple sclerosis patients who were in early stages of the disease suffered from improper balance control even they had no falls in their daily mobility.

050117FP

DEVELOPING WHO ICF CORE SETS FOR SUBACUTE STAGE OF SPINAL CORD INJURY IN TAIWAN

Chin-Wen Wu¹, Tsan-Hon Liou¹, Yen-Ho Wang², Wen-Ta Chiu³

¹Department of Rehabilitation, Taipei Medical University – Shuang Ho Hospital, ²Department of Physical Medicine & Rehabilitation, National Taiwan University Hospital and ³Institute of Injury Prevention & Control, Taipei Medical University (Taiwan)

Purpose: The purpose of this study is to report the core sets of subacute spinal cord injury (SCI) patients with International Classification of Functioning, Disability, and Health (ICF) in Taiwan. **Materials and Methods:** The study took Comprehensive ICF Core Sets as reference and there were 118 second-level ICF categories related to subacute SCI. Delphi technique was applied to rank and the study tried to narrow the range of these categories. **Results:** 24 health experts in Taiwan including neurosurgeons, rehabilitation physicians, therapist and psychologists answered questionnaires in three rounds. Finally the most important ICF categories emerged and the core sets of subacute SCI in Taiwan were made. **Conclusion:** This is the first study using ICF concept to identify subacute SCI core sets in Taiwan. Further evaluation is necessary for island-wide application.

050118FP

THE PROGNOSTIC ROLE OF THE MODIFIED RANKIN SCALE ON SURVIVAL IN PATIENTS WITH STROKE

Hsi-Ting Chiu^{1,2}, Yen-Ho Wang¹, Shin-Liang Pan¹, Jiann-Shing Jeng³

¹Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital, ²Department of Physical Medicine and Rehabilitation, Keelung Hospital, Department of Health, Executive Yuan and ³Department of Neurology, National Taiwan University Hospital (Taiwan)

Purpose: To evaluate the prognostic value of the modified Rankin Scale (mRS) score on the survival in patients with stroke. **Materials and Methods:** A total of 664 stroke patients who had survived for

more than 3 months after stroke were recruited from a university hospital during January 2006 to December 2007. The subjects were divided into two groups according to the mRS scores measured at three months after stroke: Low mRS (LRS) group for mRS score 0–3, and high mRS (HRS) group for mRS score 4–5. The effects of the mRS and other clinical correlates on the survival were analyzed by using the Cox regression model. **Results:** The HRS group had significant higher mortality rates in comparison with the LRS group (hazard ratio=7.36, 95% CI: 3.59,15.10). Subjects with past history of hypercholesterolemia had lower mortality rates (hazard ratio=0.40, 95% CI: 0.18, 0.91). As for age, elder subjects tended to have higher mortality rates (hazard ratio=1.02, 95% CI: 0.99, 1.05). **Conclusion:** The 3-month mRS score was an independent favorable prognostic factor for the survival in patients with stroke. This finding highlights the potential benefit of rehabilitation to the survival of stroke patients through improving their functional performance.

050119FP

EARLY CHANGES OF KNEE JOINT MOVEMENT IN PEOPLE WITH KNEE OSTEOARTHRITIS DURING GAIT; A MOTION ANALYTIC STUDY WITH POINT CLUSTER TECHNIQUE

Masami Akai¹, Kenji Naito^{1,2}, Yasuharu Nagano², Hirofumi Ida³, Kimitaka Nakazawa¹, Toru Fukubayashi²

¹Department of Rehabilitation for Movement Functions, ²Faculty of Sports Sciences and ³Kanagawa Institute of Technology (Japan)

Purpose: 1) To assess the early kinematical changes of the knee joint during gait in patients with knee osteoarthritis, comparing with young normal subjects. 2) To examine the responsiveness of such changes to interventional therapeutic exercise. **Materials and Methods:** 1) Comparative study with 19 healthy people and 50 patients with knee osteoarthritis. Three-dimensional gait analysis was conducted applying the “point cluster technique” which was an accurate and extensible approach for estimation of bone motion. OA patients were assessed by X-rays grading and divided into subgroups. 2) Comparative study between the exercise and control groups among the above 50 knee OA patients. They performed 12 weeks muscle strengthening program mainly around hip and knee joint, and gait pattern was assessed before and after the intervention. **Results:** In the mild OA subgroup, there were; 1) inhibition of physiological external rotation of the knee joint and 2) occurrence of sudden abduction or adduction (i.e., lateral instability), early in the stance phase. In advanced OA subgroup, there was a specific adduction displacement covering the whole stance phase. Those changes appeared to respond to the interventional exercise. Exercise therapy had an effect on altering abnormal knee kinematics during gait. **Conclusion:** We found the following two characteristic changes in knee joint movement; 1) inhibition of physiological rotation of the tibia in horizontal plane at the early half stage of stance phase, and 2) occurrence of sudden instability in the frontal plane early in the stance phase. Those early changes could respond to the therapeutic exercise which targeted the muscles around the hip joint.

Pain Management: Part 1

0501C1

REHABILITATION OF MUSCLE INJURIES IN SPORTS

Walter R. Frontera

University of Puerto Rico, School of Medicine (Puerto Rico)

Muscle injuries represent one of the top five types of injuries in sports. Several risk factors have been identified including inadequate training and warm-up, previous injuries followed by inadequate rehabilitation, fatigue, and lack of joint flexibility.

The most commonly injured muscles in the human body are the extensor and flexors of the knee, the ankle plantar flexors, and the biceps. The mechanisms of injury may include direct trauma with contusion, repetitive eccentric muscle actions, stretching of the muscle at rest, and stretching of an active muscle. These injuries are accompanied by clinical symptoms, such as pain of sudden onset and functional loss. Physical signs include swelling, ecchymoses, tumor formation, and palpation defects. Muscle injuries are classified based on the amount of tissue damage into first, second, and third degree injuries. The latter is the most extensive. Treatment and rehabilitation interventions vary according to the degree of injury. Rehabilitation should begin immediately after the injury, with the use of R (rest), I (ice), C (compression), and E (elevation) therapy. Healing of muscle injuries includes inflammation and degeneration of damaged tissues, regeneration, and fibrosis. More research is needed to identify agents that may limit the fibrotic response to injury. The second phase of the rehabilitation process should include properly prescribed exercises to develop flexibility, muscle strength, and endurance. In the case of strengthening, exercises should activate specifically those muscles that must be strengthened. Exercise prescription should be specific and include the type, intensity, duration, and frequency of the exercise. Prevention of future injuries includes maintenance of a conditioning program, modification of training, and correction of technical errors. Rehabilitation should take into account not only the physical healing of the injury but also psychological recovery.

0501C2

CURRENT CONCEPTS IN MUSCULOSKELETAL PAIN, MOBILITY AND GENDER

Mark A. Young^{1,2}

¹Workforce & Technology Center, State of Maryland, Division of Rehabilitation, Department of Education and ²Department of Physical Medicine and Rehabilitation (PM&R), The Maryland Rehabilitation Center (United States)

Gender is a critical factor in musculoskeletal pain prevention, diagnosis and treatment. Pathologic gait patterns may exert a negative influence on pain syndromes involving the joints, muscles, bones, ligaments, spinal structures and soft tissue. Early identification of dysmorphic gait in women and men can help to avert pain syndrome onset and progression. The application of technologic (assistive technology) diagnostic solutions can improve therapeutic outcomes. This presentation will address the following fundamental objectives: 1) Provide a definition of pain; 2) Discuss gender differences & pain effects; 3) Review the most common musculoskeletal pain conditions in women; 4) Explore the link between the Foot and Low Back Pain Syndromes; 5) Understand the relationship between altered foot biomechanics and musculoskeletal pain pathogenesis in men and women; 6) Elaborate on technologic Solutions for evaluating pathologic gait's impact on the musculoskeletal system; 7) Review common gender specific complementary treatments of musculoskeletal pain and gait alterations. This oral presentation will provide a Comprehensive overview of the literature pertaining to Gender and Pain and the impact on gait abnormalities. Therapeutic strategies including complementary and traditional modalities will be reviewed.

0501C3

PHANTOM PAIN IN AMPUTEES

Parviz Mozhgani

Iran-Helal institute of applied sciences affiliated to Red Crescent Society Of Iran (Islamic Republic of Iran)

Patients with limb loss are at risk of developing pain from different sources, but obviously one of the most “unpleasant sensory and emotional experiences” is that felt in the limb that no longer exists.

This phenomenon known as Phantom Limb Pain (PLP) has been a matter of controversy in almost all its aspects since first described 5 centuries ago. Although some studies have estimated it as an uncommon condition in terms of chronic pain, current data reports its incidence as high as 85% though a wide range of discrepancy is seen in the literature. Despite the proposed explanations, the exact cause is unknown. Pathophysiological theories focus on brain, spinal cord or periphery. Since there is no consensus on the sole causality, for managing purposes it would be better to consider PLP as a multifactorial disorder. There are also some factors and conditions known to modulate or increase the risk of phantom pain perception. Although in a significant proportion of patients the intensity of pain is graded as severe, many sufferers seem to be reluctant to discuss it with their healthcare professionals, so PLP may clinically remain unrecognized. Diagnosis requires awareness and specific inquiries. A great variety of treatments try to prevent the occurrence of PLP with different rates of success. Pain management initiates with a thorough assessment to characterize it according to type, frequency, intensity, duration and its effect in terms of phantom pain disability. There is no definitive treatment ensuring pain alleviation in all cases. Many researches have offered different therapeutic approaches and ongoing studies continue to introduce new options. Nevertheless acquiring the best results necessitates an individualized multidisciplinary approach. This paper briefly reviews the epidemiology, etiology and management of phantom limb pain in amputees.

0501C4

ACUPUNCTURE AND MYOFASCIAL TRIGGER POINTS – HUMAN STUDY

Li-Wei Chou^{1,2,3}, Yueh-Ling Hsieh^{3,4}, Chang-Zern Hong⁴

¹Department of Physical Medicine and Rehabilitation, China Medical University Hospital, ²School of Chinese Medicine, College of Chinese Medicine, China Medical University, ³Department of Physical Therapy, China Medical University and ⁴Department of Physical Therapy, Hungkuang University (Taiwan)

Purpose: To investigate the effectiveness of a new modified acupuncture (MAcP) technique for suppression of remote myofascial trigger point (MTrP), as compared to the simple acupuncture (SAcP) and placebo therapy (PT). **Materials and Methods:** Patients with active MTrPs in upper trapezius muscles and with no previous experience in acupuncture therapy were randomly divided into three groups (PT, SAcP, and MAcP). The acupuncture needles were placed in contact with the skin surface for the PT group, and inserted into the regular depth without needle manipulation for the SAcP group. For the MAcP group, the needles were inserted into multiple loci in the acupuncture (AcP) point region with rapid “in-and-out” movement and simultaneous rotation (“screwed in-and-out”) to elicit local twitch responses. The AcP points of Waiguan and Qu-chi were treated. For every patient, the subjective pain intensity (PI), pressure pain threshold (PPT), and objective changes in the ROM of cervical spine were assessed, both before and after the whole treatment course. EPN in the MTrP region of the upper trapezius muscle was monitored and assessed before, during, and after the whole course of treatment. **Results:** Immediately after acupuncture in the SAcP and MAcP groups, mean PI and mean EPN amplitude were significantly reduced. Mean PPT and mean ROM of the cervical spine were significantly increased. There were significantly larger changes in all four parameters of measurement in the MAcP group than that in the SAcP group. Simultaneous needling manipulation on two AcP points could provide better effects than needling manipulation of a single AcP point. **Conclusion:** It appears that the MTrP irritability can be suppressed after a remote acupuncture treatment, with a better effectiveness after the modified acupuncture therapy than the simple one. The effectiveness after needle manipulation on two AcP points simultaneously was much more remarkable than that after needle manipulation on a single AcP point.

0501C5

EFFECT OF NEUROMUSCULAR BLOCKING AGENT ON THE SPONTANEOUS ELECTRICAL ACTIVITY IN A MYOFASCIAL TRIGGER SPOT OF RABBIT SKELETAL MUSCLE

Shu-Min Chen¹, Ta-Shen Kuan¹, Wei-Chang Yen¹, Jeng-Feng Yang², Chang-Zern Hong³, Jo-Tong Chen¹

¹Department of Physical Medicine and Rehabilitation, National Cheng-Kung University Hospital, ²Department of Physical Therapy, National Cheng-Kung University Hospital and ³Department of Physical Therapy, Hung-Kuang University (Taiwan)

Purpose: This study is designed to investigate the effect of mivacurium, a new nondepolarizing diester neuromuscular blocking agent, on the prevalence of spontaneous electric activity (SEA) recorded from the myofascial trigger spot (MTrS) in rabbit skeletal muscle which is equivalent to human myofascial trigger point (MTrP). **Materials and Methods:** Eighteen adult New Zealand rabbits equally and randomly divided into two groups. Mivacurium was injected intravenously at a concentration of 0.15 mg/kg followed by flushing with normal saline for the animals in the experimental group. Same amount of saline was injected intravenously for the animals in the control group. Prevalence of spontaneous electrical activity (SEA) recorded from the MTrS region in the biceps femoris muscle was assessed before, immediately after, and 30 min after the intravenous injection for all animals in both groups. **Results:** The SEA prevalence decreased from 40.3% to 4.6% after Mivacurium injection ($p < 0.001$). However, it recovered up to 33.9% about 30–40 min after injection. For group comparison, there were no significant differences in SEA prevalence before and 30 min after injection between the experimental and control groups. However, SEA prevalence immediately after injection was significantly lower in the experimental group than the control group. **Conclusion:** The short-acting, non-depolarizing, neuromuscular blocking agent can reversibly suppress the prevalence of SEA recorded from a rabbit MTrS (equivalent to human MTrP) region. This finding further confirms that the SEA is predominantly endplate potentials. The dysfunction endplate potentials may be involved in the pathogenesis of MTrP. The irritability of an MTrP can be suppressed by a neuromuscular blocking agent.

Musculoskeletal Disorders: Osteoarthritis and Osteoporosis

0501F1

PHYSICAL EXERCISE AND THE OSTEOCYTE OSTEOGENIC RESPONSE

Jorge Lains

Abstract missing.

0501F2

THE ROLE OF EXERCISE IN OSTEOARTHRITIS OF THE KNEE

Angela B.M. Tulaar

Department of Rehabilitation Medicine, Faculty of Medicine, University of Indonesia (Indonesia)

Purpose: To see the effect of Quadriceps exercises in osteoarthritis (OA) of the knee. **Materials:** Patients with OA of the Knee grade 2 according to Kelgren & Lawrence. **Methods:** Weight-bearing Plain radiograph of the knee joint. Measurement of the FemoroTibialAngle using the Toda's method. Pain measurement using VAS (Visual Analog Scale). Walking speed was measured

for 15 m. Quadriceps strength was measured using Cable Tensiometer. Quadriceps strengthening exercise performed until local muscle fatigue, three times a week for 6 weeks, using 80% of 3RM weight determined weekly. Blood Serum was taken and stored in -60°C , before- and after 6 weeks of exercise. Serum MMP3 (Metalloproteinase-3), TIMP-1 (Tissue Inhibitor of Metalloproteinase-1) and COMP (Cartilage Oligomeric Matrix Protein) were analyzed with ELISA method. **Results:** Plain Radiographs of 93 patients with mean age of 54 years old (42–65 years) with OA of the knee joint were taken in weightbearing (standing) positions. The Femoro-Tibial Angle was measured using the Toda's method. The VAS ranges from 4.5–8.4 with a mean of 6.31 (SD 1.07). The FTA ranges from 165° to 194° with a mean of 175.22° . There was a significant correlation ($p=0.02$) between the FTA and VAS of 0.20. Serum from 29 female patients who completed the 6 weeks Quadriceps exercise showed a decrease in the mean MMP-3 level from mean 17.65 ± 12.79 ng/ml pre-exercise to 14.53 ± 7.67 ng/ml at 6 weeks post exercise ($p=0.048$; t -test); the TIMP-1 level increased significantly ($p=0.024$; t -test) from mean 180.43 ± 48.25 ng/ml to 201.32 ± 55.84 ng/ml and the MMP-3/ TIMP-1 ratio decrease from 0.105 ± 0.08 pre-exercise to 0.078 ± 0.05 post-exercise. The serum COMP showed a decrease significantly ($p=0.012$; paired t -test) from 11.97 ± 2.90 U/l to 11.14 ± 2.61 U/l post-exercise. The Quadriceps muscle strength increased significantly ($p<0.0001$) from 7.84 ± 1.92 kg pre-exercise to 10.72 ± 2.35 kg post exercise. The mean VAS decreased significantly ($p<0.0001$) from 6.03 ± 1.23 to 1.73 ± 1.71 and the 15 m walking speed increased significantly ($p<0.0001$; paired t -test) from 18.97 ± 5.80 s pre-exercise to 14.18 ± 3.51 s post-exercise. The percentage increase in the muscle strength has correlation, although weak, with the decrease in serum MMP-3 (linear regression with $r=0.16$), with the increase in serum TIMP-1 (quadratic regression with $r=0.51$, and with the decrease in serum COMP (quadratic regression with $r=0.34$). **Conclusion:** Quadriceps strengthening exercise increased quadriceps muscle strength, increased serum TIMP-1 level, decreased serum MMP-3 and serum COMP level. The percentage increase in the muscle strength has correlation, although weak, with the decrease in serum MMP-3, with the increase in serum TIMP-1, and with the decrease in serum COMP. Quadriceps strengthening exercise also decreased pain and increased walking speed. **Key words:** osteoarthritis, matrix metalloproteinase (MMP), tissue inhibitor of metalloproteinase (TIMP), cartilage oligomeric matrix protein (COMP).

0501F3

EXERCISE TO MAXIMIZE PEAK BONE MASS AND MINIMIZE BONE LOSS

Sukajan Pongprapai

Department of Rehabilitation Medicine, Vichaiyut Hospital (Thailand)

Exercise plays a key role in bone health. The best way to prevent osteoporosis is to maximize peak bone mass in the first three decades of life. Physical activity during adolescence and early adulthood is a far more important predictor of peak bone mass than calcium intake, possibly because growing bone has a much greater capacity of new bone formation than mature bone. But different types of exercise have different effects. Weight bearing exercises increase in bone density than non-weight bearing exercises. Also, the skeletal response to exercise is site-specific, being greatest at the site of maximum stress. Hormonal determinants of peak bone mass and mechanotransduction related to osteocyte, osteoblast, and osteoclast will be discussed. During natural bone loss period (late 30 years), exercise intervention program is prescribed to minimize bone loss and reduce risk of falling. Well-designed exercise program should address the issues of weight bearing, balance, posture, coordination, and functional strength. Systematic review of exercise and bone mineral density and bone marker in postmenopausal osteoporosis women will be presented.

0501F4

HEADACHE DUE TO C2 SENSORY RADICULOPATHY

Juan Manuel Guzmán González

Physical Medicine and Rehabilitation Indiana (Mexico)

Purpose: To spread this technique in order to demonstrate its great value for the diagnosis in patients with headache from C2 sensory root injury origin, with difficult clinical diagnostic. **Materials and Methods:** We developed the technique to measure the latency of C-2 sensory root in our laboratory and studied the range of values of the latency of C2 sensory root in both sides of able body people, with EMG equipment. Later on, we applied this technique to a group of patients with headaches from upper neck origin. 80% had latency more than 2.5 milliseconds. **Results:** 100 able body people studied: 58 male, 42 female. Age: 18–40 years old. 200 Sensory C2 root latencies, 100 right and 100 left. Range: 1.5–2.5 ms. Normal value: 2.0 ± 0.5 MS. **Conclusion:** In this research study we have found that one of the main causes of headache from upper neck origin is the entrapment of the C2 sensory root. In order to know if the C2 sensory root is affected, we developed a new technique to measure the latency of C2 sensory root. The range of values of the latency of C2 sensory root was standardized in both sides of able body people. This technique has become of great value in order to diagnose sensory radiculopathy C2, with difficult clinical diagnostic. It is very useful to do the differential diagnosis in the cases of secondary headaches, cranial neuralgias, facial pain, and other headaches.

0501F5

CERVICAL RADICULOPATHY-INDUCED NECK PAIN

Kamyar Akrami

Abstract missing.

0501F6

MANAGEMENT OF CERVICALGIA IN THE MIDDLE AGED

Yi-Jia Lin¹, Cheng-Hsiu Lai¹, Chih-Wei Chou², Shih-Wei Chou², Alice MK Wong²

¹Department of PE and Health, Taipei Physical Education College and ²Department of PM&R, Chang Gung Memorial Hospital (Taiwan)

Purpose: To evaluate the effects of neck muscle training on cervicalgia and balance in the middle aged. **Materials and methods:** 30 patients with chronic neck pain were recruited. X-ray of their cervical spines revealed nonspecific spondylosis. 17 out of them had completed 18 times training sessions, including warm-up, stretching, strengthening, and neuromuscular control exercises. A SMART Balance Master® System was employed to acquire equilibrium scores of SOT under 6 conditions. Visual analog scale (VAS) of neck pain, range of motion (ROM) and isometric strength were measured. 17 healthy age-matched adults were also recruited. Statistical analyses were firstly performed for baseline comparison between groups using independent-t test. Learning effects of tested conditions were screened by comparisons between two test trials of the control group with 6-weeks interval using paired-t test. Then, the effects of 18-sessions muscle training were tested by pre- and post- intervention comparison in the training group using paired t -test. **Results:** Baseline comparison between groups using independent-t test revealed difference in neck fitness and balance performance existed between the patients with chronic neck pain and the normal controls. Comparisons between two test trials of the control group with 6-weeks interval eliminated the learning effect in all the tested conditions. Pain scale, ROM, and strength of neck were all improved after neck muscle training. Equilibrium scores

were significantly higher in all the SOT conditions except the EC. Sensory ratios were all improved except the SOM. Strategy score were improved in the three more challenged conditions of EOSS, ECSS, and SVSS. **Conclusion:** In the patients with cervicgia, neck muscle training may help reduce neck pain, improve ROM and strengthen neck muscle. As a result, balance performance was improved in terms of SOT and strategy score. The visual and vestibular sensory ratios, which may reflect the ability to use the respective balance-related sensory systems, were both improved after neck fitness improved. Neck fitness training may be suggested in the middle aged with cervicgia, not only for pain relief, but also balance re-education.

Pain Management: Part 2

0501J1

CURRENT ADVANCE IN MYOFASCIAL PAIN

Chang-Zern Hong

Hung-Kuang University (Taiwan)

Myofascial trigger point (MTrP) is the major cause of myofascial pain syndrome. Based on recent studies, MTrP is the accumulation of multiple sensitized nociceptors associated with dysfunctional endplates. The degree of irritability is determined by the amount of sensitized nociceptors. Stimulation of sensitive nociceptors can cause pain, referred pain, and local twitch response. Morphologically MTrP is a contraction knot in the endplate zone of the involved muscle. Biochemically high concentration of inflammation and pain related substances can be found in an active MTrP region. Due to excessive leakage of acetylcholine in the dysfunctional endplate, sarcomeres in this endplate region become shortened that can cause taut band formation and elicit energy crisis to perpetuate the vicious cycle train of "excessive acetylcholine leakage"- "increase of tension in taut band"- "release of sensitizing painful substance". Interruption of this cycle can inactivate the MTrP. However, the most important strategy to treat myofascial pain is to identify and treat the underlying etiological lesion that activates the MTrP. The effective methods to inactivate an MTrP include stretching, deep pressure massage, laser therapy, needling, etc.

0501J2

DIAGNOSIS AND TREATMENT FOR MYOFASCIAL PAIN SYNDROME OF THE UPPER BACK MUSCLES

Avirmed Baljinnjam¹, Sh. Batchimeg¹, N. Tumurbaatar²

¹Department of Rehabilitation Medicine, School of Medicine, Health Sciences University of Mongolia, ²School of Traditional Medicine, Health Sciences University of Mongolia (Mongolia)

Purpose: To investigate the short term effects of diagnosis and treatment methods on myofascial pain in the upper back muscle and to develop standard diagnostic and treatment methods that are appropriate in Mongolia. **Method:** A comparative study was conducted by randomized clinical control trial. The patients participated in our study were randomly divided onto 3 treatment groups using a single blind method with portions of 1:1:1. The treatment result has been comparatively assessed using a clinical parallel research design. Outcome measures: The treatment result was evaluated and measured by following methods: Pain pressure threshold (PPT) by algometry (kg/cm²); cervical range of motion by tape meter (cm); pain pattern and intensity by the McGill pain questionnaire; level of depression by the Beck' depression inventory; level of anxiety by the Tailor Manifest Anxiety Scale; quality of life by the health survey SF-36 questionnaire. **Results:** Pain pressure thresholds improved in lidocaine and massage group and did not significantly change in acupuncture group. In the lidocaine group, PPT values were significantly higher than in the acupuncture and massage group. Visual

analog scale and pain index significantly decreased in the all three groups. Compared with healthy people, myofascial pain syndrome patients reported significantly more often fatigue and poor sleep. The mean scores on Beck Depression Inventory were higher in myofascial pain patients than healthy people ($p < 0.001$). Compared with control group quality of life of people with MPS was extremely low on six subscales of SF-36. In our study quality of life of patients with MPS was statistical significance in physical functioning, role physical, vitality, role emotional, mental health, mental composite scale. Of the four correlations exceeding 0.30, three related to the mental composite scale t -score. Spearman's correlation showed that level of depression negatively correlated with the scores on quality of life ($r = -0.57; p < 0.001$). **Conclusions:** When combined with neck stretching exercises, acupuncture, massage treatment and trigger point injections were found to be effective. But lidocaine injection is more practical and rapid than other treatment and is more cost effective and seems the one of the choice of treatment in MPS. The quality of life profile and depression level of myofascial pain patients is quite different from healthy people. Myofascial pain syndrome impacted mostly on mental health than physical health. The multidisciplinary and integrated team approach is important in managing the symptoms of MPS.

0501J3

THE LINK BETWEEN IMMOBILITY AND MICROGRAVITY LOW BACK PAIN

Reynaldo Rey-Matias

St. Luke's Medical Center and College of Medicine (Philippines)

The lecture is designed to provide you with a basic understanding of the physiological effects associated with exposure to microgravity as it compares to Immobilization. Emphasis is placed on understanding low back pain as well as the time course of these adaptations. Astronauts exposed to microgravity frequently report low back pain. This pain is described as moderate to severe in intensity. This will discuss microgravity to study assumed changes in the functions of the deep back muscles as an effect of disuse. They will also investigate the pressure/spinal-length relationship: Hypotheses related to atrophy of specific muscles, to the effect of functional strength of others, as well as to the reasons for changes in spine length during weightlessness, will be examined. It is also possible that the pathogenesis of back pain in microgravity is discogenic (or mechanical) and somatic, referred from the sinuvertebral nerves due to excessive expansion of the lumbar intervertebral discs associated with reduction of gravitational compressive loads in space. Changes in bone structure appear to be caused by increased osteoclastic activity and are particularly pronounced in the spine and legs will be also discussed. Further studies of countermeasures are recommended to prevent excessive spinal elongation and disc expansion, reduce low back pain in microgravity, and simulate 1-G disc homeostasis, which may also help prevent HNPs postflight. This brings the potential to help our general understanding of spinal physiology, and could provide important information resulting in improved treatments of back problems in terrestrial patients.

0501J4

APPROACH TO MECHANICAL LOW BACK PAIN

Ahmad Raessadat¹, Leya Sedighpour²

¹Shahid Beheshti University of Medical Sciences, Modarres Hospital and ²Physical Medicine & Rehabilitation, Shahid Beheshti University of Medical Sciences (Islamic Republic of Iran)

Introduction: Mechanical Low back pain and sciatica are common complaints that affect a major proportion of general population with lifetime prevalence exceeds 70% in most countries. Its social and economic impact is substantial all around the world. Clinical approach and management of this condition may vary widely. Approximately 80% of low back pain has no specific or recognizable

etiology and is therefore termed “mechanical” or “musculoskeletal.” low back pain. In approach to an acute or chronic low back pain, same as other medical disorders, a careful informed history and physical examination are invaluable and cornerstone of further evaluation. Diagnostic imaging, however, could never be a substitute. Even though low back pain has a benign course in 90% of patients, at the initial assessment of a patient presenting with low back pain, it is important to identify any ‘red flag’ indicators of serious spinal pathology, or ‘yellow flag’ indicators of psychological risk factors. By excluding rare systemic and serious causes of low back pain, the physician can avoid catastrophic outcomes due to patient mismanagement. **Conclusion:** Eventhough multiple evidence-based guidelines worldwide have indicated how low back pain should be managed, a patient-focused strategy combining best evidence and clinical expertise is suggested as the mainstay for the management of this disorder. The physiatric approach to low back pain is functional and interdisciplinary. Physiatry approaches the patient from the physical, psychological, and social perspectives to obtain a thorough understanding of his or her goals and needs. Once the assessment is complete, treatment focuses on reducing pain; restoring ability to participate in activities of daily living, work, and recreation; achieving patient independence with care; and reducing dependence on the health care system. We evaluated evidence based clinical approach to mechanical low back pain in the present paper.

0501J5

LOCAL TREATMENT OF MYOFASICAL PAIN – NSAID PATCHES

Lin-Fen Hsieh

Shin Kong Wu Ho-Su Memorial Hospital (Taiwan)

Locally administered nonsteroidal anti-inflammatory drugs have been widely used in acute soft-tissue damage and articular musculoskeletal pain. This double-blind, placebo-controlled, randomized study was designed to evaluate the efficacy and safety of a topical diclofenac sodium patch in the relief of pain and inflammation as a result of myofascial pain syndrome (MPS) in the upper trapezius.

0501J6

LASER TREATMENT FOR MYOFASICAL TRIGGER POINTS

Kai-Hua Chen

Department of Physical Medical and Rehabilitation, Chang Gung Memorial Hospital (Taiwan)

Low-level laser therapy (LLLT) has been widely used in treating myofascial pain syndrome due to myofascial trigger points (MTrPs). Various double-blind placebo control studies have demonstrated positive effects of LLLT on pain relief, range of motion or disability scale. However, other studies have reported no therapeutic effect. These inconsistent results may be related to different modes, types or dosages of LLLT, and different frequency of treatments were applied. In this session, we will review the literatures about the effect and the possible mechanisms of LLLT on MTrPs.

Rehabilitation Technology and Engineering

0501G1

APPLICATION OF A CYCLING WHEELCHAIR TO THE PATIENTS WITH GAIT DISTURBANCE

Yasunobu Handa¹, Takaaki Sekiya², Kazunori Seki²

¹Division of Developmental Neuroscience, Tohoku University Graduate School of Medicine and ²Division of Restorative Neurorehabilitation, Tohoku University Graduate School of Medicine (Japan)

tation, Tohoku University Graduate School of Medicine (Japan)

Purpose: To clarify to which patients with severe gait disturbance the newly developed cycling wheel chair (C-C/W) can be applied and to evaluate its effects on physical function. **Materials and Methods:** C-W/C which we developed can be propelled by pedaling with both legs. We have applied to the patient with gait disturbance caused by stroke, spinal cord injury, Parkinson disease, osteoarthritis, femur fracture of the etc. In particular, C-W/C was applied to the hemiplegics with the Brunnstrom stages from I to III. In these patients, functional changes before and after C-W/C application was evaluated by surface EMG, maximum driving speed (MDS), score of Barthel index etc. **Results:** All of the patients could drive C-W/C with almost the same speed as quick step of walking. EMG recordings showed apparent reciprocal firing during pedaling movement even in the hemiplegics with Brunnstrom stage I. In other patients, maximum walking speed, score of Barthel index and maximum driving speed and distance of C-W/C significantly increased after C-W/C training for 4 weeks. **Conclusion:** Physical training with C-W/C has a possibility to improve physical function through reinforcement of reciprocation in the lower extremities and efficient use of physical fitness.

0501G2

FUNCTIONAL ELECTRICAL STIMULATION CYCLING EXERCISE

Shih-Ching Chen¹, Chih-Wei Peng¹, Chien-Hung Lai¹, Jia-Jin Jason Chen²

¹Department of Physical Medicine and Rehabilitation, Taipei Medical University and Hospital and ²Institute of Biomedical Engineering, National Cheng Kung University (Taiwan)

Purpose: FES-cycling system is a kind of the FES devices, which is by means of a stimulator’s cycling software to control sequential stimulation of the large leg-actuating muscles of paralyzed leg muscles in subjects with spinal cord injury (SCI) and produce cyclical leg motion. Currently, the FES cycling has often been used in rehabilitation therapy. There were a number of subsequent investigations reported the physiological adaptations after regular cycling exercise training. This article provides an overview of the potential therapeutic benefits of FES-cycling exercise training in rehabilitation applications in subjects with SCI. **Materials and Methods:** In general, FES-cycling ergometers can be divided into two major types, mobile and stationary types. The mobile type, a locomotion device, focused on muscle training as well as giving some mobility to patients. For the stationary type of cycling ergometer, it is usually used for aerobic exercise training in subjects with SCI for conditioning their muscles strength and enhancing cardiopulmonary function. Currently, the stationary cycling ergometers has more often been used in rehabilitation therapy than mobile ones. A typical pattern of stationary FES-cycling system will be shown with a closed-loop control software (developed in National Cheng-Kung University, Taiwan), which has been used in multiple clinical centers (1). Sometimes FES-cycling devices may combine with certain accessories for specific purposes, e.g. arm-crank for the purposes of upper-extremities training or warm-up exercise, as shown in Fig 1b (2). This paper provides a brief review of the research findings regarding the effects of FES cycling on candidate patients’ cardiopulmonary, muscular, and skeletal systems. **Results:** Individual with spinal cord injury (SCI), typically lost motor control and muscle mass of lower limbs and consequently have limited opportunities for conditioning their lower extremities and destined to a relatively sedentary lifestyle. This can lead to marked adaptations of the cardiovascular, muscular, and skeletal conditions (3). Studies have reported that FES-cycling exercise training can increase the cross area of arteries and the density of capillary and improve blood inflow volume to the lower limbs (4–5). Studies also indicated that subjects with SCI after 12 to 20 weeks of training increased a 4.1% of left ventricular mass, a 2.5% of left ventricular end-

diastolic volume, and a 6% of high-density lipoprotein (6). All these results suggested that FES-cycling exercise could improve cardiopulmonary capacity as well as reduce the risk of cardiovascular disease. Moreover, several studies reported that subjects with SCI after several months of FES-cycling training can improve muscle endurance and peak power output. Besides, the training can also increase their muscle mass and muscle strength. (7). Another aspect, several studies have evaluated the effects of subjects with SCI after FES-cycling exercise training on bone mineral density. Many studies found the FES-cycling training could significantly reduce the rate of SCI-induced bone loss or even increase the bone density of paralyzed limbs (8–10). Thus, the potential therapeutic benefits of FES-cycling exercise include conditioning cardiopulmonary, muscular, and skeletal systems, as well as improving other physiological and psychological performances. **Conclusion:** The general objective of rehabilitation management of subjects with SCI is to improve quality of life. This article indicated that lower limb FES-cycling exercise training can provide multiple health benefits for subjects with SCI. In addition, studies evidenced that FES-cycling exercises are safe, functional, and accessible to subjects with SCI or stroke. Although the potential therapeutic benefits of FES-cycling exercise training are immense, currently the cycling exercise is still not widely prevalent among all subjects with SCI. This may be owing to most of the subjects find the daily back-and-forth transportation to a clinical center is difficult, which may reduce the feasibility to participate the cycling exercise training. Therefore, to develop an in-home use and low cost of FES-cycling ergometer might be a feasible way to promote the wide use of the cycling device among subject with SCI.

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0501G3

THE DEVELOPMENT OF NEW INTELLIGENT COMPREHENSIVE INTERACTIVE CARE SYSTEM FOR ELDERLY CARE

Alice M.K. Wong

Department of Physical Medicine & Rehabilitation, Chang Gung Memorial Hospital (Taiwan)

Purpose: In Taiwan, the elderly population is increasing rapidly. In addition to the decreased fertility rate during recent years, the Taiwan society is ageing at a really rapid pace. Presently, more and more elderly individuals are living alone or are living alone during the daytime hours when their family members are out working. Therefore, proper care system should be established in order to deliver services to their homes. In elderly care, telemedicine is only a part of the caring system. Diet, living, transportation, education, and safety issues are also important parts of elderly care and must not be neglected. Therefore, we have developed a new intelligent comprehensive interactive care (ICIC) system to provide complete elderly care services through the integration of personal to community information technology (IT) platforms. **Materials and Methods:** The "ICIC" system composes of seven different services items. Medication care model consists of physiology measuring system, medication reminder system, and doctor – patient interactive system. In the doctor – patient interactive system, the health education information system is integrated into the medical care system. The diet, living, and transportation services are delivered by living information, household electronic control, and service reservation systems. The entertainment system combines personal media sharing, and touchable community entertainment systems (share-touch). For safety, accidental fall detection, positioning and navigating systems, and emergency rescue and dispatch systems are intergraded to prevent elderly individuals from injuries in home and community settings. However, all the new electronic devices or IT system should be examined first by technology acceptance model (TAM). For this new "ICIC" system, it has been tested by the following demands including behavior intention, perceived usefulness, perceived ease of use, enjoyment, subjective norm, image, job relevance output quality, result demonstrability, and voluntariness. **Results:** For the medical education model, 30 elderly subjects (75.0±5.7 years) were invited for the test. Result showed that no one complained of difficulties in the use of this model. There was no statically difference between pre-test and post-test scores for different sex and educational level groups. For the medication reminding system, 18 elderly subjects (82.3±5.5 years) participated in the evaluation of this system. The questionnaire of behavior intention, perceived usefulness and ease of use were very acceptable in these elderly individuals. However, the acceptance scores of female group were lower than the male group in all items. As for the community entertainment system (share tough IT table), which could provide communication, data sharing (pictures), and interactive games for the elderly, the acceptance scores in 52 elderly individuals were good to excellent. However, the number of elderly individuals participation in these study groups is still relatively small. The empowerment of self care and improvement in quality of life for elderly people by this ICIC system still need further study. **Conclusion:** This newly developed Intelligent Comprehensive Interactive Care system (ICIC system) for the elderly is a interdisciplinary model of care that integrates medical care, diet, living, transportation, education, entertainment, and safety demands into a common IT platform. Therefore, the promotion of health and quality of life can be delivered to the elderly population at home. Positive acceptance scores were observed for the elderly individuals who have used the ICIC system.

0501G4

CORTICAL ACTIVATION DURING ROBOT-AIDED REHABILITATION

Futoshi Wada, Kenji Hachisuka

Department of Rehabilitation Medicine, School of Medicine, University of Occupational and Environmental Health (Japan)

Robotic-assisted rehabilitation training is expected to offer the opportunity to help restoring the upper and lower limb functions in paretic patients. However, it is not clear how robotic-assisted rehabilitation training change cortical activation pattern during

gait. Yasukawa Electric Corporation and our university have co-developed the robotic rehabilitation system (BRMS; Bio-Responsive Motion System) for the stroke patients with severe gait disturbance. We measured the cortical activation of the motor area during robot assisted gait by a near-infrared spectroscopic imaging system in normal healthy subject and stroke patients. 2-dimension topography indicated significant cortical activation of the motor area was induced when subject actively walked according to the robotic arm trajectories. Otherwise, small cortical activation were observed when subject passively walked with both legs moved by the robot arm. Motor imagery also has a small contribution to induce cortical activation in normal subject during robot assisted gait. Passive leg movement during robot assisted gait enhances this cortical activation. The same phenomenon was observed when using upper-limb rehabilitation robot (Bi-Manu-Track arm trainer) in stroke patients. Cortical activation was enhanced when subject practices bilateral forearm pro-supination in an active training mode than in a passive training mode. These experiment results indicate that active arm or leg movement is important factor to induce significant cortical activation during robot assisted training.

Prosthetic and Orthotics

0501K1

INFLUENCE OF THE LEVEL OF AMPUTATION ON SURVIVAL ADVANTAGE AND FUNCTIONAL PERFORMANCE IN ELDERLY AMPUTEES

Takaaki Chin, Sayaka Hamamura, Tetsuhiro Iguchi

Department of Rehabilitation Science, Kobe University Graduate School of Medicine (Japan)

There has been an increase in cases of peripheral arterial disease (PAD). PAD is the cause of 80–90% of the amputations in the elderly population. In recent years, increased recognition of the functional advantage of the preservation of the knee joint, advance in revascularization procedures have brought about a change of surgical policy. As a result, the ratio of transtibial to transfemoral amputation has increased over the years. The level of amputation has a clinical impact on survival advantage and functional performance. The first purpose of this presentation is to review the influence of amputation level from the perspective of functional performance and survival advantage in vascular amputees. It is well known that higher amputation level results in decreased functional performance. Decision making on selecting candidate of prosthetic rehabilitation should be directed toward maximizing functional performance and independent living. The second purpose is to address the factors affecting successful prosthetic ambulation based on our research results investigating 64 unilateral trans-femoral or hip-disarticulation amputees (40 males and 24 females) aged between 60 to 81 years.

0501K2

LOWER-LIMB PROSTHETICS - PREVIOUS RESEARCH AND FUTURE DEVELOPMENT

Winson Lee

The Hong Kong Polytechnic University (Hong Kong)

A lower-limb prosthesis is conventionally attached to the residual limb by a socket and often some suspension devices. Although this approach has been used for many years, local residual limb pain, gait deviation and structural failure are common. Some new prosthetic designs have been brought to the market, aiming to bring amputees better comfort and gait efficiency, but with higher cost. Meanwhile, researchers are developing a surgical approach (osseointegration)

for directly connecting a trans-femoral prosthesis into the femur using a titanium implant. Improved comfort and sensory feedback, and greater hip range of motion are the advantages. But there are occasional mechanical failures of fixation and fears of infection and bone fracture. This presentation introduces the two types of prostheses (external and implanted). It also reviews the use of various advanced technologies, including computer-aided design and manufacturing, computational modeling, gait analysis, and material testing in evaluating and optimizing the mechanical designs of lower-limb prostheses.

0501K3

THE EFFECT OF RIGID VS FLEXIBLE SPINAL ORTHOSIS ON THE CLINICAL EFFICACY AND ACCEPTANCE OF THE PATIENTS WITH ADOLESCENT IDIOPATHIC SCOLIOSIS

Man Sang Wong¹, Jack C. Y. Cheng², Tsz Ping Lam², Bobby K. W. Ng², Sai Wing Sin³, Sandra L. F. Lee-Shu⁴, Daniel H. K. Chow¹, Sandra Y. P. Tam¹

¹Department of Health Technology and Informatics, The Hong Kong Polytechnic University, ²Department of Orthopaedics and Traumatology, Chinese University of Hong Kong, ³Department of Prosthetics and Orthotics, Prince of Wales Hospital and ⁴Department of Physiotherapy, Prince of Wales Hospital (Hong Kong)

Purpose: The objective of this prospective study is to compare the treatment effectiveness and patients' acceptance of the flexible spinal orthosis, SpineCor with that of the rigid spinal orthosis for the patients with moderate adolescent idiopathic scoliosis. The patients' acceptance to the rigid spinal orthoses is always a concern as it could greatly affect the clinical outcome. SpineCor is a relatively new design for tackling those inevitable drawbacks found in rigid orthosis. However, there was no study to compare this design with the conventional method regarding their treatment efficacy and the patient's acceptance. **Materials and Methods:** Forty-three subjects with moderate adolescent idiopathic scoliosis were randomly assigned to the SpineCor group (S group, $n=22$) and rigid orthosis group (R group, $n=21$). Their survival rate in the first 45 months of intervention was studied. The subjects' acceptance to the orthoses was evaluated by a purpose-designed questionnaire, which was administered in the 3rd, 9th, and 18th months of intervention. **Results:** In the study period, there were 68% of the subjects in the S group and 95% of the subjects in the R group did not show curve progression. Significant difference ($p=0.046$, by Fisher exact test) in failure rate between the 2 subject groups was found although the 2 groups had similar responses to the questionnaire. **Conclusion:** The current study showed that the failure rate of the SpineCor was significantly higher than that of the rigid spinal orthosis, and the patients' acceptance to the SpineCor was comparable to the conventional rigid spinal orthosis.

0501K4

APPLICATION OF ANKLE-FOOT ORTHOSES FOLLOWING STROKE – UPDATE AND FUTURE

Chih-Kuang Chen^{1,2}

¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital and ²School of Medicine, Chang Gung University (Taiwan)

Stroke has been one of the leading causes of mortality in both the developed and the developing countries. The World Health Organization estimates 5.7 million people died from stroke worldwide in 2005, which was approximately 1/10 of all deaths (1). Although the incidence of stroke is decreasing in high-income countries through the efforts of preventive medicine, the overall rate of stroke remains high due to the aging of the population. On the other hand, the stroke incidence rates in low to middle income

countries have grown rapidly and exceeded those in high-income countries since 2000 (2). This makes stroke an unavoidable challenge for the healthcare and socioeconomic system globally. While stroke threatens human life for its potential mortality, disability resulting from stroke is the main burden to the individuals and societies. About half of the stroke survivors are left some degree of physical and functional impairment (3–4). Among the clinical spectrum of stroke, mobility problem is a major concern of the patients and carers (5). In a prospective study of 804 acute stroke patients, Jørgensen et al. reported 18% of the patients lost their walking ability and 11% were in need of assistance for walking at the end of rehabilitation (6). A variety of lower limb orthoses are designed for patients with mobility problems following stroke. Of these, the ankle-foot orthoses (AFOs) are most frequently prescribed. AFOs are externally applied devices encompassing the ankle joint and the whole or part of the foot (7), with the goals to control motion, correct deformity, and/or compensate for weakness (8). The clinical applications of AFOs are common, yet the rationale and efficacy of using AFOs in stroke patients should be verified in the times of evidence-based medicine and practice. Old style AFOs are made of metal and leather. Gök et al. reported metal AFOs provide better stabilization of the ankle, allowing better heel strike and push-off during gait (9). Due to the heavy weight and unappealing appearance, however, the metal AFOs are much less commonly used nowadays. The rare indications for the metal AFOs include wearers satisfied or accustomed to previous metal AFOs, large or heavy individuals, patients with fluctuating edema, and people sensitive to heat (8). The plastic AFO has been replacing the metal AFO as the mainstream of lower limb orthotic management of stroke. It can be a prefabricated product or a custom-made one. Prefabricated plastic AFOs are convenient, but seldom fit the stroke patients well because the shapes and sizes available for selection are limited. In addition, they can not effectively control the complex deformity of the foot and ankle, which is common in stroke patients with spasticity. For individuals with hypertonicity or spasticity, a custom-made plastic AFO is more appropriate for its adequate correction by intimate fitting (10). Custom-made plastic AFOs can be divided into articulated and non-articulated design. Articulated AFOs have mechanical joints at the ankle to control, assist, or limit the motion of the ankle joint. They can improve gait performance (11–12), but the mediolateral control of the foot and ankle complex may be inadequate due to the space left for the mechanical ankle joints. A Solid AFO is a non-articulated design. It is the AFO of choice to provide maximal stability of the foot and ankle complex (10). The stiffness of a solid AFO is determined by the material, thickness, and geometry of the plastic. For example, a posterior leaf spring (PLS) AFO is a variant of solid AFO. The trim line around the ankle of the PLS AFO is narrowed to below and behind the malleoli. This modification allows some sagittal motion at the ankle level of the PLS AFO despite its non-articulated design. Consequently, the PLS AFO compromises the stability of the foot and ankle complex and is only indicated in isolated dorsiflexor weakness (10). In general, the plastic AFOs are designed in posterior leaf type. Anterior leaf type AFO is a modification by moving the calf shell anteriorly to the pretibial area (13). The advantages of an anterior AFO include the interchangeability with different types of shoes as well as the convenient use for indoor barefoot walking, as is the custom in some Asian countries (14). Wong et al. first reported the positive effects of an anterior AFO on gait performance in stroke patients with hemiplegia (13). The effectiveness of an anterior AFO has been proven comparable to that of a posterior AFO in terms of gait improvement (13, 15). Based on a systemic literature review, Leung and Moseley concluded that AFOs might improve velocity, stride length, gait pattern and walking efficiency in people with hemiplegia (16). Some researchers described the effect of AFOs on the energy consumption of walking (17). The AFO effect on the muscle activities of paretic lower limbs, however, is inconclusive according to Leung and Moseley (16). The effect of AFOs on balance and postural control in stroke patients is an emerging topic to be investigated. Wang et al. reported that a posterior AFO might

improve the symmetry in quiet standing and the dynamic standing balance in stroke patients with hemiparesis of less than six months duration (18). Chen et al. reported that an anterior AFO might assist stroke patients with hemiplegia in improving their postural stability in the early stage of recovery (14). For long-term hemiplegic individuals, Chen et al. suggested that use of an anterior AFO could provide improvements in lateral weight shifting and weight bearing through the affected leg (19). However, Park et al. stated that the Berg Balance Scale scores of hemiplegic patients did not differ significantly among the barefoot condition, wearing an anterior AFO, and wearing a posterior AFO (15). The debatable results can be attributed to the different assessment methods. As the novel AFO devices, such as the MIT active AFO (20), are being introduced, the relevant evidence needs to be strengthened in terms of high-level research design, applicable methodology, and logical interpretation of the outcome. In addition, patient perception is the most important value to be studied. Only when the best evidence from research meets clinical information, as well as patient feedback, will the optimal decision on the application of AFOs following stroke be possible.

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0501K5

ORTHOTIC MANAGEMENT OF MYELOYDYSPLASIA***Moon Suk Bang****Department of Rehabilitation Medicine, Seoul National University College of Medicine (Republic of Korea)*

Myelodysplasia affects spinal cord, nerve root or even brain. As a result, limb paralysis and developmental deformity may follow. Orthotic management for myelodysplasia is one of the main components of the rehabilitation management. Still, most of orthotic managements have been done by empirical basis, not by objective evidence. Pattern of practice depends on geographic area or insurance system of each country. Main purposes of orthosis are preventing deformity, support for normal joint alignment and mechanics, providing variable range of motion when appropriate, and facilitation of function. For tetraplegia or high paraplegia, standing frame, praapodium, or swivel walker can be used. Crawling, scooting training, or wheelchair training may be needed for mobility. Various Hip Knee Ankle Orthosis (HK AFO) including Reciprocating Gait Orthosis can be prescribed for the patients with deficit from T11 to L3 level. KAFO is for mid lumbar level and various AFO can be prescribed for lower lumbar level. FO or shoe can be applied for sacral lesion. Patients may prefer wheel chair to orthosis for ambulation. Special concern should be made not to cause skin problem after orthotic management because it may easily progress to skin ulcer or even osteomyelitis due to sensory deficit. Orthotic management is a component of comprehensive rehabilitation for myelodysplasia. For the optimization of orthotic management, combined education, physical therapy, occupational therapy, and home exercise should be encouraged.

0501K6

REHABILITATION AND ASSISTIVE TECHNOLOGY***Eric Tam****Jockey Club Rehabilitation Engineering Centre, Department of Health Technology and Informatics, The Hong Kong Polytechnic University (Hong Kong)*

Purpose: Rehabilitation and Assistive technology (AT) helps individuals with disabilities to improve their quality of life by

increasing and improving their functional capabilities, augmenting communication deficiency, facilitating learning activities and providing assistance in rehabilitation. In this presentation, specific applications of rehabilitation and assistive technology will be highlighted. Current limitations and future challenges in this field will also be discussed. **Materials and Methods:** Based on author's past experience in providing AT services, specific cases were selected to highlight the different applications of AT for individual use and rehabilitation training. These included the use of a small motion sensor for switch activation and computer input, a gangplank to bridge platform gaps in public transit and various interactive computer therapeutic training devices for rehabilitation training. **Results:** Individuals with severe limitations of hand/finger movements and weak activation power have great difficulties in control an input device. To overcome these functional deficits, an accelerometer was used to detect subtle motions of the finger and the toe. Although this sensor was found to be effective for many users, it fails to perform well when the user cannot initiate a fast motion. As an alternative, optical/hall-effect sensors were used instead. Platform gap between trains and stations is a major obstacle to barrier free access for individuals with disabilities and the elderly. In Hong Kong, a gangplank was developed to bridge the platform gaps of the railway system. The operation of this device only requires minimal support from the station operator. Wheelchair users can get in and out of the train compartment safely within the normal boarding time. This gangplank can handle a platform gap of up to 500 mm and a height discrepancy of 190 mm between the platform and the train compartment. Traditional therapeutic training could be an uninteresting process for many patients as it involves many repetitive movements without any feedback of the user's performance. Lack of motive in participation is often a cause of failure to many rehabilitation training programs. The use of computerized therapeutic training devices can allow therapeutic training to become interactive. Therapists can prescribe training program for each individual patient prior to the training session. During training, user's performance was also tracked and recorded in the database, to allow outcome evaluations. **Conclusion:** The successfulness of using AT to improve independency of individual with disabilities is highly dependent on the design of a good human-equipment interface. This is apparent for those suffered from lock-in syndrome and other severe physical limitations. The future challenges in rehabilitation and assistive technology will be directed towards the elderly where functional and cognitive impairments increase during the aging process.

KEYNOTE SPEECH (MAY 2, 2010)

KS03-01

REHABILITATION OF COMBAT-INJURED POLYTRAUMA (TBI, AMPUTATION AND SCI): THE U.S. VETERANS HEALTH ADMINISTRATION EXPERIENCE

David X. Cifu

Center for Rehabilitation Sciences and Engineerin, Virginia Commonwealth University (United States)

Purpose: To provide an overview of the U.S. Veterans Health Administration's Polytrauma System of Care for service members with Combat-Injured Polytrauma, including TBI, Amputation and SCI. **Materials and Methods:** Didactic lecture with Powerpoint presentation. **Results:** This presentation will be appropriate for the novice and intermediate-level clinician in PM&R and rehabilitation, introducing an overview of the system of care and the latest statistical data available. **Conclusion:** This presentation will offer both an overview of this important topic and a description of the specifics of the polytrauma care that is of practical use to attendees.

KS03-02

RECENT ADVANCES IN THE MANAGEMENT OF SPASTICITY

Anthony B Ward

North Staffordshire Rehabilitation Centre (United Kingdom)

The management of spasticity has developed greatly since the introduction of newer technologies and the resurrection of splinting

and chemodenervation. Together, these have allowed clinicians to define treatment expectations and outcomes with greater precision. Updated guidance has now been published for pharmacological therapy in patient management and this also sets out the essentials of a competent service¹. This presentation will use these to assist those clinicians, who have developed the expertise in managing their own patients with spasticity and who plan to take on referrals from other sources. The following are of strategic importance in creating a successful spasticity service: 1) The establishment of dedicated teams of expert professionals in this field; 2) Trained clinicians in treatments for disabling neurological conditions; with the knowledge & experience of all available spasticity treatments; 3) Organisational commitment to accept referrals from outside; 4) Business plan and financial security to identify the range of the service Physical treatments, including casting and splinting; Functional electrical stimulation; Botulinum toxin treatment; Intrathecal baclofen treatment. The following are then important for success; 5) Multi-disciplinary team working using evidence-based protocols, where possible; 6) Team networking with other health professionals in hospitals and in the community for inward referral of patients and onward treatment after the patient has been seen in the service; 7) Facilities to assess & treat patients; 8) The necessary documentation and systems to evaluate audit the service; 9) Education, training and research activity: This presentation will go through the steps of how organisations can be encouraged to support clinicians in delivering optimal specialist spasticity services.

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ORAL PRESENTATIONS (MAY 2, 2010)

Brain Disorders: Spasticity

0502A1

SEVERE SPASTICITY (ITB THERAPY)**Mauro Zampolini***Department of Rehabilitation, ASL3 (Italy)*

Purpose: The intrathecal baclofen therapy has become widespread in the treatment of conditions of severe spasticity general. A group of diseases that benefit from this treatment are the acquired severe Brain Injuries traumatic or non traumatic. In order to evaluate the effect of intrathecal baclofen therapy was carried out a multicenter study. **Materials and Methods:** This retrospective study included 184 patients who underwent implant of SynchroMed® pump (Medtronic, Inc., Minneapolis, MN) for the intrathecal administration of baclofen between September 1994 and January 2007 at 21 Italian centers. **Results:** The difference between the follow-up and pre implant scores showed a significant improvement in both Ashworth upper and (3.8 vs 3.1, $p < 0.05$), lower limbs scale (4.2 vs 2.9, $p < 0.05$), and in spasm scale (1.5 vs 0.4, $p < 0.05$). The ITB prevention of deformities/contracture was partially/totally obtained in 71% of patients. An improvement of care management in 82%, participation to rehabilitation programs in 66%, improvement in activities of daily living (ADLs) in 70%, a decrease of pain in 67%, an improvement in mobility in 67%, and a decrease of neurovegetative crisis in 50%. 77% of caregivers has been obtained. **Conclusion:** The study showed the effects of the treatment in terms of reduction of the spasticity, help to achieve the Rehabilitation goals and satisfaction for the patient and the caregiver. As a retrospective observational study some data cannot be completely reliable. In order to overcome the problem a prospective study has been started that will aim to better outline the terms and the effects of treatment.

0502A2

**EVALUATING FUNCTIONAL OUTCOMES
AFTER THE USE OF BOTULINUM TOXIN FOR
SPASTICITY POST ACQUIRED BRAIN INJURY –
AN AUSTRALIAN EXPERIENCE**
John Olver*Chairman of the Clinical Institute of Rehabilitation, Psychiatry and Pain Management Epworth Healthcare, Monash University (Australia)*

Purpose: The current literature is convincing when considering that injection of botulinum toxin reduces spasticity related to acquired brain injury but is sparse when reviewed to look for evidence of improvement of an individual's function after injection. The purpose of this paper is to review three Australian studies aimed at demonstrating improvements in function and quality of life following injection of botulinum toxin for spasticity post stroke and TBI. **Materials and Methods:** The first study, was a prospective, non-interventional study conducted at 17 investigational sites in Australia to examine the relationship between functional walking capacity (ie gait speed) and health related quality of life in patients with focal lower limb spasticity due to upper motor neuron syndrome (all etiologies). 127 patients were recruited. Based on gait speed, each patient was assigned to one of 4 functional walking categories. (e.g. a gait speed of > 25 m/min was used as a demarcation between the household and limited community groups) The Assessment of a Quality of Life (AQoL) questionnaire was completed by each patient. In a second study the

walking speeds of 58 patients who had been enrolled in a double blind placebo controlled trial looking at dosing and effectiveness of Botox on lower limb spasticity after stroke were retrospectively analysed before and after calf injection. With respect to the upper limb, in a third study, Dysport 500U–1000U or placebo was injected into the affected distal upper limb muscles twice (12 weeks apart), in a multi-centre, randomised, double-blind, placebo controlled study in 96 (ITT) patients. The primary endpoint was the assessment of Quality of life scale (AQoL) with other endpoints being Goal attainment scaling (GAS), pain, mood, global benefit, Modified Ashworth Scale and measures of disability and carer burden. **Results:** In the first study the AQoL returned utility values ranging from -0.04 (a state worse than death) to 1.0 (perfect health). Analysis of the utility scores for the functional walking categories found statistically significant differences between the groups, with community walkers having a better QoL relative to household walkers. In the second study BoNTA significantly increased walking speed by 23.6%, 23.8%, and 34.5% at 4, 8, and 12 weeks post-treatment ($p = 0.014$, $p = 0.018$, and $p = 0.003$, respectively). Placebo increased walking speed by 18.6% ($p = 0.027$) at 4 weeks; however, no significant change was seen at 8 or 12 weeks. After the injection, walking speed improved in 70.3% (26/37) of BoNTA-treated patients significantly enough to change mobility by at least one functional walking category, compared with 33.3% (7/21) of placebo-treated patients ($p = 0.012$, BoNTA vs placebo). In the upper limb study, compared with placebo, the injected group showed significant reduction in spasticity (MAS) ($p < 0.001$), which translated into higher GAS scores ($p < 0.01^*$) and greater global benefit ($p < 0.01$) There was however, no significant difference in AQoL (primary endpoint), pain and mood disability or carer burden. **Conclusion:** In looking at outcome measurement after injection of botulinum toxin for spasticity management, there is a need to focus on the improvement of function in individual patients with respect to their daily activities as well as looking at issues of changes in quality of life.

0502A3

**BOTULINUM TOXIN AND INTRATHECAL
BACLOFEN: CONCURRENT OR SEQUENTIAL
THERAPIES?**
Gerard E. Francisco*Physical Medicine and Rehabilitation, University of Texas Medical School, TIRR Memorial Hermann (United States)*

Botulinum toxin and intrathecal baclofen therapies are the most important recent developments in the pharmacological management of spasticity. The choice of one over the other depends on various factors related to spasticity (e.g., severity, clinical presentation, limb distribution), pharmacologic properties (e.g., drug delivery, duration of action, adverse effects) and cost-effectiveness. In general, botulinum toxin is preferred for focal spasticity while intrathecal baclofen, for generalized spasticity. Frequently the complex clinical presentation and functional impact of spasticity challenge clinicians to reconsider if these therapies are mutually exclusive or should be considered part of the armamentarium of spasmolytic therapies that can be used concurrently. This presentation will discuss various situations where it is appropriate to use botulinum toxin and intrathecal baclofen as sequential or concurrent therapies dictated by, among others, desired clinical outcome, tolerance of adverse effects, and current treatment goals. Since each management strategy has its own beneficial effect, they should be considered complementary, rather than competing, therapies.

0502A4

THE APPLICATION OF MOTOR CONTROL ASSESSMENT IN PATIENTS WITH SPASTICITY***Simon Fuk-Tan Tang****Department of Rehabilitation Medicine, Chang Gung Memorial Hospital and Chang Gung University (Taiwan)*

The ability to ambulate independently is the ultimate goal in rehabilitation treatments. However, depending on the severity of the central nervous system injury and the degree of spasticity, the goal of independent ambulation is often difficult to achieve. Therefore, it is crucial to have reliable clinical tools that can precisely assess and predict ambulatory outcome. During the past 16 years, we have successfully applied polyelectromyography (PEMG) and gait analysis to assess the motor control feature of spasticity in patients with stroke, cerebral palsy, and spinal cord injuries (SCI). In hemiplegic stroke patients, we have discovered that PEMG patterns are a more sensitive assessment tool as compared with Brunnstrom's stages. Patients with patterns of 3 and 4 had better motor recovery and ambulatory capabilities 6 months after stroke than those with patterns of 1 and 2. This was an essential finding as PEMG patterns may allow physicians to predict the fine motor outcome soon after stroke, even in patients who can not move their legs initially. In terms of motor control assessment for cerebral palsy patients who are to receive selective posterior rhizotomy, PEMG patterns of 2–3 was discovered to be able to predict independent ambulatory ability. On the other hand, PEMG patterns of 6–7 will interfere with ambulatory ability. Based on these findings, it is possible that PEMG patterns may allow physicians to select the appropriate children with spastic cerebral palsy to receive rhizotomy with good treatment results. In patients with hemiplegic stroke, cane is often needed for walking. We have conducted a study using temporal stride and force analysis to examine in detail the significance behind cane-assisted gait pattern in patients with hemiplegic stroke. Interestingly, we discovered that cane provided support and a braking function for people with hemiplegic stroke. The sound limb was in fact used for propulsion. Data obtained in this study could be used for assessing the nature of cane assistance and in planning therapeutic strategies for patients with hemiplegic stroke. In our other stroke related studies, we have also discovered that motor recovery and functional outcome after stroke correlated more with brain lesion profiles (BLPs). Surprisingly, motor recovery and functional outcome had no or only a weak relationship with either the absolute or relative lesion size. These findings suggested that motor recovery and functional outcomes after stroke correlated more with BLPs (a combination of delimiting sizes and primary locations) rather than with the absolute and relative lesion size only. In our pilot study using poly-surface EMG (poly-SEMG) to assess the motor control in chronic incomplete SCI patients, our results suggested that SCI individuals exhibit identifiable patterns of motor control in the lower extremities and these patterns can help us in predicting clinical characteristics of ambulation such as choosing the assistive device used. Coactivation of proximal muscle, poor timing of muscle activity and radiation of activity into contralateral muscles were noted in subjects who required a walker or crutches and may be a marker of inadequate motor control for more independent ambulation. Our team has integrated PEMG and gait analysis to serve as reliable tools to predict the motor recovery and functional outcome in spastic patients who suffer from stroke, cerebral palsy and SCI. Our findings may provide crucial information for the physicians to apply early and aggressive treatment strategies for patients who are predicted to have good motor recoveries. Early rehabilitation treatments to these patients may ensure good subsequent ambulation capabilities.

0502E1

TREATMENT OF EARLY POST-STROKE UPPER LIMB SPASTICITY IN ASIAN PATIENTS – RESULTS OF A PROSPECTIVE, MULTICENTRE, RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED TRIAL OF BOTULINUM TOXIN A INJECTION***Keng-He Kong, R Rosales, W Kumthornthip, KJ Goh, J Sain, KS Wong, V Mok****Tan Tock Seng Hospital (Singapore)*

Purpose: To investigate the efficacy of a single injection of Botulinum toxin A in the treatment of early post-stroke upper limb spasticity in Asian patients. **Materials and Methods:** This is a prospective, multicentre, randomized, double-blind placebo-controlled study. Patients with upper limb spasticity within 2–12 weeks of a stroke were randomized to receive a single dose of Botulinum toxin A or placebo into muscles of the elbow and wrist. The primary outcome measure was the Modified Ashworth Scale of the elbow or wrist. Secondary outcome measures included passive and active range of motion of the elbow/wrist, Barthel Index, Pain, Modified Rankin Scale and Motor Assessment Scale. These measures were evaluated at baseline, 4, 8, 12 and 24 weeks after injection. **Results:** 163 patients (80 on Botulinum toxin A, 83 on placebo) were studied. Patients in the Botulinum toxin A group had significantly greater reduction in Modified Ashworth Scale scores than those in the placebo group and this effect was sustained up to 24 weeks. Patients receiving Botulinum toxin A also reported significant reductions in pain at 4 and 24 weeks. There were significant improvements in passive elbow and wrist ROM at several time points, and improvements in active hand movements at weeks 4, 8 and 12. There were no significant changes in the Barthel Index, modified Rankin scores, or Motor Assessment Scale. Adverse events were no different between arms of the study. **Conclusion:** In patients with early post-stroke upper limb spasticity, a single dose of Botulinum toxin A is effective in reducing spasticity and this effect is sustained up to 24 weeks post-injection.

0502E2

COMPREHENSIVE MANAGEMENT OF SPASTICITY IN CEREBRAL PALSY***Moon Suk Bang****Department of Rehabilitation Medicine, Seoul National University College of Medicine (Republic of Korea)*

Spasticity is one of the frequently encountering problems in cerebral palsy (CP). Spasticity causes torsional deformity of joint and muscle, developmental problems such as gait disturbance, or difficulty for caring patients. An integrated team is required to manage spasticity successfully including physiatrist, orthopedic surgeon, neurosurgeon, physical therapist, occupational therapist, orthotist, nurse, and family members. After careful evaluation of spasticity, physician should consider whether spasticity is affecting function, pain or will lead to musculoskeletal deformity. Appropriate treatment decision can be made with considering the goal of the therapy in consultation with the patient and caregiver, with an emphasis on patient function. Therapeutic approaches can be classified as follows. 1) Functional approach is aimed to maintain proper length of muscle and optimization of muscle spindle activity. Side effects are minimal but duration is short; reduction of noxious stimulation, positioning, stretch, physical modalities such as heat and cold, electrical stimulation, splint, orthosis, seating device. 2) Oral medications are for control of generalized spasticity and may cause systemic side effects such as sedation or metabolic loads. Mechanism of action of most medications are related to neurotransmission except dantrolene, which interferes with calcium release from sarcoplasmic reticulum; benzodiazepine, baclofen, tizanidine, clonidine, diazepam, gabapentine, dantrolene. 3) Chemodenervation is targeted for focal spasticity. For motor point or nerve block, phenol and alcohol are preferred agents, which need EMG guided or electrical stimulator. Botulinum toxin type A (Botox, Dysport, Neuronox, Prosigne, Xeomin) and type B (Myoblock) act on neuromuscular junction, which are easy to administer comparing with phenol block. 4) Orthopedic procedure and neurosurgical procedure such as intrathecal baclofen pump (ITP) and selective dorsal rhizotomy. Goal of orthopedic procedure is to elongate contracted muscle, simplify a complex

muscle action and corrects lever-arm dysfunction of patients with CP. Combination of above treatment options should be considered for the successful outcome with functional gain, satisfaction, or elimination of pain.

0502E3

NEUROPHYSIOLOGICAL MONITORING OF INTRATHECAL BACLOFEN DELIVERY FOR CONTROL OF SPASTICITY

Dobrivoje S. Stokic

Center for Neuroscience and Neurological Recovery, Methodist Rehabilitation Center, Jackson (United States)

Intrathecal baclofen (ITB) is commonly used for management of muscle hypertonia. Despite generally favorable results, the spinal cord response to ITB is not well understood and the implanted system occasionally fails. Thus, neurophysiologic monitoring of ITB delivery seems warranted. The purpose of this presentation is to demonstrate the utility of Hoffman (H)-reflex recording in the soleus muscle as a valid, reliable, and user-friendly technique for monitoring neurophysiologic response to ITB administration in different clinical scenarios. Rationale for utilizing the H-reflex as an adjunct to clinical assessment will first be presented followed by results of several "proof of principle" investigations describing clinical applications, data interpretation, and limitations of this technique. The greatest yield of the H-reflex is achieved with serial evaluations, starting with baseline assessment, hourly after the ITB bolus injection, immediately after the pump implantation at the lowest possible dose, during initial dose titration, and then "as needed" when system malfunction is suspected. This approach proved useful for troubleshooting ITB bolus injection, "low reservoir syndrome", "early" system malfunction, and "late" system malfunction, including more challenging situations, such as partial or progressive interruption of continuous ITB delivery. Although more sensitive, H-reflex should be viewed as complimentary to clinical and other methods for monitoring and troubleshooting ITB delivery.

0502E4

EMG PATTERNS INDUCED BY DIFFERENT ANGULAR VELOCITY IN STROKE PATIENTS WITH ANKLE SPASTICITY

Ta-Sen Wei^{1,2}

¹Department of Physical Medicine and Rehabilitation, Changhua Christian Hospital and ²Institute of Biomedical Engineering, College of Medicine and College of Engineering, National Taiwan University (Taiwan)

Spasticity of ankle plantarflexors is a common positive symptom of upper motor lesion observed in stroke patients. Abnormal muscle tone results in an equinovarus foot which not only affects patient's functional performance but increases the risk of fall. Precise assessment of muscle tone is a prerequisite task for predicting the outcome and as an indicator for tone reduction treatment, such as a tone blocker injection. Ashworth and Tardieu scales are usually used for assessing the severity of spasticity in clinical practice. While selecting the scales, inter-intra, test-retest reliability and validity are most concerned. Since these scales are based on clinical rating, it is easily prone to subjectiveness. A constructed test standard is necessary and can promote understanding of the relationship between scales and instrumented measurements. Isokinetic Dynamometer and sEMG have been used for studies in this field. Isokinetic dynamometer can perform consecutive sinusoidal passive movement at preset angular velocity and quantify the velocity-dependent phenomenon of spasticity. Stretch response can be verified by electromyographic activity of anterior tibialis and gastrocnemius. Resistive peak torque and integrated EMG (iEMG) amplitude are analyzed for quantitatively assessing spasticity. The EMG activity increased significantly when angular velocity increased. The Modified Ashworth Scale correlates

peak torque, work, and catch angle, but iEMG does not. Based on isokinetic dynamometer with sEMG recording, clinician can objectively follow the effect of rehabilitation treatment and tone reduction treatment for strokes. In addition, it is essential to match the biomechanical and clinical findings. The rheological change of muscles in strokes with different onset durations may play an important role of passive stiffness, affected limb and the relationship of spasticity to contracture, but remains to be determined.

Rehabilitation Technology and Engineering, Geriatric Rehabilitation, Complementary and Alternative Medicine

0502I1FP

APPLICATION OF SURFACE EEG-BASED BRAIN-MACHINE INTERFACE (BMI) TO REHABILITATION PRACTICE

Meigen Liu¹, Toshiyuki Fujiwara¹, Junichi Ushiba^{1,2}, Yasunari Hashimoto², Kimiko Kawashima², Keiichiro Shindo³

¹Department of Rehabilitation Medicine, Keio University School of Medicine, ²Graduate School of Fundamental Science and Technology, Keio University and ³Department of Rehabilitation Medicine, Tokyo Metropolitan Rehabilitation Hospital (Japan)

Purpose: Brain-machine interface (BMI), which operates external device based on brain activities, is a potentially useful technology in rehabilitation not only to substitute for lost functions but to induce brain plasticity. Among various types of BMI, EEG-BMI is widely used because of its fine temporal resolution, ease of use, portability and low cost. However, it is susceptible to noise, and extensive training is required to use it. Recently, we developed a new EEG-BMI system to counter these problems. The purpose is to test its applicability to rehabilitation practice. **Materials and Methods:** EEG signals were recorded from C3, Cz and C4, and mu rhythms appearing or disappearing on motor attempts (mu-ERD) were quantified with a bispectral function. To extract motor associated signals with high SN ratio, we performed coherence analyses between the two EEG signals obtained with two different recording methods from the same site. Real-time classification was performed with both linear and nonlinear detectors depending on patterns of signal changes. With this system, we performed the following experiments. 1) We tested the accuracy of classification in 6 healthy individuals, and applied the system to a patient with muscular dystrophy and 2 patients with cervical cord injury to control an avatar in the virtual 3-D world Second Life®. 2) We tested the feasibility of a BMI neurofeedback training in 4 patients with chronic hemiparetic stroke who were unable to extend their fingers fully. We recorded EEG from the primary motor cortex during motor imagery of extending the affected fingers, and simultaneously recorded EMG activities from extensor digitorum communis (EDC). We analyzed mu-ERD and provided a real time visual feedback in the direction of moving a cursor on the monitor. After successful motor imagery, the affected fingers were extended by activating a motor-driven hand orthosis. The patients tried to extend their paretic fingers by thought for 2–5 seconds in every 10 s, and performed 50–100 trials a day, 12 time(s) a week. The training period ranged from 4 to 7 months. We analyzed changes of mu-ERD, motor recruitment of EDC with motor intention, and cortical excitability as assessed with transcranial magnetic stimulation (TMS) before and after the intervention. **Results:** 1) In healthy individuals, the accuracy of detection was 80%, much higher when compared with previously reported methods. The 3 patients successfully learned to control the avatar after 5 training sessions. 2) With long-term BMI training, the accuracy of the affected hand imagery improved and the degrees of mu-ERD became larger and more stable at the final session. The affected EDC EMG activities increased during motor imagery, although no apparent functional improvement was observed. With TMS, the resting motor threshold of the motor evoked potential recorded from

first dorsal interosseus decreased in 3 of the 4 patients. **Conclusion:** Our EEG-BMI system can be a useful tool not only to assist persons with disability to broaden their world, but to restore more effective motor control in paralyzed limbs.

050212FP

CAN TRANSCRANIAL DIRECT CURRENT STIMULATION (TDCS) MODIFY THE RESTING-STATE FUNCTIONAL CONNECTIVITY OF THE MOTOR CORTEX? A PROOF OF CONCEPT FMRI STUDY

Gad Alon¹, Steven Roys², Rao P Gullapalli²

¹University of Maryland, School of Medicine, Department of Physical Therapy & Rehabilitation Sciences and ²Department of Diagnostic Radiology (United States)

Purpose: To develop and test an innovative method to obtain fMRI data during the application of non-invasive tDCS. **Materials and Methods:** One subject participated in 5 MRI sessions. Functional images (Siemens 3T Tim Trio scanner, 8-channel head coil) were acquired using single-shot EPI T2*-sensitive sequence (TE = 30 ms, TR = 3 s, 1.8×1.8 mm² in-plane resolution and a FOV of 23 cm) using 36 axial slices (4 mm thick) with no gaps between slices. A high-resolution T1-weighted-MPRAGE (TE = 3.44 ms, TR = 2 s, TI = 900 ms, flip angle = 9°, 72 slices, slice thickness 2 mm, 0.898×0.898 mm² in-plane resolution and a FOV of 23 cm) was acquired for anatomic reference. In each session, two resting state scans were separated by two tDCS scans and one functional activation scan involving the motor cortex. The functional scan was a self paced finger-thumb apposition task. Block design was used with 20 s-On and 20 s-Off for a total of 8 cycles. In tDCS sessions 1–3, 2 mA of direct current was applied for 6.45 min placing the positive electrode over the right primary motor area of the cortex and the negative electrode over the supra-orbital area on the left side of the head. In session 4–5 we applied a pulsed tDCS stimulator (tPDCS) with identical electrodes size and positions. Data were analyzed using AFNI (Robert Cox, NIH) and MATLAB (MathWorks Inc., Natick, MA). Images were corrected for slice timing, registered, blurred with a 6 mm FWHM Gaussian blur, and intensity normalized. For motor fMRI analysis, the general linear model (GLM) was used to determine the voxels that were significantly correlated with the motor task paradigm. For fcMRI, 7 mm spherical regions of interest (ROIs) were drawn centered on the right M1 and left M1 regions, guided by the fMRI results. The resting-state time series from the voxels in the RM1 ROI were averaged and the resulting time series used as a regressor in the GLM analysis of resting state data. The functional connectivity maps thus obtained were thresholded at 0.6 of the maximum R² value, and then combined to give overlap maps for each of the 3 resting-state conditions (non-simulated, tDCS, and tPDCS). Voxels that were above the 0.6 threshold in all of the scans for each condition were considered “highly active” seed voxels (HASV). **Results:** The ROI were the left and right M1 regions. During rest, the number of HASV in the left M1 were 401 compared to 65 HASV in the right M1, indicating 84% vs. 16% activity. tDCS increased the left M1 HASV to 564 and decrease the right M1 HASV to 19 (a 97% vs. 3% activation). Pulsed tDCS increase both the left (698) and right (168) HASV while decreasing the left M1 percentage to 76% and increasing the right M1 to 24%. **Conclusion:** This maybe the first-ever in-vivo demonstration that non-invasive tDCS can affect fMRI recording of the motor cortex’s resting-state. tDCS and pulsed tDCS may have different effect on fMRI derived hemodynamic response within the brain.

050213FP

EFFICACY OF A COMPUTERIZED ASSESSMENT AND TRAINING SYSTEM FOR CHRONICALLY DIZZY PATIENTS

Chung-Lan Kao^{1,2,3}, Rai-Chi Chan^{1,2}, Wan-Ling Hsieh^{1,3}, Shuu-Jiun Wang^{2,4}, Shih-Jen Chen^{2,5}, Shun-Hwa Wei³

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¹Department of Physical Medicine and Rehabilitation, Taipei Veterans General Hospital (Taiwan)

²School of Medicine, National Yang-Ming University, ³Institute of Physical Therapy and Assistive Technology, National Yang-Ming University, ⁴Department of Neurology, Neurological Institute, Taipei Veterans General Hospital and ⁵Department of Ophthalmology, Taipei Veterans General Hospital (Taiwan)

Purpose: It is known that disruption of vestibulo-ocular reflex can contribute to oscillopsia, which in turn, will cause dizziness and unsteadiness in persons suffering from vestibular disorders. The assessment of vestibular dysfunction is generally based on vestibulo-ocular reflex (VOR) and vestibule-spinal reflex (VSR). To date, the clinical evaluations have certain limitations. The objectives of this study were to 1) develop a device providing evaluation and training modules for chronically dizzy patients, 2) compare the differences of DVA and center of pressure (COP) among normal, unilateral vestibular hypofunction (UVH) and bilateral vestibular hypofunction (BVH) subjects, and 3) to evaluate the effectiveness of this computerized training device. **Materials and Methods:** The signals of rate sensor and force plate were transferred and composed. The evaluating module and training module were created by LabVIEW software. Dynamic visual acuity and COP were evaluated with our device on subjects’ first visits and one month after training. Questionnaires and objective scales were evaluated on their first and follow-up visits. Statistical analysis: 1) The changes in DVA and COP among the three groups were compared by ANOVA ($p < 0.05$), 2) post hoc was used to compare the difference between groups, 3) the results in DVA, COP displacement and questionnaire between pre-training and post-training in three groups were compared by paired-t test. **Results:** Thirty-four patients were included in this study (17 Male and 17 female, average 58.85±21.19 years). Based on physical examinations and caloric test results, subjects were categorized into 3 groups including normal, UVH and BVH subjects. Significant differences in horizontal DVA (HDVA) ($p = 0.000$) and vertical DVA (VDVA) ($p = 0.001$) were found among the 3 groups before training. No significant difference was found in COP displacement (SVA: $p = 0.684$, HDVA: $p = 0.447$, VDVA: $p = 0.076$). After 4.78±1.26 weeks training, subjects improved significantly in HDVA ($p = 0.000$) and VDVA ($p = 0.000$) and COP displacement reduced from 11246.74±4280.46 mm to 8005.60±2765.43 mm ($p = 0.006$). Subjects’ subjective and objective clinical assessments improved significantly after training ($p < 0.005$). **Conclusion:** The device developed in this study can evaluate and train subjects’ visual acuity and center of pressure simultaneously. This low priced equipment with minimal environmental constraints could be applied to vestibular patients to improve their life quality.

050214FP

FUNCTIONAL ELECTRICAL STIMULATION TO DORSIFLEXORS AND PLANTAR FLEXORS DURING GAIT TO IMPROVE WALKING IN ADULTS WITH CHRONIC HEMIPLEGIA

Gad Alon², David G. Embrey¹

¹Good Samaritan Physical Medicine and Rehabilitation Center and ²University of Maryland, School of Medicine, Department of Physical Therapy & Rehabilitation Sciences (United States)

Purpose: To determine if functional electrical stimulation (FES) timed to activate the dorsiflexors and plantar flexors during gait, improves the walking of adults with hemiplegia. **Materials and Methods:** A randomized cross-over trial. Twenty-eight adults with hemiplegia (4.9±3.8 years post-stroke). Intervention “A” included 3 months of wearing the FES system which activated automatically the dorsi and plantar flexors during walking for 1 hours/day, 7 days/week. Intervention “B” included 3 months of walking an hour/day, six days/week without FES. Of the 28 patients who completed the study, 15 were randomly assigned to group A-B, and 13 to group B-A. Cross-over

occurred at 3 months. Outcome Measures: Variables were measured at pre-treatment, at 3 months, and at 6 months. Three primary outcomes were selected a priori and included two functional variables: six minute walk (6MW), Emory Functional Ambulatory Profile (E-FAP); and one participation variable, the Stroke Impact Scale (SIS). All tests were done without electrical stimulation. **Results:** At the end of phase one, (3 months) patients who received treatment A showed significant improvement over patients who received treatment B on 6MW ($p=0.02$), E-FAP ($p=0.08$), and SIS ($p=0.03$). In phase two, the A-B group (without FES) maintained improvement in all three primary outcomes. Both groups improved significantly on all primary outcome measures, comparing 6 month to initial measures ($p\leq 0.05$). **Conclusion:** An FES system that stimulates dorsiflexors and plantar flexors while approximating the timing of typical adult gait, when combined with structured walking, can improve the walking ability of adults with chronic hemiplegia.

050215FP

THE EFFECT OF NEWLY-DESIGNED DYNAMIC CUSHION SYSTEM ON DEEP TISSUE OF HUMAN BUTTOCK: A 3D FINITE ELEMENT ANALYSIS

Shih-Cherng Lin^{1,2}, *Fuk-Tan Tang*¹, *Pai-Chu Chen*¹, *Yue-Xing Zhang*², *Jiun-Jie Wang*³, *Yu-Chun Lin*³, *Weng-Pin Chen*⁴

¹Department of Physical Medicine and Rehabilitation, ²Department of Biomedical Engineering, ³Department of Medical Imaging and Radiological Sciences, ⁴Department of Mechanical Engineering (Taiwan)

Purpose: Pressure sore is a common complication for wheelchair-bound persons with spinal cord injury. The effects of pressure and time are believed to be the major factors accounted for the formation of pressure sores. Appropriate cushion are often used to reduce the possible damage that caused by excessive pressure on the weight-bearing soft tissue, and to prevent the development of pressure sores. Therefore, the purpose of current study was to develop a newly-designed dynamic cushion system, and finite element analysis was used to evaluate its effect on deep tissue of human buttock. **Materials and Methods:** This newly-designed dynamic cushion system consisted of an upper base, a lower base, a universal joint and four spring elements. The upper base and lower base were assembled by the ball joint and socket which were located at the center of base respectively. Four spring elements were set at the corner of upper and lower base respectively for damping function. The principle of this design is to transfer center of pressure (COP) trajectory by the upper limb movement and damping system. A computer aided design software (Hypermesh) was used to construct the model of the dynamic cushion system with spring elements. The magnetic resonance images of a healthy male subject were also used to reconstruct the finite element model of a human buttock. Besides, the Vicon motion analysis system and the Novel Pliance pressure measurement system were integrated to capture the kinematic and kinetic data of the same male subject in sitting posture in order to provide boundary and loading conditions for computer simulation. Finally, the results from finite element analysis were compared with the data from pressure measurement to verify the accuracy of computer simulation. **Results:** In terms of shear stress at skin beneath the ischial tuberosity, the shear stress of rigid cushion system was 5.45 kPa. The maximum shear stress of high stiffness and low stiffness cushion were 7.2 kPa and 7.3 kPa; the minimum were 5.1 kPa and 5 kPa, respectively. Even though the maximal shear stress resulted from dynamic cushion system was higher than rigid cushion, the minimal shear stress was lower than that. According to the peak stress in the deep soft tissue beneath the ischial tuberosity, the averaged peak von Mises stress of rigid cushion system was 10.65 kPa. The maximum peak von Mises stress of high stiffness and low stiffness cushion were 13.7 kPa and 14.1 kPa; the minimum were 8 kPa and 7.7 kPa, respectively. Although the maximal peak von Mises stress resulted from dynamic cushion system was higher than rigid cushion, the minimal peak von Mises stress was lower than that. **Conclusion:** Based on the results from finite element analysis,

the dynamic cushion system could cyclically relieve the shear stress at the skin as well as the peak stress in the deep soft tissue beneath the ischial tuberosity. Therefore, this device could reduce the probability of pressure sore formation. In conclusion, this newly-designed dynamic cushion system can provide a means for preventing pressure sores and the quantitative data of the current evaluation can provide reference for clinician and biomechanics researchers.

050216FP

INTENSIVE TRAINING OF CHRONIC STROKE ON A MOTORIZED CYCLE COMBINED WITH FUNCTIONAL ELECTRICAL STIMULATION (FES): EFFECT ON LOCOMOTION

Gad Alon, Vincent M. Conroy

University of Maryland, School of Medicine, Department of Physical Therapy & Rehabilitation Sciences (United States)

Purpose: To document changes in locomotion of chronic hemiplegia after intensive training using a motorized cycle combined with functional electrical stimulation (FES) system. **Materials and Methods:** Ten subjects completed 24 sessions of 30 min, 3x per week cycling on a stationary motorized cycling system combined with FES (RT300™). The stimulation activated the knee and ankle joints flexors and extensors using a stimulation pattern that assisted cycling motion of the paretic lower limb. Patients attempted to cycle as close as possible to 60 RPM and the resistance to cycling was gradually increased. **Results:** No adverse reactions to the training or the FES were noted. Time to complete the get up and go test improved from 45.4 ± 54.9 s to 34.0 ± 31.8 s ($p=0.03$), and gait velocity increased from 0.4 ± 0.3 m/s to 0.5 ± 0.4 m/s ($p=0.01$). Active dorsiflexion (DF) with the knee in either 90 deg flexion of fully extended improved statistically (Wilcoxon test $p=0.05$). Plantar flexion, knee extension and knee flexion did not change. **Conclusion:** Intensive training using a motorized cycle+FES appears safe and can improve selected variables of locomotion and paretic lower extremity active range of motion.

050217FP

MALNUTRITION AND REHABILITATION OUTCOME OF DISUSE SYNDROME: A RETROSPECTIVE COHORT STUDY

Hidetaka Wakabayashi, Hironobu Sashika

Department of Rehabilitation Medicine, Yokohama City University Medical Center (Japan)

Purpose: Disuse syndrome is defined as "a state in which an individual is at risk for deterioration of body systems as the result of prescribed or unavoidable musculoskeletal inactivity." Concept of disuse syndrome, deconditioning, and debility resemble each other in some respect. Some patients with disuse syndrome are malnutrition, but association between disuse syndrome and malnutrition is unclear except body mass index. The purpose of this study is to determine whether malnutrition is associated with rehabilitation outcome of disuse syndrome. **Materials and Methods:** A retrospective cohort study was performed in 223 inpatients admitted to university medical center and diagnosed disuse syndrome by physicians of the rehabilitation department. All patients were prescribed physical therapy. Data was collected from participants in a prospective cohort study of "clinical research for development of diagnostic criteria for disuse syndrome in rehabilitation medicine". Malnutrition was defined as body mass index was below 18.5 and/or moderately impaired biochemical measurements (hemoglobin below 10 g/dl, serum albumin below 3 g/dl, or total lymphocyte count below 1200). Rehabilitation outcome was defined as whether patients' Barthel Index score during rehabilitation improved or not. Nutrition status at referral including hemoglobin, serum albumin, total lymphocyte count, body mass index, Onodera's prognostic nutritional index (serum albumin x 10 + total lymphocyte count x 0.005), age, sex, duration between admission and referral

to the rehabilitation department, and Barthel Index score at referral were assessed. Chi square test and logistic regression analysis were performed with SPSS 17.0, and $p < 0.05$ was considered statistically significant. This study was approved by the ethics committee of the institution. **Results:** There were 136 men, 87 women. Mean age was 67.5 years. Median duration between admission and referral was 17 (25 percentile: 11, 75 percentile: 27) days, median rehabilitation duration was 32 (16, 61) days. 202 patients (91%) were malnutrition. 115 patients' (52%) hemoglobin were below 10 g/dl, 163 patients (73%) were hypoalbuminemia (below 3 g/dl), 103/198 patients' (52%) total lymphocyte count were below 1200, and 56 patients (25%) were underweight (body mass index was below 18.5). Mean prognostic nutritional index was 32.9 (standard deviation: 7.1), and 122/198 (62%) patients were below 35. 135 patients (61%) improved Barthel Index score during rehabilitation. Rehabilitation outcome of malnutrition patients was poor compared to normal nutrition patients (malnutrition: improved 118, not improved 84, normal nutrition: improved 17, not improved 4; relative risk (RR): 2.18, $p = 0.04$). Patients with low hemoglobin (RR: 1.82, $p = 0.001$) and low total lymphocyte count (RR: 1.46, $p = 0.03$) were associated with poor rehabilitation outcome. Serum albumin ($p = 0.08$) and body mass index ($p = 0.78$) were not different significantly. Prognostic nutritional index below 35 was associated with poor rehabilitation outcome (RR: 1.64, $p = 0.01$). Logistic regression analysis (covariate was age, sex, hemoglobin, total lymphocyte count) revealed hemoglobin was independently associated with rehabilitation outcome (OR 2.34, $p = 0.005$). **Conclusion:** Malnutrition is common in patients with disuse syndrome. Patients with low hemoglobin and prognostic nutritional index at referral are related with poor rehabilitation outcome. Moderate and severe malnutrition may be associated with poor rehabilitation outcome in patients with disuse syndrome.

050218FP

PERFORMANCE ON HORNSBY DISC TEST PREDICTS REHABILITATION POTENTIAL IN COGNITIVELY IMPAIRED ELDERLY

Jan Yueh-Chen Hong, Jane Wu

Department of Rehabilitation & Aged Care Service, Hornsby Kuring-gai Hospital (Australia)

Purpose: To design a quick and easy-to-administer bedside screening tool to assist clinicians in selecting cognitively impaired elders requiring inpatient rehabilitation who are more likely to achieve successful outcomes. **Materials and Methods:** The Hornsby Disc Test (HDT) is adapted by the authors from the Tower of Hanoi/ Toronto which have evidence for testing procedural memory involved in motor learning. There are also some evidence that cognitive procedural learning requires the intervention of nonprocedural cognitive functions, including episodic memory, working memory and executive functions. HDT consists of a pegboard with 3 pegs and 2 discs. Subjects are asked to move the discs to a certain position shown on a picture. The test takes less 5 min to administer. A cohort of 30 English speaking subjects with MMSE ≤ 24 admitted to an inpatient general rehabilitation unit in Sydney, Australia, between July to December 2009, were asked to participate. Data collected on admission included pre-morbid mobility, self care, Barthel Index, accommodation, social support, MMSE, and the conditions requiring rehabilitation. Discharge mobility, self care, discharge destination, and FIM score were also collected on completion of rehabilitation. Successful outcomes are defined as independent mobility and return to previous accommodation. **Results:** Premorbidly all subjects were mobile. 47% of subjects resided at home and the rest in low level care facility (hostels). At completion of rehabilitation, 50% of the subjects achieved independent mobility and 50% of the subjects were discharged to their previous residence. Seventy-one percent of the subjects who completed the test correctly achieved independent mobility, in contrast with only 31% of the subjects who failed the test ($p = 0.03$). Sixty-three percent of the subjects who completed the test correctly returned to previous accommodation, compared with 37.5% of subjects who failed the test, though this did not reach statistical

significance ($p = 0.14$). This may be due to small study numbers or the lack of social support at home. The MMSE score was not different in those who passed and failed the disc test (MMSE of 20 for both groups; $p = 0.69$). Subjects who achieved independent mobility at discharge had a mean MMSE of 21, compared to mean score of 19 in those who did not achieve independent mobility ($p = 0.26$). The MMSE score, a commonly used global cognitive assessment tool, did not reflect on the performance of the HDT or predict mobility outcomes after rehabilitation. This suggests that perhaps more emphasis should be placed on assessing one's procedural learning ability when considering cognitively impaired elders' rehabilitation potential. **Conclusion:** The Hornsby Disc Test has a good predictive ability in mobility outcomes in cognitively impaired elders requiring rehabilitation, and can potentially be used as a bedside screening tool to select candidates in this particular population who are more likely to achieve successful rehabilitation outcomes. There is a plan to replicate the study with a bigger sample size.

050219FP

WALKING AND BALANCE PERFORMANCE IN EXERCISE, LIFESTYLE ACTIVE AND INACTIVE ELDERLY

Thiwaporn Thaweewannakij, Sugalya Amatachaya, Kitiyawadee Srisim, Katavut Phiwjinda, Sawitree Maharattanawongsa, Lugkana Mato

School of Physical Therapy, Faculty of Associated Medical Sciences (Thailand)

Purpose: To compare walking and balance performance among exercise, lifestyle active and inactive older adults. **Materials and Methods:** The study recruited one-hundred and fifty healthy well-functioning older adults, aged 65 to 80 years (30 females and 20 males per group) from several communities in Thailand. The subjects were classified into 3 groups which were exercise, lifestyle active and inactive groups by using intensity, duration of performing activities per day, and frequency of doing activity a week. Subjects were measured their walking speed by using the 10-meter walk test (10MWT), walking distance by using the 6-minute walk test (6MinWT), and functional balance by using the Berg Balance Scale (BBS). Findings of these subjects were compared by using ANOVA and post-hoc test ($p < 0.05$). **Results:** There were clearly significant differences of the outcomes among the groups, particularly in female subjects. The walking speed and distance of exercise and lifestyle active subjects were clinically significant from those of inactive subjects (more than 0.1 m/s and 50 m, respectively). In addition, the functional balance of exercise subjects was significant difference from that of inactive subjects ($p < 0.05$), but not clinically significant. **Conclusion:** The findings indicated that participation in optimal physical activity or exercise program is important for, particularly female, older adults to reduce functional decline associated with aging, and improve mobility and balance control. However, the program for older adults should emphasize on intensity, duration, frequency and types of activity.

Brain Disorders: Speech and Swallowing

0502B1

NEW DEVELOPMENT IN DYSPHAGIA EVALUATION

Tai Ryoan Han, Han-Gil Seo, Ja-Ho Leigh, Byung-Mo Oh

Department of Rehabilitation Medicine, Seoul National University Hospital (Republic of Korea)

Purpose: For more objective analysis of the VFSS, we did the kinematic motion analysis of the VFSS in normal persons and

stroke patients. The first purpose is to evaluate the effect of the chin tuck maneuver kinematically and the second purpose is to evaluate the longitudinal changes of the swallowing process in subacute stroke patients with aspiration. **Materials and Methods:** For the kinematic evaluation of the VFSS, we digitized 7 points for motion analysis—tip of food bolus, anterior and posterior margin of hyoid bone, anterior and posterior margin of vocal cord and tip and base of epiglottis. For the study of the effect of the chin tuck maneuver, we recruited 23 normal volunteer and the kinematic data of the chin tuck maneuver and chin down position. For the study of the longitudinal changes of the swallowing in subacute stroke patients, we recruited 28 stroke patients who had the definite aspiration in the first VFSS. We did the follow-up VFSS 3weeks later in average and we classified them into 2 groups—recovered group (14 pts.) and non recovered group (14 pts). And we compared the kinematic data between the first and the second VFSS. **Results:** With the kinematic analysis of the chin tuck maneuver, we found that horizontal movement of the hyoid bone was reduced significantly compared to the neutral and chin down position. Also, there was significant elevation of vertical displacement of the base of the epiglottis with the chin tuck maneuver, however, there was no changes in epiglottic rotation. For the longitudinal study of subacute stroke patients with aspiration, we found that most temporal variables of the hyoid bone and epiglottis were prolonged in non-recovered group. Also we found that the epiglottic angle was significantly improved in recovered group compared to the non compared group. **Conclusion:** The kinematic analysis of VFSS is a very useful evaluation in dysphagia evaluation in terms of understanding of the swallowing process more objectively. Chin tuck maneuver is a very effective maneuver to prevent the aspiration and the basic mechanisms of the chin tuck maneuver are to reduce the horizontal movement of hyoid bone and to elevate the base of epiglottis. Delayed swallowing triggering at initial VFSS might predict poor recovery from aspiration in subacute stroke patients. Also, sustained reduction of the epiglottic rotation could be the main pathology of poor recovery of dysphagia in subacute stroke patients.

0502B2

EFFECTS OF PNEUMATIC DILATION ON CRICOPHARYNGEAL FUNCTION IN PATIENTS WITH ACHALASIA

Zulin Dou, Yue Lan, Guifang Wang

Department of Rehabilitation Medicine; The 3rd Affiliated Hospital; Sun Yat-sen University (China)

Purpose: To investigate the efficacy of two different methods of catheter pneumatic dilatation therapy to treat cricopharyngeal achalasia and benign strictures, and analysis the correlation relationship between pneumatic capacity and swallowing function in pneumatic dilatation therapy. **Materials and Methods:** 23 cricopharyngeal achalasia and 7 benign strictures of cricopharyngeal muscles were diagnosed by videofluoroscopic swallowing study (VFSS). All cases received active and passive dilatation pneumatic dilatation therapy combined with the manipulation treatment of dysphagia, indirect training, direct training and feeding guide. Efficacy and correlation were evaluated by swallowing function scale. **Results:** Two different methods of dilatation can come into being different efficacy. Correlation analysis by SPSS15.0 showed that the related coefficient of pneumatic capacity and swallowing function is 0.921. Reevaluation by VFSS showed that the opening of cricopharyngeal muscles were improved significantly. **Conclusion:** pneumatic dilatation therapy was an effective treatment for cricopharyngeal achalasia and benign strictures. It has close correlation relationship between swallowing function and pneumatic capacity. Comprehensive treatment for dysphagia will obtain the better outcomes.

0502B3

EVALUATION AND MANAGEMENT IN IRRADIATED NPC PATIENTS WITH DYSPHAGIA

Tyng-Guey Wang

Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: Nasopharyngeal carcinoma (NPC) is a common disease among Southeast Chinese. Radiotherapy is the most common primary treatment for NPC with good outcomes reported, but complications frequently arise. These include hearing loss, xerostomia, trismus, local soft tissue fibrosis and dysphagia. Xerostomia, dysphagia, and hearing loss most negatively impact quality of life (QoL). Dysphagia also increases the risk of aspiration, which may cause death. This purposes of this work are to quantitatively assessment of swallowing function in irradiated NPC patients with dysphagia and to evaluation the efficacy of functional electrical stimulation (FES) in this group of patients. **Materials and Methods:** Thirty-three NPC subjects (25 men and 8 women) and ten normal subjects (7 men and 3 women) participated in the study. The displacement and velocity of hyoid bone movement, the amount of pyriform sinus stasis, and the widest opening distance of the cricopharyngeal muscle during swallowing. Another twenty NPC subjects with dysphagia were divided into a FES and a home rehabilitation program (HRP) group. The FES group received FES of the supra-hyoid muscles over fifteen sessions. The HRP group performed self-swallowing exercises at home. The evaluation parameters included the QoL questionnaire scores, the penetration-aspiration scale (PAS), the movement of the hyoid bone, and the amount of pyriform sinuses stasis were performed at the commencement and the end of the procedures. **Results:** The displacement of the hyoid bone in the NPC patients was significantly less than that of the normal subjects (1.58 ± 0.59 vs. 2.23 ± 0.49 cm, $p=0.0033$). The forward displacement of the hyoid bone in the NPC patients was found to be less than that of the normal subjects (0.85 ± 0.50 vs. 1.65 ± 0.51 cm), achieving statistic significance ($p<0.0001$). The pyriform sinus stasis of the NPC subjects was significantly more than that of the normal subjects (2.24 ± 0.98 vs. 0.30 ± 0.17 cm², $p<0.0001$). Most swallowing outcomes of the FES group improved after FES. The QoL score ($p=0.003$), the duration of the movement of thin barium through the hyoid ($p=0.001$), the moving speed of paste barium through the hyoid ($p=0.028$), and the pyriform sinus stasis area of the paste barium ($p=0.026$) reached significant difference in the FES group. Most swallowing outcomes did not improve in the HRP group. **Conclusion:** The irradiated NPC subjects with dysphagia experienced a reduction in hyoid bone displacement, occurring in a forward direction. FES will improve the swallowing function of NPC patients with dysphagia and bring about better QoL.

0502B4

SPEECH AND LANGUAGE PROBLEMS IN PRESCHOOL CHILDREN IN TAIWAN

Pao-Chuan Torng

Department of Speech and Hearing Disorders and Sciences, National Taipei College of Nursing (Taiwan)

Purpose: To study the speech and language problems in three- to six-year-old preschool children in Taiwan. Speech and language problems including articulation, voice, resonance, fluency, and receptive and expressive language were analyzed from parent questionnaires. In addition, articulation problems were further examined and discussed. **Materials and Methods:** A two-year study was carried out to examine the speech and language problems in three- to six-year-old preschool children in Taiwan. Nine thousand five hundred and ninety preschool children were recruited from the northern, central, and southern part of Taiwan.

Speech and language assessment tools and testing procedures were established to identify children who need further services in the areas of hearing, speech and language. A total of 60 speech language pathologists, audiologists, and speech language graduate students were trained to administrate testing and analyse data. **Results:** Based on the parent questionnaires, 10.0% of the preschool children had articulation issues, 12.7% voice issues, 2.3% resonance issues, 5.4% fluency issues, and 16.9% language issues. As for articulation issues, problems were further classified into eight phonological error patterns, including backing process, fronting process, stopping, affrication, unaspiration, initial consonant deletion, final nasal deletion and others. **Conclusion:** This study provides an in-depth understanding of the speech and language problem in Taiwan. Results are essential in establishing an early intervention program for preschool children with speech and language disorders.

0502B5

RECENT TRENDS AND TOOLS IN THE ASSESSMENT OF APHASIA IN TAIWAN

Lu Lu

Department of Physical and Rehabilitation Medicine, National Taiwan University Hospital (Taiwan)

Purpose: To review the recent trends in the assessment of aphasia and the current tools available in Taiwan. Aphasia is a common communication disorder after stroke or other brain disorders. The assessment of aphasia can be done via many different approaches. Traditional aphasic batteries focus on the comprehensive assessment of the severity of impairment in various language components. There are also tests for specific language ability, and tests exploring the underlying cognitive processing deficits. In recent years, assessment of functional communication ability and quality of life is more and more emphasized. There had been limited assessment tools for aphasia in Taiwan. In recent years, several assessment tools have been developed for the use in aphasic patients in Taiwan and some related researches have been done, but more are still needed.

0502B6

LINGUAL KINEMATICS WHEN SPEAKING AT A FAST RATE IN DYSARTHIC AND NONDYSARTHIC INDIVIDUALS POSTSTROKE

Yea-Tzy Chen

The Chung Shan Medical University (Taiwan)

This study aimed to examine, using electromagnetic articulography (EMA), tongue movement of speakers with and without dysarthria poststroke when speaking at a fast rate. Three groups of participants were included: stroke with dysarthria (Stroke+D, $n=10$), stroke without dysarthria (Stroke-D, $n=9$), and a matched control cohort ($n=19$). During tongue-tip and tongue-back sentence production, speed-related parameters (lingual velocity, acceleration, and deceleration), duration of movement, and distance of movement were measured. In both tongue-tip and tongue-back, most kinematic results revealed significant differences ($p<0.001$) among groups. When compared to the controls, Stroke+D patients demonstrated significant differences across most parameters: increased duration of movement and decreased speed-related parameters ($p<0.05$); Stroke-D patients showed significant differences only in velocity and acceleration. In relation to the Stroke-D group, these impairments appear to be at a subclinical level.

Molecules Biology

0502F1

THE EFFECTS OF ULTRASOUND ON TENDON CELLS

Wen-Chung Tsai

Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital (Taiwan)

Purpose: To investigate the effects and molecular mechanisms of therapeutic ultrasound on migration, proliferation and collagen expressions of tendon cells. **Materials and Methods:** Tendon cells intrinsic to Sprague-Dawley rats after ultrasound treatment were used. Cell viability was evaluated by MTT assay. Cell migration was evaluated by transwell filter migration assay. The expression of proliferating cell nuclear antigen (PCNA) protein and types I and III collagen in cells was evaluated by immunocytochemistry. The mRNA expression of PCNA, α -smooth muscle (SM) actin, $\alpha 1(I)$ procollagen, $\alpha 1(III)$ procollagen, and TGF- β were determined by reverse transcription-polymerase chain reaction (RT-PCR). Furthermore, the concentration of TGF- β in conditioned medium was evaluated by enzyme-linked immunosorbent assay (ELISA). **Results:** A dose-dependent increase in the cellularity of tendon cells by either pulsed or continuous mode ultrasound was demonstrated by MTT assay. Ten minutes of treatment achieved maximum cellularity compared to 5-min of treatment time. Dose-dependent ultrasound enhancement was demonstrated on the migration of tendon cells through the transwell filter. Immunocytochemical staining revealed that ultrasound treated tendon cells were stained more strongly for PCNA than were control cells. Up-regulation of PCNA at the mRNA level was also confirmed by RT-PCR. Immunocytochemical staining also revealed that ultrasound-treated tendon cells were stained more strongly for types I and III collagen than were control cells. Upregulation of procollagen $\alpha 1(I)$ gene, procollagen $\alpha 1(III)$ gene, and TGF- β at the mRNA level was confirmed by RT-PCR. A dose-dependent increase in the concentration of TGF- β in conditioned medium obtained from cells treated with ultrasound was demonstrated by ELISA assay. **Conclusion:** Ultrasound stimulates proliferation, migration and the expression of types I and III collagen in a process that is likely mediated by the up-regulation of TGF- β .

0502F2

PROTEOMIC RESEARCH IN AGEING AND REHABILITATION MEDICINE

Carl P.C. Chen, Simon Fuk-Tan Tang

Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital (Taiwan)

Changes in cerebrospinal fluid (CSF) proteins are now widely used in the diagnosis of central nervous system (CNS) age-related diseases. However, little is known about the changes in CSF protein concentrations that occur during healthy ageing to help interpreting clinical studies. This talk will explore the use of neuroproteomics and in situ perfusion of the lateral ventricle choroid plexus (CP) techniques in ageing studies and in rehabilitation medicine. Sheep of wide age range (between 1–9 years) is a good model to be used to comprehensively investigate the changes in CSF and plasma protein concentrations, their CSF/plasma ratios and percentage of protein transport across the blood-CSF-barrier (BCSFB) during healthy ageing. The proteomic technique of 2-dimensional electrophoresis (2-DE) is an ideal tool to identify all the proteins in the CSF and plasma, and their relative concentrations. The steady state in situ perfusion of the lateral ventricle choroid plexus (CP) technique is a reliable method to measure the CSF secretion rate and the amount of drug transport across the BCSFB. In

the process of healthy ageing, CP tissue weight increased significantly with age, while CSF secretion rates and CSF turnover were measured to decrease substantially. Reduced CSF turnover was shown to be the main modulator of the normal CSF proteome. Plasma-derived proteins revealed elevated crossing from blood into CSF during ageing. The production of brain-derived proteins decreased substantially with age. In the steady state *in situ* perfused CP technique, CP epithelial cells were shown to be leakier in the old age as compared to middle age, with increased protein transport across the BCSFB with age. In rehabilitation medicine, 2-DE technique can be used to study the proteome pictures relative to treatment effectiveness. For example, the proteome of the synovial fluid in knee osteoarthritis patients can be analyzed using the 2-DE technique before and after hyaluronic acid injections. The proteins that reveal significant changes in concentrations after treatment can be correlated to the improved clinical symptoms to thoroughly explore the pathophysiological functions of these proteins.

0502F3

THE EFFECTS OF PHYSICAL AGENTS ON MUSCULOSKELETAL CELLS

Chia-Hsin Chen

Department of Physical Medicine and Rehabilitation, College of Medicine, Kaohsiung Medical University (Taiwan)

Physical agents are widely used in rehabilitation fields and sports activities to improve the damaged tissue. The agents include mechanical load, light, electromagnetic waves, and so on. Molecular studies by using physical agents have been also developed. A goal of our research is to apply physical agents to cells or animals. We attempt to search the mechanisms and effects after applying these agents *in vitro* or *in vivo*. Achilles tendon problems are commonly encountered in sports medicine and low-level laser therapy is used in to decrease pain, reduce inflammatory processes and promote tissue healing. We examined the effects on the proliferation of porcine Achilles tendon fibroblasts and gene expression, using different doses of low-level laser irradiation. Whole-body vibration training is applied to improve muscle strength, balance and flexibility. However, the molecular mechanisms of vertical vibration training and their effect on the myogenesis of myoblasts remain undefined. This study was undertaken to address the hypothesis that vertical vibration (VV) can enhance the expression of extracellular matrix (ECM) proteins and myogenic regulatory factors (MRFs) in myoblasts and, in turn, increase myotube formation. VV treatment at frequencies of 8 to 10 Hz can stimulate the expression of ECM proteins and MRFs in myoblasts and, in turn, increase myotube formation. Osteoporosis is characterized in decreased bone density and results in major morbidity and mortality in the elderly. Disused osteoporosis is also found in immobilized patients leading many complications in day life. Electromagnetic field can prevent osteoporosis in animal and human model. Pulsed electromagnetic field (PEMF) promoted fracture healing in non-unions. It also can stop bone loss in sciatic neurectomy. However, it takes much time to obtain the beneficial effects. We develop a novel high dose stimulator, single-pulse and short-duration of PEMF, to increase bony density in animal and to compare the influence with PEMF. While many clinical trials have already demonstrated positive results from the stimulation of physical agents in the musculoskeletal system, we provided some insight into how these clinically observed beneficial effects occur in molecular levels.

0502F4FP

CAVEOLIN-1 DEFICIENCY REDUCES EARLY BRAIN INJURY AFTER EXPERIMENTAL INTRACEREBRAL HEMORRHAGE

***Che-Feng Chang*^{1,2}, *Song-Kun Shyue*², *Tzong-Shyuan Lee*³, *Szu-Fu Chen*^{4,5}**

¹Graduate Institute of Life Sciences, National Defense Medical Center, ²Cardiovascular Division, Institute of Biomedical Sciences, Academia Sinica, ³Department of Physiology, National Yang-Ming

University, ⁴Department of Physiology, National Defense Medical Center and ⁵Department of Physical Medicine & Rehabilitation, Cheng Hsin General Hospital (Taiwan)

Purpose: Spontaneous intracerebral hemorrhage (ICH) is a global health problem with high mortality, accounting for 10–15% of strokes. Despite its public importance, effective medical treatment has been unsatisfactory, and the pathogenesis of ICH-induced brain damage remains incompletely understood. Caveolae is a membrane microdomain within lipid raft. Caveolin-1 (Cav-1) is the major component of caveolae known for its role in regulating cholesterol homeostasis and signal transduction. Cav-1 has been reported to possess a physiological role in central nerve system including maintenance of nerve architecture and regulation of neuronal plasticity. Cav-1 gene mutations were associated with Alzheimer's disease and ablation of the Cav-1 gene increased the extent of cerebral ischemic injury. However, the role of Cav-1 in the pathogenesis of ICH remains unknown. In the present study, we investigated the role of Cav-1 and its underlying mechanisms in the pathogenesis of ICH using a murine model of collagenase-induced basal ganglion hemorrhage. **Materials and Methods:** ICH was induced by microinjecting collagenase VII-S into the striatum of both wild type (WT) and Cav-1 knockout (Cav-1 KO) mice. Brain injury and brain water content were assessed by macroscopic *ex vivo* analysis, luxol fast blue and cresyl violet staining, and wet/dry method. Fluoro-Jade B (FJB) histochemistry and TUNEL staining were performed to label degenerating neurons and apoptotic cells. Neutrophil infiltration and reactive oxygen species production were determined by myeloperoxidase and nitrotyrosine immunostaining, respectively. Enzyme-Linked Immunosorbent Assay (ELISA), western blot and quantitative reverse transcriptase polymerase chain reaction (RT-PCR) were used to examine protein and mRNA expression of inflammatory mediators and heme oxygenase-1 (HO-1). Enzymatic activity of MMP-9 was investigated by gelatin gel zymography. **Results:** Cav-1 was up-regulated in the peri-hematoma area predominantly in endothelial cells. Co-localization of Cav-1 with neurons and microglia was infrequently seen. Cav-1 KO mice had smaller hemorrhagic and injury volumes, less brain edema and neuronal death 1 day after ICH than WT mice. Mechanistically, Cav-1 KO hemorrhagic brain showed marked reduction in leukocyte infiltration, decreased expression of inflammatory mediators, including macrophage inflammatory protein-2 and cyclooxygenase-2, and reduced matrix metalloproteinase-9 activity. Moreover, deletion of Cav-1 suppressed heme oxygenase-1 expression and attenuated reactive oxygen species production after ICH. **Conclusion:** These findings suggest a deleterious role of Cav-1 in ICH-induced early brain injury, which implies Cav-1 as a potential therapeutic target for treatment of ICH.

0502F5FP

THE CROSS-TALK BETWEEN TRANSFORMING GROWTH FACTOR-BETA1 AND ULTRASOUND-INDUCED MATRIX CATABOLISM DURING MECHANOTRANSDUCTION OF RAT TENOCYTES

***Yuna-Hung Chao*^{1,3}, *Ming-Hong Chen*¹, *Jui-Sheng Sun*^{2,5}, *Yang-Hwei Tsuang*⁴**

¹Institute of Biomedical Engineering, National Yang-Ming University, ²Institute of Clinical Medicine, National Yang-Ming University, ³Department of Physical Therapy, Taipei City Hospital, ⁴Department of Orthopedic Surgery, Taipei City Hospital and ⁵Department of Orthopedic Surgery, National Taiwan University Hospital (Taiwan)

Purpose: Therapeutic ultrasound (US) has been found to be an effectively non-invasive treatment for resolving various tendon pathologies. However, scientific evidence of US therapeutic effects and biochemical mechanisms on tenocytes remain limited. This study aims to investigate the effects of US on matrix catabolism, and the crosstalk mechanism between transforming growth factor- β (TGF- β) and US-induced signaling pathways in cultured rat tenocytes. **Materials and Methods:** Tenocytes were harvested from

Achilles tendons of Sprague-Dawley rats. Therasound 3.5 ultrasound apparatus (Rich-Mar Corporation, Inola, USA) at a frequency of 1.0 MHz was used for our study. Ultrasound treatments were performed for 20 min at the intensity of 0.1 W/cm² with three different duty cycles (20%, 50% and 100%, respectively). Control samples were prepared in the same manner without ultrasound exposure. Tenocytes viability and proliferation were assayed by colorimetric MTT (Tetrazolium) assay. Their genes expression was analyzed by real-time polymerase chain reaction. The signaling pathways were evaluated by western blotting of specific proteins. **Results:** In the pilot study, 100 mW/cm² was selected for this study since this parameter was the intensity that attained the highest viability. The effects of ultrasound were first examined at transcriptional level on the expression of MMP-8 and MMP-13 in rat tenocytes. It was found that US treatment (100 mW/cm² for 20 min) significantly enhanced MMP-13, c-Fos and c-Jun mRNA expression, whereas MMP-8 did not show the same trend. In addition, US treatment increased JNK and p38, but not ERK 1/2, phosphorylation at 5 min and sustained for 60 min following US, as shown by Western blotting analysis. JNK Inhibitor SP600125 and p38 inhibitor SB203580, but not ERK 1/2 inhibitor PD98059, attenuated US-dependent induction of MMP-13 expression, indicating that the JNK and p38 pathways are required for US-induced MMP-13 expression in tenocytes. We also investigated the role of TGF- β on US-induced MMP-13 expression and found that SB431542 (TGF- β receptor kinases inhibitor) suppressed US-induced MMP-13 and c-Fos mRNA expression, and p38 phosphorylation. **Conclusion:** This study revealed that US stimulated MMP-13 gene expression through JNK and p38 signaling pathways to regulate matrix catabolism. The crosstalk mechanism between TGF- β and US-induced MMP-13 expression potentially involved p38 signaling pathway and c-Fos gene expression.

0502F6FP

LIVING MUSCLE TISSUES IMAGING WITH AUTOFLUORESCENCE BY USING TWO PHOTON LASER EXCITATION MICROSCOPY (TPEM)

Chien-Cheng Chen¹, Szu-Fu Chen¹, Fu Kang Liu¹, Da-Hsing Wang², Chii-Wann Lin²

¹Cheng Hsing Rehabilitation Medical Center and ²Institute of Biomedical Engineering, National Taiwan University (Taiwan)

Purpose: Two photon laser excitation microscopy (TPEM) makes it possible to image in real-time fluorescently labeled cells located in deep tissue environments and even those weak auto-fluorescent molecules in living cells and tissues. We have successfully demonstrated real-time imaging ex-vivo living muscle tissues without staining procedure by using TPEM, which provide the idea of direct intra-vital observation of myocytes in molecular level with minimal invasive procedure. **Materials and Methods:** The microscope were set as followings : exciting beam as 780 nm Ti-Sapphire pulse laser; Four different fluorescence light channel including: SHG, red light (560–680 nm), green light (495–560 nm) and blue light (435–495 nm) were separated and acquired by dichroic mirror. Without extrinsic fluorescence staining, these signals present different auto-fluorescent molecules or sub-organelles. In order to observe the reaction of muscle tissues to treatment, four different treatment solutions were selected, these are Ginkgo extracts (EGb761); Potassium chloride (KCL); Phosphate buffered saline (PBS); and Normal Saline (NS) as controlled group, muscle samples were cut from anesthetized rats and immersed into solutions around 10 min before scan. **Results:** At the advantage of minimal interference to the tissues and continuous observation (time laps), real-time treatment effects recordings became possible by using TPEM, we found that the muscle cell membrane disrupted quickly in KCL group; On the other hand, The EGb761 group showed less contractility and cells autolyzed in higher concentration; The other two groups showed intact myocyte with micro-peristalsis of membrane lasting over half an hour. **Conclusion:** KCL showed cyto-toxicity to tissues as well-studied, EGb761 preserved or protected muscle tissues at certain concentration, but not in higher concentration,

and these could be real-time obtained and recorded by TPEM. With the characteristics of deep penetration, less photo bleaching, less toxicity, and capability of auto-fluorescence excitation, TPEM enables the monitoring of long-term changes in certain types of cells in a living tissues or animals whether by fluorescent staining or by auto-fluorescent molecules; in this study, we showed that it could be a powerful tool in investigation of muscular patho-physiology in molecular level.

Education and Ethics in Rehabilitation

0502J1

EVOLVING MEDICAL BOARD CERTIFICATION IN THE UNITED STATES

Joel A. DeLisa

Department of Physical Medicine and Rehabilitation, UMDNJ-New Jersey Medical School (United States)

Purpose: Present a continuous process of assessing physician quality of care beyond the basic Board Certification. **Materials and Methods:** Mandate Maintenance of Certification (MOC) process by the American Board of Medical Specialties. **Results:** The MOC program consists of evidence of professional standing, evidence of commitment to lifelong learning and involvement in a periodic self assessment process, evidence of cognitive expertise (closed book proctored examination) and evidence of evaluation of performance in practice (1). **Conclusion:** MOC is a move to continuous assessment of physician quality. Its goal is improved physician performance and improved patient outcomes.

Reference:

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0502J2

STRATEGIES FOR UNDERGRADUATE EDUCATION IN PRM

John L. Melvin, NS Ankam

Jefferson Medical College (United States)

Purpose: The purpose of this presentation is to provide information that might 1) persuade medical school undergraduate curriculum committees to incorporate Physical and Rehabilitation Medicine (PRM) education into their curricula and 2) enable medical students to demonstrate the knowledge and attitudes needed to provide people with disabilities effective and understanding health care. **Materials and Methods:** The information the authors present is from their experiences as faculty members in medical schools with undergraduate PRM curricula, and from related published literature. One (JLM) has chaired PRM departments in two different USA medical schools, both of which have formal PRM courses. The other (NSA) as Assistant Director of Undergraduate Education is directing the comprehensive revision of the PRM curriculum at Jefferson Medical College. **Results:** The following are observations regarding undergraduate medical education that the authors believe are important when planning PRM curricula. 1) Students vary significantly in their perception of the relevance of rehabilitation to their future practices. 2) Students early in their medical education are more likely to see general principles of practice as relevant to their needs. 3) After they have identified their future specialties, students tend to focus on the knowledge and skills they believe necessary for them to practice their choices. 4) A significant number of students choosing procedural specialties fail to see the relevance of rehabilitation. 5) These students are also likely to have the same views regarding the relevance of chronic disease care or geriatrics. 6) Rehabilitation teams have difficulty in integrating students into their clinical activities if the student assign-

ments are short. 7) Students in their last year of medical education value meaningful roles during their clinical assignments. 8) Brief exposure of medical students to PRM principles has limited value in changing their practice behaviours. 9) PRM faculty members are particularly valuable resources for education in functional anatomy, neuromuscular and functional examinations including those of the back and pain assessment and management. 10) Student assignments to clinical rotations are not long enough for the students to follow single patients through their full rehabilitation process. 11) Medical education presents to students a linear approach to clinical problems that they extrapolate to rehabilitation circumstances. From these observations, the authors suggest the following strategies when advocating for and implementing undergraduate PRM curricula. 1) Provide curricular elements in each year of medical education. 2) Incorporate PRM elements into the curricula of other departments, including those focusing on chronic disease care and aging. 3) Present required curricular elements in the early years of medical education and make those in the latter years elective. 4) Design clinical educational experiences in the last two years of medical education to be at least three weeks long. 5) Include both in and outpatient clinical experiences to students so they see the full continuum of rehabilitation care. 6) Assure that students participating in these clinical educational experiences have meaningful roles in the care of patients. 7) Arrange for PRM faculty members and trainees to participate in the courses of other departments that include appropriate anatomy, introduction to clinical medicine, physical diagnosis, pain management and other areas of PRM faculty expertise. 8) Demonstrate the non-linear (ICF) conceptual basis of rehabilitation. **Conclusion:** PRM undergraduate medical education will best succeed if its objectives are a part of those of the curriculum as a whole, and the strategies of meeting those objectives are integrated into the entire undergraduate experience.

0502J3

SUBMISSION AND PUBLICATION OF SCIENTIFIC ARTICLES IN REHABILITATION MEDICINE

Gunnar Grimby

Rehabilitation Medicine, Institute of Neuroscience and Physiology, Sahlgrenska Academy at University of (Sweden)

Aspects are given on: steps before writing and submitting an article, choice of journal for publication, arrangement of a manuscript, authorship requirements, conflicts of interest, copyright, editorial handling of manuscripts, the peer review process, open access. Examples from the publication of Journal of Rehabilitation Medicine will also be presented.

0502J4

TITLE MISSING

Marta Imamura

Abstract missing.

0502J5

EDUCATION AND TRAINING OF PM&R PHYSICIANS IN MAINLAND CHINA

Dahong Zhuo

First Affiliated Hospital Sun-Yat Sen University (China)

Purpose: To identify the critical needs of qualified rehabilitation physicians (physiatrists) in mainland China and to explore appropriate approach to train physiatrist which meets the international standards and practice and adapts to the local situation of mainland China as an oriental developing country. **Materials and Methods:** 1) From the statistics of the population in need of rehabilitation to make a projection on the manpower needs for physiatrist in mainland China; 2) In comparison with the current international standards and practice of training physiatrists to identify the goals and pathway

for China's innovation on the education and training of physiatrists; 3) Based on the social culture and healthcare system of China to explore the characteristic and unique measures and educational goals for physiatrists which China should adopt. **Results:** 1) According to a rough estimate in 2009, The number of PM&R physicians in mainland China is 14131, i.e. about 0.50% of the total number of doctors in medical profession, while the PM&R physician manpower need by 2010 should be 19000 in number; thus the gap is remarkable. Significant shortage of physiatrists was felt by 81.5% of the general hospitals in 1909; 2) Since 2008 China has started her residency program (3 years) to train physiatrists, along with the postgraduate master program (clinical) (also 3 years) of PM&R; 3) Various courses and practical training of clinical rehabilitation constitute the main contents of physiatrist residency program. In addition, traditional Chinese medical rehabilitation and community-based rehabilitation are also included; 4) A complete system of national examination and certification/registration for a qualified physiatrist has to be established and carried out in mainland China. **Conclusion:** Following the current international standards and practice, China has been making progress in recent years in setting up formal system of residency training program to train physicians specialized in PM&R. However, much has to be done before a modernized, complete and integrative system for the training and accreditation of PM&R physicians is established.

0502J6

RESIDENT AND TRAINING OF PMR IN TAIWAN

Alice M.K. Wong

Chang Gung Memorial Hospital (Taiwan)

Due to the endemic infection of poliomyelitis, thousands of children in Taiwan became disabled during the 1950's to 1960's. Urgent rehabilitation treatments and services were needed at that time. As a result, the department of Physical Medicine and Rehabilitation was established in National Taiwan University Hospital in 1963. At that time, physiatrists were sent to the United States for board certified rehabilitation training. The first program for resident training has been started in Department of PMR of National Taiwan University Hospital in 1968. The duration of resident training is four years basically. The training program for PMR resident has been developed and improved during the past decades as the practice of rehabilitation medicine became popular and mature in all levels of hospital in Taiwan in 1980's. Board examination for physiatrists was hold since 1984. The basic requirements of training program for physiatrists need at least three tutor physiatrists for each PMR teaching hospital. The amount of residents is two for each year. Increase number of one tutor physiatrist at that hospital, one more resident is able to be trained per year. The facilities for PMR training hospital should include services of physical therapy, occupational therapy, and speech therapy as well. They should provide out-patient clinics for four or more per week and have PMR in-patient service for 1% of total beds in general hospital with at least ten beds in capacity with laboratory and research facilities. The qualification of training hospital should be reviewed every 3 years. The core curriculum for resident training in PMR includes followings:

1. Skills of physical examination and evaluation of disability, ROM, MMT, ADL, gait, motor development, evaluation of speech, swallowing, and bladder functions, etc.
2. Physical medicine; basic theory and clinical application.
3. Orthoses and prostheses
4. Prescription of rehabilitation program.
5. Certification of disabilities.
6. Rehabilitation for specific diseases, such as orthopedic conditions, neurological disorders, cardiopulmonary disease, pediatric conditions, sport injuries, geriatric conditions, and career rehabilitation, etc.
7. Medical laws and ethics.
8. Laboratory techniques, including electro diagnosis (NCV, EMG), sonography study for soft tissue injuries and cystometry.
9. Basic and clinical researches.

10. Elective courses, such as traditional medicine (acupuncture, manipulation), team physician in gymnastics and athletics. PMR residents who have received training longer than 3.5 years with at least one published paper can apply for board examination held by National Association authorized by Department of Health in Taiwan. They should take written test with 200 questions which covered 28 subcategories in PMR. Oral tests in 8 stations can be taken after passing the written test. Board certification for PMR should be renewed every 6 years for each physiatrist with the requirement of 180 credit-hours of on-job training and 12 credit-hours of medical laws and ethics training. Now, there are 38 teaching hospitals with training program of PMR resident in Taiwan. As a result, rehabilitation services in Taiwan can be widely provided at local clinics, regional hospitals, tertiary hospitals, and long term care facilities of the whole community including small satellite islands in good quality. The prospect for PMR resident training program should improve clinical service, level-up academic background, and strengthen research ability for continuous improvement of quality of training in the future.

0502J7FP

OLDER PEOPLE'S ACCEPTANCE OF FALLS PREVENTION EDUCATION

Moreena Kwa¹, Jane Wu²

¹Rehabilitation Registrar, Westmead Rehabilitation Hospital and
²Rehabilitation Physician, Westmead Rehabilitation Hospital (Australia)

Purpose: 1) To assess the knowledge of cognitively intact elderly at risk factors for falls and interventions for falls prevention. 2) To examine the uptake of a falls prevention education programme in elderly patients with a recent history of falls. 3) To compare the characteristics between the attenders with the non-attenders of these education sessions. **Materials and Methods:** A survey was administered to 100 consecutive cognitively intact, community dwelling patients aged 65 and older admitted to a general rehabilitation unit May–November 2009 with a recent history of falls (last 12 months). They are offered to attend a falls prevention education session conducted by a multidisciplinary team in a small group setting. Topics covered in the session include risk factors for falls and how to minimise or correct these, how to get up from a fall and fracture reduction strategies. **Results:** Overall, 75% of the patients at risk of falls believed that falls can be prevented. When given a list of 9 possible risk factors for falls, the patients could only correctly identify on average 3.3 factors (SD 2.0). When given a list of 10 possible falls prevention strategies, the patients could only correctly identify an average of 3.4 strategies (SD 2.7). The perception of falling as a health problem is relatively low. Despite strong medical and therapist advice, only 60% of patients were willing to attend a multidisciplinary education session on falls prevention. The attenders vs. the non-attenders were similar in age (80 vs. 81 years, $p=0.81$), prevalence of community ambulators (88% vs. 82%, $p=0.41$), prevalence of independence in self-care (87% vs. 90%, $p=0.62$), and the mean number of falls in the preceding 12 months (2.4 vs. 2.2, $p=0.56$). Attenders are more likely to have a positive perception that falls can be prevented (85% vs. 65%, $p=0.01$); have a better pre-test knowledge of risk factors for falling (mean score 3.7/9 vs. 2.7/9, $p=0.016$); have a more positive perception of the usefulness of falls prevention education (mean VAS 6.5 vs. 2.6 out of 10, $p<0.01$); have a higher prevalence of fear of falling (38% vs. 20%, $p=0.05$). Some of the reasons for non-attendance will be explored. **Conclusion:** Uptake of falls prevention education by those elderly patients at risk is suboptimal. Overall pretest knowledge of risk factors for falling and falls prevention strategies is low. More effort is required in promoting the message that falls are preventable and there are many strategies for minimising or correcting the risk factors for falling in the elderly population.

0502J8FP

REHABILITATION DOCTORS' ATTITUDES TOWARDS ETHICS ISSUES

Julia Patrick Engkasan

University of Malaya (Malaysia)

Purpose: To explore rehabilitation doctors' attitudes towards ethics issues faced in clinical practice. **Material and Methods:** This is a descriptive survey conducted in a teaching hospital that has an established Rehabilitation Medicine Unit. A self designed questionnaire was developed to gather basic demographic information and to assess respondents' attitudes on ethics issues. The questionnaire consists of 10 statements describing a clinical situation and the decision made in each situation. The respondents were asked to state whether they agree or disagree with the decisions made. The given clinical situations covers ethics issues such as allocation of limited resources, suboptimal discharge planning, goal setting, truth telling, decision-making, goal setting, autonomy, confidentiality and advanced directives. The questionnaire was disseminated to all rehabilitation physicians and Master of Rehabilitation Medicine trainees through email and by hand. **Results:** Twenty (50%) questionnaires were returned. Ten of respondents are rehabilitation physicians while another ten are trainees. The age ranges from 29 to 52 years old (mean 35.6). 50% had exposure in ethics during their undergraduate training and from workshops. When given a scenario of a vegetative patient, 65% agreed that therapy should be kept to the minimum. If the patient does not take care of self, 55% will not refer patient for expensive procedure such as flap surgery. Even though 60% agreed with the option of sending patient back to a nursing home where they know the care is bad, it is not the same when it comes to sending the patients home. 70% would go against the patient and family decision and would not send the patient home if the family is unable to care for the patient. In early phase of rehabilitation, 63% think that it is not acceptable for doctors to act in the best interest of patients. However, 50% agreed that the team should set the goal for patient in post-acute rehabilitation because at this point of time the patient and the family might not understand the disease process or the impact of disability. When they are required to communicate or write to the insurance company to get what's needed by the patients, 55% do not agree with 'stretching' the truth. In confidentiality issue, 72% will still reveal the information if it is pertinent to the rehabilitation process. 58% will not execute advance directives requested by patients. **Conclusion:** Ethics issues drew varied responses from rehabilitation doctors and this may be related to ethics education.

Electrodiagnosis

0502C1

PITFALLS AND PEARLS IN NERVE CONDUCTION STUDY AND NEEDLE EMG

Shin J. Oh

Distinguished Professor of Neurology, the University of Alabama at Birmingham, (United States)

Nerve conduction represents the physiological status of fast-conducting, larger diameter nerve fibers. It is normal in small fiber neuropathy. Focal segmental demyelinating is the basic pathological process in the entrapment neuropathy. Thus, the focal slowing in NCV is typical of entrapment neuropathy. Diagnosis of demyelinating and axonal neuropathy is usually detected by motor nerve conduction study. This is because sensory compound nerve action potential (CNAP) is usually unobtainable when a NCV is less than 20 m/sec with surface electrode. Conduction block and dispersion phenomenon are two cardinal diagnostic hallmarks of demyelination. These may be the only findings in the entrapment

site. Uniform slowing is the electrophysiological hallmarks of CMT IA. Nonuniform demyelinating neuropathy is the cardinal feature of acquired demyelinating neuropathy, but is also the characteristic nerve conduction findings in Dejerine-Sottas disease, sex-linked CMT IA, and hereditary pressure palsy. Absent sensory CNAP in the presence of normal motor nerve conduction is indicative of sensory neuropathy (sensory ganglionopathy). This is typically observed in Friedreich's ataxia, sensory neuropathy associated with Sjogren's syndrome, and paraneoplastic subacute sensory neuropathy. Absent or low CMAP is not always due to axon loss. Absent or low CMAP response can be due to a total or partial conduction block in the distal segment or to severe atrophy of the recording muscles. F-wave prolongation is not always due to a proximal neuropathy. Since the F-wave pathway includes the terminal latency from the stimulating site to the recording muscle, the F-wave prolongation may be markedly prolonged in severe carpal tunnel syndrome. Slow NCV in the presence of fibrillation and PSW in the needle EMG does not mean that the neuropathy is mixed (axonal and demyelinating). Criteria of demyelination should be present to justify such an interpretation. *Needle EMG*: All needle EMG parameters are useful for the diagnosis of neuromuscular diseases. Studies showed a concordance between the clinical and EMG findings in 80–95% of patients with myopathy and nearly all patients with denervation process. Myotonic potentials are the most specific needle EMG findings and sine qua non in myotonic syndromes. Fibrillations and positive sharp waves (PSW) not always indicative of denervation process because they are also observed in active myopathy. This is one of characteristic findings in inclusion body myopathy (IBM). With nerve injury, PSW and fibrillations are time related: they are absent in the first 5 days. Fasciculations are not always indicative of amyotrophic lateral sclerosis. Fasciculations are rarely seen in normal individuals and common in demyelinating neuropathy. Small amplitude-short duration (SASD) MUPs are not always indicative of myopathy. They are also observed in neuromuscular transmission diseases such as MG, LEMS, and botulism, though they are classically varying in amplitude. High amplitude-long duration (HALD) MUPs are not always indicative of chronic denervation and are also observed in IBM. In mixed pattern of SASD and HALD MUPs, IBM should be considered. HALD MUPs are the most crucial finding in type II and III spinal muscular atrophy. Usually fibrillation and PSW are not observed in these conditions. There is a definite limitation in the pediatric needle EMG.

0502C2

PERIPHERAL NERVOUS SYSTEM ELECTROPHYSIOLOGY: REPORTING PROCEDURES, AND PITFALLS

Gülseren Akyuz

Marmara University School of Medicine, Department of P.M.&R. (Turkey)

The patients have been sent to the electrophysiology laboratories with certain diagnoses or conditions like neck and/or arm pain, low back and/or leg pain, carpal tunnel syndrome, peripheral neuropathy, and peripheral nerve injury. During the electrodiagnostic investigation, these problems have been classified and then, the etiology, severity and sometimes the prognosis of the conditions have been clarified. The electrodiagnostic investigation is very important, because the exact diagnosis will bring about the effective treatment. Clinical examination is not very different than those of other medical specialties. There are two important points in putting the diagnosis: gathering the information and hypothesis testing. Information gathering starts with a detailed history taking and a good physical examination. The list of hypotheses will then form the differential diagnosis. Each hypothesis should be tested and verified or rejected. This process requires experience and expertise. The array of referring physicians can be quite variable. Some could easily interpret the findings of electrodiagnostic study, while others have a very limited information on the study process

and the place of findings. A physician sending a peripheral nerve injury patient to the laboratory might expect a detailed study, and could interpret the results accordingly, whereas, an endocrinologist sending a diabetic patient for a possible neuropathy probably does not want a detailed study. Commonly, EMG reports are done in two ways: In the first one, numeric values are summarized followed by a detailed interpretation or comments; the second, on the other hand, includes detailed numeric values and a short diagnosis or comment. The favourable one could be something between the two approaches. Some detailed reports bear the risk of inattention to some or most parts. In addition, only a minority of referring physicians could understand the whole electrodiagnostic report, especially the numeric data. Actually it is known that most doctors only read the comment, or the final diagnosis. Another point is to use common terms and to avoid exaggerated words or diagnoses. A good communication with the patient, understanding the problems and fears of them, providing information about the study and obtaining a verbal and/or written consent. As a result, a correct diagnosis and preparation a good report are difficult and need experience in electrodiagnostic evaluation.

0502C3

POST POLIO – ETIOLOGY, DIAGNOSIS AND TREATMENT

Gunnar Grimby

Rehabilitation Medicine, Institute of Neuroscience and Physiology, Sahlgrenska Academy at University of Gothenburg (Sweden)

Poliomyelitis is a virus mediated lower motor neurone disorder affecting the anterior horn cells. Polio survivors may develop new symptoms, an entity being post polio syndrome (PPS) define as prior paralytic polio with evidence of motor neuron loss and signs of denervation on EMG, a period of partial or complete recovery, gradual or sudden onset of new muscle weakness or abnormal fatigability, muscle atrophy, or muscle and joint pain, and no other causes of the symptoms. The etiology of the reduced muscle function is primarily due to an ongoing denervation / reinnervation, which has reached its upper limit. Besides an increase in the size of the motor units there is usually also a compensatory muscle fibre hypertrophy. There may be several factors leading to the reduced number of motor units and muscle fibres, as inability to maintain the increased metabolic demand of the enlarged motor units and all terminal axonal sprouts, enhanced aging effects, and immunological factors. Pain may be due to different biomechanical factors and to overexertion. The diagnosis of PPS should be based on the criteria above, keeping in mind that also polio survivors not fulfilling the PPS criteria may need medical attendance for their symptoms. After clinical history, specifically on post polio symptoms, is taken the examination should include assessment of muscle and respiratory function. Muscle strength should be measured and EMG recorded in relevant muscle groups. Measurement of the size of motor units will indicate risks for reduced function at very large motor units, Note that also muscles, which have been considered "normal" may show new muscle weakness, as they were polio affected but well compensated. Causes of pain should be analysed. Activity patterns should be evaluated. The treatment should be based on a multi professional team approach. Advices should be given on the activity pattern in daily life. Most patients except those with most reduced function may benefit from some form of resistance and/or endurance training. This should be individually chosen (also for specific muscles) after functional assessment. In the lecture advices on intensity will be given. Pool exercise has shown to be beneficial. Measures should be taken to reduce pain. Respiratory dysfunction may require ventilator assistance. There is no clear evidence for pharmacological treatment except recent positive results of intravenous immunoglobulin. Orthoses and assistive devices should be prescribed when indicated. Aspects on adaptation in daily activities and need for changes in working situation should be considered.

0502C4

PERIPHERAL NERVE ELECTRODIAGNOSIS IN REHABILITATION MEDICINE**Zongyao Wu***Department of Rehabilitation Medicine, Southwest Hospital (China)*

Purpose: To illuminate some confusion in peripheral nerve electrodiagnosis. **Materials and Methods:** Based on years experience in treatment of peripheral nerve injury after civil and war events, we emphasize some confusion in the use of electrodiagnosis. **Results:** Electrodiagnosis is necessary in the whole course of rehabilitation. It is used to determine if there is peripheral nerve injury and where it is? Is it neurapraxia? axonotmesis? or neurotmesis? Is the injury partial or complete. How to treat and how the rehabilitation treatment effect is? If the operation is necessary or not? If the surgery is success. Its most advantage is sensitive and prompt in detecting peripheral nerve abnormal. It can find out the abnormal earlier than morphological diagnosis, such as CT, MRI, and ultrasound. Every kind of electrodiagnosis may be useful in peripheral nerve injury treatment including electromyogram, nerve conduction and evoked potential study. Electrodiagnosis is popular and wellknown among physiatrists. We shall emphasize some confusion often overlook. The one is number of polyphase motor unit potential. It is defined as a motor unit potential changes direction once is a peak. Peak goes across baseline is a phase, not across baseline is a turn. So that number of turns must be equal to or more than phase. A motor unit with more than 3 phases or more than 4 turns is polyphase or serrated. A muscle with too many polyphase unit or serrated is abnormal. The rate or polyphase or serrated potentials in normal muscles is different from muscles. But different author take different standards to identify a turn or phase. So as the norms of polyphase potential in normal muscle is different and phases is more than turns in some case. In hundreds patients after operation on lumbar disc hernia, we found that if we setup polyphase potential 30% or more as abnormal, the consistency of electromyography and operation found is more than 90%. If we setup a standard of 20%, it would be too many false positive diagnoses. The other confuse may be the volume conduction and anastomosis influence in the electrodiagnosis. Nerve conduction velocity varied a lot. Someone collected a lot of normal value from different literatures. The range is so wide. We have to take care of the normal limit in diagnosis. More reliable is compare the homonymy nerve or muscle in left and right, the involved and not involved even though the EPs are used for detect the abnormal in central nerve system, but it is also useful in confirm or negate a diagnosis with peripheral nerve abnormal. Some peripheral nerve injury are denied by EP study in our cases. **Conclusion:** Even though electrodiagnosis in peripheral nerve injury is well-known, how to use it comprehensively and correctly is still a challenge.

0502C5

ON-NERVE NEEDLE NERVE CONDUCTION STUDY: HISTOLOGICAL BASIS OF NCS, CONVERSION FACTOR, AND ITS CLINICAL RELEVANCE**Shin J. Oh***Distinguished Professor of Neurology, the University of Alabama at Birmingham, (United States)*

Purpose: For the recording of CNAPs, the use of surface electrodes is widely accepted as the standard method. This method is easy and less time consuming, but the amplitude of CNAPs is usually smaller and small components are not recordable. When active recording needle electrode is used instead of surface electrode and placed on the exposed nerve to record CNAP, more accurate CNAP would be obtained. **Materials and Methods:** We performed the intra-operative on-nerve nerve conduction study (ON-NCS) in 54 patients with peripheral neuropathy during the sural nerve biopsy. In the ON-NCS, CNAPs were recorded antidromically by placing active recording

needle electrode on the exposed nerve and by stimulating a sural nerve over mid-calf with surface electrodes. We also performed the conventional NCS (CV-NCS) with surface electrodes to record CNAPs in the sural nerve. In the sural nerve, we examine a correlation with the density of large myelinated fibers (MF) and the amplitude of CNAP, and a correlation with the density of large MFs and the maximum NCV. In addition, we calculated the conversion factor (CF) in normal and abnormal nerves. **Results:** Among the analyses in various different diameters, the best correlation was found in the density of MFs of more than 7 μm in diameter with the CNAP amplitudes ($R^2=0.749$), and MFs of more than 8 μm in diameter with the maximum NCV ($R^2=0.7663$). This finding remained true even with demyelination or axonal degeneration. In the density of MFs, there was no significant difference between the plain correlation and the log 10 correlation. When it was related to the maximum NCV. In the sural nerve, number of MFs of more than 7 μm in diameter is the key in the CNAP amplitude and number of MFs of more than 8 μm in diameter is the key in the maximum NCV. The CF in normal sural nerves was 4.3 ($n=2$), and the CF in axonal neuropathy was close to the normal value (3.85 ± 0.55 , $n=4$). However, the CF in demyelinated neuropathy was smaller than the normal value (2.77 ± 0.47 , $n=24$), indicating disproportionately slower conduction than expected from the diameter of nerve fibers. We found that the CF was helpful in differentiation demyelinating neuropathy from axonal neuropathy. From this, we propose that 36% decrease from the mean value of NCV is a reasonable criterion for demyelination. The amplitude of CNAPs was higher in the ON-NCS than the CV-NCS ($p<0.001$). The duration of CNAPs was longer in the IO-NCS than the CV-NCS ($p<0.001$). However, there was no significant difference in the fastest or the negative peak NCV between the ON- and CV-NCS. In the ON-NCS, in 12 cases, the CNAPs could be recorded due to the proximity of recording electrode to the nerve when the CNAPs were absent in the CV-NCS. The latency of the initial positive peak was determined with greater precision in the ON-NCS than the CV-NCS. In 7 cases, we changed our interpretation by the IO-NCS, because abnormal temporal dispersion was observed. **Conclusion:** 1) The ON-NCS is more accurate in identifying abnormality than the CV-NCS. 2) Numbers of MFs of more than 7 or 8 μm are responsible for the NCV and CNAP amplitude; and 3) 36% decrease from the mean value of NCV is a reasonable criterion for demyelination.

Pain Management: Part 3

0502G1

PAIN MANAGEMENT**Marta Imamura***Collaborative Professor University of Sao Paulo School of Medicine, Department of Orthopaedics and Traumatology, Department of Orthopaedics and Traumatology (Brazil)*

Contemporary pain management has shifted from symptom control to management based on the pathophysiological mechanisms of pain. This has been associated with improvements in function and health-related quality of life as well as avoidance of therapeutic toxicity. The clear understanding of the complex mechanisms involved in pain generation, modulation, amplification and perpetuation plays a critical role in a comprehensive pain control program for chronic disabling pain patients. Recently, it has been recognized that constant and intense nociceptive sensory information generated by painful, inflamed deep somatic structures produce significant neurochemical and metabolic changes and reorganizations within corresponding spinal cord segments. These changes include an increased excitability of dorsal horn neurons producing pain hypersensitivity in a segmental distribution. Together, these neurochemical changes suggest that pain induces and is partially maintained by a state of central sensitization in which an increased transmission of nociceptive information allows normally non-noxious input to be amplified and perceived as noxious stimuli. Once these complex mechanisms

are present, the rationale for treatment approaches should also target the central nervous system structures rather than using local anti-inflammatory agents alone. Important to note, is that these spinal cord changes may not be attenuated by blocking the original tissue damage and pain and refractory pain may persist even after the removal of the etiological factors. In fact, changes in the central nervous system associated with chronic pain may cause peripheral inflammation. Diagnosis of central and peripheral sensitization is, therefore, very important because spinal cord neurons that normally would only be activated by noxious stimuli are now activated by normally non noxious stimuli, a phenomenon widely known as allodynia. Despite the clinical importance, negative functional and quality of life impact and the extensive research creating an increasing body of knowledge in the field of chronic disabling pain syndromes, the pathogenesis of fibromyalgia syndrome, for example, is not yet well understood. In fact, emerging evidence suggests that complex central nervous system (CNS) dysfunction involving changes in peripheral and central structures plays an important role in the maintenance of chronic pain. Spinal Segmental Sensitization (SSS) is a hyperactive state of the spinal cord caused by irritative foci sending nociceptive impulses from a sensitized damaged tissue to dorsal horn neurons. The clinical manifestation of dorsal horn sensitization includes hyperalgesia of the dermatome, pressure pain sensitivity of the sclerotome and myofascial trigger points within the myotomes, which are supplied by the sensitized spinal segment. Shah et al. (2005) found that active myofascial trigger points present lower pressure pain threshold when compared to people with no pain or the presence of only latent trigger points. They also demonstrated the distinct in-vivo biochemical milieu of muscle with significant elevated levels of substance P, calcitonin gene-related peptide (CGRP), bradykinin, tumor necrosis factor- α (TNF- α) and interleukin-1 β (IL-1 β), serotonin, and norepinephrine in the vicinity of the active myofascial trigger point at the upper trapezius muscle. Overall, pH was significant lower in the active trigger point. Treatment rationale and techniques may evolve from this information, and should be taken into account when dealing with chronic patients with amplified pain responses. Irritative foci in the form of myofascial trigger points (MTrPs) located within the associated myotomes and tender spots in the supra/interspinous ligaments (SSL/ISL) of the segment frequently lead to SSS. The mechanism consists of the nociceptive stimuli generated in the sensitized areas bombarding the dorsal horn of the spinal cord. This causes central nervous system sensitization with resultant hyperalgesia of the dermatome and sclerotome and spreads from the sensory component of the spinal segment to the anterior horn cells, which control the myotome within the territory of the SSS. The importance of SSS is emphasized by the fact that it is consistently associated with musculoskeletal pain. Patients with chronic disabling neuromusculoskeletal pain due to moderate and severe knee osteoarthritis presents hyperalgesia of central nervous origin that negatively impacts knee functional capacity and most aspects of quality of life. In fact, combined pressure pain thresholds measured by a pressure algometer over the patellar tendon, at S2 subcutaneous dermatome and at the adductor longus muscle were the best predictors for pain scores rated at a visual analogue scale, Western Ontario and McMaster Universities Osteoarthritis Index, accounting for 61% of those scores in patients with knee osteoarthritis. The development or amplified activity of MTrPs is one of the clinical manifestations of SSS. Failure to recognize and diagnose SSS often leads to only temporary deactivation of MTrPs, since physical therapy and trigger point injection procedures are aimed at treating the peripheral MTrPs without addressing the segmental dysfunction. This may lead to transient benefit rather than long term relief because MTrPs and their associated symptoms frequently recur. Eradication of the sensitized spinal segment by the technique of paraspinal block (PSB) with 1% Lidocaine effectively desensitizes (reverses to normal sensitivity) the SSS by blocking the nociceptive impulses from the SSL/ISL and prevents afferent bombardment of the dorsal horn. Subsequent needling and infiltration of the SSL/ISL with 1% Lidocaine as well as needling and infiltration of MTrPs in the myotome of the

territory of the sensitized spinal segment leads to long term relief of neuromusculoskeletal pain and dysfunction. The application of shockwave therapy to rat skin decreases calcitonin gene-related peptide expression in dorsal root ganglion neurons and might also relieve pain by decreasing central sensitization. Radial shockwave therapy seems to be better than placebo to decrease pain. There is also limited, however emerging evidence of the peripheral role of botulinum toxin in the management of chronic neuromusculoskeletal pain. Finally, plastic changes in the spinal cord might induce changes in other central nervous system structures such as the limbic and the somatosensory cortex. Both mechanisms, if not addressed properly may play a role in the maintenance of the chronic pain state. Modulation of the primary cortex by non invasive brain stimulation techniques including high frequency repetitive transcranial magnetic stimulation, anodal transcranial direct current stimulation and new alternate low frequency currents demonstrated to be superior to placebo to achieve chronic pain relief.

0502G2FP

THE APPLICATION OF SURFACE ELECTROMYOGRAPHY ON TREATING LUMBAR DISC HERNIATION

Jing-Song Mu, Ni Chao-Min Ni, Qing Xia, Yun Miao

Department of Rehabilitation Medicine, Affiliated Provincial Hospital of Anhui Medical University (China)

Purpose: To explore the application of surface Electromyography (sEMG) on treating Lumbar Disc Herniation (LDH). **Materials and Methods:** Fifty subjects with LDH underwent proprioception enhancement training and Mckenzie therapy for one month. sEMG was used to record the activities of lumbar paraspinal muscles during isometric contraction pre-treating and after 1 month. **Results:** After treatment, 16 cases are marked, 32 are effective, and 2 are invalid, the rate of improvement is $54.25\% \pm 15.74\%$. There are significant difference for sEMG between healthy and suffered side before treatment ($p < 0.05$); absolute values of MFs for sacrospinal in the affected side were significantly reduced as compared to pre-treating, AEMG of suffered side were increased ($p < 0.05$); no statistical differences were observed after training between healthy and suffered side ($p > 0.05$). **Conclusion:** sEMG may be used as an objective tool for evaluation of therapeutic effect of patient with LDH.

0502G3FP

EFFECT OF SITTING POSTURES ON LUMBAR MULTIFIDUS AND INTERNAL OBLIQUE FATIGUE

Pattanasin Areeudomwong¹, Rungthip Puntumetaku², Sawitri Wanpen², Nareumon Leelayuwat²

¹Division of Physical Therapy, Faculty of Associated Medical Sciences, Khon Kaen University and ²Back, Neck and Other Joint Pain Research Group, Khon Kaen University (Thailand)

Purpose: To investigate the fatigability of lumbar multifidus (LM) and internal oblique (IO) muscles using a surface electromyography (sEMG). **Materials and Methods:** This study is a cross-over design. Twenty-three healthy Thai men aged 20 to 30 years were asked to perform the crossed sitting and heel sitting postures for 30 min in each sitting posture on two occasions. Normalized median frequency slopes (normalized MF slope) of the muscles were recorded to investigate their fatigue throughout 30 min. **Results:** The results revealed that the normalized MF slopes of all muscles provided from the crossed sitting posture are significantly greater than those from the heel sitting posture ($p = 0.014$ in right LM, $p = 0.044$ in left LM, $p = 0.041$ in right IO and $p = 0.044$ in left IO, respectively). **Conclusion:** We conclude that the crossed sitting posture provides greater fatigability of lumbar multifidus and internal oblique muscles than the heel sitting posture does.

0502G4FP

INCREASED BOTH CONTRACTILE SUBUNIT PROTEIN PHOSPHORYLATION SIGNALING AND ENDPLATE NOISE PREVALENCE IN MYOFASCIAL TRIGGER SPOTS OF RABBIT SKELETAL MUSCLE

Ta-Shen Kuan¹, Shu-Min Chen¹, Jo-Tong Chen¹, Ping-Yen Liu², Chi-Hsien Chien³, Tsui-Ting Yeh⁴, Chang-Zern Hong⁵

¹Department of Physical Medicine and Rehabilitation, National Cheng Kung University, ²Division of Cardiology, Department of Internal Medicine, National Cheng Kung University, ³Department of Cell Biology and Anatomy, National Cheng Kung University, ⁴Yi-An Rehabilitation Clinic and ⁵Department of Physical Therapy, Hungkuang University (Taiwan)

Purpose: Myofascial trigger point (MTrP) is a hyperirritable spot located in the taut band of skeletal muscle. The characteristic of electromyographic activities recorded from an MTrP locus is endplate noise (EPN). EPN is probably related to excessive leakage of acetylcholine in the neuromuscular junction, which causes focal contraction of myofibrils in the endplate zone and then the formation of the taut band, and finally the MTrP. The pathogenesis of MTrP could be attributed to the “energy crisis” hypothesis from local hypoxia. Several subcellular contractile signaling pathways may be linked to focal contracture of the taut band. We thus hypothesized that local hypoxia caused by focal subcellular contraction proteins’ activation could result in “energy crisis” in associated with increased EPN numbers. The objective of this study is to measure the expression and phosphorylation of the proteins in an MTrP rabbit model and also to delineate their association with MTrP. **Materials and Methods:** Three adult New Zealand rabbits (3–5 Kg) were investigated and their bilateral femoris biceps were exposed. Three points in each femoris biceps were located and compared: Point A: a myofascial trigger spot (MTrS; equivalent to MTrP in human MPS), a most irritable point on the taut band; Point B: a point on the taut band, but is not an MTrS; Point C: a point outside of the taut band, and is not an MTrS. The prevalence of EPN loci in each point was assessed (EPN mapping). Muscles around these three points were biopsied for further analyses of the expression and phosphorylation of possible subcellular contractile proteins using Western blot method. **Results:** The prevalence of EPN was highest in Point A (mean 3.8), which was followed by Point B (mean 1.7), and then by Point C (mean 0.2). Compared with Point C, the degree of both phosphorylation and expression amount of the muscular contraction proteins, including rho-associated coiled-coil containing protein kinase-2, mitogen-activated protein kinase, extracellular signal-regulated kinases 1 and 2, and JNK pathway were highest in Point A with greatest EPN numbers (3.15–4.03 times of Point C, $p < 0.01$; 1.18–1.45 times of Point B, $p < 0.05$; $n = 3$, respectively) and followed by Point B with less EPN numbers (2.68–2.78 times of Point C, $p < 0.05$; $n = 3$). Furthermore, the number of EPN was well correlated with the degree of protein phosphorylation ($p < 0.05$). **Conclusion:** This is the first study to demonstrate that the expressions and the degrees of phosphorylation of muscular contraction associated proteins are increased and correlated with the prevalence of EPN in a rabbit MTrS model. It further supports our current concept of the pathophysiology of MTrP and is emerged for the development of new strategy on treating MPS.

0502G5FP

COMPARISON OF MIRE AND TRADITIONAL PHYSICAL THERAPY FOR THE INHIBITION OF THE IRRITABILITY OF MYOFASCIAL TRIGGER SPOT OF RABBIT SKELETAL MUSCLE

Wei-Chih Lien¹, Shu-Min Chen¹, Jo-Tong Chen¹, Ta-Shen Kuan¹, Chi-Hsien Chien², Chang-Zern Hong³

¹Department of Physical Medicine and Rehabilitation, National Cheng Kung University, ²Department of Cell Biology and Anatomy, National Cheng Kung University and ³Department of Physical Therapy, Hungkuang University (Taiwan)

Purpose: MIRE, monochromatic infrared photo energy, is one kind of photon therapy (890 nm of wave length). It has been reported that it is useful for the restoration of sensation and reduction of pain in diabetic peripheral neuropathy. The vasodilatation effect of MIRE might play a major role in its therapeutic effectiveness. The pathogenesis of myofascial trigger point (MTrP) has been attributed to the “energy crisis” hypothesis (local hypoxia) from current animal and human studies. The characteristic of electromyographic activities, the endplate noise (EPN), can be recorded much more frequently from an MTrP locus than from other sites. The prevalence of EPN has been proven to be highly correlated to the irritability of an MTrP. Our previous study had shown that MIRE could significantly inhibit the irritability of myofascial trigger spot (MTrS; equivalent to MTrP in human) in rabbits. The objective of this study is to compare MIRE and traditional physical therapy (tPT) for their decreasing effect on the prevalence of EPN of an MTrS in rabbit skeletal muscle. **Materials and Methods:** We investigated 12 adult New Zealand rabbits (3–5 kg) and located MTrSs in their femoris biceps muscles. We randomly selected an MTrS in one side of femoris biceps as the experimental group (treated with MIRE), and another MTrS on the other side of femoris biceps as the control group (treated with tPT). The protocol for MIRE consisted of a daily 40 min treatment, three times per week for 2 weeks. The same treating schedule was applied for tPT, except that the interventions were hot packing for 20 min and electrical stimulation for 20 min. The prevalence of EPN in an MTrS region (EPN mapping) was assessed before, immediately after, and one week after completion of the whole course of the intervention. **Results:** In the experimental group, the mean values of the prevalence of EPN in an MTrS before the intervention of MIRE, immediately after MIRE, and one week after MIRE were 13, 8, 9, respectively. In the control group, the mean values of the prevalence of EPN in an MTrS before the intervention of tPT, immediately after tPT, and one week after tPT were 11, 11, 10, respectively. The decrease of EPN prevalence in an MTrS was statistically significant in the experimental group ($p < 0.01$). **Conclusion:** Our study showed that the irritability of an MTrS could be inhibited significantly more by MIRE treatment than by tPT. The result suggested that, compared to tPT, MIRE might be a more effective strategy for the management of MTrP.

0502G6FP

THE CHARACTERISTICS OF POLYSOMNOGRAPHIC FINDINGS AMONG THE PATIENTS WITH CHRONIC NECK – SHOULDER PAIN

Hung-Sheng Chen¹, Shih-Ching Chen¹, Song-Hung Tseng¹, Jiunn-Horng Kang^{1,2}, Fu-San Jaw², Hsu-Kuei Lin³

¹Department of Physical Medicine and Rehabilitation, Taipei Medical University Hospital, ²Institute of Biomedical Engineering, National Taiwan University and ³Department of Electrical Engineering, National Taiwan University (Taiwan)

Purpose: Sleep problem is a common complaint among the patients with chronic shoulder neck pain. The bidirectional interaction was also noted between chronic pain and sleep. Furthermore, although the mechanism is unknown, increased surface electromyographic (sEMG) activity during sleep among the patients with chronic neck-shoulder pain has been reported. Polysomnography (PSG) is a well-established objective tool to investigate the human sleep. The goal of this pilot study is to evaluate the characteristics of PSG findings over night among patients with chronic neck-shoulder pain. **Materials and Methods:** Patients who chronic neck-shoulder pain for more than three months were included in this pilot study. We excluded the patients who had known systemic rheumatologic diseases, malignancy, previous neck trauma or surgery and co-existing cervical

radiculopathy. The overnight PSG were conducted according to the standard of American Sleep Medicine Association in a sleep lab in eight patients with pain and eight healthy controls. Additional sEMG channels over bilateral neck-shoulder area (trapezius muscles) were included during recording. Mann-Witney U test was performed to analyze the sleep variables between two groups. Fisher exact test was computed to analyze the associated sleep conditions between two groups. Alpha level was set as $p < 0.05$. **Results:** Although there is no difference of sleep efficiency between two groups, we found significantly increased sleep fragmentation and spontaneous arousal ($21.0 \pm 4.2/\text{hour}$ vs. $16.4 \pm 5.4/\text{hour}$, $p = 0.03$) in PSG among the patient with chronic neck shoulder pain. Increased alpha intrusion of EEG ($p < 0.01$) and periodic limb movement index ($16.8 \pm 27.5/\text{hour}$ vs. 4.2 ± 2.2 , $p = 0.02$) were also noted among the patients with chronic neck shoulder pain. The difference of apnea-hypopnea index between two groups was not significant. The root mean square of SEMG of trapezius muscle during sleep was significantly higher among the patients with chronic neck-shoulder pain ($3.4 \pm 1.2\%$ peak vs. $1.8 \pm 0.7\%$ peak, $p < 0.01$). **Conclusion:** Our study indicated the objective sleep parameters could be altered among the patients with chronic neck shoulder pain. Increased sleep fragmentation and sleep movement disorders were noted which could be associated with pathomechanism of chronic neck shoulder pain. We propose the central mechanisms could be involved in disturbance of sleep and pain development among these patients.

0502G7FP

THE IMMEDIATE EFFECTS OF A SINGLE THORACIC MANIPULATION ON CERVICAL RANGE OF MOTION AND PAIN IN PATIENTS WITH CHRONIC MECHANICAL NECK PAIN: A RANDOMIZED CONTROLLED TRIAL

Thavatchai Suvarnato¹, Rungthip Puntumethaku², Yodchai Boonphakop², Suphaporn Phadungkit², Preeda Arayawichanon³

¹Physical Therapy Program, Graduate School, Khon Kean University, ²Back, Neck and other Joint Research Group, Faculty of Associated Medical Sciences, Khon Kean University and ³Department of Physical Medicine and Rehabilitation, Faculty of Medicine, Khon Kean University (Thailand)

Purpose: To investigate the immediate effects of single thoracic manipulation on cervical range of motion and pain level. **Materials and Methods:** Twenty subjects with chronic mechanical neck pain participated in this study. Each subject was measured cervical range of motion by a Cervical Range of Motion (CROM) and assessed pain level by a visual analog scale (VAS) immediately before and after treatment intervention. Subjects were randomly allocated into two groups; single thoracic manipulation (intervention group) or prone lying (control group). **Results:** The results demonstrated that subjects received single thoracic manipulation group showed a significant increase in cervical range of motion in flexion ($p = 0.004$) and left rotation ($p = 0.001$) direction but no significance in pain level ($p = 0.91$). **Conclusion:** In conclusion the results suggest that the single thoracic manipulation results in increasing of cervical flexion and left rotation movements in patients with chronic mechanical neck pain.

0502G8FP

INTRA-ARTICULAR BOTULINUM NEUROTOXIN TYPE A FOR ADVANCED KNEE OSTEOARTHRITIS

Chen-Liang Chou^{1,2}, Shin-Yo Lu¹, Ko-Lun Tsai¹, Chung-Yu Ho¹, Hsuan-Chu Lai¹, Si-Huei Lee^{1,2}

¹Department of Physical Medicine and Rehabilitation, Taipei Veterans General Hospital and ²Department of Physical Medicine and Rehabilitation, National Yang-Ming University, School of Medicine (Taiwan)

Objectives: Osteoarthritis (OA) is a major cause of musculoskeletal pain that causes morbidity, physical limitation associated with functional limitation and poor quality of life. The purpose of this study was to evaluate the pain reduction of botulinum neurotoxin A (BoNT/A) intra-articular injection for advanced knee OA. **Methods:** 24 patients (total 38 advanced OA knees) were enrolled in this study. The subjects were radiographically verified as stage III or IV according to Kellgren-Lawrence classification. We used WOMAC for pain measurement and then evaluate the therapeutic effects every month for totally 6 months. BoNT/A (Botoxin 100 U) was reconstituted with 4.0 ml of saline and was injected to symptomatic OA knee joints after baseline evaluation and 3 months later. We also measured the circumference of thigh to evaluate if there was any muscle. **Results:** The therapeutic effects of BoNT/A IA was clinically significant but statistically significance was noted 3 months after first BoNT/A IA and maintained till the endpoint of our study. The therapeutic effects were significant in stage III OA knee pain with statistically significance. There was no significant difference between stage III and IV groups. There was no difference in thigh circumference between study groups. **Conclusions:** BoNT/A IA injection can provide a new therapeutic option for refractory pain in advanced OA knee patients. Though BoNT/A IA is effective and safe for the management to chronic advanced OA knees, the results can not be generally used to patients with mild knee joint pain or non-specific soft tissue pain in knee joint region.

0502G9FP

OCCIPITAL NERVE STIMULATOR THERAPY FOR A REFRACTORY CERVICOGENIC HEADACHE

Linqiu Zhou^{1,2}, John Villanueva¹, Christopher Hennessy²

¹Jefferson Medical College, Thomas Jefferson University and ²Underwood Memorial Hospital (United States)

Purpose: Cervicogenic headache (CeH) is a headache originating from the cervical spine. The treatment for CeH is challenging for clinicians. This study is to assess the efficacy of occipital nerve stimulator therapy for the treatment of refractory CeH. **Materials and Methods:** This is a retrospective chart review. 9 patients (3 male, 6 female, mean age = 46) with clinical diagnosis of CeH. 8 patients had a history of cervical decompression and fusion and 1 had a history of cervical herniated nucleus pulposus. All failed conservative therapies (physical therapy, medications, and epidural injections). All received temporary pain relief from cervical C1-2, C2-3 facet and C2 and C3 spinal rami blocks. All then underwent a percutaneous occipital nerve stimulator trial. 8 patients received > 50% and one had 20-40% of headache reduction during this trial. **Outcome Measure:** The change from baseline head pain intensity, rated using a numerical pain scale (NPS), and the duration of pain relief. Patients who received permanent implantation were followed up from 1 to 3 years. **Methods:** After routine preparation and sedation, a 15 gauge 10 cm spinal needle was inserted 2 cm on the contralateral side (1 cm below the occipital protuberance) towards the headache site until the needle tip was close to the posterior temporal fascia. If the patient had bilateral CeH, a second needle was inserted using similar technique. After accurate position was confirmed fluoroscopically, an 8-electrode spinal stimulator lead was inserted. The spinal needle was then removed. Patients were awakened to test whether the stimulant provided pain relief. Eight CeH patients from the trial, who received at least 50% of pain relief on the NPS, underwent bilateral stimulator implantation. This procedure involved anchoring the stimulator lead to skull fascia with 1-0 silk suture after making a 5 cm "T" shape incision and blunt dissecting the skin and skull fascia (a precaution: avoiding damage to the occipital nerve and vessels). A pulse generator was then implanted. **Results:** Of the eight patients receiving permanent stimulator implantation, all had at least 75% occipital and parietal headache relief, including two reporting 99% relief on the NPS. Four patients received > 50% of pain relief at the trigeminal nerve distribution. Four patients had

some pain relief at the supraorbital and temporal nerve distribution. All patients had decrease of the frequency and shortening of the duration of headache and decreased taking pain medications. All eight returned to their normal activity level. **Conclusion:** Based on the International Headache Society (IHS) criteria, CeH presents as a non-shifting unilateral or bilateral headache, originating from the neck with radiation to the occipital parietal region. Some have headaches similar to trigeminal neuralgia due to the greater, lesser and third occipital nerves (the occipital parietal region) converging with the trigeminal nerves in the lower brain stem and upper cervical spine. The treatment for CeH is challenging, as there are no definite or effective modalities available. This study demonstrates that occipital nerve stimulators may provide satisfactory pain relief for a long duration of time.

Pain Management: Part 4

0502K1

PICTORIAL GUIDES TO MYOFASCIAL PAIN

Yoon Kyoo Kang

Dept. of Rehabilitation Medicine, College of Medicine, Korea University (Republic of Korea)

Purpose: Myofascial pain patterns are referred pain felt at a site remote from the site of origin - trigger points. There is no general rule for guessing the referred pain pattern of an individual muscle. Purpose of this study is to help understanding the myofascial pain, finding an easy way and to memorize the pain patterns from individual myofascial trigger point. **Materials and Methods:** I try to classify the 169 referred pain patterns in volumes 1 and 2 of the Myofascial Pain and Dysfunction: the Trigger Point Manual by [Simons & Travell, 1989, 1999]. Classification was done in several ways, morphology and functions of the muscles and neurological myotome and dermatome. Referral patterns also analyzed distribution of the pain areas, especially LOCATION and shape. **Results:** Simons et al. reported as follows. Most common direction of the referral is peripheral (to distal), 85%. 48% refer only in the direction of the periphery. 20% of all patterns refer to both periphery and Center. 10% of the patterns have only a local pattern. And 5% refer only in a central direction (to proximal). Pain is more likely to be projected distally than proximally in the limb, and it is often to a joint moved by that muscle. Some of the referred pain zones from trigger points overlap exactly with the dermatome of the corresponding spinal segment (myotome). Table on this slide shows summary of the Rules or Classes. The Most Prevalent classification is 'Over the TrP' 59 patterns (35%). The second is 'To the JOINT' 26 patterns (15%). 21 patterns belong to "Along TENDON" (12%). 15 patterns were "Radiculopathic" (9%). 40 patterns were unclassifiable (25%). **Conclusion:** Though this study is not a complete one, I found several trends in the myofascial pain patterns. These finding would be helpful to study the myofascial pain in the clinical practice.

0502K2

VARIOUS INTERVENTIONS IN MYOFASCIAL PAIN

Yayat Hadiyat Lofrیمان, Darmadi J. Gunawan, Erwin A.D. Nanulaitta, Angela B.M. Tulaar

Physical Medicine and Rehabilitation Department, Faculty of Medicine, University of Indonesia (Indonesia)

Purpose: To study the various interventions in the management of Myofascial Pain Syndrome (MPS). **Materials:** Patients with Myofascial Pain Syndrome and VAS (Visual Analog Scale) more than 5 involving Trapezius muscle. **Methods:** Forty-one patients were randomized into 2 groups, 21 patients in group one receiving TENS (Transcutaneous Electrical Nerve Stimulation) and 20 patients in

group two receiving TENS + Ischemic compression, three times in one week. Eighty patients were randomized into 37 patients receiving Ischemic compression and 37 patients receiving Spray & Stretch for 5 consecutive days. Sixty patients were randomized into 30 patients receiving hot packs therapy and 30 patients receiving hot packs + ischemic compression therapy for 5 consecutive days. Sixty four patients were randomized into 33 patients receiving Low Power Laser therapy and 31 patients receiving ischemic compression therapy for 5 consecutive days. **Results:** The 20 patients in group two receiving TENS + Ischemic compression with $54.53 \pm 14.45\%$ decrease in pain (VAS) was significantly better ($p=0.001$) than the 21 patients in group one receiving TENS ($36.67 \pm 12.52\%$) only. The PTM (Pressure threshold meter) score increased more significantly ($p=0.001$) in the 20 patients in group two receiving TENS + Ischemic compression ($51.40 \pm 22.79\%$) compared to the 21 patients in group one receiving TENS ($22.53 \pm 15.12\%$). The % decrease of VAS did not differ significantly ($p=0.432$) between the 37 patients receiving Ischemic compression ($64.92 \pm 16.7\%$) and the 37 patients receiving Spray & Stretch ($61.63 \pm 14.93\%$) and so was the PTM score ($p=0.40$) between the 37 patients receiving Ischemic compression ($90.34 \pm 18.51\%$) and the 37 patients receiving Spray & Stretch ($85.96 \pm 20.91\%$). The VAS decrease significantly in both the 30 patients receiving hot packs therapy ($64.37 \pm 16.95\%$) and the 30 patients receiving hot packs + ischemic compression therapy ($72.02 \pm 23.36\%$) but did not differ significantly ($p=0.151$), while the significant increase of PTM score differ significantly ($p=0.019$) in both the 30 patients receiving hot packs therapy ($55.17 \pm 24.79\%$) and the 30 patients receiving hot packs + ischemic compression therapy ($71.53 \pm 27.50\%$). The % VAS decrease did not differ significantly ($p=0.086$) between the 33 patients receiving Low Power Laser therapy (43.40 ± 11.02) and the 31 patients receiving ischemic compression therapy (38.85 ± 9.79). The % increase in PTM differ significantly ($p=0.020$) between the 33 patients receiving Low Power Laser therapy (59.25 ± 31.97) and the 31 patients receiving ischemic compression therapy (40.54 ± 30.69). **Conclusion:** The application of various interventions in myofascial pain syndrome involving the trapezius muscle showed different therapeutic effects. All interventions decreased the pain (VAS decrease) and increased the pain threshold shown by the increase in PTM. Low power Laser therapy seems to have better results compared to Ischemic compression therapy, although ischemic compression had better results when compared to spray and stretch, TENS and hot packs, either alone or in combination.

0502K3

PATHOPHYSIOLOGY OF MYOFASCIAL TRIGGER POINT

Ta-Shen Kuan

Department of Physical Medicine and Rehabilitation, College of Medicine, National Cheng Kung University (Taiwan)

Myofascial pain syndrome (MPS) is characterized by the existence of a myofascial trigger point (MTrP). An MTrP has been defined as a localized hyperirritable spot in a palpable taut band of skeletal muscle fibers. It has been suggested that the minimal criteria for identifying an MTrP are "spot tenderness", "pain recognition", and "taut band", and the confirmatory signs of an MTrP are "referred pain (ReP)" and "local twitch response (LTR)". The characteristic of electromyographic activities recorded from an MTrP locus is regarded as spontaneous electrical activity (SEA), which includes endplate noise (EPN) and endplate spike. The pathogenesis of an MTrP has been postulated to be related to "energy crisis theory", that is: muscle fibers overload results in dysfunctional endplates (EPNs), which cause muscle fibers hypercontraction (taut bands) leading to local hypoxemia and sensitization of nociceptive neurotransmitters. In an MTrP region, multiple hyperirritable loci can be found and "Multiple Loci Theory" has been proposed. It was hypothesized that each MTrP contains many basic units of an MTrP, the MTrP locus. Each MTrP locus consists of a sensory component (a sensitive locus) and a motor component (an active locus). The sensory components of the MTrP

locus are sensitized nociceptors that are responsible for pain, ReP, and LTR. The motor components, where SEAs can be recorded, are dysfunctional endplates that are responsible for taut band formation as a result of excessive acetylcholine (ACh) leakage. This MTrP circuit is the connection among spinal sensory (dorsal horn) neurons responsible for the MTrP phenomena. It has been hypothesized that excessive ACh release, sarcomere shortening, and release of sensitizing substances are three essential features that relate to one another in a positive feedback cycle. Therefore, the pathogenesis of MTrPs is probably related to sensitized nociceptors (sensory loci) associated with dysfunctional endplates (active loci).

0502K4

DIAGNOSTIC ULTRASOUND TO MYOFASCIAL TRIGGER POINT AND TAUT BAND

Hsin-Shui Chen¹, Li-Wei Chou², Chang-Zern Hong³, Mu-Jung Kao⁴

¹Department of Physical Medicine and Rehabilitation, China Medical University, Bei-Gang Hospital, ²Department of Physical Medicine and Rehabilitation, China Medical University Hospital, ³Department of Physical Therapy, Hungkuang University and ⁴Department of Physical Medicine and Rehabilitation, Taipei City Hospital (Taiwan)

Purpose: To describe the morphology of myofascial trigger point (MTrP) and taut band with high-resolution ultrasound (US). **Materials and Methods:** Twelve subjects with neck pain and shoulder pain were eligible for this study. The inclusion criteria included neck and shoulder pain with active MTrP in the upper trapezius muscle. The identification of active MTrP in the upper trapezius muscle was performed with palpation examination and EPN studies. Both PE and EPN studies were assessed by the same physiatrist. When the MTrP was identified, a monopolar needle was inserted into the marked MTrP region and the US study was performed to assess the morphologic changes in bilateral upper trapezius muscles, using 2D gray scale picture and Doppler studies (including color Doppler and power color Doppler). The GE logic 5 ultrasound machine and lineal probe were used. **Results:** All 12 active MTrP were assessed for the existence of EPN. All cases had increased EPN amplitude. Echogenicity changes including taut band, and increased microvasculature flow were noted in the MTrP region, but not in the surrounding non-MTrP regions. **Conclusion:** High-resolution US may be used to identify the echogenicity change and focal characterization, and taut band, in the MTrP region.

0502K5

THREE-DIMENSIONAL REAL TIME SONOGRAPHIC MORPHOLOGIC ASSESSMENT OF HUMAN MYOFASCIAL PAIN DURING NEEDLING: DEMONSTRATION OF A PILOT STUDY

Hung-Chih Hsu^{1,2}

¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital and ²Graduate Institute of Clinical Medical Sciences, Chang Gung University (Taiwan)

Purpose: The purpose of this study was to assess the reproducibility and real-time characteristics of 3-dimensional (3D) sonography of myofascial trigger point (MTrP) in human upper trapezius muscle during needling by using gray-scale histogram method. **Materials and Methods:** Three patients with myofascial pain involving the upper trapezius muscle clinically diagnosed by an experienced physician were reevaluated by 2-D and 3-D ultrasound. During needling, the 2-D and 3-D images of the needle path and localized twitch responses induced by needling were recorded and analyzed. Histograms in gray-scale value of taut band and areas twitch responses were calculated and analyzed to differentiate with normal

muscle tissue. **Results:** After histogram comparison, the path of inserting needle, taut band, and localized twitch responses were clearly visualized distinctively from the normal tissue. More specifically, the initiations of localized twitch responses were observed near the epimysium area of the upper trapezius muscle. **Conclusion:** According to our pilot study, three-dimensional sonography is a reproducible technique for morphologic assessment of myofascial taut band and localized twitch response, and is better visualized than the traditional 2D ultrasound method in real-time. Analysis with histograms of gray-scale value analyses is an effective method in identifying taut band, and localized twitch responses within surrounding muscular tissues.

0502K6

MYOFASCIAL TRIGGER POINTS IN THE EARLY LIFE

Mu-Jung Kao^{1,2}, Ting-I Han³, Ta-Shen Kuan⁴, Yueh-Ling Hsieh⁵, Bai-Horng Su⁶, Chang-Zern Hong^{4,5}

¹Department of Physical Medicine & Rehabilitation, Taipei City Hospital, ²Department of Rehabilitation Medicine, College of Medicine, China Medical University, ³Department of Rehabilitation Medicine, China Medical University Hospital, ⁴Department of Physical Medicine & Rehabilitation, College of Medicine, National Cheng-Kung University, ⁵Department of Physical Therapy, Hungkuang University and ⁶Department of Pediatrics, China Medical University Hospital (Taiwan)

Objective: This study is designed to see if latent myofascial trigger points (MTrPs) can be identified in normal infants and in normal adult subjects. **Design:** Sixty normal adults and 60 infants (age 0-12 months) were investigated. An algometer was used to measure the pressure pain threshold (PPT) on three different sites, including a mid-point (assumed to be the MTrP site), in the brachioradialis muscle. **Results:** It was found that the mean PPT values at the MTrP site was significantly lower than the other sites in the adult muscles. However, no significant differences in PPT values among these three sites were found in the infants. Taut bands were found in all the adult muscles but none in the infants. **Conclusions:** It was concluded that, in the adult subjects, the mid-point of brachioradialis muscle was significantly more irritable than other sites and the mid-point was probably a latent MTrP. However, in the infants with age less than one year-old, such phenomenon could not be observed in this study. It is very likely that the latent MTrPs might not exist in the early life, but develop in the later life.

Pediatric Rehabilitation

0502D1

GABAA RECEPTOR EXPRESSION IN PATIENTS WITH SPASTIC CEREBRAL PALSY

Chang-Il Park

Department and Research Institute of Rehabilitation Medicine, Yonsei University College of Medicine (Republic of Korea)

Periventricular leukomalacia (PVL), due to hypoxic ischemic insults, has been known as a leading cause of motor and cognitive dysfunction in patients with perinatal brain injury, especially in patients with spastic cerebral palsy (CP) who were born prematurely.¹ However, children with spastic CP do not always have PVL and the exact correlation between brain damage and motor impairments still remains unclear. Despite the high incidence of white matter injury in children born prematurely with very low birth weight, the incidence of spastic CP in this group was approximately 10%.^{2,3} In addition to morphological and anatomical abnormalities, various neurotransmitters are thought to be involved in the pathogenesis of CP. For example, GABA is a well-known inhibitory neurotransmit-

ter in the human brain, but it is also known to generate excitatory action in an immature brain and may lead to brain damage.⁴ In regards to the brain remodeling process after injury, perilesional or motor cortical GABAA receptor expression was reported to decrease during the repairing process after brain injury for optimal practice-dependent plasticity.⁵ In contrast, our previous study demonstrated a higher uptake of a non-selective GABAA receptor marker, 18F-fluorofluminazil (18F-FFMZ), within the bilateral motor and visual cortices in patients with spastic CP compared to normal controls on statistical parametric mapping (SPM) analysis using delayed PET images.⁶ In a recent study, we investigated the regional expression profile of the GABAA receptor within the motor cortical network zone in patients with perinatal injury and spastic CP. We measured regional GABAA receptor binding potential using a dynamic PET scan with 18F-fluorofluminazil (18F-FFMZ) in spastic CP. Twenty-nine patients with spastic CP had PVL and six did not have PVL on conventional MRI. SPM analysis was used to compare the receptor BP profiles of all spastic CP patients and patients without PVL ($n=6$) with those of normal control. We obtained a functional connectivity map of the primary motor cortex (M1) at a resting state with functional MRI in 21 patients and compared the connectivity map with the receptor binding potential map. The primary motor cortex has extensive functional connections with the adjacent somatosensory cortex, cingulate gyrus, parietal cortex, visual cortex, basal ganglia, thalami, and cerebellum. The GABAA receptor binding potential in the spastic CP group diffusely decreased except for the specific areas that were functionally connected with M1. In addition, receptor binding potential was focally increased within the paracentral lobule (including the lower extremity homunculus), convexity of the motor cortex, visual cortex, and cerebellum. The non-PVL group also showed a trend toward increased BP within these regions. The etiological mechanisms of altered regional GABAA receptor binding in spastic CP patients are still unknown. However, these alterations of receptor binding might play an important role in the pathogenesis of motor dysfunction and spasticity in spastic CP.

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0502D2

LONGITUDINAL STUDIES ON THE DEVELOPMENTAL FUNCTIONS AND CLINICAL VARIABLES IN CHILDREN BORN WITH PREMATURITY

Suh-Fang Jeng^{1,2}, Kuo-Inn Tsou³, Chyong-Hsin Hsu⁴, Kuo-Su Tsou⁵, Li-Jung Fang⁶, Shu-Chi Mu⁷

¹School and Graduate Institute of Physical Therapy, National Taiwan University College of Medicine, ²Physical Therapy Center, National Taiwan University Hospital, ³College of Medicine, Fu Jen Catholic University, ⁴Department of Pediatrics, Mackay Memorial Hospital, ⁵Taipei Child Development Assessment Center, Taipei City Hospital, ⁶Department of Neonatology, Branch for Women and Children, Taipei City Hospital and ⁷Department of Pediatrics, Shin-Kong Wu Ho-Su Memorial Hospital (Taiwan)

Purpose: This study assessed the functional status of very low birth weight (VLBW) preterm infants (birth weight <1,500 g) and term infants from preschool to school age, and sought to identify

risk factors for functional morbidity. **Materials and Methods:** This was a multi-centered study that longitudinally assessed the developmental outcomes of VLBW preterm infants and term infants born between 1995 and 1997 in northern Taiwan. A total of 238 VLBW children and 91 term children were prospectively examined the functional status at 3 years of corrected age using the Chinese Child Development Inventory and neurodevelopment using the Bayley Scales of Infant Development, second version. Of them, 130 VLBW preterm children and 59 term children were assessed their intelligence using the Wechsler Intelligence Scale for Children, 3rd Edition at 8 years of age. Perinatal and sociodemographic data were collected through review of medical records. **Results:** Functional limitation (defined as more than two standard deviations below the means of term infants) occurred more frequently in VLBW children than in term children at preschool age: gross motor, 23% vs. 3%; fine motor, 12% vs. 1%; expressive language, 21% vs. 2%; comprehension-conceptual, 23% vs. 4%; situation comprehension, 17% vs. 4%; self-help, 17% vs. 1%; and personal-social, 19% vs. 3% (all $p<0.01$). Significant risk factors associated with functional morbidity included gestational age <30 weeks, grade III–IV intraventricular hemorrhage, chronic lung disease, stage III–IV retinopathy of prematurity, male gender, and maternal education below high school. Furthermore, there were significant differences in performance IQ (90.16 ± 17.05 vs. 108.51 ± 15.65 , $p<0.001$), verbal IQ (97.43 ± 15.62 vs. 111.78 ± 13.65 , $p<0.001$), full-scale IQ (93.14 ± 16.33 vs. 111.05 ± 14.81 , $p<0.001$), verbal comprehension index score (98.06 ± 15.53 vs. 112.47 ± 13.74 , $p<0.001$), perceptual organization index score (92.39 ± 17.13 vs. 109.42 ± 14.87 , $p<0.001$) and freedom from distractibility index score at school age (98.34 ± 17.71 vs. 110.53 ± 10.94 , $p=0.008$). There was no correlation between perinatal outcomes and full-scale IQ in VLBW preterm children, however. **Conclusion:** VLBW preterm children had a higher risk of functional morbidity than their term counterparts at preschool age. VLBW children further demonstrated significantly poorer IQ at school age compared with term children. Children with functional limitations might require comprehensive developmental assessment and continued follow-up.

0502D3

ADVANCES IN MEASUREMENT METHODS FOR CHILDREN WITH DEVELOPMENTAL DELAY IN TAIWAN

Hua-Fang Liao^{1,2}

¹National Taiwan University and ²Department of Rehabilitation Medicine; Physical Therapy Center, National Taiwan University Hospital (Taiwan)

Purpose: To introduce the reliabilities, validities of developmental tests developed recently in Taiwan for children less than 6 year-of age. **Materials and Methods:** The screening tests include: Comprehensive Developmental Inventory for Infants and Toddlers, screening test (CDIIT-ST), Taipei Preschooler Developmental Checklist 2nd version (Taipei II), Simplified Child Developmental screening Test (SiDesT), Developmental Surveillance Items of Child Health Pamphlet (DICHP); The diagnostic test is CDIIT diagnostic test (CDIIT-DT). The reliability indices include: internal consistency, inter-rater and test-retest reliabilities (ICC, Kappa). Validities are presented by are concurrent and predictive validity indices (Pearson correlation, ROC curve, ANOVA, Kappa, sensitivity etc). **Results:** CDIIT diagnostic test and screening tests have acceptable reliability and validity. For children less than 2 years old, DICHP has acceptable reliability and validity. Most scales of Taipei II in different age range have acceptable reliabilities and validities. **Conclusion:** Reliabilities and Validities of CDIIT-DT, CDIIT-ST and Taipei II are acceptable. These tests can be used in clinics to help clinical decision. More researches are needed for the validities and cost-benefits of multi-phasic tests.

0502D4

ADVANCES IN THE APPLICATION OF BOTULINUM TOXIN IN PEDIATRIC REHABILITATION***Jeng-Yi Shieh****Department of Physical Medicine & Rehabilitation, National Taiwan University Hospital (Taiwan)*

Purpose: To review the applications of Botulinum toxin in pediatric rehabilitation. **Summary:** Botulinum toxin has been applied in many clinical conditions in rehabilitation. In recent years, there had been even more applications in pediatric population. This lecture will review the use of Botulinum toxin in the following subjects, spasticity, dystonia, drooling and contracture.

0502D5

ADVANCES IN CURRENT INTERVENTION FOR CHILDREN WITH CEREBRAL PALSY***Chia-Ling Chen****Physical Medicine and Rehabilitation, Chang Gung Memorial hospital (Taiwan)*

Cerebral palsy (CP) describes a group of disorders of movement and posture, causing activity limitation, due to non-progressive disturbances in a developing fetal or infant brain. The affected areas vary from partial (e.g. diplegia) to total body (e.g. quadriplegia) involvement. Moreover, gait performance also has wide variations such as equinus, scissored or crouched gait even the areas of the body involvement are the same such as spastic diplegia. Most children with CP who have upper limb disabilities encounter difficulties during certain activities, especially computer operating activities, such as usage of pointing devices (computer mouse). The reasons for variations in clinical manifestations of motor deficits might be that there is a diversity of etiological factors, location of lesions, and mechanisms of underlying motor control in CP. Therapy to restore movement and functional deficits in children with spastic CP is based on an understanding of the underlying mechanism in these deficits. To provide more precise information about therapeutic requirements in children with CP, it is needed to determine objective assessment criteria for planning optimal treatment strategies. Our previous studies suggest polyelectromyographic (PEMG) patterns correlate with motor deficits and may allow us to plan treatment strategies based on underlying motor control in CP. Children with CP exhibited four distinct PEMG patterns, ranging from partial reciprocal to complete synchrony.² Lower PEMG pattern scores were significantly associated with better ambulatory and functional capacities. Most children of spastic diplegia with PEMG patterns II and III had independent ambulatory capacities and mild limitation of functional capacity, whereas most children with pattern of IV and V had no ambulatory abilities and no independent functional capacities. Children with CP may be at increased risk of poor bone health, especially those who experience delayed growth, reduced physical activity or inadequate nutrition, as well as those who take anticonvulsant medications which may affect bone development. The increased risk of fracture in children with CP is caused by "physiological osteopenia", which is associated with poorly and abnormally functioning musculature and related immobility, both of which reduce the mechanical load on the developing skeleton and prevent healthy bone development. Low bone mineral density (BMD) are prevalent in children with moderate to severe CP. Low BMD is linked with significant fracture risk. Repeated fractures diminish the quality of life for these children, and increase their care requirements. Therefore, managing low bone density and quality in children with CP is a significant issue. Our study investigated the BMD and bone metabolism in children with mild and severe CP and explored the relationship of muscle strength and BMDs in ambulatory children with spastic CP. Our results revealed the BMDs vary in children with CP with different motor severities. Severe CP group had lower femur BMD and serum albumin level than mild CP and

ND children. Linear regression analysis revealed that the GMFCS levels had a negative relationship with femur BMD. However, all bone metabolism variables were not related to the BMD. Correlation analysis revealed that the peak torques of knee extensor and knee flexor were correlated with femur BMDs. Our findings may suggest the Gross Motor Functional Classification System (GMFCS) levels significantly impact determination of the femur BMD. The mechanical factors, including reduced mechanical loading from anti-gravitational muscle contraction and reduced postural muscle activity, mainly contributed to BMD in ambulatory children with CP. The motor disorders of CP are often accompanied by disturbances of sensation, perception, cognition, communication, and behavior, by epilepsy, and by secondary musculoskeletal problems. Speech and language impairments are commonly associated with CP. These communication disorders, especially poor speech production, may result from disturbed neuromuscular control of speech mechanism. Reduced intelligibility in children with CP can adversely impact communication abilities and limit their vocational, educational, and social participation. Such limitations may consequently diminish these children's quality of life. Our study investigated speech motor control in children with CP using clinical and kinematic analysis. Our results revealed high spatiotemporal indexes (STIs) values and high variability on utterance durations in children with CP reflect deficits in relative spatial and/or especially temporal control for speech in these children. Children with spastic CP may have more difficulty in processing increased articulatory demands and resulted in greater oromotor variability than normal children. Children with quadriplegic CP may use compensatory movement strategies, greater jaw force to compensate for lip movement, to efficiently produce speech movement. These findings may suggest that treatment strategies of spatiotemporal oro-motor stability training may benefit to improve speech intelligibility for children with CP. Coordination, communication, documentation, patient/client-related instruction, and core interventions were the main components of rehabilitation programs. Core interventions consisted of movement therapy (such as neurophysiological approaches), modality, manual therapy, and other therapies. Physical modality used as an adjunct to physical therapy, such as electrical stimulation (ES), and biofeedback, and Treadmill Training with Partial Body Weight Support (PBWS). Complementary and alternative medicine (CAM) is becoming increasingly widespread in the USA for treatment of CP in addition to traditional rehabilitation programs. Hurvitz et al 6 found 56% of the 235 families used one or more CAM techniques, which massage therapy (25%) and aquatherapy (25%) were the most common. Current interventions on motor performance in CP may involve a variety of therapeutic strategies such as constrain-induced therapy (CIT), intensive Neurophysiological Rehabilitation System (INRS, Kozijavkin method), FES, Treadmill Training with PBWS, adaptive technology, BTA, CITB, combination therapies (such as FES and orthopedic surgery, BTA and casting), and CAM. Children with spastic CP usually exhibit motor deficits and limited daily activities. Studies indicated that constraint-induced movement therapy (CIMT) might improve motor performance in children with CP. Combining kinematic analysis with clinical assessments, our study investigated the effect of modified CIMT (mCIMT) in four children with spastic CP immediately and one month after treatment. During the 3-week intervention, subjects underwent task-related training using the affected hand with restraint of the unaffected hand. The experimental results revealed the mCIMT therapy improved movement performance of the affected hand, bimanual coordination, and energy efficiency immediately and one month after therapy. The clinical implications are that, in comparison with CIMT, mCIMT is easier to be implemented and may improve compliance in children with CP as well as parents or caregivers. Despite the commercial availability of numerous computer-pointing devices, many severely children with CP still rely on customized equipment to operate computers. We developed a novel Integrated Pointing Device Apparatus (IPDA) that integrates numerous commercial pointing devices. The novel IPDA is compatible with most tested computer-pointing devices and flexibly integrates commercial computer devices, tailoring them to suit individual needs. The IPDA had the advantages of flexibility, low cost, and acceptable efficiency. The IPDA can help some children

with CP, who cannot utilize a commercial mouse alone, to achieve acceptable operational efficiency. The operation methods for children with CP were determined by their underlying motor control. Severe spasticity in children with CP not only causes functional impairment, but also results in gait abnormalities. Botulinum toxin type A (BTA) or phenol injections, and selective posterior rhizotomy (SPR) are commonly used to reduce the spasticity. Our previous studies investigate the effectiveness of the BTA, phenol, and SPR using by clinical measures and gait analysis. Our study used a computer dynography (CDG) gait analysis system to assess the effects of SPR on the gait in children with spastic CP. Our results showed the distribution of ground reaction forces improved significantly in children with CP after SPR, although the temporal-spatial gait parameters did not change significantly. In another study, the muscle tone decreased significantly in all muscles three months after BTA injection. Our results revealed that BTA treatment could improve ROM, gross motor, functional ability and gait by reducing the muscle tone. Weakness and widespread spasticity are the most significant determinant factors on motor performances. However, sometimes clinicians have difficulties to identify the underlying weakness in spastic CP based only on the clinical observation. The interventions on the spasticity in CP included medication, rehabilitation programs, serial casting, orthotics, intramuscular neurolysis such as phenol nerve block or BTA injection, continuous intrathecal baclofen (CITB), orthopedic surgery, and SPR. Based on PEMG patterns, for example, children with mild spasticity may benefit from antispastic techniques such as stretch exercises, therapeutic electrical stimulation (ES), or intramuscular neurolysis for normalizing muscle tone, followed by facilitation techniques and corrective insoles. Children with moderate spasticity may need more invasive interventions, such as SPR or CITB. Children with diffuse & widespread spasticity may not respond well to therapy, although CITB or SPR may be tried to reduce spasticity in order to improve handling or nursing care, rather than to improve ambulatory capacity. Spastic children with underlying weakness may need strengthening, partial weight support training or facilitation techniques, and ES, followed by long leg braces and adaptive devices for assisted standing or walking. CITB may be indicated for such cases, who use their spasticity to stand and walk, because its effects can be titrated. However, SPR should not be used for such cases because it has a permanent effect and may increase existing weakness. In the previous study, SPR did not improve or may even aggravate the function in such cases. Thus, intramuscular neurolysis may be beneficial for only in cases with more focal and localized spasticity. CITB and SPR may be tried for more widespread spasticity because they reduce spasticity not only in the local segments but also in supraspinal segments. However, SPR or tenotomy should not be used in spastic CP co-existing weakness due to aggravation of irreversible weakness. Tendon lengthening or tenotomy may be more beneficial in cases where reduced extensibility resulting from inappropriate muscle length. While serial casting may be indicated to increase extensibility in spastic children with underlying weakness. In conclusion, the treatment of motor dysfunction and associated problems in children with CP is based on the underlying mechanism of motor and functional deficits. Future studies may be needed to develop a rational basis and evidence-based medicine for current interventions in children with CP.

0502H1FP

FOOTPRINT MEASUREMENTS ANALYSIS OF THE FLATFOOT IN PRESCHOOL CHILDREN

Kun-Chung Chen^{1,2}, **Chun-Hou Wang**^{2,3}, **Chih-Jung Yeh**³, **Li-Chen Tung**⁴

¹Institute of Medicine, Chung Shan Medical University, ²Department of Prosthetics and Orthotics, Chung Shan Medical University Rehabilitation Hospital, ³School of Public Health, Chung Shan Medical University, ⁴Chi-Mei Medical Center and ⁵School of Physical Therapy, Chung Shan Medical University (Taiwan)

Purpose: Preschool children's feet are not simply smaller versions of adult feet, because their feet are still growing and developing.

Our aim in this study was to analyze the footprint measurements and grades of flat foot in a population of preschool children. Three footprint measurements, Clarke's angle, Chippaux-Smirak index, and Staheli arch index were used for comparison with clinical diagnosis. **Materials and Methods:** A total of 855 children (414 girls and 441 boys), aged from 3 to 7 years, from kindergartens in central Taiwan, were included in this study. Children's footprints were recorded on a Harris-Beath mat. A static footprint was recorded for each foot in a 100% weight-bearing/loaded position and then scanned to digital images. The plantar footprint was classified according to Denis and the clinical experiences into three grades of flatfoot: grade 1 (mild), in which the support of the lateral edge of the foot is half of that of the metatarsal support; grade 2 (moderate), in which the support of the central zone and forefoot are equal; and grade 3 (severe), in which the support in the central zone of the foot is greater than the width of the metatarsal support. We defined children who had a grade 2 or 3 plantar footprint as flatfooted, and compared them with the others. Assessments were conducted with the digital images, and Clarke's angle, Chippaux-Smirak index, and Staheli arch index were calculated by software. The receiver operating characteristic (ROC) curve was used for selecting an optimal cut-off point for the three measurements, and the area under the curve (AUC) was used for comparing the accuracy of these tests. An AUC greater than 0.9 has high accuracy; 0.7–0.9 indicates moderate accuracy; 0.5–0.7, low accuracy; and 0.5, a chance result. The positive predictive value (PPV) and the negative predictive value (NPV) of the optimal cut-off point were used to reflect the probability that children with positive test results and those with negative test results were correctly diagnosed. **Results:** The optimal cut-off point for Clarke's angle, Chippaux-Smirak index, and Staheli arch index were 14.84 degrees, 62.70% and 107.45%, all of them with high sensitivity: 0.814, 0.872, and 0.878, respectively. The AUCs were 0.900 (95% CI: 0.886 to 0.914), 0.946 (95% CI: 0.936 to 0.956), and 0.917 (95% CI: 0.904 to 0.930), respectively. The positive predictive values of the optimal cut-off point were 0.861, 0.906, and 0.868, respectively, and the negative predictive values were 0.758, 0.830, and 0.826, respectively, reflecting that all three measurements could distinguish well between children with or those without flatfoot. **Conclusion:** This study demonstrated that footprint analysis could be used effectively for screening flatfoot in preschool children and that the grades of flatfoot of preschool children were different from those of others. All three measurements demonstrated high accuracy, and the Chippaux-Smirak index is superior as a screening tool for distinguishing children with or without flatfoot.

0502H2FP

A CLINICAL RESEARCH ON FRONTAL LOBE DEVELOPMENT DURING INFANTS AND YOUNG CHILDREN PERIOD WITH QUANTITATIVE ASSESSMENT OF CRANIAL MRI AND EARLY DETECTION OF COGNITIVE FUNCTION

Xiang Chen, Shuang Zhang

Department of Rehabilitation, The Second Affiliated Hospital & Yuying Children's Hospital of Wenzhou (China)

Purpose: To investigate the application of MRI methods to quantitatively assess the situation of frontal lobe development after brain injury in early childhood, and combined with the assessment of cognitive function to make a comprehensive analysis, with a view to contribute to the clinical assessment, diagnosis and rehabilitation treatment of brain development especially the frontal lobe development in infants and young children. **Materials and Methods:** Screening of the children who were clinically diagnosed as frontal lobe dysplasia (FLD), a total of 23 cases for the observed group, including male 14 cases, female 9 cases, 21.4–59.1 weeks old (38.304 ± 11.753 w); children with normal physical examination or with no obvious stunting, a total of 19 cases for the control group, including male 12 cases, female 7 cases, 25.5–59.6 weeks old (40.832 ± 11.739 w). For all subjects to have cranial MRI checking

and Gesell development schedules (GDS) test. Measuring the volume of frontal lobe and relative cranial cavity by Image-Pro Plus6.0 image analysis software used on cranial MRI, and calculating the standardized individual frontal lobe volume. Linear correlation analysis is used between and total development quotient (DQ) score. And logistic regression analysis is used in high-risk factors that might affect cognitive function. SPSS13.0 software is used for the statistical analysis. **Results:** The observed group average: 1761.642 ± 24.577 , the control group average: 2110.870 ± 79.375 . The relative frontal lobe volume of the observed group is less than that of the control group ($p < 0.001$). Regarding the four functional areas of GDS (motor behavior, adaptive behavior, language behavior, personal-social behavior) and the total DQ, between the observed group and the control group has the obvious statistics difference ($p < 0.001$). The value of and total DQ in the observed group and the control group has the linear correlation analysis, the Pearson correlation coefficient r is 0.905, 0.798, $p < 0.001$, respectively. 4. The possibility correlation factors that could affect the cognition function with Logistic regression analysis showed that the hypoxia is the primary factor that enters the regression equation ($=4.330$, $p=0.037$), the OR value of is 4.444. **Conclusion:** The degree of the frontal lobe development (lobe volume) in FLD children is less than that in normal children. The GDS score of cognitive function in FLD children is significantly lower than that in normal children. There is a positive correlation between the frontal lobe volume and early cognitive function score in infants and young children. Hypoxia during the neonatal period is a high-risk factor that could affect the frontal lobe development and early cognitive function in infants and young children period. The method of quantitative measurement of frontal lobe volume by MRI combined with early cognitive assessment enriches the clinical diagnosis of FLD.

0502H3FP

ESTABLISHING HYPOTHETIC MODELS BASED ON "INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY, AND HEALTH – CHILDREN AND YOUTH VERSION" (ICF-CY) IN INFANTS AND TODDLERS WITH MOTOR DELAYS – WITH MAINTAINING A BODY POSITION (D415) AS THE MOTOR OUTCOME

Ai-Wen Hwang¹, Hua-Fang Liao², Li-Jen Weng³, Lu Lu⁴

¹Graduate Institute of Early Intervention, College of Medicine, Chang Gung University; ²School and Institute of Physical Therapy, College of Medicine, National Taiwan University; ³Department and Graduate Institute of Psychology, National Taiwan University and ⁴Department of Rehabilitation and Medicine, National Taiwan University Hospital (Taiwan)

Purpose: To establish and test the hypothetical ICF-CY based models for explaining the antigravity gross motor outcomes (d415 maintaining a body position) in infants and toddlers with motor delays. **Materials and Methods:** Systematic reviews were conducted to establish the hypothetical ICF-CY based models and to identify the measures in ICF components for predicting motor outcomes for infants and toddlers with motor delays. The measures included developmental tests and questionnaires and were linked to the following categories in 4 ICF-CY components: (1) Health Condition: Motor Severity; (2) Body Functions: Cognitive DQ (b117), Motivation (b130), Muscle Power Functions (b730), Muscle Tone Functions (b735), Muscle Endurance Functions (b740), Balance (b755); (3) Activities and Participation: the basic motor outcome (maintaining a body position (d415)); and (4) Environmental Factors: Motor Toys (e115), Learning Material (e130), Physical Home Environment Arrangement (e155), Relationships and Support (e310), Family Coping Strategies (e410), Needs (e5)). Only the measures with adequate reliability or validity were retained for data collecting. A convenient sample of infants and toddlers with motor delays ($n=146$) aged 6–24 months and their families was recruited from January 2007 to November 2009. All the enrolled

children and their families received the ICF linked developmental tests by trained visitors and the parents completed the ICF linked questionnaires in a one-week period. All the 6 Body Function variables ($r=0.40-0.78$, $p < 0.05$) and four of the environmental variables (Involvement (e310), Learning material (e115), Inside space (e155), and Fine motor toys (e115)) ($r=0.15-0.20$, $p < 0.05$) were significantly correlated to the Maintaining position (d415) and were used to test the hypothetical ICF-CY based models with Structure Equation Modeling. **Results:** All the hypothetical models showed acceptable model fit according multiple fit indexes except involving balance as a Body Function predictor. The fit indexes of acceptable models showed SRMR approaching 0.08, and any of NFI, CFI, IFI, MFI over 0.95. The derived ICF-CY models were portrayed with significant pathways between the ICF categories. Motor Severity could predict Body Functions and the motor outcomes. Environmental Factors could be the mediators between the Health Condition and some categories in Body Functions. One social aspect of Environmental Factors (Involvement (e310)) and three categories of physical Environmental Factors (Inside space (e155), Fine motor Toys (e115), and Learning material (e115)) was also the mediator between Health Condition and the Maintaining position (d415) outcome. One more complex mediating path may exist: Motor severity would affect Environmental Factors, and then Body Functions, and then the motor outcomes. However, Distal Environmental Factors (Family Coping Strategies (e410) and Needs (e5)) were not correlated with the Maintaining position (d415). **Conclusion:** The derived ICF-CY based models provide a possible explanation for the basic motor outcome of maintaining a body position in infants and toddlers with motor delays. The multiple mediators, early social and physical environmental factors, in the derived ICF based models would help early interventionists to process clinical reasoning and early intervention programs. Longitudinal follow up, however, would be needed to verify the causal relationship between the early motor predictors and later motor outcomes.

0502H4FP

GENE EXPRESSION PROFILING IN CONGENITAL MUSCULAR TORTICOLLIS

Shin-Young Yim¹, Il Yung Lee¹, Dukyong Yoon², Ki Young Lee², Il Jae Lee³, Myong-Chul Park³, Myung Ae Lee⁴, Young-In Na⁵, Jae-Bum Jun⁵

¹Ajou Torticollis Clinic, Department of Physical Medicine and Rehabilitation, Ajou University School of Medicine, ²Department of Medical Informatics, Ajou University School of Medicine, ³Department of Plastic and Reconstructive Surgery, Ajou University School of Medicine, ⁴Brain Disease Research Center, Ajou University School of Medicine and ⁵The Hospital for Rheumatic Diseases, Hanyang University (Korea)

Purpose: While intrauterine malpositioning, birth trauma, and ischemia resulting from vascular occlusion have been widely proposed for the cause of congenital muscular torticollis (CMT), the pathogenesis of CMT still remains elusive. Furthermore, little has been known about the functional alteration within sternocleidomastoid muscle (SCM). Gene expression profiling is a useful marker of functional alteration of CMT. However, there was no report on gene expression profiling of CMT. The objective of this study was to investigate gene expression profiling of CMT as a marker of the functional alterations of CMT. **Materials and Methods:** This study was conducted in a tertiary medical center. Seven subjects who underwent myectomy of SCM for CMT in 2008 and who agreed to participate in this study were included in this study. Muscle tissue was collected from CMT (T-CMT) and non-CMT (T-non CMT) area which was in periphery of CMT for each subject. Total RNA was extracted from both tissues for each subject and was hybridized to Affymetrix GeneChip Human Gene 1.0 ST Array which offers whole-transcript coverage. Differentially expressed genes (DEGs) were determined. Using Onto-Express Analysis (OEA) and Ingenuity Pathway Analysis (IPA), top canonical pathways and functions of DEGs were identified. **Results:** Among 28,869 genes

on the array, 1.03% was identified as differentially expressed. 208 genes (60.47%) were up-regulated and 136 genes (39.53%) were down-regulated. 2. OEA shows that the genes most over-expressed in CMT were genes for extracellular matrix among several cellular components with p value of 0 such as the genes for thrombospondin 4 (THBS4), fibromodulin (FMOD) and type XIV collagen, alpha 1 (COL14A1) were most over-expressed. In terms of biological function, genes related with adhesion such as cell-cell adhesion, cell-substrate adhesion and regulation of adhesions were most over-expressed with p value of 0 including the gene for epidermal growth factor (EGF)-like repeats and discoidin 1-like domains 3 protein (EDIL3). IPA shows that fibrosis is the top canonical pathway of CMT where that hepatocyte growth factor (HGF) plays a main role. **Conclusion:** We used whole genome microarrays to characterize for the first time the transcriptome of human CMT tissue from seven subjects with CMT, where data of CMT tissue were co-analyzed with data from tissue of non-CMT area from same subjects. Our current data indicated that CMT is a developmental disorder characterized by fibrosis of SCM and HGF seems to play a role in pathogenesis of CMT.

0502H5FP

CHARACTERISTICS OF CHILDREN WITH CEREBRAL PALSY IN SOUTH KOREA

In-Young Sung, Shin-Young Yim, Myeong-Ok Kim, Bum-Sun Kwon, Jeong-Yi Kwon, Seong-Woo Kim, Joo-Hyun Park, Bong-Ok Kim, Yong-Beom Shin, Eun-Young Kang, Min-Young Kim, Zee-Ihn Lee, Chung-Young Yang, Sang-Joon Kim, Ji-Chan Chang

Korean Society of Pediatric Rehabilitation and Developmental Medicine (Republic of Korea)

Purpose: There are wide variations in the use of terms regarding definition, classification, severity, and topographic distribution of cerebral palsy (CP). In 2007, the task force team of Korean Database of Cerebral Palsy (KDCP) was formed by KSPRDM. The aim of the KDCP was to set up a nationwide multi-center cohort of children with CP, for better understanding of characteristics of CP and for providing a framework for further research. A standard minimum dataset (KDCP1.0) had been developed in January 2009, using the agreed criteria. The objective of this study is to report the characteristics of children with CP in South Korea based on the KDCP1.0. **Materials and Methods:** Data of children who met the diagnostic criteria provided in the KDCP1.0 were entered onto the KDCP1.0, when the child is at least 12 month-old or older at the time of registration. Anonymous data without personal identifiers such as name and address were sent to KDCP1.0 online by the regular members of KSPRDM. There were 15 mandatory variables for subjects whose age is less than 48 month-old. For the children whose age is 48 month-old or older, there were 16 mandatory items where MACS were added to 15 variables. Mandatory variables were about type of CP, GMFCS, birth weight, gestational age, delivery mode, birth number, postnatal events causing CP, brain MRI findings, and associated problems. **Results:** Among the data by June 2009, 612 subjects with CP (boy 56.4%, girl 43.6%) were completed with all mandatory variables. Cases were well distributed nationwide. The distribution of CP subtypes showed 86.4% of spastic type, 4.7% of dyskinetic type and 1.8% of ataxic type. GMFCS was 23.5% of level I, 27.1% of level II, 13.2% of level III, 15.4% of level IV, and 20.8% of level V. There were 58.8% of children with CP who were born before 37 weeks of gestation. Children with very low birth weight (1000–1499 g) were 19.9% and 9.2% of children had extremely low birth weight (<1,000 g). Brain MRI showed abnormal findings in 90.7%, where periventricular leukomalacia (43.5%) and mal-development of the CNS (8.2%) were the top two findings. 12.4% of 612 subjects were CP of postnatal origin, where hypoxic ischemic encephalopathy associated with seizure (58.5%) was the most common cause. Regarding associated problems, language impairment (56.5%) and intellectual disability (49.9%) were most common. Visual

impairment (43.0%), epilepsy/seizure (26.6%), and swallowing problems (17.1%) were reported to be associated with CP as well. **Conclusion:** This is the first nationwide report on characteristics of children with CP in South Korea. We hope that these results would be used as basic information for better rehabilitation intervention and further research on cerebral palsy.

0502H6FP

A STUDY OF THE PROTECTION OF BDNF ON CORTICAL NEURONS

Jiangbao Zhou, Pingyun Qiao

Children's Hospital of Chongqing Medical University (China)

Objective: To explore the protective effect of brain-derived neurotrophic factor (BDNF) on cultured rat cortical neurons cell against injury induced by glutamate, and the mechanism. **Materials and Methods:** Primary cultured cortical neurons cell. The cortical neurons were divided randomly into three groups: control group, Glu group and BDNF group. Glu group need 50 μ mol/ml glutamate acid in cells for half an hour, BDNF group need to exposed to 50 ng/ml BDNF for 24 hours based on above, but the control group is cultured as usual with nothing. Cell viability were determined by the colorimetric MTT assay. The morphological features of the neuron cells were observed under fluorescence with AO/EB. Expression of p75NTR, JNK, Erk were observed using western blot analysis. **Results:** There are 95% of the cells is cortical neurons cells, and they have plump and solid bodies and long axons which contacts with each other and form a dense network. The primary cortical neurons grew well, BDNF can protect cortical neurons cell from glutamate. The mortality of neurons in BDNF group is lower than in the control group. The expression of p75NTR is higher in control group and BDNF group than in normal group; the expression of JNK increase in the control group to the BDNF group; at the same time, the expression of ERK decrease in the control group to the BDNF group. The difference between the control group and the BDNF group have statistical significance. **Conclusion:** BDNF can adjust the proportion between the p75NTR and the TrkB to protect the cortical neurons against neurotoxicity induced by glutamate. In addition, enhance the survival and suppress the apoptosis by increasing the expression of the Erk downstream signal and decreasing the expression of the Jnk downstream signal.

0502H7FP

THE EFFECT OF THERAPEUTIC EXERCISE ON BEHAVIORAL PERFORMANCE IN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER: A SYSTEMATIC REVIEW

Chao-Chi Hong¹, Alice M.K. Wong^{1,2}

¹Graduate Institute of Rehabilitation Science, Chang Gung University and ²Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital- Taoyuan Branch (Taiwan)

Purpose: According to different symptoms, APA set up three subtypes as following: inattentive type (ADHD-I), hyperactivity - impulsivity type (ADHD-HI), and In 2000, American Psychiatric Association (APA) defined attention deficit hyperactivity disorder (ADHD) as a disorder of display difficulties with attention and/or impulsive control and hyperactive behavior of individuals combined type (ADHD-C). ADHD people not only have high prevalence around the world, but have a high ratio of comorbidity with other mental disorders, such as: anxiety, Bipolar I disorder, major depressive disorder, oppositional defiant disorder, and Tourette syndrome. Since ADHD have a deep impact to children, lots of researchers have developed different treatment trials, from pharmacotherapy (CNS stimulants), cognitive behavior therapy (CBT), therapeutic exercise, to neurofeedback training. The purpose of this study was to investigate the effect of therapeutic exercise on behavioral performance in children with attention deficit hyperactivity disorder.

order (ADHD). **Materials and Methods:** A systematic search in published and unpublished literature from 1977 to November 2009. Comprehensive search was performed both in electronic databases, PubMed, MEDLINE, PsycInfo, Cochrane library, CINAHL, ERIC, Scopus, CEPS and manual search in reference lists of articles. According to the inclusion and exclusion criteria, the appropriate articles were selected. All included articles were rated with using the PEDro scale. Reviewer determined study eligibility based on inclusion criteria, rated study quality, and extracted information on study methods, design, intervention, and results. **Results:** Based on the selection criteria, total 12 studies were included in this study. Most of the articles showed that therapeutic exercise had positive effect either in increase attention or improve hyperactivity behavior. The PEDro scores of included studies ranged from 3 to 5, that is moderate quality. The types of therapeutic exercises which were used in these studies included yoga, martial arts, relaxation exercise, aerobic exercise, and ambulation. However, all of the articles in this review only suggested that therapeutic exercise could improve the symptoms of ADHD, but could not distinguish which type of exercise could modify which kind of symptom in ADHD children. In clinical practice, children with ADHD also have a high prevalence with developmental coordination disorder. It is important to offer therapeutic exercise in this kind of children with ADHD, not only to improve the behavioural performance of ADHD, but to improve the symptoms of developmental coordination disorder. **Conclusion:** In this review, therapeutic exercise had positive effect on behavioural performance in children with ADHD. However, all of the articles in this review only suggested that therapeutic exercise could improve the symptoms of ADHD, but could not distinguish which type of exercise could modify which kind of symptom in ADHD children.

0502H8FP

A REVIEW ON THE EFFECT OF BOTULINUM TOXIN A INJECTION FOR CHILDREN WITH CEREBRAL PALSY USING ICF FOR GOAL SETTING AND OUTCOME MEASURE

Nar-Chi Chan¹, S.C. Lee¹, K.L. Kwong², W.K. Chak²

¹Department of Physiotherapy and ²Department of Paediatric and Adolescent Medicine, (Hong Kong)

Objective: Botulinum toxin A (BTX-A) is widely used in the population of Cerebral Palsy (CP) for spasticity management. The change in muscle tone of the spastic muscle is definite. Based on the International Classification of Function, Disabilities and Health (ICF), we need to set the goal of intervention based on the body function, activity and participation. The personal and environmental factors had also to be addressed. With the consideration of all these factors, we selected clients to receive the intervention with BTX-A therapy and follow up an intensive physiotherapy program. The aim of the present study is to review the effect of the program in changing the body function and the activity of the children with CP. **Methods:** A total of 123 children with CP matched with the selection criteria were selected throughout the 7 years of period. BTX-A was used and injected into the gastro-soleus, hamstrings and hip adductors muscles of the children based on the functional goal set with the physiotherapist in-charge of the client. Five repeated measures were performed on pre-injection, post 2 week, one-month, two-month and three-month. Assessment of outcomes on body functions included (1) muscle tone by Modified Asworth Scale (MAS); (2) passive range of motion (PROM) of lower limbs. The change in activity and participation include the measurement on the change in Gross Motor Function Measure (GMFM); and the change in gait by Observational Gait Score. **Results:** Over the 123 patients, 53% of them were belonged to spastic diplegia and 27% were spastic hemiplegia. 75% of them received BTX-A injection to gastro-soleus and 40% of them received injection to medial hamstrings. There was significant decrease in muscle tone ($p < 0.001$, power > 0.99) and improvement in PROM of ankle dorsiflexion ($p < 0.001$, power = 0.98). The change

in GMFM ($p < 0.001$, power = 1) and the improvement in gait score ($p < 0.001$, power = 0.998) were encouraging. By comparing the difference between time, optimal effect was seen on post-injection 2 week time ($p < 0.001$) and one month ($p < 0.001$) on the change of muscle tone. The functional gain could be maintained throughout the 3 months period ($p < 0.001$). **Conclusions:** BTX-A injection is an effective means of spasticity management for children with CP. Muscle tone reduction and joint range improvement are most effective one month post injection. With intensive physiotherapy training, the functional gain could be maintained after the tone reduction effect subsided.

0502H9FP

FUNCTIONAL OUTCOME OF ACUTE PHASE REHABILITATION BY GMFCS AND DISEASE PATTERN CLASSIFICATION FOR PEDIATRIC ACUTE ENCEPHALOPATHY PATIENTS

Kaoruko Takada¹, Hidetaka Wakabayashi¹, Hironobu Sashika¹, Naohisa Kikuchi²

¹Department of Rehabilitation, Yokohama City University Medical Center and ²Dept. of Rehabilitation, Yokohama City University Hospital (Japan)

Purpose: To evaluate the functional outcome for pediatric acute encephalopathy by GMFCS (Gross Motor Function Classification System) and disease pattern classification system. **Setting & Intervention:** University hospital, Rehabilitation therapy (PT&OT). **Materials and Methods:** Retrospective study was performed for 18 pediatric acute encephalopathy children (6 boys, 12 girls) who admitted in the pediatric center of our hospital in 2000 to 2009 without history of epilepsy, cerebral palsy or other neuromuscular disease. Mean age at admission was 2.7 years old (10 months to 14 years old). Mean length of stay was 70.2 ± 73.3 days. Mean time at first rehabilitation referral was 15.3 ± 10.8 days. We used GMFCS for evaluating their motor function. We evaluated at first rehabilitation time and at discharge. Then we divided recovery group (reach level 1 or 2) and non-recovery group (remain level 3, 4, 5) by GMFCS. And we compared these two groups by disease classification system, GCS (Glasgow Coma Scale) and speech function. The classification system by MR imaging and clinical symptom had 3 disease patterns, AEFCS (acute encephalopathy with febrile convulsive status), ANE (acute necrotizing encephalopathy), and non-applicable type. In AEFCS group, we compared recover with MR imaging. JMP 7.0 was employed to analyze statistically. **Results:** GMFCS level at the first time rehabilitation, level 5: 15, level 4: 1, level 3: 1, level 2: 1. At discharge, level 5: 4, level 4: 4, level 3: 0, level 2: 2 and level 1: 8. 10 patients were divided into recovery group, and 8 patients were divided into non-recovery group. For the classification system, AEFCS: $n=9$, ANE: $n=2$, non-applicable type: $n=7$. GCS at admission, severe: $n=10$, moderate: $n=6$, mild: $n=2$. 7 patients remained speech disorder, and 11 patients were normal speech at discharge. There was no significant difference between recovery group and non-recovery group by GCS. Existence of speech disorder was significant different between two groups ($p < 0.05$). There was no significant correlation between GMFCS at discharge and disease classification system. Also there was no significant correlation between GMFCS at discharge and existence of speech disorder. Disease classification system was not significant different between recovery group and non-recovery group. As for functional outcome, AEFCS group tended to recover well in motor and speech function. In AEFCS group, the patients who had bilateral and diffuse lesion were poor prognosis, but those who had unilateral or frontal lobe lesion were favourable prognosis ($p < 0.05$). However, the patients who had brain atrophy in frontal lobe lesion type at discharge remained mental retardation. **Conclusion:** It is important to classify pediatric acute encephalopathy patients into disease patterns by their clinical symptom, and findings from MR imaging. That is because we can predict their prognosis by their disease patterns. GMFCS may play an important part to predict their prognosis.

0502L1

MIRROR NEURONS, EMPATHY, AND AUTISM

*Ya-Wei Cheng**Institute of Neuroscience, National Yang-Ming University (Taiwan)*

Purpose: Autism spectrum disorder (ASD) is characterized by a broad range of difficulties in social interaction and communication, including deficit in empathy. While a lack of empathy is one of the main symptoms of ASD, its neural mechanism remains unclear. The perception of pain in others can be used as a paradigm to investigate empathy. **Materials and Methods:** Twenty-two male individuals with ASD (mean age 16.86±4.05 years) and twenty-one typically developing controls (mean age 17.11±4.43 years) were presented with animated visual stimuli depicting faces and body parts in painful and non-painful situations. Participants were also required to provide pain intensity and pain unpleasantness ratings of the stimuli while eye-tracking was simultaneously recorded. **Results:** Individuals with ASD, as compared with the controls, showed reduced hemodynamic response in the anterior cingulate cortex, anterior insula, medial prefrontal cortex, temporo-parietal junction, and superior frontal gyrus while perceiving facial expressions of pain, as well as body parts in pain. The activation in anterior cingulate, insula, and inferior frontal gyrus was inversely correlated with the severity in their social reciprocity. Behaviorally, individuals with ASD relative to healthy controls showed lower self-reported ratings on pain intensity and unpleasantness despite of paying similar attention on the stimuli as indicated by eye fixation performance. **Conclusion:** The study demonstrates that the individuals with ASD have broad impairments in both affective and cognitive facets of pain empathy. Atypical neural underpinning empathy may play a role in the social impairments of ASD.

0502L2

ADVANCES OF INTRAOPERATIVE NEUROPHYSIOLOGIC MONITORING DURING SPINAL CORD AND SPINAL SURGERY IN CHILDREN

*Tsui-Fen Yang¹, Chi Kuang Feng², Kwong Kum Liao³, Rai Chi Chan¹**¹Department of Physical Medicine and Rehabilitation, Taipei Veterans General Hospital, ²Department of Orthopedic, Taipei Veterans General Hospital and ³Department of Neurological Institute, Taipei Veterans General Hospital (Taiwan)*

There are several spinal surgical procedures that have potential risk to vulnerable structures including spinal cord, nerve roots and related vascular supply in children. Scoliosis, due to neuromuscular disease, congenital or is idiopathic in nature, frequently requires surgical correction with instrumentation if magnitude of major curves reaches more than 45 degrees. The force of distraction and derotation applied to the spine during correction can possibly jeopardize the functional integrity of related neural tissues with consequence of lower limbs weakness, paralysis, sensory impairment, and bowel and bladder dysfunction as well. During surgical removal of spinal tumor and repair of lipomyelomeningocele, surgeons face the similar situation that as much removal of tumor mass as possible and preservation of neural function with no residual deficits are both mandatory in every single case. Several neurophysiologic modalities are now available to safeguard the functional integrity of central and peripheral nervous systems during many neurosurgical, orthopedic surgery and other procedures. Somatosensory evoked potentials technique (SSEP) has been used for decades and remains the mainstay of spinal cord monitoring. It provides monitoring of the dorsal column-medial lemniscus pathway, which mediates tactile discrimination, vibration sensation, form recognition, and joint/muscle sensation. Motor techniques, both in forms of motor evoked potentials (MEP), or spontaneous EMG (sEMG) and triggered EMG (tEMG), are a more recent development and can monitor function of corticospinal pathways and peripheral motor system

during surgery. Changes of MEPs during surgery are believed to be more sensitive in detection of postoperative motor deficits if applied appropriately than SSEP monitoring alone. Four methods are used by related professionals to interpret MEP response during intraoperative monitoring: 1) the all-or-nothing criterion, 2) the amplitude criterion, 3) the threshold criterion, 4) the morphology criterion. Detailed discussion of monitoring techniques will be elaborated in presentation. The personnel that responsible for intraoperative neurophysiologic monitoring need to work with surgeon, anesthetist as a team and know very well of the unique strength and limitations of above mentioned modalities in use. Under many circumstances, different monitoring modalities are applied in combination during spinal surgery so as to take advantage of sensitivity and specificity of each modality, and to reduce false negative and false positive rate as well. Application of monitoring modalities alone or in combination depends mainly on surgical sites and particular neural tissues at risk. During surgery at cervical and thoracic levels, SSEP and MEP are applied to monitor functional integrity of spinal cord mainly, but sEMG and tEMG can be used to safeguard particular nerve roots as well. During lumbosacral spine surgery, neural tissues at risk are nerve roots instead of spinal cord. Under that circumstance, SSEP, sEMG and tEMG are then applied together to safeguard the functional outcome of this particular surgery. We will present several cases as well to demonstrate how to perform intraoperative monitoring during spinal surgery.

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0502L3

SPEECH AND LANGUAGE INTERVENTION PROGRAM FOR PRESCHOOL CHILDREN IN TAIWAN

*Pao-Chuan Torng**Department of Speech and Hearing Disorders and Sciences, National Taipei College of Nursing (Taiwan)*

Purpose: This study aims to establish a language enhancement program to facilitate speech and language abilities for preschool children in Nantou County, Taiwan. **Materials and Methods:** One hundred and ninety five preschool children from 10 preschools participated in a language enhancement program. All children were from the remote mountain areas, and mostly of socially and linguistically disadvantage statuses, in Nantou County, Taiwan. The "Responsive to Intervention" (RTI) approach were incorporated in the language program. In addition, two language teaching strategies, the "Focus Stimulation" and the "Language is the Key" models were also used. Story telling activities were emphasized and brain-based teaching, including novelty, intensity and motion, were utilized during speech and language intervention sessions. Three major goals, 1) vocabulary learning, 2) sentence usage and 3) story grammar concept establishment, were targeted. **Implication:** This study provides a speech and language intervention program for preschool children, especially children with socially and linguistically disadvantage, as well as, at the remote areas. Teaching framework and language strategies are utilized to facilitate the speech and language abilities for these children.

0502L4FP

DEVELOPMENT OF REHABILITATION AND SERVICES OF CHILD CEREBRAL PALSY IN CHINA

*Xiao-Jie Li**Children Neural Rehabilitation Laboratory of Jiamusi University; Rehabilitation Medicine College (China)*

Purpose: To summary and discuss Chinese rehabilitation services for children with cerebral palsy, identify the characteristics and shortcomings and explore the direction of development, the correct ways and methods in the future. **Materials and Methods:** The following were summarized and discussed as the basic situation of the child cerebral palsy, the history of setting up the first rehabilitation center, the basic situation of the rehabilitation and services, the situation of the professional team, the situation of the education and training, the academic organizations and conferences and the questions and challenges through the questionnaires, investigations and a large number of the references. **Results:** The incidence of CP was 1.8~4 ‰ and the prevalence of CP in 1~6 years was 1.92‰. The types of CP is divided into spastic, dyskinetic, rigid, ataxia, hypotonic and mixed types currently. The first rehabilitation center for CP children was set up in 1987. There are three ways of the rehabilitation and services and the two types of techniques and methods applied as Modern Rehabilitation Medicine (MRM) and the Traditional Chinese Rehabilitation Medicine (TCRM). It is clearly shows the team is lacking of the professionals with the background of rehabilitation medicine and the highly educated persons. Rehabilitation therapy education for undergraduate student has been started for nearly 10 years, and it was developed quickly in recent years. TCM education has been long history and there is a large number of the traditional Chinese medical therapy (TCMT) education existed. There are three main organizations for children rehabilitation in China and the national conference was held every two years. **Conclusion:** Although the rehabilitation and the services have made great achievements, it is still a distance between China and developed countries and a lot of questions and challenges we have to face.

0502L5FP

PREVALENCE AND ASSOCIATED FACTORS FOR FUNCTIONAL ARTICULATION DISORDERS IN MANDARIN-SPEAKING CHILDREN OF TAIWAN

*Isabel Tou, Hui-Chun Juan, Pei-Chi Hsiao, Yu-Lin Wang, Tsen-Jieu Ji, Ching-Chi Chen**Department of Physical Medicine and Rehabilitation, Chi Mei Medical Center (Taiwan)*

Purpose: This study was designed to evaluate the prevalence and associated factors for functional articulation disorders in Mandarin-Speaking Children of Taiwan. **Materials and Methods:** In this study the associated factors and articulation error patterns of 153 Mandarin-speaking children with functional articulation disorder were described. Every child was tested by picture-naming task. 84 pictures are selected to sample all the vowels and consonants in Mandarin. Quantitative measures (frequency of error) as well as qualitative measures (phonetic and phonemic inventories; phonological processes) were presented. Besides, the parents of the children completed a questionnaire investigating associated factors with articulation disorders. **Results:** For vowels and consonants in Mandarin, female have higher frequency of error in pronouncing /x/ than male. Children with mothers' nationality of Mainland China have lower frequency of error in pronouncing/ts/, and higher frequency of error pattern such as stopping in their production than children with mothers' nationality of Taiwan. Children living in urban areas have higher frequency of error patterns such as affrication

and frication than rural areas. The total amount of articulation errors is in negative correlations with age and proportion of substituted phonological patterns ($p < 0.01$). However, it is in positive correlations with frequency of incorrect phonological patterns such as stop-plosive, affrication, frication, lateral, nasal, bilabial, labial-dental, alveolar, lingua-alveolar, velar, palatal, retroflexes and dental sibilants ($p < 0.01$). **Conclusion:** Associated factors such as age, gender, parents' nationality, dialectal variation, multi-cultural living district do affect the prevalence and various error patterns of articulation disorder in Mandarin-Speaking Children of Taiwan.

0502L6FP

PRACTICE PATTERN GROUPS IN THE PEDIATRIC INPATIENT PHYSICAL THERAPY PROGRAMS – PRELIMINARY STUDY

*Hsu-Fan Chang-Chien¹, Wen-Yu Liu¹, Wei-Pin Huang¹, Kuo-Kuang Yeh¹, Yung-Cheng Chen¹, Shiau-Chian Jeng¹, Alice MK Wong^{1,2}**¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, Lin-Kao Branch and ²Department of Physical Therapy, Graduate Institute of Rehabilitation Sciences, Chang Gung University (Taiwan)*

Background and Purpose: Pediatric inpatient physical therapy programs is one of the services which domestic most hospital usually provides, but because the most hospital pattern, pediatric inpatient physical therapy programs often merges in adult's treatment service. Pediatric prognosis and demand often have a difference with the adult, therefore understanding existing pediatric physical therapy in hospital service pattern is basic one step to plan adequate intervention of pediatric physical therapy. American Physical Therapy Association proposed the physical therapy disciple pattern (preferred practice patterns) which may use for the treatment method which differentiates the case demand, therefore this research's goal is to describe the physical therapy disciple pattern and function change during hospital period in child who accept the pediatric physical therapy in hospital service. **Materials and Methods:** Retrograde reviews the medical record and reorganizes the case who accept the pediatric physical therapy in Chang Gung Memorial Hospital – Lin-Kao Branch from March to July in 2009, the collective data record from the first physical therapy service after admission to last physical therapy service before discharge in inpatient child. The analysis was reorganization by the descriptive statistics. **Results:** A total of 71 children (35 boys, 36 girls) with average age 18.3+37.1 months (1 day to 108 months old) accept the service and the interval between physical therapy service to admission was 23.6+33.7 days (1~165 days). In the physical therapy disciple pattern, the total 71 children has 10 (14%) belong to the musculoskeletal system, 58 (82%) child belong to neuromuscular system, some 3 (4%) child belong to the cardiovascular/pulmonary system, 2 (3%) belong to pattern A with primary prevention/risk reduction for cardiovascular/pulmonary disorders. And 29 (41%) child belong to pattern B with impaired neuromotor development was the most large group. In child who accepts physical therapy service, the total score of Barthel Index progresses from 11.7+25.0 to 31.1+63.3 ($t = -2.6, p = 0.012$). **Conclusion:** Based on this preliminary data, the result demonstrated a high variation in child's age and the time to receive intervention in child who accept inpatient physical therapy service. And there are many type pattern, among which most the child who needs to accept inpatient pediatric physical therapy service belong to impaired neuromotor development. The most child after accepting the pediatric physical therapy service has the obvious motor function improvement, but the variation was high and this may response the difficulty of pediatric inpatient physical therapy. More analyze for the demand of different type was necessary in the further. **Clinical meaning:** This preliminary study's result can use for the future pediatric physical therapy department service and the educational training plan.

0502L7FP

SYSTEMATIC REVIEW AND META-ANALYSIS OF HORSEBACK RIDING INTERVENTION ON GROSS MOTOR CHANGE IN CHILDREN WITH CEREBRAL PALSY

Hung-Chou Chen¹, Sung-Hui Tseng¹, Ka-Wai Tam²

¹Department of Physical Medicine and Rehabilitation, Taipei Medical University Hospital, ²Department of Surgery, Taipei Medical University Hospital (Taiwan)

Purpose: The purpose of this study is to assess the efficacy of horseback riding intervention for improving gross motor function in children with cerebral palsy (CP). **Materials and Methods:** Articles from the following data source were sorted: PubMed, Embase, Ovid and Cochrane databases. Studies that reported quantitative gross motor functional change in children with CP less than 18 years old before and after horseback riding were selected for this review. The following measurements were selected to evaluate the efficacy of horseback riding intervention on gross motor change in children with CP: 1) Gross Motor Function Measure (GMFM), 2) asymmetry scores, 3) gait parameters and 4) posture. Pooled data were analyzed using the statistical Review Manager, version 5. Statistical significance was $p < 0.05$. **Results:** 13 studies were included for review. From the perspective of horseback riding intervention on gross motor function, muscle symmetry, and postural stability, most of the studies suggest efficacy of the treatment. Pre-riding and post-riding data of total GMFM-66 score, total GMFM-88 score, GMFM-88 Dimension E score and Asymmetry score from 7 articles were pooled for meta-analysis. Pooled Asymmetry score confirmed a substantial reduction of adductor muscle asymmetrical activity after short term horseback riding. Pooled GMFM data did not confirmed a substantial improvement. **Conclusion:** Short term horseback riding is effective in reducing hip adductor asymmetrical activity. The effect of long term horseback riding on gross motor function in children with CP was not significant.

0502L8FP

GROUP-BASED PHYSICAL THERAPY EARLY INTERVENTION FOR INFANTS WITH DEVELOPMENTAL DELAY: TWO CASE REPORTS

Szu-Chieh Lee¹, Shiau-Chian Jeng¹, Wei-Pin Huang¹, Chin-Man Wang¹, Jyh-Yuh Ke¹, May-Kuen Wong Alice¹, Fang-Chen Liang¹, Wen-Yu Liu^{1,2}

¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, Linkou Branch and ²Department of Physical Therapy, Graduate Institute of Rehabilitation Sciences, Chang Gung University (Taiwan)

Purpose: To report the effects of “group-based physical therapy early intervention” for two infants with developmental delay. **Materials and Methods:** Empowerment parenting is the key part of early intervention. We design to let patient’s caregiver involve the rehabilitation programs more to improve empowerment parenting. Two infants with developmental delay received group-based physical therapy in physical therapy room, 30 min per time, once per week, total for four weeks. Physical therapist taught their care givers about home exercise. Then their care givers could apply rehabilitation programs in activities of daily lives at home. The design of home exercise programs is: the first week focus on head control, the second week focus on rolling, the third week focus on head elevation and elbow support at prone position, and the fourth week focus on head and neck control at sitting position. After four weeks training, we re-evaluated the infants’ via AIMS (Albert Infant Motor Scale). In addition, their parents filled out the “parents satisfy questionnaire.” (Designed by Liu etc, 2001). **Results:** After four weeks training, the AIMS score of infant A improved from 11 to 22, and infant B from 19 to 27. In parents satisfy questionnaire, the parent of infant A felt much improvement in motor and interaction. The parent of infant B thought that there was much improvement in motor area. In addition, parents knew more about children’s motor and posture training. **Conclusion:** Our results showed that both infants had improvement in AIMS score after 4 weeks training. However, we could not confirm the effect of “group-based physical therapy early intervention” due to lack of control group. Because of no adverse effects and good response from parents, this therapy deserves further study.

POSTER PRESENTATIONS (APRIL 30, 2010)

0430PP1

EFFECT OF REHABILITATION PROGRAM ON HOSPITALIZED PATIENTS RECEIVING TOTAL KNEE ARTHROPLASTY: AN ANALYSIS OF CLINICAL PATHWAY MANAGEMENT**Shih-Wei Huang, Ta-Sen Wei, Po-Hung Chen, Ya-Hui Chou, Tsung-Ju Wu***Department of Physical Medicine and Rehabilitation, Changhua Christian Hospital (Taiwan)*

Purpose: To get efficient and effective rehabilitation program for total knee arthroplasty patients to decrease medical expenditure with maintenance of healthcare quality, clinical pathway was implemented in knee osteoarthritis patients received total knee arthroplasty (TKA). **Materials and Methods:** A total of 148 inpatients (113 women), aged 69.6 ± 7.0 years old with BMI 27.1 ± 4.3 , underwent unilateral TKA and subsequent rehabilitation program. Subjects were allocated into three groups: group 1 received 1 to 2 times of rehabilitation program (once daily for 40 min); group 2 received 3 to 4 times, and group 3 received 5 to 6 times during hospitalization. Parameters evaluated included demographic data, length of stay (LOS), medical expenditure, knee pain, knee range of motion (ROM). Ambulation ability when patient discharged was defined as the final outcome of rehabilitation. **Results:** The LOS of patients was 7.6 ± 1.4 days with 3.6 ± 1.3 rehabilitation days, and the mean medical expenditure was one hundred and twenty-four thousand NT dollars which was significantly correlated with LOS and rehabilitation days. The variables measured before and after rehabilitation were: 3.6 ± 0.7 vs 2.4 ± 0.6 in VAS and 35.1 ± 19.5 degrees in ROM. In bi-variate analysis of patient's ambulation status (independent or dependent), there were significant difference between groups in body height ($p=0.003$), BMI ($p=0.034$), rehabilitation times ($p=0.008$), ROM before rehabilitation ($p=0.001$), ROM after rehabilitation ($p<0.001$), and ROM improvement ($p<0.001$) but no difference in LOS ($p=0.076$) and medical expenditure ($p=0.315$). When comparing ROM before rehabilitation, after rehabilitation, and improvement among 3 groups, there was only one significant difference in knee ROM improvement which was between group 1 and group 2 ($p=0.004$). By multivariate logistic regression analysis, it showed that knee flexion ROM after rehabilitation (adjusted odd ratio (OR), 8.1; 95% confidence interval (CI), 3.6-18.2, $p<0.001$) and different groups of rehabilitation days (group 1 vs 3, OR, 0.078, 95% CI, 0.016-0.387, $p=0.002$; group 2 vs 3 OR, 0.4, 95% CI, 0.104-1.544, $p=0.183$) were independent predictors of ambulation ability when patient discharged. **Conclusion:** From this clinical pathway analyses, for better knee ROM improvement and ambulation ability with less medical cost, 3 to 4 days of rehabilitation is appropriate to meet the goal of this study.

0430PP2

ULTRASONOGRAPHIC APPEARANCE OF GLOMUS TUMOR**Yi-Pin Chiang, Chia-Yu Hsu, Yao-Chia Chuang, Gwo-Chi Hu, Li-Ru Chen***Mackay Memorial Hospital (Taiwan)*

Purpose: To analyse the sonographic criteria for diagnosis of digital glomus tumors. **Materials and Methods:** Ten patients of the medical centre with clinical suspicion of digital glomus tumor were referred for the high-resolution ultrasound examination in the year 2009. Eight out of the ten patients received surgical excision for the tumors. All the specimens were sent for pathological diagnosis and six of them were proven to be glomus tumor. The sonographic pictures of the patients were reviewed to correlate with the pathologic finding. Whether presence of the following pictures under ultrasound was recorded: 1) a small (<1 cm) solid homogeneously

nodule beneath the nail with hypervascularity under color or power Doppler imaging, 2) bony erosion of the underlying phalangeal bone. **Results:** Six patients including five women and one man with pathological diagnosis of glomus tumor were recruited. Their ages ranged from 23 to 53 years. The sizes of the tumors were measured from 3 to 9 mm in greatest diameter. Three lesions involved the right hand, two involved the left hand, and one involved the right big toe. Four patients had focal hypervascular mass under color and power Doppler. Three patients had focal bony erosion in the underlying phalangeal bone. Only one in the six patients met both criteria. **Conclusion:** In assessing the glomus tumor with High-resolution ultrasonography, either criteria of focal hypervascular mass or bony erosion of the phalangeal bone under the nail could make the diagnosis of the tumor.

0430PP3

HEALTH PERCEPTION AND TIME OFF WORK IN DIFFERENT SEVERITY OF HAND INJURY**Yueh-Hsia Chen^{1,2}, Yuan-Hung Chao³, Hsin-Tai Lin²***¹Plastic and Reconstructive Surgery Rehabilitation Center, Chang Gung Memorial Hospital, ²Graduate Institute of Rehabilitation Counseling, National Taiwan Normal University and ³Institute of Biomedical Engineering, National Yang-Ming University (Taiwan)*

Purpose: Forearm, wrist and hand injuries account for the most frequent body part of vocational injury, and result in different severity of hand functional impairment. This study aims to investigate self-perceived health among different hand injury severity workers before return to work, and time taken to return to work after injury. **Material and Methods:** A total of 120 clients were enrolled. All clients were medical stable and prepared to return to work. Modified Hand Injury Severity Score (MHISS) was measured to quantify hand, wrist and forearm injuries. SF-36 Taiwan version was self-administered as health perception. Pearson correlation coefficient was used as association between the MHISS, SF-36 and time off work. One-way ANOVA was used to compare the group difference among the 4 categories of injuries on their health status. **Results:** Mean time off work was 126.5 days for mild MHISS category, 108.4 days for moderate injury, 159.6 days for severe injury, and 236.1 days for major injury. A statistically significant negative correlation was found between the MHISS and self-perceived physical functioning ($r=-0.196$, $p<0.05$), and positive correlation between MHISS and time off work ($r=0.459$, $p<0.01$). The results also showed that minor severity had poorer self-perceived social functioning compared with moderate or severe injury ($p<0.05$). Time to return to work was found significantly different between the major category with mild or moderate severity injury ($p<0.05$). **Conclusion:** The severity of hand injuries had moderate correlation with time off work. Mean time to return to work increased from minor to major MHISS category and had significant difference between major with mild or moderate injuries. Minor MHISS category had poorest self perception of social functioning before plan to return to work.

0430PP4

EFFECTS OF TAI CHI EXERCISE ON JOINT PROPRIOCEPTION AND STABILITY IN ACL RECONSTRUCTION SUBJECTS**Linrong Liao, Ju Wang, Haibin Liu, Dan Tang, Yata Ouyang***Guangdong Provincial Work Injury Rehabilitation Hospital (China)*

Purpose: To determine whether a Tai Chi exercise was effective to improve the knee joint proprioception and standing balance control than

control subjects. **Material and Methods:** Tai Chi and control subjects ($n=30$ each, aged $32.4 \pm SD 5.5$ and 38.3 ± 6.1 years, respectively) were matched with respect to age, sex, and physical activity level. Passive knee joint repositioning was used to test joint proprioceptive acuity. Balance function was evaluated by functional balance testing and single leg standing test. **Results:** Tai Chi practitioners were found to have better knee joint proprioceptive acuity, in that they made less absolute angle error (3.2 ± 1.5 degrees) than control subjects (5.0 ± 4.8 degrees, with $p=0.018$) in passive knee joint repositioning. Significant difference was found of the distance of functional reach of Tai Chi exercise group ($p<0.05$), and Significant difference was found of the duration of one-leg standing in TC exercise group ($p<0.05$). **Conclusion:** These results demonstrate that long-term Tai Chi practitioners had improved knee joint proprioception and can improve balance function and the duration of one-leg standing.

0430PP5

THE KINEMATICS FEATURE DURING WALKING AND OBSTACLE CROSSING FOLLOWING TOTAL HIP ARTHROPLASTY

Na-Ling Lin¹, Jen-Suh Chern¹, Shiuann Sheng Lee², Simon Fuk-Tan Tang², Susan Chang³, Hsieh Ching Chen⁴
¹Chang Gung University, ²Chang Gung Memorial Hospital, Linkuo Branch, ³Yang Ming University and ⁴Chaoyang University of Technology (Taiwan)

Purpose: Total hip arthroplasty (THA) effectively relieve pain caused by hip joint arthritis and/or fracture. But it is not clear to what extend the THA restores patients' balance function during walking and obstacle crossing. The aim of this study was to examine the balance function during walking and obstacle crossing before and after THA by kinematic analysis. **Material and Methods:** 14 patients with unilateral hip arthritis and/or fracture planning to accept THA participated in the study. The balance function during walk and obstacle crossing were measured with a three-dimension (3D) motion analysis system at one week before and 3 months after surgery. Three different obstacle heights (10, 20, and 30 cm) were used to grade the balance challenges. The subjects were instructed to perform the tasks at a self-selected comfortable speed. Lower limb trajectory and end-point variables (joint crossing angles) together with 3D joint kinematics of both the leading- and trailing-limbs were analyzed. Paired t-test was used to compare the walking performance before and after surgery. The obstacle height effects on the crossing angles for each periods were tested using repeated measures analysis of variance (RMANOVA) with a polynomial test to determine the trend (linear and quadratic, $\alpha=0.05$) and using leg length as a covariance. Independent t-tests were used to compare between before and after surgery for each obstacle height conditions. **Results:** Step time(s), step length (% normalizes with leg length) and walking speed (s/m) as not different significantly between limbs and between two time periods while walking. Hip flexion, hip adduction and knee flexion angles of the affected leading limb before surgery was smaller but pelvic tilt, pelvic obliquity, and pelvic rotation angles was larger of the affected leading limb for all height than after surgery. While the unaffected leading toe was above the obstacle of 20 cm and 30 cm high, hip extension of the affected stance limbs was larger and ankle dorsiflexion for all height was larger after surgery than before surgery period. Hip flexion and adduction for 30 cm height obstacle of the unaffected swing limb was smaller before surgery than after surgery. **Conclusion:** The gait parameters of the affected and unaffected limb were not different before and after surgery, indicating that the surgery did not influence the balance control during walking. The kinematic features of the affected limb, including hip flexion, external rotation, knee flexion, ankle dorsiflexion, pelvis anterior-posterior tilt, pelvis lateral tilt changed significantly 3 months after surgery comparing with before surgery, indicating that the surgery improved the balance functions while crossing obstacles of patients underwent THA, especially under conditions with high balance demands.

0430PP6

THE EFFECT OF TRIAMCINOLONE ACETONIDE INJECTION TO THE BURN SCAR

Jianxin Li, Luxi Zhang, Baoyun Huang, Pengdong Li
 Guangdong Provincial Work Injury Rehabilitation Hospital (China)

Purpose: To investigate the effect of Triamcinolone Acetonide Injection to soften the burn scar tissue. **Material and Methods:** Random select 20 patients with small burn scar tissue which is less than 5×5 cm² and not be suit to pressure treatment due to the special part, such as mandible, infront part of neck, etc. To add Triamcinolone Acetonide Injection 40 mg into 2% lidocaine hydrochloride, making of 1ml turbid liquor, and separating it to 5–6 parts to inject point to point with non-pinhead injector into scar tissue. **Results:** Among all the 20 patients receiving the Triamcinolone Acetonide Injection, 5 cases were recovered, 9 cases were prominently effective, 3 cases were effective, 3 cases were invalid. **Conclusion:** Triamcinolone Acetonide Injection can significantly soften the burn scar tissue, and the effective percentage can reach 85%.

0430PP7

THE EFFECT OF TAI CHI EXERCISE ON BALANCE OF PATIENTS WITH LOWER LIMB FRACTURE

Hao Liu, Jun Wang, Dan Tang
 Guangdong Provincial Work Injury Rehabilitation Hospital (China)

Purpose: To investigate the influence of Tai Chi on the balance ability of patients with lower limb fracture. **Material and Methods:** 49 subjects which suffered the lower limb fracture were assigned to control group (23) and Tai Chi group (26). The patients with fresh and unstable fracture were excluded from this study. Both two group patients were received the movement therapy which include muscle strengthening exercise, balance exercise, ROM exercise, and so on. The Tai Chi groups patients also do the Tai Chi exercise three times in one week. Functional reach in standing position and single leg standing were assessed in two groups 1 month later. **Results:** Compared with Tai Chi group and control group, the distance of functional reach and the duration of single leg standing in Tai Chi group patients are significantly more than the patients in control group ($p<0.05$, $p<0.05$). **Conclusion:** Tai Chi exercise is an effective way to improve the balance of patients with lower limb fracture.

0430PP8

THE EFFECT OF WORK-HARDENING PROGRAM ON RETURN-TO-WORK FOR LABORS WITH HAND INJURY

Min-Yuan Yu¹, Hsiao-Wei Hsu¹, Jer-Hao Chang², Jui-Kun Chang¹

¹Rehabilitation Department, Kaohsiung Chang Gung Memorial Hospital and ²Occupational Therapy Department, National Cheng Kung University (Taiwan)

Purpose: Forearm, wrist and hand injuries are the most common work-related injuries and often result in different severity of hand dysfunction. The purpose of this study is to examine the training effect of work hardening program for the functional hand capacity and return to work. **Material and Methods:** Fourteen labors with occupational hand injury were referred for work hardening program for return-to-work. Twelve were males and two were females. Their average age at the time of work hardening program was 40 years old (range: 19–61 years). The average time from injury to receive work hardening program was 26.72 weeks (range: 3.29–76.57 weeks). The average duration in receiving training program was 7.64 weeks (range: 4–10 weeks). Statistical analysis was performed by paired-t test to examine the difference of hand strength (grasp power and pinch power) and

functional capacity (The Purdue Pegboard Test and The Complete Minnesota Dexterity Test [CMDT]) before and after work hardening program. **Results:** All cases had improvement in hand strength and some functional capacity. The statistically significance presented in gasp power ($p=0.0082$), pinch power ($p=0.0006$) and The Purdue Pegboard Test ($p=0.0015$). In addition, the statistically significance was found in bilateral hand turning ($p=0.0102$) in CMDT. **Conclusion:** Because both the hand strength and functional capacity meet the trainees' individual work demand after work hardening program, all patients returned to full-time work.

0430PP9

EFFECT OF TREADMILL RUNNING ON THE VERTICAL SPINAL CREEP RESPONSE: A RANDOMIZED CONTROLLED TRIAL

Jutarat Adirek-Udom¹, Rungthip Puntumethak², Wantana Siritaratitwa², Rosalai Kanlayanapho²

¹Physical Therapy Program, Graduate School, Khon Kean University and ²Back, Neck and Joint Pain Research Group, Khon Kean University (Thailand)

Background: Vertical spinal creep (VSC), measured as the loss of spinal height change, is assumed to provide a measure for spinal loading. The spinal loading commonly occurs in a range of sporting activities and this could result in injuries, especially running. Although the previous studies have demonstrated that the VSC response is influenced by several activities, such as weight training, running, walking, those studies were not a randomized controlled trial study. **Purpose:** The aim of the study was to determine the magnitude of VSC response compared between treadmill running and control groups. **Material and Methods:** This study was a randomized controlled trial. Sixty healthy participants, aged 20 to 39 years, were randomized into the running group ($n=30$) and control group ($n=30$) by using block randomized allocation with block sized of 2, 4, and 6. Each subject was asked to attend for two separate occasions. The first occasion was for a familiarization session and the second occasion was for an experimental session. For the running group, each subject was asked to lie down in a Fowler's position for 20 min in order to minimize any effects of preloading on the spine before the experiment. After that, each subject was measured their VSC response using a height loss measuring stadiometer for 2 min (the first measurement) then the subject was asked to perform the running process for 41 min (2-min for general stretching, 3-min for warm up, 30-min for running, 3-min for cool down and 3-min for breathing recovery). After that, the subject was measured the VSC response again (the second measurement). For the control group the process of the experimental was similar to the running group except the subject in the control group was asked to continue their normal daily activities, instead of running on the treadmill, the same amount of time. **Results:** Paired t -test demonstrated a significant increase of VSC response in a running group ($p=0.007$) but not a control group. Unpaired t -test demonstrated that running on treadmill provided greater VSC response than normal daily activities, however no significant difference between groups was found ($p=0.87$). **Conclusion:** In conclusion, the results support that treadmill running could affect the VSC, but not significantly greater than normal daily activities in this study group.

0430PP10

IS CONTINUOUS PASSIVE MOTION DEVICE A POTENTIAL PROPRIOCEPTION ENHANCEMENT TOOL FOR CLINICAL REHABILITATION – RESULTS FROM THREE EXPERIMENTAL STUDIES

Hsin-Yi Cheng¹, Yan-Ying Ju²

¹Graduate Institute of Early Intervention, Chang-Gung University and ²Graduate Institute of Rehabilitation Science, Chang-Gung University (Taiwan)

Purpose: To examine the effects of continuous passive motion device (CPM) on knee proprioception via: 1) evaluating the influence of repetitive active movement (RAM) and repetitive passive movement (RPM) on knee proprioception, 2) comparing the effects of RPM with different angular velocities on knee proprioception, and 3) studying the influences of rapid RPM on knee proprioception in the elderly. **Material and Methods:** All the three experimental studies measured active repositioning and kinesthesia as proprioceptive indicators. The two indicators were presented with error scores before and after the movement intervention. Fifteen healthy young volunteers were recruited for the first two studies. Study 1 utilized a quasi-experimental design with repeated measure on two forms of knee joint movement (RAM and RPM in $120^\circ/s$ with 60 repetitions over a 10° – 100° range) in two consecutive days with a counter-balanced manner. Study 2 was a quasi-experimental design with repeated measure on movement velocity ($0^\circ/s$, $2^\circ/s$, $90^\circ/s$, and $150^\circ/s$ with 30 repetitions over a 10° – 100° range) with counter-balanced sequence in four successive days. So far Five elderly participated in study 3. Study 3 used the same RPM protocol in study 2 to evaluate the effects of rapid RPM on the elder population. **Results:** Results from study 1 showed a statistically significant increase in error scores following RAM, but a decrease in error following rapid RPM intervention ($p<0.05$). Results from study 2 revealed a significant decrease in error scores in both active repositioning and kinesthesia measurements with rapid RPM velocities ($90^\circ/s$, and $150^\circ/s$) ($p<0.05$); however no significant change was seen with static condition ($0^\circ/s$) or with the velocity of $2^\circ/s$. Results from study 3 also demonstrated a decrease in error scores after rapid RPM intervention among the elderly. **Conclusion:** We concluded that rapid RPM was capable of improving knee proprioception, specifically in active repositioning and kinesthesia measurements. Although it is unknown at this point whether subjects with pathology or injury would respond similarly to the healthy subjects with the proposed intervention, the results of this study suggested rapid RPM provided by the CPM device could serve as a potential rehabilitation tool for enhancing joint proprioception. Further investigations on subjects with pathology or injury, or subjects with proprioceptive impairment are warranted.

0430PP11

SAFETY OF LOW-DOSE ORAL ADMINISTRATION OF DANTROLENE SODIUM ON HEPATIC FUNCTION

Jung Yoon Kim^{1,2}, Sewoong Chun^{1,2}, Moon Suk Bang^{1,2}, Hyung-Ik Shin^{1,3}, Shi-Uk Lee^{1,3}

¹Department of Rehabilitation Medicine, Seoul National University College of Medicine, ²Department of Rehabilitation Medicine, Seoul National University Hospital and ³Department of Rehabilitation Medicine, Seoul National University Bundang Hospital (Republic of Korea)

Purpose: To investigate the incidence of hepatobiliary dysfunction after low-dose (≤ 400 mg/day) oral administration of dantrolene sodium. **Material and Methods:** A retrospective survey of medical records was performed in one secondary and two tertiary hospitals. A total of 243 patients (144 men, 34 children, aged 46.4 ± 21.6 years) who were administered a daily dose of 12.5400 mg of dantrolene for ≥ 4 weeks from January 2005 to February 2009 were included. Liver function test results recorded were serum total bilirubin, AST, ALT and ALP before and at least 1 month after the initial dose of dantrolene. In cases of cessation, the reason why was investigated. Significantly elevated LFTs were defined as ≥ 2 times of upper referent limits. **Results:** Administration duration of dantrolene was 268.0 ± 428.5 days (range 28–2,517 days) with daily dosage of 65.2 ± 44.7 mg (range 12.5–400 mg). At the end of investigation, 95 (18.5%) patients had been lost to follow-up, 105 had stopped dantrolene for any reason. The reasons for cessation were improved spasticity (42.9%), no effect of medication (27.6%) and other medical problems (5.7%). Seven patients (6.7%) showed weakness, however, did not have elevated levels in liver function tests. One

patient stopped dantrolene owing to asymptomatic elevation of AST 43 days after the initial dose, although it was less than 2 times of upper referent limits. Liver function test results before and after the administrations were available in 93 subjects (16 children, 77 adults) and these patients were aged 46.4 ± 21.6 years (8.9 ± 4.1 in children, 54.2 ± 14.3 in adults). There were significant difference between children and adults in post-administration serum total bilirubin (0.48 ± 0.19 vs. 0.64 ± 0.28 , $p=0.028$ by *t*-test) and pre- and post-administration ALP (198.21 ± 136.17 vs. 100.41 ± 91.30 , $p=0.001$ and 176.31 ± 55.67 vs. 97.24 ± 68.55 , $p<0.001$, respectively). All the other patients did not show any significant elevation in serum bilirubin, AST, ALT and ALP. **Conclusion:** No significant hepatic dysfunction was noted in 243 patients after at least 4 weeks' administration of low dose oral dantrolene. Low dose dantrolene could be used safely with clinical and laboratory monitoring.

0430PP12

MODIFIED DYNAMIC TRACTION SPLINTS FOR INTRA-ARTICULAR FRACTURE-DISLOCATIONS OF INTERPHALANGEAL JOINT

Jui-Kun Chang, Yee-Hwa Wu

Rehabilitation Dept., Kaohsiung Chang Gung Memorial Hospital (Taiwan)

Purpose: Follow-up outcomes of cases using modified dynamic traction splints for the treatment of unstable intra-articular fracture-dislocations about the interphalangeal joint. **Materials and Methods:** 1) The patients with near-digital-joint fracture or comminuted intra-articular fracture of the PIP and MCP joints were treated by dynamic traction splinting and early active mobilization. 2) Surgery involved the placement of a pin for traction. The traction splints were fabricated by occupational therapists after or before pinning. 3) The most of the traction splints we used consist of U-shape (modified from ring-shape loop) aluminum wire, elastic band, and tab. Distal traction was provided by 2 rubber bands connecting the transosseous pin to the tab around the forefront of U-wire. 4) Under exact alignment of digital traction, active ROM exercise of fracture site was carried out on a timed schedule. 5) The splints and transosseous pins were removed after 6-8 weeks. The follow-up evaluation of hand function was arranged. **Results:** At follow-up assessment, most of cases had good results in ROM and hand function after splints removed. X-ray films revealed good results of fracture union, joint remodeling, and preservation of joint space. **Conclusion:** 1) Adequate alignment, traction and active ROM exercise can be effective treatment for near-digital-joint fracture or digital intra-articular fracture. 2) The modified simple U-shape wire dynamic traction splint design is recommended.

0430PP13

APPLICATION OF ELECTROMAGNETIC EXTRACORPOREAL SHOCK WAVE IN THE TREATMENT OF PERIARTHRITIS OF SHOULDER

Rongqiu Mao, Ying Chen, Huiliang Si, Xinpeng Wang

The First Affiliated Hospital of Guangxi Medical University (China)

Purpose: To observe the clinical effect of electromagnetic extracorporeal shock wave in the treatment of periarthritis of shoulder. **Material and Methods:** Sixty cases of periarthritis of shoulder, aged 24–65 years, were treated with electromagnetic extracorporeal shockwave. The electromagnetic lithotripter was used to produce the shock wave impact on the spur, and 9.0–16.0 Kv of the work voltage and 1000–1200 times of impact dose were chosen, and every treatment have a break of 7 days, a total of 3 times. We will have a evaluation and assessment of pain and the range of shoulder and activities of daily living in pre-treatment and after treatment a week. **Results:** Of sixty cases, pain scores, shoulder joint activity scores and ADL scores of test group in the 7th day–14th day and the

21th day after treatment than that before treatment were significantly decreased comparing with pre-treatment and the decrease was statistically significant, $p<0.05$. **Conclusion:** The electromagnetic extracorporeal shock wave is a safe and effective non invasive method in the management of periarthritis of shoulder.

0430PP14

TAYLOR SPATIAL FRAME IN THE LOWER LIMB – A CASE REPORT

Yasutaka Takagi¹, Hiroshi Yamada¹, Yoshimitsu Kanazawa¹, Wataru Nasu¹, Hiroyuki Tanaka¹, Shingo Shimozaki¹, Kenji Kagechika², Hiroyuki Tsuchiya³

¹Tonami General Hospital, ²Kanazawa Medical University and ³Kanazawa University (Japan)

Purpose: The Taylor Spatial Frame (TSF) is a modern multiplanar external fixator that combines the ease of application and computer accuracy in the reduction of fractures. We report a case of tibia fracture with Taylor Spatial Frame whose treatment period was very short. **Case Description:** 47-year-old man suffered his left tibia fracture when 800 kg metal frame dropped at his lower leg. His left leg showed remarkably swelling but open wound and compartment syndrome were not recognized. X ray showed intraarticular fracture and metaphyseal fracture. Immediately we fixed the fracture with the TSF and fracture displacement was measured and corrected by the computer program. In two weeks, complete reduction of fracture was obtained and partial weight bearing was started. Rehabilitation of early ROM exercise in knee and ankle joint was done. In nine weeks after the TSF fixation, we obtained bone union and the TSF was removed. The TSF has two rings and six struts that are expandable. It can correct every deformity simultaneously: angulation, translation, rotation, elongation, and shortening. The TSH is supported with software available on a web site to analyze the deformity parameters of interest. **Conclusion:** We can treat high energy trauma in minimum invasive method with the TSF. We believe the TSF is an excellent and useful tool for acute fracture.

0430PP15

EFFECTS OF REHABILITATION ON HEALTH OUTCOMES AND MEDICAL EXPENSES AFTER TOTAL KNEE REPLACEMENT

Hui-Wen Chen^{1,2}, Ching-wen Chien²

¹Far Estern Memorial Hospital and ²National Yang Ming University (Taiwan)

Purpose: Taiwan has become an aging society. An increase in the elderly population inevitably result in a rise in the expenditure of medical care utilization, especially total knee replacement (TKR). Although TKR is one Case Payment System in November 1997, a complete study on rehabilitation on TKR has never been studied. This study aims at comparing different time moment of receiving rehabilitation and the consequence in cost and quality of medical utilization. **Materials and Methods:** A retrospective study of comparing TKR patients' medical utilization, abstracted from 2003–2006 National Health Insurance Research Database (NHIRD), for one year after discharge was conducted. All medical utilization in outpatient, inpatient and emergency care were collected and aggregated by each subject's de-identification number. ANOVA and *t* tests were major data analysis methods. **Results:** During 2004–2005, there were 21,243 patients taken total knee replacement and 15,898 (75.19%) were female. They were further divided into three groups: no rehabilitation after TKR, rehabilitation within 2 weeks of discharge and rehabilitation after 2 weeks of discharge. The outcomes were measured by outpatient, inpatient, emergency care and overall medical expenditures for one year. Incidence of venous thrombosis and infection with admission were used as measures of quality. After controlling for patient demographic characteristics and severity of illness, the group who received rehabilitation within TKR 2 weeks spent least medical resources and

the incidence of venous thrombosis was significant differences than other groups ($p < 0.0001$). **Conclusion:** Early rehabilitation is the most effective method in reducing expenditure and increase quality for TKR patients. The rehabilitation should be included in minimal requirements standard for TKR patients. The Department of Health (DOH) should establish a clinical database which collects all follow-up data for TKR patient's quality of care.

0430PP16

THE EFFECTS OF THE ANKLE FUNCTION AND DONOR-SITE MORBIDITY AFTER MANDIBLE RECONSTRUCTION WITH DIFFERENT FIBULA FLAPS IN HEAD AND NECK CANCER

Yu-Chi Huang, Yi-Ta Tsai, Yur-Ren Kuo, Chau-Peng Leong

Chang Gung Memorial Hospital, Kaohsiung Medical Center (Taiwan)

Purpose: The aim of this study is to compare the difference of the ankle function and the donor-site morbidity between two different fibula flaps in mandible reconstruction. **Material and Methods:** Twenty-one patients with oral cancer who received mandible reconstructions with the free fibula graft were recruited in this study. The original fibular osteocutaneous flap was done in 13 of these patients and the fibula osteocutaneous flap with a sheet of the soleus muscle (chimeric flap) were performed in 8 of the patients. Point Evaluation System (PES) questionnaire for the donor-site morbidity and isokinetic testing (peak torque and total work) of the affected ankle were completed for each patient at least 3 months after surgery. **Results:** The comparison of the ankle peak torque and total work between the patients receiving the original or chimeric fibula flap while doing ankle plantarflexion/dorsiflexion and inversion/eversion revealed no significant difference ($p = 0.12-0.85$). No significant difference was found in the mean points of the PES questionnaire between the original or chimeric fibula flap ($p = 0.45$). **Conclusion:** The chimeric fibula flap could not contribute to more attenuation of the ankle force and endurance while performing ankle plantarflexion/dorsiflexion and inversion/eversion than the original flap. Furthermore, the chimeric flap could provide sufficient bulk and tissue for filling dead space and decreasing the chances of neck wound infection and post-operative hematoma.

0430PP17

EFFECT TO CLINICAL EFFICACY OF KERITHERAPY TO PATIENTS WITH TAKAYASU ARTERITIS

Yan Wang¹, Qing Tang¹, Juan Li²

¹Second Affiliated Hospital of Heilongjiang University of Traditional Chinese Medicine and ²Chinese and Mongolian Medicine Hospital of Inner Mongolia (China)

Purpose: To investigate the function of kerithery, to patients with takayasu arteritis. **Material and Methods:** 22 patients with Takayasu arteritis (TA) were treated in our rehabilitation medicine center in the past 5 years. They were 4 men and 18 women. The age of development TA was between 19 to 67 years old. The courses of the disease were between 1 to 5 years. The patients were treated by kerithery, 30 min per time and 1 time per day, 6 times per week and a course of treatment was made up of 4 weeks. The melting point of medical paraffin we selected was 56°. Putting the melting paraffin to a special plate to cool off and made it to round and flat which is called "wax cake", then putting the wax cake to back and four limbs of the patients' body. Meanwhile, to stop intake adrenal cortical hormone and immunosuppressor. Besides, they could be treated for relieving some symptoms, such as reducing blood pressure and platelet aggregation inhibitor and so on. **Results:** After 4 weeks treating, a patient became clinical recovery, 11 patients became markedly effective, 8 patients became effective and 2

patients became no effective. **Conclusion:** In a word, kerithery relieve the clinical symptoms of patients with Takayasu arteritis, which deserve to further study and popularize.

0430PP19

IS SYMPTOM DURATION AN OUTCOME PREDICTOR OF CARPAL TUNNEL SYNDROME TREATED WITH NIGHT SPLINTING?: AN ULTRASONOGRAPHIC FOLLOW-UP STUDY

Lin-Yi Wang¹, Ting-Yuan Liu¹, Yu-Chi Huang^{1,2}, Yiu-Chung Lau^{1,2}, Wun-Schen Chen^{2,3}, Henry L. Lew⁴, Ya-Ping Pong¹

¹Department of Rehabilitation, Chang Gung Memorial Hospital-Kaohsiung Medical Center, ²Department of Rehabilitation, Chang Gung University College of Medicine, ³Department of Orthopedics, Chang Gung Memorial Hospital-Kaohsiung Medical Center (Taiwan) and ⁴PM&R Service, VA Boston Health Care System, Harvard Medical School (United States)

Purpose: To investigate whether the symptom duration of carpal tunnel syndrome (CTS) is an outcome predictor of night splinting, and to evaluate the potential value of ultrasonography (US) as an objective outcome measure of CTS treated with splinting. **Material and Methods:** Thirty-five subjects diagnosed with mild to moderate CTS were evaluated before and after 6-month night splinting. The subjects were divided into two groups according to their symptom duration: the short duration (SD) group, symptom duration ≤ 12 months, and the long duration (LD) group, symptom duration > 12 months. Three outcome measures were: (1) symptom severity scale (SSS) of CTS, (2) the onset sensory distal latency of the median nerve (SDL) in nerve conduction study, and (3) the cross-sectional area of the median nerve at the pisiform level (P-CSA) on US. Within-group and between-group comparisons were made for the corrected data. **Results:** A total of 27 subjects completed the study. Twenty-three hands were categorized in the SD group and 15 hands in the LD group. For SSS, there were significant improvements in both groups after splinting, with a trend toward better outcomes in the SD group ($p = 0.079$). For SDL and P-CSA, there were significant improvements after splinting only in the SD group; and significant better outcomes were observed in the SD group ($p = 0.002$ for SDL, and $p = 0.012$ for P-CSA). Moreover, while comparing the percentage of change, significant better outcomes were observed in SD group for all the three outcome measures ($p < 0.001$). In addition, SSS, SDL, and P-CSA correlated to each other significantly. **Conclusion:** Mild to moderate CTS with shorter symptom duration (≤ 12 months) could be treated with night splinting. P-CSA on US could be an objective outcome measure of CTS treated with splinting.

0430PP20

PREVALENCE OF FRAIL FRACTURE IN WESTERN CHIAIYI COUNTY

Chu-Hsu Lin¹, Tung-Jung Huang², Hung-Chih Hsu¹, Kai-Hua Chen¹, Chien-Min Chen¹, Wei-Chi Hsieh¹, Wen-Ming Chang¹, Kuan-Ming Fang¹

¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, Chiayi and ²Division of Chest, Department of Internal Medicine, Chang Gung Memorial Hospital, Chiayi (Taiwan)

Purpose: Chiayi County is one of the most serious counties with aging of the population in Taiwan and osteoporosis related frail fracture may be a major medical problem to the residents. The present study is to investigate the prevalence of frail fracture in western Chiayi County and its possible association factors. **Material and Methods:** This is a subproject of a community-based study with investigation on hypertension, metabolic syndrome, serum uric acid level, frail fracture and chronic obstructive lung disease of residents of western

Chiayi County including Dongshi, Budai, Lucao, Xingang, Liujiao, Yizhu and Shuishang Township, Puzi and Taibao City. People older than 45 years old, who attended the morning health examination held by local public health centers of western Chiayi County were asked whether to join such a study. Totally 1,800 cases would be recruited and interviewed with a common questionnaire designed for all subprojects. The questions asked, including fracture history (fracture sites and causes), past systemic disease, life style (diet and exercise habits) and medical care habits. The data of blood pressure, body height, body weight, circumference of waist and hip, serum examination including Bun, creatinine, cholesterol, LDL, HDL, triglyceride, glucose, glycohemoglobin (HbA1c), urine microalbumin and creatinine were also collected. Frail fractures were defined as fracture due to falling down from standing, walking, running, jumping and slow bicycling. The association of frail fracture and all the other factors were analyzed statically using SPSS 12.0. **Results:** At present, 1396 (male 520, female 876) cases were recruited. Eighty-six percent of the cases were older than 55 years old. There were 263 (18.8%) cases had fracture history and 101 (7.2%) cases were assumed to have frail fractures. Wrist was the most common site of frail fracture with 44 people involved, and then in turn are spine (27 people), hip (21) and proximal humerus (15). The prevalence of frail fracture of each site is around 1.0%–2.3%. Four hundred and forty six people (31.9%) had been informed to have osteopenia or osteoporosis by health-care personnel, most of them diagnosed by ultrasonography (69.3%), then in turn are X ray examination (21.7%), DEXA (5.6%), X-ray revealed osteoporotic fracture (2.0%), and diagnosed clinically only (1.3%). Totally, only 92 people (6.6%) had received Dual energy X-ray absorptiometry (DEXA) before. Female was at higher risk of health-care personnel informed bone loss (odds ratio male/female: 0.62, 95% CI: 0.52–0.74, $p=0.00^*$) and higher rate of frail fracture (7.9% V.S 6.2%) but not statically significant ($p=0.23$). People older than 55 years old had higher risk of frail fracture compared to younger group (8.2% V.S. 1.8%, $p=0.01^*$). Body weight and body mass index seemed not affect the rate of frail fracture. People who had been health-care personnel informed bone loss had higher risk of frail fracture (Odds ratio: not informed bone loss/informed bone loss: 0.52, 95% CI: 0.36–0.76, $p=0.001^*$). Residents of Yizhu and Lucao townships had higher rate (11.9%, 11.6%, respectively) of frail fracture than other areas ($p=0.046^*$). Coffee, alcohol consumption, smoking, vegetarianism, eating out, history of diabetes, hypertension, dyslipidemia, liver disease and renal disease had not thing to do with frail fracture although people who drank tea every day seemed to have lower rate of frail fracture but not statically significant (odds ratio no tea/tea every day: 1.74, 95% CI: 0.97–3.14, $p=0.057$). Blurred vision is an important risk factor to predict frail fracture in female older than 55 years old (odds ratio good vision/blurred vision: 0.32, 95% CI: 0.17–0.61, $p=0.001^*$). Laboratory examination including serum Bun, creatinine, cholesterol, LDL, HDL, triglyceride, glucose, glycohemoglobin (HbA1c), urine microalbumin and creatinine had nothing to do with frail fracture, however, in male older than 55 years-old group, people who had lower albumin creatinine ratio seemed to have higher frail fracture risk (26.2% V.S 12.3%, $p=0.02^*$). Occurrence of fracture might change medical care behavior since people with fracture history had higher rate of DEXA examination (24.2% vs 5.3%, $p=0.00^*$) and calcium tablet intake (21.3% vs 13.6%, $p=0.002^*$). **Conclusion:** The estimated frail fracture prevalence in western Chiayi county is about 7.2% of which wrist fractures are the most common site involved. Health-care personnel informed bone loss and blurred vision were important risk factor to predict frail fracture.

0430PP21

REHABILITATIVE ULTRASOUND IMAGING OF TRANSVERSAL ABDOMINIS MUSCLES IN TAIWANESE WOMEN: EFFECTS OF AGE AND DIFFERENT CONTRACTION STATES

San-Pei Chen^{1,2}, *Li-Wei Chou*^{1,3,4}, *Maria Stokes*²

¹Department of Physical Medicine and Rehabilitation, China

Medical University Hospital (Taiwan), ²School of Health Sciences, University of Southampton (United Kingdom), ³School of Chinese Medicine, College of Chinese Medicine, China Medical University and ⁴Department of Physical Therapy, China Medical University (Taiwan)

Purpose: The abdominal muscles, in particular the transversus abdominis (TrA) muscle, are considered to be stabilizers of the spine in the lumbo-pelvic region. The TrA can become wasted and its activity pattern relative to other muscles may be altered during functional tasks in people with low back pain. Rehabilitative ultrasound imaging (RUSI) offers a non-invasive way to visualize and measure muscles. However, research has mainly been limited to Western populations and the abdominal muscles have not yet been examined in Taiwanese women. A preliminary study has shown that the reliability of RUSI in Taiwanese women was sufficiently high enough ($ICC > 0.75$) to apply the technique in further studies. The present study aimed to characterize the morphometry of TrA in Taiwanese women of different ages, both at rest and during a functional activity using the active straight leg raise (ASLR) test to produce abdominal muscle contraction.

Material and Methods: Thirty-three healthy Taiwanese women aged 18 to 65 years were studied; 16 participants were recruited through the Taiwanese Student Society at the University of Southampton UK, to establish the reliability of the RUSI technique, and 17 participants were recruited at the China Medical University Hospital (CMUH) in Taiwan as part of an age-matched control group for coccydynia. In each session, the lateral abdominal wall was scanned bilaterally, twice at rest and twice during a unilateral ASLR. The mean values for the two scans taken in each contraction state were used in the analysis. In Southampton, an Aquila (Pie Data) ultrasound scanner with a 6 MHz linear probe was used to obtain images. In Taiwan, a GE ultrasound scanner with a 7L linear probe (2.5–7 MHz) was used. All images were stored and muscle thickness was measured off-line using Image J software. **Results:** Due to the age differences between the two study cohorts in the UK and Taiwan, the muscle thicknesses results are presented for the two groups separately. In the younger group (mean age = 25.9 ± SD 3.3 years), TrA thickness was smaller than in the older group (mean age = 43.6 ± SD 12.8), both at rest and during the ASLR (right TrA thickness at rest, mean ± 1 standard deviation; 2.1 ± 0.7 mm and 4.8 ± 2 mm, respectively; during ASLR 2.1 ± 0.7 mm young group and 6.1 ± 3.3 mm older group). The younger group did not appear to recruit their TrA during the ASLR test. The thickness of TrA was similar on both sides at rest and during contraction in both groups. **Conclusion:** This study provides normal reference values for TrA muscle thickness in healthy Taiwanese women of different ages as a basis for studying pathological groups. The findings in the younger women show smaller values than in Western women of similar ages. The larger values in the older Taiwanese women may reflect their higher body weight. The present findings confirm the symmetry of TrA thickness between the two sides of the body found in Western populations. The lack of change in TrA thickness during the ASLR in young women warrants further study of motor control mechanisms in this age group.

0430PP22

COMBINED HOME EXERCISE IS MORE EFFECTIVE THAN RANGE-OF-MOTION HOME EXERCISE IN PATIENTS WITH ANKYLOSING SPONDYLITIS – A RANDOMIZED CONTROLLED TRIAL

Lin-Fen Hsieh^{1,3}, *Ching-Shiang Tseng*¹, *Hsin-Yi Lee*², *Chih-Cheng Chuang*^{3,4}, *Wen-Shan Chen*¹, *Ching-Chou Cheng*¹

¹Department of Physical Medicine and Rehabilitation, Shin Kong Wu Ho-Su Memorial Hospital, ²Institute of Occupational Medicine and Industrial Hygiene, College of Public Health, National Taiwan

University, ³School of Medicine, Fu Jen Catholic University and ⁴Department of Allergy, Immunology and Rheumatology, Shin Kong Wu Ho-Su Memorial Hospital (Taiwan)

Purpose: To compare the effectiveness of combined home exercise (COMB) and range-of-motion home exercise (ROM) in patients with ankylosing spondylitis (AS). **Material and Methods:** This is a single-blind randomized controlled trial. Nineteen subjects with AS completed either COMB (9) or ROM (10) program. The COMB program included range-of-motion, strengthening, and aerobic exercise while the ROM program consisted daily range-of-motion exercise only. After exercise instruction, subjects in each group performed home exercise for 3 months. Assessment included exercise tolerance test, pulmonary function test, spinal mobility measurement, chest expansion, Bath Ankylosing Spondylitis Functional Index (BASFI) and other functional ability tests, and laboratory tests. **Results:** After exercise, the COMB group showed significant improvement in peak oxygen uptake (12.3%, $p=0.008$) and BASFI ($p=0.028$), and the changed score between pre- and post-exercise data was significantly greater in the COMB group regarding peak oxygen uptake and BASFI. Significant improvement in finger-to-floor distance after 3-month exercise was found only in the COMB group ($p=0.033$). There was no significant difference with regard to most of the spinal mobility tests, pulmonary function tests, and laboratory tests, either within-group comparison or between-group comparison. **Conclusion:** In Chinese patients with AS, a 3-month combined home exercise program provides beneficial effects in aerobic capacity and BASFI, and combined home exercise was more effective than range-of-motion exercise alone. It is also suggested that range-of-motion or stretching exercise should be started in the early course of the disease.

0430PP23

CLINICAL AND SONOGRAPHIC APPEARANCE IN PATIENTS WITH INTRAMUSCULAR HEMANGIOMA

Shiau-Fu Hsieh, Yu-Chung Hong, Yao-Chia Chuang, Gwo-Chi Hu, Li-Ru Chen, Yi-Pin Chiang
Mackay Memorial Hospital (Taiwan)

Purpose: To determine the clinical and sonographic appearance in patients with intramuscular hemangioma. **Material and Methods:** From Nov. 2004 to Oct. 2009, patients with hemangioma as diagnosis or one of the choices of diagnosis in our musculoskeletal ultrasound examination were reviewed. There were twenty-eight patients met the criteria. In which, twelve patients were confirmed to have intramuscular hemangioma by either MRI or tissue proof. **Results:** The clinical setting and sonographic appearance were analyzed. There were 10 female and 2 male patients with average age of 24.1 ± 14.2 years (ranged from 9 to 58 years). Nine of the lesions located in the lower extremities while three of them were in upper extremities. Nine of the patients experienced palpable mass in their limbs but limb pain was the only complaint of the other three patients. Well-margined localized mass with rich vascularity were noted in all the 12 patients. All the masses were easily compressed and echogenic phleboliths were noted in only two patients. The size, shape, echogenicity and vascularity were then compared with MRI findings. **Conclusion:** Intramuscular hemangioma could be diagnosed under ultrasonography and the sonographic findings had good correlation with MRI studies.

0430PP24

ULTRASOUND-GUIDED ACUPUNCTURE FOR TREATMENT OF SHOULDER CALCIFIC TENDINITIS: A CASE REPORT

Yi-Pin Chiang, Yao-Chia Chuang, Gwo-Chi Hu, Li-Ru Chen
Mackay Memorial Hospital (Taiwan)

Purpose: To present a case of shoulder calcific tendinitis with resorption of the calcific spot after ultrasound-guided acupuncture. **Material and Methods:** A 40-year-old female patient suffered from shoulder pain for several months. Musculoskeletal ultrasound depicted a one centimeter calcific deposit in her supraspinatus tendon. She received physical therapy with ultrasound diathermy for two months but the calcific spot remained. Acupuncture with a two-inches-long needle was arranged under ultrasound guidance. In-and-out and twist technique were applied for needling to the calcific spot. During the acupuncture procedure, patient felt nausea and dizzy about 2 min after beginning of needling. The needle was immediately removed and the patient was carefully put in supine position. The symptom became better in about 5 min and the patient no longer felt discomfort. The vital sign was stable before she could stand and walk. **Results:** The patients returned to the clinic for follow up three months after acupuncture. The calcific deposit completely disappeared under X-ray and ultrasound. **Conclusion:** Ultrasound-guided acupuncture may be one of the methods for treating calcific tendinitis of the shoulder. The mechanism for enhancement of resorption of calcific lesion was not yet fully understood.

0430PP25

FIBULAR OSTEOCHONDROMA ASSOCIATED WITH COMPRESSION NEUROPATHY OF COMMON PERONEAL NERVE: A CASE REPORT

Shu-Hua Lin¹, Eou-Ting Hsieh¹, Chein-Wei Chang², Jen-Li Pan¹, Chien-Huang Kuo¹, Tai-Yi Wu¹

¹Department of Physical Medicine and Rehabilitation, Long-Tong Pohai Hospital and ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: To report a rare case of fibular osteochondroma associated with a compression neuropathy of common peroneal nerve. **Material and Methods:** A 13 year-old boy was noted to have a progressive left lower extremity weakness and drop foot for two weeks. A series of examinations including electrophysiological study, roentgenography and magnetic resonance (MR) image were performed, and the diagnosis was made with an osteochondroma at fibular head associated with a compression neuropathy of common peroneal nerve. Surgical decompression was done then after, and the histopathology of the removed specimen approved the diagnosis. **Results:** Electrodiagnostic findings demonstrated a common peroneal neuropathy with a major involvement of deep peroneal nerve branch. A bony exostosis appeared at proximal fibula in roentgenography. Continuity of the cortical and medullary bone in a bone tumor with the parent bone was found in MR image. Osteochondroma was confirmed by the histological examination of proximal fibula. After decompression surgery of the tumor and an intensive course of comprehensive rehabilitation, the patient's neurological symptoms subsided and his neurological functions improved leading to a good prognosis. **Conclusion:** In comparison with adult, children have higher incidence of osteochondroma. Peroneal nerve mononeuropathy occurred in children should be considered as an associated bone tumor in the diagnosis. Surgical decompression is always required and expected to have a good outcome.

0430PP26

SUPERFICIAL RADIAL NERVE AND CEPHALIC VEIN: AN ANATOMIC STUDY BY CADAVER DISSECTION

Soon Hee Yoo, Joon Sung Kim, Myung Eun Chung, Ju Sun Oh

Department of Rehabilitation Medicine, College of Medicine, The Catholic University of Korea (Republic of Korea)

Purpose: To acquire normal anatomy of superficial radial nerve and cephalic vein and identify the optimal site for venipuncture of cephalic vein at wrist to decrease the damage of superficial radial nerve. **Mate-**

rial and Methods: We examined the anatomic relationships of the superficial radial nerve, cephalic vein, styloid process of radius in 6 hands from 4 cadavers. The distances were measured from the styloid process of radius to the point at which the superficial radial nerve pierced fascia, and to the crossing point of superficial radial nerve with cephalic vein. **Results:** The mean distance from the styloid process of radius to the point at which the superficial radial nerve pierced fascia was 75.5 ± 11.1 (60–88) mm and from the styloid process of radius to the crossing point of superficial radial nerve with cephalic vein was 22.8 ± 5.9 (13–30) mm. **Conclusion:** The most optimal injection site for venipuncture of cephalic vein at wrist was located 30 mm more proximal area from styloid process.

0430PP27

MAGNETO THERAPY EFFECT ON ANKLE STRAIN

Yenny Lindoyo

Setia Medika Medical Rehabilitation Clinic (Indonesia)

Introduction: Magneto therapy is a therapy that utilizes the static magnetic fields to assist in rehabilitating body metabolism. The most important phenomenon that occurs in biological tissue exposed to a pulsed magnetic field is the onset of induced micro currents. Protein macromolecules, called biopolymers have piezoelectric properties and behave as transducers, so that magnetic field applied will cause a variation in their electric states. Trauma can cause a depolarisation of these protein structures and reduce the transmembranous electric potential of the cell. The micro currents induced by the magnetic therapy repolarise the biopolymers, re-establish the correct electrical potential, accelerate ionic movement and resume enzymatic kinetics, re-integrate tissue functions. The utilized static magnetic fields have a low frequency from 0 to 100 Hz with intensity range between 5 and 100 Gauss. A strain is an injury to the muscle–tendon unit, it may be caused by acute overload or repeated submaximally activity. Acute injuries is classified from first to third degree. First degree is a microscopic injury to ligament or muscle–tendon. Second degree is a macroscopic injury with fiber continuity (partial tear). Third degree is a severe injury with fiber discontinuity (full tear). The main interest of this case is to test the effect of magnetotherapy on ankle strain on elderly people (63 years old). **Case:** Male, 63 years old, with chief complaint pain on his left ankle. He felt suddenly pain on his ankle when he played basket ball. He is unable to walk on his toes. The ankle became swollen and redness. He felt that his left foot became weak. **Physical examination:** Antalgic gait, at regio left foot look oedem, color, dolor and functiolaesa on left ankle, pain on movement in all direction, limited range of motion, positive Thompson's test. **Supporting examination:** Ultra Sono Graphy: Left ankle strain grade II (partial tear) Rehabilitation medicine programs are magneto therapy with the power 80 Gauss, frequency 50 Hz, duration 20 min, 3 times a week. At this stage, patient was using Ankle Foot Orthose. **Results:** At the third week of treatment, USG result was minimal tear. After 6 weeks treatment, USG result was no more tear, the new formation of fibrin tissue was shown. The therapy was continued 2 times a week, started with gentle stretching, and then followed by gradual strengthening exercises. On the third month, patient was able to run without pain. On the fourth month, patient played basketball again without any problems. **Conclusion:** Low frequency magneto therapy works on strain grade II case. It accelerates the healing process.

0430PP28

PREVALENCE OF FLATFOOT AND ITS CLINICAL CORRELATION IN TAOYUAN TEENAGERS

Huan-Jui Yeh, Hwei-Yu Lo, Yau-Wai Wai, Wai-Keung Lee

Taoyuan General Hospital (Taiwan)

Purpose: To establish a database of prevalence of flatfoot among Taiwanese local teenagers and make a comparison between different measurement methods, relevance of clinical foot symptoms and to

discuss the impact of flatfoot on teenagers. **Material and Methods:** Five hundred and forty-four 12 to 14-year-old teenagers in Taoyuan were enrolled in this study. Footprint Analysis methods was used to diagnose flatfoot (plantar arch index more than 1.15 OR Denis grade equal or more than grade I OR Footprint index less than 1cm OR Footprint angle less than 30 degree). Clinical symptoms of foot and endurance were collected by questionnaires. **Results:** The prevalence of flatfoot in Taoyuan teenagers was 11.6% to 61.2%. This variation is attributed to the different footprint analysis methods used. While using the diagnostic criteria of plantar arch index (PAI) or Denis grade or Footprint index (FI), the flatfoot teenagers experience greater pain when standing and walking and less endurance when standing and running. However, if using Footprint angle (FPA) less than 30 degree as diagnostic criteria, there is no significant difference between flatfoot patients and the control group unless the measurement standard is changed to Footprint angle less than 20 degree. **Conclusion:** Teenagers in Taoyuan with flatfoot diagnosed by footprint analysis mediated PAI or Denis grade or FI showed more clinical symptoms than FPA, and should consider further evaluation and intervention. Flatfoot diagnosed by FPA (either less than 30 degree or less than 20 degree) may need further evaluation and research.

0430PP29

USE OF BAYESIAN MODELING TO ESTIMATE THE ACCURACY OF ULTRASONOGRAPHY AND MAGNETIC RESONANCE IMAGING IN DIAGNOSING MENISCAL TEAR

Ya-Ning Chiu^{1,2}, Tyng-Guey Wang¹, Kai-Min Chang¹, Shin-Liang Pan¹

¹Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital and ²North Coast Jin-Shan Hospital (Taiwan)

Purpose: This study aimed to determine the diagnostic accuracy of both ultrasonography (US) and magnetic resonance imaging (MRI) for meniscal tear of knee when the information of gold standard was incomplete. **Material and Methods:** A total of 140 knees underwent both US and MRI for the diagnosis of meniscal tear were reviewed. Twenty-one of these 140 knees underwent surgical exploration regarded as the gold standard for diagnosing meniscal tear. Bayesian estimation was used to determine the sensitivity, specificity and likelihood ratio for US and MRI simultaneously given the incomplete information of gold standard. **Results:** For the US, the estimated sensitivity was 0.61 (95% confidence interval (CI): 0.48 to 0.74), the specificity was 0.87 (95% CI: 0.81 to 0.92), and the likelihood ratio for a positive test was 4.9. For the MRI, the estimated sensitivity was 0.88 (95% CI: 0.79 to 0.95), the specificity was 0.71 (95% CI: 0.62 to 0.80), and the likelihood ratio for a positive test was 3.1. **Conclusion:** Although the sensitivity of US was lower than MRI, the specificity of US was significantly higher than MRI. This contributes to a high likelihood ratio for US in comparison with MRI.

0430PP30

ALTERATION OF POSITIONAL CONTROL IN ORTHOSTATIC ERECT IN PATIENTS WITH RETICENT TYPE OF SPINAL DYSRAPHISM, TYPE 1 AND TYPE 2

Shin-Tsu Chang, Shang-Lin Chiang, Tsung-Ying Li, Heng-Yi Chu, Liang-Cheng Chen, Ming-Fu Hsieh, Cheng-Chiang Chang, Min-Hsin Lai

Department of Rehabilitation, Tri-Service General Hospital, NDMC (Taiwan)

Purpose: To examine if a posture for upright control is worsened in subjects with reticent type of spinal dysraphism (SD) by

comparing the testing during orthostatic erect and vision input. **Material and Methods:** A total of 80 SD patients, 38 in type 1 SD and 42 in type 2 SD, was enrolled in the experimental group, where a group of healthy subjects as a control. We performed 10 tests while orthostatic erect on a platform with 0 degree level and tilting surface (10 and 20 degrees) in the foot dorsiflexion and plantarflexion, together with eyes open and closed in each. We recorded a series of sway parameters (sway area, intensity, mean, and velocity) via a force platform to stand for the orthostatic erect. **Results:** SD subjects within the type 1 and type 2 groups had higher values of sway area while compared with the control. Taken from comparison within the group differences at baseline, there was a higher sway area at 10 degrees at all three groups, and the differences of sway intensity were significantly decreased at 10- and 20-degrees, respectively. There was non-significant difference in sway mean at 10 degrees but significant difference sway mean at 20 degrees. With respect to sway velocity, the differences of type 2 SBO group were significantly decreased at different tilting degrees when compared with type 1 SBO and control groups, whereas the difference in type 1 SBO was only significant at 0° when compared with control. Group differences (type 1 SBO vs. control, type 2 SBO vs. control) showed a significant decrease in sway velocity when comparing at 10° than at 0° and at 20° than at 0°. In all type with SBO, the sway intensity/velocity values obtained with open eyes and with plantarflexion had lower values, when compared with values obtained with closed eyes and with dorsiflexion. **Conclusion:** Our study suggests that reticent type of spinal dysraphism, irrespective of type 1 or type 2, results in impairment of postural dysfunction information for controlling orthostatic erect in resting as well as in challenging postures.

0430PP31

RELATIONSHIP BETWEEN FUNCTIONAL IMPAIRMENT OF EARTHQUAKE VICTIMS AND THEIR REHABILITATION EFFECTS

Xiang Wang¹, Quoxin Wang¹, Dianhuai Meng¹, Qiumin Zhou¹, Tong Wang¹, Min Xiao², Zhide Jiang², Xun Yu²

¹Dept. of Rehabilitation Medicine, the First Hospital of Nanjing Medical University and ²Jiangsu Disabled Persons Federation (China)

Purpose: We analyze the rehabilitation effects of 1196 filed stroke victims transferred to Jiangsu province to provide effective rehabilitation service, allocate medical resources in an reasonable way, and decrease the disability level of wounded. **Material and Methods:** The information of 1299 earthquake victims transferred to nine cities in Jiangsu province was recorded. Motor function, social adaptive capacity, index of life quality and ADLs were analyzed among those victims to analyze their function impairment as well as the effects of rehabilitation therapy. **Results:** 71% of all earthquake victims suffered from Fracture, which is the most common type of injury, and it is followed by soft tissue injury, peripheral nerve injury and amputation for the number of victims. The impacts of earthquake on victims, function were motor function: 55%, social adaptive capacity: 48%, index of life quality: 42%, ADLs: 33% (from strong to weak). 31.94% of those wounded showed psychological problems. Among the items assessed, motor function was significantly improved after rehabilitation training with 31% increase (the score was increased to 13.7 ± 4.6 from 8.1 ± 6.23), while social adaptive capacity, index of life quality and ADLs increased by 23% (the score was improved from 4.74 ± 2.31 to 6.77 ± 2.2 , $p < 0.01$), 21% (the score was improved from 8.11 ± 3.47 to 10.56 ± 2.5 , $p < 0.01$), and 21% (the score was improved from 5.83 ± 2.61 to 7.89 ± 2.8 , $p < 0.01$), respectively. The ability of standing, transferring, walking up and down stairs, wash, toilet, household chores, participation in social life or collective activities showed the most significant improvement among the function advancement in earthquake victims. With the improvement of social adaptive capacity, index of life quality and ADLs, the psychological problems were also solved partly with the

SEQ masculine rate decreased from 31.94% to 5.20% (the score was decreased from 7.15 ± 4.72 to 2.91 ± 3.21 , $p < 0.01$), while no special psychological intervention was included in the therapy. **Conclusion:** While rehabilitation help improved motor function and index of life quality among earthquake victims, their mental health was also greatly promoted.

0430PP32

REHABILITATION OF TETANUS: A CASE REPORT

Kang-Ming Huang¹, Jo-Tong Chen^{1,2}, Shu-Min Chen^{1,2}

¹Department of Physical Medicine and Rehabilitation, NCKU Hospital and ²Department of Physical Medicine and Rehabilitation, College of Medicine, NCKU (Taiwan)

Despite routine immunization, tetanus is still occasionally seen in Taiwan. Tetanus is a nervous system disorder characterized by trismus, dysphagia, opisthotonus and severe generalized muscle spasm. It's caused by the neurotoxin which is produced by Clostridium tetani. The treatment consists of immediate active and passive immunization, parenteral antibiotics, and early tracheostomy with mechanical ventilation in the intensive care unit. After the acute episode, long-term neurological and musculoskeletal sequelae are common. Individuals may encounter deconditioning, generalized muscle wasting, decreased respiratory capability, multiple joint contractures, decubitus ulcers, dysphagia and even psychotic syndrome. Although, this kind of disease could gradually and totally recovered in a neurological respect, early physiatrist intervention, not only prevents complications mentioned above, but also would help the individual more fully and safely restored previous capacity of daily living. This report presented a description and discussion of the rehabilitation program for a 76-year-old female tetanus patient, and a review of articles as a reference resources for the clinicians.

0430PP33

ELBOW FLEXION CONTRACTURE IN A PATIENT WITH MUSCULAR TUMOR-SUCCESSFUL TREATMENT WITH BOTULINUM TOXIN AND SERIAL CASTING

Yen-Jung Chen¹, Jeng-Yi Shieh¹, Wen-Ji Tsai², Ting-Ming Wang²

¹Department of Physical Medicine & Rehabilitation, National Taiwan University Hospital and ²Department of Orthopedic Surgery, National Taiwan University Hospital (Taiwan)

Purpose: To treat elbow flexion contracture in a patient with muscular tumor with Botulinum Toxin and serial casting. **Material and Methods:** A girl, at age 2, was found to have a mass at her right arm. MRI showed a $4 \times 2.5 \times 1.5$ cm mass in the brachialis muscle. A biopsy was performed and pathology revealed myofibromatosis. No further surgery was taken afterwards. With growth, progressive loss of extension range at the elbow joint developed. Repeated MRI at age 8 suspected local recurrence near the distal humeral shaft and adhesion of brachialis tendon. At her age of 12, the physical examination showed that she could do full flexion of the elbow but the extension range was limited to 90 degrees (-90 to full extension). The supination and pronation ranges were within normal limits. Forceful stretching of the elbow induced discomfort of the arm muscles. There was no sensory nor motor deficit. With the intent to increase extension range, we decided to use serial casting and combine Botulinum Toxin for relaxation of the elbow flexors, which might serve as an opponent during casting. With sonography as guidance, 200 U Botulinum Toxin type A (BOTOX) was injection into the normal elbow flexor muscles. Long arm cast was applied and changed every two weeks. **Results:** There was no adverse reaction to Botulinum toxin. Extension range of the elbow increased gradually. Three months later, the elbow extension range became 165 degrees (-15 to full extension). **Conclusion:** Botulinum toxin as an adjunct to serial casting was effective in treating elbow contracture.

0430PP34

COMPLETE TEAR OF THE COMMON FLEXOR TENDON FOLLOWING YOGA AND LOCAL CORTICOSTEROID INJECTION: A CASE REPORT**Ke-Vin Chang¹, Tian-Shin Yeh², Tyng-Guey Wang²**¹Department of Physical Medicine & Rehabilitation, National Taiwan University Hospital Yun-Lin Branch and ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Severe tear of the tendons around the elbow is rare even in athletes, especially referring to the common flexor tendon of wrist. Few literatures have mentioned the common flexor tendon tear and most of them focus on the image studies only. We reported a 52-year-old housewife who complained of bilateral medial elbow pain after forcefully extending her wrist and elbow while practicing Yoga. Repetitive corticosteroid injections were applied over her right medial elbow at the orthopedic clinic. Her pain was relieved temporarily but recurred later. She visited our rehabilitation outpatient department and the physical examination revealed weakness when performing right wrist flexion and forearm pronation. Sonography was thus arranged which revealed a hypoechoic area and soft tissue indentation within the right common flexor tendon. The following magnetic resonance imaging demonstrated a focal area with hyperintense signal in Fast STIR images around the medial epicondyle. Both image studies favored the complete tear of the common flexor tendon and the surgical exploration confirmed the tentative diagnosis. We speculated the eccentric loading and valgus stress during Yoga plus the weakened tendon tissues after repetitive corticosteroid injections resulted in the infrequent presentation of medial elbow injury.

0430PP35

THE EFFECTS OF PROPRIOCEPTION STRENGTHENING TRAINING ON KNEE OSTEOARTHRITIS**Zunke Gong, Hongwei Zhai, Wei Chen, Jie Sun, Haiyan Wang**

Central Hospital (China)

Purpose: To observe the therapeutic effect of proprioception strengthening training on knee osteoarthritis. **Material and Methods:** Based on clinical diagnostic criteria, 80 patients with knee osteoarthritis were randomly divided into a treatment group (41 cases) and a control group (39 cases). The patients in the treatment group were administered proprioception strengthening training, muscle strengthening exercise and treatment with sodium hyaluronate injection of knee joint, while the patients in the control group were administered muscle strengthening exercise and treatment with sodium hyaluronate injection of knee joint. Before and after the treatment, knee function were assessed with Lysholm Assessment Standard on knee function. **Results:** The patients in both groups scored significantly higher on Lysholm on knee function. The patients in the treatment group are better than the patients in the control group. **Conclusion:** Proprioception strengthening training can improve the knee function and it is a valid method to treat knee osteoarthritis.

0430PP36

CHANGING PATTERN IN HAEMOPHILIC ARTHROPATHY: REPORTING CLINICAL AND RADIOLOGICAL DATA FROM A SINGLE CENTER IN TAIWAN**Shao-Chi Lu^{1,2}, Tsung-Ying Li¹, Yung-Tsan Wu¹, Min-Hsin Lai¹, Shin-Tsu Chang¹, Wen-Chi Hou²**¹Department of Physical Medicine and Rehabilitation, Tri-Service General Hospital and ²Department of Physical Medicine and Rehabilitation, Hualien Armed Forces General Hospital (Taiwan)

Purpose: To clarify the current clinical and radiological characteristics of joint involvement in young haemophilic patients in Taiwan. **Material and Methods:** From September 2006 to August 2009, a total of 40 young patients followed at outpatient department of haemophilic comprehensive care center were studied. Factors examined including age, haemophilia type, disease severity, body mass index (BMI), receiving prophylactic treatment and inhibitor status. Bilateral shoulder, elbow, hip, knee and ankle joints were evaluated as range of motion (ROM). Radiological score as the Arnolde-Hilgartner scale and the Pettersson Score of each joint were obtained. **Results:** All of the forty patients are boys with a mean age of fifteen. Thirty-five of them are the patients of haemophilia A and five are the haemophilia B patients. There are five patients with mild haemophilia, seven patients with moderate haemophilia and twenty-eight patients with severe haemophilia, three of the severe haemophilia patients presenting with inhibitors. Mean BMI is 19.18 (kilogram/meter square). Four hundred joints were measured and the abnormal Arnolde-Hilgartner scale presented in forty-three joints, ROM limitation in fifty-eight joints and abnormal Pettersson Score in fifty-four joints. Ankle joints are most frequently involved ($n=22$, 51.16% in abnormal Arnolde-Hilgartner scale joints; $n=30$, 51.72% in ROM restricted joints; $n=25$, 46.30% in abnormal Pettersson Score joints.) The second frequently involved joint is the elbow joint and the third is the knee joint. All of the patients younger than 12-year-old presented as normal radiology score and joints ROM. No abnormal data was obtained in those with mild haemophilia, as logically extrapolate, more abnormal joints ($n=33$, 11.79% in abnormal Arnolde-Hilgartner scale joints; $n=47$, 16.79% in ROM restricted joints; $n=44$, 15.71% in abnormal Pettersson Score joints) in severe haemophilic patients than in moderate haemophilic patients. The influence of BMI in haemophilic arthropathy was not significant, which may relate to no obesity patient was included. **Conclusion:** Our report demonstrates the current clinical and radiological data of haemophilic arthropathy in young male. Recent investigation revealed the most frequently involved joint in bleeding site changing from the knee joint to the ankle joint, which was compatible to our result. The majority factor including disease severity and younger age. There is a clear cut in age between present or absent haemophilic arthropathy, which is well-matched to the beginning of our national health insurance.

0430PP37

INCREASED UPTAKE OF SACROILIAC JOINT RESULTED FROM MECHANICAL ORIGIN BY HEMIVERTEBRA IN LUMBAR SPINE**Shao-Chi Lu^{1,2}, Yung-Tsan Wu¹, Min-Hsin Lai¹, Wei-I Su¹, Shin-Tsu Chang¹, Wen-Chi Hou²**¹Department of Physical Medicine and Rehabilitation, Tri-Service General Hospital and ²Department of Physical Medicine and Rehabilitation, Hualien Armed Forces General Hospital (Taiwan)

Purpose: Sacroiliac joint disorder had many different etiologies. No previous lecture revealed the relationship between sacroiliac disorder and hemivertebra. We report a young adult with hemivertebra in the lumbar spine, which resulted in increased uptake in the joint. **Material and Methods:** A 24-year-old young male who did not recall any specific trauma and systemic disease presented with progressive low back pain about half a year ago prior to visit us. The patient was well before and performed normal daily life. He denied any birth injury or systemic disease. Medication such as non-steroid anti-inflammatory drug was prescribed but the symptoms bothered him off and on, thus he came to our outpatient clinic for help. On examination, his vital sign was stable and mental status was normal. Grossly there were no abnormalities could be found on the waist skin. There were tenderness at posterior superior iliac spine and muscle spasm at lower paraspinal musculatures. The patient showed limited range of motion on flexion and extension due to pain. There were no radiating pain to leg while performing straight leg raising test, but positive findings in Mennell's test and Patrick's test (FABER test). Thigh thrust test and the sacral

thrust test showed positive as well. **Results:** The plain film showed hemivertebra of the fifth lumbar spine and butterfly anomaly in the fourth lumbar and the tenth thoracic vertebral bodies, which abnormality was associated with cervico-thoraco-lumbar scoliosis. The magnetic resonance imaging of lumbar spine did not show any significant abnormality. There were negative findings in serology tests, e.g. HLA-B27, rheumatoid factor, antistreptolysin O titer, antinuclear antibody titer. Technetium-99m methylene diphosphonate (Tc-99m MDP) quantitative sacroiliac scintigraphy showed increased uptake in the both SI joints. The patient received medication for pain relief and received rehabilitation program for relief muscle tightness, the symptoms of pain relief gradually. **Conclusion:** Sacroiliac joint disorder might be considered in cases of hemivertebra, even insidious. MRI should be performed in hemivertebra cases in order to evaluate spinal anomaly. A concurrence of hemivertebra and sacroiliitis is practically likely. This is the first case revealing the relationship between hemivertebra and sacroiliitis.

0430PP38

DIAGNOSIS OF CHRONIC FOREIGN-BODY INCARCERATED PATELLAR TENDINOPATHY WITH PATELLAR TENDON PARTIAL TEAR BY HIGH-RESOLUTION ULTRASONOGRAPHY: A CASE REPORT

Tung-Liang Lin¹, Howard Haw-Chang Lan², Yu-Chun Lee¹, Sen-Wei Tsai¹, Chin-Teng Chung¹

¹Department of Physical Medicine and Rehabilitation and ²Department of Radiology, Taichung Veterans General Hospital (Taiwan)

Purpose: To report a rare image finding of chronic patellar tendinopathy with foreign body incarceration combined with patellar tendon partial tear. **Material and Methods:** We report a 25-year-old male patient with good physical condition before. He suffered from falling down and kneeling onto the ground scattered with countless tiny chips of glass. Multiple wounds over both knees were noted and he was brought to the emergency department. Numerous pieces of glass incarcerated into the skin and subcutaneous tissue were noted over both knees. Surgical removal of the glass chips was performed as much as possible, but due to the size, number, and the translucence entity of glass material, it was believed that a certain amount of tiny chips still remained unremoved. The patient started to experience weakness, tightness, and soreness of his left knee after the accident. He can still walk but had difficulty in jumping, squatting, and climbing up and down the stairs. He thought that the symptoms may recover spontaneously and returned to work. However, the symptoms remained unchanged. He re-visited the hospital 1.5 months after the accident. Multiple scars were noted over left knee with granulation tissue formation and mild local heat over the area of left patellar tendon. Physical examination disclosed left patellar tendon tightness and mild limited left knee flexion range of motion (supine position : 0-108 degree, and prone position : 0-112 degree), which was regarded as tight patellar tendon related. Plain-film X-ray disclosed increased soft tissue density and radio-opaque substances over left infra-patella region. Soft tissue ultrasonography of left knee was performed about 2.5 months after the injury which disclosed multiple tiny irregular echogenic spots located in the subcutaneous tissue over the anterior aspect of the knee close to the anterior tibial tuberosity, and over the distal portion of the patellar tendon, in favor of residual foreign body (FB) glass fragments. The distal half of the patellar tendon is thickened and hypoechoic. Color Doppler ultrasound revealed blood flow signals throughout the tendon. Several small FB fragments were also noted over the distal quadriceps tendon which is of normal echogenicity. These findings suggested chronic partial tear with fibrosis and granulation over the distal half of the patellar tendon and multiple FB fragments are still noted in the subcutaneous tissue over anterior aspect of the knee, distal portion of the patellar tendon, and the quadriceps tendon. No abnormal fluid accumulation was found in the knee joint. **Results:** After a series of history taking, clinical examination, and image survey, chronic

patellar tendinopathy with foreign body incarceration and patellar tendon partial tear was diagnosed. **Conclusion:** Tiny translucent foreign-bodies and related lesions are difficult to detect by physical examination, plain-film x-ray, and even by direct observation during surgical debridement. High-resolution ultrasonography is a good measure of diagnosis for this clinical condition.

0430PP39

HAEMOPHILIC SHOULDER ARTHROPATHY: CLINICAL, RADIOLOGICAL AND ULTRASONOGRAPHIC CHARACTERISTICS FROM A SINGLE CENTER IN TAIWAN.

Tsung-Ying Li, Liang-Chang Chen, Min-Hsin Lai, Yung-Tsan Wu, Shao-Chi Lu, Shin-Tsu Chang
Tri-service general hospital (Taiwan)

Purpose: To evaluate clinical, radiological and ultrasonographic characteristics of shoulder joint in haemophilic patients in Taiwan. **Material and Methods:** From Aug 2008 to Oct 2009, a total of 70 patients followed at outpatient department of haemophilic care and research center were studied. Factors examined including age, haemophilia type, disease severity, body mass index (BMI), handedness, receiving prophylactic treatment, inhibitor status, age of shoulder first bleeding and bleeding frequency. Bilateral shoulders were evaluated as range of motion (ROM), visual analog scale (VAS), and Oxford shoulder score. Radiological evaluation was performed based on Pettersson classification. Ultrasonography (USG) evaluation was done in standard technique using a 5–12 MHz linear transducer. **Results:** Sixty-nine male and one female were included in the study with a mean age of thirty-three. Sixty-six of them are the patients of haemophilia A and four are haemophilia B patients. There are five patients with mild haemophilia, seven patients with moderate haemophilia and fifty-eight patients with severe haemophilia, four of the severe haemophilia A patients presenting with inhibitors. Mean BMI is 23.1 (kilogram/meter square). Thirty-five severe and moderate haemophiliacs have past history of shoulder bleeds (bilateral=21, right=8, left=6) and all abnormal Pettersson Score shoulders ($n=23$) are in the 56 haemarthrotic shoulders (HS). Thirty-nine HS and one non-haemarthrotic shoulder are asymptomatic. ROM limitations are observed in thirty-five shoulders, especially in internal rotation and abduction. USD detected tenosynovitis of long head biceps tendon in 37/140 shoulders (HS group=35), bony irregularity in 35/140 humeral heads, joint synovitis in 14/140 glenohumeral joints and rotator cuff tear in 32/140 shoulders (HS group=30). A good correlation between cartilage damage in USG and progression of bone changes in radiological evaluation was found. **Conclusion:** Our report demonstrates the haemophilic shoulder arthropathy characteristics in our center. USG is useful in detecting the hypertrophic synovium, effusion, and cartilage change of shoulder joint in haemophiliacs before radiological examination showing abnormalities. Rotator cuff tears are common in haemophilic arthropathy of the shoulder.

0430PP40

EFFECTS OF PULSED ELECTROMAGNETIC FIELD AND EXERCISE ON BONE MINERAL DENSITY OF RATS WITH OSTEOPOROSIS

Wenhua Chen, Bo Yu, Zhihao Liu

The Department of Rehabilitation Medicine, Shanghai First People's Hospital (China)

Purpose: To observe the effects of pulsed electromagnetic field (PEMFs) or/and exercise on the area bone mineral density (aBMD) and volume bone mineral density (vBMD) of rats with osteoporosis induced by tretinoin gastric perfusion. **Material and Methods:** 100 female SD rats were randomly divided into 5 groups with 20 rats in each group: PEMFs group, exercise group PEMFs plus exercise group, osteoporosis group and healthy control group. Except for the

healthy control group, the osteoporosis models of other 4 groups were built by tretinoin gastric perfusion. After the building of models, each group was intervened with different treatment. In the 4th, 6th and 8th week after treatment, relevant results of aBMD and vBMD were tested. **Results:** Compared with the osteoporosis group, the AD of the rats of PEMFs group, exercise group, PEMFs plus exercise group significantly increased significantly ($p < 0.05$) in the 6th week, 4th week and 4th week after treatment respectively. In the 6th and 8th week there was no significant differences among the PEMFs plus exercise group, the exercise group and the PEMFs group ($p > 0.05$). **Conclusion:** PEMFs can increase the BMD of the rats with osteoporosis as well as exercise, PEMFs takes effect slower than exercise.

0430PP41

EFFECT OF BOWEN TECHNIQUE TO INCREASE HAMSTRINGS FLEXIBILITY

Uraivon Chatchawan, Wichai Eungpinichpon, Thanita Thivato, Nareerat Santakit, Salinee Kakaew

Division of Physical Therapy, Faculty of Associated Medical Sciences, Khon Kaen University (Thailand)

Purpose: Bowen therapy is a dynamic remedial bodywork technique that works on the connective tissue structures of the body. It may relatively increase the flexibility of muscle and the whole body. There is very little scientific evidence to support its use. The aim of this study to verify the effectiveness of Bowen therapy to increase hamstring flexibility. **Material and Methods:** Thirty subjects with hamstring tightness (straight leg raise or SLR between 40–70 degrees) were randomly allocated to receive either Bowen therapy or control group (resting on bed), only one treatment for 30 min. Each subject was assessed the outcome measures before and after treatment. The primary outcome measure was SLR in both legs. The secondary outcomes were body flexibility measure by using sit and reach box, heart rate, respiratory rate and blood pressure. The pair *t*-test and analysis of covariance (ANOVA) was performed. **Results:** Results show that the average of SLR in each leg of both groups was slightly increase when compare to baseline. Comparing between two groups, SLR in each side was no significant difference (p -value=0.556 on left leg and 0.171 on right leg respectively). In addition, the trunk flexibility was increase significant among the subjects in Bowen therapy group after treatment ($p > 0.002$), but there is no significant difference when comparing it with the other group. **Conclusion:** This study concluded that, there is not enough evidence to support the effectiveness of single Bowen therapy with any significant increase hamstring flexibility. We therefore recommend that need further studies.

0430PP42

EFFECT OF TRANSVERSUS ABDOMINIS ON THE MOVEMENT OF LIMBS

Dong-Liang Shi, Hui-Juan Pan, Hui-Fang Wang, Yu-Bin Wang

Dong Fang Hospital, Tongji University (China)

Purpose: To evaluate the effect of transversus abdominis (TrA) on the movement of limbs. **Material and Methods:** 59 valuable reviews or articles were found in PubMed or ISI from January 1985 to December 2008 through key-word searching. These medical literature concerning the TrA were reviewed in the aspects of the effect and underlying mechanism of TrA during limbs moving. **Results:** TrA was one of the local stabilizing muscles of core muscles, which kept the stabilization of lumbar by increasing abdominal pressure or the tension of thoracolumbar fascia. TrA had the ability of maintaining dynamic stability when it was stabilizing the lumbar by the contraction in advance when upper or lower limbs were moving. Furthermore, the contralateral feedforward of TrA of moving upper limb was earlier than the ipsilateral one, which was controlled by central nervous system (CNS). **Conclusion:** Various feedforwards of TrA controlled

by CNS are all in favour of stabilization of the movement of limbs. The perspective of regarding the role of TrA as a bilateral stabilizer should be modified in anticipatory adjustments. Future research needs to be done to explore the application in clinical works.

0430PP43

EFFECT OF BOTULINUM TOXIN INTRA-ARTICULAR INJECTION IN THE TREATMENT OF KNEE OSTEOARTHRITIS

Shih-Hui Wu, Lin-Fen Hsieh

Shin Kong Wu Ho-Su Memorial Hospital (Taiwan)

Purpose: The purpose of this study was to investigate the effects of IABOTOX for subjects with KOA. **Material and Methods:** Nineteen subjects with symptomatic KOA with grade II–III on Kellgren/Lawrence scale were collected. They received intra-articular injection of 100 units botulinum toxin to the affected knee. All of the assessments were performed before, one week and six months after IABOTOX. Assessments included evaluation of range of motion over knees and ankles, visual analogue pain scale, and questionnaires of functional status including Lequesne index and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). **Results:** The short-term results showed KOA subjects had moderate knee pain (5.03 ± 1.06) before the intra-articular Botulinum injection and the pain significantly decreased after the injection (2.89 ± 0.90). The short-term result implicated 40% pain reduction after IABOTOX. The average onset time for pain relief was 5.35 ± 2.09 days. With regard to the functional questionnaires, both Lequesne (13.11 ± 2.53 vs 9.94 ± 3.25) and WOMAC (37.21 ± 5.94 vs 25.88 ± 8.52) index significantly decreased after the injection. There was no significant improvement in lower limb range of motion after the injection. **Conclusion:** IABOTOX provided the subjects of knee osteoarthritis with not only pain relief but also functional abilities improvement in short-term effects. Further follow-up will provide more information about the long-term effects.

0430PP44

RANDOMIZED DOUBLE-BLIND PLACEBO-CONTROLLED TRIAL ON THE POTENTIAL MODES OF ACTION OF SHEAFLEX70TM IN OSTEOARTHRITIS

Phillip Cheras¹, Stephen Myers¹, Peta-Anne Paul-Brent², Kerry Outerbridge³, Gary Nielsen⁴

¹NatMed-Research, School of Health and Human Sciences, Southern Cross University, ²The Australasian Kidney Trials Network, University of Queensland, Brisbane, ³Division of Orthopaedics, Greenslopes Private Hospital, Brisbane and ⁴Orthopaedic Surgery, Mater Health Services, Brisbane, (Australia)

Purpose: Extracts from the seed of the African shea tree *Vitellaria paradoxa* C.F. Gaertn have been used traditionally for the treatment of arthritic conditions. However, little is known about the mechanisms by which benefit is conferred. **Material and Methods:** This single-site, 15-week randomized, double-blind, parallel, placebo-controlled study examined a range of biomarkers in 89 patients with osteoarthritis of the knees and/or hips to determine potential modes of action of SheaFlex70TM, a triterpene-rich extract of *Vitellaria paradoxa*. Two measures of clinical outcome were employed, WOMAC and COAT respectively. Biomarkers were assessed to gain insight into the modes of action of SheaFlex 70 within the total placebo and treatment groups and also in the subset of these groups defined as those with upper quartile levels of the biomarkers which generally correlate with increased risk of OA. These included measures of inflammation, cartilage synthesis and degradation and bone formation. The statistical program SPSS Version 11.0 was used. **Results:** In the group of participants with levels of osteoarthritis biomarkers in the upper quartile at baseline, there were significant decreases in

inflammation and cartilage breakdown and trend level decreases in bone remodeling in the SheaFlex70TM group versus placebo between commencement and completion of the study. Inflammation marker TNF-alpha fell 23.9% vs 6% (treatment vs placebo), $p=0.041$. Cartilage degradation marker CTX-II fell 28.7% vs an increase of 17.6% (treatment vs placebo), $p=0.018$. This marker also showed significant falls across the entire study group, 10.6% vs an increase of 11.6%, (treatment vs placebo), $p=0.016$. Osteocalcin levels fell 9.2%, $p=0.014$ (treatment) vs 1.2%, ns (placebo), $p=0.096$ (treatment vs placebo). **Conclusion:** These findings indicate that in patients with the highest levels of osteoarthritis biomarkers, SheaFlex70TM demonstrated multiple beneficial activities consistent with slowing the disease process.

0430PP45

THE EFFECT OF PULSED ELECTROMAGNETIC FIELDS ON THE EXPRESSION OF OPG AND RANKL IN OSTEOBLAST AND BONE TISSUE FROM OVX-INDUCED OSTEOPOROSIS RATS

Hongcheng He¹, Yujun Hu², Lin Yang¹, Ling Wang¹, Zhongjie Lei¹, Chengqi He¹, Li Deng³

¹Rehabilitation Medicine, West China Hospital of Sichuan University, ²Rehabilitation Medicine, Guangxi Zhuang Autonomous Region People's Hospital, ³Laboratory for Tissue Engineering, West China Hospital of Sichuan University (China)

Purpose: The purpose of this research was to observe the effect of PEMFs for the expression of OPG, RANKL mRNA on osteoblasts and the bone tissue from ovariectomized rats with osteoporosis and to explore the possible mechanism of PEMFS for osteoporosis patients. **Material and Methods:** 1) *Experiment in vivo:* 48 3-months-old female SD rats were randomly divided into SHAM control group, OVX experimental group, OVX estrogen group, OVX control group. After experimental model were made, exposed the OVX experimental group rats to pulsed electromagnetic fields (8 Hz, 3.8 mT), 40 min/day; OVX estrogenic group rats were given Premarin see conjugated estrogen lavage (0.065 mg/kg/day). After 30 days, use actual time fluorescent quantitation PCR instrument to detect the expression of OPG, RANKL mRNA on iliac bone tissue in each group rats. 2) *Experiment in vitro:* The osteoblast cells in SHAM group, OVX experimental group, and OVX control group were isolated from calvaria of ovariectomized rats with osteoporosis by sequential digestion. Exposed OVX experimental group to PEMFs (8 Hz, 3.8 mT), 40 min/day; after 5 days use actual time fluorescent quantitation PCR instrument to detect the expression of OPG, RANKL mRNA on iliac bone tissue in each group rats. **Results:** *Experiment in vivo:* Compare with OVX control group, OPG mRNA expression in OVX experimental group increased significantly, RANKL mRNA expression was no significant difference; *Experiment in vitro:* Compare with OVX control group, RANKL mRNA expression in OVX experimental group reduced significantly, OPG mRNA expression was no significant difference. **Conclusion:** PEMFs reduce the expression of RANKL mRNA on osteoblasts from OVX osteoporosis rats and increase the OPG mRNA expression. PEMFS affect the signal transmission of OPG-RANK-RANKL system in OVX osteoporosis rats that maybe one mechanism of PEMFS for osteoporosis treatment.

0430PP46

THE EFFECT OF LOW-FREQUENCY PULSED ELECTROMAGNETIC FIELDS ON MUSCLE STRENGTH AND MUSCLE ENDURANCE OF PATIENTS WITH POST-MENOPAUSAL OSTEOPOROSIS

Hongchen He¹, Chengqi He¹, Jian Xu¹, Yan Zhang², Lin Yang¹, Zhongjie Lei¹, Wei Xie¹, Yonghong Yang¹

¹Rehabilitation Medicine, West China Hospital of Sichuan University (China) and ²Department of Rehabilitation Science and Occupational Therapy, The Hong Kong Polytechnic University (Hong Kong)

Purpose: To observe the effect of PEMFs on muscle strength and muscle endurance in post-menopausal women with osteoporosis. **Material and Methods:** 43 patients were randomly divided into experimental group ($n=24$) and control group ($n=19$). Both groups received conventional drug therapy. Meanwhile, experimental group was treated with PEMFs once a day, for 30 days. **Results:** In experimental group, the muscle strength of back muscle, abdominal muscle, quadriceps femoris and the muscle endurance of these muscles were significantly increased after treatment ($p<0.05$). In control group, only the increase of abdominal muscle had statistical significance ($p<0.05$). Between the two groups, the increase of back muscle and abdominal muscle in experimental group was higher than control group ($p<0.01$). **Conclusion:** PEMFs could improve the muscle strength of back muscle and abdominal muscle of post-menopausal women with osteoporosis. PEMFs combined with drugs could improve muscle strength of quadriceps femoris and muscle endurance of back muscle, abdominal muscle and quadriceps femoris of post-menopausal women with osteoporosis.

0430PP47

FLEXNOW RELIEVE THE SYMPTOMS OF OSTEOARTHRITIS IN JAPANESE PATIENTS

Mitsuhiro Kawano

Kanazawa University Hospital (Japan)

Purpose: To determine the safety and efficacy of sheanut oil (FlexNowTM) in Japanese osteoarthritis patients. **Material and Methods:** A two sites 12 week observational study was conducted. For the primary outcome, efficacy was assessed by Comprehensive Osteoarthritis Test (COAT). The secondary outcome was evaluated by safety measurements including laboratory data and adverse events. **Results:** There were 35 patients with osteoarthritis enrolled in this study. Twenty-five patients completed the trial and no severe side effects were observed. COAT scores were significantly improved after consumption of FlexNow in patients whose baseline COAT scores were more than 30 (inclusion criteria). Hence pain was reduced by 27.7% ($p=0.0241$), stiffness by 25.9% ($p=0.1346$), physical disability by 26.5% (0.0307) and overall symptoms by 24.4% ($p=0.0276$). No clinically relevant changes were noted for safety markers of the hematopoietic, liver, or renal systems. **Conclusion:** Sheanut oil is safe for Japanese osteoarthritis patients. In addition, it is effective in about 46% of patients.

0430PP48

ULTRASOUND-GUIDED INJECTION OF PLATELET-RICH PLASMA FOR CHRONIC ELBOW TENDINOSIS

Joon Beom Hong, Il Young Jung, Keewon Kim, Kwan Sik Seo, Sun Gun Chung

Seoul National University College of Medicine, Department of Rehabilitation Medicine (Republic of Korea)

Purpose: To evaluate the effect of ultrasound-guided autologous platelet-rich plasma (PRP) injection for Chronic elbow tendinosis in the aspects of pain, function and structure. **Material and Methods:** 7 elbows from 5 patients with chronic epicondylar pain (5 right and 2 left) were evaluated. 3 ml Platelet-rich plasma was obtained for each patient. Patients underwent sonographic evaluation prior to injection with PRP. PRP was injected into the site of tendon defect. Measures of Visual Analogue Scores (VAS), Modified Mayo Clinic Performance Index for the Elbow, Nirschl score were taken pre- and 8 weeks post procedure. **Results:** Following PRP injection, Visual

Analogue Scores at rest and action were decreased from 32.29 (SD 24.76), 68.86 (SD 17.11) at pre-procedure to 10.71 (SD 16.61), 25.71 (SD 26.51) at 8 week post-procedure, respectively. Modified Mayo Clinic Performance Indexes for the Elbow were increased from 67.14 (SD 10.84) to 86.79 (SD 11.15). Nirschl scores were decreased from 6.00 (SD 1.15) to 4.29 (SD 1.70). Reduction of tendon thickness was observed from 3.9 mm (SD 0.9) to 3.6 mm (SD 1.1) at 8 week post-procedure. **Conclusion:** Autologous PRP injection reduced pain, improved activity of daily living and decreased size of interstitial tendon defect. But statistical significance was not determined because of the small sample size. Further researches with larger group of patients are required.

0430PP49

NEEDLE INSERTION INTO THE TIBIALIS POSTERIOR USING ANTERIOR APPROACH: ULTRASONOGRAPHIC EVALUATION

Sang Chul Lee¹, Dong-Wook Rha², Dong Jin Kim²

¹Department of Physical Medicine and Rehabilitation, Myongji Hospital, Kwandong University. College of Medicine and ²Department and Research Institute of Rehabilitation Medicine, Yonsei University College of Medicine (Republic of Korea)

Purpose: Electrodiagnostic evaluation of tibialis posterior is particularly useful in patients with a foot-drop for differentiating peroneal neuropathy and L5 radiculopathy. Moreover, this muscle is frequently targeted for botulinum toxin injections to reduce the abnormal hypertonicity and to correct equinovarus deformity in patients with spastic paralysis. Although needle insertion into the tibialis posterior is usually performed with the guidance of anatomical landmarks, the tibialis posterior is considered by some to be the least accessible muscle for needle placement as it is located deep within the lower leg. Therefore, in order to determine the most appropriate needle insertion point, the ultrasonographic anatomy of the lower leg was investigated for safe and accurate needle placement into the tibialis posterior via the anterior approach. **Material and Methods:** We examined a total of 62 normal subjects (30 men, 32 women). The safety window (the tibia to the neurovascular bundle) and the depth to the midpoint of the safety window (skin to the tibialis posterior) at the upper third and the midpoint of the tibia were measured on the transverse ultrasonographic scan to avoid the neurovascular bundle in the anterior approach. **Results:** The safety window at the upper third of the tibia was significantly larger than that at the midpoint ($p < 0.01$). The safety window ranged from 0.64 cm to 2.13 cm at the upper third tibias point, and ranging from 0.32 cm to 1.30 cm at midpoint. The depth to the tibialis posterior at the upper third of the tibia was significantly deeper than that in the midpoint ($p < 0.01$). The depth ranged from 2.47 cm to 4.66 cm at the upper third tibias point, and ranging from 2.35 cm to 4.28 cm at the midpoint. **Conclusion:** The anterior approach using ultrasonography on the upper third of the tibia offers the advantage of a larger safety window for needle insertion into the tibialis posterior than on the midpoint. The method using ultrasonography suggested in current article can be used for the needle insertion into the tibialis posterior and deserves more widespread use in clinical practice.

0430PP50

ACHILLES TENDON TEAR AFTER SHOCK WAVE THERAPY FOR CALCIFIC TENDINITIS OF ACHILLES TENDON: A CASE REPORT

Tsung-Ching Lin, Cheng-Yuan Lin, Cheng-Min Chiu
Far Eastern Memorial Hospital (Taiwan)

Extracorporeal shock wave therapy (ESWT) has been advocated for treating a number of soft tissue conditions, including plantar fasciitis, lateral epicondylitis, calcific and noncalcific tendonitis of

the supraspinatus, and tendinopathy of the Achilles tendon, and it is considered to be an effective and safe procedure. Minor complications, such as pain, local soft-tissue swelling, cutaneous erosions, and erythema, and major complications, such as tendon rupture and osteonecrosis have been reported. We present a case of calcific Achilles tendinitis with following Achilles tendon partial tear after the ESWT treatment. The patient received emergent tendon repair after being diagnosed and recovered well.

0430PP51

THE EFFECT OF DIFFERENT STRETCHING METHOD ON FLEXIBILITY OF LOWER LIMBS

Tsung-Ching Lin^{1,2}, Shao-Yi Liu³, Tzzy-Yiang Shiang², Chen-Ming Chiu¹

¹Department of Physical Medicine and Rehabilitation, Far Eastern Memorial Hospital, ²Institute of Exercise & Sport Science, National Taiwan Normal University and ³Institute of Physical Education, National Taiwan Normal University (Taiwan)

Purpose: Effect of different stretching method on flexibility of lower limbs and range of motion of hip joint in elite male taekwondo athletes. **Material and Methods:** Eighteen elite male taekwondo athletes were recruited in this study and randomly divided to two groups. Self static stretching (SS) group (age = 20.2 ± 1.3 yrs; body height: 176.4 ± 7.9 cm; body weight: 64.9 ± 4.7 kg) and vibration stretching (VS) group (age = 20.4 ± 1.1 yrs; body height: 173.4 ± 9.0 cm; body weight: 68.9 ± 10.1 kg). Three types stretching exercise (straight-leg raise of left and right leg, both hip abduction) were applied to two groups. The SS group stretched with the device turned off; The VS group stretched with the device turned on. Simultaneous vibration (30 Hz) and stretching was performed in VS group. The frequency of training is twice a week, 3 repetitions per time, stretching time is 30 s with 1 min of rest in between for 6 weeks. Leg flexibility is evaluated by measuring the height of self straight-leg raise. The increment of height of self straight-leg raise adjusted leg length and range of motion of bilateral hip joint was measured pre-, immediate and post- 2, 4, 6 week training. Within-group differences were analyzed by paired *t*-test. The differences between the pre- and post-test scores were analyzed by independent *t*-test. The significant level was set at 0.05. **Results:** There is statistically significant difference in increment abduction range of motion of hip joint between VS and SS group at immediate period. Both groups had statistically significant increase in leg flexibility and range of motion of hip joint after 6 weeks stretching training. In SS group, the increment percentage after 6 weeks training of left, right leg flexibility and range of motion are 7.6%, 5.3% and 11.9%. In VS group, the increment percentage after 6 weeks training of left, right leg flexibility and range of motion are 4.7%, 6.4% and 13.8%. But there is no statistically difference between two groups at 6th week. **Conclusion:** This study showed both static and vibration stretching training had benefit in flexibility of lower limbs and range of motion of hip joint in elite male taekwondo athletes after 6 weeks training. Simultaneous vibration and stretching had more immediate effect than self static stretching in increasing abduction range of motion of hip joint. **Acknowledge:** Thanks for Tonic Fitness Technology, INC provide the equipment. **Key words:** Stretching, vibration, range of motion, flexibility.

0430PP52

EFFECT OF ULTRASOUND PARAMETERS ON ENHANCEMENT OF FRACTURE HEALING

Chien-Hung Lai^{1,2}, Walter Hong-Shong Chang¹, Chiung-Cheng Chuang¹, Chih-Wei Peng², Jiunn-Horng Kang², Shih-Ching Chen²

¹Department of Biomedical Engineering, Chung Yuan Christian University and ²Department of Physical Medicine and Rehabilitation, Taipei Medical University and Hospital (Taiwan)

Purpose: The aim of this study is to investigate four ultrasound stimulated parameters to enhance the bone fracture healing. **Material and Methods:** Fifteen New Zealand white male rabbits were used for animal experiment. These 15 rabbits were randomly divided into 5 groups of 3 animals each; one control group (CA0) and 4 experimental groups underwent ultrasound (US) treatment with various frequencies (0.5 (TB0.5), 1.0 (TC1.0), 1.5 (TD1.5), and 2.0 (TE2.0) Hz, respectively). Histologic evaluation of bone growth was performed by fluorescent labelling of callus in fibulae. Three different fluorochromes were sequentially injected on the 3rd, 10th, 17th, and 24th postoperative day in control and 4 US-treated groups. **Results:** Our result showed that US-treated side was significantly higher than that of the contralateral sham-treated side in all groups at the end of treatment ($p < 0.05$). Interestingly, our result also revealed that there are different efficacies toward enhancing bone healing at each week while applying four US frequencies. For the bone growth of week 1, US-treated side was significantly higher than that of the contralateral sham-treated side only in 1.5 and 2.0 MHz groups ($p < 0.05$). During the period of week 2, US-treated side was significantly higher than that of the contralateral sham-treated side in all groups ($p < 0.05$). Only 0.5 MHz group was enhancing bone growth during the third week while compared with contralateral sham-treated side ($p < 0.05$). **Conclusion:** This study showed that US can enhance bone formation in a rabbit model. Our results also implied that higher frequency such as 1.5 and 2.0 MHz promote bone growth during the first two weeks, whereas relatively lower frequency, for example 0.5 MHz, enhance bone growth since second weeks.

0430PP53

CHANGES IN INTER-RECTI DISTANCE AND ABDOMINAL MUSCLE FUNCTIONS IN POSTPARTUM WOMEN: A 6-MONTH FOLLOW-UP STUDY

Lih-Jiun Liaw^{1,2,3}, Ar-Tyan Hsu^{1,5}, Mei-Fang Liu^{2,3,4}

¹Institute of Allied Health Sciences, College of Medicine, National Cheng Kung University, ²Department of Physical Therapy, College of Health Science, Kaohsiung Medical University, ³Department of Rehabilitation Medicine, Kaohsiung Medical University Hospital, ⁴Institute of Biomedical Engineering, College of Engineering, National Cheng Kung University and ⁵Department of Physical Therapy, College of Medicine, National Cheng Kung University (Taiwan)

Purpose: The increase in inter-recti distance (IRD) around linea alba was called diastasis recti abdominis. This phenomenon indicates a history of prolonged abdominal muscle lengthening, and consequently force production capacity of the abdominal muscles might become impaired. This research project was aimed to study natural recovery of IRD, if ever, by investigating changes in inter-recti distance, abdominal muscles strength and endurance in women between 6 weeks and 6 months postpartum, and comparing them with nulliparous females in order to find out whether spontaneous recovery would actually occur after 6 months postpartum. **Material and Methods:** From June 2006 to September 2008, 43 postpartum women and 20 nulliparous female controls from communities in Kaohsiung were recruited. The inter-recti distance of linea alba at four locations (1 inch above and below the umbilicus, upper and lower margin of the umbilicus) were measured with a 7.5 MHz linear ultrasound scanner in a supine position. Data of abdominal functions obtained by using Manual Muscle Testing and by calculating the holding time and the number of repetitions during the performance of curl-ups to objectively determine the strength and endurance of trunk flexors and rotators. All evaluations were conducted twice in postpartum women, at 6 weeks and at 6 months after childbirth; and once in the nulliparous female controls. **Results:** Among the 43 postpartum participants, 30 completed the 6 month postpartum follow-up. During the period of follow-up, 6 weeks to 6 months postpartum, the inter-recti distance (IRD) at two locations investigated have become significantly reduced, one

was 1 inch above the umbilicus ($p = 0.013$) and the other at its upper margin ($p = 0.002$). The strength and endurance of abdominal muscle groups have significant improvement (all $p < 0.05$). The total IRD change of four locations was correlated with the improvement of trunk flexors strength between 6 weeks and 6 months postpartum (Spearman = 0.38, $p = 0.04$). The IRD change at 1 inch below the umbilicus was significantly correlated with improvement of trunk rotators strength (Spearman = 0.45, $p = 0.01$). After 6 months postpartum, these postpartum women still had greater inter-recti distances (range from 1.16 ± 0.58 to 2.13 ± 0.65 cm) than those of nulliparous females (range from 0.43 ± 0.17 to 0.99 ± 0.31 cm) (all $p = 0.00$), with the greatest difference found at the upper margin of the umbilicus. The abdominal strength and endurance were also less than those of nulliparous females (all $p = 0.00$). **Conclusion:** In the present study we found that the natural resolution of diastasis recti abdominis was not complete at 6 months postpartum. Significant reduction in IRDs was found at two locations above the umbilicus, and these changes were correlated with strength of trunk flexors and rotators. Our results strongly indicate that routine physical therapy intervention even just for home exercise instruction may be necessary for postpartum women to facilitate the recovery of their trunk muscle function. Further studies are necessary to investigate the efficacy of physical therapy intervention.

0430PP54

PNEUMOTHORAX ASSOCIATED WITH NONINVASIVE INTERMITTENT POSITIVE PRESSURE VENTILATION IN DUCHENNE MUSCULAR DYSTROPHY – A CASE REPORT

Soon-Kyu Lee, Seung-Ho Choi, Won-Ah Choi, Seong-Woong Kang, Jong-Hoon Baek
Gangnam Severance hospital (Republic of Korea)

Introduction: Duchenne muscular dystrophy (DMD) is a severe recessive X-linked disorder characterized by rapid progression of muscle wasting and weakness. Long term noninvasive intermittent positive pressure ventilation (NIPPV) is an important treatment for neuromuscular patients with chronic respiratory failure. NIPPV is easy to administer and life-threatening complications are rare. We report two cases of pneumothorax associated with long term NIPPV in DMD. **Case 1:** A 24 year old DMD patient with NIPPV application via nasal mask 24 hours a day visited Gangnam Severance Hospital complaining of dyspnea and left sided chest pain. Leukocytosis was observed on lab results and decreased breathing sounds were auscultated at the left chest area. Chest X-ray showed left lung volume loss of over 50% warranting chest tube insertion and IV antibiotics infusion. Dyspnea and chest pain subsided 4 days after treatment. Left lung volume loss was reduced to 10% on follow-up chest X-ray. The chest tube was removed and the patient was discharged. Through 20 months of follow-up period, NIPPV application was reinstated and no consequent pneumothorax developments were manifested. **Case 2:** A 26-year-old DMD patient with NIPPV application via nasal mask 24 hours a day visited Gangnam Severance Hospital complaining of dyspnea, chest pain and cough. Decreased breathing sounds were auscultated at the left chest area. Chest X-ray and CT showed left lung volume loss of over 30% warranting chest tube insertion and negative pressure maintenance along with pleurodesis, despite which no improvements were observed. Thus the patient was discharged with the chest tube inserted. 4 months later, pneumothorax recurred at the right lung prompting chest tube insertion and negative pressure maintenance once again. Dyspnea and chest pain subsided after treatment but pneumothorax itself was not resolved, and thus the patient was discharged in bilateral chest tube state. The right chest tube was removed 6 months later but the left chest tube was retained. **Conclusion:** Given the increasing utilization of chronic NIPPV, we suggest that care givers and patients must be aware of this potentially life-threatening complication.

0430PP55

OUTCOMES OF LOW-LEVEL LASER TREATMENT FOR CLOSED BONE FRACTURE OF HAND AND FOREARM**Wen-Dien Chang^{1,2}, Yi-Jing Chu², Jih-Huah Wu³, Joe-Air Jiang²**¹Department of Rehabilitation Medicine, Da Chien General Hospital, ²Department of Bio-Industrial Mechatronics Engineering, National Taiwan University and ³Department of Biomedical Engineering, Ming Chuan University (Taiwan)

Purpose: The aim of this study was to investigate the efficacy of low-level laser therapy (LLLT) in the treatment of closed bone fracture of hand and forearm. The closed bone fracture of hand is usually remedied by the cast, splint, or medication, but it is less to cure the fracture area directly. Past researches confirmed that low-level laser could increase the osteocyte quantity in animal experiment, but human's studies were few reported and the suitable parameters of LLLT were unconfirmed. **Material and Methods:** In our study, we recruited 9 subjects who had closed bone fracture without surgery. The programs of LLLT (10 Hz, duty cycle 50%, 60 mW, 9.7 J/cm², 830 nm) were performed for two weeks and five treatments were conducted each week. We evaluated the pain (Visual Analog Scale, VAS), functional disability (Quick Disabilities of the Arm, Shoulder, and Hand questionnaire, Quick DASH), and user satisfaction before and after treatment, as well as two-week follow-up. We also assessed to observe the absence of the fracture line and find the cortical bridging on the fracture sites in X-ray image. **Results:** After two-week laser treatment, swelling and pain of the recruited patients with closed bone fracture were reduced significantly. Furthermore, we also found one case of the fracture healing via X-ray image inspection. The subjective satisfaction of applying LLLT was recorded after two-week treatment. After treatment, LLLT could significantly reduce pain ($p < 0.05$) and decrease disability of involved hand ($p < 0.05$). **Conclusion:** The efficacy of LLLT had pain relief and beneficial result to treat CBF of hands and forearms. However, the promotion of healing closed bone fracture by LLLT was still unrecognized due to insufficient evidence of radiographic signs. The more studies to confirm the effect on bone healing should be conducted in future.

0430PP56

FEASIBILITY OF ULTRASONOGRAPHIC EXAMINATION AFTER SURGERY IN CARPAL TUNNEL SYNDROME**Joon Shik Yoon, Sei Joo Kim, Byung Kyu Park, Kyu Hun Sim, Sun Jae Won, Jung Mo Cho, Jin Seok Jeong**

Department of Physical Medicine and Rehabilitation, Korea University College of Medicine (Republic of Korea)

Purpose: To verify the feasibility of ultrasonographic value of cross sectional area (CSA) and CSA ratio at normal segment/maximal swelling of median nerve after surgery in CTS and to determine which measurement increase the diagnostic accuracy compared to absolute maximal CSA. **Material and Methods:** This study was carried out on 33 consecutive hands. The diagnosis was made according to American Association of Electrodiagnostic Medicine criteria (AAEM). The protocol included Boston questionnaire, Electrodiagnosis (EDx), and ultrasound evaluation, at the time of prior to surgery and at 3 weeks and 3 months after surgery. Three sites were chosen to visualize the median nerve in axial scan: 1) point of maximal swelling (MS), 2) 2 cm proximal to MS (2CM), 3) 12 cm proximal to MS (12CM). The CSA ratio between maximal swelling and non-swelling point of median nerve, and each absolute mean CSA were measured. **Results:** The mean motor nerve conduction latency (ML) and sensory nerve conduction amplitude (SA) were

significantly improved between before surgery and 3 weeks, 3 months and 3 weeks and 3 months after surgery. The mean motor nerve conduction amplitude (MA) and sensory nerve conduction latency (SL) were significantly improved between before surgery and 3 weeks, 3 months after surgery. The mean CSA of maximal swelling site was significantly improved between before surgery and 3 weeks, 3 months and 3 weeks and 3 months after surgery. Ratio of MS/12CM was significantly improved between before surgery and 3 weeks, 3 months after surgery. The ML, SL, SA were correlated with MS of median nerve before surgery. The ML were correlated with ratio of MS/2CM, 12CM and the SL were correlated with ratio of MS/12CM before surgery. The improvement of ML was correlated with ratio of MS/12CM between initial and 3 weeks after surgery and with ratio of MS/2CM between 3 weeks and 3 months after surgery. The improvement of SL was correlated with ratio of MS/2CM, 12CM between 3 weeks and 3 months after surgery. **Conclusion:** The CSA ratio between maximal swelling and non swelling point of median nerve, and mean absolute CSA of maximal swelling site were significantly improved within 3 weeks after surgery. However, ratio of area was not superior to absolute CSA at maximal swelling point.

0430PP57

SUBJECTIVE AND OBJECTIVE OUTCOMES AFTER METACARPAL FRACTURES**Jen-Mu Chang, Yueh-Hsia Chen, Shwu-huei Lien**

Plastic and Reconstructive Surgery Rehabilitation Center, Chang Gung Memorial Hospital (Taiwan)

Purpose: Disability of the Arm, Shoulder, and Hand (DASH) questionnaire, have been developed that appreciate the limitations patients experience in everyday life. And objective outcome evaluation is performed mostly by range of motion and strength after metacarpal fracture. In this study, the correlation between subjective and objective outcomes were assessed 3 months after metacarpal fractures patients. **Material and Methods:** Twenty-one subjects with metacarpal fractures were recruited from August 2008 to October 2009. Patients with tendon or phalangeal bone injury other than metacarpal fracture were excluded. The recruited subjects were received physical therapy and regular follow more than 3 months. 3 months after injury, the validated Chinese version of the full DASH questionnaire was used as subjective outcome. Grip strength, pinch strength and active range of motion were measured simultaneously. Data were analyzed by SPSS 12.0 version. Correlation analysis was performed using the Pearson correlation coefficient. The "open/close fracture type" and "with/without articular injury" groups were separately compared by independent *t*-tests. All tests with a *p*-value of less than 0.05 were considered to be statistically significant. **Results:** Overall DASH score was 11.5 (SD 10.76). The average grip strength and pinch strength of the injured hands was mean of 87% (SD 23.5) and 71% (SD 22) of the uninjured hand. The mean total active range of motion was 256.4 (range 200–275, SD 16). DASH disability score exhibited a moderate negatively correlation with % grip strength ($r = -0.45, p = 0.005$), and was not correlated with % pinch strength ($r = -0.31, p = 0.08$), or %TAM ($r = -0.054, p = 0.80$). The DASH work score of optional DASH module were statistically significant in correlation with grip strength ($r = -0.32, p = 0.01$), but only few cases answered DASH sports/performing arts score. The group with open fracture type or intra-articular fracture obtained a higher DASH disability score than the group with close fracture or non-articular joint involved ($p = 0.01; p = 0.03$). **Conclusion:** The patient's subjective evaluation of their function after metacarpal fractures by means of the DASH score, when combined with an objective assessment, represents a valuable comparative methods. The correlation between grip strength, fracture type and DASH scores emphasizes the relation between subjective and objective outcomes.

0430PP58

CAHNAGES IN KNEE SENSORY FUNCTION AND HIP MUSCLE STRENGTH IN PEOPLE WITH UNILATERAL PATELLOFEMORAL PAIN SYNDROME

Chich-Haung Yang², Jen-Ju Huang¹, Chung-Chao Liang¹, Tzai-Chiu Yu³, Lan-Yuen Guo⁴

¹Department of Physical Medicine and Rehabilitation, Tzu-Chi General Hospital, ²Department of Physical Therapy, Tzu-Chi College of Technology, ³Department of Orthopedic Surgery, Tzu-Chi General Hospital and ⁴Faculty of Sports Medicine, College of Medicine, Kaohsiung Medical University, (Taiwan)

Purpose: The present study aimed to use quantitative sensory testing such as pressure pain threshold, thermal detection threshold, thermal pain threshold and vibration sense to identify the pain intensity and sensory function around the knee in people with and without unilateral patellofemoral pain. In addition, we also examine the hip muscle strength in people with patellofemoral pain syndrome (PFPS). **Material and Methods:** A total of 36 volunteers (age 22 ± 3.9 years, BMI 22.5 ± 3.3 kg/m², male: female = 1:1) were recruited by physicians' referrals, consisted of 18 individuals with unilateral PFPS and 18 age- and BMI-matched healthy controls. A pressure algometer (Smedic Co., Sweden) was used to examine the PPT over specific location around the knee. A thermal pad (Medoc Advanced Medical Systems, USA) was used to examine TPT applied on patella. A quantitative sensory testing system (TSA II, Medoc, USA) was used to test warm detection threshold, cold detection threshold. A vibrometer was used to testing vibration sense on the specific location over patellofemoral joint on affected and unaffected sides. Hip muscle strength in abduction, extension and internal/external rotation were examined using a hand-held dynamometer. Two-way repeated measures ANOVA (SPSS 15.0, SPSS, Inc., USA) was used to examine any significant difference between groups in pain intensity and sensory measures and hip strength. Significance level was set up as 0.05. **Results:** Significant reduced warm detection threshold and cold detection threshold were found in affected compared to unaffected side in individuals with PFPS and healthy controls ($p=0.001$, $p=0.000$, respectively). Reduced hip strength in abduction and external rotation were found in affected side of PFPS group compared to unaffected side of PFPS group and healthy controls ($p<0.05$). There was significant reduced PPT in affected side of PFPS group compared to healthy controls ($p<0.05$), regardless of no significant difference between affected and unaffected sides in PFPS group. **Conclusion:** Our results showed reduced hip joint strength in abduction and external rotation as well as deficits in sensory function and pain in people with unilateral PFPS.

0430PP59

MANAGING REHABILITATION OF PHYSICAL THERAPY IN TREATMENT OF PATIENTS WITH RHEUMATOID ARTHRITIS

L. Mircea, S. Birsan, F. Cioara

Oradea University School of Medicine (Romania)

Purpose: The aim of study was to evaluate effect of the combination physical therapy and medical treatment in patients with RA. **Material and Methods:** We examined 25 patients 47.16 years old, with predominance of female (80%), who suffered from RA 14.24 years (which was RF positive in 70% patients). All patients were treated with analgetic electrotherapy, magnetotherapy, kinetotherapy and massage. **Results:** Duration of the application physical therapy was approximately 14 days. After treatment we have statistically significant improvement in patient's state of health in 86.29%. RA changes was classified with Stein-Brockner's criteria and we found that 72% of our patients were in Grade 2 and 28% were in Grade 3. We found significant improvement in functional status of patients after treatment. Morning stiffness was in 24% of patients was longer

than 60 min, but after treatment it was not statistically significant shorter. **Conclusion:** According to our findings we recommended application of physical treatment in patient with RA.

0430PP60

ALTERED AUTONOMIC NERVOUS FUNCTION IN SUBJECTS WITH MECHANICAL NECK DISORDER

Su-Ya Lee¹, Chich-Haung Yang², Yi-You Hou¹, Sheng-Kai Chen¹, Lan-Yuen Guo¹

¹Department of Sports Medicine, College of Medicine, Kaohsiung Medical University and ²Department of Physical Therapy, Tzu-Chi College of Technology (Taiwan)

Purpose: Mechanical neck disorder (MND) is increasingly prevalent in spinal disorders in our modern lifestyle. Weak deep neck flexors may play a major role for a poor posture with head forward, which is an increased extended neutral position in upper cervical spine. These changes may affect the normal function of the autonomic nervous system, which is possible a vicious cycle for the consistent symptoms. We aimed to examine any alteration of autonomic function alternation in individuals with MND. **Material and Methods:** Forty participants were voluntarily recruited to two groups (MND group 27 subjects and 13 controls). Electrocardiograph was used to determine the heart rate variability (HRV) for subjects at different head and neck positions. Meanwhile, laser doppler flowmetry (LDF) was used to monitor their effects on the microcirculation of ? at different head and neck positions. **Results:** Individuals with MND group had significant ($p<0.05$) increased myogenic activity and decreased heart activity in LDF during all cervical movements compared to healthy controls. Interestingly, MND group had significant ($p<0.05$) increased HF% and decreased ($p<0.05$) LF/HF ratio in HRV in rotation to right, neutral and full flexion positions. **Conclusion:** Subjects with long-lasting improper head and neck posture could affect their function in autonomic nervous system or circulatory system. The findings may provide in-depth knowledge for clinicians to classify the different type of MND and determine the different interventions for people with MND.

0430PP61

AMELIORATIVE EFFECTS OF FACILITATION THERAPY ON MOTOR FUNCTION OF UPPER LIMB IN PATIENTS WITH HEMIPLEGIA AND SHOULDER PAIN

Qingfa Chen

(China)

Purpose: To observe the effects of combining with Transcutaneous Electrical Nerve Stimulation device (TENS) and nerve facilitation rehabilitation in the treatment of hemiplegia and shoulder pain in stroke patients. **Material and Methods:** Sixty stroke patients with hemiplegia and shoulder pain, treated in Wuxi No.2 People's Hospital from March 2007 to November 2008 were selected. According to the serial number of therapy sheet, they were assigned into facilitation device group and control group with 30 in each group. The patients in the control group were treated with nerve facilitation technique (30 min every time once a day). Those in the facilitation device group were treated with TENS plus facilitation technique. Firstly, the spinal cord was treated with electrical for 15 min, and then upper and lower limb were treated with electrical treatment, respectively, for 15 min in each limb. The treatment was once a day, 10 min as a course, totally for 3 courses. Before and after treatment all the patients were treated with Fugl-Meyer assessment to evaluate motion and ache of shoulder joint. Meanwhile, the motor function of the upper limb was assessed with Fugl-Meyer motor function assessment scale. **Results:** According to the intention-to-treat analysis, 60 patients in the two groups were all involved in the result analysis. 1) the total integral in 30 patients of the facilitation

device group after treatment was higher significantly than that in the control group (160 vs 116 points, $p < 0.01$). 2) The total integral in 30 patients of facilitation device group after treatment was higher significantly than in the control group (162 vs 78 points, $p < 0.01$). 3) The score in the facilitation device group after treatment was higher significantly than that in the control group ($X^2 = 11.12$, $p < 0.005$). **Conclusion:** The nerve facilitation technique integrated with TENS can relieve the hemiplegia and shoulder pain after stroke, and improve the motor function of upper limb in patients.

0430PP62

THE EFFECT OF ACCELERATED REHABILITATION ON THE RECOVERY OF KNEE FLEXION FUNCTION AFTER TOTAL KNEE REPLACEMENT (TKR)

Ming Wu, Wenxiang Fan, Xifu Shang

Department of Rehabilitation Medicine, Anhui Provincial Hospital (China)

In order to study the effect of accelerated rehabilitation on the recovery of knee flexion function after total knee replacement (TKR), the 61 knees in 56 patients (cases) were chosen. Cases are divided into two groups. One is called pro-operation accelerated rehabilitation group (30 knees in 27 cases) and the other is called comparison group (31 knees in 29 cases). The observations for the knee flexion function were made a week, two weeks, and six months after the operation. The knee joints were evaluated based on the ROM estimation. Evaluation results were analyzed statistically. It indicates there are no difference between two groups according to ROM estimation before the operation ($p > 0.05$). The knee flexion function in the accelerated rehabilitation group is obviously better than the comparison group after the operation. The difference is efficient statistically ($p < 0.01$). It is concluded that accelerated rehabilitation can improve the knee flexion function after total knee replacement (TKR).

0430PP63

DEVELOPMENTS FOR THE RESEARCH OF TKA PERIOPERATIVE REHABILITATION

Ming Wu, Hao Fu, Xifu Shang

Department of Rehabilitation Medicine, Anhui Provincial Hospital (China)

Total Knee Replacement (TKR) has been used widely. The perioperative rehabilitation has important affection on the total effect of the TKR. The accelerated rehabilitation to improve the function of the knee joint has been emphasized. In this paper, overviewing the researches of comprehensive estimation of perioperative cares, psychological rehabilitation, improvement of the joint activity, muscle training, proprioceptive training, walking training, the prevention of the important complications and the important roles of the treatments in the TKR, shows that perioperative rehabilitation can improve the effect after the TKR.

0430PP64

PARTICIPATING BEHAVIORS OF APHASIC PATIENTS' PARTNERS DURING INTERVIEWED CONVERSATION

Ai-Hua Li, Lu Lu

¹Graduate Program of Communication Disorders, Taipei Municipal University of Education and ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: Communication partner's attitude is an important environmental factor to consider in the treatment of aphasia. The purpose of this study was to investigate the participation behaviours of com-

munication partners of aphasic patients during an interviewed conversation, and the influences of the aphasic patients' speech fluency and naming ability on their partner's conversational participation behaviours. **Material and Methods:** Twenty-six pairs of subjects, 52 in total, were recruited in this study. The aphasic group was composed of 17 aphasic patients of mild to moderate severity (2 or above in the severity scale of Boston Diagnostic Aphasia Examination) and their close relatives with intact communication abilities. The control group was composed of 9 pairs of normal subjects both with intact communication abilities. Semi-structured interviews were conducted to each pair to collect conversation speech samples for discourse analysis. The number of participations and the type of participations of the communication partners were compared between the two groups. The aphasic patients' speech fluency and naming ability as assessed by utterance length and the Chinese Picture Naming Test score were further correlated with their partner's participation behaviours. **Results:** The results showed that the communication partners of the aphasic patients had significantly more frequent conversational participations, both active and invited ones, and in all types of participation behaviors ("speaking for", conversational repair, and other behaviors). Furthermore, the communication partners of non-fluent aphasia patients had significantly more frequent total conversational participations, active participations and "speaking for" behaviors. The patients' naming abilities were negatively correlated with the frequency of their communication partners' repairing behaviors. **Conclusion:** Our result showed that aphasic patient's communication partners often intervened, sometimes inappropriately, while the patients were speaking with others, especially for nonfluent patients with poorer naming ability. This might have clinical implications in the treatment for aphasia.

0430PP65

EFFECTS OF REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION ON UPPER EXTREMITY MOTOR FUNCTION IN STROKE PATIENTS: A META-ANALYTICAL REVIEW

L-Ning Tang¹, Hen-Yu Lien¹, Alice MK Wong^{1,2}

¹Graduate Institute of Rehabilitation Science, Chang Gung University and ²Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital-Taoyuan Branch (Taiwan)

Purpose: Cerebrovascular accidents (CVA) is the major cause of disability worldwide. According to Department of Health, Taiwan, 13,000 people died of CVA in 2008. For survivors, recovery of upper extremity motor function is usually incomplete. Current treatment protocols largely depend on therapeutic exercise. However, novel interventions like restoring interhemispheric balance after stroke by providing different types of brain stimulation have been applied to improve motor function recently. Repetitive transcranial magnetic stimulation (rTMS) is a non-invasive brain stimulation technique which can alter excitability in the motor cortex, and is a potential treatment for motor impairment in stroke patients. rTMS can either facilitate or inhibit motor cortices of the brain, depending on the stimulation frequency. High frequency rTMS (>1 Hz) produces excitatory effect and low frequency (1 Hz) rTMS exerts inhibitory effect. However, there is no consensus on the treatment effect of rTMS in stroke patients' upper extremity function. The purpose of this study was to perform a systematic review and meta-analysis on the effectiveness of rTMS on upper extremity motor function in stroke patients. **Material and Methods:** A comprehensive literature search up to October 2009 was performed on following computer databases: PUBMED, The Cochrane Library, CINAHL plus with FT, and Chinese Electronic Periodical Services (CEPS). Besides, the references of articles obtained from these searches were examined for retrieving additional articles. Key words for the broad search were stroke, cerebrovascular accident (CVA), transcranial magnetic stimulation (TMS), repetitive transcranial magnetic stimulation (rTMS), and brain stimulation. Each study was assessed by Jadad scale basing on three criteria: 1) randomization 2) double blinding and

3) withdrawals or drop outs. The comprehensive meta-analysis version 2.0 software (Biostat US & UK) was used to perform meta-analysis. **Results:** Eleven studies were included in this meta-analytical review. All subjects recruited suffered from cortical and subcortical strokes. Outcome measures of upper extremity motor function after stroke were grip strength, nine hole peg test (NHPT), Wolf Motor Function Test (WMFT), Motor Activity Log (MAL), Jebson-Taylor Test of Hand Function, Fugl-Meyer motor score, and finger tapping frequency. The overall fixed effects model revealed significant positive treatment effect of rTMS applied on primary motor cortex (M1) (Hedges's $g=0.650$, 95% CI=0.459~0.842, $p=0.000$). In subgroup analysis, low frequency rTMS (1Hz) applied on contralesional M1 revealed a significant positive treatment effect (Hedges's $g=0.930$, 95% CI=0.599~1.261, $p=0.000$), and high frequency rTMS (10 Hz and 20 Hz) applied on lesional M1 also has significant positive treatment effect (Hedges's $g=0.509$, 95% CI=0.274~0.745, $p=0.000$). The fail-safe analysis showed that 160 null effect studies were needed to overthrow the overall fixed result of rTMS. **Conclusion:** rTMS applied on primary motor cortex is effective for improving upper extremity motor function in cortical and subcortical stroke patients. Using either low frequency rTMS on contralesional motor cortex or high frequency on lesional motor cortex can enhance functional motor recovery. Further studies are needed to explore possible combined effect of using low frequency and high frequency rTMS on bilateral motor cortices at the same time, and to evaluate if rTMS has remote effect for infratentorial lesions.

0430PP66

ETIOLOGICAL ANALYSIS AND REHABILITATION NURSING OF POST-STROKE DEPRESSION

Yanjing Qin, Dongyu Wu, Hailing Li, Li He

The Department of rehabilitation Medicine, xuanwu hospital capital medical university (China)

Purpose: To investigate and analyze the etiology of depression for patients with stroke and provide corresponding rehabilitation nursing methods. **Material and Methods:** 348 patients with stroke were evaluated with Hamilton Rating Scale for Depression (HAMD) and Self-rating Depression Scale (SDS), and etiology analysis was performed in 156 of them who were diagnosed depression. **Results:** Patients with stroke had obvious psychological problem and 44.8% of them suffered from depression to a varying degree. Severity of neurological impairment was the main etiology of depression. Influencing factors of depression for patients with stroke also included whether the patient could go to work and financial burden. **Conclusion:** Uses should master certain psychological knowledge. Strengthening psychological nursing and early rehabilitation training were effective to improve mood of depression and quality of life for patients with stroke.

0430PP67

THE EARLY REHABILITATION OF PATIENTS DIE ADL PARALYSIS IN THE OBSERVATION

Xiaoying Shang, Shoubin Lu, QiuHong Cui, Xiaoming Zhu, Hao Feng, Lu Gan, Bo Wu, Yaotao Zhao, Fei Xu, Yandong Liu

Heilongjiang Provincial Hospital (China)

Purpose: Observation of the early rehabilitation of patients die paralysis in the capacity of the daily life activities. **Materials and Methods:** The study 66 patients with stroke were randomly divided into rehabilitation and control groups, 34 patients recovered, in neurology given acupuncture treatment plus routine medication based on the week after the intervention in the rehabilitation hospital; the control group 32 cases, simply to conventional drugs and acupuncture neurological treatment outcomes were compared between the two groups. **Results:** Rehabilitation group had better effects

than the control group, Barthel index were significantly different ($p<0.01$). **Conclusion:** Early rehabilitation can significantly improve the soldier, hemiplegia patient ADL and reduce disability, improve life quality, high levels of clinical value, and to shorten treatment to reduce costs, would be effective in enhancing economic and social benefits, it is worth promoting. **Key-words:** Early rehabilitation, stroke, hemiplegia.

0430PP68

A FMRI STUDY ON A PATIENT WITH CENTRAL POST-STROKE PAIN

Yongmei Li¹, Feifei Yang¹, Lijuan Ao², Jin Chen², Jie Wang²

¹Department of Rehabilitation, the second Affiliated hospital of Kunming college and ²Department of Rehabilitation, the second Affiliated hospital of Kunming college (China)

Purpose: To explore the expression of neural activity of different brain area on a patient with central post-stroke pain by using fMRI. **Material and Methods:** The patient 62 years old man was included in this study. He was suffered from left thalamus hemorrhage for 4 months and right hand neuropathetic. A detailed clinical assessment of somatic sensory function was examined, including tactile sensory, acupuncture sensory, warm and cool sensory and two-point discrimination sensory. The MRI and fMRI scan was carried out using 1.5T High-Speed scanner. The functional scan were collected using blood oxygen level dependent contrast (BOLD) protocol with a T2-weighted gradient echo-planar imaging sequence (TR=2000 ms, TE=50 ms, 64*64). The warm stimulation at 50° and cool stimulation at 5° was applied in the palmaris surface of right hand finger of the patient. **Results:** sensory testing: Most of sensory including tactile sensory, acupuncture sensory, two-point discrimination sensory showed diminishing. However, the patient felt allodynia at the 5° and 50°. Functional imaging: the intensive activations were showed in the posterior central gyrus of left parietal cortex (Brodmann 1 area) when cold stimulation were exerted on the the affected side (right side hand). The mild activation lied in the posterior central gyrus of left parietal cortex (Brodmann 40 area) when warm stimulation were exerted in the same site. Mild activation were found in the middle frontal gyrus of the right cortex (Brodmann 2 area) and (Brodmann 8 area) when cold stimulation were exerted on the the unaffected side (left side finger). Less mild activation lied in cuneate lobe of the left parietal cortex (Brodmann 18 area) when warm stimulation were exerted in the same site. **Conclusion:** In this patient with CPSP, the activation area and intensity with cold stimulation is more than that of warm stimulation. With the same stimulation, activation area in the cortex is less in the affected side than the unaffected side.

0430PP69

THE CHANGE AND SENSE OF MICROGLIA CELLS IN PENUMBRA FOLLOWING FOCAL CEREBRAL ISCHEMIA IN RATS OBSERVED BY LASER CONFOCAL MICROSCOPY

Xiang Chen, Suzheng Han

Department of Rehabilitation, The Second Affiliated Hospital & Yuying Children's Hospital of Wenzhou (China)

Purpose: To study the change and sense of microglia cells in penumbra following focal cerebral ischemia in rats observed by Laser Confocal Microscopy. **Material and Methods:** The transient focal cerebral ischemia-reperfusion model was established with modified method of insertion of thread fish nylon into and staying for two hours and then withdrawing it from middle cerebral artery in rats. Thirty six male Sprague-Dawley rats were randomized into 6 groups: sham-operated group (S, $n=6$), model group (group M6h, group M24h, group M48h, group M72h, group M7d, $n=6$). For monocyte labeling, Rhodamine

6G was retrogradely injected through the tail artery at the start of the surgery, and was repeated after the first 12 hours. The neurological behavior scores were valued after animals waked up and before killed. All of animals were transcardial perfused and fixated to study the invading monocytes and brain derived microglia by FITC-islectin B4 histochemistry under CLSM. **Results:** The number of ILB4+ cells in penumbra in group M were remarkably higher than one in group S ($p < 0.01$). The number of ILB4+ cells in penumbra in group M7d, group M72h and group M48h were significantly higher than ones in group M6h ($p < 0.01$) and group M24h ($p < 0.01$). Compared for the ratio of brain-derived microglia to blood-borne monocytes in penumbra, ones in group M72h were significantly higher than ones in group M6h ($p < 0.01$) and group M24h ($p < 0.05$). Compared for the ratio of brain derived microglia to blood-borne monocytes at the border areas of the infarct, ones in group M72h were higher than ones in group M6h ($p < 0.05$) and group M24h ($p < 0.05$). **Conclusion:** A part of microglia cells derived from the invading monocytes in blood circulation. There was a distinct increase of the movement of microglia in penumbra, the population of cells was even higher at 72 hours after MCAO, and the morphology was more about ameboid. There was a correlation between the changes of microglia in penumbra and neuroreparation following focal cerebral ischemia in rats.

0430PP70

REHABILITATION OF STROKE PATIENTS IN THREE TREATMENT EFFECT ANALYSIS

Yuan Dawei

Le Du Hospital (China)

Objective: To investigate the rehabilitation of stroke patients in three research programs whether it is effective rehabilitation treatment programs. **Methods:** The subjects for the April 1, 2004 to February 28, 2007 in hospital in line with the conditions selected patients with acute cerebrovascular disease were 80 cases, male 56 cases, female 24 cases; the average age of 65.04 ± 5.19 years; Infarction 40 cases of cerebral hemorrhage 40 cases, of which 2 cases were lost because of complications. Were randomly divided into rehabilitation group and control group, the rehabilitation group was given standard three-stage rehabilitation treatment, the control group without any rehabilitation treatment, but does not rule out the traditional rehabilitation on their own, such as acupuncture, integrated functional evaluation. Method for Evaluation of therapeutic effect, in the selected time and three rehabilitation therapy at the end (the first six late onset) were evaluated to carry out three rehabilitation effectiveness analysis. When the results of selected rehabilitation group and control group differences in the measurement scale was no significant ($p > 0.05$); rehabilitation unit through the standard three-stage rehabilitation treatment, the measurement scale score was significantly higher than that, the difference was significant if the sex ($p < 0.001$), the measurement scale score is also significantly higher than the increase in value ($p < 0.001$). **Conclusion:** The rehabilitation of stroke patients in three research program is an economical and remarkable efficacy of rehabilitation treatment programs.

0430PP71

EFFECT OF CLEARING THE GOVERNOR VESSEL AND REFRESHING THE MIND NEEDLING ON HEAD SPECT AND CT SCANNING OF KIDS WITH CEREBRAL PALSY

Zhenhuan Liu

Nanhai Affiliated Maternity and Children's Hospital of Guangzhou University of Traditional Chinese (China)

Purpose: To investigate action and value of acupuncture in cerebral palsy rehabilitation. **Material and Methods:** 100 spasm cerebral palsy patients from 2 to 7 years old were randomly divided into two groups. Acupuncture group: 50 patients were treated with head acupuncture and body acupuncture; Rehabilitation-training group: 50 patients were

treated with physical therapy of Bobath and Vojta methods. **Results:** The total effective rate acupuncture and rehabilitation-training group were obvious higher than that of rehabilitation-training group. After treatment the DQ value of rehabilitation-training + acupuncture group were higher than that of rehabilitation group ($p < 0.01$). In acupuncture and rehabilitation-training group were higher than that of rehabilitation-training group ($p < 0.01$). In acupuncture and rehabilitation-training group, improvement rate of brain dysphasia, brain atrophy in skull CT and recovery normal rate of skull SPECT were obvious higher than that of rehabilitation-training group ($t = 4.731, t = 5.971, p < 0.01$). **Conclusion:** Acupuncture can obviously increase cerebral blood flow (CBF) and improve cerebral cell metabolism, promote partial or complete compensation of cerebral function and the restoration and function of plasticity of cerebral tissue in children with cerebral palsy.

0430PP72

CONTRAST RESEARCH ON EFFECT OF TUINA (CHINESE TRADITIONAL MEDICINE MASSAGE) AND CHIROPRACTIC ON BALANCE AND BASIC ACTIVITIES OF DAILY LIVING (B-ADL) AFTER STROKE

Jianzhao Yang, Jinglong Liu, Yu Guo

Heilongjiang Province Rehabilitation Hospital (China)

Purpose: Contrast research on Effect of Tuina (Chinese traditional medicine massage) and Chiropractic on balance and basic activities of daily living (B-ADL) after stroke. To evaluate outcome of two different treatments. **Material and Methods:** 60 patients with problem of balance were recruited to this study. Inclusion criteria: first-event stroke; no ill-controlled serious underlying systemic disease; no aphasia; no dementia; no subarachnoid hemorrhage (SAH) and 4 weeks after onset. The score of Fugl-Meyer balance assessment were no more than 6. The patients were randomly divided into two groups: group A ($n = 30$, age: 57.67 ± 10.26) and group B ($n = 30$, age: 59.27 ± 7.85). Both groups do following treatment: daily physiotherapy, occupational therapy, and other therapy according to individual needs. Patients in the group A received traditional Chinese medicine massage (Tuina), but group B do the treatment of Chiropractic. The subjects received 30 min daily treatments of Tuina and Chiropractic, 6 times per week. The Modified Barthel Index (MBI) and Fugl-Meyer balance assessment was respectively used to assess patients' capacity in B-ADL and balance. Assessment was done upon admission to rehabilitation and 6 weeks afterwards. SPSS12.0 was used for statistic. **Results:** After 6 weeks, performance in the entire patient group increased (paired samples t test: $t = 32.44, p < 0.001$). At that time, the difference in Fugl-Meyer balance assessment scores of 2 groups was not significant (independence samples t test: $t = 1.378, p > 0.05$), but MBI was ($t = 2.384, p < 0.05$). **Conclusion:** Standard rehabilitation treatment including measures of both Tuina and Chiropractic has a beneficial effect on the functional capacity of stroke patients with problem of balance and outcome is similar. But in B-ADL, Tuina maybe better.

0430PP73

TEMPORAL MEASURES OF SWALLOWING IN POST STROKE INDIVIDUALS RECOVERED FROM DYSPHAGIA

Kumar B. Radish, S. Bhat Jayashree

Kasturba Medical College (India)

Purpose: The swallowing problems after acute stroke are often temporary but sometimes leads to various complications such as aspiration pneumonia, dehydration and death. Though these individuals recover from swallowing disorder, it is not known if they have recovered completely. Previous studies in individuals with dysphagia used quantitative measurements like amplitude of EMG muscle activity during swallow, time duration for which the

activity is present, swallowing apnea duration, etc in the assessment of individuals with swallowing disorders. The present study administered timed test of swallowing was administered to identify swallowing problems, if any, in six months post stroke individuals. This measure is useful in identifying those at risk of dysphagia or its complications, and also in monitoring the progress. Hence, it was chosen for this study. **Material and Methods:** The study followed a case control design. Participants were divided into two groups. Group 1, clinical group, comprised of thirty individuals, who had a history of dysphagia during the acute period of stroke six months ago in the age range of 40 to 60 years. Group 2, control group, consisted of thirty healthy age matched adult volunteers. All the participants were asked to drink 150 ml of water from a plastic beaker 'as quickly as possible'. All the participants were able to hold the beaker of water to their mouth and drink. A stopwatch was started when the water first touched the lower lip, and stopped when the larynx came to rest, ensuing the last swallow. The number of swallows performed by the participants was counted by observing the movement of the thyroid notch along with the time taken to completely drink 150 ml of water. Volume per swallow, time per swallow and the swallowing capacity was calculated in both the group of participants. **Results:** The results of independent *t*-test revealed a significant difference between the means for both the group of participants, at $p < 0.05$ for all the three indices of timed test of swallowing, suggesting that the clinical group exhibited lower volume per swallow, increased time per swallow and a lower swallowing capacity in each swallow than control group. **Conclusion:** The present study investigated the swallowing problems in six months post stroke individuals using timed test of swallowing. The results revealed a significant difference between the means for both the group of participants, at $p < 0.05$ for all the three indices of timed test of swallowing, suggesting lower volume per swallow, increased time per swallow and a lower swallowing capacity in post stroke individuals in comparison with the control group. Hence, the timed test of swallow can be used as a clinical tool for identifying swallowing problems in post stroke individuals.

0430PP74

RESPIRATORY SWALLOW COORDINATION IN HEALTHY AGED POPULATION

S. Bhat Jayashree, Kumar B. Radish
Kasturba Medical College (India)

Purpose: A variety of age-related changes occur in the oral pharyngeal mechanism, with some affect on the coordination between swallowing and breathing is reported in the literature. Also, the incidence of swallowing disorders rises sharply with advanced age along with problems in breathing. As the population ages, by 2010, 16.5 million persons in US are estimated to have dysphagia and will require treatment. The present study was planned to investigate the differences between respiratory swallow coordination in healthy aged Indian population. The differences if any in the respiratory swallow coordination across various food consistencies and the volume of food consumed was also aimed at. **Material and Methods:** 15 healthy aged individuals in the age range of 50–69 years & 15 adults in the age range of 18–40 years participated in the study. The swallowing examinations were recorded on a Digital Swallowing Workstation (Model 7200; Kay Elemetrics Corporation) coupled to the swallowing signals lab. Nasal respiratory flow was captured by using a standard 7-ft nasal cannula coupled to the Swallow Signals Lab (Model 7120 Kay Elemetrics Corporation) module to create a digital display of the respiratory phase and the swallow apnea duration. The participants were requested to swallow the bolus in one complete action in the following order: Dry swallow, 5 ml and 10 ml of thin liquid, followed by 5 ml and 10 ml of thick liquid. Respiratory measures (inhalation/exhalation) were recorded for all swallowing attempts. Swallow apnoea duration was calculated from these measurements. Obtained data was analysed statistically using three way repeated measure ANOVA. **Results:** The results of apnea duration revealed significant differences between the means for

adults & healthy aged population indicating that the apnea duration is prolonged in healthy aged population. There was no significant difference observed between the means of swallow apnoea duration across different food consistency and volume. Also, it was found that swallow apnoea occurred at the expiratory phase predominantly followed by inspiratory expiratory cusp, expiratory inspiratory cusp and the inspiratory phase in both the groups although the higher occurrence of expiration bracketing the swallow is observed in healthy aged population. **Conclusion:** The present study investigated the swallow apnoea duration in healthy aged population and the results revealed a significant increase in the swallow apnoea duration in the healthy aged population. Also, swallow apnoea occurred at the expiratory phase in many individuals followed by inspiratory expiratory cusp, expiratory inspiratory cusp and the inspiratory phase in both the groups. Increased apnoea duration and the higher occurrence of expiration bracketing the swallow in the healthy aged population may be compensatory protective mechanism rather than the result of decreased muscle mobility or reaction times, and not indicative of impairment. Early detection of swallowing impairment, including breathing and swallowing dis-co-ordination that contributes to aspiration, may lead to prevention of pneumonia. The findings of the current study represents an initial step toward this far-reaching objective that has high clinical relevance in aging population.

0430PP75

SPATIAL BIASES IN PROCESSING NUMBERS BY DEVELOPMENTAL DYSCALCULIC CHILDREN

N. Devadiga Deepa, Kumar B. Radish, S. Bhat Jayashree
Kasturba Medical College (India)

Purpose: Numbers consist of a unique feature which represents a particular aspect of quantitative information. Studies indicate that the quantitative representation of numbers has a spatial structure, and that it may orient from left to right. Since developmental dyscalculia (DD) is a specific learning disability affecting the normal acquisition of arithmetic skills, it is hypothesized that they may be lacking ability to represent and manipulate numerical magnitude nonverbally on an internal number line (Butterworth, B, 2005). Hence the present study was attempted with the aim of observing spatial biases if any in children with developmental dyscalculia. **Method:** Participants consisted of 12 children with developmental dyscalculia and 12 typically developing children in the age range of 9–10 years. Each participant received four white pages containing written instructions on the first page; and the other 2 pages contained 16 strings of digits in one and the other with 16 lines. Two sets of digits represented small (1.2) and large (8.9) magnitudes. From each of these four digits, two strings were generated, containing an odd (17 digits) or even (18 digits) number of elements yielding 52 mm and 55 mm, respectively. The 16 control stimuli (87 mm and 84 mm) were horizontal black lines that matched the digit strings with respect to their length and positions on the page. All the stimuli were presented in midsagittal plane. All participants were instructed to bisect each stimulus in the middle. The distance between a bisection mark and both ends of a line was determined to the nearest millimeter, yielding a left and right interval for each stimulus. The difference score (left interval minus right interval) yielded a negative value when performance was biased to the left and a positive value when performance was biased to the right. **Results:** The average bisection scores for lines in the developmental dyscalculia and the typically developing group were -2.67 and -1.50 , respectively and there was no statistically significant difference between the two groups at $p > 0.05$. The average bisection scores for small and large numbers in the control group were 0.1208 and 0.2028 , respectively, and there was no significant difference between the bisection scores for small and large numbers. Comparisons across lines and numbers in the control group revealed significant differences. The average bisection scores for small and large numbers in children with developmental dyscalculia were -0.0870 and -1.087 , respectively and there was no significant difference between the bisection scores for small and large numbers. Comparison across lines and numbers revealed no significant differences in children with

developmental dyscalculia. **Conclusion:** In summary, the results revealed no evidence of SNARC effect in both the groups of children, i.e., normal controls exhibited a right handed bias for both small and large numbers and left handed bias for lines whereas children with developmental dyscalculia exhibited a left sided bias for both lines and numbers. The present observations, if substantiated by further research, may be useful for the diagnosis of number comprehension skills in children with developmental dyscalculia.

0430PP76

EFFECT OF NEUROMUSCULAR ELECTRICAL STIMULATION WITH TRAINING OF SWALLOWING ON SWALLOWING FUNCTION IN PATIENTS WITH CEREBRAL VASCULAR ACCIDENT

Zunke Gong, Wei Chen, Jie Sun, Cheng Quan
Central Hospital (China)

Purpose: To observe the effect of neuromuscular electrical stimulation with training of swallowing on swallowing function in patients with cerebral vascular accident. **Material and Methods:** Seventy dysphagia patients caused by stroke were randomly divided into a treatment group (35 cases) and a contrast group (35 cases). All the patients were given routine medication treatment, training of facial and masticatory muscles, training of swallowing, and so on. The patients in the treatment group were given electrical stimulation. Then, the swallowing function and curative effect are analyzed statistically. **Results:** After 15 days of treatment, the swallowing function of all the patients has been improved ($p < 0.01$), and the treatment group is more distinct than the contrast group ($p < 0.05$). The effective rate in the treatment group is 88.56 per cent, while that in the other group is 71.44%. There is significant difference between the two groups. **Conclusion:** Neuromuscular electrical stimulation with training of swallowing can improve the movement of facial and masticatory muscles, and help the patients build up good swallowing reflex, reduce complication and improve their living.

0430PP77

CLINICAL STUDY OF STANDARDIZED THREE STAGES' REHABILITATION PROGRAM IN PROMOTING COMPREHENSIVE FUNCTIONING IN STROKE PATIENTS WITH HEMIPLEGIA

Jirong Zhang, Shuang Wu, Yu Huang, Lili Feng, Tingfeng Chen, Yan Long, Mei Li, Ling Li, Li Ma, Lianfang Wang, Xiaomin Feng

Department of Rehabilitation Medicine, Teaching Hospital, Guiyang Medical College (China)

Purpose: To explore the effects of standardized three stages' rehabilitation on the comprehensive function in stroke patients with hemiplegia. **Materials and Methods:** 80 cases with acute brain vascular disease (male: 58, female: 22; average age: 62.94 ± 8.59 ; brain infarction: 44 cases, brain hemorrhage: 36 cases; 2 died) have been divided randomly into 2 groups: the treatment group and the control group. The treatment group has been treated with THREE GRADES regular rehabilitation treatment whereas the control received no rehabilitation [1] treatment unless treated with acupuncture or massage by patients themselves. Both groups received routine treatment of internal medicine. Both groups have been evaluated with simplified Fugl-Meyer scale, simplified ADL scale and comprehensive functional scale at the beginning and the end of the treatment. **Results:** All the scales of two groups showed no significant difference at the beginning ($p > 0.05$). But the scales of the treatment group were significantly higher than those of the control group ($p < 0.001$) and the increasing rate were significant higher than those of the control group. **Conclusion:** Standardized three stages' rehabilitation can promote stroke patients' comprehensive function

of every stage obviously. **Key-words:** standardized three stages' rehabilitation; stroke; hemiplegia; comprehensive function.

0430PP78

RELATIONSHIPS BETWEEN FORWARD REACH AND THE SIT-TO-STAND ACTIVITY IN PATIENTS WITH STROKE

Chen-Yin Chen¹, Ray-Yau Wang²

¹Department of Physical Therapy, Chang Gung Memorial Hospital and ²Institute of Physical Therapy and Assistive Technology, National Yang-Ming University (Taiwan)

Background and Purpose: Sit to stand is one of the most important activities of daily living. It requires coordination, balance, mobility, and strength. The ability of reach while in sitting is also important for an independent living. Trunk forward and loading body weight to the feet, both are key components for reaching a distant object. Both are also important components in the early phase of the sit-to-stand activity. The purpose of this study is to investigate the relationships between the reaching activity in sitting and the ability of sit-to-stand in patients with stroke. **Study design:** A cross-sectional, exploratory study was carried out in a medical center. **Subjects:** Thirty-three patients with hemiparesis resulting from cerebral vascular disease participated in the study. **Measurements:** The forward reach distance in sitting was measured by a displacement transducer. With regard to the sit-to-stand activity, a 'fail' was marked if the patients cannot complete the activity. Once the patient can succeed in the activity, the time needed to complete the sit-to-stand was recorded by a stopwatch. The trunk movement was recorded by video camera during the reaching and sit-to-stand activities, and was analyzed by kinview 2.0 to determine trunk forward angle. **Statistical analysis:** The independent *t*-test was used to compare the differences in the forward reach distance and trunk flexion angle between subjects who failed and subjects who succeeded in the sit-to-stand activity. Further, the Pearson correlation was used to examine the relationships between the forward reach distance and the time needed to complete the sit-to-stand activity and between trunk flexion angle and the time needed to complete the sit-to-stand activity. The lever was set at 0.05. **Results:** There were significant difference in reaching distance between subjects who failed and subjects who succeeded in the sit-to-stand activity. But there were no correlation between reaching distance and the time needed for the sit-to-stand activity. There was no significant difference in trunk flexion angle between the two groups during the sit-to-stand activity. Significant correlation was found between trunk flexion angle and the time needed to complete the sit-to-stand activity. **Discussion and Conclusion:** The forward reach activity was an important component for preparing the sit-to-stand activity. When performing the sit to stand activity, the more trunk flexion forward, the shorter the time needed to complete the task. The results of our study can provide information to clinicians. The patients can practice forward reach in sitting for preparing a sit-to-stand activity. Trunk forward, which is the key component for sit-to-stand, can also practice during the reaching activity.

0430PP79

UTILITY OF CUEING HIERARCHY AS AN EFFECTIVE TREATMENT APPROACH IN ANOMIC APHASIA

Sudhin Karuppali¹, Buddhima Samaraweera², B.S. Premalatha²

¹Kasturba Medical College and ²Dr. S.R.Chandrasekhar Institute of Speech and Hearing (India)

Purpose: The principle deficit in anomic aphasia is the difficulty in naming. Since the naming plays an important role in language, naming disturbances have to be treated systematically. The symptoms of the presenting case includes circumlocution, difficulty in defining reference, confrontation naming, categorical naming, automatic closure

naming. There are several approaches to train access to the lexicon. Among them, cueing is a common technique which facilitates word retrieval. Cueing may be of different types which are selected according to the patient's severity of the lexical access and the effects may vary across the population. Hence the present study attempted to evaluate the effectiveness of an intervention program focusing on the cueing hierarchy as a primary treatment method for Anomic Aphasia. **Material and Methods:** The present study is a prospective single case study. The subject who had come with a complaint of unclear speech after Cerebrovascular Accident was evaluated using the Western Aphasia Battery and was found to have relatively good auditory verbal comprehension and repetition, but severe naming deficits, placing him under the category of Anomic Aphasia. His response time for several naming categories was recorded in the first session after which, Cueing hierarchy had been introduced as a primary treatment strategy to elicit verbal fluency and also auditory recall tasks to improve memory. Post therapy evaluation was done after 15 sessions to monitor his response time for the same naming categories. **Results:** Significant improvement was seen in response time for confrontation naming (nouns and verbs), defining referents and automatic closure naming tasks after 15 sessions of therapy using the cueing hierarchy. The Auditory recall tasks did not show significant improvement. **Conclusion:** Selecting a cueing hierarchy to improve lexical retrieval is an effective approach for rehabilitating anomic aphasics. Therefore the cueing hierarchy selected for the intervention process should be individual specific.

0430PP80

STUDY OF THE CONGENITAL BLIND READING BRAILLE IN FMRI

Guangyao Wu, Junmo Sun, Li Wei

Department of Radiology, Zhongnan Hospital of Wuhan University (China)

Purpose: Cerebral activation areas will be displayed in fMRI during the congenital blind reading Braille. To explore occipital cortical functional reorganization of the congenital blind. **Material and Methods:** Right-handed the congenital blinds ($n=10$) performed reading Braille and the differentiation senseless dots. Freshmen as control group ($n=10$) performed touching Braille. Acquisition of FE-EPI images. The data was processed and analyzed in software of Medx3.2. **Results:** 1) Both side primary visual cortex V1 and supplementary visual cortex V2+V3 were activated during the congenital blind ($n=10$) reading Braille. Left and Right V1 activated extensions were 20 and 19 pixels respectively; (V2+V3) were 44 and 50 pixels; (V2+V3)>V1. Right total (V1+V2+V3) was 69 pixels, T value was 9.8; Left total was 64 pixels, T value was 9, no significant difference. 2) Both visual cortical scattered activated clusters were appeared during identifying senseless dots. Right total (V1+V2+V3) was 16 pixels, T value was 4.1; Left total was 64 pixels, T value was 3.8. There was significant difference between reading Braille and identifying dots ($p<0.001$). 3) Additional activated areas during reading Braille included BA4, BA3, BA7, SMA and left inferior frontal gyrus and so on. 4) During the control group touching Braille, there were activated no visual cortex but two side areas such as BA4, BA3, BA7, BA6 et al. **Conclusion:** Reading Braille of early visual deprivation person can cause the activation of visual cortex. Visual cortical function happens reorganization, which involves the process of complex language cognition.

0430PP81

THE FMRI STUDY OF BRAIN FUNCTIONAL REORGANIZATION IN PATIENTS WITH CEREBRAL INFARCTION

Xi-Quan Hu¹, Rui-Shu Jiang¹, Ya-Dan Zheng¹, Zhuang Kang²

¹Department of Rehabilitation Medicine, the Third Affiliated Hospital of Sun Yat-sen University and ²Department of Radiology, the Third Affiliated Hospital of Sun Yat-sen University (China)

Purpose: To investigate activation patterns of motor cortex in patients with cerebral infarction by BOLD-fMRI, and to explore the brain functional reorganization mechanism. **Material and Methods:** Sixteen patients (12 men and 4 women, age from 37 to 80 years old, mean 61.0 ± 11.3) with subcortical infarction within 3 months were included. All the patients received fMRI scanning during passive movement for both affected and unaffected wrested separately clenching. Brain functional mapping was acquired with SPM2, and different activation patterns of brain were compared between affected and unaffected hand. **Results:** The volume and intension of activated areas of fMRI in stroke patients were diversity, however, showing some orderliness. The fMRI map showed a general hyperactivation when the affected hand was moved. When the unaffected hand moved the contralateral M1 and S1 were activated. **Conclusion:** After cerebral infarction, brain cortex showed compensatory changes. Register as the main motor cortex (M1) unactivated and the non-main motor cortex such as PMC, SMA, CMA, IPL, PFC, CRB activated. Besides, the motor areas activated shift to area around the lesion, also the non-motor area activated.

0430PP82

RISK FACTORS OF FALLS IN HOSPITALIZED STROKE PATIENTS

Zong-Han Yang, Ta-Sen Wei

Changhua Christian Hospital (Taiwan)

Purpose: Falling is a high risk, high volume and multi-factorial problem in stroke patients. We aimed to identify the risk factors of falls in hospitalized stroke patients received rehabilitation program. **Material and Methods:** This case-control study enrolled stroke inpatients with one case (faller) matching 2 controls (non-faller). Variables measured included demographic data, type of stroke, first ever or recurrent stroke, hospitalization length, Mini-Mental state examination, depression status, trunk control ability, Brunstrom's stage of extremities, and functional independence measure (FIM). Besides, indwelling catheters (nasogastric tube or Foley catheter), other complications (pneumonia, urinary tract infection, etc.) and co-morbidities (hypertension, diabetes mellitus, etc.) were also recorded. **Results:** A total of 192 stroke patients (64 fallers), aged 65.8 ± 12.8 years were enrolled with BMI 23.6 ± 3.9 kg/m², length of stay 24.1 ± 5.8 days, and MMSE 18.3 ± 8.8 . The initial FIM was 61.7 ± 20.4 (35.8 ± 14.8 in motor subscale and 26.6 ± 8.2 in cognition subscale, while the discharged FIM was 73.7 ± 19.9 (44.9 ± 15.7 in motor subscale and 29.0 ± 6.4 in cognition subscale). By bivariate analysis, there were significant difference between groups in discharged total FIM score ($p=0.026$), ability of sit-up and stand-up ($p=0.019$ and 0.048 , respectively), and depression or not ($p=0.009$). **Conclusion:** For appropriate fall-prevention in hospitalized stroke patients, it is crucial to facilitate patients' trunk control ability, promote their activities of daily living, and well manage the psychological problems.

0430PP83

THE CLINICAL STUDY ON POST-STROKE PATIENT REHABILITATION OF APPLYING WITH WORKING MEMORY AND MENTAL PRACTICE

Yanming Zhang, Jie Dai, Long Qian, Weiqun Song

Department of Rehabilitation Medicine, Xuanwu Hospital Capital Medical University (China)

Purpose: To study the relationship between working memory and motor function improvement obtained from applying with mental practice and physiotherapy on post-stroke patient rehabilitation. **Material and Methods:** 40 post-stroke patients were measured the Kinesthetic and Visual Imagery Questionnaire (KVIQ) and working memory before treatment. They were divided into normal

working memory group (21 cases) and impaired working memory group (19 cases). The two groups were measured the Fugl-Meyer of lower limb and loading of the affected lower limb before and after treatment which were trained with mental practice and the general rehabilitation for 4 weeks. **Results:** 40 post-stroke patients were measured the Kinesthetic and Visual Imagery Questionnaire (KVIQ) and working memory before treatment. They were divided into normal working memory group (21 cases) and impaired working memory group (19 cases). The two groups were measured the Fugl-Meyer of lower limb and loading of the affected lower limb before and after treatment which were trained with mental practice and the general rehabilitation for 4 weeks. **Conclusion:** There is evident effect that mental practice and physiotherapy treat the lower function of post-stroke patients, and the effect depends on the ability to maintain and operate information in working memory.

0430PP84

A PILOT STUDY OF A HAPTIC KNOB FOR HAND REHABILITATION IN CHRONIC POSTSTROKE HEMIPLEGIA

Karen Sui Geok Chua¹, O. Lambercy², L. Dovat², C.W.K. Kuah¹, Hong Yun¹, S.K. Wee¹, C.L. Teo¹

¹Dept of Rehabilitation Medicine, Tan Tock Seng Hospital and-
²Dept of Mechanical Engineering, National University of Singapore (Singapore)

Purpose: The Haptic Knob (HK) is a novel 2 degree of freedom portable upper limb robotic device with haptic visual feedback used to train pronation-supination and hand opening-closing in either arm. We conducted a pilot clinical trial from April 2008 to May 2009 to study the clinical effects on motor impairment reduction, safety and acceptability of the HK for hand rehabilitation in 15 subjects with chronic poststroke hemiplegia in a single tertiary rehabilitation centre. **Material and Methods:** Inclusion criteria included subjects with first-ever confirmed stroke diagnosis who were at least 9 months poststroke, with upper extremity Fugl-Meyer assessment (FMA) scale (0–66) of 10–45, and shoulder-elbow motor power of 3–5/5. Exclusion criteria included those with severe arm pain, arm spasticity, neglect or medical contraindications to intensive training. The training protocol consisted of 60 min of therapist and engineer-supervised outpatient exercise on the HK 3 times per week for 6 weeks. Independently scored outcome measures included the FMA score, Motricity Index (MI), grip strength, Modified Ashworth Scale scores for spasticity and pain using the Visual Analogue Scale (VAS) and Functional Test of the Hemiplegic Upper Extremity (FTHUE) at week 0, 6 and 12. **Results:** Altogether, 15 subjects (mean age 55.5 years, 7 males, 8 females) with a mean duration of 597.5 days poststroke were recruited. The mean FMA scores at weeks 0, 6 and 12 were 32.5 (SD 10.5), 34.9 (SD 11.2) and 36.7 (SD 10.6) respectively and the gains were significant at weeks 6 and 12 ($p < 0.05$, $p < 0.001$ respectively). Both proximal and distal FMA improved significantly by 10.1% at 6 weeks with maintenance of gains at week 12. Mean affected hand grip strength at weeks 0, 6, and 12 was 3.2kgf (SD 2.7), 3.3 kgf (2.2) and 3.7 kgf (2.2), respectively and the gains from week 0–6 and 0–12 were significant ($p < 0.001$). FTHUE scores were not significantly improved from their baseline scores of 3.0 (SD 0.65). There was no increase in upper limb spasticity or pain scores (baseline VAS 1.1) at weeks 6 or 12. No adverse events related to training were reported. 75% of subjects rated their training with the device as good or excellent. **Conclusion:** Based on this pilot study, we conclude that the HK has potential as a novel robotic device for reduction of motor impairment in chronic hemiplegia with little carryover to upper extremity functional skills. It also has a good safety and acceptability profile. Future larger controlled studies on long term clinical effects are needed.

0430PP85

THE EXERCISE EFFECTS ON EXPRESSION OF SYNAPTOTOPHYSIN AROUND HEMOTOMA AFTER ICH IN RATS

Hongling Li, Huiping Zhang, Yanping Liu, Gang Huang, Xiping Xue, Changchun Wang

The Second Hospital of Hebei Medical University (China)

Purpose: To investigate the exercise effects on expression of synaptophysin around hematoma after intracerebral hemorrhage (ICH) in rats. **Material and Methods:** The 95 male SD rats (weight, 270 to 300 g) were divided into three groups, trial group (ICH-induction and exercise group, $n=20$), control group (ICH-induction group, $n=20$) and sham operated group (no ICH without exercise, $n=20$). The rats brains were removed at 7d, 14d, 21d, 28d after operation. The other 35 rats were divided into 7 groups (6 h, 12 h, 24 h, 48 h, 72 h after ICH, no ICH and normal). The activation of synaptophysin was measured by Immunohistochemistry. The rats in trial group begin cage-running exercise at 72 h after operation. The others live in the standard cages. **Results:** Synaptophysin-positive cells appeared around the hematoma and cortex. There is no expression in the centre of hematoma. The number of synaptophysin-positive cells in ICH group was less than the sham-operation and normal group from 6 h to 24 h. there is a rising again in 48 h, increasing in 7 days, high peak in 28 days. That of trial group has a more notable expression increase. There was a significant difference compared with control group, $p < 0.05$. Compared with sham operated group the trial and control group have a highly significant difference, $p < 0.01$. **Conclusion:** The results suggested that synaptophysin participated in neuron plasticity after ICH, but exercise training (cage-running) can accelerate the expression of synaptophysin, thereby improve function recovery.

0430PP86

EFFECTS OF KINESIO TAPING FOR PARETIC UPPER LIMB IN CHRONIC STROKE PATIENTS

Rong-Bin Hong¹, Jeng-Feng Yang², Yi-Ru Chen¹, Da-Fang Chan², Willy Chou¹, Chen-Yu Chow³, Lin-Yen Chang¹

¹Department of Physical Medicine and Rehabilitation, Chi Mei Medical Center, Yong Kang Campus, ²Department of Physical Therapy, National Cheng Kung University and ³Department of Physical Medicine and Rehabilitation, Chi Mei Medical Center, Liou Ying Campus (Taiwan)

Purpose: The purpose of this study was to evaluate the effects of Kinesio taping (KT) on motor recovery of paretic upper limb in the chronic stroke patients. **Material and Methods:** A pre-post design was used for the study. Three tests were conducted for assessing the motor functions of the paretic upper limb before and after KT applied and at 3 weeks follow-up. All subjects received regular rehabilitation throughout the experiment. KT was applied to the upper trunk and shoulder of the subjects in addition to regular rehabilitation for 3 weeks between the first and the second tests. Then, the subjects received only regular rehabilitation for 3 weeks between the second and the third tests. For each test, the movement amplitudes of active shoulder flexion and abduction, Fugl-Meyer Motor Assessment, Wolf Motor Function Test, and Motor Activity Log were measured. **Results:** Ten chronic stroke patients with upper limb paresis were recruited. These patients were at least at Brunnstrom's stage III and were able to voluntarily move their arms to some extent. Our results showed a trend of increase, but not statistically significant, in the movement amplitude of shoulder flexion and abduction after application of KT, compared to before application of KT. Fugl-Meyer Motor Assessment for upper limb, Wolf Motor Function Test (except the item of circle drawing), and Motor Activity Log were not significant changed across the three tests. The significant reduction in the time of circle drawing was mainly occurred at 3 weeks follow-up. Half of our subjects reported their subjective feeling of easier to move

their arms while KT was applied. **Conclusion:** The effects of applying KT to improve motor functions were not significant according to our objective measurements. However, the subjective report of favoring KT from our subjects may be worth to consider using KT for other clinical applications to the stroke patients.

0430PP87

IMPROVED MOTOR AND BALANCE FUNCTION BY THERMAL INTERVENTION ON MODERATELY TO SEVERELY PARETIC LOWER LIMB OF ACUTE STROKE

Jia-Ching Chen^{1,2}, Chung-Chao Liang^{1,3}, Chun-Hsiang Lin^{1,2}, Qi-Xing Zhang¹, Yu-Chun Wei¹, Yi-Win Huang¹

¹Department of Rehabilitation Medicine, Buddhist Tzu Chi General Hospital, ²Department of Physical Therapy, Tzu Chi College of Technology and ³Department of Medicine, Tzu Chi University (Taiwan)

Purpose: The effectiveness of Thermal Stimulation (TS) has been demonstrated on motor function of upper limb; however, there is unknown for that in the lower limb in people with acute post-stroke. The present study aimed to examine whether TS, given during acute stroke, was more effective in facilitating motor and balance function of the paretic lower limb than standard rehabilitation group without TS. **Material and Methods:** A total of 36 patients, with a history of within one month after stroke causing moderate to severe leg paresis (Brunnstrom stage ≤ 3 [Br stage, 0 to 6]), were randomly assigned to standard rehabilitation treatment and standard treatment in combination with TS (30 min daily for 6 weeks). Both groups received similar treatment duration in one session. Thirty-three patients completed the experiment. Outcome measurements consisted of Fugl-Meyer Assessment for Lower Extremity (FMA-LE) motor control, Medical Research Council scale for Lower Extremity muscle power (MRC-LE), the Modified Motor Assessment Scale (MMAS) for motor functions. Balance was assessed using the Postural Assessment Scale for Stroke Patients Trunk Control (PASS-TC) and Berg Balance Scale (BBS); Functional Ambulation Category (FAC) and gait speed for walking ability and muscle tone by the Modified Ashworth Scale. All measures were performed at baseline, the fourth and sixth week after intervention. **Results:** No significant differences were found in the baseline measurements between two group patients. After TS intervention, the performance of FM-LE, MRC-LE and FAC were improved significantly at 6-week ($p < 0.05$). The alterations in all motor functions, balance and FAC at TS group were significantly greater than those of the control group at both 4 and 6 weeks ($p < 0.05$), except for PASS-TC and gait speed. Interestingly, the higher percentage of independent walker at TS group (88.2%) compared to the control group (56.3%) without TS after 6-week intervention ($p = 0.06$). Similar muscle tones were found in both groups, and no adverse effect occurred. **Conclusion:** The findings in this pilot study indicate that TS on the paretic lower limb is a feasible and effective treatment for the early-phase stroke patients with moderate to severe motor impairment.

0430PP88

ROLE OF PATHOLOGICAL YAWNING IN REHABILITATION

Cheng-Chiang Chang, Shin-Tsu Chang

Tri-Service General Hospital, National Defense Medical Center (Taiwan)

Background: Chang et al. described how pathological yawning was terminated following tracheostomy in a case of locked-in syndrome. In response, Prasad stated a relationship between the disappearance of symptoms and selective brain cooling via the upper respiratory tract due to the cooling mechanism, which seems to prevent the brain

tissue susceptible to the thermal fluctuation from thermal harm.

Purpose: 1) Realizing the mechanism for termination of the pathological yawning. 2) Connecting the central modulation of pain evoked from MTP and excessive yawning. **Material and Methods:** *Case 1:* The frequency of yawning gradually decreased within hours following the tracheostomy in a patient with locked-in syndrome which is near the central location of yawning control: presumably close to or within medullary respiratory and vasomotor centers. The premier emergence of yawning was seen in a 15-week-old embryo. Frequency of yawning decreases with brain maturation when the limbic system and the forebrain areas are already connected. Larger total dead space of the respiratory system in pediatric subjects would also make them more prone to yawn. In addition, vagus nerve manipulation or stimulation might occur during the tracheostomy, which possibly had influence on the touching off or even cease of pathological yawning. *Case 2:* Excessive yawning developed whenever a 44-year-old woman was performing self-myofascial-release in our physiotherapy room who has had severe muscle tightness in upper trapezius, levator scapulae, scalenes and the suboccipital extensors pain with subcutaneous posterior cervical and thoracic trigger points for months. Niddam et al. suggested that intervention of MTP partially involves supraspinal pain control through midbrain periaqueduct gray (PAG). Besides, van der Plas et al. concluded the PAG involving in the hypotensive pathway could be affected by the electrical stimulation of hypothalamic areas. **Results:** Three possible points of view on the termination of the pathological yawning: 1) Reduction of the dead space. 2) Vagus nerve stimulation. 3) Thermoregulation influenced by hypothalamus. The relationship between MTP and excessive yawning. Central modulation of pain evoked from MTP might be connected to excessive yawning via spinothalamic tract, PAG and hypothalamus. **Conclusion:** Pathological yawning terminated following tracheostomy possible results from certain factors. Pain associated with MTP might be connected to excessive yawning via the neural tract.

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0430PP89

TENSION PNEUMOCEPHALUS AFTER HYPERBARIC OXYGEN THERAPY IN A PATIENT WITH TRAUMATIC BRAIN INJURY

Lin-Chien Lee, Szu-Fu Chen, Fu-Kong Lieu

Cheng Hsin General Hospital (Taiwan)

Pneumocephalus is not uncommon in patients with skull bone fracture after head trauma. The presence of a cerebrospinal fluid (CSF) shunting system causing a decrease in intracranial pressure and co-existed craniodural defect were postulated to be the pathogenesis. Tension pneumocephalus, causing a mass effect and increased intracranial pressure, may lead to neurological compromise, brain herniation and death if not treated emergently. We report a patient with traumatic brain injury (TBI) who had tension pneumocephalus after hyperbaric oxygen therapy (HBOT). A 25-year-old male presented with left occipital bone fracture, subarachnoid and subdural hemorrhage after being hit by a car.

He had craniectomy with removal of hematoma the next day. CSF diversion with a ventriculo-peritoneal shunt was created 4 months later because of hydrocephalus, and subsequent cranioplasty was also performed. Bilateral hemiplegia, communication disorder and dysphagia were complicated. Due to pneumocephalus and subdural empyema, he underwent craniectomy again with following cranioplasty 14 months after trauma. He received HBOT to promote neurological recovery 15 months after trauma. Sudden onset of consciousness disturbance and generalized tonic-clonic seizure were noted after decompression out of hyperbaric oxygen chamber. He also developed subcutaneous emphysema over left face, periorbital area and eyelid. A computed tomography (CT) scan of brain disclosed tension pneumocephalus over bilateral frontal regions with mass effect. Burr hole drainage to evacuate the intracranial air was performed emergently, and antiepileptic medications were administered. He underwent ligation of CSF shunt 8 days after the onset of tension pneumocephalus, and the follow-up brain CT showed evidence of resolution of intracranial air and mass effect. He was discharged home 2 weeks after the final operation, and has remained asymptomatic for more than 2 years. In our clinical practice, patients with central nervous system injury such as traumatic brain injury or stroke tried HBOT as adjuvant treatment to facilitate neurological recovery. Unrepaired skull base fracture with or without coexisting CSF diversion system should be evaluated before HBOT carefully to identify patients with high risk of tension pneumocephalus. Repair of air entry site is suggested before HBOT.

0430PP90

STUDY ON THERAPEUTIC EFFECT OF HEAD ACUPUNCTURE COMBINED WITH ACCELERATION TECHNIQUES ON STROKE PATIENTS USING THE SIAS APPRAISAL TABLE

Yanli Xing, Qiang Tang, Tie Hua Wei

The second attached hospital of Heilongjiang University of Chinese Medicine (China)

Purpose: To study and analyze the validity of cluster needling of scalp point combined with acceleration techniques on stroke patients. **Material and Methods:** Using the SIAS appraisal table, adopt the method of comparison and observation of three treatment groups (cluster needling of scalp point combined with facilitation techniques group, facilitation techniques group, cluster needling of scalp point group) to assess impairment conditions at stroke patients before and after treatment. **Results:** The conditions of patients' movement function, myodynamia, physical balance, ROM and pain had significant difference in the cluster needling of scalp point combined with facilitation techniques group and other groups ($p < 0.05$); patients' movement function had significant difference in cluster needling of scalp point combined with facilitation techniques group and other two groups ($p < 0.05$), there was insignificant difference between facilitation techniques group and cluster needling of scalp point group ($p > 0.05$). **Conclusion:** This study shows that there is significant effect for the patients of acupuncture and rehabilitation group for their joint pain relief and joint activities. Research proves to cluster needling of scalp point that can produce stimulation for cerebral cortex, change corticocerebral cells' excitability, correct suppressant generalization, strengthen the coordination and compensatory for the corticocerebral domain, promote function restructuring, and improve the corresponding clinical disorders. While cluster needling of scalp point change method of traditional acupuncture that important is development muscle strength, in the process of CongCi with Bobath therapy that can inhibit the paralysis of the body's synkinesis and simultaneous reaction, promote the normal mode, prevent pervasive syndrome, expedite the brain function of recuperation, improve the quality of life. Acupuncture and rehabilitation method can improve the cerebral apoplexy patients' function and relieve their pain.

0430PP91

THE EFFECT OF COMBINED TRADITIONAL AND VIDEO EDUCATION OF SHOULDER EXERCISES IN HEMIPLEGIC SHOULDERS AFTER ACUTE STROKE

Ya-Ping Pong, Cheng-Hao Tseng, Yu-Chi Huang

Chang Gung Memorial Hospital-Kaohsiung Medical Center (Taiwan)

Purpose: To investigate the effect of the video education combined with traditional education for shoulder range of motion (ROM) exercise in hemiplegic shoulder pain (HSP) and upper extremity neurological recovery after acute stroke. **Material and Methods:** We enrolled 48 hemiplegic acute stroke patients with hemiplegic shoulders admitted to the rehabilitation department of the Chang Gung Memorial Hospital. The motor levels of all hemiplegic shoulders were Brunnstrom motor recovery (BMR) stage I, II, III, or IV. Twenty five patients were placed in the control group (traditional education only) and 23 patients were allocated to the experiment group (the video education combined with traditional education). The traditional education included appropriate hemiplegic shoulder positioning, transfer techniques and performing shoulder passive ROM exercise which were educated by nurses. All of patients and caregivers were asked to carry out passive shoulder ROM exercises for 10 to 15 min every time and four times every day. In addition to traditional nursing education, we arranged the video education 3 times in first week to educate appropriate shoulder positioning, transferring techniques and the same ROM exercises for the experiment group. The therapist rechecked the techniques of all exercise after completing the video education. Hemiplegic shoulder motor function level (BMR), shoulder motion, sensation, spasticity, the presence and severity (VAS) of HSP were recorded by one therapist on admission and 1 week before discharge. The shoulder sonography was performed with a 5–12 MHz linear-array transducer (i3000, Terason, USA) by the same physiatrist both on admission and 1 week before discharge. We compared the physical (shoulder sensation, spasticity, motor recovery, shoulder motion, presence and VAS score of HSP) and sonographic findings before discharge between the control and experiment groups. A statistical significance was defined as $p < 0.05$. **Results:** There were no significant differences in the demographic, clinical characteristics, physical and sonographic findings between two groups at admission. Before discharge, there were no significant differences in shoulder sensation, spasticity, presence and severity of HSP, shoulder motion, sonographic findings between two groups. However, the motor recovery of hemiplegic shoulders was significantly improved in the experimental group ($p < 0.05$). **Conclusion:** The combined traditional and video education of appropriate shoulder positioning, shoulder ROM exercises and transferring techniques can enhance shoulder neurological motor recovery in stroke patients with poor shoulder motor function when compared with the traditional education only.

0430PP92

THE CORRELATIONS BETWEEN PHYSICAL/ SONOGRAPHIC FINDINGS AND HEMIPLEGIC SHOULDER PAIN IN STROKE

Ya-Ping Pong, Yu-Kuang Chen, Yu-Chi Huang

Chang Gung Memorial Hospital-Kaohsiung Medical Center (Taiwan)

Purpose: To clarify the correlation between the physical/sonographic findings and hemiplegic shoulder pain (HSP) in both acute and chronic stages. **Material and Methods:** We enrolled 76 hemiplegic stroke patients admitted to the rehabilitation department of the Chang Gung Memorial Hospital. Motor function level (Brunnstrom motor recovery stage; BMR), shoulder motion and sensation, spasticity, glenohumeral subluxation and the presence of HSP were

recorded by one therapist and shoulder sonography was performed by the same physiatrist 1 week before discharge (acute stage) and 6 months after discharge (chronic stage). The shoulder sonography was performed with a 5–12 MHz linear-array transducer (t3000, Terason, USA). The correlation between HSP and BMR stages, spasticity, and glenohumeral subluxation of hemiplegic shoulder, abnormal sonographic findings were analyzed by Point-biserial correlation test. Pearson correlation coefficient test was used to analyze the correlation between HSP and shoulder motion. A statistical significance was defined as $p < 0.05$. **Results:** Seventy-six patients completed all evaluations and sonography examinations at both acute and chronic stage. At acute stage, significant correlations (all $p < 0.05$) were found between HSP and shoulder motor function level ($r = -0.30$), shoulder motion limitation (flexion/ extension/abduction /external rotation/internal rotation; $r = -0.25$ to -0.57), and sonographic subscapularis tendinopathy ($r = 0.33$). At chronic stage, we found significant correlation between HSP and shoulder motor function level ($r = -0.28$), shoulder motion limitation (flexion/ extension/abduction /external rotation; $r = -0.38$ to -0.61), shoulder spasticity ($r = 0.28$), abnormal sonographic findings ($r = 0.45$), sonographic biceps or supraspinatus tendinopathy ($r = 0.24, 0.25$). **Conclusion:** For both acute and chronic stroke patients, there are moderate to high correlations between shoulder motion limitation and HSP; low to moderate correlation between poor shoulder motor function level and HSP. In chronic stage, we also found moderate correlation between HSP and abnormal sonographic findings; low correlation between HSP and shoulder spasticity. Therefore, we consider that restricted shoulder motion may play the most important role for both acute and chronic stroke patients with HSP. Patients with poor shoulder motor function should be cautious of HSP in both stages. However, soft tissue injuries and spasticity of hemiplegic shoulders are associated with HSP in only chronic stroke patients.

0430PP93

SPONTANEOUS INTRAVENTRICULAR HEMORRHAGE CAUSING PERSISTING ALEXIA WITHOUT AGRAPHIA: A CASE REPORT

Wen Hui Hsueh, Nai-Hsin Meng

Department of Physical Medicine and Rehabilitation, China Medical University Hospital (Taiwan)

The syndrome of alexia without agraphia is caused by lesions involving the temporooccipital region (occipital lobe and splenium of posterior corpus callosum) in the territory of posterior cerebral artery of the dominant cerebral hemisphere. Intraventricular hemorrhage without extending into the brain parenchyma seldom causes prominent and persisting neurologic deficits. To the best of our knowledge, there has been no report of intraventricular hemorrhage which induces persisting alexia without agraphia in medical literature. We report a 56-year-old male dentist with spontaneous intraventricular hemorrhage which manifested with right hemiparesis, decreased visual acuity, color anomia and alexia without agraphia. He underwent endoscopic removal of hematoma and extraventricular drainage about 2.5 hours after onset, and his limbs weakness, color anomia and decreased visual acuity resolved within 2, 6, and 8 weeks post-onset respectively. However, his reading ability improved slowly and still prevented him from resuming his clinical practice 6 months after onset of the intraventricular hemorrhage. We also discussed the probable pathophysiological mechanism and the strategies of rehabilitation for this patient.

0430PP94

EFFECT OF 4-WEEK AEROBIC EXERCISE INTERVENTION ON RATS NON-ALCOHOLIC FATTY LIVER AND LIVER CYTOCHROME P450 2E1

Hongling Zhang, Yanli Shi

Department of Health Science and Nursing Wuhan Polytechnic University (China)

Purpose: To investigate the effects of aerobic exercise on Liver tissue and cytochrom P450 2E1 (CYP2E1) in rat with nonalcoholic fatty liver disease (NAFLD) induced by high fat diet. **Methods:** The rats were randomly divided into normal group, model group and model + exercise group. Aerobic exercise intervention was applied on the model + exercise group for 4 weeks. Total cholesterol (TC), triglyceride (TG), liver pathological changes and liver tissue CYP2E1 expression in each group. **Results:** After six weeks lipid emulsion gavage, the level of body weight, TG and TC rised evidently, $p < 0.05$ the liver pathological changes indicated NAFLD model was produced successfully, the level of hepatic cytochrome P450 2E1 rised evidently compared with control group, $p < 0.05$. After four-week aerobic exercise, the exercise liver histopathological changes significantly, the level of TG, TC and cytochrome P450 2E1 declined evidently, $p < 0.05$, and the liver pathological changes improved significantly. **Conclusion:** Aerobic exercise not only improve hyperlipidemia, but also can reduce cyp2E1 expression, prevent and therapy oxidative injury of liver tissue in NAFLD.

0430PP95

PERSPECTIVE OF CHINESE GRADUATE STUDENTS THE DEVELOPMENT OF THE JAPANESE RESPIRATORY REHABILITATION

Xiaoying Shang¹, Kenji Kagechika², Yasutaka Takagi³, Akira Shimasaki³

¹Rehabilitation Hospital of Heilongjiang (China), ²Kanazawa Medical University Hospital and ³Tonami General Hospital (Japan)

This article by the author in Japan, the rehabilitation and study the experience of the Japanese breathing the concept of rehabilitation of historical development and evaluation, treatment and clinical practice on the Japanese. In particular early from bed status as a Japanese breathing rehabilitation of the view that the clinical application higher value in recent years has gradually been accepted. The early from bed status is not only technology, but also against all bed status of the patients for treatment. breathing rehabilitation The study will be the latest opinion early from the bed for surgery and diseases such as a result of the bed state patients, as far as possible as early as possible to take place, the exercise and capacity improved guidance. Breathing rehabilitation particularly early from bed state perspective, not only in Japan, in my country is also very clinical value, is worthy of promoting rehabilitation treatment.

0430PP96

THE EFFECTS OF STRENGTH TRAINING ON C-REACTIVE PROTEIN AND PLASMA FIBRINOGEN IN UNTRAINED YOUNG ADULT MEN

Heshmat Alah Parsian¹, Khosro Abraham², Hojat Alah Nik-bakht³, Shahram Soheily⁴, Samaneh Parsian⁵, Fataneh Khanali⁶

¹Islamic Azad University (Azadshahr Branch), ²Shahid Beheshti University, ³Islamic Azad University (researches & sciences branch), ⁴Islamic Azad University (Shahriar Ghods branch), ⁵Islamic Azad University and ⁶Tehran University (Islamic Republic of Iran)

Purpose: The purpose of this study was to investigate the effect of strength training on C-reactive protein and plasma fibrinogen in untrained young adult men. **Material and Methods:** The subjects of this research consisted of twenty-four healthy student men with mean age (25 ± 1.19) years, weight (74.37 ± 5.38) kg, height (174.70 ± 5.51) cm which were divided randomly into two groups: strength group ($n = 12$) and control group ($n = 12$). The strength training was consisted of 12 weeks, 3 days per week in circuit pattern in 6 stations. Each training session included three sets with (70, 80, 90%) intensity of one maximum repetition (1RM) with (12, 10, 8) repetitions in every station, respectively. The blood samples were gathered in pre and post of training. Hs-CRP and fibrinogen were measured with

ELISA kits and immunoturbidimetric assay. Data were analyzed by *t*-test (). **Results:** Results showed that strength training cause no significant decrease in C-reactive protein, fibrinogen, weight and body mass index (5.47, 5.12, 1.9, 3.57%, respectively), significant decrease in body fat percent (12.28%) and no significant maximum oxygen consumption in untrained young adult men. **Conclusion:** strength trainings have inverse effect on CRP and fibrinogen, so it can be used as predictors of coronary heart disease.

0430PP97

THE RELATIONSHIP BETWEEN THE QUALITY OF LIFE AND THE AEROBIC CAPACITY OF THE PATIENTS ENTERING PHASE II CARDIOPULMONARY REHABILITATION PROGRAM

Yi-Chieh Chou¹, Chen-Liang Chou^{1,2}, Si-Huei Lee¹, Su-Ying Hung¹, Shun-Ping Cheng³, Cheng-Ming Chiu⁴, Ko-Lun Tsai¹, Po-Chin Strong¹

¹Department of Physical Medicine and Rehabilitation, Taipei Veterans General Hospital, ²Department of Physical Medicine and Rehabilitation, School of Medicine, National Yang-Ming University; ³Department of Health at Lo-Sheng Sanatorium and ⁴Department of Physical Medicine and Rehabilitation, Far Eastern Memorial Hospital (Taiwan)

Purpose: This cross-sectional study aimed to examine 1) the relationships between patients' aerobic fitness and general health perceptions, and 2) the relationships between their functional aerobic impairment and general health perceptions. **Material and Methods:** 105 patients (99 male and 6 female adults) who underwent coronary artery bypass (CABG) surgery participated in this study. They completed a version of the World Health Organization Quality of Life brief form (WHOQOL-BREF, short form) questionnaire and then underwent maximum graded exercise tolerance testing to determine their aerobic fitness. We used Pearson's and Spearman's correlation analysis to assess the associations between variables of the WHOQOL-BREF questionnaire and patients' aerobic fitness. **Results:** Pearson's correlation coefficient demonstrated a significant association between the patients' WHOQOL-BREF scores and peak VO_2 in the physical domain ($p=0.01$, facets: energy, mobility and activity). It also showed a significant association between the patients' WHOQOL-BREF scores and FAI in the facets of energy ($p=0.014$), and information ($p=0.048$). **Conclusion:** Our results indicated that impaired aerobic fitness influenced many facets of the patients' quality of life, especially in the physical domain. Thus, phase II cardiopulmonary rehabilitation (CR) that focuses on improving the physical fitness of the patient is essential to improve the quality of life in these patients. Besides, we should also emphasize rehabilitation programs that focus on psychological support and environmental adaptation to further improve the quality of life in patients underwent CABG surgery.

0430PP98

THE JAPANESE STYLE NORDIC WALK IN CARDIAC REHABILITATION PROGRAM

Motohiro Kawauchi¹, Munemoto Endo¹, Keisuke Ueda¹
IMS Itabashi Rehabilitation Hospital (Japan)

Purpose: To evaluate the feasibility of the Japanese style Nordic Walk, a revision of European style Nordic Walking by the Japanese Nordic Walking Federation, in Cardiac Rehabilitation Program. **Material and Methods:** Twenty-four cardiac rehabilitation patients who admitted our hospital between June 2009 and December 2009, and participated in the Japanese style Nordic walk program, were enrolled in this study. The patient's ages were between 62 and 93 (mean 76), and there were ten males and 14 females. Original diseases were ischemic heart disease (6), aortic aneurysm (14) and valvular heart disease (4). **Results:** Six patients (25%) were not able to do Nordic walking, four for too heavy heart failure

and two for hemiparesis. Nordic walking session was employed in 18 patients (75%). An 83-year-old woman after surgical therapy of an aneurysm of aortic arch employed Nordic walking as a main exercise session. She could walk only 30 m with a T cane when she arrived, and could not ride an ergometer because of the malfunction of the artificial joints in both knee. After 5 weeks of Nordic walking program, a six-min-walk test with Nordic poles was 162 m and that with T cane was 111 m. Walking with Nordic poles resulted in better posture than that with T cane. Eight out of eighteen continued Nordic walking after discharge, six continued ergometry and four stopped exercise. All the sixteen patients improved in exercise capacity after the program. **Conclusion:** The Japanese style Nordic walking is a feasible and appropriate program for cardiac rehabilitation. The patients in rehabilitation program were easier to start walking sessions with Nordic Walk, and the recovery of walking speed was earlier than usual. As Nordic Walk demands 20% more oxygen uptake than that of walking with the same speed, even a slow and deliberate Nordic walking session results in an effective aerobic exercise.

0430PP99

THE EFFECTS OF SWIMMING EXERCISE ON THE NEUROTROPHIN-3 LEVELS IN SKELETAL MUSCLES OF DIABETIC RATS

Zhongli Jiang¹, Hongwei Li¹, Feng Lin¹
Nanjing Medical University (China)

Purpose: The purpose of this study was to explore the effects of swimming exercise on the levels of Neurotrophin-3 (NT-3) in skeletal muscles in streptozotocin-induced diabetic rats. **Material and Methods:** Sixteen diabetic rats induced by streptozotocin (STZ, 55mg/kg) were randomly divided into diabetic group with exercise for 8 weeks (A: $n=6$), diabetic group with exercise for 4 weeks (B: $n=5$) and diabetic control group without exercise (C: $n=5$). Twelve SD rats with euglycemia were randomly divided to control group without exercise (D, $n=6$) and control group with exercise for 8 weeks (E, $n=6$). The exercise rats were forced to swim 60 min/day with 5 day/week. The levels of NT-3 in skeletal muscle were measured by ELISA method. **Results:** The NT-3 levels of muscles were lower in group C than in groups with A, D and E ($p<0.05$). There were no statistical significance in the NT-3 levels of muscles between groups B and C ($p=0.051$). The NT-3 levels were a significant positive correlation with the CNCV at 8 weeks ($r=0.405, n=28, p<0.05$). **Conclusion:** The increase in NT-3 levels of skeletal muscles induced by exercise could contribute partially to the improvement of diabetic neuropathy.

0430PP100

REHABILITATION APPROACH AND ADL CHANGE FOR THE PATIENTS WITH PRIMARY BRAIN TUMOR

Akiyoshi Nagatomi¹, Hiroaki Kimura¹, Mitsuo Ochi²

¹Department of Rehabilitation Medicine, Hiroshima University Hospital and ²Department of Orthopedics, Hiroshima University Graduated School (Japan)

Purpose: Operation and/or conservative therapy including chemotherapy and radiation therapy are performed for curing patients with primary brain tumors. These patients with brain tumor have many problems about functional impairments and Activities of Daily Living (ADL) during and after those therapy courses so that rehabilitation therapy is required and performed. The aim of this study was to evaluate and follow these patients' ADL change during rehabilitation courses. **Material and Methods:** From January 2001 to December 2006, sixty-nine patients with primary brain tumor were undergone rehabilitation including physical, occupational and speech therapy during operation and/or conservative therapy courses (40 men and 29 women, mean age 49.3 ± 19.9

years) in our hospital. We evaluated patients' histological and clinical diagnosis, length of hospital stay from the date of rehabilitation start to that of discharge. To measure ADL change, we followed patient's Barthel Index (BI) during rehabilitation course. **Results:** Forty-seven patients were diagnosed as brain tumor for the first time and were undergone operation therapy. Underlying pathology in those patients was glioma ($n=26$), meningioma ($n=6$), neurinoma ($n=4$), and others ($n=11$). Mean length of Rehabilitation therapy was 69.1 days after operation. During this period, mean BI score of these patients changed from 47.8 before rehabilitation therapy to 72.5 after rehabilitation. After discharge, 29 patients went back home and 17 patients went to other hospital or nursing home. Range of Motion (ROM) exercise, muscle training, gait exercise and ADL exercise were mainly prescribed. Twelve patients were diagnosed as brain tumor for the first time but undergone conservative treatment. Underlying pathology in those patients was glioma ($n=4$), malignant lymphoma ($n=3$), benign tumor ($n=2$) and others ($n=3$). Mean length of Rehabilitation therapy was 56.4 days. Mean BI score of these patients changed from 36.5 before rehabilitation therapy to 46.3 after rehabilitation. After discharge, 4 patients went back home, 5 patients went to other hospital or nursing home and 3 patients were dead. Ten patients were diagnosed as recurrent brain tumor. Five of them were undergone operation and most of them were diagnosed as glioma. Mean length of rehabilitation therapy was 60 days after operation. Mean BI score of these five patients changed from 58 to 60. Other five patients were treated conservatively. Mean length of rehabilitation therapy was 109 days after operation. Mean BI score of these five patients changed from 40 to 51. Among recurrent cases, exercise and activities were performed for about 40 min per day. ROM exercise, sitting exercise and best supportive cares were mainly prescribed. **Conclusion:** Among patients diagnosed as brain tumor for the first time, operation may improve most patients' ADL and the aim of rehabilitation exercise may be to improve functional impairment and ADL. Among patients with recurrent tumors, rehabilitation exercise may play a role to maintain their ADL.

0430PP101

THE INFLUENCE ON MIGRATION, PROLIFERATION AND APOPTOSIS OF ENDOTHELIAL PROGENITOR CELLS BY PHYSIOLOGICAL ISCHEMIC EXERCISE TRAINING

Chengjian Yang¹, Chunxiao Wan^{1,2}, Jianan Li²

¹Wuxi No.2 Hospital Affiliated with Nanjing Medical University and ²Nanjing Medical University (China)

Purpose: The aim of this study was to investigate the migration, proliferation and apoptosis of endothelial progenitor cells (EPCs) in response to physiological ischemic exercise training in rabbits with myocardial ischemia. **Material and Methods:** Eighteen male adult New Zealand rabbits were randomly divided into three groups (six rabbits per group): Group A was a sham operated; Group B had the myocardial ischemia (MI); while Group C received the physiological ischemic exercise training in condition of MI. Physiological ischemic exercise was induced by electrical stimulation (40% maximum current strength, 1 ms, 40 Hz) for 4 min twice a day, 5 days a week, for 4 weeks. Pathological MI was induced by left ventricular branch intermittent occlusion for 2 min, twice a day, also for 4 weeks. 20 ml blood was drawn from ear central artery just at the end of the experiments for all groups. Endothelial progenitor cells (EPCs) were calculated and identified by double-positive staining with 1,1'-dioctadecyl-3,3',3'-tetramethylindocarbocyanine-labeled Ac-LDL (Dil-Ac-LDL) and Ulex europaeus agglutinin-I (UEA-1). Migration was detected by a modified Boyden chamber assay. Proliferation was analyzed by MTT, and EPCs apoptosis was evaluated by flow cytometric analysis. **Results:** EPCs were characterized by Dil-Ac-LDL and UEA-1 double staining. Migration capacity in Group C was found

to be the highest in all groups (Group C: 21.2 ± 1.9 cells/HFP). However, there were no significant difference between EPCs proliferation and apoptosis founded in the groups. **Conclusion:** Our results indicate that physiological ischemic exercise training could enhance the migration capacity of EPCs, but had no significant effects on proliferation and apoptosis of them.

0430PP102

EXPERIMENT TREATMENT OF VIRAL MYOCARDITIS INDUCED BY COXSACKIE VIRUS B3 WITH ULTRASHORT WAVE IN MICE

Yan-Li Shi¹, Hong-Ling Zhang¹, Cui-E Li²

¹Department of Health Science and Nursing, Wuhan Polytechnic University and ²The People's Hospital, Wuhan University (China)

Objective: To investigate the effects of ultrashort wave in viral myocarditis of mice induced by Coxsackie virus B3. **Design:** Randomized controlled animal experiment. **Setting:** Laboratory of rehabilitation therapy, Wuhan Polytechnic University; Basic Laboratory, Medical College Wuhan University. **Materials:** Twenty-three healthy male Balb/c mice, aged 4–6 weeks were involved and randomized into 3 groups: control group ($n=7$), viruses + ultrashort wave group ($n=8$) and viruses group ($n=8$). The mice of three groups were raised in the same condition. **Methods:** *Control group:* Mice were not intervened. Viruses + Ultrashort wave treatment group and virus infection were given the CVB3 virus 100TCID50 intraperitoneal injection of 0.1 ml. The mice of ultrashort wave were placed in ultra-high frequency electric field 24×12 cm plastic baskets, the electrodes 24×15 cm, polar distance 18 cm, no temperature 50 mA, 2 times a day (8 am, 4 pm and 1 times), every 8 min, a total of 6 days of treatment. 7 days later the mice were killed to detect. **Main outcome measures:** Determination of cardiac LDH, CK levels. Observed under light microscope morphological changes of myocardium. **Results:** Ultrashort wave therapy group and the virus group between the control group were significantly different in the levels of myocardial LDH and CK, the difference was significant ($p < 0.01$). The release of LDH and CK of myocardium in Ultrashort wave treatment group declined evidently than virus group ($p < 0.05$). Under light microscope, the control group showed normal myocardial cells; ultrashort wave treatment group shows a little of myocardial inflammatory cell infiltration; mononuclear cell infiltration and necrosis developed in all the survived mice of viruses group. **Conclusion:** Ultrashort wave therapy could improve the conditions of viral myocarditis induced by CVB3.

0430PP103

POST-EXERCISE ANKLE-BRACHIAL INDEX AND ENDOTHELIAL FUNCTION IN POSTMENOPAUSAL FEMALES

Shinji Sato¹, Shingo Otsuki¹, Shiro Tanaka¹, Ryuji Nohara²

¹Osaka Sangyo University, Department of Sport and Health Science and ²Kitano Hospital Heart Center (Japan)

Purpose: We investigated the alteration in post-exercise ankle-brachial index (ABI) and endothelial function in postmenopausal females. **Material and Methods:** In 15 postmenopausal females (mean age: 69 years), the ABI was measured at rest and immediately post exercise. Endothelial function was assessed by measuring flow-mediated vasodilation (FMD) in the brachial artery using ultrasound imaging. **Results:** There was a poor correlation between FMD and ABI at rest. However, good correlation was observed between FMD and post-exercise ABI ($r=0.70$, $p=0.04$). **Conclusion:** A reduction of post-exercise ABI over baseline readings are associated with decreased FMD.

0430PP104

INSPIRATORY MUSCLE TRAINING IS EFFECTIVE IN PATIENTS WITH BRONCHIECTASIS: A PROSPECTIVE RANDOMIZED CONTROLLED STUDY

Mei-Yun Liaw¹, Meng-Chih Lin^{2,3,4,5}, Yu-Chin Tsai³, Kuo-Tung Huang, Pei-Wen Chang^{4,2}, Yu-Hsiu Chung^{2,3}, Yi-Hsi Wang^{2,3}

¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital-Kaohsiung Medical Center, ²Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, Chang Gung Memorial Hospital, ³Department of Respiratory Therapy, Chang Gung Memorial Hospital-Kaohsiung Medical Center, ⁴Department of Respiratory Care, Pulmonary Disease Research Center, Chang Gung Institute of Technology, (Taiwan), ⁵Department of Physical Medicine and Rehabilitation, Xiamen Chang Gung Hospital (China)

Purpose: This study aimed to investigate the efficacy and feasibility of home-based IMT in patients with bronchiectasis. **Material and Methods:** A prospective, single-blind, randomized-controlled study was conducted in the outpatient clinic of a tertiary care medical center. Twenty-six patients with bronchiectasis were randomly divided into the IMT or control group. In the IMT group ($n=13$), the training program started with an intensity of 30% maximal inspiratory pressure (MIP), which was increased by 2 cm H₂O each week, for 30 min daily, five days a week for 8 weeks under supervision and monthly monitoring. The control group ($n=13$) did not receive IMT but the same measurements were taken, which included spirometry, resting oxyhemoglobin saturation by pulse oximetry (SpO₂), lowest SpO₂ and Borg's scale evaluation during six-min walking test, six-minute walking distance (6MWD), six-minute walking work (6MWORK), MIP, maximal expiratory pressure (MEP), and St George's respiratory questionnaire. **Results:** There were statistically significant improvements in MIP, MEP, 6MWD, 6MWORK and the symptom scores of SGRQ after the 8-week IMT, and significant difference of symptom, activity and total scores of SGRQ within the control group. Borg scale in IMT group was significant improved as compared to that of control group. There were significant difference in FEV1 (% predicted), FEV1/FVC (%), MMEF (%) between groups at baseline data and at end of study and there was no difference in health-related quality of life between both groups. **Conclusion:** An eight-week home-based inspiratory muscle training supports that IMT is effective in improving respiratory muscle strength, walking ability in patients with bronchiectasis.

0430PP105

THE EFFECTS OF PSYCHOLOGICAL, COGNITIVE-BEHAVIORAL AND PATIENT EDUCATION INTERVENTIONS ON RECOVERY FROM POST-CORONARY ARTERY BYPASS GRAFT SURGERY

Willy Chou¹, Heng-Hsin Tung², Cheng-Hsin Lin³, Tou Isabel Tou¹, Ching-Ching Wang¹, Shu-Yu Yang¹, Chen-Yu Chou¹

¹Department of Physical Medicine and Rehabilitation, Chi Mei Medical Center, ²Graduate Institute and School of Nursing, National Taipei College of Nursing and ³Department of Cardiovascular Surgery, Chi Mei Medical Center (Taiwan)

Purpose: To evaluate whether post-CABG patients who are provided information and emotional support to help them cope with the medical crisis do better than patients who receive only routine care. **Material and Methods:** A total of thirteen post-CABG patients were enrolled in this study. There are six in the experimental group and seven in the control group. The experimental group received adaptation training program. The program consist of eight sections, which lasted approximately 90 min per section, and each section will be held once a week. Thus, the program will last for a total of two month. Post hoc interviews were conducted in the experimental groups about 15 min in person

when they return to the clinic. Besides, all patients underwent routine cardiac rehabilitation after the surgery. **Results:** 66.7% of the patients in the experimental group were relatively higher educated with above high school degree and no patient in the control group were educated above high school. The results show the quality of life was improved in both experimental and control groups ($p=0.01$). The anxiety level was higher in both groups post-CABG when compare to before the surgery. The trait anxiety level was higher in the experimental group after the intervention ($p=0.08$). Post hoc interviews was conducted to clarify the rationales of this result. **Conclusion:** Although the anxiety level did not decrease as time pass by in both groups when compare to before the surgery. The participants stated that the training program did help them reduced their anxiety level and improve their coping ability according to the post hoc interviews.

0430PP106

PREDICTING MAXIMUM HEART RATE EQUATION AMONG PATIENTS WITH RECENT MYOCARDIAL INFARCTION

Tung-Liang Lin¹, Yan-Wen Chen², Sen-Wei Tsai¹

¹Department of Physical Medicine and Rehabilitation, Taichung Veterans General Hospital and ²Department of Physical Therapy, Taichung Veterans General Hospital (Taiwan)

Purpose: The maximal heart rate prediction equation for post-myocardial infarction in clinical cardiac rehabilitation is not valid. **Material and Methods:** *Design:* Prospective study in post myocardial infarction cardiac rehabilitation programs. *Setting:* Rehabilitation center outpatient clinics. *Subjects:* Patients with recent myocardial infarction who completed cardiopulmonary exercise tests. Seventy-three subjects were recruited from cardiac rehabilitation programs. *Intervention:* Cardiopulmonary exercise test. *Main measurements:* The maximal heart rate during exercise test. **Results:** In final, 51 subjects (45 males) completed cardiopulmonary exercise test. There were no differences of VO_{2max} ($p=0.19$) and MET level ($p=0.2$) between groups. There is the tendency that HR_{max} decreased when age is increased. The difference of HR_{max} was noted between young (age 31–60) groups and old (61–90) groups ($p=0.000$). In each age group, the differences were all significant between equation (220 – age) predicted and actual measured HR_{max}. A new estimated equation of (170 – 0.9 x age) was obtained from the linear regression analysis of HRmax versus age (coefficient r is 0.6). The effect of beta-blocker in HRmax showed there is no difference ($p=0.4$) between groups with or without beta-blocker. **Conclusion:** The HRmax prediction equation (220 – age) is not suitable for clinical use in post MI cardiac rehabilitation exercise prescription, and HR_{max} = 170 – 0.9 x age is a valid equation for post MI patients. Beta-blocker did not have influence in HR_{max}.

0430PP107

EFFECTS OF EXERCISE TRAINING ON PERIPHERAL CIRCULATION IN PATIENTS WITH PERIPHERAL ARTERIAL DISEASE: A SYSTEMATIC REVIEW AND META-ANALYSIS

Wan-Ju Chao¹, Ying-Tai Wu^{1,2}, Cian-Ci Liou¹

¹School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University and ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: Exercise therapy, mainly aerobic training, has been proved to be effective in improving the walking capability in patients with peripheral arterial disease (PAD). Resistance exercise has been introduced and used in individuals with cardiovascular diseases, including PAD in recent years. However, the effect of exercise on peripheral circulation was inconclusive. The purpose of this study was to review the evidence of aerobic and resistance training on parameter of peripheral circulation and make meta-analysis in patients with PAD. **Material and Methods:** A systematic review and meta-analysis were

conducted, after searching for randomized controlled trials (RCT) of comparing supervised exercise therapy with usual medicine regimens between 1989 and 2009. Main outcome measurements included indices of peripheral circulation. Data were analyzed by Review Manager (RevMan) Version 5.0 (The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen 2008). **Results:** Eleven articles published were included, while one article investigated the effects of aerobic and resistance training respectively comparing with the control group. It made 9 studies in aerobic exercise ($n=291$) and 3 studies in resistance exercise ($n=97$). In most studies, participants were older adults and the exercise programs ranged from 6 weeks to 12 months with the majority of 3 months or 6 months. Aerobic training significantly improved maximal hyperemic calf blood flow by 2.83 ml/100ml/min (95% CI 0.18 to 5.49), but not the resting or post-exercise ABI. No beneficial effects on limb blood flow or ABI at rest or post-exercise were found after resistance training. **Conclusion:** Aerobic exercise training increased maximal hyperemic calf blood flow in PAD patients. More RCTs are needed to provide evidence of effects on peripheral circulation, especially the resistance training.

0430PP108

EFFECTS OF RESISTANCE TRAINING ON HEART FUNCTION, EXERCISE CAPACITY, AND QUALITY OF LIFE IN PEOPLE WITH HEART FAILURE: A SYSTEMATIC REVIEW AND META-ANALYSIS

Chueh-Lung Hwang¹, Chen-Lin Chien¹, Ying-Tai Wu^{1,2}

¹School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University and ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: The major symptoms in patients with chronic heart failure (CHF) are easily dyspnea, fatigue, exercise intolerance, or functional limitations that all account for poor quality of life. Resistance training could improve muscle strength but the effects on other outcomes remain controversial. The purpose of this study was to perform a meta-analysis to systematically examine the effects of resistance training with or without aerobic training compared with aerobic training or non-training on heart function, exercise capacity, and quality of life in people with CHF. **Material and Methods:** The randomized controlled trials were searched mainly from electronic databases with PubMed, MEDLINE, EMBASE, Chinese Electronic Periodical Service (CEPS), CINAHL, and Cochrane Library Register of Controlled Trials. The keywords were used in our searches as the following: heart failure, heart dysfunction, ventricular dysfunction, resistance training, strength exercise, strength training, weight-lifting, and weight training. Included studies consisted of comparing resistance training with non-training or resistance combined aerobic training with aerobic training in adult patients with CHF. The effect size for each outcome was calculated by weighted mean difference (WMD) or standardized mean difference (SMD) and 95% confidence interval (CI). A Chi-square heterogeneity test was used, a random effect model adopted in case of significant heterogeneity or else a fixed effect model applied. **Results:** Eight randomized controlled trials with 241 participants were included. Most participants were male with mean age of 58-65 years and New York Heart Association Class I to III. The length of training ranged from 2 to 6 months with most programs consisting of three times a week, 2 sets of 8-12 repetitions for 5-6 exercises including large muscle groups of upper limbs, trunk and lower limbs at the moderate intensity or intensity of 50-75% of 1 repetition maximum. Resistance training significantly increased 6-minute walking distance by 51.7 m (WMD, 95% CI 18.7 to 84.7, $p<0.05$) but not peak VO_2 (WMD 1.4, 95% CI -0.3 to 3.1). Combined resistance with aerobic training showed similar improvement in peak VO_2 (WMD -0.7, 95% CI -2.3 to 1.0), left ventricular ejection fraction (WMD -0.5, 95% CI -4.3 to 3.3) or the score on Minnesota Living with Heart failure Questionnaire (WMD -0.9, 95% CI -5.4 to 3.7) as aerobic training only. **Conclusion:** Resistance training alone or in combination with aerobic training was considered safe in chronic heart failure patients. Resistance training

alone increased 6-minute walking distance but had no additional effects on heart function, exercise capacity, or quality of life than aerobic training only in patients with chronic heart failure.

0430PP109

OVERWEIGHT AFFECT LUNG-TO-HEART RATIO IN ASYMPTOMATIC PHYSICAL INACTIVE POSTMENOPAUSAL WOMEN

Chen-Lin Chien¹, Ying-Tai Wu¹, Pan-Chyr Yang^{2,3,4}, Wei-Shiung Yang^{2,3,4}, Yen-Wen Wu^{2,3,6}, Hui-Min Su⁵

¹School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University, ²Department of Internal Medicine, National Taiwan University Hospital, ³College of Medicine, National Taiwan University, ⁴Graduate Institute of Clinical Medicine, and Department of Medicine, National Taiwan University, ⁵Department of Physiology, College of Medicine, National Taiwan University, ⁶Department of Nuclear Medicine, National Taiwan University Hospital (Taiwan)

Purpose: The incidence of coronary artery disease (CAD) in women increases dramatically after menopause and becomes the major cause of mortality among postmenopausal women. Evidence demonstrated physical inactivity not only associated with central obesity but also hypertension, diabetes and dyslipidemia, all of which increased the risk of CAD. However, the change of myocardial perfusion and cardiac function in physical inactive postmenopausal women was unknown. This study was designed to investigate the impact of physical inactivity in postmenopausal women with normal weight. In addition, the effect of overweight in physical inactive postmenopausal women was examined. **Methods:** A total of 60 postmenopausal women with no angina symptoms or clinical history suggesting of CAD were recruited. The participants were considered as physical active if they have regular physical activity, performing moderate-intensity aerobic physical activity for a minimum of 30 min five days or vigorous activity for a minimum of 20 min three days weekly according to the latest update physical activity recommendation by American Heart Association and American College of Sports Medicine in 2007. Normal weight was defined if body mass index (BMI) between 18.5-23.9, while BMI ≥ 24 was considered as overweight. Subjects who were physical active but overweight were excluded because of the small sample size. The recruiting subjects were divided into groups of: physical inactive overweight ($n=26$, 58.5 yrs), physical inactive with normal weight ($n=13$, 57.2 years), and physical active with normal weight ($n=15$, 60.9 yrs). All postmenopausal volunteers were with low Framingham risk (mean $2.1 \pm 1.5\%$). Clinical characteristics were collected, cardiopulmonary function test, and ECG-gated 201Tl SPECT using 8 frames per cardiac cycle at rest and post-stress were performed. Group comparisons by t test, Chi-square tests or Fisher exact measures for continuous or categorical variables were performed. A p value <0.05 was considered statistically significant. **Results:** Clinical characteristics and results of cardiopulmonary function did not differ in either group comparisons. The active women with normal weight had lower resting HR (67.2 ± 8.9 vs 75.5 ± 7.8 bpm, $p<0.05$) and higher level of exercise capacity than inactive women. The overweight inactive women exhibited significantly lower level of exercise capacity and higher lung-to-heart ratio (the ratio between lung uptake and myocardial uptake, representing the pulmonary wedge-pressure, and an index of severe and extensive coronary heart disease) at rest (0.41 ± 0.05 vs 0.35 ± 0.05 , $p<0.05$) and post-stress (0.36 ± 0.06 vs 0.31 ± 0.04 , $p<0.05$) than normal weight women. Abnormal myocardial perfusion was noted in 4 (27%) of the physical active with normal weight group, 5 (38%) in physical inactive with normal weight group, and 12 (46%) in physical inactive overweight group. **Conclusion:** A trend of abnormal SPECT-based myocardial perfusion and impaired cardiac function were noted in physical inactive and overweight postmenopausal women despite they were asymptomatic and with low Framingham risk. Overweight affects lung-to-heart ratio and might further impair cardiac outcome in physical inactive postmenopausal women. Cardiovascular health in postmenopausal women should be addressed especially those who are inactive and overweight.

0430PP110

EFFECTS OF TRADITIONAL CHINESE MEDICAL EXERCISE PRESCRIPTION ON QUALITY OF LIFE IN PATIENTS WITH COPD*Wen Zhang, Wenhua Chen**Rehabilitation Department of Shanghai First People's Hospital (China)*

Purpose: To investigate the effects of traditional Chinese medical exercise prescription on quality of life in Patients with COPD. **Material and Methods:** Fifty-six patients with stable moderate COPD were randomly divided into control group (CG) and traditional Chinese medicine group (TG). Specific traditional Chinese medical exercise prescription was written to the patients in TG groups individually. The TG groups took part in two months of intensive training course at home under the guidance of one doctor. **Results:** 6MWD in TG group increased from 337.68 ± 59.18 to 386.14 ± 76.71 meters while the Borg scales dropped from 3.14 ± 1.94 to 2.32 ± 1.25 . SGRQ scores also showed statistical significant difference. All these evaluations showed us some favorable efficiency in TG group compared to the CG group. **Conclusion:** Traditional Chinese medical Training Prescription can improve the exercise tolerance and decrease dyspnea in COPD patients in stable stage. It also can improve the quality of life.

0430PP111

NONINVASIVE RESPIRATORY MANAGEMENT OF THE PATIENT WITH BILATERAL PHRENIC NERVE PALSY – A CASE REPORT*Seung-Ho Choi, Seong Woong Kang, Jae Ho Moon, Won-Ah Choi, Soon Kyu Lee**Yonsei University College of Medicine (Republic of Korea)*

Introduction: Bilateral phrenic nerve palsy (BPP) is an extremely rare but serious complication that occurs after open cardiac surgeries, leading to respiratory failure or cardiopulmonary arrest. Patients with BPP must rely on ventilatory support until spontaneous recovery of their respiratory function. Although noninvasive intermittent positive pressure ventilation (NIPPV) has been known to be an effective management method for BPP, it has not yet been attempted in Korea. **Case:** A 76-year-old male had a history of elective aortic valve replacement and thymic resection under hypothermic cardiopulmonary bypass. Despite otherwise unremarkable postoperative recovery, the patient received tracheostomy after several times of extubation failure, and was in ventilator dependent state. A chest radiograph and electro-diagnostic study of the phrenic nerve confirmed the diagnosis of bilateral phrenic nerve palsy. Invasive intermittent positive pressure ventilation (IPPV) was applied in the intensive care unit. Approximately six months following injury (at first admission to our hospital), he showed generalized muscular weakness (fair to good grade of muscle power on the manual muscle test) as a result of prolonged treatment in the intensive care unit, and was in tracheostomy state and had an indwelling Levin tube. Arterial blood gas analysis (ABGA) results showed hypercapnia ($\text{PaCO}_2 = 54.2$ mmHg), and desaturation (minimal O_2 saturation = 93%) and hyperventilation (respiratory rate = 29/min) was noted on gas exchange analysis (GEA). Pulmonary assessment such as vital capacity (VC) and peak cough flow (PCF) was not available due to mechanical ventilatory support. On full-inspiratory chest radiograph both hemidiaphragms were elevated. Extensive pulmonary rehabilitation including NIPPV was performed. General condition improved and he was transferred to general ward, where he received comprehensive rehabilitation. Approximately nine months after injury (at second admission), he showed improvement of general condition, and used NIPPV only during night time. On pulmonary function evaluation, VC was 1000 ml (26.6% of predictive value) and PCF was 210 l/min. The follow-up chest radiograph showed remarkable improvement of initially elevated hemidiaphragms and ABGA and GEA results were within normal range. He could have been sealed off, but he and his family refused, as they were concerned about possible complications, and

he discharged in tracheostomy state. Fourteen months after the initial surgery (at his third admission), the concerns were resolved, and the patient was sealed off. As he was able to maintain sufficient ventilation without ventilatory support, he was weaned off completely. At out-patient follow-up, approximately two years after initial surgery, pulmonary improvement was observed. VC improved to 1740 ml (53.3% of predictive value) and PCF improved to 290 l/min. Other pulmonary complications were not noticed. **Conclusion:** By applying NIPPV to a BPP patient, in need of ventilatory support, the duration of IPPV was minimized, reducing its disadvantages, and the transition to ventilation weaning was facilitated.

0430PP112

IMPROVEMENT OF CARDIORESPIRATORY CAPACITY FOR PATIENTS WITH SEVERE HEART FAILURE AFTER LVAS IMPLANTATION*Shigeru Makita, Ryusei Uchida**Department of Cardiac Rehabilitation, Saitama International Medical Center, Saitama Medical University (Japan)*

Purpose: Cardiac rehabilitation for patients who received LVAS (left ventricular assist system) is important because those patients have extreme low level exercise capacity due to severe heart failure. The purpose of this study is to evaluate progress of cardiorespiratory capacity for LVAS patients. **Material and Methods:** 14 (39.0% ischemic cardiomyopathy 11/12, LVEF $20.5 \pm 8.1\%$) end-stage severe heart failure patients who received LVAS (Toyobo Ltd. Japan) participated in exercise training program using cycle ergometer at the intensity of AT (anaerobic threshold: $68.5 \pm 11.1\%$ of peak VO_2) level. Endurance exercise training was carried out 3–5 times weekly for 30 min. Before the training (A) and 1 month (B) and 3 months (C) after the beginning of exercise training, symptom-limited cardiopulmonary exercise testing (CPX) were done in order to evaluate peak VO_2 , peak watt and AT. During CPX capillary blood was taken for the measurement of blood lactate concentration every one minute. **Results:** Peak VO_2 (12.2 ± 2.8 (A), 14.3 ± 3.3 (B), 15.3 ± 3.5 (C) ml/kg/min; $p = 0.044$ ANOVA) and peak workload (53.4 ± 10.9 (A), 69.71 ± 15.2 (B), 76.9 ± 17.1 (C) watt; $p = 0.0004$) increased significantly during training period. The changes of blood lactate concentration between rest and exercise at the intensity of 40 watt showed significantly decrease (0.9 ± 0.8 (A), 0.4 ± 0.4 (B), 0.3 ± 0.3 (C) mmol/l; $p = 0.022$). The improvement of peak VO_2 between A and B was 17.5% and between B and C was 7.6%, respectively. **Conclusion:** The improvement of exercise capacity of LVAS patients is detected by long-term aerobic exercise training. These findings suggest that peripheral skeletal muscle metabolism can ameliorate though cardiac function of these LVAS patients shows no significant increase in 3 months after LVAS implantation.

0430PP113

TRANSPOSING OTOLITHS FROM THE ANTERIOR CANAL TO THE POSTERIOR CANAL IN BENIGN PAROXYSMAL POSITIONAL VERTIGO SYNDROME – 2 CASES REPORT*Xin-Xian Lee¹, Pei-Chen Sun²**¹Cender General hospital and ²Dacun Junior High School (Taiwan)*

It is generally recognized that benign paroxysmal positional vertigo (BPPV) syndromes result from the otoliths deposited in semicircular canals (canalith) or attached to cupulae (cupulolith). The posterior canal BPPV is by far the most common and can be easily treated with ipsilateral Epley's maneuver. However, we found 2 patients with ipsilateral anterior canal-BPPV which are similar to the contralateral posterior canal-BPPV on presentation but poorly responded to contralateral Epley's maneuver. Fortunately, the otoliths in the ipsilateral anterior canal can be transposed to the ipsilateral posterior canal in ipsilateral hyper-extended head hanging position. After the transposition, the patients were successfully treated with ipsilateral Epley's maneuver quickly and easily.

POSTER PRESENTATIONS (MAY 1, 2010)

0501PP1

RARELY RECURRENT CEREBELLAR HEMORRHAGE IN AN UNUSUAL PERIOD: A CASE REPORT*Yung-Tsan Wu, Ming-Fu Hsieh, Heng-Yi Chu, Tsung-Ying Li, Shin-Tsu Chang**Department of Physical Medicine and Rehabilitation, Tri-Service General Hospital (Taiwan)*

Purpose: To report a rare case of cerebellar hemorrhage (CH) that occurred in other hemisphere after 4 months of the first attack due to irregular intake of anti-hypertensive regimens and emphasize the importance of blood pressure control. **Materials and Methods:** A 58-year-old man had a 41 mm hematoma in the right cerebellum with intraventricular extension. After the emergency surgical intervention and intensive rehabilitation, the satisfactory outcome was observed. **Results:** After discharge, the patient irregularly took the anti-hypertensive regimens. Four months after first attack, the recurrent hematoma in left cerebellum was noted. The well recovery was obtained under the conservative treatment. **Conclusion:** The rare case is only the second one thus far in which CH recurred in the other hemisphere. Further, no patient of CH has been reported to have a recurrence in such a short period after the first onset. We discuss the risk factors associated with such events and the importance of blood pressure control.

0501PP2

EFFECTS OF COLSEID KINETIC CHAIN EXERCISE ON BALANCE AND GAIT ABILITY USING SLIDING REHABILITATION MACHINE IN STROKE PATIENTS*Yang-Soo Lee¹, Dong-Hyup Kim¹, Seung-Deuk Byun²**¹Kyungpook National University Hospital and ²Fatima Hospital (Korea)*

Purpose: The purpose of this study was to investigate the effects of closed kinetic chain exercise on balance and gait in hemiparetic patients, using the sliding rehabilitation machine which newly developed by department of rehabilitation medicine in kyungpook national university hospital and enables forced use of affected lower limb. **Subjects and Methods:** This study was fulfilled using cross over training protocol. Thirty chronic hemiparetic patients (more than 6 months) whose Berg balance scale score less than 44 were involved in this study. They were divided into two groups of 15 and underwent 4 weeks training with different protocol. One group (group A, $n=15$) underwent training with the sliding rehabilitation machine for 30 min/day, 5 day/week for 2 weeks in addition to concurrent conventional training, and subsequently underwent only the conventional training for another 2 weeks. The other group (group B, $n=15$) underwent only the conventional training for initial 2 weeks, and subsequently underwent training with the sliding rehabilitation machine for another 2 weeks in addition to concurrent conventional training. Experimental period ($n=30$) was defined as sum of 2 weeks period used the machine in each group (group A&B), and control period ($n=30$) was defined as sum of 2 weeks period not used the machine in each group. Functional Ambulation Category (FAC), Berg Balance Scale (BBS), 6 minute Walking Test (6mWT), Timed Up and Go (TUG), modified Barthel Index (MBI), modified Ashworth scale (MAS), and manual muscle test (MMT) were the tools used for evaluating balance, gait abilities and Activities of daily living. All participants were assessed before training, and at 2 and 4 weeks of training. **Results:** The results were as following: 1) Statistically significant improvements were observed in all parameters in experimental period after 2 weeks

training ($p<0.01$). 2) Statistically significant improvements were observed only in 6mWT ($p<0.05$) in control period after 2 weeks training. 3) Statistically significant differences were shown in all parameters when comparing the degree of changes of parameters between the experimental and control period during the respective 2 weeks period ($p<0.05$ in MAS, $p<0.01$ in the rest parameters). **Conclusion:** we think the sliding rehabilitation machine can be a useful tool for the improvement of balance and gait ability in chronic hemiparetic patients.

0501PP3

CURATIVE EFFECTIVENESS OF ACUPUNCTURE POINT INJECTION OF DANGGUI FOR STROKE CONVALESCENTS*Zuo Nian**Wuhan University (China)*

Purpose: Curative Effectiveness of Acupuncture Point Injection of Danggui for Stroke Convalescents **Materials and Methods:** Fifty-five stroke convalescents were recruited randomly divided into observation group A ($n=28$) and control group B ($n=27$). Group A with Danggui (1 ml) was injected into acupuncture points Zusanli and Quchi of paralytic side, once every other day, with one week rest every 10 treatments. **Results:** Quality of life was assessed by stroke specific form SS-QOL and factor scores (except visual score) were significantly increased in both groups after treatment ($p<0.01$ and $p<0.05$). upper-extremity were significantly increased in observation group as compared with control group ($p<0.01, 0.05$). **Conclusion:** Combination of Danggui acupuncture point injection with conventional rehabilitation treatment can improve the clinical symptoms of stroke convalescents.

0501PP4

XINGNAO KAIQIAO ACUPUNCTURE ON THE REHABILITATION OF LIMB FUNCTION IN STROKE PATIENTS*Yang Oiming**Wuhan University (China)*

Purpose: To observe the curative effectiveness of Xingnao Kaiqiao acupuncture along meridians on rehabilitation of limb function in stroke patients. **Materials and methods:** 36 patients with stroke were randomly group A (observation group) subject to Xingnao Kaiqiao acupuncture group B (treatment group) subject to ordinary and combined with massage along meridians. **Results:** group A were significantly increased as compared with groups B ($p<0.01$). **Conclusion:** Xingnao Kaiqiao acupuncture can effectively promote the rehabilitation of limb function in patients with stroke.

0501PP5

THE IMPACT OF OCCUPATIONAL THERAPY AND THERAPEUTIC EXERCISES ON ADL OF PATIENTS WITH HEMIPLEGIA*Jihong Wang², Wei Chen¹, Chengwei Kuai², Qiuyang Zhang²**¹People's Health Publishing House and ²Rehabilitation Medicine Xuzhou Center Hospital (China)*

Purpose: To observe the impact that the occupational therapy and Therapeutic exercises on activities of daily living (ADL) of stroke patients. **Materials and Methods:** Since October 2005 to October 2007, I selected the 60 patients with stroke that admitted to my

rehabilitation department, stroke was diagnosed according to WHO diagnostic criteria, and was confirmed as stroke crossing head CT or MRI, eliminated the possibility significant disturbance of consciousness and serious complications in patients with the same time, there is life past to exclude the disabled. Observation group of 30 patients aged 29–71 years, mean 51.60 years old, 11 cases of cerebral hemorrhage, cerebral thrombus in 19 cases, of which 14 cases of right hemiplegia, left hemiparesis in 16 cases. The control group of 30 patients aged 28–71 years, mean 51.20 years old, 13 cases of cerebral hemorrhage, cerebral thrombus in 17 cases, of which 15 patients with right hemiplegia, left hemiparesis in 15 cases. **Evaluation Method:** Both groups used Barthel Index score, before treatment and after treatment two weeks, four weeks after treatment two groups were compared to carry out activities of daily living score. 1.3 Treatment: Clinical addition to conventional treatment groups, the control group only to take simple Therapeutic exercises, while the observation group was treated with occupational therapy and Therapeutic exercises at the same time. Control group: That was an independency Therapeutic exercises. To give good limb position, passive joint movement, bridge activity, sitting balance, standing balance, gait training, a daily 40-min treatment for 4 weeks as a course of treatment. Observer Group: namely, occupational therapy and Therapeutic exercises co-therapy. In addition to the contents of Therapeutic exercises have also been adopted the following methods of treatment given early stand up, feeding, washing, dressing, transferring, going to the toilet training. Into the recovery focus on strengthening the capacity of upper limb coordination and hand fine features practice, selective treatment of the operation of topics, such as wood, paper cutting, weaving, when necessary, Kin-limb compensatory day, 45 min, occupational therapy, exercise therapy 40 min, morning and afternoon hours to complete. 4 weeks as a course of treatment. **Statistical analysis:** *t* test was used to compare between the two groups $p < 0.01$, significant difference. **Results:** The Group's activities of daily living (ADL) score was significantly higher ($p < 0.01$). **Conclusion:** Occupational therapy is of great significance to improving ADL of stroke patients with hemiplegia and patient quality of life.

0501PP6

THE MULTIPLICITY ON PERSISTENT VEGETATIVE PATIENTS TO COME AROUND

Yong-Hui Wang, Yang Zhang, Shou-Wei Yue, Juan Huai

Department of Rehabilitation Medicine, QiLu Hospital, Shandong University (China)

Purpose: To observe the effect of comprehensive rehabilitation approaches on persistent vegetative patients (PVS) and to analyze the factors that contribute to come around from PVS. **Materials and Methods:** Sixty patients with PVS were treated with comprehensive rehabilitation approaches which included wake-up therapy, domestic treatment, physical therapy, acupuncture and moxibustion and neurotrophic drugs for 3 months to 1 year. The PVS were evaluated with the PVS score. The factors that contribute to come around from PVS were analyzed with logistic analysis. **Results:** Among sixty patients with PVS, twenty-three patients came to consciousness completely, twelve patients were excellence and ten patients were improved. The factors of domestic treatment, movement posture and rehabilitation intervention time were included in logistic regression equation. **Conclusion:** The PVS perhaps come to consciousness if they are treated with comprehensive rehabilitation approaches and Who have good domestic treatment, early awaked rehabilitation and no abnormal movement posture have more opportunity to come around.

0501PP7

HEMIPLEGIC UPPER LIMB REHABILITATION BY THERAPEUTIC ELECTRONIC INSTRUMENTAL MUSIC PERFORMANCE

Fumihito Kassai, Hideyasu Watanabe, Masazumi Mizuma

Department of Rehabilitation Medicine, Showa University School of medicine (Japan)

Purpose: TIMP (Therapeutic Instrumental Music Performance) has been established as a neurologic music therapy in sensorimotor rehabilitation. However, it is not popular in the field of stroke rehabilitation. We tried upper limb rehabilitation for cerebrovascular accident hemiplegia patients by therapeutic electronic instrumental music performance and thereby were able to obtain some paralytic improvement. We herein discuss the effectiveness of this method based on our results. **Materials and Methods:** We trained the hemiplegic upper limbs of seven cerebrovascular accident patients (ranging from 21 to 59 years of age, with three in the chronic stage and four in the subacute stage) by therapeutic electronic instrumental music performance at a rehabilitation hospital. The musical instruments which we used were an electric guitar, an electric guitar YAMAHA EZ-AG which was equipped with a microcomputer, digital percussion DD-55 and electric drums Roland RMP-5. The patient played a guitar and drums with the paralyzed hand. We used the EZ-AG in 6 of 7 patients because it could change the chord automatically by means of the built-in computer. Therefore, even patients who had no experience playing the guitar were able to perform the therapeutic exercise. DD-55 and RMP-5 were performed with sticks which patients held in their paralyzed hand. We used the upper limb items of the Fugl-Meyer Assessment (FMA) to evaluate the hemiplegic upper limbs. **Results:** The mean FMA scores which was determined before training was 79.7 ± 14.2 . After training it improved to 91.1 ± 16.8 ($p < 0.05$, Wilcoxon signed-rank test). TIMP is still not popular in the field of stroke rehabilitation because it is difficult for elderly patients to perform. Another reason for its lack of popularity is due to the fact that there are also few music therapists and there are a limited number of suitable musical instruments. However, the people who used to listen to the Beatles have now reached the age where the occurrence of stroke is not uncommon. As a result, most elderly people generally enjoy music. Neither the patients nor the therapists were required to be competent musicians since the musical instruments used in this therapy had a built-in computer. Therefore many patients had a strong motivation to participate and some became easily absorbed in this training. As a result, an improvement in the upper limb function was observed. **Conclusion:** Generally speaking, obtaining a functionally improvement of paralyzed limbs depends on the quantity of training. Patients can therefore increase their quantity of training by the use of therapeutic electronic instrumental music performance due to the fact that this training is enjoyable and the patients can also observe their own progress. Therapeutic electronic instrumental music performance is therefore expected to become an effective method for upper limb physical exercise by stroke patients in the future.

0501PP8

THE OBSERVATION OF THE EFFECT BY USING ACUPUNCTURE COMBINED WITH REHABILITATION THERAPY EARLY ON THE ACUTE STROKE PATIENTS

Gao Chong¹, Li Li¹, Huang Liping²

¹TianJin DaGang Oil Field General Hospital and ²Dept. of Health & Exercise Science, Tianjin University of Sport (China)

Purpose: To investigate the ability of ADL of acute stroke patients by using acupuncture combined with rehabilitation therapy early. **Materials and Methods:** 100 patients of acute stroke were randomly divided into rehabilitation group and control group, 50 patients each group; The patients in control group were given routine treatment of neurology and the patients in rehabilitation group were given acupuncture combined with rehabilitation therapy early except for the routine treatment of neurology. The device of acupuncture: Mainly depending on the acupuncture of Hand-Foot-Yangming Meridian and decorated with Xingnao Kaiqiao, tongjing huo luo. Acupoints: the main points Bai hui, ipsilateral feng chi, jian yu, Qu chi, Wai guan, He gu, Huan tiao, Yang Ling-chuen, Zusanli, Jue

gu, Tai chong and so on . Acupoints depending on the disease: the patients with facial paralysis were taken Si bai, Di cang, Jia che; the patients with the strong tongue were taken Lian quan, Tong li; the patients with the pain in the shoulder were taken within Jian nei ling, Jian wai ling ,Jian zhen,Jian zhong yu, Jian wai yu. **Methods:** Requires the feel of acupuncture, according the syndrome and asthenia and sthenia to impose reinforcing or reducing techniques, and most strong stimulation mainly stay-pin 20–30 min, a day one time, 10 days for a course of treatment, a total of three treatments. The methods of rehabilitation treatment, mainly adopting the Bobath approach with the comprehensive rehabilitation therapy. Scoring with NIHSS and BI index system before and after the treatment for 4 weeks. **Results:** The improvement on ADL and neurological impairment were significant ($p < 0.01$). **Conclusion:** The using of early acupuncture combined with rehabilitation therapy can promote the restore of neurological function in patients with stroke and improve their quality of life.

0501PP9

REHABILITATION PROGRAMS FOR A GIRL WITH ANTI-NMDA RECEPTOR ENCEPHALITIS: A CASE REPORT

Min-Yuan Yu, Jen-Wen Hung¹, Ying-Chao Chang²

¹Rehabilitation Dept, Kaohsiung Chang Gung Memorial Hospital (Taiwan), ²Pediatric Dept, Kaohsiung Chang Gung Memorial Hospital (Taiwan)

Introduction: Anti-N-methyl-D-aspartate receptor (NMDAR) encephalitis is a new category of treatment-responsive encephalitis associated with “anti-NMDAR antibodies”. The clinical presentation of psychosis like symptoms, seizures, abnormal movements, and autonomic disturbances is a highly characteristic of NMDA-receptor antibodies in both of female and male patients. **Case Report:** This report describes a 16-year-old girl with anti-NMDAR encephalitis who had psychosis symptoms (such as emotional disturbances, aggressive behavior and disorientation), cognitive impairment, short attention span and memory problems. She was brought to our rehabilitation department and rehabilitation programs were arranged. The occupational therapist designed specialized activity programs for her, including computer cognition therapy, attention concentration training, memory training, visual perception training, visuomotor organization training, thinking operations training and art therapy. The duration of the training program was 14 weeks. (3 times/week, 30~60 mins/time). **Discussion:** The great improvement presented in Loewenstein Occupational Therapy Cognitive Assessment. (LOTCA) The girl had great improvement in not only cognition but also behavior. After 31 therapeutic sessions, she returned to school successfully.

0501PP10

A CASE OF SPORADIC RAPID PROGRESSIVE JUVENILE AMYOTROPHIC LATERAL SCLEROSIS POST CEREBRAL PALSY

Tung-Liang Lin¹, Yu-Chun Lee¹, Chin-Teng Chun¹

¹Department of Physical Medicine and Rehabilitation, Taichung Veterans General Hospital (Taiwan)

Purpose: Sporadic rapid progressive juvenile amyotrophic lateral sclerosis is a rare disease. To our knowledge, this may be the first report of sporadic rapid progressive juvenile amyotrophic lateral sclerosis post cerebral palsy. **Materials and Methods:** We report a 20-year-old male patient suffering from cerebral palsy after birth. He has no family history of hereditary disease. He could jump, run and besides of minimal spastic gait, his motor function was acceptable for daily life. Although with mild mental retardation, he had independent Activity Daily Living (ADL) function and worked part-time at a cookie store. However, since January 2009, several episodes of falling down were noted. He visited the hospital and

hypoxic encephalopathy related spastic gait was impressed. Due to progressive tremor over left hand and then right hand, thyroid function was examined but with negative finding. Cervical spine magnetic resonance imaging was arranged in March 2009 with no specific finding. However, in April 2009, an episode of generalized tonic-clonic seizure occurred. He was then admitted in the hospital and brain magnetic resonance imaging, electroencephalography were arranged. Results showed no specific findings at that time. Upper limbs nerve conduction study and electromyography were performed with normal findings. Other serum examinations, including creatine phosphokinase, magnesium, vitamin B12, folic acid, and phosphate were within normal range. He was discharged in May 2009 under the diagnosis of suspected delayed hypoxic encephalopathy. However, progressive limb weakness starting from left upper limb to right upper limb, and finally both lower limbs was noted. Upper limb nerve conduction study and electromyography were repeated again in September 2009 and revealed diffuse anterior horn lesion. Riluzole was given thereafter. However, weakness of four limbs progressed rapidly and he became bedridden with total dependent ADL function one month later. Manual muscle test by Medical Research Council scale disclosed grade 1 over left upper limb, grade 2 over right upper limb, and grade 3 over both lower limbs. Four limbs muscle atrophy with fasciculation was noted. Deep tendon reflex increased over four limbs. Lower limbs nerve conduction study was performed in October 2009 with no specific finding. Abdominal muscle wasting was also observed. Speech function was evaluated and spastic dysarthria with tongue atrophy was noted. Neither sensory impairment nor sphincter dysfunction was found. **Results:** After a series of history taking, clinical examination, image and laboratory examination, sporadic juvenile amyotrophic lateral sclerosis was diagnosed definitely by Revised El Escorial criteria. **Conclusion:** Sporadic rapid progressive juvenile amyotrophic lateral sclerosis in patients of cerebral palsy is rarely reported. Early diagnosis may be difficult due to the misleading underlying disease of hypoxic encephalopathy. This case reminds physicians to consider it as a differential diagnosis for patients with cerebral palsy presenting with combined upper and lower motor neuron signs. The relationship of hypoxic encephalopathy with amyotrophic lateral sclerosis is still unclear in literature. We believe this is the first reported case of sporadic rapid progressive juvenile amyotrophic lateral sclerosis post cerebral palsy.

0501PP11

THE EFFECT OF INJECTION OF BOTULINUM TOXIN A ON TIBIALIS POSTERIOR IN THE TREATMENT OF SPASTIC EQUINOVARUS FOOT AFTER STROKE

Jen-Wen Hung^{1,2}, Ming-Sue Tasi¹, Wei-Ning Chang^{3,4}

¹Department of Rehabilitation, Chang Gung Memorial Hospital-Kaohsiung Medical Center, ²Chang Gung University College of Medicine, ³Department of Orthopedics, Kaohsiung Veterans General Hospital and ⁴Department of Orthopaedics, School of Medicine, National Yang-Ming University (Taiwan)

Purpose: Using the computerized gait analysis tool to investigate the outcome of Botulinum toxin A (BoNT-A) injection on tibialis posterior for equinovarus foot in patients with hemiplegic stroke. **Materials and Methods:** A prospective study was conducted at an out-patient rehabilitation clinic and a gait laboratory. Twelve chronic hemiplegic stroke patients with equinovarus foot were recruited. They were all independent ambulators with or without walking aids. Patients were injected with 100 units of BoNT-A (BOTOX, Allergan, Inc.) to the affected tibialis posterior muscle (TP). Full gait evaluation was performed before and 1 month after the injection. The gait evaluation uniformly included a videotape analysis, a physical therapy evaluation, kinematic, kinetic, dynamic electromyography, plantar pressure studies and a questionnaire. The kinematics study was done with a six-camera Motion Analysis System (Motion Analysis Inc., Santa Rosa, CA, USA)

with a sampling rate of 60 Hz. Kinetic data was obtained with four AMTI OR6-7 force plates (Advanced Mechanical Technology Inc., Watertown, MA, USA). The plantar pressure were evaluated with the Foot scan 3D Pressure System (RSscan International, Belgium). The percentage of medial impulse (PMI) was calculated using the duPont foot model (Chang WN, Gait and Posture 2004). The following parameters were obtained and analyzed. *Temporal-spatial data:* Self-selected walking speed, cadence, step length, stride length, and step width. *Kinematic data:* The peak flexion/extension angle and total range of flexion-extension motion of the hip/knee/ankle joints in stance/swing phases, along with the foot progression angle. *Kinetic data:* Peak ankle plantar flexion and supination/pronation moment, the peak and summation of ankle power generation. *Plantar pressure:* The percentage of medial impulse (PMI) was calculated with the duPont foot model. (Chang WN, Gait and Posture 2004) Subjective improvement after BoNT-A injection was obtained from a questionnaire. *Statistic analysis:* A series of paired *t* tests was done to compare the temporal-spatial, kinetic and plantar pressure data between the pre- and post-injection conditions. In order to identify the good responders of BoNT-A injection, the patients were categorized into antagonist-active and antagonist-inactive groups according the dynamic EMG amplitude of the tibialis anterior muscle. The Mann-Whitney *U* test was used to test the subjective improvement rate between two groups. **Results:** The results showed significant improvement in walking speed ($p=0.007$), step length of unaffected side ($p=0.046$), the sum of hip flexion range and peak hip flexion of unaffected side ($p=0.017, 0.046$). The peak and sum of plantar flexion moment of affected ankle also improved ($p=0.025$, and 0.041). The antagonist-active group has a higher rate of subjective improvement ($p=0.018$). **Conclusion:** BoNT-A injection on TP for equinovarus foot deformity in patients with stroke is effective in improving some but not all gait parameters. Based on the fact that the tibialis anterior-active group has a higher improvement rate, the indications of BoNT-A treatment for equinovarus foot in hemiplegic patients should include an active antagonist of the target muscle.

0501PP12

CLINICAL OBSERVATIONS OF TREATMENTS OF POST-STROKE DEGLUTITION DYSFUNCTION WITH ACUPUNCTURE AND ELECTRIC STIMULATION

Zhen Huang, Yu Min

Panyu Central Hospital (China)

Purpose: To compare therapeutic effects of acupuncture and electric stimulation on post-stroke deglutition dysfunction on the basis of rehabilitation training. **Materials and Methods:** 97 patients with post-stroke deglutition dysfunction were recruited and divided into acupuncture group (A, $n=32$), electric stimulation group (ES, $n=35$) and control group (C, $n=30$) randomly. On the basis of conventional rehabilitation training, A group added with acupuncture while ES group received Vitalstim® electric stimulation once per day for 2 course of treatment (12-day as one treatment course). C group received only conventional treatment. At the end point of the observation, deglutition function was evaluated with water-drinking test, stethocatharsis scoring and fluoroscopic examination of swallowing function. **Results:** After 2-course of treatments, deglutition function from three groups all improved significantly ($p<0.01$). By comparison with C group, both A group and ES group displayed statistic significance ($p<0.01$). By intervention, the total effective rate of A group was 96.88%, with ES group 94.29% and C group 66.67%. There was significant difference on the total effective rate among three groups ($p<0.01$), while no difference between the former two groups ($p>0.01$). **Conclusion:** The therapeutic effect of acupuncture and ES combination with rehabilitation treatment was better than that of simple rehabilitation training. As to deglutition dysfunction, the therapeutic effects of acupuncture and ES were almost equivalent, while the former

was better than the latter and had a shorter course of treatment to severe patients. So our observation showed the advantage of therapeutic effects.

0501PP13

ASSESSING FACTORS THAT ASSOCIATE WITH THE OCCURRENCE OF DEPRESSION AMONG POST-STROKE ADULTS IN TAIWAN

Laure Kuei-Tsu Kao

Department of Adapted Physical Education, National Taiwan Sport University (Taiwan)

Purpose: This study investigated the point prevalence of post-stroke depression (PSD) from the aspects of patients' demographic characteristics and health conditions. It also examined factors predictive depression from the perspectives of patients and their caregivers. **Materials and Methods:** A total of 90 post-stroke patients including 47 males and 43 females, admitted in two rehabilitation centers were invited for this study. A Post-Stroke Depression Inventory (PSDI) consisted of 31 yes/no questions were used to assess symptoms of depression. Ratings of depression were obtained from patients' self reports, and from reports of the caregivers in the cases of aphasia following stroke. Patients' conditions were evaluated by age, gender, education level, physical functioning (Barthel Index) and living arrangement (home care vs. institutional care). Data from a one-to-one semi-constructed interview and onsite observations were also collected for result interpretation. Quantitative data was analyzed using chi-square, multivariate analysis of variance (MANOVA), correlation coefficients and multiple regressions. **Results:** Comparisons of the PSD prevalence suggested patients of institutional care were significantly more depressed than that of the home care with the rates of 76.7% and 41.7%, respectively; both of the self-rated and caregiver-rated responses indicated higher PSD among institutional patients. The correlation coefficient of Pearson Product was 0.82 between the PSD ratings of patients and caregivers. Results from the multiple regression analysis of the self-rating scores indicated the occurrence of PSD was best predicted by patients' scores of Barthel Index, the onset age of the stroke and the patients' education level with accumulated $R^2=0.3272$; whereas two important PSD predictors rated by the caregivers were scores of Barthel Index and the onset age of the stroke with accumulated $R^2=0.3118$. **Conclusion:** Comparisons of the PSD prevalence suggested patients of institutional care were significantly more depressed than that of the home care with the rates of 76.7% and 41.7%, respectively; both of the self-rated and caregiver-rated responses indicated higher PSD among institutional patients. The correlation coefficient of Pearson Product was 0.82 between the PSD ratings of patients and caregivers. Results from the multiple regression analysis of the self-rating scores indicated the occurrence of PSD was best predicted by patients' scores of Barthel Index, the onset age of the stroke and the patients' education level with accumulated $R^2=0.3272$; whereas two important PSD predictors rated by the caregivers were scores of Barthel Index and the onset age of the stroke with accumulated $R^2=0.3118$.

0501PP14

PHYSICAL EXERCISE INDUCES EXPRESSION OF CD31 AND FACILITATES NEURAL FUNCTION RECOVERY IN RATS WITH FOCAL CEREBRAL INFARCTION

Haiqing Zheng, Xiquan Hu, Jie Fang, Tiebin Yan

Department of Rehabilitation Medicine, The Third Affiliated Hospital, Sun Yat-sen University (China)

Purpose: To examine that the physical exercise might play activating role in angiogenesis as well as improving the neural function. **Materials and Methods:** An infarction model was induced by ligating the left middle cerebral artery occlusion (MCAO) in total sixty-six

adult Sprague-Dawley rats, which were further randomly divided into three groups: the physical exercise group ($n=30$), which were given running wheel exercise everyday after MCAO, the control group ($n=30$) and sham-operated group ($n=6$), which were fed in standard cages with no any special training exercise. Then the rats were sacrificed on 3rd, 7th, 14th day and the neurological severity scores (NSS) was examined for evaluating the neural function, as well as the neogenetic microvessels around the peri-infarction region were studied with the specific marker CD31. **Results:** Though neogenetic microvessels in the peri-infarction region were observed in both control group and physical exercise group, which showed the highest signal on the 7th day after ischemic, the number of CD31 positive cells in significantly increased in physical exercise group in comparison with those in control group, on the 7th and 14th day after ischemic ($p<0.01$). Furthermore, the neurological severity scores in the physical exercise group showed more quick declination as compared to those in control group from 7th day after ischemic. **Conclusion:** our study implicating that physical exercise could play an important role in angiogenesis as well as promoting neural function recovery after cerebral infarction in rats, but the mechanisms need to be further investigated.

0501PP15

THE EFFECT OF THE HYDROTHERAPY ON UPPER-LIMB DISCOORDINATION

Sachiko Osada, Shin Yamada, Tetsuya Iwamoto, Hoshi Murai, Tomoko Watanabe, Hiroshi Fuseya, Hirofumi Terabayashi, Akio Kimura

Keio University Tsukigase Rehabilitation Center (Japan)

Objective: The purpose of this study is to investigate the effect of the hydrotherapy on upper-limb discoordination. To assess the usefulness and applicability of the hydrotherapy for patients with motor dysfunction, muscle activity and joint movement were evaluated during repetitive elbow flexion and extension in water. **Subjects and Methods:** Subjects were 2 patients with upper-limb discoordination due to stroke. Patient 1 was a 76-year-old male with pontine hemorrhage who suffered from left ipsilateral limb ataxia, and patient 2 was a 75-year-old male with ischemic stroke who presented with left hemiparesis. Both of the patients had no remarkable communication problems and written informed consent was obtained. The subjects were required to move their affected hands back and forth between their episternums and a target according to rhythm of an electronic metronome (45, 60, 75 beats/min). The target was placed at the level of subjects' episternums, and distance to the target was set the same as their reach length. Surface EMG signals were recorded from the biceps brachii and triceps brachii with water-proof sealed electrodes and the elbow joint angle with an electric goniometer. These procedures were performed on the ground and in water conditions sequentially. Data were stored in a computer and processed offline. After full-wave rectification, the EMG signals were smoothed by moving averages. In the next step, cross-correlation coefficient (CC) between the recorded waves and computer simulated sinusoidal waves, which had the same frequency as the tempo of the metronome, was calculated. Statistical analyses were conducted by using the MATLAB 6.1 (The Mathworks, Inc.). **Results:** There were a high correlation between joint angles and the simulated waves on dry ground ($CC>0.9$). Correlation was the lowest at 75 beats/min in water (patient 1 $CC=0.33$, patient 2 $CC=0.89$). The faster upper-limb moved the lower CC become in underwater condition. **Discussion and Conclusion:** Movement of the upper-limb was disturbed under the influence of water resistance, whereas no positive effect was observed nevertheless of water buoyancy which had seemed to support body weight. Because water resistance is proportional to square of velocity, it must be difficult to perform faster and accurate limb movement in water. On the other hand, the EMG activities kept consistent rhythm at every velocity. One of the causes of this was that feedback control strategy could not catch up with dynamic water resistance and turbulent flow. To achieve smooth and coordinated limb movement, reinforcement of anticipatory feedforward control should be needed. These findings

suggest that the hydrotherapy could be used as a training method for patients with discoordination.

0501PP16

CNS DIFFUSE LARGE B CELL LYMPHOMA PRESENTING INITIALLY WITH ACUTE INFARCTION OF MIDBRAIN AND THALAMUS: A CASE REPORT

Cheng-Yuan Lin, Hui-Wen Chen, Cheng-Min Chiu
Far Eastern Memorial Hospital (Taiwan)

Primary central nervous system lymphoma (PCNSL) can mimic diverse neurological diseases. A 40-years-old male, who denied any other systemic disease except schizophrenia under regular medication for 10 years, experienced acute onset of dizziness and left side limbs weakness and was sent to a area hospital for help. Computed tomography was performed but the diagnosis was unclear. He was transferred to our hospital for further evaluation and MRI of brain was then performed and revealed acute infarct in the right midbrain and right thalamus with mild hemorrhagic transformation. He was admitted for further evaluation and rehabilitation therapy. A series of young stroke data work up was done and no significant contributory factor was identified. He was then discharged under stable condition one months later. Two months later, he was re-admitted for further rehabilitation therapy due to persistent left side limbs weakness with ADL impairment. During hospitalization, sudden onset of headache and vomiting without progressive neurological deficit were impressed. MRI with contrast of brain was performed due to the persistent symptoms and signs and revealed two rapidly grown intra-axial brain tumor in the right caudate nucleus and the right posterior basal ganglia with well-enhancement post contrast administration and moderate perifocal or vasogenic edema appearing in the right frontal lobe and the right striatocapsular region. Metastatic lesion was not suspected after a series of examination. The patient then received stereotaxic biopsy of the tumor and diffuse large B-cell lymphoma was confirmed.

0501PP17

EXTRA- AND INTRAMUSCULAR NERVE DISTRIBUTION PATTERNS OF THE MUSCLES OF VENTRAL FOREARM

Dong-wook Rha¹, Dong Jin Kim¹, Hee-Jin Kim², Sung-Yoon Won²

¹Department and Research Institute of Rehabilitation Medicine, Yonsei University College of Medicine and ²Division of Anatomy & Developmental Biology, Dept. of Oral Biology, Oral Science Research Center (Republic of Korea)

Purpose: The aim of this study was to clarify the detailed intramuscular nerve branching patterns innervating the pronator teres (PT), flexor carpi radialis (FCR) and flexor carpi ulnaris (FCU), thereby providing critical information on determining the most effective points for Botulinum toxin injection. For this purpose, we used Modified Sihler's staining to overcome the limitation of manual dissection and to reveal the exact distribution of the intramuscular branches. **Materials and Methods:** To investigate nerve entry points and intramuscular nerve arborization patterns, 17 Korean and 6 French cadavers (9 males, 14 females; mean 70 years, range: 56–87 years) were dissected and subjected to whole-mount nerve staining with Sihler's method which shows the exact nerve distribution patterns without manual dissection. The location of nerve entry point and arborized portion were expressed as a percentage of distance from interepicondylar line to interstyloid line. **Results:** For PT, it was supplied by 2 separated branches in 17 cases (1 proximal and 1 distal), and it was supplied by a single branch in 6 cases. Common nerve entry points were located at about 12.6% and 25.7%. The arborized portion of the intramuscular branch was located at

about 19.5%. For FCR, the nerve supply to the flexor carpi radialis came from a single branch in all cases. Common nerve entry point and the arborized portion of the intramuscular branch were located at about 28.0% and 32.1%. For FCU, ulnar nerve always gave off two branches (dorsal and ventral) and common nerve entry points were located at about 22.9% and 31.2%. But the arborized portions of the intramuscular branch were diffusely located through the muscle. **Conclusion:** Using whole-mount nerve staining with Sihler's method, the area with high density of neuromuscular junctions was found to be at about 20% for PT, and about 30% for FCR. These results might be helpful for maximizing the efficiency and minimizing the side effect of Botulinum toxin injections into forearm muscles.

0501PP18

A CASE OF POLYARTERITIS NODOSA PRESENTING INITIALLY AS INTRACEREBRAL HEMORRHAGE IN YOUNG ADULT: A CASE REPORT

Chien-Chung Lin¹, Wen-Yih Hsieh¹, Hsin-Shui Chen¹, Ruei-Kai Ho², Tzung-Chang Tsai³, Da-Wei Chen⁴

¹Department of Physical Medicine and Rehabilitation, China Medical University Beigang Hospital and ²Department of Cardiology, China Medical University Beigang Hospital, ³Department of Neurology, China Medical University Beigang Hospital and ⁴Department of Gastroenterology, China Medical University Beigang Hospital (Taiwan)

A 40-year-old man was transported by ambulance from his home to the emergency department because of a sudden change in mental status and left hemiplegia. Computed tomographic scanning of the brain revealed an intracerebral hemorrhage. The patient received rehabilitation and was discharged in a stable condition with left hemiplegia. He presented symptoms of progressive little verbal output followed by emergency admission to the neurology service eight months after his first intracranial hemorrhage. Computed tomographic scanning and magnetic resonance imaging (MRI) of the brain showed a cerebral infarction. A diagnostic procedure was performed and a diagnosis of polyarteritis nodosa (PAN) was made.

0501PP19

ROLE OF TRANSCRANIAL MAGNETIC STIMULATION IN TREATMENT OF CEREBRAL INFARCTION

Chun-Jing You¹

¹Tongji Hospital (China)

Purpose: To investigate role of transcranial magnetic stimulation in treatment of cerebral infarction. **Materials and Methods:** Role of transcranial magnetic stimulation in treatment of cerebral infarction. **Results:** Role of transcranial magnetic stimulation in treatment of cerebral infarction. **Conclusion:** Role of transcranial magnetic stimulation in treatment of cerebral infarction.

0501PP20

KINEMATIC ANALYSIS OF ASPIRATION PATTERNS DURING SWALLOWING IN STROKE PATIENTS

Ja-ho Leigh, Han Gil Seo, Byung-mo Oh, Tai Ryoan Han
Seoul National University College of Medicine (Republic of Korea)

Purpose: The purpose of this study is to classify aspiration patterns kinematically, quantitatively and to find out the correlations between aspiration patterns and clinical results. **Materials and Methods:** A total of 28 subacute stroke patients with subglottic aspiration on 2cc or 5cc of fluid at the initial videofluoroscopic swallowing

study (VFSS) were included. The patterns of aspiration were differentiated as pre-swallowing ($n=5$) and during-swallowing pattern ($n=23$), by the order between swallowing and aspiration event. In aspiration that occurs during swallowing, anterior group ($n=10$) and posterior group ($n=13$) were identified in terms of the route of aspiration. Two-dimensional motion analysis on the hyoid bone, vocal cord and epiglottic movements was performed. temporal and spatial variables and clinical results, such as clinical scores and residue, were compared among aspiration patterns. **Results:** In during-swallowing aspiration, initiation of the epiglottic rotation was significantly delayed than that of vocal cords and hyoid bone in posterior group as compared with valleculae group ($p<0.05$) and the horizontal displacement of hyoid bone is increased in piriform sinus group ($p<0.05$). there are no difference in angle of epiglottic closure. Between pre-swallowing and during-swallowing aspiration, there were no significant differences in spatial characteristics, while earlier aspiration time than onsets of hyoid, vocal cords, epiglottic movement were significant in pre-swallowing group ($p<0.01$). **Conclusion:** These results suggest that the starting order of vocal cords and hyoid bone movement is different between pre- and during-swallowing aspiration. But there are no significant differences in clinical outcomes and spatial characteristics between pre- and during-swallowing aspiration. Increased hyoid movement and delayed epiglottic closure can show the mechanism of posterior type aspiration, overflowed residue of piriform sinus, but there are no differences in clinical outcomes between during-aspiration groups.

0501PP21

QUANTITATIVE BIOMECHANICAL EVALUATION FOR MOTOR CONTROL OF UPPER LIMB IN STROKE AFTER USING KINESIO-TAPING

Yu-Chia Tsai¹, Shu-Min Chen¹, Jin-Wen Lei¹, Bing-Cheng Kung²

¹Dept. of Physical Medicine and Rehabilitation, National Cheng Kung University Hospital and ²Dept. of Mechanical Engineering, National Cheng Kung University (Taiwan)

Purpose: Arm and hand functions are crucial for many activities in daily living. Loss of function in an affected upper limb after stroke is common. Various methods including kinesio-taping have been used to improve the function of upper limb function in the adult with hemiplegia. Some studies have showed that Kinesio-taping improves the function of upper limb, but no quantitative assessments on the effects were used. We applied the shoulder-elbow rehabilitation robot to assess the effect of motor control of the upper limb quantitatively after using Kinesio-taping. **Materials and Methods:** A 48-year-old male had left putaminal hemorrhage with right hemiplegia for two years. He had received comprehensive rehabilitation. He could walk with a regular cane independently at the time of this study. Brunnstrom stage of the affected upper limb was III, modified Ashworth scale was 1+ and Fugl-Meyer scale was 24. He had flexor spasticity in the elbow with poor finger flexion movement during catching objects which disturbed the activities of daily living. He received kinesio-taping for the right upper limb, 24 hours each time, three times a week, for a period of one month. Then the upper limb function was assessed objectively with quantitatively biomechanical indices including EMG index and Intergration of Absolute Deviation of Torque (IADT). These two indices were built by a shoulder-elbow rehabilitation robot. The changes in Brunnstrom stage, modified Ashworth scale and Fugl-Meyer scale were also compared before and after taping. **Results:** There were no differences in Brunnstrom stage and modified Ashworth scale between the pre-treatment and after treatment data. However, Fugl-Meyer scale increased from 24 to 26 after taping. In the aspect of biomechanical indices, both EMG index and IADT decreased after taping which indicated an improvement in motor control. In addition, the patient reported improvement in the function of the affected upper limb subjectively during the application of Kinesio-taping. **Conclusion:** The Kinesio-taping could improve upper limb function both subjectively and objectively. Further clinical studies are needed in the future.

0501PP22

EFFECT OF FUNCTIONAL ELECTRICAL STIMULATION ON THE EARLY NEURONAL PLASTICITY IN THE PENUMBRA OF RATS WITH PERMANENT FOCAL CEREBRAL ISCHEMIA

Dongmei Jin¹, Zhiqiang Zhuang¹, Tiebin Yan¹, Yun Xiang¹, Xiuyuang Zheng¹, Yuan Peng², Yannan Fang³, Raymond Ky Tong⁴

¹Department of Rehabilitation Medicine, Sun Yat-sen Memorial Hospital, Sun Yat-sen University and ²Department of Rehabilitation Medicine, First People's Hospital in Guangzhou City, ³Department of Neurology, First Affiliated Hospital, Sun Yat-sen University and ⁴Department of Health Technology and Informatics, The Hong Kong Polytechnic University (China)

Purpose: This study investigated the neural mechanisms of functional electrical stimulation (FES) on motor behaviors, synaptic ultrastructures and protein expression of synaptophysin in the penumbra of rats with cerebral infarction. **Materials and Methods:** Following surgery of middle cerebral artery occlusion (MCAO), SD rats were randomly allocated to FES, placebo or sham-operated group. Rats in FES group and placebo group received electrical stimulation and placebo stimulation respectively for 3, 7 or 14 days (10 min/day), while the ones in sham-operated group received the similar surgery without MCAO occlusion and had no particular treatment. Functional evaluations were assessed at baseline and each time point described above. Synaptic ultrastructures in the penumbra were observed under transmission electron microscope and protein expression levels of synaptophysin in the penumbra were also measured by Western blot. **Results:** When compared with the rats in placebo groups, rats in FES group exhibited a significantly improved functional performance in prehensile traction test at the time point of 7d and 14d ($p < 0.05$), although the performance scores were still lower than that of rats in sham-operated groups at the corresponding time points. With prolonged treatment, the regressive ultrastructures of synapses in the penumbra of the infarcted hemisphere of the rats in FES groups improved more markedly than that of placebo groups. When compared with the protein expression levels of synaptophysin in the penumbra of placebo group, the ones in FES group were up-regulated significantly at the time point of 3 days, 7 days and 14 days ($p < 0.05$). **Conclusion:** Results from this study indicated that FES applied at the early stage of cerebral infarction could facilitate the functional recovery of the paralyzed limbs and activate the neuronal plasticity in the penumbra of the rats with cerebral ischemia.

0501PP23

THE EFFECTS OF ANGELICA SINENSIS INJECTION ON THE NEURONAL METABOLITES AND BLOOD FLOW SPEED WITHIN REPERFUSION FOLLOWING THE ISCHEMIC CEREBRAL INJURY IN RATS

Wei-jing Liao¹, Wan-tong Yang¹, Li-yun Li², Mai-li Liu², Yun-huang Yang²

¹Department of Rehabilitation Medicine, Zhongnan Hospital, Wuhan University, ²Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences (China)

Purpose: To investigate the effects of Angelica sinensis injection on the neuronal metabolites and blood flow speed within reperfusion in the ischemic cerebral injury in rats. **Materials and Methods:** Sixty-nine male Sprague Dawley rats with an average body weight of 160 ± 10 g (mean \pm SD) were used, and were randomly divided into three groups: group A rats ($n = 4$) underwent sham operation, group B ($n = 30$) underwent an operation of ischemic brain injury, group C rats ($n = 35$) underwent the same operation and received the treatment of Angelica sinensis injection (5 g/kg weight, i.p.). The right middle cerebral artery occlusion (MCAO) of both group B and group C rats was induced by 5/0 nylon suture for 2 hours. The reperfusion

was conducted for four hours and six hours respectively following MCAO. T2 weighted-imaging (T2WI) and 1H magnetic resonance spectroscopy (1H MRS) were performed, to study the changes of the imaging and the neuronal metabolites N-acetyl aspartate (NAA), creatine/phosphocreatine (Cr/PCr) and choline (Cho) following cerebral ischemia. The changes of blood flow speed were measured by laser Doppler flowmetry. The surface vascular density in right hemisphere were calculated. **Results:** The hyperintense signals and volume in the right cerebrum in group C were decreased compared to that of the group B, the T2 values were decreased, and the level of NAA increased, the ratio of Cr/NAA and Cho/NAA decreased. The blood flow speed in group C were improved. The length of brain surface vessels in group C increased. **Conclusion:** The Angelica sinensis injection enhanced the blood circulation in the ischemic brain, improved the neuronal metabolisms.

0501PP24

THE EFFECTIVENESS OF SURFACE ELECTRIC STIMULATION ON THE TREATMENT OF DYSPHAGIA IN STROKE PATIENTS

Chi-Fen Chang, Lu Lu, Yin-Ting Tseng, Ai-Ju Wu

Department of Physical and Rehabilitation Medicine, National Taiwan University Hospital (Taiwan)

Purpose: To investigate the effectiveness of surface electric stimulation therapy in stroke patients with dysphagia. **Materials and Methods:** Stroke patients referred for swallowing therapy during 2008 were recruited with the inclusion criteria of dysphagia with nasogastric tube feeding as the main nutritional supply, fair mentality and cooperation, informed consent, and no significant medical problems. 36 subjects were included in this study initially and were assigned into 2 groups randomly but 4 dropped out before reaching the treatment goal due to unrelated reasons. A total of 32 subjects finished the study. 20 subjects in the experimental group received simultaneous surface electric stimulation and traditional swallowing therapies. The 12 subjects in control group received traditional swallowing therapy only. There was no significant difference in dysphagia severity or oromotor function between these two groups. Each patient received 30 min of therapy twice a week till they could eat per oral safely or till 30 treatment sessions. Outcome were analyzed by the changes in dysphagia severity scale, oral and pharyngeal motor function scale, oral and pharyngeal swallowing function scale, and rate of successful oral feeding. **Results:** There were significant improvement ($p < 0.05$) in all outcome measures in both groups of patients. However, no significant difference was noted in any outcome measures between these two groups. Further analysis by correlating the pretreatment severity with the treatment outcome also showed no group differences. **Conclusion:** Our study results did not support additional treatment effect of superficial electric stimulation on stroke dysphagic patients. However, since most of the subjects were in acute stage, further studies using chronic cases are necessary before exclusion of its treatment effectiveness.

0501PP25

THE EFFECTS OF EXERCISE ACCORDING TO THE APPLICATION TIME AND INTENSITY ON COGNITIVE FUNCTION IN TRAUMATIC BRAIN INJURED RATS

Sam-Gyu Lee¹, Seung-Hoon Yang¹, Jae-Young Han¹, In-Sung Choi¹, Gye-Yeop Kim², Kyoung-Yoon Kim²

¹Department of Physical and Rehabilitation Medicine, Research Institute of Medical Sciences, Chonnam National University Medical School & Hospital and ²Department of Physical Therapy, Dongshin University (Republic of Korea)

Purpose: Exercise and physical activity can improve cognitive function by the growth and genesis of nerve cells in the hippocampus. However, there are debates on the proper time and intensity

of exercise for the maximal therapeutic effects in traumatic brain injured rats. The aim of this study was to investigate the effects of exercise according to the application time and intensity on cognitive function in traumatic brain injured rats **Materials and methods:** One hundred male Sprague-Dawley rats, weighing 250 ± 50 g, aged 8–10 weeks old were used. Before the induction of brain injury, all rats were acclimated to treadmill training, Rota-Rod training, and swimming for 1 week. Traumatic brain injury was induced by weight drop method. All rats were randomly divided into 4 groups: early high intensity exercise group (group A, $n=25$); early low intensity exercise group (group B, $n=25$); delayed high intensity exercise group (group C, $n=25$); delayed low intensity exercise group (group D, $n=25$). High intensity exercise (20 min of treadmill, 20 min of Rota-Rod, four times of swimming for 3 min each) and low intensity exercise (10 min of treadmill, 10 min of Rota-Rod, two times of swimming for 3 min each) were performed from 2nd and 8th day after brain injury once a day, for 3 weeks according to the groups. Morris water maze test for the evaluation of cognitive function and immunohistochemistry for BDNF in the CA1 region of the hippocampus were performed before and at 1st, 7th, 14th, 21st day after brain injury. **Results:** 1) On Morris water maze test, there were no significant differences in all groups before and at 1st day after the induction of brain injury ($p > 0.05$). Escape latency was significantly delayed in group B compared to the other groups at 21st day after brain injury ($p < 0.05$). Escape latency was delayed in group A with time. However, it was shortened in group B, C, and D with time. That of group B was shortest among them. 2) There was no immunoreactivity in all groups at 1st day after brain injury. There was no immunoreactivity in group A at 7th and 14th day. Immunoreactivity had been observed in group B, C, and D at 7th, 14th, and 21st day. Group B and C showed increased immunoreactivity with time. Group B showed the most significant immunoreactivity among them. **Conclusion:** We think that early low intensity exercise may be the most effective exercise protocol for the recovery of cognitive function in traumatic brain injured rats.

0501PP26

EFFECT OF ALL-TRANS RETINOIC ACID ON THE EXPRESSION OF MATRIX METALLOPROTEINASES 9 AFTER INTERCEREBRAL HEMORRHAGE IN RATS

Guangyu Shen, Jie Ji, Kefu Cai, Su Liu

Affiliated Hospital of Nantong University (China)

Purpose: To investigate the effect of all-trans retinoic acid (ATRA) in intercerebral hemorrhage (ICH) and observe its role on brain edema. **Materials and methods:** First, rat models of cerebral hemorrhage were made, and then these rats were divided into two groups: experimental group and control group. Rats in experimental group were given ATRA. The expression of matrix metalloproteinases -9 (MMP-9) was detected by immunohistochemistry. **Results:** The expression of MMP-9 in experimental group was lower than that of control group. There has been the significant difference in the two groups ($p < 0.05$). **Conclusion:** ATRA could reduce the expression of MMP-9 in experimental group and further reduce the brain edema.

0501PP27

A PRELIMINARY STUDY ON THE APPLICATION OF DYNAMIC PHARYNGOESOPHAGRAPHY IN DYSPHAGIA

Zhiyan Lu

Medical Imaging Division, Zhongnan Hospital, Wuhan University (China)

Purpose: To investigate the etiological diagnosis of dysphagia by using the digital gastrointestinal machine for patients with dysphagia underwent dynamic pharyngoesophagography. **Materials and Methods:** 5 cases of healthy volunteers and 18 cases of patients with dysphagia underwent dynamic pharyngoesophagography during April 2007 to September 2008 in Zhongnan Hospital. 18 cases of patients: 13 males and 5 females, 42–85 years old, median age: 65 years old. 3 patients with traumatic brain injury, 9 patients with stroke after treatment, 4 patients with esophageal cancer after radiotherapy, 2 patients of carcinoma in the upper esophagus. Philips OD digital gastrointestinal machine, photo images 25 frames per second, checking and recording of digital images at the same time, the images can be saved as dynamic AVI format and JPG format. **Results:** Dysphagia is divided into two stages, oral phase and pharyngeal phase, the patient may appear an anomaly or the coexistence of a variety of abnormalities. **Abnormal Stage I:** 2 cases with the cricopharyngeus muscle abnormal opening, 3 cases with abnormal lips closing, 5 cases with swallowing launch delaying, 4 cases with the mouth remaining, 5 cases with ineffective swallowing, 3 cases with abnormal tongue movement, 6 cases with repetitive swallowing, 9 cases with the epiglottis valley stranded, 13 cases with pyriform sinus stranded, 3 cases with the nose penetrating; **Abnormal Stage II:** 14 cases with the penetration before swallowing or aspiration, 8 cases with reducing pharyngeal peristalsis, 8 cases with the penetration during swallowing or aspiration, 5 cases with glottal insufficiency, 4 cases with penetration after swallowing or aspiration. **Conclusion:** Applying dynamic pharyngoesophagography could diagnose specific location of dysphagia and improve the accuracy of further treatment.

0501PP28

QUESTIONNAIRE ASSESSMENT OF SATISFACTION OF PLASTIC ANKLE-FOOT ORTHOSES IN STROKE PATIENTS

Min-Cheol Joo, Hyo-In Park, Se-Eung Noh

Department of Rehabilitation Medicine (Korea)

Purpose: Plastic Ankle-Foot Orthoses (AFOs) are widely used orthoses in the rehabilitation of the patients with stroke. This study was performed to investigate the status and the satisfaction of using orthoses in social activities, and complaints about orthoses as well. **Materials and Methods:** The questionnaires were given to 27 patients with stroke whom orthoses were applied to over one month. Details about the appliance included its comfort, fit, cosmetic acceptability, and frequency of wear. **Results:** The level of patient satisfaction with the plastic AFOs was 64%. The satisfaction at color was the highest among these by 68%, the satisfaction at weight was the lowest by 56%. The purpose of using orthoses in each item of Gait supporting, Spasticity control, and Instability supporting accounted for 70%, 15%, and 15% of the total, respectively. As to the time when orthoses are used, the items of Never, Necessary Condition, Indoor, Outdoor, and Always accounted for 33%, 33%, 4%, 4%, and 15%, respectively. The patients who did not wear AFOs during the investigation reached to 13 people, 48% of the whole. The causes of disuse in order of frequency were like Pain, Discomfort, Heavy weight, and Unimproved Gait Pattern. Many of the patients who were dissatisfied had more than one criticism. The main criticisms were as follows: High price, The delicacy of manufacturing process, Explanation of the purpose of wearing, After Service, Proper prescription based on functional roles, Periodical examination, etc. **Conclusion:** This survey shows an unacceptably high level of patient dissatisfaction with AFOs. Physiatrists should pay more attention to physical examination before AFOs prescription and follow-up survey of patients with stroke.

0501PP29

THE COMPARISON OF THE THERAPEUTIC EFFECTS OF NEUROMUSCULAR ELECTRICAL STIMULATION COMBINED WITH SWALLOWING REHABILITATION THERAPY FOR RECENT AND PERSISTENT DYSPHAGIA IN STROKE

Chau-Peng Leong, Tsung-Hsun Yang, Yi-Jung Hsin, Yiu-Chung Lau, Yu-Chi Huang

Chang Gung Memorial Hospital-Kaohsiung Medical Center (Taiwan)

Purpose: The purpose of this study is to compare the effectiveness of neuromuscular electrical stimulation (NMES) combined with swallowing rehabilitation program (SRP) between recent and persistent dysphagia in stroke patients. **Materials and Methods:** Forty patients with post-stroke dysphagia were analyzed in this retrospective study. All of them had treated with traditional SRP at least for one month, but failure to remove their feeding tubes. Twenty-two of them with post-stroke dysphagia lesser than 6 months were enrolled in the recent dysphagia group (RD group). Eighteen of them with dysphagia more than 6 months were enrolled in the persistent dysphagia group (PD group). All patients received both clinical swallowing evaluation and videofluoroscopic swallowing study (VFSS) before treatment. All of the subjects received 60 min NMES combined with SRP as one session of therapy, 2 to 3 sessions each week. The end point of swallowing treatments was removing the feeding tube, reaching the functional oral intake scale (FOIS) level 7, or no more swallowing improvement in five consecutive sessions. The outcome measures were the change of FOIS, patient numbers of successfully removing the feeding tube, and sessions of the swallowing therapy. **Results:** There were no significant differences in the age, sex, stroke characteristics and severity of dysphagia between the RD and PD groups. In both of the RD and PD groups, we found significant improvements in FOIS scores after therapy. The average change in FOIS scores of the RD and PD groups were 4.32 ± 2.14 and 3.67 ± 1.60 , respectively, but this scores did not show statistically significant differences in either groups. At the end of treatment, the average numbers of sessions in the RD and PD groups were 15.91 ± 9.81 and 26.11 ± 15.92 , respectively. The treatment sessions of the RD group were significantly lesser than that of the PD group. Eighteen (81.8%) patients in RD group and 13 (72.2%) patients in PD group regained swallowing ability and successfully removing their feeding tube after treatment. No complication was observed in both groups. **Conclusion:** The NMES combined with SRP is an effective treatment strategy for both recent and persistent dysphagia caused by stroke. To supply this therapy for recent dysphagia is more cost effectiveness than persistent dysphagia because lesser treatment sessions are needed.

0501PP30

THE EFFECT OF IMPROVING UPPER LIMBS MOTOR FUNCTION OF HEMIPLEGIC PATIENTS BY ELECTROMYOGRAPHY BIOFEEDBACK TRAINING

Hong-wei Zhai, Wei Chen, Zun-Ke Gong, Jiang-Bo Hu, Jing-jie Zhou

Chinese Association Of Rehabilitation Medicine (China)

Purpose: To study the effect of improving upper limbs motor function of hemiplegic patients by electromyography biofeedback training. **Materials and Methods:** 60 hemiplegic patients were randomly divided into control group ($n=30$) and study group ($n=30$). The latter received electromyography biofeedback training, 6 times a week for 60 days, in addition to regular medication. All patients were evaluated with wrist joint active AROM, upper limbs FMA and the largest EMG signal in the wrist extensor before and after the treatment. **Results:** The AROM, FMA and EMG in each group had a significant difference ($p < 0.01$) after the treatment. The improvement in the study group was greater than that

in the control group ($p < 0.05$). **Conclusion:** Electromyography biofeedback training can improve upper limbs motor function of hemiplegic patients.

0501PP31

THE THERAPEUTIC EFFECT OF MONOCHROMATIC INFRARED PHOTO ENERGY (MIRE) ON MYOFASCIAL PAIN SYNDROME IN THE UPPER TRAPEZIUS MUSCLE

Kang-Ming Huang¹, Shu-Min Chen¹, Jo-Tong Chen¹, Wei-Jang Yen¹, Ta-Shen Kuan¹, Chang-Zern Hong²

¹Department of Physical Medicine and Rehabilitation, National Cheng Kung University and ²Department of Physical Therapy, Hungkuang University (Taiwan)

Purpose: Myofascial pain syndrome (MPS) is characterized by the existence of myofascial trigger point (MTrP). Current animal and human studies have attributed the pathogenesis of myofascial trigger point (MTrP) to the “energy crisis” hypothesis (local hypoxia). Many therapeutic strategies for MTrP have been reported, including myofascial release, physical modalities, myofascial trigger point injection...etc. Monochromatic infrared photo energy (MIRE) is one kind of photon therapy (890 nm of wave length). Its effects in the restoration of sensation and reduction of pain for patients with diabetic peripheral neuropathy have been demonstrated. The vasodilatation effect of MIRE might play a major role in its therapeutic effectiveness. Our recent study has shown that MIRE could significantly inhibit the irritability of an MTrP in rabbit skeletal muscle. The objective of this study is to determine whether the therapeutic effect of MIRE is beneficial for an MTrP in human upper trapezius muscle. **Materials and Methods:** We have recruited 6 patients (one male, 5 females, mean age: 39.8 years old) with MTrPs in their upper trapezius muscles. The interventional protocol consisted of a daily 40 min treatment of MIRE, three times per week for 2 weeks. Pain measurements including verbal rating scale (VRS), visual analog scale (VAS), pressure pain threshold (PPT), neck disability index (NDI) were evaluated before the intervention of MIRE (M0), immediately after the 2-week intervention (M1), and one week after completion of the intervention (M2). **Results:** After 2 weeks of MIRE intervention, the mean value of VRS was decreased from 2.3 (M0) to 1.5 (M1), and then 1.5 (M2); the mean value of VAS was decreased from 4.6 (M0) to 2.9 (M1), and then increased to 3.3 (M2); the mean value of PPT was increased from 2.2 (M0) to 2.4 (M1), and then 2.4 (M2); the mean value of NDI was improved from 18% (M0) to 8% (M1), and to 6% (M2). **Conclusion:** Our preliminary results revealed that the therapeutic effect of MIRE might be a useful option for the treatment of an MTrP. Further studies are needed for a definite conclusion.

0501PP32

PHYSICAL THERAPY COMBINED WITH CERVICAL SYMPATHETIC NEVER BLOCK IN THE TREATMENT OF ACUTE FACIAL NEURITIS

Hongguang Duan, Liqiang Yang, Meihua Hu, Hong Geng, Yuna Guo

The Department of Rehabilitation Medicine, Xuanwu Hospital Capital Medical University (China)

Purpose: To compare the effects of physical therapy and the combined use of physical therapy and cervical sympathetic never block in treatment of acute facial neuritis. **Materials and Methods:** The patients with acute facial neuritis were divided into two groups. The patients in group A ($n=52$) were treated by ultrashortwave and polarized light, while those in group B ($n=50$) were treated by ultrashortwave and polarized light combined with cervical sympathetic never block. **Results:** The effect was better in group

B than in group A, with a significant difference ($p < 0.05$), and no complication occurred in both the groups. **Conclusion:** The combined use of the physical therapy and cervical sympathetic nerve block is better than the only use of ultrashortwave and polarized light in the treatment of acute facial neuritis.

0501PP33

PREVALENCE OF LOW BACK PAIN AND ASSOCIATED FACTORS AMONG ADULTS IN TAIWAN: A POPULATION-BASED STUDY

Yi-Chun Chou¹, Chun-Chuan Shih², Jaung-Geng Lin², Chien-Chang Liao²

¹Department of Physical Medicine and Rehabilitation, China Medical University Hospital and ²College of Public Health and College of Chinese Medicine, China Medical University (Taiwan)

Purpose: Low back pain is a common symptom interfering with activities of daily living and a leading cause of disability. The purpose of this study is to investigate the prevalence, characteristics, and associated factors of low back pain (LBP) among adults in Taiwan. **Materials and Methods:** This study analyzed the data from the 2002 National Health Interview Survey conducted by Department of Health, Taiwan. It was a face-to-face questionnaire survey among people aged 15 years and older. People who complained of sometimes or frequent LBP within the past three months were considered as case group. Adolescents aged 15–19 years were excluded from this study. **Results:** Among 24435 eligible study participants aged 20 years and older, 25.7% of them had LBP within the past three months. The prevalence of LBP was 18.8% among people aged 20–29 years increased to 36.4% among people aged 80 years and older ($p < 0.0001$). Female (odds ratio [OR]=1.67, 95% CI=1.433–1.95), low education (OR=1.38, 95% CI=1.23–1.55) and blue collar (OR=1.16, 95% CI=1.07–1.26) were factors associated with LBP in the multivariate logistic regression. Compared with people had no osteoporosis, people had osteoporosis were more likely to have LBP (OR=2.55, 95% CI=2.33–2.78) or frequent LBP (OR=4.15, 95% CI=3.66–4.70). The ORs of frequent LBP in association with osteoporosis in men and women were 5.77 (95% CI=4.66–7.15) and 3.49 (95% CI=2.99–4.07), respectively. **Conclusion:** This study found a high prevalence of low back pain within past three months among adults in Taiwan. Low back pain was associated with osteoporosis and the association seemed stronger in men than in women.

0501PP34

EFFECTS OF VITAMIN D IN THE TREATMENT OF LOW BACK

Chunbo Cai

Kaiser Permanente Medical Center, San Francisco (United States)

Purpose: To evaluate the role of Vitamin D in the treatment of low back pain. **Materials and Methods:** This is a descriptive cohort study with 98 cases collected from 2008 to 2009. The patients came to the spine clinic for chronic low back pain with the reported visual analog score (VAS) at 5–9/10. Their blood Vitamin D level was tested to be below the normal limit. The age of the patients was from 20 to 80 year-old. There were 34 (35%) males and 64 (65%) females. All have failed physical therapy and commonly used pain medications. They were advised to take Vitamin D supplement for 8 to 12 weeks. Eight patients were lost in follow up at 8th to 12th week. **Results:** In the 90 cases, 61 patients (68%) reported at least 50% improvement of the pain, among which 19 (21%) patients reported at least 90% improvement; 29 patients (32%) reported less than 50% improvement of the pain, among which 15 patients (17%) patients reported no relief. **Conclusion:** Vitamin D does play a role in low back pain. Although it warrants more in-depth study to determine whether Vitamin D should be screened in the patients who have chronic low back pain, it is ad-

visible to test the Vitamin D level and to consider supplementation accordingly for the treatment of chronic low back pain.

0501PP35

THE ASSOCIATION BETWEEN PERCEIVED PAIN, PSYCHOLOGICAL DISTRESS, AUTONOMIC STATUS, DISABILITY AND SLEEP AMONG THE CHINESE PATIENTS WITH CHRONIC NECK SHOULDER PAIN

Su-Hsien Lin¹, Shih-Ching Chen¹, Sung-Hui Tseng¹, Chien-Hung Lai¹, Allen Chia-Lin Hsu¹, Jiunn-Horng Kang^{1,2}

¹Department of Physical Medicine and Rehabilitation, Taipei Medical University Hospital and ²Institute of Biomedical Engineering, National Taiwan University (Taiwan)

Purpose: The chronic neck-shoulder pain is relative common problem. The impact of chronic neck-shoulder pain could be multi-dimensional. Complex interaction between psychological and physiological factors could be involved in pathomechanism of chronic neck-shoulder pain. The goal of the study is to analyze the perceived pain, psychological distress, autonomic status, disability and sleep among the Chinese patients with chronic neck shoulder pain. **Materials and Methods:** Patients who chronic neck-shoulder pain for more than three months were included in this study. We excluded the patients who had known systemic rheumatologic diseases, malignancy, previous neck trauma or surgery and co-existing cervical radiculopathy. Totally Forty-three patients (37 female/6 male) were included in this study. Average VAS for pain was recorded for each patient. Chinese Health Questionnaire-12 (CHQ-12), Pittsburgh Sleep Quality Index (PSQI), Neck Disability Index (NDI) were also recorded for measure patients' psychological stress, sleep quality, and disability respectively. Pressure pain thresholds were recorded with a pressure algometry at bilateral neck paraspinal muscles, trapezius and rhomboid for each patient. 5-min EKG were recorded under quiet supine position for each subject and short term HRV were further analyzed with lead II in both frequency and time domains. Pearson's and Spearman's correlation test were conducted to analyze the correlation between perceived pain and psychological distress, sleep quality, disability, and HRV parameters. Significant level was set as $p < 0.05$. **Results:** The mean VAS, PSQI, CHQ-12 and NDI were 5.5 ± 2.0 , 12.0 ± 4.2 , 5.2 ± 3.1 and 17.0 ± 8.0 , respectively. We found VAS for pain was significantly positive correlated with pain duration ($r = 0.31$, $p = 0.04$). In addition, VAS for pain was negative correlated with RMSSD and HF power in HRV analysis ($r = -0.273$, $p = 0.05$; $r = -0.31$, $p = 0.004$, respectively). However, VAS for pain was not significantly correlated to psychological distress and sleep quality. Interestingly, we found the NDI was significantly positively correlated with CHQ-12 and PSQI ($r = 0.50$, $p = 0.001$; $r = 0.37$, $p = 0.02$, respectively). **Conclusion:** We found the perceived pain was associated with significantly decreased HRV and increased sympathetic component among the patients with chronic neck-shoulder pain which could reflect with common pathophysiological effects of pain in autonomic status. In addition, we found the level of disability among these patients was positively correlated with psychological status and sleep quality. Our data support the impact of chronic neck-shoulder pain is tremendous and complex. Our data can help to develop further clinical strategy to improve the care of these patients.

0501PP36

RESTORATION OF CERVICAL LORDOSIS AND REDUCCION OF FORWARD HEAD POSFURE FOR THE TREATMENT OF NECK PAIN IN YOURY ADULTS USISY SEATED EXTENDED COMPRESSED CERVICAL 2-WAY TRACTION

Sunto Yen

Healthone Rehabilitation Clinic (Taiwan)

Purpose: To study whether a seated, extended and compressed cervical 2-way traction would cause tension in the anterior ligament, anterior disc and muscle structure, and thereby restore cervical lordosis, reduce forward head posture in the treatment of young adult patients with neck pain. **Materials and Methods:** This is a nonrandomized prospective clinical control trial. Thirty preselected patients after diagnostic screening for tolerance to cervical extension with compression were treated for the 2 months of care using hot pack and a new type of cervical extension-compression traction (vertical weight applied to the subjects' forehead in the sitting position with a transverse load at the areas of cervical kyphosis); Measurements are as follows: 1) Visual Analogue Scale (VAS) 2) Neck Disability Index. 3) Lateral Cervical Radiographs analyzed with the posterior tangent method for changes in alignment measurements of pretreatment and posttreatment of each patient were compared. Results are compared to a control group of 30 subjects receiving no treatment and matched for age, sex, weight, height, and pain. **Results:** Control subjects reported no changes in VAS pain ratings, neck disability index; and had no statistical significant change in cervical alignment on comparative lateral cervical radiographs. (difference in all angle mean values < 1.0) For the traction group, VAS ratings were 5.8 pretreatment and 0.9 posttreatment; neck disability index were 26.5 pretreatment and 7.8 posttreatment. Comparative lateral cervical radiographs showed statistically significant improvements including anterior head weight bearing (mean improvement of 15mm), Cobb angle at C2-C7 (mean improvement of -12), and the angle of intersection of the posterior tangent, at C2-C7 (mean improvement of 16.5). **Conclusion:** A seated extended compressed cervical 2-way traction can decrease neck pain and improve cervical lordosis in 30 visits over 8 weeks, as indicated by increases in segmental and global cervical alignment. Anterior head weight-bearing was reduced by 15 mm; Cobb angles averaged an increase of 12; and the angle of intersection of posterior tangents on C2 and C7 averaged 16.5 of improvement.

0501PP37

PHYSICAL AGENT MODALITIES ENHANCES CARDIAC VAGAL ACTIVITIES IN LOW BACK PAIN PATIENTS

Clement SH Yang^{1,6}, Terry B.J. Kuo^{2,7}, Cheryl CH Yang^{2,7}, Kun-Ruey Shieh³, Pesus Chow^{4,8}, Chieh-Yu Liu⁵

¹Department of Physical Medicine and Rehabilitation, Buddhist Tzu Chi General Hospital, ²Sleep Research Center, National Yang-Ming University, ³Institute of Physiological and Anatomical Medicine, Tzu Chi University, ⁴Community Medicine Research Center, National Yang-Ming University, ⁵Department of Nursing, National Taipei College of Nursing, ⁶College of Medicine, Tzu Chi University, ⁷Institute of Brain Science, National Yang-Ming University and ⁸Department & Institute of Public Health, National Yang-Ming University (Taiwan)

Purpose: To investigate the potential differences in pain, disability and autonomic function of low back pain (LBP) patients before and after physical agent modalities. **Materials and Methods:** Twenty-nine LBP patients (14 men and 15 women) who never had or had no physiotherapy for over 6 months were enrolled (mean age 38.7 years, standard error of the mean 2.1). The same prescription of physical agent modalities including hot pack, interferential current therapy, and lumbar traction were applied on all the study participants. A battery of measures including assessment of their pain, disability and autonomic function by means of heart rate variability (HRV) were carried out before and after physical agent modalities. Pain was measured using a visual analog scale (VAS) with a score of 0 (no pain) to 100 (unbearable pain), and disability was measured using the Oswestry Disability Index (ODI). Frequency-domain analysis of the stationary R-R intervals (RR) was performed to calculate the mean of the RR, variance of the RR (Var), total power (TP), high-frequency power (HF, 0.15–0.40 Hz), low-frequency power (LF, 0.04–0.15 Hz), LF in normalized units (LF%), and the LF/HF

ratio (LF/HF). **Results:** A significantly increased RR, HF, TP, and Var were found in LBP patients after physical agent modalities. Besides, the scores of VAS and ODI significantly decreased on comparing with the pre-treatment status. There was a significant negative correlation between post-treatment ODI and pre-treatment LF, HF, TP, and Var, respectively. **Conclusion:** The study demonstrates enhanced cardiac vagal activities and decreased pain as well as disability in LBP patients after physical agent modalities. There might be a potential link between parasympathetic function and improvement of disability in LBP patients with modality therapy. The clinical implication of autonomic function in predicting the efficacy of physiotherapy warrants further investigation.

0501PP38

SCIATICA CAUSED BY A INTRASPINAL JUXTA-FACET SYNOVIAL CYST: A CASE REPORT

Tai-Yi Wu¹, Yu-Ting Hsieh¹, Jen-Li Pan¹, Chien-Huang Kuo¹, Shu-Hua Lin¹, Chung-Sheng Ho¹, Hsing-Hong Chen², Chein-Wei Chang³

¹Department of Physical Medicine and Rehabilitation, Poh-Ai Hospital, ²Department of Neurosurgery, Poh-Ai Hospital and ³Departments of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: Report a case of left sciatica due to an intraspinal juxta-facet synovial cyst. **Materials and Methods:** Detailed history was taken and clinical physical examination was done. A 50-year-old female patient, who suffered from painful numbness over her left leg for 4 months despite of conservative treatments was evaluated by electrophysiological study, plain film and magnetic resonance image (MRI). A juxta-facet synovial cyst between the left lumbar fourth and fifth spine levels associated with the left fifth lumbar radiculopathy was diagnosed and approved from the specimen of an excisional surgery. **Results:** Weakness of left extensor hallucis longus muscle and painful numbness over her left fifth lumbar dermatome were noted. MRI showed a facet joint synovial cyst between her left fourth and fifth lumbar spinal segments, with an obliteration of lateral recess and compression on the fifth spinal nerve root. Under the diagnosis of synovial cyst causing fifth lumbar radiculopathy, hemilaminectomy with excision of the synovial cyst was performed. Synovial cyst was confirmed by histological examination. After operation, her neurological functions get much improvement. **Conclusion:** Juxta-facet synovial cyst is a relatively uncommon cause of sciatica in lumbar spine. Most juxta-facet cysts are observed between the fourth and fifth lumbar spinal levels, and commonly occur in patients older than 65 years old. MRI is the imaging modality of first choice for the diagnosis. Treatment regimen such as physical therapy, epidural injection, oral steroid medication, and non-steroidal anti-inflammatory drugs are usually given in patients without neurological deficit. Surgical intervention with excision of the synovial cyst has been recognized as a highly effective treatment for pain relief.

0501PP39

THE IRRITABILITY OF THE MYOFASCIAL TRIGGER SPOT IN GASTRONEMIUS MUSCLE FROM RABBITS WITH HYPERTHYROIDISM

Wei-Chi Hsieh¹, Kai-Hua Chen¹, Hung-Chih Hsu^{1,2}, Chang-Zern Hong³

¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, ²Graduate Institute of Clinical Medical Science, Chang Gung University, College of medicine and ³Department of Physical Therapy, Hung Kuang University (Taiwan)

Purpose: A animal model to investigate the influence of thyroid hormone on the prevalence of endplate noise (EPN) recorded from the myofascial trigger spot (MTrS) in skeletal muscle from

hyperthyroidism rabbit; a blinded controlled study. **Materials and Methods:** Twenty New Zealand male white rabbits were divided randomly into hyperthyroidism and control group. The rabbits with hyperthyroidism are following the induction of hyperthyroid state by intramuscular administration of L-thyroxine for 7 days. The control group rabbit were also intramuscular injected with the same volume of normal saline one week. Before and after full course injection, TSH, free T4, T3 and TSH level in serum were checked. The prevalence of endplate noise (EPN) from MTrS in bilateral gastrocnemius muscle were also recorded at the same time by EMG study. **Results:** The serum level data of T3, T4, free T4 and TSH in control group was not significant before and after 0.45% saline injected ($p > 0.05$); and so did in the prevalence ($p > 0.05$). In Hyperthyroidism group, post seven days L-thyroxine injected, T3, T4, FreeT4, TSH level and EPN prevalence are significant ($p < 0.05$) compare with pre-injected by thyroxine. The regression analysis between T3, T4, free T4 or TSH with EPN prevalence are significant (R square: T3:0.52 T4: 0.42 free T4: 0.42 TSH: 0.26; sig: 0.00). **Conclusion:** In hyperthyroidism condition, the irritability of MTrS in rabbit's skeletal muscle increase. The serum levels of T3, T4, free T4 and TSH have positive correlation with EPN prevalence. Furthermore T3 has stronger effect on EPN prevalence than others.

0501PP40

EFFECTS OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION (PNF) STRETCHING ON MYOFASCIAL TRIGGER POINT OF UPPER TRAPEZIUS MUSCLE IN FEMALE UNDERGRADUATE STUDENTS

Saowanee Luangaram, Suwalee Namwongsa

Naresuan University (Thailand)

Purpose: Myofascial trigger point (MTrPs) in the upper trapezius muscle is claimed to be a common source of neck pain. Patients often report regional and persistent pain that usually result in a decreased cervical range of motion (CROM). Stretching exercise has been recommended as an easy treatment of MTrPs. Previous researches suggest some proprioceptive neuromuscular facilitation (PNF) stretching techniques produce greater increase in range of motion and reduce pain than static or ballistic stretching. However, the most effective PNF technique was still unclear. Therefore, the purpose of this double blind control trial was to determine the effectiveness of three types of PNF stretching in women with MTrP in upper trapezius muscle. **Materials and Methods:** Eighty-nine females (18-25 years old), were recruited from the undergraduate students of Naresuan University. Volunteers were randomly allocated to 3 groups; Hold-relax group (HR, $n = 30$), Agonist-contract-relax group (ACR, $n = 30$) and Contract-relax-antagonist-contract group (CRAC, $n = 29$). Passive stretching in all groups was done by the same physical therapist and hold 15 seconds for 10 times and alternate with 5 seconds rest. The outcome parameters, pressure pain threshold (PPT) on the MTrP and CROM (flexion, lateral flexion and rotation), were measured before and 0, 5, 15 and 30 min after treatment. Data were analysed by ANOVA and repeated measures ANOVA with significance level of 0.05. This study was reviewed and approved by the Institute Ethics Committee, Naresuan University. **Results:** The general characteristics, baseline PPT and CROM of all groups were not significantly different and were all within the normal range. In addition, PPT and CROM of all groups show significantly increase ($p < 0.05$) after stretching complete. Moreover, PPT levels were improved 17.39%, 12.23% and 8.80% in HR, ACR, and CRAC, respectively. However, CROM in all groups increased linearly with time but showed no statistical significance between groups ($p > 0.05$). No adverse effects from all subjects were reported after stretching procedure. **Conclusion:** Based on the result, we conclude that all techniques in this study help improve PPT and CROM in women with MTrP in upper trapezius muscle. In addition, from PPT level, the HR technique tends to show more efficiency than others. So, the further studies should focus on the effect of HR technique

either in the same group of patient or using other techniques such as self-stretching.

0501PP41

THE EFFECTIVENESS OF EXTRACORPORAL SHOCK WAVE THERAPY ON TENDINITIS OF THE SHOULDER

Wang Yan

Wuhan University (China)

Purpose: The Effectiveness of Extracorporeal Shock Wave Therapy on Tendinitis of the Shoulder **Materials and Methods:** We treated 30 patients in Extracorporeal shock wave therapy (ESWT) and control group each to have the medium frequency electrical therapy (MFET). **Results:** 12 weeks after ESWT the patients treated have a significant better outcome as the shame group by scoring the Constant-Murley-Score ($p < 0.001$). **Conclusion:** The shock wave therapy is the best evidence based treatment lesions of the shoulder and must be indicated before operative

0501PP42

LOW BACK PAIN FROM MULTIPLE MYELOMA: A CASE REPORT

Chao-Chih Lee

Chen Hsin General Hospital, Rehabilitation Department (Taiwan)

Low back pain is a common musculoskeletal disorder affecting 80% of people at some point in their life time. It can be either acute, subacute, or chronic in duration. Most often, the symptoms of low back pain show significant improvement within a few weeks with conservative treatment. However, there are some causes of low back pain which require different approach and management. A case of 57 y/o female patient suffered from sudden onset of low back pain since four months ago, she received conservative treatment and seemed no improvement. Due to pain persisted, she then visited emergency department for help, T8 compression fracture with retrolisthesis of L4/5 were diagnosed, and surgery was then performed. However, the pain progressed after series of treatment; she was hospitalized for further evaluation. During hospitalization, a series of survey were arranged. Whole body bone scan showed increased uptake of numerous segments of T-spine, and no positive finding of tumor makers. Serum protein electrophoresis gives positive finding of the presence of M band, IgA, and kappa light chain. Bone marrow biopsy was then arranged and showed hypercellularity and increased portion of immature plasma cell, which fulfilling the diagnostic criteria of multiple myeloma, thus we have found the cause and explanation of low back pain, and further anti-cancer therapy were suggested. This case suggests that there are variable causes of low back pain. If the pain condition was not improved after conservative or surgical management, it is necessary to explore other etiology with more detailed survey as in this case, for example, a malignant condition, even it is uncommon.

0501PP43

THE EFFECT OF REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION (RTMS) ON NNOS AND GFAP IN RATS WITH CHRONIC NEUROPATHIC PAIN

Tiecheng Guo, Jingfei Xu

Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology (China)

Purpose: Repetitive transcranial magnetic stimulation (rTMS) has been applied for treatment of chronic neuropathic pain. However, the mechanism has not been elucidated. In this study, we evaluate the effects of different frequencies of rTMS on chronic neuropathic

pain and observe change of neuronal nitric oxide synthase (nNOS) in the dorsal root ganglion (DRG) and glial fibrillary acidic protein (GFAP), a specific activation marker of astrocytes in the lumbar spinal cord. **Materials and Methods:** A chronic neuropathic pain model was adopted and made by chronic constriction nerve injury (CCI). A total of 28 male Sprague-Dawley rats were divided into a control group and an rTMS group which in turn were divided into a sham-rTMS group, 1 Hz rTMS group, 20 Hz rTMS group, with 7 animals in each group. Three days after the CCI operation, rTMS was applied to primary motor cortex (M1) contralateral to the site of pain for 10 consecutive days. Behavioral observation, mechanical allodynia and thermal hyperalgesia tests were examined before surgery, 3 days postsurgery and after 10 days of rTMS. The expression of nNOS in DRG and GFAP in lumbar spinal cord were examined, respectively, by using immunohistochemistry technique. **Results:** The withdrawal thresholds of the hind paw to mechanical stimulation and the latencies of foot withdrawal to noxious heat in rats underwent CCI operation were lower than those in the control group ($p < 0.05$) 3 days postsurgery. After rTMS, mechanical allodynia and thermal hyperalgesia were relieved only in 20 Hz rTMS group but not in 1 Hz rTMS group ($p < 0.05$). Compared with control group, the expression of nNOS was significantly increased in ipsilateral L4–L6 DRG in sham-rTMS group and 1 Hz rTMS group ($p < 0.05$) and the nNOS staining was mainly found in the small and medium neurons. A recovery of nNOS expression was observed in the 20 Hz rTMS group but not the 1 Hz rTMS group ($p < 0.05$), and the expression of GFAP in the ipsilateral L4–L6 lumbar spinal dorsal horn showed similar change. **Conclusion:** can Relief of mechanical allodynia and thermal hyperalgesia after 20Hz rTMS to contralateral M1 was accompanied with down-regulation of over-expression of nNOS in the corresponding segmental ipsilateral DRG and GFAP in ipsilateral lumbar spinal dorsal horn. It is suggested that high frequency rTMS can relief neuropathic pain through down-regulating the over-expression of nNOS in the DRG and inhibiting the proliferation and activation of astrocytes spinal dorsal horn.

0501PP44

THE IMMEDIATE EFFECTS OF REMOTE DRY NEEDLING ON PATIENTS WITH MYOFASCIAL PAIN SYNDROME

Wen-Ming Chang¹, Hung-Chih Hsu¹, Chu-Hsu Lin¹, Kai-Hua Chen¹, Wei-Chi Hsieh¹, Alice MK Wong²

¹Department of Physical Medicine and Rehabilitation, Chang Gung Medical Foundation, Chiayi Branch and ²Department of Physical Medicine and Rehabilitation, Chang Gung Medical Foundation, Linkou Branch (Taiwan)

Purpose: To evaluate the immediate effects of remote dry needling on the myofascial trigger point in the upper trapezius muscle. **Materials and Methods:** Twenty-five patients with active myofascial trigger points in upper trapezius muscles were recruited in this study and received dry needling on the distal acupoint (Hoku; LI4). We measured the visual analog scale, pressure pain threshold, and range of motion of the neck before and immediately after the treatment. **Results:** The immediate effect on the intensity of visual analog scale was significantly decreased, but the pressure pain threshold was significantly increased ($p < 0.001$). Also, there were significant improvement of range of motion of the cervical spine, including neck extension, side bending and rotation ($p < 0.05$). **Conclusion:** The positive immediate effects of remote dry needling were demonstrated based on the pain intensity, pressure pain threshold and range of motion of the neck. Dry needling on the distal acupoint may provide a new approach to treat the active proximal myofascial trigger point.

0501PP45

EFFICACY OF THREE WEEKLY INTRAARTICULAR INJECTIONS OF HYALURONATE ON PAIN, PHYSICAL FUNCTION AND BALANCE IN PATIENTS WITH UNILATERAL ANKLE

OSTEOARTHRITIS – A PROSPECTIVE STUDY WITH 6 MONTHS FOLLOW-UP

Shu-Fen Sun^{1,2}, Chiao-Wen Hwang¹, Jue-Long Wang¹, Chien-Wei Hsu³, Kam-Fai Wong⁴, Yi-Jiun Chou⁵, Hsien-Pin Sun⁶

¹Department of Physical Medicine and Rehabilitation, Kaohsiung Veterans General Hospital, ²National Yang-Ming University School of Medicine, ³Department of Internal Medicine, Kaohsiung Veterans General Hospital, ⁴Institute of Statistics, National University of Kaohsiung, ⁵Department of Orthopedic Surgery, Kaohsiung Veterans General Hospital and ⁶Department of General Surgery, Cheng Ching Hospital (Taiwan)

Purpose: Ankle osteoarthritis can cause substantial pain, functional limitations and often it affect a person's balance and walk. Viscosupplementation with 3 to 5 intraarticular injections at weekly intervals is a well-established treatment option in knee OA and is included in the treatment guidelines, evidence for efficacy and safety of its use in ankle OA is limited. Previous studies reported that five weekly hyaluronate injections were safe and effective for the treatment of ankle osteoarthritis. The effect of three weekly injections has rarely been investigated. The purpose of this study was to evaluate the efficacy and safety of three weekly injections of sodium hyaluronate (Hyalgan) in patients with unilateral ankle osteoarthritis. **Materials and Methods:** As a prospective observer-blind study done in a university-affiliated tertiary care medical center, 50 patients with unilateral ankle pain for at least 6 months and radiographically classified as Kellgren-Lawrence grade 2 or 3 ankle osteoarthritis were recruited. Patients received three weekly intraarticular injections of Hyalgan into symptomatic ankles. The primary outcome was the change in the Ankle Osteoarthritis Scale (AOS) score at 6 months after the third injection. Several secondary outcome measures including American Orthopedic Foot and Ankle Society ankle/hindfoot score, four clinical balance tests, analgesics consumption and patients' global satisfaction were assessed. **Results:** Forty-six participants completed the study. Significantly greater reduction in AOS scores was noted at 1, 3 and 6 months after the third injection ($p < 0.001$ for each following visit compared with baseline). The mean American Orthopedic Foot and Ankle Society ankle/hindfoot score improved from 60.5 points at baseline to 73.5, 75.5 and 76.7 points at 1-month, 3-month and 6-month follow-up, respectively ($p < 0.001$). Acetaminophen consumption dropped significantly following treatment ($p < 0.001$). Patients demonstrated significant improvements in four clinical balance tests at each follow-up visit compared with baseline ($p < 0.001$ for each test). The patients' satisfaction rate was high with no serious adverse events. **Conclusion:** This study suggests that three weekly injections of sodium hyaluronate are well tolerated, can provide pain relief and improve function and balance in patients with unilateral ankle osteoarthritis. The results require confirmation in larger, well-controlled trials.

0501PP46

A DOUBLE-BLIND RANDOMIZED PLACEBO CONTROLLED PARALLEL GROUP STUDY DEMONSTRATES ANALGESIC EFFECTS OF SHEANUT OIL EXTRACT [BSP-201] IN EXERCISE INDUCED MUSCLE TENDERNESS

Lars Arendt-Nielsen¹, Allan Rosetzky², Morten Weidner²

¹Center for Sensory-Motor Interaction, Laboratory for Experimental PainResearch, Aalborg University and ²Copenhagen Science Park Symbion (Denmark)

Purpose: Oral sheanut oil extract [BSP-201] is an active bio-complex obtained from a fraction of sheanut oil with approximately 50 to 70 percent unsaponifiables that reduced dose-dependently interleukin-6 production from the rat pristine-induced peritonitis exudates cells. The primary objective of this placebo-controlled study was to investigate the effects of BSP-201 on development of post-exercise muscle tenderness. **Materials and Methods:** Three grams of BSP-201 or placebo

was given orally daily in 4 × 750 mg soft gel capsules for 22 days to 20 healthy men aged, 26±0.61 years [mean±standard deviation] in a double-blind, randomized control study. Subjects carried out an intensive eccentric exercise of the first dorsal interosseous muscle of the left hand on a standardized hand exerciser on the day 14. Muscle tenderness was tested on days 0, 14 [before exercise], 14 [immediately after exercise], 15 [one day after exercise], 16 [two days after exercise with maximal tenderness], and 22 [eight days after exercise] by pressure algometry. **Results:** Muscle tenderness on days 0 and 14 [before exercise] was not different in the two groups. Muscle tenderness was significantly reduced [24.3±4.8 mm] in the group that consumed BSP-201 as compared to the placebo group [47.4±6.5 mm] at day 14 [immediately after, $p < 0.01$] and at day 16 [$p < 0.04$] after the exercise. None of the participants reported any adverse effects. **Conclusion:** This current study showed that sheanut oil extract reduces muscle tenderness most likely via reduction of pro-inflammatory cytokine IL-6.

0501PP47

THE SHORT-TERM EFFECT OF A HOME EXERCISE PROGRAM AND SELF-MASSAGE FOR SUBJECTS WITH MYOFASCIAL PAIN SYNDROME

Tzzy-Juan Wang¹, Mei-Wun Tsai¹, Yuan-Chi Chan^{1,2}, Mei-Mang Chu²

¹Department of Physical Therapy and Assistive Technology, National Yang-Ming University, ²Department of Rehabilitation, Tri-Service General Hospital (Taiwan)

Purpose: The purpose of this study is to investigate a short-term effect of a home exercise and self-massage program for subjects with MPS. **Materials and Methods:** This study was a randomized controlled trial. The patients were randomly assigned into either the self massage plus stretch exercise (MS) or the modality (MO) group. The MO group received six sessions of physical therapy including Silver Spike Point (SSP) and hot pack. The MS group received the same treatment as the MD group plus a self massage and stretch exercise instruction by a physical therapist. The intervention lasted for 2 weeks. Outcome measures including Patient Specific Functional Scale (PSFS), pressure pain threshold (PPT) on trigger points and heart rate variability (HRV) were recorded at the beginning and after 2 weeks of intervention. Repeated measures ANOVA were used to compare the between group differences of the treatment effects. **Results:** The self massage and stretch exercise group demonstrated significantly more improvement on reducing resting pain ($p = 0.000$), pain during regular activities ($p = 0.000$), maximal pain intensity ($p = 0.000$) and PPT ($p = 0.000$). Significantly more functional improvement was also observed in the self massage and stretch exercise group than the modality only group. With regards to the HRV indices, the self massage and stretch exercise group demonstrated significantly more increases in LF% ($p = 0.008$), HF% ($p = 0.001$), and decrease in LF/HF ($p = 0.002$) than the modality group. **Conclusion:** A 2-week self-massage and stretch exercise combine with SSP and hot pack is more effective than SSP with hot pack alone in pain relief and functional improvement for subjects in MPS. The effects can be partially explained by the increases of the parasympathetic activity.

0501PP48

EFFECTIVENESS OF PAIN MEASUREMENT BY ELECTRIC PHENOMENON

Kenji Kagechika¹, Minori Nakata¹, Misao Tsubokawa¹, Hirotaka Kawasaki¹, Masao Yamaguchi¹, Akio Kobe², Yasutaka Takagi³

¹Department of Rehabilitation Medicine, Kanazawa Medical University hospital, ²Department of Medical Rehabilitation Services, Kanazawa Medical University Hospital and ³Department of Orthopedic Surgery, Tonami General Hospital (Japan)

Purpose: To examine whether it is possible to evaluate of the pain by the measurement of the change in the skin impedance. **Materials and**

Methods: The skin impedance obtained from the electrode applied to the hand was measured, and it made comparative study of the value before and after the pain treatment. The patients with the chronic pain and the low back pain were done the hyperthermia of hot pack and the xylocaine intramuscular injection, and visual analogue scale was compared additionally before and after treatment as sight scale.

Results: For the patients with the chronic pain and the low back pain, the difference was admitted in the individual value that was able to be put in the resting state, and the change was seen in response to the state of their posture. Impedance decreased with the exacerbation of the pain, and it has increased with the improvement of the pain sensation. The larger the improvement of the pain sensation was the smaller increases of impedance when the low back pain was improved by the effect of the hyperthermia. There was no change in impedance in case of the patients by the intramuscular injection of physiological salt solution though their sight scales were improved. **Conclusion:** The pain is a subjective phenomenon, and it is changeable. The objective evaluation is difficult because there are extremely a lot of troubles that cause the pain. The improvement of the pain and the change in the skin impedance were in the correlation. It was suggested that a quantitative evaluation of the pain sensation was possible though it was thought the change of the pain took place through the autonomic nerve system. The possibility of quantitatively appreciation of the pain by the change of the skin impedance value was suggested. We hope to examine the change in the pain sensation exactly in the future and to examine the assessment that can do by 24 h measurements.

0501PP49

THE TREATMENT EFFECTS IN MYOFASCIAL TRIGGER SPOTS BY SONOPHORESIS WITH XYLOCAINE

Wei-Chi Hsieh^{1,2}, Chang-Zern Hong³

¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, ²College of Medicine, Chang Gung University and ³Department of Physical Therapy, Hung Kuang University (Taiwan)

Purpose: A blind controlled study for well knowing the treatment effects of sonophoresis with 2% xylocaine in human's myofascial trigger points by animal model which the irritability of myofascial trigger spot (MTrS) determined by recording the prevalence of endplate noise (EPN) in gastronemius muscle of rabbits. **Materials and Methods:** Ten rabbits, we randomize bilateral gastronemius muscle into experiment and control side. In controlled side, the MTrS in gastronemius was applied with pure jelly by sonophoresis (1 KJ/cm², continuous mode, duration 5 min) and the experiment side with 2% xylocaine by the same setting of sonophoresis. Six treatments were applied to each rabbits. The treatment effect included immediate and cumulative were assessed by the prevalence of EPN with electromyographic (EMG) recordings after the first and last treatments. **Results:** In control group, the prevalence of EPN in first or last treatment compare with the before one, the values are significant ($p = 0.00$); but between first and last treatment has no significant different. In experiment group, significant different ($p = 0.00$) by comparing prevalence of EPN in first or last treatment with the before. Last treatment has no significant different than first treatment. Compare between groups, first and last treatment effects on EPN both have no significant result ($p > 0.05$). **Conclusion:** Sonophoresis with 2% xylocaine did not inhibit the irritability of an MTrS in rabbit skeletal muscle.

0501PP50

EFFECTS OF INTRA-ARTICULAR BOTULINUM TOXIN INJECTIONS ON LOWER-LIMBS BIOMECHANICS AND FUNCTIONAL ABILITIES IN PATIENTS WITH KNEE OSTEOARTHRITIS

Lin-Fen Hsieh¹, Shih-Hui Wu¹, Sai-Wei Yang², Ching-Chieh Chou²

¹Department of Physical Medicine and Rehabilitation, Shin Kong

Wu Ho-Su Memorial Hospital and ²Institute of Biomechanical Engineer, National Yang-Ming University (Taiwan)

Purpose: Intra-articular botulinum toxin (IA-BOTOX) injection is a new therapeutic option for pain management, especially for patients with refractory joint pain; however the biomechanical effects of IA-BOTOX injection is still unknown. This is the first study to evaluate the early effects of IA-BOTOX injection on lower-limb biomechanics and functional abilities in patients with knee OA. **Materials and Methods:** Nineteen subjects (4 male and 15 female) with knee OA and 20 normal controls (6 male and 14 female) participated in this study. Each patient with knee OA received IA-BOTOX injection (100 units in 2 ml) in the affected knee. The assessments for patients with knee OA included demographic data, WOMAC index, Lequesne index, plain films of knee joints, clinical examinations, and gait evaluation. All of the assessments were performed before and 1 week after the IA-BOTOX injection. Normal controls were assessed with only demographic data and gait evaluation once. **Results:** The severity of knee OA ranged between II and IV (grade III: 68.4%). After IA-BOTOX injection, knee pain was reduced 40%, Lequesne index (13.11 to 9.94) and WOMAC index (37.21 to 25.88) were also improved. On level walking, increased peak ground reaction force and cadence (91 to 101 steps/min) were observed. The onset time of vastus medialis (VM) firing was improved (-88.36 to -114.93 ms), the EMG intensities of VM increased 27 to 121% at all intervals, and the shock absorption ability of the knee muscles was also improved after the injection. However, the co-contraction pattern of knee muscles was not changed. No adverse effects were found after the injection. **Conclusion:** IA-BOTOX injections are suitable for knee OA patients with refractory pain, and for patients who are not suitable for medications or joint replacement. We believed that pain relief contributed to the improvement in lower-limb biomechanics and restoration of functional abilities in early phase. Further long-term follow-up of the effects and side effects of IA-BOTOX injections is indicated.

0501PP51

INTRA BACLOFEN THERAPY OF SPASTIC PARALYSIS AFTER SPINAL CORD INJURY CLINICAL ANALYSIS ON PATIENTS

Xiaoying Shang¹, Kenji Kagechika², Yasutaka Takagi³
¹Rehabilitation Hospital of Heilongjiang (China), ²Kanazawa Medical University Hospital and ³Tonami General Hospital (Japan)

Purpose: Observation and analysis of intra vote with baclofen therapy in severe spinal cord injury patients with spasticity and spasm of the effect of ADL. **Object:** July 2006 to March 2009, Japan Tonami Municipal Comprehensive Byoin received intra vote baclofen therapy in 15 patients with the target. Among them, 14 males and 1 female; mean age of 61.3 years (20-86 years). Baclofen pump implantation in 12 cases; reservation operation, 2 cases; patients do not agree with surgery for one case. According to the disease can be divided into: 12 cases of cervical spine injury; thoracic injury in 1 case; spastic paralysis of lower limbs in 2 cases. **Materials and Methods:** In this study, Ashworth Evaluation and Kenny-style self-health management evaluation method before and after ITB therapy for spasticity of the changes in clinical observation and evaluation. **Results:** Ashworth score before administration of the average 3.08±0.73; after administration of 1.35±0.71, a significant improvement. Efficiency is 93.3%. Significant improvement in spasticity, while QOL improved, with cases also reduced. However, two cases of catheter loss, seizures again after surgery to improve again. **Discussion:** ITB therapy can improve the central spasmolytic spastic invalid, because the body buried in the baclofen pump, so the long-term maintenance of efficacy. However, issues such as catheter loss ITB therapy should be an important part of postoperative management.

0501PP52

SELECTIVE INNERVATION OF SACRAL ANTERIOR ROOTLETS TO MICTURITION AND ERECTION FUNCTION IN RATS

Wen-Ting Wang, Mou-Wang Zhou, Hong-Shi Huang, Ya-Ping Chen, Yan-Yan Yang, Fan-Shuo Zeng
Department of Rehabilitation Medicine, Peking University Third Hospital (China)

Purpose: To investigate the selective innervation of sacral anterior rootlets to micturition and erection function in SD rats. **Materials and Methods:** 40 male SD rats of clean grades, aged of 6 weeks, were selected. 10 rats were conducted retrograde nerve tract tracing study; 30 rats were chosen to do electro-physiology research: the L6-S1 spinal cord segment anterior rootlets of anesthetic rats were electrostimulated respectively, the intravesical pressure, urethral perfusion pressure and intracavernous pressure were recorded simultaneously, and innervation effectiveness was analyzed. **Results:** CB-HRP labeled neurons were observed mainly in the L6-S1 spinal cord. When some anterior rootlets of L6-S1 were electrostimulated, the intravesical pressure was increased gradually, but the urethral perfusion pressure and the intracavernous pressure curve changed slightly; when other rootlets of the same anterior root were stimulated, the urethral perfusion pressure could reach the peak maximally; while others were stimulated, the intracavernous pressure was increased quickly, but there were no great changes on intravesical pressure and urethral perfusion pressure. There were some other rootlets which could lead 2 or 3 pressures mentioned above changed simultaneously. **Conclusion:** The innervation of L6-S1 anterior rootlets to rats' bladder detrusor, external urethral sphincter and penis cavernous are significantly distinct, different rootlets can be distinguished by microanatomy and electrostimulation.

0501PP54

A CASE OF NONTRAUMATIC SPINAL CORD INJURY - HISTORICAL ASPECT OF POTT'S PARAPLEGIA

Kimihiko Nakata
EN Clinic (Japan)

Purpose: To clarify the natural history of tuberculous spondylitis or Pott's paraplegia. **Materials and Methods:** A famous Japanese Haiku and Tanka poet Masaoka Shiki, who was born in 1867 and died at the age of 34 in 1902, continued writing articles of newspapers until 2 days before his death. He made a precise description of his physical deterioration of Pott's disease at these articles in 'Bokuju-itteki' or 'Byosho-rokushaku' and in his diary 'Gyoga-manroku'. The clinical course of this historical case treated without anti-tuberculosis drugs is reported here. **Results:** When the patient was 20, he began coughing up blood due to pulmonary tuberculosis. At the age of 28 he felt severe low back pain and diagnosed as spinal caries. He underwent drainage operation for gravitation abscess and its wound remained open. After the age of 32, he became bed-ridden, suffering from paraplegia, neuropathic pain and faecal incontinence, which were probably due to the injured spinal cord. Intolerable pain during dressing change and suicide attempt were written by himself in the diary. Flexion contracture of the left knee, anal fistula, gingivitis were pointed out. But only oral morphine was administered to alleviate pain, which probably caused constipation. Approximately 7 fistulae in the back were discharging and he was afflicted by the diarrhoea caused by tuberculous colitis at the terminal stage. In autumn 1902 he was considered to have died of cachexia and respiratory failure resulting from systemic tuberculosis. One of the last poems is 'a quart of phlegm – even gourd water couldn't mop it up (translator: J. Beichman)'. **Conclusion:** Pott's paraplegia laid the case at the

sickbed for 6 years, but he was clear conscious and described his physical and mental status in clinical detail, which would show us the natural history of Pott's paraplegia.

0501PP56

SELECTIVE INNERVATION OF SACRAL DORSAL ROOTLETS TO MICTURITION AND ERECTION FUNCTION IN SD RATS

Mou-Wang Zhou, Wen-Ting Wang, Hong-Shi Huang, Gen-Ying Zhu

Department of Rehabilitation Medicine, Peking University Third Hospital (China)

Purpose: To investigate the selective innervation of sacral dorsal rootlets to micturition and erection function in SD rats. **Materials and Methods:** 40 male SD rats of clean grade aged of 6 weeks were selected. 10 rats were conducted retrograde nerve tract tracing study and microsurgical anatomy research; 30 rats were chosen to do electro-physiology research: The L6–S1 spinal cord segment dorsal rootlets of anesthetic rats were electrostimulated respectively, the bladder pressure, the urethral perfusion pressure and the intracavernous pressure were recorded simultaneously, and innervation effectiveness was analyzed. **Results:** CB-HRP labeled neurons observed in the L6S1 spinal cord. The dorsal root could be divided into several rootlets. When some dorsal rootlets of L6–S1 spinal cord segment were electrostimulated, the intracavernous pressure reached the peak rapidly, while the bladder pressure and the urethral perfusion pressure curve changed a little. When other rootlets were stimulated, the bladder pressure increased rapidly, but at the same time and the urethral perfusion pressure and the intracavernous pressure didn't change too much. When some other rootlets were stimulated, the urethral perfusion pressure could reach maximally, but there were no great changes on the bladder pressure and the intracavernous pressure. There were some other rootlets which could induce 2 or 3 pressures mentioned above to change simultaneously. **Conclusion:** There are different rootlets in the L6–S1 dorsal root which conduct bladder detrusor, external urethral sphincter and penis cavernous. The different rootlets can be distinguished by microanatomy and electrostimulation.

0501PP57

AFTER BOTULINUM A TOXIN INJECTION THE CHANGE OF MUSCLE TISSUE OF SPASTIC RAT WITH SPINAL CORD INJURY IN MORPHOLOGY AND FUNCTION

Yu Fu, Lijuan Ao, Yongmei Li, Wenli Wang

Department of Rehabilitation, the Second Affiliated Hospital of Kunming College (China)

Purpose: To establish a stable spasm model of spinal cord injury, intramuscular injection of botulinum toxin type A was applied in order to observe their morphology, spasticity and function score changes before and after injection. Spasms were observed at different times of the formation of botulinum toxin type A, after their morphology, spasticity and function score changes. To identify the effect of botulinum toxin type A to the morphology of the spasm muscle, and compare the change in the morphology of spasm muscle after the botulinum toxin type A was injected at different stage of spasm. To make it clear given after spasm after botulinum toxin type A change in their morphology, and further formed at different times to give a clear spasm botulinum toxin A. What is different from its morphology. **Materials and Methods:** Establish the model of spinal cord injury with adult SD rat, the were divided into 1-week group, 3-week group, saline group and normal control group according to the time of spasm formed. Botulinum toxin type

A injection or saline injection were applied, observe the change in electron microscopy, functional score and spasticity and compare with the normal control group 1 week and 3 weeks after injection. In the observed 1 week after injection and 3 weeks of electron microscopy, functional assessment and spastic changes at the same time, the formation of 1 week of cramps and 3 weeks after the injection of botulinum toxin type A groups of the electron microscope, function and spasticity score for comparison. **Results:** 1) compare before and after injections: after the formation of spastic model, electron microscope results indicate that: sarcomere was shortened significantly, muscle wire was in disorder, H-zone shortened, the number of mitochondria glycogen reduced. After the injection of botulinum toxin type A significant change in sarcomere length, myofilament disarray, Z-line drift, H band broadens, and markedly increased mitochondrial swelling, glycogen is also increased in the number. 3 weeks after injection, sarcomere length is longer than 1 week after injection. Function score: BBB ratings are part of the improvement, Ashworth score also significantly reduced. 2) spasticity formed after 1 week and 3 weeks compared: electron microscopy results showed that: cramps 3 weeks than 1 week shorter sarcomere, Z-line drift is more obvious, H-zone with a significantly reduced compared with 1 week. In the post-injection of botulinum toxin type A has a variable-length sarcomere, mitochondria swelling and the Z-line drift, but the sarcomere length of the 3 weeks group compared with the injection of more 1-week group before the opposite. Function score: the improvement of function after injection of both, BBB ratings are part of the increase, Ashworth score also significantly lower function scores slightly better three weeks than 1 week. **Conclusion:** 1) A-type botulinum toxin can significantly reduce the level of muscle spasm; 2) in the morphology the reduction of the muscle spasm degree of the 3 weeks after injection is better than 1 week after injection; 3) part of muscles function improvement has been achieved after injection of botulinum toxin type A; 4) the reduction of the spasm is much higher in the 3rd weeks group than that of the 1st week group.

0501PP58

EXPERIENCE OF INTRATHECAL BACLOFEN (ITB) THERAPY TO SEVERE SPASTICITY

Yasutaka Takagi¹, Hiroshi Yamada¹, Yoshimitsu Kanazawa¹, Wataru Nasu¹, Hiroyuki Tanaka¹, Shingo Shimozaki¹, Kenji Kagechika²

¹Tonami General Hospital and ²Kanazawa Medical University (Japan)

Purpose: To determine the outcome of intrathecal baclofen (ITB) therapy in patients with severe spasticity. **Materials and Methods:** The baclofen of 50 µg was administered to 18 patients who had severe spasticity due to 16 spinal cord injury, 1 cerebral infarction, 1 hereditary spastic paraplegia in lumbar puncture as a schooling injection, and the pump burial operation were performed to 13 patients. The change of the spasticity was evaluated by the Ashworth score points. **Results:** The improvement of the spasticity was remarkably admitted in all cases, and the pain from the spasticity disappeared. The pain was reduced by adjusting the amount of the medicine without the exacerbation of the spasticity and it became former walking ability though it became difficult to walk temporarily by reducing the spasticity in the cases who could walk before. Moreover, there was a case to whom the substantial contents of rehabilitation was able to be done by improving the spasticity, too. Two catheter-related complications were found. Additional operations of the exchange of the catheter were needed. The improvement of the spasticity was recovered of additional operations. **Conclusion:** The spasticity of the pain who doesn't obtain the improvement by the taking treatment is improved enough, and the reduction of the pain is seen, and the ITB therapeutic effect is expected that the improvement of patient and family's QOL can be attempted from the experience of these series.

0501PP59

SPINAL CORD INJURY CAUSED BY LONG-TERM NECK EXTENSION IN A PATIENT WITH C-SPINE HERNIATED INTERVERTEBRAL DISK – A CASE REPORT

Yi-Ling Chen, Yung-Tsan Wu, Shin-Tsu Chang, Shang-Lin Chiang

Department of Physical Medicine and Rehabilitation, Tri-Service General Hospital (Taiwan)

Purpose: Discuss the pathogenetic relation between long-term neck extension and anterior cord syndrome. **Materials and Methods:** Case report. **Results:** A 39-year-old previously healthy male had habit of nap with neck extension for 30 min every day. One day, he suffered from acute four-limb weakness predominant in the bilateral legs and distal part of right hand, urinary retention, and impaired sensory of temperature and pain below the cervical region after a nap. T2-weighted image on MRI showed an area of hyperintensity over the anterior two-third region of cord and disc herniation at the C6/C7 vertebral level. Laboratory investigation showed no evidence of infections, autoimmune, inflammatory, or neoplastic causes. We hypothesized that he developed anterior spinal cord syndrome which caused by disc herniation. Treatments with steroid for 8 days and surgical intervention on the 11th day were given. The recovery of neurological function was fast and progressively good along with rehabilitation programs. **Conclusion:** The common cause of anterior cord syndrome was hyperflexion injuries with impingement of bone or herniated disc tissue directly on the anterior spinal cord and the outcome is usually poor. However, this is a rare case showing long-term neck extension induce anterior cord syndrome. Besides, early steroid use and surgical decompression resulted in better neurological outcomes of anterior cord syndrome.

0501PP60

SPINAL CORD ATROPHY AND MOTOR RECOVERY FOLLOWING TRANSVERSE MYELITIS IN PEDIATRIC PATIENTS

Moon Suk Bang, Jung Yoon Kim, Sang Jun Kim

Department of Rehabilitation Medicine, Seoul National University College of Medicine (Korea)

Purpose: To investigate relationship between spinal cord atrophy and motor recovery following transverse myelitis in pediatric patients **Materials and Methods:** A Retrospective case-control study was performed in one tertiary children's hospital in Seoul, Korea. Subjects were children who were diagnosed as transverse myelitis from January 1995 to January 2009 and undertook initial and follow-up MRIs. Medical records and spine MRI scans were reviewed to find out whether clinical improvements in motor weakness had occurred and spinal cord atrophies had developed on follow-up MRIs. Spinal cord atrophy was defined as an abnormal thinning of the spinal cord in the sagittal plane in two segments or more beyond the limits of vertebral injury and reduction in spinal cord area $\geq 50\%$ in more than two consecutive transverse planes. It was confirmed by radiologists. Atrophic changes were also measured in cross-sectional areas using an image processing program, Marosis M-view 5.4 (Marotech Inc., Seoul, Korea). Improved motor power was defined as elevation of one or more grades in Medical Research Council grades. The chi-square test was used and the odds ratio was calculated. A probability of $p < 0.05$ was taken as statistically significant. All statistical analysis was done using SPSS 17.0 for windows. **Results:** Nineteen patients were selected (8 males and 11 females, onset age 5.6 ± 3.8 years). Initial MRI was taken 5.2 ± 8.9 days after the onset. Interval between initial and follow-up MRIs was 56.2 ± 113.4 days. Seven patients had developed spinal cord atrophies and 12 patients had not. Of the 7 patients with spinal cord atrophy, 6 showed no motor recovery. Among 12 patients without atrophy, 11 had motor improvement except one. There was

statistically significant difference in the chances of motor improvement between groups with and without spinal cord atrophy (odds ratio = 66.0, 95% CI [3.472-1254.567], p -value = 0.002). Decrease in CSA of the atrophied segment was $35.1 \pm 13.2\%$ from the initial one. **Conclusion:** Pediatric patients with transverse myelitis who had developed spinal cord atrophy on follow-up MRIs had poor motor recovery than those who had not. The appearance of spinal cord atrophy on MRI could be an indicator of poor prognosis in pediatric transverse myelitis.

0501PP61

INTRADURAL SPINAL ARACHNOID CYSTS ASSOCIATED WITH SPINAL CORD INFARCTION: A CASE REPORT

Chun-Ching Chang^{1,2}, Li-Wei Chou^{1,3,4}

¹Department of Physical Medicine and Rehabilitation, China Medical University Hospital, ²Graduate Institute of Integrated Medicine, China Medical University, ³School of Chinese Medicine, College of Chinese Medicine, China Medical University and ⁴Department of Physical Therapy, China Medical University (Taiwan)

Purpose: We report a case of spinal arachnoid cyst related to spinal cord infarction. This 43-year-old female with end-stage renal disease suffered from progressive left abdominal distention and pain accompanied with acute onset of bilateral lower limb weakness and numbness during her regular renal dialysis. High-grade fever was also noted. **Materials and Methods:** Intestinal obstruction was considered and abdominal-pelvic computed tomography (CT) revealed a left tubulo-ovarian abscess with compression of sigmoid colon. After treatment with drainage of the abscess and antibiotics use, her abdominal symptoms and fever got resolved but weakness of bilateral lower limbs with numbness still existed with exacerbation into nearly paraplegia. Magnetic resonance imaging (MRI) of the thoracic spine showed linear hyperintensity in the center of T1 to T5 spinal cord on T2-weighted image. Spinal cord infarction with paraplegia was considered and rehabilitation program was arranged. At a three-month later MRI follow-up, a longitudinal subdural arachnoid cyst at T5 to T7 level with anterior compression of the spinal cord was discovered, but there was no worsening of her neurologic symptoms. Unfortunately, one month later worsening of her neurologic symptoms was noted including pain sensation, trunk weakness and autonomic dysfunction with orthostatic hypotension. **Results:** Surgical intervention with T5 to T7 laminectomy for decompression and removal of the arachnoid cyst was performed. Her recovery was excellent and she could walk without walking assist for a short distance at eight months after the operation. **Conclusion:** This case reminded us that the formation of spinal arachnoid cyst could be related to spinal cord infarction, and provided a good example for further understanding about the mechanism of spinal arachnoid cyst formation.

0501PP62

TREATMENT FOR PATIENTS WITH SPINAL CORD INJURY BY TRANSPLANTATION OF AUTOLOGOUS BONE MARROW STEM CELLS IN 5 CASES

Gongwei Jia, Lehua Yu

The Second Affiliated Hospital of Chongqing Medical University (China)

Purpose: To discuss the possibility of treatment for patients with spinal cord injury by transplantation of autologous bone marrow stem cells in human. **Materials and Methods:** Bone marrow was harvested (about 200 ml) from patient's ilia. To get the bone marrow stem cells (BMSC), bone marrow was processed by Marrow & Cord Blood Stem Cells Isolating Reagents produced by Ningxia Zhonglianda Biotech Co., Ltd. The final preparation of BMSC were

infused into subarachnoid space. At different time (1st week, 4th week, 8th week) after transplantation, ASIA were detected, and improve of symptom were investigated. **Results:** The patient's ability to control urine improve greatly who has urination disorder and the score of the ASIA has no improvement at 1st week after transplantation of bone marrow stem cells. And at 8th week, the motor score improve at least 14, the pin prick score improve 4-10, and the light touch score improve 4-6 only. **Conclusion:** ASIA were significantly improve after bone marrow stem cells transplantation, especially on the ability of motor, the treatment of bone marrow stem cells transplantation is safe and effective.

0501PP63

THE EFFECTS OF FUNCTIONAL ELECTRICAL STIMULATION WITH CYCLING TRAINING FOR LOWER LIMB IN SPINAL CORD INJURY PATIENTS

Ninghua Wang, Xin Wang, Bin Xie, Rongli Wang

Department of Physical Medicine and Rehabilitation (China)

Purpose: To review the effects of functional electrical stimulation cycling training in the spinal cord injury patients, and there provide the evidence base for the clinical application. **Materials and Methods:** We did the literature search from medical databases, like OVID and MD consult core service for recent 10 years, the 38 of all articles were chosen for our target reference. These target articles were met the inclusion criteria on the base of the Cochrane Collaboration Method to minimize the bias. **Results:** The article showed that functional electrical stimulation with cycling training in the spinal cord injury patients could reduce the spams muscle tone, improve weakness muscle strength, and knee extensor power output with higher cycling speed. The results also showed that bone mineral intensity was increased after training with 1 hr per time, 3-4 times each week for 12 months. The positive physiological effects such as cardiopulmonary function and cardiovascular function were also demonstrated. **Conclusion:** The functional electrical stimulation with cycling training has become a useful method for improvement of functional ability and quality of life of patients who suffered from spinal cord injury.

0501PP64

YOLK SAC TUMOR IN THE SPINAL CORD – A CASE REPORT

Sun Mio¹, Shan-Ju Lin², Yen-Ho Wang¹

¹Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital and ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital YunLin Brand (Taiwan)

Yolk sac tumor, so called endodermal sinus tumor, is the rarest germ cell tumor. The germ cell tumor generally arises in the gonads, and the incidence of primary central nervous system (CNS) has been reported to be 2.8% in Japan. The CNS lesion is often within intracranial area, rarely primarily in spinal cord. Here we presented a case of primary yolk sac tumor in thoracic spinal cord. This 9-year-old boy was admitted with the complaint of progressive bilateral lower limbs weakness in one week in July 2009. The physical examination revealed muscle power grading 3 of 5 over bilateral lower extremities without evidence of sphincter dysfunction. The magnetic resonance imaging (MRI) of thoracolumbar spine showed multiple T-spine intradural extra- and intra-medullary tumors with cord compression. His alpha-fetoprotein (AFP) was measured as up to 984.46 ng/ml. Only partial resection could be performed due to unclear margin between the tumors and the spinal cord. The histological examination showed yolk sac tumor. And no suspicious primary tumor was noted in the brain, abdominal, and pelvic computerized tomography (CT). Postoperatively, paraplegia with neurogenic blad-

der and bowel were noted, and the boy received several courses of chemotherapy. The rehabilitation program for balance control and upper limbs strengthening were prescribed. During hospitalization in November 2009, there was minimal neurological improvement including temperature sensation, trace muscle power in trunk flexor, but his neurological status still remained T4 paraplegia. Follow-up AFP was within normal ranges. The cervicothoracic spine MRI showed no recurrent tumor.

0501PP65

LONG-TRM SURVIVAL OF SPINAL CORD INJURIES ADMITTED TO THE REHABILITATION WARD OF A MEDICAL CENTER

Yu-Ren Chen¹, Huey-Wen Liang¹, Yen-Ho Wang¹, Fu-Chang Hu²

¹Departement of Physical Medicine and Rehabilitation, College of Medicine, National Taiwan University and ²National Center of Excellence for Clinical Trial and Research, National Taiwan University Hospital (Taiwan)

Purpose: To follow up the mortality and calculate the standard mortality ratio for traumatic spinal cord injuries (SCI) who was admitted for in-patient rehabilitation in a medical center. **Materials and Methods:** 183 patients (150 men and 33 women) with acute spine cord injuries and admitted to a rehabilitation ward from 1989 to 1997 were included in the current study. The date and cause of death was obtained by linking to the mortality database till 2007 provided by Bureau of Vital Statistics of Department of Health, Taiwan. Standardized mortality ratios (SMRs) were calculated and compared with the mortality of general population in the Taipei County. **Results:** Forty-two cases (23.0%) were deceased at the end of follow up, with an average follow-up period to be 12.7 years. The leading cause of death recorded by the database was malignancy. SCI patients in the cohort had a significantly increased mortality compared to the general population. SMR was significantly higher for women than for men (65.0 vs. 40.8), and higher in patients with complete tetraplegia compared to patients with paraplegia (64.7 vs. 44.8). Those cases injured in a young age also had a high mortality, with the highest SMR among those injured under 20 years old (SMR: 388.9) and between 30 to 39 years old (SMR: 96.5). **Conclusion:** Although long-term survival of SCI is improving in recent decades, the life expectancy of the cohort in this study was still lower than that of the general population, especially among the young population, complete tetraplegia and females. Whether the high mortality for this group of patients was related to the post-injury care or not warranted further investigation.

0501PP66

CHARACTERISTICS OF SPINAL CORD INJURY PATIENTS IN AN ACUTE HOSPITAL

Julia Patrick Engkasan, Tze Yang Chung

University of Malaya (Malaysia)

Purpose: To describe the profile of spinal cord patients managed by a Spinal Rehabilitation Unit of an acute hospital. **Materials and Methods:** All patients managed who were wholly and partially by the Spinal Rehabilitation Unit during a 3 months period were included in the study. Demographics data of both in-patients and out-patients were collected and analyzed. **Results:** There are more males (70.2%) than females in the study. The mean age is 43.2 years. Non traumatic spinal cord dysfunction constitutes 40.7% of the etiology. For traumatic spinal cord injury, half (51.0%) were due to transport related accident, followed by fall (35.4%). Approximately half (52.0%) has vertebral injury but only a small percentage (14.0%) has associated injuries such as traumatic brain injury, abdominal or chest injury needing surgery and major limb

trauma needing amputation. There are more paraplegia (62.0%) compared to tetraplegia (35.1%) and 59.0% have incomplete lesions. Using the American Spinal Injury Association (ASIA) guidelines, 34.5% have ASIA Impairment Scale (AIS) A, 31.0% have AIS D followed by 16.4% with AIS C and 11.7% with AIS B. The main place of discharge was to private residence (85.4%). **Conclusion:** Educating the public about transport safety and fall precautions play a role in prevention of spinal cord injury.

0501PP67

INTRADURAL SCHWANNOMA PRESENTED AS RADICULOPATHY IN PATIENT WITH ANKYLOSING SPONDYLITIS – CASE REPORT

Wei-Hao Sung, Fong-Cheng Lin, Mu-Jung Kao, Ching-Yang Lin

Department of Rehabilitation Medicine, Taipei City Hospital (Taiwan)

Schwannoma is a common spinal cord tumor. The most initial presentation is pain, which may be confused with degenerative spinal disease. Moreover, it seems to be more difficult in patients complicated by ankylosing spondylitis. A 50-year-old male patient was presented with right mid-back pain in root distribution. He was first treated as subacute radiculopathy from degenerative disease or esthesitis resulted from ankylosing spondylitis. Due to failure of treatment with anti-inflammatory agents and physical modalities, magnetic resonance image was arranged and showed a mass at T8 level with high signal intensity on T2-weighted image, with low signal intensity on T1-weighted image. Resection of tumor was performed and symptoms were relieved after excision. It is important to differentiate schwannoma from other disease with similar presentation, especially in patient with ankylosing spondylitis. The better outcome relied on the earlier diagnosis.

0501PP68

BARRIERS TO EXERCISE IN SPINAL CORD INJURED PARAPLEGICS

Tze Yang Chung, Nazirah Hasnan, Julia Patrick Engkanan
University of Malaya (Malaysia)

Purpose: To determine the levels of involvement of spinal cord injured paraplegics in exercise, their associated demographic factors, and their perceived barriers to exercise. **Materials and Methods:** Fifty four subjects, with the diagnosis of acquired Spinal Cord Injury (SCI) at level T2 and below for at least 1 year, wheelchair dependent and who were attending the spinal rehabilitation clinic in a tertiary hospital during the study period, were asked to complete a self reported questionnaire. The questionnaire consists of demographic characteristics, injury details, pre and post injury exercise status and a pre-generated list of common barriers to exercise. **Results:** The mean age of the subjects ($n=54$) is 36 years. Male to female ratio was 7:3. More than half of them were involved in some form of exercise (69%). Only 11 (20%) exercised at least 5 times a week for at least 30 min duration while another 10 (27%) exercised at least 3 times a week for the same duration. The only significant association amongst them was income levels of RM1000 and below ($p=0.005$). Their pre injury exercise status was not associated with current status of exercise. Two most common exercises performed were propelling their wheelchairs (30%) and sports (24%). The top five perceived barriers are 'lack of equipment and facilities' (57%), 'weather is too hot' (33%), 'too lazy' (24%), 'no transportation' (22%) and 'exercise causes pain' (22%). Those who had more negative perceptions were less likely to exercise. **Conclusion:** The prevalence of exercise in this study is surprisingly high compared to the general population. Other than the usual environmental and motivational factors, warm weather is an important barrier to exercise in a tropical country.

0501PP69

INJURY-INDUCED MIGRATION OF WHITE MATTER ASTROCYTES IS INFLUENCED BY MAGNETIC STIMULATION

Zheng-Yu Fang, Xiao-lin Huang, Zhe Li, Jiang Xu, Yi-Zhao Wang, Jie Huang

Tongji Medical College, Huazhong University of Science and Technology (China)

Purpose: To investigate the effects and underlying mechanism of magnetic stimulation on injury-induced migration of white matter astrocytes. **Materials and Methods:** 24 adult healthy SD rats were selected to inject 0.5 ml of 1% ethidium bromide (EB) in PBS into the dorsal spinal cord funiculus on the left side at the T10–11 level to make located spinal cord injury models. Then they were randomly divided into four groups (A, B, C and D). Groups A, B, C and D were exposed to 1 Hz pulsed magnetic stimulation underwent 5-min sessions on 14 consecutive days at the following levels: 0T (Group A); 1.9×40% T (Group B); 1.9×80% T (Group C); 1.9×100% T (Group D). On the day 14 after stimulation, the rats were killed and the expression of glial fibrillary acidic protein (GFAP), microtubule associated protein-2 (MAP-2), extracellular signal-regulated kinase1/2 (ERK1/2) and the volume of holes were detected with immunohistochemistry. Quantitative analysis of the expression of GFAP, MAP-2 and ERK1/2 were performed with the image analysis system. **Results:** With the increase of magnetic stimulation intensity, the volume of hole decreased at day 14 ($p<0.05$). In lesion areas, the expression of GFAP and ERK1/2 could be seen, while that of MAP-2 did not change before and after magnetic stimulation. Significant difference was revealed in the expression of GFAP, ERK1/2 among the four groups. It was significantly higher in the magnetic stimulation groups than that in the control group ($p<0.05$). After magnetic stimulation, astrocytes migrated into the hole. U0126, a potent and selective MEK1/2 inhibitor, inhibited up-regulation of pERK1/2 which was stimulated by magnetic stimulation. **Conclusion:** Our results showed that magnetic stimulation increases the migratory capacity of reactive white matter astrocytes in the injured center nervous system, which may be associated with activation of MEK1,2/ERK mitogenic pathway.

0501PP70

RESPIRATORY MANAGEMENT STATUS OF PATIENTS WITH ACUTE TRAUMATIC CERVICAL SPINAL CORD INJURY WHO ADMITTED TO AN ACUTE CARE HOSPITAL WITH EMERGENCY CARE CENTER

Kozo Hanayama, Takashi Kasahara, Mitsuhiro Kodama, Yuji Koyama, Yoshihisa Masakado
Tokai University (Japan)

Purpose: To know respiratory management status and prognosis in patients with acute traumatic cervical spinal cord injury (SCI) who admitted to an acute care hospital with emergency care center not specialized for SCI. **Materials and Methods:** We reviewed the medical records of the patients with acute traumatic cervical SCI who admitted to our hospital between October 2003 and March 2009 and discharged until September 2009. The patients who admitted within 24 hours from injury and remained ASIA impairment scale (ASIA-IS) A, B or C through the hospital stay were included. The patients who were complicated with severe brain injury and/or had preexisting neurological disorder were excluded. We examined demographic data, length of stay (LOS), ASIA-IS, neurological injury level, associated injuries, co-morbidities, complications, ventilator use, tracheostomy surgery, use of noninvasive positive pressure ventilation (NPPV), use of mechanically assisted coughing (MAC) and respiratory management status at discharge from our hospital. **Results:** Sixty-four patients (9 females, aged 58.2 on average (19–89 years old)) met the criteria. Twenty-seven patients were classified into ASIA-IS A, 6 into B and

31 into C, respectively. The injury level of 15 ASIS-IS A patients and 1 ASIS-IS B was C4 and above. Three ASIA-IS A patients died during hospitalization. Their direct causes of death were not respiratory complications. Among 61 patients excluded these patients, LOS was 11–625 days (median 56 days). All of them were transferred to rehabilitation hospitals or long-term care hospitals. Twenty-six cases (43%) were intubated and managed with ventilators, 19 were tracheostomized (73% of intubated cases) and 3 patients discharged on ventilator. Sixteen cases were weaned and discharged with tracheostomy. LOS of the patients with ASIA-IS A, B and C was 98, 59 and 44 days on average, respectively. LOS of the patients with and without tracheostomy was 111 and 50 days on average, respectively. Nocturnal NPPV was applied for 2 patients and MAC for 8. MAC was used one or two sessions daily with +40 cm H₂O for insufflation and –40 cm H₂O for exsufflation through the tube in 4 patients and with face mask in 4 patients. All of 4 patients through the tube were finally undergone tracheostomy. All of 4 patients used MAC with face mask did not get intubated even if the patient's cough peak flow (CPF) was as low as 60 L/min. **Conclusion:** Acute traumatic cervical SCI patients who admitted to an acute care hospital with emergency care center had high rate of intubation, especially ASIA-IS A and B. Most intubated patients were weaned but many discharged with tracheostomy. There was still little use of NPPV and MAC, but the introduction of a comprehensive system seemed to be necessary to improve respiratory status of acute cervical SCI.

0501PP71

THE EFFECTS OF COMPREHENSIVE REHABILITATION THERAPY ON MUSCLE SPASTICITY IN PATIENT WITH SPINAL CORD INJURY – ONE CASE REPORT

Xiang-dong Xu

Department of Rehabilitation Medicine, Zhongnan Hospital, Wuhan University (China)

Purpose: To observe the effects of comprehensive rehabilitation therapy on muscle spasticity in patient with spinal cord injury. **Materials and Methods:** One patient with thoracic spinal cord injury complicated with muscle spasticity were treated with exercise therapy, heat pad and automatic compression system, etc. The modified Ashworth Scale was used to evaluate the change of spasticity of the patient. **Results:** The score of modified Ashworth Scale was improved after the comprehensive rehabilitation therapy in comparing with the pretreatment state. **Conclusion:** The comprehensive rehabilitation therapy is effective for improving muscle spasticity in patient with after spinal cord injury.

0501PP72

URODYNAMIC FINDINGS IN SPINAL CORD INJURY PATIENTS

In-Gyu Kim, Hyung-Suk Sun, Jae-Young Han, In-Sung Choi, Sam-Gyu Lee

Department of Physical and Rehabilitation Medicine, Research Institute of Medical Sciences, Chonnam National University Medical School & Hospital (Republic of Korea)

Purpose: Neurogenic bladder is a very common complication in spinal cord injury patients. Urodynamic study is the gold standard for the evaluation of the function of bladder and urethral sphincter and recommended to be conducted on a regular basis to evaluate changes in bladder function after spinal cord injury. The aim of this study was to investigate the characteristics of urodynamic findings in spinal cord injury patients. **Materials and Methods:** We retrospectively reviewed the medical records of the urodynamic study in 109 spinal cord injury patients (86 males, 23 females; age 43.0±12.7 years; duration 18.1±15.9 months; complete injury 51 patients, incomplete injury 58 patients; cervical 43 patients, thoracic 51 patients, lumbar 5 patients, cauda equina 10 patients) admitted to the rehabilitation unit of Chonnam National University Hospital from January 2004 to

June 2009. The patients with traumatic brain injury, previous renal or bladder diseases, and peripheral polyneuropathy were excluded. Urodynamic study (Urolab Janus-V, Life-Tech Inc., Texas, USA) was performed in all patients. Voiding senses were checked and ice and warm water tests were performed. Maximum cystometric capacity, compliance of detrusor muscle, reflex of detrusor muscle, maximal detrusor pressure, and urethral pressure profile were analyzed. We used the anatomical classification of neurogenic bladder by Wyndale, which were the part above the 10th thoracic cord, that between the 10th thoracic cord and the 2nd lumbar cord, and that below the 2nd lumbar cord. **Results:** 1) According to the anatomical classification of neurogenic bladder, neurological level of injury was above T10 in 78 patients, between T1–L2 in 20 patients, and below L2 in 11 patients. 2) The lower the level of injury was, the higher the compliance of detrusor muscle was and the lower its reflex was, however, it was not statistically significant ($p>0.05$). There was no significant correlation between the level of injury and the activity of detrusor muscle ($p=0.142$). 3) In the patients whose level of injury were above T10, no significant differences were observed in the tonicity, reflex and activity of detrusor muscle according to the completeness ($p>0.05$). 4) There was a significant correlation between the reflex of detrusor muscle in the urodynamic study and the infusion volume in the ice water test ($r=0.346$, $p=0.045$), however, no significant correlation between the maximum cystometric capacity and the infusion volume in the warm water test ($r=0.291$, $p=0.095$). 5) In the patients whose level of injury were above T10, no significant difference was observed in the tonicity, activity and reflex of detrusor muscle according to the existence of voiding sensation. **Conclusion:** Urodynamic study findings according to the anatomical classification of neurogenic bladder are not consistent in spinal cord injury patients. Therefore, it would be necessary to apply a patient-specific individualized bladder management program in spinal cord injury patients.

0501PP73

EFFECT OF RECIPROCATING GAIT ORTHOSIS(RGO) IN THE TREATMENT OF LOWER EXTREMITY IN PATIENTS WITH THORACIC SPINAL CORD INJURY

Qin Yang, Ya-tao Ouyang, Dan Tang, Yan-ling Zhao, Yuan-bao Li

Fraternity Rehabilitation Hospital (China)

Purpose: To explore the effect of reciprocating gait orthosis (RGO) on muscle spasticity and activity function of the affected lower extremity in patients with thoracic spinal cord injury. **Materials and Methods:** By 15 cases of thoracic (T1–T12) spinal cord injury patients with lower limb muscle spasm assembly Reciprocating gait orthosis (RGO), respectively, give them the compensatory and residual strength training, balance training, balance of walking training within Parallel rod, walking training by walkers and elbows Shui indoor or outdoor before and after assembly. Then use Modified Ashworth Spasticity Scale (MAS), 6 min walking distance test and Barthel index to evaluate the treatment efficacy. **Results:** The patient's walking ability and ADL ability improved significantly compared with before ($p<0.01$), their lower limb muscle cramps are also ease differently ($p<0.05$); They achieve functional walking essentially. **Conclusion:** The selection of Reciprocating gait orthosis can significantly improve the walking and ADL ability of patients with thoracic spinal cord injury, also, there is a certain effect on improving their lower limb muscle spasm.

0501PP74

EFFECT OF RECIPROCATING GAIT ORTHOSIS (RGO) IN THE TREATMENT OF LOWER EXTREMITY IN PATIENTS WITH THORACIC SPINAL CORD INJURY

Qin Yang, Ya-Tao Ouyang, Dan Tang, Yan-ling Zhao, Yuan-Bao Li

Hunan Fraternity Rehabilitation Hospital (China)

Objective: To explore the effect of reciprocating gait orthosis (RGO) on muscle spasticity and activity function of the affected lower extremity in patients with thoracic spinal cord injury. **Materials and Methods:** By 15 cases of thoracic (T1–T12) spinal cord injury patients with lower limb muscle spasm assembly Reciprocating gait orthosis (RGO), respectively, give them the compensatory and residual strength training, balance training, balance of walking training within Parallel rod, walking training by walkers and elbows Shui indoor or outdoor before and after assembly. Then use Modified Ashworth Spasticity Scale (MAS), 6 minutes walking distance test and Barthel index to evaluate the treatment efficacy. **Results:** The patient's walking ability and ADL ability improved significantly compared with before ($p < 0.01$), their lower limb muscle cramps are also ease differently ($p < 0.05$); They achieve functional walking essentially. **Conclusion:** The selection of Reciprocating gait orthosis can significantly improve the walking and ADL ability of patients with thoracic spinal cord injury, also, there is a certain effect on improving their lower limb muscle spasm. **Key words:** Reciprocating gait orthosis; spinal cord injury; lower limb; muscle cramps; motor function.

0501PP75

STANOZOLOL IN OSTEOPOROSIS MANAGEMENT AFTER SPINAL CORD INJURY: A CASE REPORT

Michael Acuff

Physical Medicine and Rehabilitation, University of Missouri Columbia (United States)

Purpose: A case report of a 66 year old female with L2 complete paraplegia, 49 years post-injury, severe osteoporosis, treated with the anabolic steroid Stanozolol. **Materials and Methods:** The patient underwent DEXA scan for osteoporosis monitoring: T-scores were 1.6–5.4, and –5.6 at the lumbar spine, femoral neck, and hip, respectively. She initiated off-label treatment with Stanozolol, an anabolic steroid, 2 mg twice daily, compounded by a local pharmacy. The patient continued her previous standard osteoporosis treatment, including a bisphosphonate and calcium with Vitamin D supplementation. She also received 1 month treatment with Ergocalciferol 50,000 units weekly for Vitamin D deficiency. **Results:** Following four months of treatment, T-scores improved to 2.1, –3.6, and –3.6 at the lumbar spine, femoral neck, and hip, respectively. Liver function tests remained in normal range. The patient complained of hirsutism and acne, and following the repeat DEXA scan, Stanozolol dose was reduced. **Conclusion:** Stanozolol was used successfully for the treatment of osteoporosis in one spinal cord injury patient. Future studies should evaluate the efficacy and side effect incidence of Stanozolol for osteoporosis management in a larger spinal cord injury population.

0501PP76

SPINAL CORD INFARCTION PRESENTING WITH URINARY RETENTION

Lin-Yi Wang, Bin-Chi Chang

Chang Gung Medical Foundation, Kaohsiung Branch (Taiwan)

Spinal cord infarct is an uncommon disease, and frequently presenting with motor weakness. It is rare that urinary retention as the first presentation of a spinal cord infarct. To our knowledge, there were only 3 cases reported. We report a case diagnosed as T6 spinal cord infarct presenting as urinary retention after a surgery of aortic aneurysm. A 56 year-old man visited PM&R clinic with a chief complaint of urinary retention for 3 months. The patient received a repair surgery for type B aortic aneurysm, and complicated with right hemiparesis 5 weeks after the operation. Brain MRI was done under the impression of stroke by a neurologist, and revealed bilateral multiple embolic cerebral infarctions. The weakness related to the stroke recovered well gradually, and he could ambulate with mild support. After the stroke, several episodes of urinary tract infection (UTI) developed and were treated with

antibiotics successfully. However, urinary retention persisted and failed to remove the indwelled catheter. An urologist was consulted, and ordered urodynamic study with a tentative diagnosis of neurogenic bladder. The urodynamic study showed detrusor hyporeflexia with decreased sensation, detrusor-sphincter dys-synergia (DSD), marked post-voiding residual without evidence of outlet obstruction. Plain film of lumbosacral spine revealed minimal L5/S1 spondylolisthesis. He was referred from the Urology Department for intermittent catheterization program (ICP) because of persistent urinary retention although been treated with bethanecol and tamsulocin. The neurological examination showed clear consciousness with mild impaired memory, no obvious motor weakness in four limbs, impaired light touch sensation below bilateral inguinal areas, impaired proprioception at bilateral big toes, and hyperreflexia in right upper and bilateral lower extremities. He was admitted to PM&R ward under the impression of thoracic spinal cord infarct with neurogenic bladder. T spine MRI, intermittent catheterization program, standing balance training, and ambulation training were arranged. The MRI showed recent spinal cord infarction in posterior aspect of T3 to T8 level (mostly in T6 level) and no obvious thecal sac compression at the lumbosacral level. Seven weeks after starting the ICP, he had a balance bladder. He was ambulatory independently later and discharge. Follow-up urodynamic study showed detrusor hyperreflexia with DSD and small capacity, which were compatible with spastic type neurogenic bladder. During the 2-year follow-up in the clinic, his endurance and gait pattern gradually normalized, only one episode of UTI developed, and with normal renal sonographies.

0501PP77

A RANDOMISED CLINICAL TRIAL TO INVESTIGATE THE EFFECTS OF ORAL INTAKE OF WATER IN PATIENTS WITH DYSPHAGIA

Martha J.P. Karagianni^{1,2}, Leonie K. Chivers³, Tom C. Karagiannis^{4,5}

¹Manager Allied and Community Health, West Wimmera Health Service, ²Founding Director, Darebin Aged Care Health Service, ³Speech Pathologist, Latrobe Regional Hospital (Australia), ⁴Senior Research Officer, Trescowthick Research Laboratories, Peter Mac-Callum Cancer Centre and ⁵Department of Pathology, the University of Melbourne (Australia)

Purpose: We designed a relatively large-scale, randomised-control prospective study, to investigate the following:

- the effects of water aspiration in dysphagic patients prescribed thickened fluids;
- the hydration levels in dysphagic patients on thickened fluids only compared to dysphagic patients on thickened fluids and water;
- the quality of life and satisfaction levels of dysphagic patients on thickened fluids only compared to dysphagic patients on thickened fluids and water. **Materials and Methods:** A total of 100 patients were randomly assigned either to the control group (thickened fluids only) or to the study group (thickened fluids and free access to water). Patients were examined for chest status, temperature changes and hydration levels. Furthermore, quality of life surveys were administered at the end of the monitoring and intervention or control phases depending on the group in which patients were assigned. **Results:** Our findings suggest a significant increase in aspiration pneumonia in patients allowed access to water compared to the control group. However, further analysis of our observations indicates that only a subset of patients, namely, those with no or very low mobility developed aspiration pneumonia. Further, our findings indicate an increase in total fluid intake in patients allowed free access to water, and patients in the study group noted significant improvements in quality of life. Overall, our findings reaffirm the difficulties associated with the management of patients with dysphagia. **Conclusion:** On the basis of our findings we recommend that, only sub-acute patients with relatively good mobility, be considered for placement on free water protocols. In addition, we

recommend that these patients be closely monitored for 24-36 hours post implementation for adverse effects. Further research should be aimed at clarifying the risk factors for aspiration pneumonia in sub-acute patients with dysphagia.

0501PP78

INDIVIDUAL SPINAL DORSAL RAMUS DYSFUNCTION CAUSING LOWER BACK PAIN (SPINAL DORSAL RAMUS SYNDROME)

Lingju Zhou¹, Carson Schneck², Zhenhai Shao³

¹Jefferson Medical College, ²Temple University School of Medicine (United States), ³Nanjang Medical University (China)

Purpose: To review the relationship between the spinal dorsal ramus and low back pain, including the anatomy, clinical findings, pathogenesis and treatment of low back pain. **Materials and Methods:** The literature on spinal dorsal ramus and low back pain was reviewed along with a summary of the author's extensive experience. **Results:** Each spinal dorsal ramus arises from the spinal nerve and then divides into at least medial and lateral branches. The medial branch supplies the tissues from the midline to the facet joint line and innervates two to three adjacent facet joints and their related soft tissues. The lateral branch innervates the tissues lateral to the facet joint line. Clinically, an individual dorsal ramus dysfunction secondary to segmental nerve distortion or compression can cause low back pain. The patients with spinal dorsal ramus syndrome can present unilateral or bilateral low back pain. In the acute phase, patient usually complains of unilateral low back pain with radiation to the ipsilateral iliac and buttock. Some patients may present ipsilateral paraspinal muscle spasms. In the chronic phase, low back pain can be bilateral and paraspinal muscle spasm may be absent. The pain never radiates below the knees. During the physical examination, the patient usually points the pain at lower back or lateral iliac crest. When palpating patient's spinous processes, there is a step-off and deep tenderness at the intraspinous processes. At the same level, there is also a deep tenderness at the conjunction of the lateral facet joint and proximal transverse processes ipsilaterally with pain radiating to the distal complaining site (referral pain area). The level of step-off intraspinous processes and deep tenderness of the lateral facet are usually at two to three segments of vertebrae above the referral pain area depending on involvement of the median and/or lateral branches. Based on clinical presentation and anatomy, the involved dorsal ramus can be localized. The diagnosis can be confirmed by relief of low back pain and muscle spasm by a single injection to the involved spinal dorsal ramus. Etiologically, any factor which stimulates the spinal dorsal ramus can cause low back pain. A mild low back injury such as twisting low back or awkward positioning during sitting, standing, weight lifting or acute compression fracture causing vertebra deformity, which irritates or strains the spinal dorsal ramus, can cause acute low back pain. Facet joint hypertrophy, lumbar scoliosis and other chronic conditions usually cause chronic low back pain. The authors' studies found that L1 and L2 are the most common sites of dorsal rami involvement because of more mobile and free rotation at the thoracolumbar junction. Treatment includes injection to the involved spinal dorsal ramus and percutaneous neurotomy with radiofrequency or cryoablation for intractable patients. **Conclusion:** Irritation of the individual spinal dorsal ramus is a potential source of low back pain (spinal dorsal ramus syndrome). The precisely localizing the origination of low back pain is challenging. Based on the anatomy and clinical presentation, the involved spinal dorsal ramus can be localized and treated.

0501PP79

EFFECT OF APHASIA ON THE HEALTH-RELATED QUALITY OF LIFE IN PATIENTS OF CHRONIC STROKE WITH MINIMAL MOTOR DISABILITY

Chang Lochia¹, Lu Lu²

¹Graduate Program of Speech Therapy, Taipei Municipal University

of Education and ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: To investigate the effect of aphasia on health related quality of life (HRQOL) after controlling the factor of motor disability by comparing the HRQOL among chronic stroke patients of minimal motor disability with aphasia and those without aphasia. **Materials and Methods:** 26 stroke patients with aphasia were recruited in this study. The inclusion criteria were more than 6 months post onset, fair auditory comprehension (scored 5/10 or above in the comprehension subtest of Western Aphasia Battery) and minimal motor disability (Bathel index 90 or above). 23 chronic stroke patients with minimal motor disability but no aphasia were recruited as the control group. There were no significant difference between the two groups in terms of their motor stages, daily activities functions, demographic variables, and stroke-related health variables. All subjects were interviewed with the Chinese version of The Stroke and Aphasia Quality of Life Scale-39 (SAQOL-C) for assessment of their HRQOL. T test and ANOVA were used for group comparison. **Results:** Comparing to stroke patients without aphasia, the aphasic patients reported significantly lower overall HRQOL on the SAQOL-C total score (3.56 vs. 4.03, $t=3.126$), and the communication subscale (3.03 vs. 4.71, $t=8.332$), but there was no significant difference on the physical (4.16 vs. 4.32, $t=1.081$), psychosocial (3.04 vs. 3.23, $t=0.807$), and energy (3.36 vs. 3.75, $t=1.808$) subscales between the two groups. **Conclusion:** We conclude that the presence of aphasia could have adverse effect on chronic stroke patients' health related quality of life.

0501PP80

AUTOGRAFTING SATELLITE CELLS REPAIRS THE DAMAGED MUSCLE INDUCED BY CHRONIC COMPARTMENT SYNDROME IN RABBIT

Yuehong Bai, Qingtian Li, Yiming Xu, Hong Yu, Manlin Cao

The Sixth People's Hospital Affiliated to Shanghai Jiaotong University (China)

Purpose: Chronic compartment syndrome (CCS) is one cause of muscle pain in humans, interfering with tissue circulation and causing skeletal muscles damage. This paper is to investigate the regenerative effect of satellite cells used by autografts on damaged muscle. **Materials and Methods:** 24 adult rabbits were randomized 3 groups: experimental group, non-graft group and control group. The CCS model was established in experimental group and non-graft group. Transplantation was done in experimental group and control group. Satellite cells from a half of soleus muscles in experimental group and control group were isolated and then expanded in vitro. The specific protein was identified by immunohistochemistry before engraftment. DAPI-tag satellite cells were transplanted back to the remaining half of soleus muscles. The number of satellite cells with DAPI-tag was counted by Fluorescence after grafts. The histological changes were compared at the time of the last compression and at the end of the 28th day grafting respectively. **Results:** 28 days later after grafting the same number of the satellite cells, the satellite cells from the compressed soleus muscle increased significantly than before in experimental group ($p=0.013$), whereas those in control group remained the same ($p=0.076$). In HE staining, a large cluster of myofibers and interstitial fibers necrosised in compressed muscle for both the experimental group and non-graft group, while the skeletal muscle fibers and interstitial fibers were integrity in control group. After graft, the engraft muscle showed a great repair but the non-engraft muscle exhibited dominant fibrosis. **Conclusion:** The satellite cell can be activated to repair partly the damaged muscle induced by CCS once the elevated compartment pressure is in relief. Autografting satellite cells by means of a small amount of expansion in vitro could improve the regenerative efficiency to repair a large cluster of damaged myofibers induced by CCS.

0501PP81

THE DEVELOPMENTS OF SELF CARE AND DOMESTIC LIFE ASSESSMENT SCALES IN ELIGIBILITY OF PERSON WITH DISABILITIES IN TAIWAN: AN APPLICATION OF ICF MODEL

Ting-Fang Wu, Shu-Hua Shih

National Taiwan Normal University (Taiwan)

Background and Purpose: The International Classification of Functioning, Disability and Health (ICF) endorsed by World Health Organization (WHO) in 2001 have been accepted as a global model in describing an individual's health and functions. The health and rehabilitation professions use ICF pervasively as a universal language in clinical practice, research and policies. The Right Protection Act for Person with Disability which was revised in 2007 has adopted ICF as a framework to determinate the eligibility of persons with disabilities in Taiwan. However, the difficulties encountered when administrating ICF framework to clinical assessment due to the lack of an operational definitions about the qualifiers. In order to provide a standardized process for eligibility of persons with disabilities, the Disability Eligibility Assessment Scale was developed in Taiwan recently. The aims of this study are to develop the assessment scales of the 'Self-care' chapter (d5) and 'Domestic life' chapter (d6) of the Disability Eligibility Assessment Scale. **Methods:** A panel of experts from occupational therapy, physical therapy, clinical psychology social work, and the delegates of persons with disabilities were found to establish the consensus about the items of the self care and domestic life assessment scales. There are 3 phases in the development of the self care and domestic life assessment scales: 1) *Preparatory phase (phase 1):* Through extensive literature review, the preliminary items which are essential for persons with disabilities to participate in self-care and domestic life were selected. 2) *Phase 2:* Each preliminary evaluation item was discussed one by one by experts in consensus meeting to formulate the final set of the items in the scales. 3) *Phase 3:* The qualifiers which describe the limitations in participate in self care and domestic life in each item were formulated. 4) *Phase 4:* The reliability and validity of assessment scales of self-care and domestic life of the Disability Eligibility Assessment Scale will be done in 2010. **Results:** Through the above phases, 7 second level categories of chapter 5 and 4 categories of chapter 6 were included in the assessment process of eligibility of disability. Those items are d510, d520, d530, d540, d550, d560, d570, d620, d630, d640 and d650. The qualifiers of 0, 1, 2, 3 and 4 will represent the no, mild, moderate, severe, and complete problems in participating daily activities. To sufficiently distinguish the qualifiers of 0, 1, 2, 3 and 4, each second level category item was analyzed to several tasks. Each task was assigned a disability score. An individual unable to perform the task independently will earn the disability score of the specific task. Sum of the total disability scores of an item will convert to the qualifier which describes the difficulties or problems encountered when performing this item. Using participation and activities components of ICF provide a comprehensive sketch about a person with disability rather than traditional diagnostic model. **Conclusion:** The Disability Eligibility Assessment Scale using ICF framework is being designed with the goal of providing the standard procedure in assigning the eligibility of persons with disabilities in Taiwan. The evaluation items and qualifiers of d5 and d6 were formulated. The clinical pilot study of using Disability Eligibility Assessment Scale in 500 persons with disabilities will be done in 2010. In addition, the reliability and validity of Disability Eligibility Assessment Scale will also be investigated in the nearly future. We hope using ICF framework in eligibility of disabilities will lead to further interventions and accommodations to enhance participations of persons with disabilities.

0501PP82

FEMORAL SLUMP TEST: THE NORMAL NEURODYNAMIC RESPONSE IN HEALTHY POPULATION

Weng-Hang Lai¹, Yi-Fen Shih¹, Pei-Ling Lin¹, Hsiao-Li Ma²

¹Department of Physical Therapy and Assistive Technology, National Yang Ming University and ²Department of Orthopedics, Taipei Veterans General Hospital (Taiwan)

Purpose: To investigate the normal neurodynamic response of the femoral slump test in healthy population that might assist in evaluating minor femoral nerve injury in the future. **Materials and Methods:** Fourteen asymptomatic subjects (10 males, 4 females) were included in this study so far. Individuals were excluded if they had history of lower limb pathology or injury, pain in the tested knee (Right side), or scoliosis. The examiner performed the femoral slump test by pushing the thigh towards extension with full knee flexion position. The level of passive thigh extension represented the nerve tension and was measured by recording the extension range of motion (ROM) of the hip joint at the onset of pain over the anterior thigh. Two trunk positions, slump and neutral were used in order to provide different nerve tension. Cervical extension was then performed as the structural differential method in order to determine whether it would alter the pain. Visual analog score (VAS 0-100) was used for pain measurement at the onset of pain and goniometer was used to measure the hip ROM (ICC(3,3)=0.94-0.96; SEM=1.1°~1.6°). Besides, flexibility of the hip flexors and knee extensors were also measured. One-way repeated measure ANOVA was used to compare the differences in hip ROM between different trunk and neck positions (TSNF=Trunk slump + neck flexion; TSNE=Trunk slump + neck extension; TNNF=Trunk neutral + neck flexion; TNNE=Trunk neutral + neck extension). Pair t test was used to compare the VAS score between different neck positions and Pearson correlation model was used to evaluate the relationship between the muscle flexibility and the femoral slump test. The significant level was set at 0.05. We suppose thirty asymptomatic subjects will be included on April in 2010. **Results:** We found that the hip ROM in neck extension were significantly larger than in neck flexion in two trunk positions ($p < 0.001$), and were also significantly larger in trunk neutral than in trunk slump in two neck positions ($p < 0.001$). (TSNF: $-14.5^\circ \pm 6.5^\circ$; TSNE: $-11.3^\circ \pm 5.9^\circ$; TNNF: $-8.9^\circ \pm 8.2^\circ$; TNNE: $-6.5^\circ \pm 8.2^\circ$) Moreover, we found that the VAS score were significantly reduced when neck extension was performed as structure differential method after the pain was produced in both trunk positions. (Trunk slump/Neck flexion: 39.9 ± 20.9 , Neck extension: 31.6 ± 21.9 , $p < 0.001$; Trunk neutral/Neck flexion: 45.8 ± 21.5 , Neck extension: 39.7 ± 23.7 , $p < 0.001$). Low correlations were found between muscle flexibility and the level of hip extension ROM in different positions. (Thomas test: $r = -0.19 \sim -0.28$, $p > 0.05$; Ely's test: $r = -0.16 \sim -0.4$, $p > 0.05$) **Conclusion:** By changing the trunk and neck into different positions, decreasing the nerve tension could increase the level of hip extension ROM and decrease the pain intensity. These responses should be taken into account during the clinical assessment. In addition, low correlations between muscle flexibility and the level of hip extension ROM further supported the changes in neurodynamic responses mainly came from neural tissues.

0501PP83

TO DEVELOP AN ICF CORE SET FOR DISABILITY EVALUATION ON SUBJECTS WITH STROKE IN TAIWAN

Kwang-Hwa Chang¹, Shih-Ching Chen², Tsan-Hon Liou³, Hung-Yi Chiou⁴, Kuo-Lung Lee⁵, Wen-Ta Chiu⁶

¹Department of Rehabilitation, Taipei Medical University-Wan Fang Medical Center, ²Department of Rehabilitation, Taipei Medical University Hospital, ³Department of Rehabilitation, Taipei Medical University-Shuang Ho Hospital, ⁴College of Public Health and Nutrition, Taipei Medical University, ⁵Social Worker Office, Taipei Medical University-Shuang Ho Hospital and ⁶Institute of Injury Prevention & Control, Taipei Medical University (Taiwan)

Purpose: This study aimed to develop an International Classification of Functioning, Disability and Health (ICF) core set for disability evaluation on subjects with cerebral stroke (stroke). **Materials and Methods:** Using Delphi method, we conducted

a multi-center study between October 15, and December 15, 2009. According to the previous publication, a total of 144 ICF second-level categories comprised the questionnaire which was relevant to stroke. The questionnaire included 47 categories from the component body functions, five from body structures, 59 from activities and participation, as well as 33 from environmental factors. Twenty-five experienced experts and opinion leaders, including physicians, therapists, psychologists, and social workers, attended the consensus process. Using Likert's 5-point scale, the participants weighted the impact of each category on daily life performance after stroke. Then, the core set for disability evaluation was the collection of those categories with mean scale of 4.5 or more. **Results:** The core set for disability evaluation for stroke contained 19 categories. They represented 13% of the total relevant categories for stroke. Of them, five categories (b110 consciousness functions, b114 orientation functions, b117 intellectual functions, b730 muscle power functions, and b770 gait pattern functions) were from the component body functions, one (s110 structure of brain) from body structures, 12 (d310 communicating with – receiving – spoken messages, d330 speaking, d420 transferring oneself, d440 fine hand use, d445 hand and arm use, d450 walking, d510 washing oneself, d520 caring for body parts, d530 toileting, d540 dressing, d550 eating, and d560 drinking) from activities and participation, as well as one (e410 individual attitudes of immediate family members) from environmental factors. Cronbach's α was 0.987. **Conclusion:** International Classification of Functioning, Disability and Health will be implemented in Taiwan for disability evaluation on social welfare service system in 2012. Since stroke is one of the most common causes of disability in Taiwan. It is important to develop a specific disability evaluation core set for stroke subject. From this study, the component activities and participation play an important role of disability evaluation on subjects with stroke.

0501PP84

DYNAMIC 3 DIMENSIONAL MODEL OF ANTERIOR CANAL BENIGN PAROXYSMAL POSITIONAL VERTIGO

Xin-Xian Lee', Pei-Chen Sun'

¹Department of Physical Medicine and Rehabilitation of Cender Hospital and ²Dacun Junior High School (Taiwan)

Purpose: To establish an useful dynamic 3 dimensional (3D) model of anterior canal-benign paroxysmal positional vertigo (AC-BPPV) for diagnosis and treatment. **Materials and Methods:** We use four sets of software including "Maya", "Poser", "Photoshop" and "Director" to establish the 3D model of AC-BPPV. The labyrinth model was constructed by Maya, the human model by Poser, and the eye model by photoshop. Director was used to combine all parts together and simulate the clinical presentation of AC-BPPV. The nystagmus was determined by the Edward III law. **Results:** AC-BPPV results from the otoliths depositing within anterior semicircular canal. During simulation, the otoliths within right anterior semicircular canal move toward the ampula during left Dix-Hallpike maneuver. This action causes tilting of the cupula which induces transient nystagmus and vertigo the same as the left posterior canal-BPPV. We introduce a new examination (hyper-extended head hanging position) to differentiate AC-BPPV from PC-BPPV. In the left hyper-extended head hanging position, persistent nystagmus occurred because the otoliths attach to the cupula. In the right hyper-extended head hanging position, the otoliths move from the anterior canal to the posterior canal. After the conversion from right AC-BPPV to right PC-BPPV, the otoliths are ready to be moved back to the utricle by the Epley's maneuver. **Conclusion:** The dynamic 3D model of AC-BPPV reveals that ipsilateral AC-BPPV is similar to contralateral PC-BPPV during Dix-Hallpike maneuver. The hyper-extended head hanging position help us to differentiate AC-BPPV from PC-BPPV and convert AC-BPPV to PC-BPPV which can be easily treated by Epley's maneuver.

0501PP85

THE TEST-RETEST RELIABILITY AND PRACTICE EFFECT OF THE SYMBOL DIGIT MODALITIES TEST IN PATIENTS WITH STROKE

Chia-Lin Koh', Hui-Chun Chen', I-Ping Hsueh^{1,2}, Ching-Lin Hsieh^{1,2}

¹School of Occupational Therapy, National Taiwan University and ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: The Symbol Digit Modalities Test (SDMT) is a widely used measure of switching attention in health elderly and people with neurological impairments. This paper-pencil test requires participants to match a particular number (1–9) with a paired geometric figure within 90 min. Larger amount of correct answers represents better switching attention of an individual. The test-retest reproducibility of the SDMT is largely unknown in patients with stroke limiting its utility. The purpose of this study was to examine the test-retest reliability and practice effect of the SDMT in people with stroke. **Materials and Methods:** We recruited 32 outpatients with stroke from three rehabilitation units in northern Taiwan between November 2007 and May 2008. The inclusion criteria for participants were 1) ≥ 18 years old; 2) diagnosed as either ischemic or hemorrhage stroke; 3) onset for more than 3 months when first evaluated; 4) medically stable without any other major diseases that influence cognitive functions; 5) able to follow commands to perform the tests with one of their better hand; and 6) able to provide informed consent. Initially, all eligible participants were confirmed not having spatial inattention or cognitive impairment which may encounter their performance, using the Behavioural Inattention Test and the Mini-Mental Status Examination, respectively. All participants were repeatedly measured using the SDMT in a 1-week interval. All test sessions were administered by a same examiner. **Results:** The mean age of the patients was 60.3 years. Male (84.4%) and ischemic stroke (62.5%) represented the majority of the sample. The result showed that the SDMT demonstrated sufficient test-retest reliability (ICC=0.88) in a 1-week interval. However, a medium practice effect (Cohen's $d=0.56$) of the SDMT were found. The 90% confidence interval of the practice-effect corrected reliable change index (RCIp) was [–6.3, 12.3]. **Conclusion:** Our results showed that the SDMT is a reliable measurement to repeatedly evaluate stroke patients' ability of switching attention. However, clinicians and researchers have to take account the existing practice effect for interpreting the test results. Only a patient who obtains a difference of score in a week beyond the RCIp interval [–6.3, 12.3], he or she can be considered having a significant improvement or regression during the two test sessions. Considering that clinicians may repeatedly administer the SDMT at more than one week apart, therefore having a smaller practice effect, the upper end of RCIp provided above could be viewed as a high standard for a patient to achieve significant improvement.

0501PP86

NEW DIAGRAMS EXPLAINING ICF CONCEPTS AND REHABILITATION MEDICINE

YoonKyo Kang, GueHwan Ann

Korea University Anam Hospital (Republic of Korea)

Purpose: It is not easy to understand the concept of the ICF for different cultural background with non-English speaking people, especially the relationship between the components of health and umbrella terms-functioning and disability. The purpose of this study to develop diagrams to help understand of concepts of ICF. **Materials and Methods:** We imagined the 3 individual frames of the diagram, circle (global), bridge (connection or communication) and umbrella and brought basic concepts from the bio-psycho-social model and definitions of components of health. Main concepts were translated into the drawings and others used words themselves and arranged within the diagrams. **Results:** We made 3 diagrams named

'ICF Wheels' with concentric circles, 'ICF-Bridge over Disability', and simply '3 Umbrellas'-Functioning, Disability, and HEALTH. Also authors tried to imbed those diagrams to self-learning materials made by German WHO-FIC Collaborating Centre, ICF Research Branch to provide users with basic knowledge of the ICF and its uses. **Conclusion:** It will help to learn the concepts of bio-medico-psycho-social meanings of ICF using these diagrams and to apply into various working fields.

0501PP87

STUDY ON HOW TO OBJECTIVELY ASSESS THE MEDICAL SERVICE QUALITY OF REHABILITATION

Ya-Wen Hsu, Ching-ying Lin, Chi-Lun Rau, Chin-Wen Wu, Chien-Fang Huang, Tsan-Hon Liou

Department of Physical Medicine & Rehabilitation, Taipei Medical University-Shuang Ho Hospital (Taiwan)

Purpose: To review the methods of evaluation quality of service and establish subjective and practical monitoring mechanism for rehabilitation. **Materials and Methods:** There were nine experts participated in this research, including president and opinion leaders of Taiwan Rehabilitation Association, chief of department of rehabilitation of medical centers, and professors of hospital management in national universities. Using Delphi methods, service quality indexes of rehabilitation medicine were reviewed after the first expert meeting. The questionnaire was divided into three categories: importance, appropriateness, and accuracy. Analytic hierarchy process was used for this research and experts filled up the questionnaires by giving scores from one to five. The higher the score was, the more the experts valued the item. Experts completed the questionnaires after the expert meeting. The same questionnaire was filled up again after the second expert meeting and the results were analyzed. **Results:** Nine experts returned questionnaires twice with 100% return rate. Primarily service quality items are 18 in structure perspective, 20 in process perspective and 19 in outcome perspective. Only those items that were scored greater than four in the second run of questionnaires are listed as followed: *Structure perspective:* "The percentage of visiting staffs" was scored greater than four in the service quality of index at importance, appropriateness, and accuracy while "associated certification rate of therapists" were marked at importance and appropriateness. "Fully equipped therapy rooms, and professional training equipments in therapy rooms" was only marked at importance. *Process perspective:* "Complications resulting from treatment, including burns and fractures" were scored greater than four in the service quality of index at Importance, and appropriateness. "The percentage of complicated treatment, including head injury and stroke" were scored greater than four in the service quality of index at importance, appropriateness, accuracy in all treatments while "the percentage of injury resulted from falling", "body function improving rate of patients before and after treatments", and "percentage of readmission within 14 days" were scored greater than four at importance and appropriateness. **Conclusion:** "The percentage of readmission within 14 days", "the functional improving rate of patients after treatment", "associated certification rate of therapists", and "percentage of complicated treatment" were recognized as better indexes. Further studies to evaluate the effect of these items on quality of medical service of rehabilitation will be necessary through analysis of data bank of national health insurance.

0501PP88

EVALUATION OF HOME-BASED SCREEN INDICATORS IN SLEEP DISORDERED BREATHING OF PROFESSIONAL DRIVERS

Pei-Pi Shih¹, Hua Ting^{1,2}, Shu-Yun Chang², Ai-Hui Chung², Shin-Da Lee^{2,3}, Tung-Sheng Shih^{2,4}

¹Department of Physical Medicine and Rehabilitation, Chung-Shan Medical University Hospital, Center of Sleep Medicine, Chung-Shan

Medical University Hospital, Department of Physical Therapy, Graduate Institute of Rehabilitation Science, China Medical University and ⁴Institute of Occupational Safety and Health Council of Labor Affairs, Executive Yuan (Taiwan)

Purpose: Sleepiness-at-the-wheel was well identified as a major cause for highway accidents and sleep-disordered-breathing (SDB) has been reported as an associate factor to cause accidents. Any reliable SDB home-based screen indicator should be valuable in public security. The aim of our study is investigating systematically reliabilities of individual indicator and various combinations on professional drivers. **Materials, Methods and Results:** All 151 participants were long haul bus drivers with duty period more than 12 hours a day and duty shifting by two-hour-later day after day. Each bus-driver had received overnight polysomnographic study (PSG) and following alternative devices' measurements simultaneously post anthropometrics taking and questionnaires' filling-out. Based on either recording-time or actigraphy-related corrected sleep time, the oxygen-desaturation indices by 3 and 4 %; and pulse-rising indices by 7 and 8 % from baseline detected with pulse oximetry; and apnea-hypopnea indices measured with ApneaLink all correlated significantly (all $p < 0.0001$, $r = 0.87-0.92$; $0.61-0.89$; and $0.70-0.70$, respectively) and have high agreement (94.5-96.6; 93.8-97.2; 91.1-91.3%, respectively) with apnea-hypopnea indices with PSG (AHIpsg). They are quite reliable in SDB screening, according to under-curve-areas (0.93-0.95 or 0.94-0.95; 0.76-0.76 or 0.74-0.75; and 0.79-0.79 or 0.81-0.82, respectively) of the receiver-operator-characteristic curve analysis for selected points on 5 or 15 events/hr of AHIpsg threshold. By contrast, no validities of SDB screening were found in multi-variables apnea prediction questionnaire, Epworth sleepiness scale, night-sleep heart rate variability, wake-up systolic blood pressure and anthropometric variables. **Conclusion:** The parameters from pulse oximetry and ApneaLink alone or adding actigraphy sleep-time-correction are home-based indicators in screening SDB professional drivers' SDB.

0501PP89

IMPLEMENTING THE DISABILITY EVALUATION SYSTEM IN TAIWAN BASED ON INTERNATIONAL CLASSIFICATION OF HEALTH FUNCTIONING, DISABILITY AND HEALTH (ICF)

Tsan-Hon Liou¹, Shih-Ching Chen², Hung-Yi Chiou³, Chia-Chin Lin⁴, Kuo-Lung Lee⁵, Wen-Ta Chiu⁶

¹Department of Rehabilitation, Taipei Medical University – Shuang Ho Hospital, ²Department of Rehabilitation, Taipei Medical University Hospital, ³College of Public Health and Nutrition, Taipei Medical University, ⁴School of Nursing, Taipei Medical University, ⁵Social Worker Office, Taipei Medical University – Shuang Ho Hospital and ⁶Institute of Injury Prevention & Control, Taipei Medical University (Taiwan)

Purpose: The purpose of this study is to report on how to implement disability evaluation system in Taiwan based on International Classification of Health Functioning, Disability and Health (ICF). **Materials and Methods:** A national decision-making process was applied. Members of Taiwan ICF Team includes physicians, nurses, physical therapists, occupational therapists, social workers, psychologists, special education teachers, vocational assessment workers, public health scholars, and representatives of welfare groups for people with disability. There were total of 199 professional members (124 members for body function/body structure, and 75 members for participation/environment) participated in 16 groups (8 groups for body function/body structure, and 8 groups for participation and environment). In each group, there was one member to be the leader to lead the discussion by focus group session and voting to reach agreements. These groups need to develop evaluation methods and standards and formulate related training courses for disability evaluation professionals. And each group further discussed and drafted related regulations. **Results:**

Starting from 2008, the project has completed several parts of the standards, tools, and practice manuals for ICF. For the purpose of clinical practice, we only use second-level categories of ICF codes for disability evaluation. Professionals in each group reach agreement that functional evaluations are developed based on current available tools, such as WAIS-III and Berg balance scale. In addition, environmental factors are only distinguished as positive (facilitator) and negative (barrier) to note the result of disability evaluation. **Conclusion:** Because World Health Organization (WHO) ICF is a general description of function and not a specific tool for evaluating disability, the content of ICF covers wider range than that of disability evaluation. Many items are not applicable for evaluating disability. In this new disability evaluation system based on ICF, physicians, therapists, social workers and special education teachers form an evaluation team to provide function and disability assessment. In order to prevent time wasting during evaluation, a number of core sets will be developed. Although there are several core sets developed in WHO, these core sets are mainly for diseases and may be not applicable to disability evaluation in Taiwan system. Therefore more applicable core sets, especially for disability determination, are of vital importance. Currently, the project adopted or modified current measure protocols and tools to match ICF system. However, the protocols and tools need to be tested and observed for longer period of time. And how to correlate the application in Taiwan with ICF qualifiers need to be further observed and analyzed.

0501PP90

THE ROLE OF MEDICAL SOCIAL WORKER IN NEW DISABILITY CERTIFICATION BASED ON ICF

Ti-Li Kao¹, Kuo-Lung Lee², Yi-Shan Lin²

¹Department of Social Work, Tunghai University and ²Social Work Department of Shuang Ho Hospital (Taiwan)

Purpose: Taiwan's "People with Disabilities Rights Protection Act" had originally enacted in 1980 (it was called "Physically and Mentally Disabled Citizens' Protection Act" at that time). In the past, the Act was amended 8 times. In addition to name-change of the Act, several new categories of disability had included and welfare of the disabled had adjusted. It includes categories of disability from "The International Classification of Functioning, Disability and Health" (ICF) in 2007. In accordance with the Act, new assessment mechanism will comprise the ICF principle and needs to be implemented in 2012. In the past 3 decades, most of the medical social workers only responsible for administrative procedures of disability assessment. There are even some medical social workers had never involved in any part of disability assessment. However, in new assessment mechanism imposed by the ICF principle, in addition to the doctor evaluates the body functions and structures, the PT, OT, ST, Psychologists and Social Workers all will join the assessment team to evaluate the activity, participation, and environment factors regarding disability condition. The purpose of this study is to explore the role of medical social workers in the new disability certification system based on ICF. No studies have ever tried to discuss this issue. **Materials and Methods:** This study involved questionnaires filled by participants, who are medical social workers from hospitals. Surveys were conducted in 4 ICF trial hospitals and 4 non ICF trial hospitals as a comparison of applying ICF system in Taiwan. **Results:** Ongoing. **Conclusion:** Ongoing.

0501PP91

SURFACE ELECTROMYOGRAPHY OF QUADRICEPS FEMORIS IN KNEE INJURED PATIENTS WITH JOINT DYSFUNCTION

Jing-song Mu, Chao-Min Ni, Yun Miao, Qing Xia

The Department of Rehabilitation Medicine of The Affiliated Anhui Provincial Hospital of Anhui Medicine University (China)

Purpose: To explore how joint dysfunction affects quadriceps muscles function in patients with unilateral knee injury. **Materials and Methods:** Twenty three unilateral knee injured patients with joint dysfunction were assessed for isometric EMG activity of vastus lateralis (VL), vastus medialis obliquus (VMO) and rectus femoris (RF) of both thighs during three 5-s maximal isometric voluntary contractions at a knee joint angle of 30° (0°: full knee extension), and torque were recorded at same time. **Results:** The average amplitude (AEMG, mean power spectrum (MPF) values of VL, VMO and RF muscles in affected knees are significantly lower during maximal isometric voluntary contraction at knee 30° flexion than those in unaffected knees, and torque of affected knees is lower than unaffected knees. In health side, the AEMG, MPF and MF value of VL are higher than VMO and RF, the AEMG, MPF value of RF are higher than VMO; In affected side, the AEMG, MPF value of RF are higher than VMO and VL, The AEMG, MPF value of VL are higher than VMO. **Conclusion:** sEMG can provide quantitative measurements of muscle function, the isometric strength and neuromuscular activation lever are lower in affected limb, RF may be affected less more than VL and VMO in knee injured patients with knee dysfunction. therapeutic intervention should focus on improving quadriceps neural muscles function.

0501PP92

THE APPLICATION OF SURFACE ELECTROMYOGRAPHY IN LOW BACK PAIN

Jing-Song Mu, Chao-Min Ni

Department of Rehabilitation Medicine, Affiliated Provincial Hospital of Anhui Medical University (China)

Low back pain is closed with low back muscles fatigue and reduced ability to contract. Therefore, functional assessment of back muscles has great value with diagnosis of the lower back pain and assessment of rehabilitation outcome. Early clinical and rehabilitation medicine to the evaluation of low back muscle has been limited for polyphonic subjectivity and uncertainty. Surface electromyography is concerned by rehabilitation medicine and sports medicine researchers because of its specific reliability, sensitivity, non-invasive real-time and multi-target measurement of the benefits, the paper reviewed the application on the surface electromyography in low back pain.

0501PP93

ANALYSIS OF SURFACE ELECTROMYOGRAPHY IN SWALLOWING AND DYSPHAGIA

Jing-Song Mu, Chao-Min Ni

Department of Rehabilitation Medicine, Affiliated Provincial Hospital of Anhui Medical University (China)

Swallowing is controlled by cerebral cortex and subcortical central, and participated by more of the nerves and muscles as a complex process of reflection. To some extent' Surface Electromyography (sEMG) could reflect real time neuromuscular function of swallowing and swallowing disorders, and can be used for detection of swallowing disorders and assessment of dysphagia rehabilitation outcome. At the same time, because of its non-invasive, dynamic and multi-target measurement, more and more attention is paid by scholars. Key words: surface electromyography, swallowing, dysphagia, rehabilitation assessment.

0501PP94

APPLICATION OF SURFACE ELECTROMYOGRAPHY IN FUNCTIONAL ASSESSMENT OF PATIENTS WITH LUMBAR DISC HERNIATION

Jing-Song Mu, Chao-Min Ni, Qing Xia

Department of Rehabilitation Medicine, Affiliated Provincial Hospital of Anhui Medical University (China)

Objective: To investigate the application of surface electromyography (sEMG) in patients with Lumbar Disc Herniation. **Methods:** 44 patients with chronic Lumbar Disc Herniation were classified into mild pain group (A group) and moderate to severe pain group (B group), ME6000-T8-type surface EMG machine were used to collect sEMG of two groups of patients, and calculate ratios of AEMG and MFs. **Results:** AEMG of ipsilateral erector spinae and gastrocnemius with two groups than the healthy side were significantly reduced ($p < 0.05$); absolute value of MFs in the affected side were significantly elevated ($p < 0.05$). Both sides of AEMG in lumbar paraspinal muscles and gastrocnemius, MFs of health side in gastrocnemius was no significant difference between A group and B group ($p > 0.05$); absolute value of MFs in affected lumbar paraspinal muscles and gastrocnemius with B group are significantly boosted in comparison with A group ($p < 0.05$); ratio of AEMG with B group subjects was observably increased ($p < 0.05$); MFs of lumbar paraspinal muscles and gastrocnemius were no significant difference between A group and B group ($p > 0.05$). **Conclusion:** Surface EMG can be used as a non-invasive tool in detecting neuromuscular functional status of lumbar and lower limb in patients with Lumbar Disc Herniation; isometric loading tests of gastrocnemius on maximal inflective ankle can be used as evaluation of neuromuscular functional status of crura in patients with lumbar disc herniation; there are dissimilar sEMG imbalance in lumbar paraspinal muscle and gastrocnemius while subjective pain levels of patients are different.

0501PP95

CLINICAL APPLICATIONS OF SURFACE ELECTROMYOGRAPHY IN STROKE REHABILITATION ASSESSMENT

Jing-Song Mu, Chao-Min Ni

Department of rehabilitation medicine, Provincial Hospital, Anhui Medical University (China)

Surface: Electromyography (sEMG) is a non-invasive technique to measure electrical muscle activity, which could be used for rehabilitation assessment and therapy. The paper reviews records in the past few years who has made use of sEMG to study stroke rehabilitation assessment, commonly used sEMG index and its meaning, related results of study and so on.

0501PP96

REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION BASIC PRINCIPLE AND APPLICATION PROGRESS IN DEPRESSION

Jin Chen, Chao-Min Ni

The Department of Rehabilitation Medicine, Anhui Provincial Hospital (China)

Transcranial magnetic stimulation is a biological stimulation. It can change action potentials of nerve cells in the cortex. It does this through induction current produced by time-varying magnetic field effect on the cerebral cortex, thereby affecting on brain electrical activity and metabolism. Repetitive transcranial magnetic stimulation refers to repeated transcranial magnetic stimulation in specific cortex. The occurrence of depression may be related to reduction of varying degrees of 5-HT and regional cerebral blood flow. Exciting/inhibitory amino acids imbalances can lead to depression. It is usually thought that dorsolateral prefrontal cortex have relations to emotions. Theoretically, improving the dorsal-lateral prefrontal function area can alleviate patients mood disorders. Repetitive transcranial magnetic stimulation show preliminary efficacy in treating depression, but there are still many issues to be solved. To further explore repetitive transcranial magnetic stimulation mechanism and its biological effects and its molecular changes are necessary. It makes further perfecting the treatment of depression and provides the theory basis for clinical application. There are

many evidence that low-frequency transcranial magnetic stimulation for depression is safe. As its application in the treatment of the depression, its safety performance will be considered as one of the major issues.

0501PP97

SOLVING JOBS PROBLEM FOR PEOPLE WITH DISABILITY IN DEVELOPING COUNTRY THROUGH CBR APPROACH, PSIKI EXPERIENCE 2008

Ferial Hadipoetro Idris

Department of Medical Rehabilitation RSCM Hospital / Faculty of Medicine (Indonesia)

Back ground: The most difficult aspect in rehabilitation of People with Disability (PWD) is job placement, especially in developing country, where are many People without Disability also jobless. **Goals:** 1. to identify PWD who need a jobs. 2. to solve jobs placement problems for PWD. **Methods:** Design cross sectional for goal 1, followed by intervention pre- post for goal 2. **Materials:** form 1 and 2 WHO CBR manuals adapted by Ferial HI, CBR manuals for family member number 30, small funding. **Process:** June–August 08 home visits in Urban CBR area by CBR cadets to identify PWD who need jobs use form 1 and 2. Followed by empowered family member and People with disability used CBR manuals for family member number 30, small funding as needed. **Results:** 20 PWD who need a job were identified, from August 08 to December 08 only 3 PWD success having a jobs, as cleaning worker in mosque, sales in small vendor and private laundry. Others still on going process. **Conclusion:** CBR could be solve job problem for PWD even taken time in empowering PWD and the family with the support from CBR cadets and others.

0501PP98

OXYGEN UPTAKE RESPONSE TO CYCLE ERGOMETRY AS RELATED TO SEVERITY OF HEMIPARESIS IN POST-ACUTE STROKE SURVIVORS

June-Kai Chen¹, Tien-Wen Chen¹, Ming-Cheng Weng¹, Chia-Hsin Chen^{1,2}, Mao-Hsiung Huang^{1,2}

¹Department of Physical Medicine and Rehabilitation, Kaohsiung Medical University Hospital and ²Department of Physical Medicine and Rehabilitation, Faculty of Medicine, College of Medicine, Kaohsiung (Taiwan)

Purpose: To quantify the potential impact of neuromuscular impairments on oxygen uptake response in post-acute stroke patients. **Materials and Methods:** 64 participants (mean age 59.2 ± 10.7 , mean BMI 24.3 ± 3.2) with a poststroke interval of 8.63 ± 8.8 days underwent symptom-limited cardiopulmonary exercise testing. Severity of hemiparetic lower limb was assessed by Brunnstrom recovery stages for lower limb. Oxygen uptake (VO_2) was measured by open-circuit spirometry during standard upright ergometer cycling. **Results:** Mean resting, unloaded, and peak VO_2 ($\text{VO}_{2\text{resting}}$, $\text{VO}_{2\text{unloaded}}$, and $\text{VO}_{2\text{peak}}$) were 3.9, 7.7, and $12.7 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$, respectively. Mean work efficiency ($\Delta\text{VO}_2/\Delta\text{WR}$) was 8.4 ± 2.5 . After adjustment for age, sex, stroke type, hemiparetic side, modified Ashworth Scale, time poststroke, comorbidities and medicines use, compared with participants with the four Brunnstrom recovery stages for lower limb (III, IV, and V to VI), the $\text{VO}_{2\text{peak}}$ decreased 35.8%, 28.4%, and 19.1%, respectively. Severity of hemiparetic lower limb explained 76% of the variance in $\text{VO}_{2\text{peak}}$ after adjustment for age, sex, stroke type, hemiparetic side, modified Ashworth Scale, time poststroke, and 79% after additionally adjusted for comorbidities and medicines use. Although there was a trend of increasing $\Delta\text{VO}_2/\Delta\text{WR}$ with increasing Brunnstrom recovery stages for lower limb, the difference was not statistically significant. **Conclusion:**

This study provides evidence that VO_2 peak decreases much more than 10% difference in severity of hemiparetic lower limb, and muscular work output increase lesser. It would be to take severity of hemiparetic lower limb into consideration to accurately evaluate aerobic capacity poststroke.

0501PP99

AN INVESTIGATION OF SURGEONS' MENTAL HEALTH UNDER OCCUPATIONAL STRESS AND THEIR COPING STRATEGIES FOR MENTAL REHABILITATION

Jianping Li¹, Jianan Li², Chunxiao Wan³

¹Third People's Hospital of Wuxi, ²Nanjing Medical University and ³Wuxi No. 2 People's Hospital (China)

Purpose: This study investigated 162 surgeons' mental health under occupational stress and the effects of their different coping strategies on mental rehabilitation. **Materials and methods:** The Symptom Checklist-90 (SCL-90) and Coping Strategies Scale (CSS) were used to investigate mental health and coping strategies of 162 surgeons came from different hospitals in a medium-sized city of Chinese developed region. Participations including 126 males and 36 females were anonymous, voluntary, and random. Their mean age was 37.4 ± 9.6 years. **Results:** According to the standard score of Symptom Checklist-90 (SCL-90), 54 of the participations (33.3%) had varying degrees of mental health problems such as interpersonal sensitive, anxiety, et al. At the mean while, these participations' coping strategies were immature type or mingle type according to the standard score of Coping Strategies Scale (CSS). The total level and each element of SCL-90 were positive correlation with that of the Coping Strategies Scale (CSS) ($p < 0.01$). **Conclusion:** The majority of surgeons' pressures origins from their work, so the occupational stresses of surgeons are more severe than those of social people. Surgeons should take more positive coping strategies for self-rehabilitation of mental health.

0501PP100

THE AGREEMENT BETWEEN SELF REPORT AND PROXY REPORT OF THE FUNCTIONAL COMMUNICATION NEEDS AND PERFORMANCE IN APHASIC PATIENTS

Chiung-Wen Fan¹, Lu Lu²

¹Department of Speech and Hearing Disorders and Sciences, National College of Nursing and ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: To investigate the agreement between self report and proxy report of the functional communication needs and performance in aphasic patients, and to investigate its association factors. **Materials and Methods:** A 35 item functional communication scale was designed and validated for the assessment. 41 stroke aphasic patients with fair comprehension (scored 7 or above in the auditory or reading comprehension subtest of the Concise Chinese Aphasia Test) and their significant others were recruited and interviewed with the functional communication scale. Possible association factors including the severity of aphasia, severity of stroke, and care giver burden were assessed by the severity scale of Boston Diagnostic Aphasia Examination, the Bathel Index, and the Caregiver Burdens Scale, respectively. **Results:** The proxies tended to rate the patients as having a higher communication needs and lower communication performance than the patients themselves, but the differences were mostly non-significant ($p \geq 0.05$) or relatively small in statistical magnitude ($d < 0.5$). The proportions of close agreement between the patients and their proxies ranged from 85.14%~92.07% in functional communication needs and 73.84~89.13% in functional communication performance. The agreements were highest in items on basic communication and lowest in social communication. Moreover,

significant correlation was found between ratings of communication needs and performance in the aphasic patients ($r = 0.653$) but not in the proxies ($r = 0.073$). Finally, the agreement on communication needs decreased with increasing caregiver burden and the agreement on communication performance decreased with increasing severity of stroke. **Conclusion:** Our results showed that aphasic patients differed in ratings of functional communication needs and performance from proxies, but the differences were relatively small in statistical magnitude.

0501PP101

DEVELOPMENT AND VALIDATION OF THE CHINESE VERSION OF THE STROKE AND APHASIA QUALITY OF LIFE SCALE-39

Hsiu-Fen Ko¹, Lu Lu², Ching-Lin Hsieh³, Hilari Katerina⁴, Rei-Jane Huang

¹Graduate Program of Speech Therapy, Taipei Municipal University of Education, ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital, ³School of Occupational Therapy, College of Medicine, National Taiwan University (Taiwan) and ⁴Department of Language and Communication Science, City University (United Kingdom)

Purpose: To adapt the Stroke and Aphasia Quality of Life Scale-39 (SAQOL-39) into Chinese version for the measurement of health-related quality of life in aphasic patients in Taiwan, and to test its reliability and validity. **Materials and Methods:** The SAQOL-39 was first adapted into the Chinese version (SAQOL-C) following the Mapi approach of linguistic validation, including the processes of conceptual definition, forward and backward translation, expert review, and pilot testing with a sample of 6 aphasic subjects. 34 stroke patients with chronic aphasia (onset > 6 months) and fair comprehension (scored 6 or above in the auditory or reading comprehension subtest of the Concise Chinese Aphasia Test) were then recruited and interviewed with the Chinese version of WHOQOL-BREF, the SAQOL-C and a questionnaire about its acceptability. 21 subjects were interviewed with the SAQOL-C again 1–2 weeks later. **Results:** Most subjects reported this measure to be easily comprehensible, appropriate in content, and could be finished quickly. The Cronbach's α for global scale was 0.93 and 0.73 to 0.92 for subscales, suggesting good internal consistency. There were acceptable test-retest reliability for the global scale (ICC = 0.81) and most subscales (ICC = 0.70–0.82) except for the energy domain (ICC = 0.49). There were acceptable correlations between individual items and the total scale ($r = 0.355$ to 0.732) and good correlations between subscales and global scale ($r = 0.68$ to 0.84), suggesting acceptable construct validity. The four subscales showed good convergent validity with the WHOQOL domains. There was also good discriminant validity except the psychosocial subscale. Good criterion-related validity was noted when comparing the scores of SAQOL-C and the total scores of the Taiwan version of WHOQOL-BREF and its summary subscale (Spearman's $\rho = 0.511$ and 0.505). **Conclusion:** Our results showed that the SAQOL-C is a psychometrically valid measure that can be used to assess the health-related quality of life for most aphasic patients in Taiwan.

0501PP102

EFFECTS OF PULSE MAGNETIC FIELD ON BRAIN INJURY AND INSULIN-LIKE GROWTH FACTOR-1 EXPRESSION IN RATS WITH CEREBRAL ISCHEMIA

Tye Wei, Jina-Zhong Fan, Hong-Ying Wu, Chuan Li
Southern Medical University (China)

Purpose: To study the effects of pulse magnetic field on brain injury and insulin-like growth factor-1 (IGF-1) expression in rats with cerebral ischemia. **Materials and Methods:** 48 SD rats were divided

into 3 groups: sham-operation group, model group and magnetic group. 16 rats in every group. The rats in model group and magnetic group were established focal cerebral ischemia reperfusion model by the thread occlusion method. Then the rats of magnetic group were treated by pulse magnetic apparatus (0–105 Gs, 50 Hz) immediately after reperfusion 2 h (20 min/time, 1 time/day, everyday till the rats were decapitated). The neurological function assessment was applied for every rat after reperfusion 2 h, 1 day, 3 days, 7 days. After reperfusion 7 days, the changes of pathology, IGF-1, infarct size in brain tissue of the rats were observed. **Results:** Compared with the model group, the neurologic deficit scores when 7 days after reperfusion were significantly less in magnetic group (0.31 ± 0.48) ($p=0.023$, $p<0.05$). The injury degree of neuron greatly reduced and the infarction area also markedly decreased in the magnetic group ($p=0.000$, $p<0.05$). At the same time, the number of IGF-1 positive neuron increased significantly in the magnetic group compared with model group ($p=0.000$, $p<0.05$). **Conclusion:** Magnetic field can reduce the brain injury in rats with cerebral ischemia, this effects might be associated with IGF-1 expression.

0501PP103

COMPARISON OF ULTRASONOGRAPHIC CHARACTERISTICS AND PARAMETERS OF THE LATERAL COLLATERAL LIGAMENT OF THE KNEE IN POSITIONS OF KNEE EXTENSION AND CROSS-LEG POSTURE

Min-Hsin Lai, Shin-Tsu Chang, Liang-Cheng Chen, Ming-Fu Hsieh, Kao-Chih Hsu, Tsung-Ying Li

Department of Physical Medicine and Rehabilitation, Tri-Service General Hospital, School of Medicine (Taiwan)

Purpose: The purpose was to compare imaging quality of the lateral collateral ligaments (LCL) of the knee in knee extension position with cross-leg posture, by evaluating morphologic changes and grey-scale histogram of the ligaments by means of ultrasonography (US). **Materials and Methods:** This was a cross-sectional study with a total of 64 healthy subjects. Ultrasound examination with a 5–12 MHz linear transducer was used to assess LCL. Each subject was randomly assigned to first step either the knee extension position or the cross-leg position, and 10 min later to undergo the other position. Ultrasonographic measurements obtained included the widths and grey-scale histograms of the LCL when the subjects lay with two knee positions. The angle α between the LCL and horizontal line was also measured. **Results:** Data of 64 subjects (22 men, 42 women; mean, 24.3 ± 4.0 years; height, 166.9 ± 8.6 cm; weight, 58.8 ± 10.6 kg) were analyzed. The widths of the LCL and the angle α were significantly decreased in cross-leg position when compared with those of knee extension position, and conversely the grey-scale histogram of the LCL were significantly increased in cross-leg posture (all $p<0.05$). **Conclusion:** Cross-leg position is an effective way in stretching of the LCL when compared with knee extension position. A better sonographic image quality of the LCL can be obtained in the cross-leg position.

0501PP104

MYASTHENIA GRAVIS WITH DYSPHAGIA: A CASE REPORT

Hui-Chun Juan¹, I-Hsien Wu¹, Shu-Chen Lo¹, Pei-Chi Hsiao², Jung-Tai Liu²

¹Department of Physical Medicine and Rehabilitation, Chi-Mei Medical Center and ²Department of Physical Medicine and Rehabilitation, Chi-Mei Medical Center Liouying (Taiwan)

Fatigable muscle weakness is one of the characteristics of myasthenia gravis. Weakness of the oropharyngeal muscles leads to dysarthria and dysphagia, which occurs in approximately 6–24 % of patients with myasthenia gravis. We report a 57-year-old

man presented with a 1-month history of progressive dysphagia to liquids associated with 10 kg weight loss. His past medical history included chronic sinusitis and chronic serous otitis media. Physical examination revealed right ptosis and bilateral shoulder girdle weakness. Myasthenia gravis was diagnosed by decremental response to repetitive nerve stimulation on NCV and associated with positive anti-acetylcholine receptor antibody tests. The swallowing evaluation by speech-language pathologist showed difficulty in deglutition and incoordination of swallow reflex trigger. During videofluoroscopic study, poor oral holding and tongue movements, absence of swallow reflex, incomplete glottic closure and reduction in pharyngeal movements were noted. With repeated swallowing, residues in bilateral pyriformis sinuses increased in volume, especially in the right side. However, the residues decreased in volume when the head rotated to the left side. Because the patient's medical condition exacerbated, he was admitted to intensive care unit due to respiratory failure. Dysphagia with aspiration, along with respiratory involvement, could be a significant cause of morbidity and mortality in myasthenia gravis. Swallowing therapy would play an important role in management of those cases. In this patient, compensated neck rotation to the left side, thermal stimulation and energy conservation are useful. Nevertheless, active exercises to maximize the strength of swallowing muscles are usually limited by fatigue. Pharmacologic treatment with pyridostigmine, prednisone or plasma exchange will also improve the symptoms of dysphagia.

0501PP105

ANALYSIS OF THE CLINICAL ASSESSMENT OF UNILATERAL NEGLECT AFTER STROKE

Weiqun Song, Qian Xu, Jie Hu

Department of Rehabilitation, Xuanwu Hospital, Capital Medical University (China)

Purpose: The purpose of this study is to investigate unilateral neglect patients, performance in line bisection and line cancellation tasks. **Materials and Methods:** We retrospectively analyzed the unilateral neglect patients, performance in line bisection and line cancellation tasks before and after rehabilitation treatment. **Results:** Before treatment, statistical analyses revealed the patients, performance in line cancellation and line bisection did not differ from each other ($p=0.902$). After treatment, statistical analyses revealed a significant difference between the two tasks ($p=0.007$). With line bisection only, we detected 29/30 (97%) patients with neglect; with line cancellation only, we detected 22/30 (73%) patients with neglect. **Conclusion:** As the performance of unilateral neglect patients improved, patients have revealed difference between the performance in line bisection and in line cancellation. One test alone would miss more subjects with neglect. That is to say, combination of the two tests was more sensitive than any single test alone.

0501PP106

COMPARISON OF SURFACE ELECTROMYOGRAPHY CHARACTERISTICS DURING DYNAMIC MOVEMENT BETWEEN PERSONS WITH LOW BACK PAIN AND HEALTHY CONTROLS

Bin Xie, Rongli Wang, Chun Luo, Ninghua Wang

Peking University First Hospital (China)

Purpose: To investigate surface electromyography differences in the back, hip and lower limb muscles during dynamic movement between patients with non-specific low back pain (nsLBP) and healthy control subjects. **Materials and Methods:** 10 nsLBP patients and 10 healthy controls were involved in this investigation. All participants were required to perform active extension/flexion cyclic movements of the right hip at a rate of 40 repetitions/min. Simultaneously, surface electromyography (EMG) was applied to erector spinae (ES), multifidus (MF), gluteus maximus (GM), hamstring (HS) and abdominal external

oblique (EO) muscles bilaterally to assess the muscle recruitment pattern and muscle activity in two populations during the dynamic cyclic motion. **Results:** Healthy control subjects reached peak EMG value earlier than nsLBP subjects, but decreased quickly afterwards. A higher level of muscle activation during the relaxation phase of the cyclic motion was demonstrated in all the studied muscles in nsLBP subjects compared to healthy subjects, particularly for multifidus. **Conclusion:** Surface EMG is a practical and sensitive tool to detect muscle function alterations during dynamic functional movement in LBP subjects. LBP subjects have different muscle activation patterns compared with healthy controls. Rehabilitation for LBP should stress muscle activation training or muscle reeducation of both back muscles and hip muscles, especially the multifidus.

0501PP107

INFLUENCE OF RESPIRATION ON LATERAL ABDOMINAL MUSCLES' THICKNESS WITH ULTRASOUND SCANNING IN HEALTHY SUBJECTS

Yoshitaka Otani¹, Keisuke Itotani¹, Noriaki Maeda¹, Michi Ikada², Megumi Hatanaka², Junichi Kato³

¹Division of Physical Therapy, Hyogo Rehabilitation Center at Nishi-Harima, ²Department of Clinical Laboratory, Hyogo Rehabilitation Center at Nishi-Harima and ³Department of Internal Medicine, Hyogo Rehabilitation Center at Nishi-Harima (Japan)

Purpose: Recent studies have investigated the lateral abdominal muscles in humans by means of ultrasound assessment. The abdominal muscles have important functions not only as flexors and rotators of the trunk, but also as respiratory assistant muscles. The purpose in this study was to examine the changes of thickness and the reliability of the lateral abdominal muscles during respiratory maneuvers. **Materials and Methods:** Participants were 9 healthy male volunteers (26.4±2.7 years old). The ultrasound B-mode scanning (HD11XE with 3–12 MHz linear probe, Philips Co. Ltd, Japan) was performed with the subject lying supine position and the probe was placed transversely border midway between the costal border and abdominal muscles. The muscle thickness of external oblique (EO), internal oblique (IO), transverses abdominal (TA), and also the total of the muscle thickness (lateral abdominal muscle: LAB) were measured under two conditions; resting expiration (Rex) and maximum expiratory effort (MEE). Thickness measurements under these conditions were obtained by 3 times, respectively. Percent thickness change was calculated as thickness MME – thickness Rex/thickness Rex×100. Interclass correlation coefficients (ICC1.1) were used to estimate reliability. Statistical analysis was used by Wilcoxon matched-pairs signed-rank test and a p-value less than 0.05 was taken to be significant. **Results:** Percent thickness change during MME were significantly increased to compared with that during Rex (IO, TA and LAB, respectively: $p=0.01$), although only the EO thickness was significantly decreased (EO: $p=0.03$). Intraexaminer reliability estimates (ICC) ranged from 0.72 to 0.94 in EO, 0.63 to 0.85 in IO, 0.53 to 0.71 in TA and 0.77 to 0.85 in LAB respectively. **Conclusion:** We conclude that the thickness of lateral abdominal muscles was influenced with voluntary respiration, and the assessments of that by means of ultrasound scanning are adequately reliable. This information may be useful for informing exercise prescription.

0501PP108

CORTICAL ACTIVATION DURING WRITING TRADITIONAL CHINESE CHARACTERS IN FEMALES: A FUNCTIONAL MRI STUDY

Hsin-Yu Chen¹, Ling-Fu Meng¹, Chiu-Ping Lu¹, Pei-Shan Wei², Ho-Ling Liu², Yi-Wen Li³

¹Dept. of Occupational Therapy and Institute of Clinical Behavioral Science, Chang Gung University, ²Institute of Medical Physics and

Imaging Science, Chang Gung University (Taiwan) and ³Program of Neuroscience and Education, Department of Biobehavioral Sciences, Columbia University (United States)

Purpose: To understand the brain mechanism of different Chinese writing tasks for further writing disorder diagnosis. **Materials and Methods:** Eight healthy college females (mean age=21.19 years, all right-handed, well-learned phonetic symbols) were given three Chinese writing conditions (copying, dictation, and phonogram-to-writing) and one control condition (scribbling). Stimuli of the four conditions were displayed randomly, while we used fMRI for detecting brain activation. Subjects were asked to write down corresponded Chinese characters within 10 seconds. All twelve Chinese characters were below ten strokes, and one phonogram corresponds to one character. The trial would show visual or auditory stimulus (1.3 seconds), “+” picture (8.7 seconds), and blank picture (1.3 seconds) in order. A total of three runs, 72 trials per condition were administered to one participant. **Results:** For the comparison with scribbling condition, significant activations were found only in phonogram-to-writing condition, including right medial frontal gyrus (BA 6/32), left middle frontal/precentral/postcentral gyrus (BA 3/4/6), right cingulate gyrus (BA 24/31/32), left posterior cingulate (BA 18/30/31), and left claustrum ($p<0.001$). Those areas were involved in verbal working memory, decision making, discrimination, detecting letter features, and distributed attention. The contrast between three conditions shows that the phonogram-to-writing condition elicited greater activation than dictation condition, including right caudate body and putamen for language comprehension and retrieval of implicit knowledge ($p<0.001$); the dictation condition elicited greater activation than copying condition, including left middle/superior/inferior frontal gyrus (BA 10/46), left precuneus (BA 31), right anterior cingulate (BA 33), left cingulate gyrus/sub-gyral (BA 31), left insula/claustrum (BA 13)/caudate head, and right caudate body ($p<0.001$). Plenty of activations were found in comparing phonogram-to-writing with copying condition, showing more areas in temporal and occipital lobe for more complex visual comprehension and phonological procedure. Both phonogram-to-writing and dictation condition shows activated regions in left middle/superior frontal gyrus (BA 10), left inferior frontal gyrus (BA 46), left insula/claustrum (BA 13), left caudate head, and right caudate body ($p<0.001$). Functions of inferior frontal gyrus, superior frontal gyrus, and precuneus considered for writing were dictation itself, recollection of the representation of the graphemes, and memory and visuospatial mental operations, respectively. **Conclusion:** The differences between three conditions suggest that, in a cognitive point of view, the phonogram-to-writing condition is the most complex task, which needs more phoneme-to-grapheme process than other two conditions, and the copying condition is the simplest one. Further study needs to investigate the phonogram-to-character process.

0501PP109

QUANTITATIVE ASSESSMENT OF HYOID BONE MOVEMENT AND PHARYNGEAL STASIS IN DYSPHAGIC STROKE

Pei-Hung Lin¹, Yan-Hao Chen², Yeun-Chung Chang³, Wen-Shiang Chen², Tyng-Guey Wang²

¹National Taipei College of Nursing, ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital and ³Department of Medical Imaging, National Taiwan University Hospital (Taiwan)

Purpose: To objectively evaluate hyoid bone movement and the amount of pharyngeal stasis in dysphagic stroke objects. **Materials and Methods:** Videofluoroscopic study (VFSS) was performed in 11 normal and 11 supra-tentorial dysphagic stroke subjects with 5-ml thin, thick, and paste bariums. All stroke subjects were rated level 4 to 5 by Dysphagia Outcome and Severity Scale (DOSS). The hyoid bone movement, including forward and upward displacement, duration, velocity, and amount of pharyngeal stasis were calculated

by self-designed program with Matlab®. **Results:** The hyoid bone movement with three bariums showed no difference in normal and dysphagic stroke subjects. The pharyngeal stasis with paste barium was significantly greater in dysphagic stroke subjects than that of normal subjects ($p < 0.05$). **Conclusion:** The pharyngeal stasis in dysphagic stroke subjects significantly increased; nevertheless, the hyoid bone movement seemed normal.

0501PP110

DYSPHAGIA CAUSED BY CERVICAL OSTEOPHYTE – A CASE REPORT

Chih-Ming Lin, Ke-Vin Chang, Tyng-Guey Wang

Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: To present a case with swallowing difficulties caused by ventral cervical osteophytes and assess video fluoroscopic examination results including hyoid bone movement. **Materials and Methods:** We present a 76-year-old man complaining of insidious-onset swallowing difficulties for 2 years. Voluminous ventral cervical osteophytes extending from C3 to C6 and narrowing the pharyngo-esophageal segment by external compression were diagnosed radiologically. To evaluate the mechanism, the Video fluoroscopic swallowing study was performed and results were analyzed. **Results:** The Video fluoroscopic swallowing study revealed epiglottic closure failure attributable to bridging osteophytes, prominent vallecula stasis, silent aspiration and impaired bolus passage due to mechanical obstruction. Reduced hyoid bone movement (measurement: 1.72 cm) was also found during swallowing. **Conclusion:** Large ventral cervical osteophytes could cause dysphagia. In our case, reduced hyoid bone movement, impaired epiglottic closure and bridging ventral osteophytes aggravated aspiration condition.

0501PP111

THE INCIDENCE AND AWARENESS OF FATIGUE IN AN ASIAN POPULATION OF DISABLED ADULTS – A PILOT STUDY

San San Tay, Sheldon Lee, Sherry Hy Young

Changi General Hospital (Singapore)

Purpose: This study aims to determine the incidence of fatigue in a sample population of multi-ethnic Asian disabled adults and their level of awareness of this issue. **Materials and Methods:** Twenty-one adults with the diagnosis of stroke, traumatic brain injury or spinal cord injury attending a physical medicine and rehabilitation clinic who consented and were able to complete the Brief Fatigue Inventory in either English, Chinese, Malay or Tamil were recruited. This questionnaire was administered at the end of the clinic visit. The medical records were reviewed and the following data were obtained: diagnosis, chronicity of illness, current functional status, motor FIM, presence of depression and sleep disorders. The medical records were also reviewed if the patient had complaint of fatigue or had similar complaints prior to administration of the questionnaire. Laboratory data were reviewed for anaemia or endocrinopathies. **Results:** Chinese patients consisted 66.7% of all patients. Malays and Indians made up 23.8% and 9.5% of the sample population respectively. Their ages range from 21 to 85 and the mean age was 52.6 ± 20.1 . 66.7% of patients had mild fatigue and 33.3% had moderate fatigue. None had complaint of fatigue during the clinic visit. Most were unaware of but amenable to interventions to treat fatigue. The chronicity of their illness range from 2 to 108 months and the average was 10 months. 66.7% of the patients were independent or had modified independence. The rest required assistance but were not dependent. **Conclusion:** Fatigue is common in the disabled adult population. The symptoms of fatigue may need to be screened using a tool due to the lack of awareness in Asians. Further research on this issue with greater numbers and education of this population may be beneficial.

0501PP112

JUVENILE MUSCULAR AMYOTROPHY OF DISTAL UPPER LIMBS (HIRAYAMA DISEASE) – A CASE REPORT AND REVIEW OF THE LITERATURE

Tzu-Ying Sung¹, Chiao-Wen Hwang¹, Jue-Long Wang¹, Shu-Fen Sun^{1,2}, Po-Chin Wang³

¹Department of Physical Medicine and Rehabilitation, Kaohsiung Veterans General Hospital, ²Department of Medicine, School of Medicine, National Yang-Ming University and ³Department of Radiology, Kaohsiung Veterans General Hospital (Taiwan)

Juvenile muscular amyotrophy of distal upper limbs (Hirayama disease) is a rare disease predominantly affecting the anterior horn cells of the cervical cord in young men. It is a kind of cervical myelopathy characterized by insidious onset of unilateral distal dominant upper limbs muscle weakness and atrophy due to anterior cervical cord compression. It is difficult to differentiate this disease from other diseases with similar symptoms such as motor neuron disease. Cervical magnetic resonance (MR) study in flexed position is helpful to confirm the diagnosis. We reported a 21-year-old man who complained of slowly progressed muscle atrophy and weakness of right hand and forearm after right shoulder stretching injury three years ago. Electrodiagnostic study revealed acute and chronic denervative change in the right side atrophied muscles. Routine cervical MR images showed high signal intensity over anterior horn cell of lower cervical cord. With the suspicion of Hirayama disease, flexion MR was performed and the striking and pathognomonic picture of anterior shifting of cervical posterior dura at the lower cervical spinal canal was noted. He received neck collar therapy and vitamin B12 supplement. No further progression of symptoms was noted at the 3 months follow-up study. Though Hirayama disease is spontaneous arrest, early diagnosis is necessary because early cervical collar application by preventing neck flexion has been shown to stop disease progression. Surgical managements are preserved to late stage. In cases of early onset of distal upper limb weakness with cold paresis and contractile fasciculation, the finding of asymmetric lower cervical cord atrophy on routine cervical MR study raise the suspicion of Hirayama disease. A flexion MR study should be performed to confirm the diagnosis.

0501PP113

WITHIN-SESSION ACQUISITION OF ANTICIPATORY POSTURAL ADJUSTMENTS DURING FORWARD REACHING TASK

Wen-Yu Liu¹, Yang-Hua Lin¹, Hen-Yu Lien¹, Lin-Ya Hsu¹, Yi-Ju Tsa¹, Chia-Fang Liao¹, Fuk-Tan Tang^{2,3}

¹Graduate Institute of Rehabilitation Science, Chang Gung University, ²Department of Physical Medicine & Rehabilitation, Chang Gung Memorial Hospital and ³Chang Gung University, College of Medicine (Taiwan)

Purpose: To describe the within-session acquisition of APAs in healthy adults during standing forward reaching training. **Materials and Methods:** Repeated-measures design was used in this study. Within one day, ten healthy subjects practiced the forward reaching to a moving target for a total of sixty trials (ten trials, six blocks). APAs were defined by electromyography and center of pressure measurements. Repeated measure ANOVA was used to compare the changes of APA among the six blocks. **Results:** All subjects showed basic APA patterns in the beginning, such as posterior shift of COP and the activation of tibialis anterior prior to the initiation of reach movement. With practice, the onset latencies of posterior shift of COP between block 2 and 6 ($p < 0.05$) and ipsilateral tibialis anterior between block 1 and 3 ($p = 0.01$) were significantly shortened. **Conclusion:** The results suggested the within-session acquisition of APA could be observed after 50 trials of practice in healthy adults during functional reaching in standing. Further study will need to verify the optimal number of practice trials in the different populations.

0501PP114

THE FINDINGS OF NORMAL SUBJECTS AND STROKE PATIENTS WITHOUT SPASTICITY USING A NEW HAND-DRIVEN AND PORTABLE SPASTICITY-MEASURING SYSTEM

Jeong Hwan Seo¹, Soo Yon Son¹, Keo Sik Kim², Chul Gyu Song²

¹Chonbuk National University Medical School and ²Chonbuk National University, Division of Electronics and Information Engineering (Republic of Korea)

Purpose: To see the normal findings in newly developed hand-driven portable spasticity-measuring system, we evaluated normal healthy controls and stroke patients without spasticity. By considering these normal findings, we can analyze the data of spasticity more reasonably. **Materials and Methods:** Spasticity was evaluated in 10 normal persons without CNS lesion and 10 stroke patients without spasticity, modified Ashworth scale (MAS) 0. Our device was designed for measuring the joint angle, angular velocity, electromyographic (EMG) signals, and force (torque). One set of 10 passive flexion/extension movements of elbow was completed at 60, 90, 120, 150 and 180 degrees per second(deg/s). Electromyographic data and torque were collected from the biceps and triceps muscle. **Results:** In all subjects, we measured the EMG activities, joint angles, angular velocities, and torque by using the new portable spasticity measuring system. The maximal EMG amplitude varied from 71 μ V to 926 μ V in biceps muscle and from 48 μ V to 374 μ V in triceps muscle. The maximal flexion torque was 17 Nm and the maximal extension torque was 9 Nm. The EMG activities and torque were increased with increment of angular velocity. The portable spasticity-measuring system had good inter-rater and intra-rater reliability. **Conclusion:** Newly developed portable system for measuring spasticity is designed to test spasticity more precisely and objectively. The inter-rater and intra-rater reliability was good. By considering these normal findings and the good reliability of this system, we suppose that this system can be used to measure the spasticity more precisely and easily in clinical settings.

0501PP115

ULTRASONOGRAPHIC FINDINGS IN HEMIPLEGIC SHOULDER IN PATIENTS WITH STROKE

Ting-I Hang, Pei-Yu Yang, Nai-Hsin Meng, Shu-Wei Dee, Chia-Chen Lin

Department of Physical Medicine and Rehabilitation, China Medical University Hospital (Taiwan)

Purpose: Shoulder pain is a common complication in hemiplegic patient after stroke. The well-known causes of the shoulder pain include shoulder subluxation, shoulder-hand syndrome, adhesive capsulitis and rotator cuff lesion. The exact mechanism of development of shoulder pain is not clear, thus the most effective treatment remained uncertain. Radiography with/without contrast has been used to obtain a quantitative measurement of shoulder subluxation and investigation of rotator cuff tear in post-stroke patients. However, the characters of low cost, convenience, and lack of risk make dynamic ultrasonography an excellent imaging tool for evaluating the shoulder of hemiplegic patient recently. The purpose of this study is to evaluate the hemiplegic shoulder by ultrasonography. **Materials and methods:** Seven patients with post-stroke hemiplegia (all Brunnstrom stage II in proximal part of affected upper limb) were recruited from the rehabilitation clinic in a teaching hospital. Basic data including duration of stroke, Brunnstrom stage, spasticity (Modified Ashworth scale) of the hemiplegic side were collected. Ultrasonography was performed using an ultrasonographic equipment with a 7–12 MHz linear array transducer (LOGIQTM5 PRO, GE medical system) by a physiatrist. The distance of acromion-humeral distance was measured by the method described by Gi-Young et al. We measured

the lateral distance (LD) between the lateral border of the acromion and the greater tuberosity and the anterior distance (AD) between the anterior border of the acromion and the lesser tuberosity in the affected and unaffected shoulders. The ultrasonographic findings of rotator cuff tendon abnormalities were described as normal, a tendinopathy, a partial-thickness tear, and a full-thickness tear. **Results:** The motor status of proximal hemiplegic arm of all the participants is Brunnstrom stage II. The mean duration of stroke was 42.29 \pm 9.26 days. The ultrasonographic findings of hemiplegic shoulder included partial-thickness tear in one patient, tendinopathy in four patients. The AD and LD of the affected shoulder (AD: 3.12 \pm 0.51 cm; LD: 2.87 \pm 0.27 cm) were greater than those of the contralateral shoulder (AD: 2.40 \pm 0.47 cm; LD: 2.12 \pm 0.33 cm). **Conclusion:** The ultrasonography is a convenient diagnostic tool to measure the degree of shoulder subluxation directly in patients with post-stroke hemiplegia without exposure to ionizing radiation.

0501PP116

OPTIMAL TIMING OF MEDICAL INTERVENTION FOR OSTEOPOROSIS

Fong-Cheng Lin¹, Wei-Jung Chang², Ching-Yang Lin³, Mu-Jung Kao⁴

¹Department of Physical Medicine and Rehabilitation, Taipei City Hospital, Renai Branch, ²School of Health Care Administration, Taipei Medical University, ³Department of Physical Medicine and Rehabilitation, Taipei City Hospital, Renai Branch and ⁴Department of Physical Medicine and Rehabilitation, Taipei City Hospital, Yangming (Taiwan)

Purpose: In developed countries, the morbidity of fractures caused by osteoporosis has surpassed that of heart disease and stroke; moreover, the disability caused by fractures is no less than by cerebral infarction. Therefore, it is worthwhile to determine the magnitude of the social cost of osteoporosis. The purpose of this study was to analyze bone mineral density data in the hope of finding the appropriate timing for intervention with medications, so as to reduce the probability of corresponding fractures. **Materials and Methods:** BMD T-score data measured by DXA was collected from female patients greater than 65 years of age who were admitted to the hospital or visited the OPD for femoral neck, intertrochanteric, or vertebral fractures between January 2005 and October 2007 in order to determine the difference in T-scores as compared with a control group (non-fracture OPD patients). **Results:** T-scores had a negative correlation with age. T-scores decreased with age and the T-scores of fracture patients were significantly lower than non-fracture patients at the same age. Furthermore, the correlation coefficient of age and T-score in the control group was not as significant as in the study group, which suggests that the problem of BMD decreasing with age could be relieved by interventions which served as controllable factors. However, if the decrease in BMD could not be reduced in a timely manner, the probability of fractures would increase. Of the patients in the study group, 75.6% had a T-score < -2.5 as compared with 14.9% in the control group. The odds ratio for fractures was 5.06. If the comparison standard was changed to a T-score of < -3.5, 58.5% of patients in the study group would have been included as compared with 1.1% in the control group; the corresponding odds ratio for fracture would be 50.9. **Conclusion:** After summarizing the study results and considering the problem of effective usage of medical resources, it is recommended that a T-score of -3.5 is the minimum limit for drug treatment.

0501PP117

CONTROL IN MOTOR UNITS ON GLUTEUS MEDIUS MUSCLES DURING MAXIMAL WALKING SPEED IN NORMAL PERSONS

Akio Kobe¹, Kazuhiko Kuriwa¹, Junko Kiyoi¹, Toshiyuki Muratani¹, Mayumi Oda¹, Kenji Kagechika², Ayumi Kaneuji³

¹Department of Medical Rehabilitation Services, Kanazawa Medical University Hospital, ²Department of Rehabilitation Medicine, Kanazawa Medical University and ³Department of Orthopedic Surgery, Kanazawa Medical University (Japan)

Purpose: The purpose of this study was to investigate difference of control in motor units on gluteus medius muscle (GM) using surface EMG between normal and maximal walking speeds. **Materials and Methods:** The participants consisted of 9 healthy women volunteers with informed consent. Using a foot-switch, the mid stance phase was selected and sEMG signal of GM during mid stance phase was analyzed with non-linear system called “MemCalc”. Parameters included: 1) EMG median frequency (MF); 2) integrated EMG normalized maximal voluntary contraction and compared between the normal and maximal walking speeds. **Results:** The mean EMG activity of GM during the mid stance phase in maximal walking speed was greater than that during the same stance phase in normal walking speed, but there was no significant difference. On the other hand, the mean MF, in frequency range of 20 to 1000 Hz, of GM during the mid stance phase in maximal walking speed was significantly lower than that during the same stance phase in normal walking speed ($p < 0.05$). **Conclusion:** It was suggested that the control in motor units on GM during the mid stance phase of maximal walking speed in normal persons was selectively achieved by recruitment of smaller motor units distributed over slow twitch fibers compared to normal walking speed.

0501PP118

EFFICACY OF INTRA-ARTICULAR HYALURONAN INJECTION IN KNEE OSTEOARTHRITIS

Ling-Li Liu

Department of Rehabilitation Medicine, Zhongnan Hospital, Wuhan University (China)

Purpose: To evaluate the effect of intra-articular hyaluronan injection in treatment of knee osteoarthritis. **Materials and Methods:** Twenty cases of knee osteoarthritis in outpatient were treated with intra-articular hyaluronan injection between March to August in 2009. Knee radiographs were reviewed and graded on the basis Kellgren and Lawrene classification system. Preinjection and postinjection evaluation were conducted by the score change of pain relief, physical examination and knee function. **Results:** All the cases were available for follow-up and responded to a detailed patient questionnaire. The satisfactory rate was 90% in the patients with radiographic I and II grade. **Conclusion:** It is recommended that intra-articular hyaluronan injection be used in the patients with radiographic evidence of mild disease.

0501PP119

A PILOT STUDY ON IMPLEMENTING THE DISABILITY EVALUATION FOR STROKE PATIENTS IN TAIWAN BASED ON INTERNATIONAL CLASSIFICATION OF HEALTH FUNCTIONING, DISABILITY AND HEALTH (ICF)

Hung-Yi Chiou¹, Yu-Ling Li¹, Fang-I Hsieh^{1,2}, Chyi-Huey Bai^{1,3}

¹School of Public Health, Taipei Medical University, ²Dr. Chi-Chin Huang Stroke Research Center, Taipei Medical University and ³Central Laboratory, Shin Kong WHS Memorial Hospital (Taiwan)

Purpose: The specific aim of the study is to elucidate the usefulness of disability evaluation of stroke patients using International Classification of Health Functioning, Disability and Health (ICF) in Taiwan. **Materials and Methods:** A total of 30 stroke patients were recruited through Taiwan Stroke Registry and were then evaluated their disability between the 6th month and one year after the onset of stroke based on International Classification of Health Functioning, Disability and Health (ICF). The ICF system

in Taiwan have been developed through a national decision-making process carried out by members of Taiwan ICF Team includes physicians, nurses, physical therapists, occupational therapists, social workers, psychologists, special education teachers, vocational assessment workers, public health scholars, and representatives of welfare groups for people with disability. There were a total of 199 professional members (124 members for body function/body structure, and 75 members for participation/environment) participated in 16 groups (8 groups for body function/body structure, and 8 groups for participation and environment). In each group, there was one member to be the leader to lead the discussion by focus group session and voting to reach agreements. These groups need to develop evaluation methods and standards and formulate related training courses for disability evaluation professionals. And each group further discussed and drafted related regulations. There were 6 items, 2 items, 7 items and 3 items, respectively, of body function, structure, demand and environment in Taiwan ICF used in the pilot study to evaluate disability of stroke patients. The disability of stroke patients evaluated by Taiwan ICF were also compared with that of same patients using Barthel index and modified ranking scale (mRS) to elucidate the usefulness of Taiwan ICF on disability of stroke patients. **Results:** Stroke patients with mRS 2-4 and did not have recurrent stroke would be recruited as study subjects. Compared with the item specific score of body function at 6th month after stroke onset, the memory function in one year have been improved. However, the items of brain and nervous systems did not show significant improvement during 6 month to one year. The same results were also observed for items of activity and environment. The comparison between evaluation of stroke disability based on ICF, Barthel index and mRS will be provided in the conference. **Conclusion:** This is a pilot study on evaluation stroke disability using newly development Taiwan ICF. We found that it provide more comprehensive scope including interaction between stroke patients and their living environment on stroke disability than Barthel index and mRS. We also provide a preliminary data to show it is very important to develop a country specific version of ICF on disability of chronic diseases.

0501PP120

HEAD, TRUNK, HIP AND SHOULDER MOVEMENT DURING SITTING FORWARD REACHING TO THREE DIFFERENT DISTANCES

Te-Hsiang Lo¹, Yi-Fen Shih^{1,2}

¹Department of Physical Therapy and Assistive Technology, National Yang-Ming University and ²Department of Education and Research, Taipei City Hospital (Taiwan)

Purpose: To investigate and compare the movement pattern of head, trunk, hip and shoulder segments during sitting forward reach task at three testing distances: 100%, 115% and 130% arm's length. **Materials and Methods:** From September 2009 to December 2009, the testing involved a total of ten healthy subjects who were free from spinal pain and other musculoskeletal problems. In order to collect joint motions of the head, trunk, hip and shoulder in the sagittal plane, an electromagnetic tracking device was used. Participants were instructed to reach forward to touch the target placed at eye-level under three different horizontal distances (100, 115 and 130% arm's length) with gaze fixed on the target. The speed of movement was guided by a metronome and each testing was performed in two seconds. Onset of joint motion was the moment when the joint angle exceeded two standard deviations of its baseline. The onset of hand movement and the end of reaching movement were defined respectively as the time at which contact with hand switch was broken and target switch was touched. Onset latency was defined as the difference between joint movement onset and hand movement onset. Intraclass correlation coefficients (ICC_(3,3)) were calculated to describe the measurement repeatability of the testing variables and Pearson correlation coefficients were used to examine the relationship between movement of the head, trunk, hip and shoulder joints. **Results:** During forward reach, head

and trunk extended while shoulder and hip flexed; the greatest values of amplitude of joint angle occurred at the 130% test (head extension angle = 13.92°, trunk extension angle = 9.74°, hip flexion angle = 21.00°, and shoulder flexion angle = 96.79°). The reliability of head, trunk, hip and shoulder movement angle was good to excellent for the 115% test (ICC_(3,3) = 0.84–0.98) and the 130% test (ICC_(3,3) = 0.88–0.99). The measurement of movement range was less repeatable for the 100% test (ICC_(3,3) = -0.58 to 0.96). The ICC value for the measurement of head movement onset latency was the best for the 130% distance (ICC_(3,3) = 0.74) while trunk, hip and shoulder joint onset latency had a range of moderate to good reliability in all three testing distances (ICC_(3,3) = 0.59–0.98). In both 115% and 130% testing distances, movement of trunk and head were negatively correlated ($r = -0.86$ and $r = -0.77$), and there was a positive relationship between trunk extension and hip flexion movement at the 130% testing distance ($r = 0.72$). More than half of the participants started the forward reach movement with their head segment at both 100% reach distance (57%) and 115% reach distance (72%). At 130% reach distance, 14% and 43% subjects initiated their movement with head and trunk segments respectively. **Conclusion:** During sitting forward reach, head and trunk moved into extension while hip and shoulder flexed; increased trunk extension angle was associated with increased hip flexion angle and decreased head extension angle. The testing distance of 130% arm's length resulted in the best consistency for kinematic measurement and joint onset latency.

0501PP121

THE EFFECT OF PHONOPHORESIS ON PATIENTS WITH ANTERIOR CRUCIATE LIGAMENT INJURIES OF THE KNEE

L. Mircea, Simona Daciana Birsan

Oradea University School of Medicine (Romania)

Purpose: Knee pain is one of the most common medical problem. The knee joint must also be supported by soft tissues - muscles, tendons, and ligaments - which are also subject to injury, overuse, and under use. Degenerative conditions and other diseases in the body may also contribute to knee problems, or generate pain that travels along nerves to the knee. Non-pharmacological methods including a variety of physical agents are the cornerstone of the management of the shoulder pain. Phonophoresis is the use of ultrasound to enhance the delivery of topically applied drugs. The aim of the study was to what parameters of ultrasound will most efficiently facilitate topical drugs diffusion, and what duration ultrasound should be used to maximize absorption of drugs in patients with knee pain. **Materials and Methods:** Fifty patients with knee pain (duration > 2 months) of both sexes (30 males and 20 females) aged 51.03 ± 9.25 years, admitted for stationary medical rehabilitation in a rehabilitation center, were functional evaluation was realized with ADL (Activities of Daily Living), range of motion (ROM) for knee joints, the pain and the evaluation of pain free effect of therapy were analysed with the scale VAS. One group: ultrasound was performed with continuous mobile technique, at the intensity of 0.75 W/cm² for 12 min per session used cream with Capsaicin 7.5%, and the second group: ultrasound with continuous mobile techniques at the intensity of 0.5 W/cm² for 6 min per session with ketoprofen cream. Apart from descriptive statistics, Student's test was used to assess difference between the two groups and between baseline and post-therapeutic data. The level of significance was set at $p < 0.05$. **Results:** Study results showed favorable effects of both groups used ultrasound but the group who used capsaicin cream have a good difference. The chronic pain is generally associated with physical, psychological as well as social dysfunctions. Although physical agents have many advantages over interventions. **Conclusion:** In our study of knee pain patients, phonophoresis decreased the level of pain and improved the shoulder range of motion, additional studies are needed to establish the place of these treatment modalities in patients with knee pain.

0501PP122

THE IMMEDIATE CHANGE OF CENTER OF GRAVITY AFTER DUAL TASK BALANCE TRAINING IN ACUTE ISCHEMIC STROKE PATIENTS

Min-Kyung Lee, Hyun-Sik Yun, Jae-Young Han, In-Sung Choi, Sam-Gyu Lee

Department of Physical and Rehabilitation Medicine, Research Institute of Medical Sciences, Chonnam National University Medical School & Hospital (Republic of Korea)

Purpose: Hemiplegic stroke often affects balance-demanding activities, and that limits independence in activities of daily living. The balance function can be improved by dual task balance training, which maintains balance training performing cognitive task simultaneously. There are no reports on the immediate effect of dual task balance training in unilateral hemiplegic stroke patients. The aim of this study was to investigate the immediate change of center of gravity after dual task balance training in acute ischemic stroke patients. **Materials and Methods:** Eight acute ischemic stroke patients (2 male, 6 female; age 66.5 ± 8.3 years; duration of disease 8.7 ± 3.3 days), who can stand alone for more than 60 ± 30 seconds without assistance, were recruited. Their mini-mental status examination scores were 22 points or more. The patients with visual or vestibular impairment, peripheral polyneuropathy, lumbosacral radiculopathy, musculoskeletal deformity, aphasia, and cognitive impairment were excluded. Single task balance training was performed on the balance board. Dual task balance training was performed on the balance board counting loudly backwards from 50. Single or dual task balance training was performed for 15 min, once a day, alternating two types of balance training for 4 days. Berg balance scale and functional standing balance scale were checked before and after every single or dual task balance training. Plantar pressure distribution ratio, deviation of center of gravity, and distribution of center of pressure were measured on standing position by using Gaitview (alFOOTs®, Seoul, Republic of Korea). **Results:** 1) The changes of Berg balance scale and functional standing balance scale were not significantly different in both types of balance training, respectively ($p = 0.81, 0.77$). 2) The changes of plantar pressure distribution ratio, percentage of deviation of center of gravity, and distribution of center of pressure were not significantly different in both types of balance training, respectively ($p = 0.65, 0.30, 0.53$). **Conclusion:** The immediate effect of dual task balance training was not significant in acute ischemic stroke patients. Further randomized controlled trials including long-term follow-up would be needed.

0501PP123

DETERMINANTS OF THE STROKE-SPECIFIC HEALTH-RELATED QUALITY OF LIFE (HRQOL)

Yin-Jung Wang, Chia-Yeh Chou

Department of Occupational Therapy, College of Medicine, Fu-Jen Catholic University (Taiwan)

Purpose: The health-related quality of life is expected to be improved for the outpatients of stroke survivors. This therapeutic goal can be achieved by the suggestions from the determinants identification of the HRQOL. This study was aimed to identify the determinants of the health-related quality of life (HRQOL) for the stroke patients. **Materials and Methods:** This was a prospective, cross-sectional, and a still on-going project conducted at the hospitals in Taiwan from September 2008 to November 2009. Participants with diagnosis of stroke were recruited. They were also outpatients whose cognitive comprehension allowed them to be able to listen or to read in Chinese language. The Stroke-Specific Quality of Life (SS-QOL) is a disease-specific HRQOL instrument and was used as the main outcome measure in this study. The SS-QOL was completed by self-rating or being interviewed by the researchers. In addition, the Barthel Index (BI), Mini-Mental State Examination

(MMSE), National Institutes of Health Stroke Scale (NIHSS) were also administered for the identification of the determinants. The Spearman rank correlation coefficient (ρ) was used to investigate whether there were significant correlations between the scores of SSQOL, and those of BI, MMSE, and NIHSS. The multiple regression would also be computed to search determinants from the BI, MMSE, or NIHSS on the SS-QOL. The SPSS software was used for statistical analysis. **Results and Conclusion:** The determinants of the NIHSS, MMSE, and BI on the SS-QOL would be identified. The determinants identified were relevant to either physical recovery, cognitive function, or the performance of daily activities. These determinants identified would provide valuable suggestions for the clinical practitioners and researchers regarding the areas of the health care for improving the HRQOL of the stroke outpatients.

0501PP124

PREDICTING ELDERLY FRAILTY BY FUNCTIONAL PERFORMANCE TESTS

Pay-Shin Lin¹, Meng-Tieh Chen¹, Tzu-Wen Chen¹, Alice M.K. Wong¹, Jong-Shyan Wang¹, Hsiang-Wei Tang¹, Shin-Cheng Su¹, Huey-Shinn Cheng²

¹Graduate Institute of Rehabilitation Science, Chang Gung University and ²Internal Medicine, Chang Gung Memorial Hospital, Linkou Branch (Taiwan)

Background: Frailty was a fairly common biological syndrome in the elderly. It caused vulnerability to adverse outcomes, such as falling, institutionalization, or death. Sarcopenia may be the possible mechanism of frailty, which may result in decline in muscle strength and, thus, physical function. In the current study, the author would like to know if frailty could be simply predicted by functional tests battery. **Methods:** In this cross-sectional study, we recruited 484 community-dwelling elderly aged over 65 years old. After a consent form, each participant went through an interview with a questionnaire, and 6 functional tests (grip strength (GS), knee extension (KE), 6 minute walking test (6MWT), 30 sec sit-to-stand (30STS), timed up and go (TUG) and functional reach (FR)). All the subjects were classified into normal, prefrail, and frail groups according to modified Dr. Fried et al's classification. One-way ANOVA was used to test the differences of the results of functional tests in the three groups. Multiple linear regression analysis was used to construct a predictive model of functional performance tests to frailty score for the elderly. **Results:** The ANOVA showed that different levels of frailty elderly were significantly different in functional tests in GS ($F=22.66$), 6MWT ($F=24.09$), 30STS ($F=19.12$), TUG ($F=43.41$) and FR ($F=15.70$) for male, and in GS ($F=24.33$), KE ($F=12.92$), 6MWT ($F=17.6$), 30STS ($F=30.96$), TUG ($F=68.79$) and FR ($F=12.82$) for female. In regression model for male, GS ($\beta=-0.039$) and TUG ($\beta=0.108$) were the significant predictors and both explained 40.3% of the variance of the frailty score. In female, 30STS ($\beta=-0.029$), GS ($\beta=-0.036$), TUG ($\beta=0.071$) explained 36.6% of the variance of the frailty score jointly. All $p<0.05$. **Conclusions:** Different levels of frailty elderly have significantly different functional test results. Among them, GS, TUG and 30 STS can predict the frailty score jointly in both gender. They may serve as a screening battery.

0501PP125

THE RESPNSIVENESS AND MINIMAL IMPORTANT DIFFERENCE ON THE ROLAND AND MORRIS DISABILITY QUESTIONNAIRE FOR THE PATIENTS WITH LOW BACK PAIN

Yi-Shiung Horng^{1,2}, Ming-Chuan Lin¹, Valeria Chiu¹, Chung-Wei Huang¹, Yi-Wei Chang¹, Jung-Der Wang^{3,4}

¹Department of Physical Medicine and Rehabilitation, Buddhist Tzu Chi General Hospital, Taipei Branch, ²Department of Medicine, Tzu Chi University, ³Institute of Occupation Medicine and Industrial Hygiene, National Taiwan University and ⁴Department

of Environmental and Occupational Medicine, National Taiwan University Hospital (Taiwan)

Purpose: To evaluate the responsiveness and estimate the minimal important difference (MID) on Roland and Morris Disability Questionnaire (RMDQ) for the patients with low back pain (LBP). **Materials and Methods:** Patients with low back pain were consecutively recruited from several clinics of physical medicine and rehabilitation. All patients received an initial evaluation consisting of a medical history and physical examination. Every patient completed the RMDQ and rate their pain intensity by a Visual Analog Scale. The disability days was defined as restricted activity days or work absence days during the previous 4 weeks because of back pain. Follow-up questionnaire was obtained from each patient 8 weeks later. The changes of clinical status were also recorded by the patients using a 5-point Likert Scale as an external criterion. Responsiveness was analyzed by calculating the effect size (ES) and the standardized response mean (SRM). Two methods were employed to estimate the MID in this study: (1) Receiver operating characteristic curve was created for cut-point analysis between improved and non-improved group; (2) Multiple Linear Regression analysis was used to examine how the MID linked to one disability day for RMDQ. **Results:** There were 100 patients recruited consecutively. The mean disability days during the previous 4 weeks was around 4.1 days. 84% of the participants reported improvement of LBP after the 8-week follow-up and 11% participants remained in stable condition. Only 5% of the participants reported deterioration. Comparison between the results obtained from the initial and follow-up questionnaire showed statistically significant improvements in pain intensity and disability scale. The ES and SRM of RMDQ was 0.31 and 0.33 respectively. The area under the curve for the Roland and Morris Disability Questionnaire was 0.56 (0.39, 0.73). The cut-point of the RMDQ corresponded to a change of 1.5 points. After adjustment for the effect of age and gender on the changes of disability days by multiple linear regression analysis, the coefficient of RMDQ was 0.44. In other words, an RMDQ score increment of 2.3 would reduce one disability day, which could be considered as the approximate magnitudes of MID for this instrument. **Conclusion:** In our case, the responsiveness of Roland and Morris Disability Questionnaire was only mild to moderate high. However, the estimation of the minimal important difference showed that Roland and Morris Disability Questionnaire could reflect meaningful clinical changes among the patients with low back pain.

0501PP126

IATROGENIC BRACHIAL PLEXOPATHY : A CASE REPORT

Shu-Fen Chiu^{1,2}, Lee-Kiat Ban¹, Yi-Ying Lu²

¹Department of Physical Medicine and Rehabilitation, Department of Surgery (Taiwan), ²Department of Radiology (Taiwan)

Purpose: The case report describes a lady with iatrogenic brachial plexopathy after modified radical mastectomy. The purpose is to demonstrate the predicting correlations in progression and different diagnostic tools. Iatrogenic neuropathy is used for describing the marked motor-sensory impairment after surgery. The outcome and recovery course varies among different surgical exploration, anatomic localization or injury mechanism. Rare iatrogenic neuropathy was reported after modified radical mastectomy (MRM). A 53-year-old female underwent a right MRM and dissection of the axillary lymph node. The patient suffered from predominant right shoulder weakness on the next day. The muscle strength of right shoulder flexor and biceps were trace and poor minus, respectively. The patient complained mild paresthesia of right upper limb. Consequently, localized tenderness on the skin flap and supraclavicular area was palpated. Using magnetic resonance image study, the possible presence of root avulsion or right brachial plexus lesion and localization (mechanism) was clarified. Beside, the initial post-injury electromyography revealed absence of MUAP with voluntary control. A second needle EMG shows co-

exist PSW / fibrillation and polyphasic waves 5 weeks after surgery. Complete recovery of shoulder elevation was months. **Conclusion:** The “time and location” principle should be documented by serial NCV and electromyography for extent of iatrogenic neuropathy. The MRI study is helpful to differentiating the etiology of weakness and enclose the mechanism of brachial plexopathy.

0501PP127

REAL-TIME PREDICTION OF THE VARIABILITY OF COP BY ACCELEROMETRY

Shih-Wei Chen¹, Te-Son Kuo^{1,3,4}, Shih-Ching Chen²

¹Department of Electrical Engineering, National Taiwan University, ²Department of Physical Medicine and Rehabilitation, Taipei Medical University and Hospital, ³Institute of Biomedical Engineering, National Taiwan University and ⁴Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University (Taiwan)

Purpose: Force plate system is known as an effective assistive apparatus for standing balance training and weight transferring training for hemiplegic patients. However, traditional force plate is too bulky and costly to be popular and used at home. In this study, we propose an alternative scheme of measuring the variability of center of pressure (COP) by using a practical and low cost method: accelerometry. **Materials and Methods:** 7 normal subjects were recruited in this study. One tri-axes accelerometer was attached on the L5 of the subject. Another tri-axes accelerometer was attached on the back of the right knee of the subject. The variability of COP was measured simultaneously by the force plate and accelerometry. **Results:** Each subject was asked to perform 6 anterior-posterior COP excursion trials and 6 medial-lateral COP excursion trials. The average percent error between the real-time anterior-posterior COP excursions predicted by accelerometry and the one measured by the force plate is $11.8 \pm 9.1\%$, and the average percent error between the real-time medial-lateral COP excursions predicted by accelerometry and the one measured by the force plate is $6.2 \pm 5.3\%$. The performance of predicting the anterior-posterior COP excursions is moderate because the subjects sometimes made humpbacked stances when performing anterior-posterior COP excursion. **Conclusion:** Our preliminary results demonstrated the applicability of using accelerometry to predict the variability of COP. The accelerometry can be a popular and low cost (compared with the force plate) alternative of the force plate for household use; because its portability and ease-of-use, it can also be applied to feedback-controlled lower limb functional electrical stimulation (FES) to help hemiplegic patients recover the ability of standing stably in their daily activities.

0501PP128

EFFECT OF EARLY PELVIC STRENGTHEN TRAINING ON BALANCE AND WALKING ABILITY OF PATIENTS WITH HEMIPLEGIA

Yan Li, Xudong Gu, Yunhai Yao, Hua Wu, Zhiliang Yu, Hui Li, Wei Wang, Xiongwei Zhang

The No.2 Hospital (China)

Purpose: To investigate the effect of early pelvic strengthen training on balance and walking ability of patients with hemiplegia. **Materials and Methods:** 53 cases patients with hemiplegia were randomly divided into treatment group ($n=27$) and control group ($n=26$). Both of the two groups were received routine rehabilitative training, and besides, patients in the treatment group were received early pelvic strengthen training, twice a day. Scale before and after treatments by the Fugl-Meyer scale, the BBS, and the FAC. **Results:** Fugl-Meyer scale, the BBS and the FAC all were better than before ($p<0.05$). **Conclusion:** Early pelvic strengthen training can improve balance and walking ability.

0501PP129

GAIE ANALYSIS IN THE HEMIPLEGIC WALKING WITH DIFFERENT ANGLE AFO

Guangxu Xu, Qingming Qu, Jianan Li

Nanjing Medical University (China)

Purpose: To explore the best angles of static ankle-foot orthosis (AFO) to hemiplegic patients through gait analysis. **Materials and Methods:** Ten patients using three different angles static AFO (dorsiflexion 5°, plantarflexion 5°, functioning 0°) and barefoot walking on the platform of gait analysis system, gait parameters were collected and calculated. **Results:** Comparing with barefoot, AFO with dorsiflexion 5° can significantly increase in stride length, step length and velocity ($p<0.05$). The dorsiflexion 5° AFO can significantly reduce the double support time than 0° AFO ($p<0.05$). There is no significantly difference in gait symmetry. **Conclusion:** The dorsiflexion 5° AFO can improve step length, stride length, and velocity, and reduce double support time. Though the symmetry comparisons between four groups have not significantly differences, dorsiflexion 5° AFO has more tendency to normal gait symmetry.

0501PP130

DEVELOPMENT OF A SYSTEM TO DETECT AND ANALYSE THE LOCUS OF HUMAN MOVEMENTS IN THE SAGITTAL PLANE

Guangqing Li

The Department of rehabilitation Medicine, Xuanwu Hospital Capital Medical University (China)

Purpose: To develop a low cost system to detect and analyse the locus of human movements. **Materials and Methods:** By taking images of human movements and identifying the maker points sticking to the positions waiting for analysis utilized color image processing techniques, the locus of human movements is obtained. Then we can research the human movements by analyzing and comparing the stick-figure, the phase graph of the displacement or angle, etc., getting from the locus. **Results:** The system developed for the purpose mentioned above has the advantages of convenient operation and small floor area. It also can be used with the three-dimensional force plate synchronically. **Conclusion:** The analysis software is integrated all of the commonly methods used in gait analysis and the detecting report can be obtained rapidly and conveniently.

0501PP131

THE APPLICATIONS OF SINGLE SWITCH CONTROL DEVICES FOR COMPUTER USERS WITH SEVERE MOTOR DISABILITY

Jui-Kun Chang

Rehabilitation Dept., Kaohsiung Chang Gung Memorial Hospital (Taiwan)

Purpose: Identifying client's motor ability for consistent and reliable control is essential part of a single switch assessment. The quadriplegia cases of muscular dystrophy & ALS (Amyotrophic lateral sclerosis) demonstrated well-control in computer task with single switch input devices. **Materials and Methods:** Four components of a single switch control evaluation: 1) Evaluate proper seating of the client and positioning of the devices. 2) Identify an anatomical site under the client's voluntary control. 3) Identify and assemble the array of switch/control options that work with the identified anatomical site. 4) Conduct comparative evaluations of the switch/control options through actual use with the identified anatomical site. **Results:** Following the evaluation findings, the client's needs hierarchy of input device selection and use was proposed. There are several kinds of switches were applied with auto-scanning software. The sensor switch & winking switch controlled by single smallest muscular movement were more efficient & successful according to our clients' perform-

ances. **Conclusion:** The essential components of a single switch evaluation were identified. Using this detailed information should lead to optimal switch placement and switch use.

0501PP132

PUDENDAL AFFERENT STIMULATION AUGMENTS BLADDER EMPTYING IN URINARY RETENTION RATS

Chih-Wei Peng¹, Shih-Ching Chen¹, Chien-Hung Lai¹, Wen-Jia Fan², Warren M Grill³

¹Dept. of PM&R, Taipei Medical University and Hospital, ²Institute of Physiology, National Yang-Ming University (Taiwan) and ³Department of Biomedical Engineering, Duke University (United States)

Purpose: Chronic urinary retention can lead to reflux, upper urinary tract damage, urinary tract infection, and overflow incontinence, and traditional treatments are inadequate. Currently, sacral nerve root neuromodulation has been applied in patients with urinary retention who initially failed standard treatment. While effective in some patients, many patients do not respond to sacral nerve neuromodulation. Thus, there is a need for a more effective prosthesis to restore the bladder voiding function. Our recent studies demonstrated that unilateral electrical stimulation (UES) of the pudendal sensory nerve improves bladder emptying efficiency in an animal model of urinary retention, established by acute transection of the pudendal sensory nerves in rat. In the present study, we sought to determine whether bilateral electrical stimulation (BES) of the pudendal sensory further enhanced bladder emptying efficiency, as compared to UES. **Materials and Methods:** Female Sprague-Dawley rats ($n=6$) were anesthetized with urethane (1.2 g/kg, s.c.). All rats underwent bilateral transection of the pudendal sensory nerves (BST), and the proximal ends of the transected sensory nerves were mounted in bipolar cuff electrodes for electrical stimulation. Continuous transvesical infusion cystometrogram (CMG) measurements were conducted to quantify the effect of UES and BES on voiding. **Results:** Contraction duration (CD), inter-contraction interval (ICI), bladder contraction area, and voiding efficiency (VE) were significantly reduced following BST. The average CDs and ICIs were prolonged by both UES and BES across all tested amplitudes and frequencies, and no significant differences were found between the effects of UES and BES. Further, both bladder contraction area and voiding efficiency (VE) were significantly increased by UES and BES across all tested stimulation parameters. Although BES consistently generated a 4–5% larger increase in VE than UES, this improvement did not reach statistical significance. **Conclusion:** Disruption of sensory feedback carried by the pudendal sensory nerves dramatically reduced voiding efficiency and created an effective animal model of urinary retention. Artificial replacement of sensory activity by either unilateral or bilateral electrical stimulation prolonged the duration of voiding bladder contractions and enhanced bladder emptying efficiency. Therefore, either unilateral or bilateral electrical activation of pudendal nerve afferents may be a new direction for the design of alternative neuroprostheses for patients with urinary retention as well as other voiding dysfunctions.

0501PP134

THE EFFECT OF NEWLY-DESIGNED DYNAMIC CUSHION SYSTEM ON BUTTOCKS PRESSURE DISTRIBUTION IN PARAPLEGIC PATIENTS

Shih-Cherng Lin^{1,3}, Fuk-Tan Tang¹, Ngok-Kiu Chu¹, Pei-Hsuan Wu¹, Kuan-Jung Chen¹, Pai-Chu Chen¹, Weng-Pin Chen², Feng-Long Cai³

¹Department of Physical Medicine and Rehabilitation, ²Department of Mechanical Engineering and ³Department of Biomedical Engineering (Taiwan)

Purpose: Various wheelchair cushion system designs have been developed to provide pressure relieve during prolonged sitting, espe-

cially for facilitating intermittent pressure relieve. However, pressure redistribution of static seat cushion design is only momentarily due to compression and distortion of its material. Although dynamic cushion systems have better efficacy for pressure redistribution, they are expensive and are intended for powered wheelchairs. Therefore, the purpose of current study was to develop a newly-designed dynamic cushion system, and to investigate its effect on the pressure distribution of human buttock as well as the efficacy for pressure sore prevention. **Materials and Methods:** This newly-designed dynamic cushion system consisted of an upper base, a lower base, a universal joint and four spring elements. The upper base and lower base were assembled by the ball joint and socket which were located at the center of the base respectively. Four spring elements were set at the corners of upper and lower bases for damping function. The principle of this design is to transfer the center of pressure (COP) trajectory through upper limb movement and the damping function of the cushion. Twenty male and ten female paraplegic patients with injury levels below the thoracic spine were recruited in this study as the experimental group. Novel Pliance-X system was used to perform the measurement of buttock pressure distribution. All subjects were asked to sit on this dynamic cushion system with two different spring (6.37, 10.37 N/mm) and rigid element respectively. Maximum mean pressure, peak pressure, pressure-time integral and pressure-time process were analyzed by the analytical software of Novel multimask. Statistical analysis was performed by independent-samples t test and analysis of variance repeated measurement. **Results:** In our SCI patients, the reduction of maximum mean pressure beneath the ischial tuberosity was 13.22% and 13.77% when sitting on our newly dynamic cushion system of high and low stiffness as compared to the rigid support seat cushion. As compared to rigid cushion support, the decrease in peak pressure beneath the ischial tuberosity was 11.48% and 28.01% with high and low stiffness cushion support respectively. Pressure-time integral beneath the ischial tuberosity was reduced 12.82% and 14.58% with high and low stiffness as compared to the rigid cushion support. Since peak pressure distribution was altered, the average differences between maximum and minimum pressures were 20.55 kPa, 17.39 kPa and 14.36 kPa when sitting on the rigid, high stiffness and low stiffness cushion systems respectively. **Conclusion:** Based on the experimental results, our newly designed dynamic cushion system with spring elements is able to decrease the peak pressure in the cushion-buttock interface instantaneously. This system can also relieve the effect of cumulative loading effectively. As a result, this dynamic cushion system with low spring stiffness can reduce not only the skin pressure but also the cumulative pressure loading beneath the ischial tuberosities. Therefore, this device may be used to decrease the occurrence of buttock pressure ulcer formation in patients with paraplegic spinal cord injuries.

0501PP135

EFFECT OF DIFFERENT INSOLE MATERIAL COMBINATIONS ON THE PLANTAR PRESSURE OF NORMAL FOOT

Chien-Hsuan Lee¹, Weng-Pin Chen¹, Fuk-Tan Tang², Shih-Cherng Lin^{2,3}

¹Department of Mechanical Engineering, ²Department of Physical Medicine and Rehabilitation and ³Department of Biomedical Engineering (Taiwan)

Purpose: Custom-made foot orthoses are frequently prescribed in routine clinical practice to prevent or treat plantar ulcers by reducing the peak plantar pressure. However, there was no evidence showing that stiffness or hardness was suitable to be the indicator for insole material selection. Therefore, the purpose of this study was to investigate the effect of total contact insole with different material combinations on plantar pressure distribution, and to find out either stiffness or hardness was to be a good indicator for material selection. **Materials and Methods:** Thirteen commercial orthotic materials were collected to determine their stiffness and hardness by material testing machine and durometer. Four different materials were selected from above mention to manufacture the total contact insole according to the value of

stiffness and hardness, respectively. One subject received a precision optical imaging device scanning to obtain the contours of right and left feet, and then the geometric parameters were imported into the CAD/CAM system to mill out the bottom layer of total contact insole. After that, a softer thin material which was used to be the upper layer was plastered with the bottom layer. Finally, a total of twelve combined insoles were completed for plantar pressure measurement. Novel EMED-X system and Novel Pedar-X system were used to measure the plantar pressure in barefoot and in-shoe conditions respectively. Novel multimask program was used to calculate the peak pressure (PP) and pressure-time integral (PTI) beneath forefoot, midfoot and forefoot. The mean and standard deviation of PP and PTI were calculated to compare the influence of different material combination insoles on plantar pressure. **Results:** The results showed that subject with total contact insole can reduce peak plantar pressure around 30–50% in the forefoot and rearfoot regions. The minimal reduction 32.189% was occurred in the forefoot when subject wearing insole which was consisted of the bottom layer (EFM) and upper layer (Light Weight Cork) with higher hardness. The maximum reduction 51.594% was arisen in the rearfoot when subject wearing insole which was consisted of the bottom layer (Firm Micro Puff) and upper layer (Plastazote Firm) with lower hardness. In the forefoot region, the PP was raised with the hardness increased of upper layer material under the same bottom layer material. In terms of stiffness, there was no obvious trend can be found out. In the rearfoot region, upper layer insole with the lowest hardness and stiffness could result in lower PP. Besides, the results of PTI were similar to PP in all insole combinations. **Conclusion:** According to the results of current study, insole material with higher hardness could probably lead to higher plantar pressure, especially in the forefoot region. More experimental data will collect to prove the conclusions of this study in the future.

0501PP136

MOUTH OPENING EXERCISE IN PATIENTS WITH SEVERE TRISMUS

Shinya Yura, Kenji Kagechika, Yasutaka Takagi
Tonami General Hospital (Japan)

Purpose: In patients with severe trismus, physiotherapy using a mouth opening exerciser is performed. We devise a new exercise which controls pain and gives a clear idea of interincisal mouth opening distances during active exercise. Patients and Technique: We introduced a mouth-opening exerciser (HU-OII) for mouth opening exercises in patients with severe trismus. It is made of a 5-mm thick acrylic resin plate and is wedge-shaped with a cut tip. The exerciser has 3-mm long stairs so that patients can notice improvement in mouth opening during exercise. Every stair has an extremely gentle slope so that it permits gradual mouth opening without severe pain. The patients underwent 100 times of enforced opening using the exerciser without help, with one opening per second, 100 seconds total. This exercise was done twice a day, once in the morning and once at night. **Results:** In patients with coronoid process hyperplasia, 30 days after surgery, the maximum mouth opening had increased to 40 mm. **Conclusion:** HU-OII is easy, very effective for postoperative mouth opening exercises.

0501PP137

EFFECTIVENESS OF NEUROMUSCULAR ELECTRICAL STIMULATION ON ANKLE DORSIFLEXION RECOVERY AND GAIT THERAPY IN PARETIC LEG AFTER STROKE

Jubao Du, Weiqun Song, Yu Pan, Lin Zhu, Zhen Chen, Yabming Zhang, Dahua Zhang, Yuanbin Yang
Rehabilitation department of Xuanwu Hospital of the Capital Medical University (China)

Purpose: Many people are left with a walking deficit after stroke. Ankle dorsiflexion motor weakness, poor motor control, and spas-

ticity result in an altered gait pattern during walking. This study introduces a neuromuscular electrical stimulation in enhancing functional ankle dorsiflexion based on sensor-driven electrical stimulation for the augmentation of walking. **Materials and Methods:** In our trial, ineffective ankle dorsiflexion during swing (drop foot) and failure to achieve heel strike at initial contact are common problems that disturb gait pattern after stroke. All 25 subjects are selected to the follow conditions: 1) first episode of unilateral stroke with hemiparesis during the previous 6 months, 2) a score between 1 and 3 inclusive on the Brunnstrom stages for the lower extremity, 3) ability to understand and follow simple verbal instructions, 4) ambulatory before stroke, 5) no medical contraindication to walking or to electric stimulation, and 6) ability to stand with or without assistance and to take at least 1 or more steps with or without assistance. We used an assessor-blinded, randomized, controlled design in this study. 22 patients were assigned to the control group (conventional rehabilitation program) and the remaining 23 were assigned to the NMES group (conventional rehabilitation program plus NMES). All 45 subjects participated in a conventional stroke rehabilitation program, 5 days a week, 2 to 5 hours a day, for 3 weeks. The conventional program is patient-specific and consists of neurodevelopmental facilitation techniques, physiotherapy, occupational therapy, gait therapy, and speech therapy (if needed). The NMES group also received 20 min of NMES to the peroneal nerve of the paretic limb two times a day, 5 days a week for 3 weeks. Transcutaneous NMES was given with the cefar Step II, on and off through a heel switch. It works by two skin electrodes positioned activating the peroneal nerve to the muscles that bend the foot upwards (dorsiflexors) with electrical impulses during the swing phase of gait. The stimulation was activated by the heel switch whenever the heel lost contact with the ground, and it was deactivated when the heel regained contact with the ground. The strength, frequency and delay time can be adjusted according to the condition of the patient. The Fugl-Meyer (FM) test for the lower extremities, Berg Balance Scale (BBS) for stability, Barthel Index (BI), mean walking velocity (vmean) over a 6-m distance, and Physiological Cost Index (PCI) were assessed at the entry point and at the end of the treatment. **Results:** Before treatment, there were no significant differences between the two groups for age, time post-stroke, stroke severity, and the baseline of measurements. After 3 weeks of treatment, in the two groups, we determined significant differences in the mean values of all outcomes between the entry and end points of treatment ($p < 0.01$), and we also found significant differences in the changes of FM, BBS, BI, vmean and PCI which occurred during the 3 weeks of treatment between the NMES and CON groups ($p < 0.05$). **Conclusion:** Three weeks of NMES to the affected lower extremity of subjects with early stroke improved their function recovery. NMES is an effective way to improve ankle dorsiflexion gait in individuals after stroke.

0501PP138

EFFECTS OF A FUNCTIONAL ELECTRICAL STIMULATION ASSISTED LEG-CYCLING ON IMPROVING POSTURE CONTROL OF PATIENTS AFTER STROKE

Chun-Yu Yeh¹, Hsin-Chang Lo²

¹School of Physical Therapy, Chung Shan Medical University and

²Assistive Technology Laboratory, Department of Product Design, Ming Chuan University (Taiwan)

Purpose: The purpose of this study was to determine whether a bout of functional electrical stimulation (FES)-cycling can influence the postural control of the patients after stroke. **Materials and Methods:** Twelve stroke patients (10 male, 2 female; range from 38–64 years) with hypertonia in the paretic leg, modified Ashworth scale (MAS) grade ≥ 3 , were recruited in this study. They were randomly assigned to the FES-cycling group (FES-CG) performing cycling training with the assistance of electrical stimulation and the cycling group (CG) performing cycling training without

electrical stimulation. The duration of the training program was 20 min. The target cadence of the cycling was set at 45 rpm. Postural control parameters included reaction time (RT), maximum excursion (MXE), directional control (DCL), movement velocity (MVL) and endpoint excursion (EPE) were compared before and immediately after training program. The Wilcoxon signed-rank test was used for comparing the pre- and post-test data in each group. The change ratios in postural control parameters were compared between the FES-CG and the CG using the Mann-Whitney U test. **Results:** The result of RT revealed no significant difference in both groups. However, the MXE ($p < 0.05$), DCL ($p < 0.05$) in forward direction were found significant intervention effects in FES-CG group. It indicated the subject can arrive more far distance and the accuracy of the movement was also promoted. The MVL ($p < 0.05$), EPE ($p < 0.05$) in forward direction also revealed significant differences in CG group. It revealed the movement velocity was faster and the moving distance was longer than pre-training. These results proved one bout of cycling training with or without FES can improve the postural control of the subjects after stroke. The change of RT revealed no significant difference between the FES-CG and the CG. The forward change in MXE and DCL revealed significant differences ($p < 0.05$, respectively) between the FES-CG and the CG. The results revealed the additional effect of the FES. The mechanism could be that the muscle tone of soleus in the FES-CG group after training was lower than that of the CG. The soleus muscle could less restrict the movement of the ankle joint and then the forward direction changes were larger in the FES-CG group. Besides, there were no significant differences in RT could be the insufficient training duration for those two groups. **Conclusion:** Although there was only one bout of cycling training, the postural control was improved in both FES-CG and CG. With the assistance of electrical stimulation, subjects had more progress in the ability of posture control. FES-cycling training would be a positive additional physical therapy method and can improve the balance ability of such patients. A further long term investigation concerning the changes in muscle strength and reaction time is necessary to conform the treatment effects of FES-cycling training.

0501PP139

SPECIAL CHAIR FOR SPECIAL CHILD

Marietta Prananta¹, Lydia Kidarsa²

¹ Faculty of Medicine Padjajaran University and ² Bioteknik Design (Indonesia)

Objective: Mobilization is one of the main problem in cerebral palsy patient. Most of the spastic quadriplegic cerebral palsy has low functional ability in mobilization. We present a case of spastic quadriplegic cerebral palsy with dislocated hip joint and we make custome made wheel chair to helper mobilize. **Case:** Patient is a 15 years old spastic quadriplegic cerebral palsy with dislocated of the right hip joint but the mother did not allow her child to be operated. All day long the patient can only lie in bed. All the activities of daily living should be help by her mother. She can smile, say a view word and she like to hear or see other children play. The examination identified spasticity asworth scale II in four extremities, contracture in the right knee joint and ankle joint, muscle strength are weak function and dislocated of the right hip with pain and limited ROM. There is also thoracal scoliosis. We make a wheel chair that is specific to the size of the patient and add several pads with three point pressure system, also separator and table to stabilized and accommodate herwhile sitting in the wheel chair. The body of the wheel chair made from steel pip, pads and separator made from rebonite. It cost about US\$ 350. It take a month on making and training the patient and her mother to use the chair. Now she can mobilized and watch other children play in front of her house. **Conclusion:** Properly made wheel chair can improve mobilization and quality of life for spastic quadriplegic cerebral palsy patient.

0501PP140

THE EFFECTS OF TWO DIFFERENT FREQUENCIES OF WHOLE BODY VIBRATION ON BALANCING ABILITY AND FLEXIBILITY IN NURSES

Chung Liang Lai¹, Shiuan Yu Tseng¹, Yi Yuan Peng¹, Si Xuan Zhu², Chin Yen Tseng³, Chun Hou Wang⁴

¹Health of Department, Tai-Chung Hospital Rehabilitation, ²Gerontechnology and Service Management Institute, Nan Kai University of Technology, ³School of Physical Therapy, Chun Shan Medical University and ⁴Physical Therapy and Assistive Technology, National Yang-Ming University (Taiwan)

Purpose: The musculoskeletal disorders among nursing staff in Taiwan were very common, especially at neck, shoulder and back location. A good flexibility can prevent the variety of work-related muscle and soft tissue injuries. In addition, good balance can help the body to engage a variety of dynamic and static motor performance, making the body more coordinated in all aspects of performance and being not easily to happen work accidents due to poor balance. Whole body vibration (WBV) training is a novel exercise intervention, which is applied in athletic and general populations with the aim of improving flexibility and balancing ability. The present study sought to discover the response to different frequencies of whole body vibration in sedentary nurses. **Materials and Methods:** Eighty sedentary nurses were random assigned to Horizontal WBV with 5 min a day and 3 days a week for 2 months (LV-1000, X-trend, Taiwan). The training session used a vibrating plate producing sinusoidal oscillation at 20 Hz (low frequency) or 40 Hz (high frequency) with constant amplitude (40 nurses at 20Hz vibration training and other 40 nurses in 40Hz vibration training). Balance ability test which used Balance system (Biodex, USA) included limits of stability (LOS) test and static balance test. The flexibility test used the sit and reach test. All the parameters were administered before and after the WBV training. **Results:** WBV with low frequency stimulation was shown to significantly increase sit and reach flexibility by 17.25% ($p < 0.05$) and increase balance ability LOS by 30.39% ($p < 0.05$). WBV stimulation with high frequency determined a significantly decrease in flexibility by 8.03% ($p < 0.05$). **Conclusion:** The result showed the influence of different WBV frequencies upon the subject's adaptation responses. In particular, untrained nurses showed enhancement in balance ability and flexibility after low-frequency WBV stimulation. It's was a convenient and effective training way for sedentary nurses to prevent work-related Musculoskeletal injury.

0501PP141

MAKEUP APPLICATION TOOLS WITH LIPGLOSS FOR PERSONS WHO ARE BLIND OR HAVE LOW VISION

Yasuhiro Matsuda¹, Tsuneshi Isomura¹, Makiko Yamasaki², Mika Yoshimura³

¹Faculty of Creative Engineering, Kanagawa Institute of Technology, ²Kingrun Co., Ltd. and ³Hamayu Co., Ltd. (Japan)

Purpose: Persons who are blind or have low vision have difficulties of makeup application without visual information from mirror. The purpose of present study is development of makeup application tools with lipgloss for persons who are blind or have low vision. **Materials and Methods:** According to the tips for makeup application, lipgloss can be applied with finger and clean lipgloss is suitable for a person who has just started to apply makeup. But lipgloss stains finger and the stained finger can influence their appearance. Thus, we designed the tools with lipgloss in place of lipstick with a concept of "using sense of touch but not staining finger". We had developed the tools for upper lip and bottom lip (the previous tools) because of differences of shapes of upper and bottom lips. As for the tool for upper lip, we mounted a hex nut (M5, height 3.9 mm, a vertex angle was

placed in the top), which was filled with lipgloss, on a nail tip. And as for the tool for bottom lip, we mounted a cut nail tip, which was filled with lipgloss, on another nail tip. A user sets the tool (inside of the nail tip) on the finger pulp of index finger of her dominant hand and applies lipgloss. We evaluated the previous tools by the duration of application and error of outline. As the result, lipgloss application using the previous tools was useful as well as lipstick application by index finger. To improve the error of outline at the angles of mouth, we replaced the hex nut of the previous tool for upper lip with another hex nut (M4, height 3 mm, a side was placed in the top). To improve the error of outline at the center of bottom lip, we replaced the cut nail tip of the previous tool for bottom lip with a cylinder (external diameter 10 mm, inner diameter 8 mm, height 4 mm). An evaluation experiment of the improved tools by sighted persons was conducted. Subjects were four college students. All subjects gave informed consent after hearing a description of the study. In order to simulate blindness, the subjects wore a sleep shade during the experiment. The subjects applied lipgloss using the previous tools and improved tools. The experiment consisted of three sessions. **Results:** The means of the error of outline using the improved tool and previous tool for upper lip were 0.65 mm (SD=0.45) and 0.61 mm (SD=0.41), respectively. The means of the error of outline using the improved tool and previous tool for bottom lip were 0.45 mm (SD=0.24) and 0.88 mm (SD=0.43), respectively. The error of outline using the improved tool for bottom lip was significantly smaller than the one using the previous tool ($p < 0.034$). **Conclusion:** Our results showed that we could improve the makeup application tool with lipgloss for bottom lip.

0501PP142

TACTUAL COMMUNICATION TOOL FOR EMPHASIZING EMOTIONAL COMMUNICATION

Yasuhiro Matsuda¹, Tsuneshi Isomura¹, Takehiko Shimbo²

¹Faculty of Creative Engineering, Kanagawa Institute of Technology and ²Japan Beverage Inc. (Japan)

Purpose: Elderly persons or persons with sensory disorders have difficulties not only of verbal communication but also of emotional (nonverbal) communication. The purpose of present study is development of a tactual communication tool which emphasizes emotional communication during oral conversation. **Materials and Methods:** Tactual communication can express various emotions between familiar persons. But there is social distance between unfamiliar persons. Therefore, we designed the tactual communication tool with a concept of “using tactual communication but keeping the social distance”. The tactual communication tool consists of two soft rubber balls and a hose pipe. Each soft rubber ball (diameter 60 mm) was made a hole on its surface and connected by the hose pipe (inner diameter 6 mm, length 1200 mm). The interfaces between the balls and hose pipe were sealed by adhesive bond. Two users hold the ball, respectively. When the one ball is gripped, air is pumped out. And then, the other ball is blown up. Thus, the user can grip the ball by different ways during oral conversation; the other user can recognize the different way of expansion of the ball. An evaluation experiment by non-disabled people was conducted. Subjects were nine college students. All subjects gave informed consent after hearing a description of the study. In the experiment, two subjects sat face to face and hold the ball, respectively. The subjects communicated using speech about the specific theme (e.g. favorite foods, what you want to do, etc.) and gripped the ball freely. Each session was conducted for three min. The experiment consisted of 42 sessions (120 min). **Results:** The subjects gripped the ball for 114 min in total (91%). Number of gripped times was 7702 times. We classified the way of gripping into 9 types (e.g. gripping by finger pulps 24%; gripping by one finger 24%; pinching by all fingers 23%; pinching by two fingers 18%). Then we determined whether the grips were expressed emotions. Number of the emotional grips was 1002 grips (13%). The breakdown of expressed emotions was; joy 44%, disgust 18%, fear 11%, desire 9%, intention 6%, sadness 6% and love 4%. Finally, we gave the grips meaning. The ratios of

meanings of the grips without emotions were as follows: involuntary grip 31%; response grip to the grip by the other subject 30%; response grip to the talk by the other subject 35%; voluntary grip with an emphasis 4%. The ratios of meanings of the emotional grips were as follows: involuntary grip 15%; response grip to the grip by the other subject 12%; response grip to the talk by the other subject 39%; voluntary grip with an emphasis 34%. The ratios of meanings were significantly different between the grips without emotions and emotional grips ($p < 0.001$). **Conclusion:** Our results showed that the subjects mainly used the tool to respond to the grip and talk by the other subject and intended to emphasize their talk when they expressed emotions.

0501PP143

NEUROMUSCULAR ELECTRIC STIMULATION FOR DYSPHAGIA IN A SPINAL MUSCULAR ATROPHY PATIENT – A CASE REPORT

Yi-Jung Hsin, Yiu-Chung Lau

Chang Gung Memorial Hospital-Kaohsiung Medical Center (Taiwan)

Purpose: Spinal muscular atrophy (SMA) is an autosomal recessive disease with progressive degeneration of anterior horn cell. Clinical manifestations are progressive weakness of muscles. Dysphagia secondary to weakness of swallowing muscles and cricopharyngeal dysfunction are frequently seen among these patients, especially at the late stage of their disease progression. We present an experience in using neuromuscular electric stimulation (NMES) for SMA patient with dysphagia. **Materials and Methods:** This 14 years old SMA girl with normal mental, social skill and intelligible speech had progressive dysphagia. The only daily nutrition supply was milk drinking through a straw. She was referred to our team due to difficult swallowing of milk and saliva. She and her families refused nasopharyngeal tube for feeding. She had severe kyphoscoliosis with poor head and trunk control. Videofluoroscopic study (VFS) with 2 ml and 3 ml thin barium revealed poor tongue retraction force, stasis of barium in valleculae, decreased laryngeal elevation, penetration and cricopharyngeal dysfunction. Dysphagia with pharyngeal muscle and cricopharyngeal dysfunction was highly suspected. Therefore, we try NMES to strengthen the pharyngeal muscles and to increase the laryngeal elevation. The first pair of electrodes were placed over the hyoid bone and the second pair were placed above the hyoid notch over the thyrohyoid muscle. She received 1 hour NMES treatment each day, 5 sessions per week for 2 weeks. **Results:** After NMES treatment, she regained drinking milk through a straw and swallowing saliva normally. **Conclusion:** Pharyngeal muscle strengthening with NMES is a non-invasive treatment to increase muscle power and coordination of swallowing. According to our experience, it is one of the effective choices for dysphagia in SMA patient.

0501PP144

RESEARCH ON THE CLINICAL CHARACTERS OF UVC ERYTHEMA

Xiangli Zhou, Zongyao Wu, Hongliang Liu, Jixiang Wu, Qiuhan Wu, Zhonghong Hou

Southwest Hospital, Third Military Medical University (Indonesia)

Purpose: To investigate the erythema and other skin reactions after the low pressure mercury quartz lamp radiated. **Materials and Methods:** 10 subjects aged 20–22 were recruited. They were UVC radiated from 1, 2, 3, 8, 16 to 32, 64, 256, 512, 1024 seconds with radiator ZYY-9. Investigating on the skin responses were 2, 3, 6, 12, 24 hours and 2–20 days after the radiation. **Results:** The least radiation to produce a minimum erythema is 1 second. The erythema has latent period of 3, 6, 8 hours. The longer the exposure the earlier the erythema appeared. The erythema UVC produced disappeared within 24 hours after 1, 2, 4 second radiation. It may last 15 days if the exposure is long enough. Following the erythema, pigmentation appeared within 24 hours to 5

days after UVC radiation. Pigmentation maintained for 4 days after 2 second radiation. But most of them last more than 12–18 days (6) 8 of 10 subjects had the skin swelling after radiation. (7) desquamation appears 6–7 days after exposure in 4 subjects and 10–13 days in 6. **Conclusion:** The erythema produced by low pressure mercury lamp seriously different from that by high pressure mercury quartz lamp. It appears and disappears quicker. The average erythema dose is 1 s instead of 2 s as generally believed previously. The most important is that erythema strength is less related to the radiation duration. No blistering even though 1024 erythema doses is given.

0501PP145

EFFICACY OF WIITM-BASED VIRTUAL REALITY ASSISTED REHABILITATION FOR CHRONIC STROKE PATIENTS

Zheng-Yu Hoe¹, Jue-Long Wang¹, Chao-Hung Chang¹,
Shu-Fen Sun^{1,2}, Yuk-Keung Lo³

¹Department of Physical Medicine and Rehabilitation, Kaohsiung Veterans General Hospital, ²National Yang-Ming University School of Medicine and ³Department of Neurology, Kaohsiung Veterans General Hospital, (Taiwan)

Purpose: Cerebral vascular disease is a major cause of disability. Chronic stroke patients are usually associated with cortical, motor and coordination function impairments. These impairments may greatly affect patients' quality of life if left untreated. How to enhance functional recovery with cost-saving rehabilitation strategy remains a challenging issue. Virtual reality assisted rehabilitation provides the opportunity for a safe training environment, allows intensive practice with repetitive tasks, provides real-time auditory and visual performance feedback and also may augment patients' motivation. WiiTM has all the advantages. In addition, it is much cheaper and thus is affordable and practical to be used in clinical settings. The aim of this study was to evaluate efficacy of WiiTM-based virtual reality assisted rehabilitation for chronic stroke patients. **Materials and Methods:** We recruited patients with chronic stroke (>1 year) and limbs function impairment. All patients received WiiTM-based virtual reality assisted rehabilitation program with 30 min/time, 3 times/week for 3 months. Patients' cognitive function, motor function of both upper and lower limbs, manual dexterity, balance, activity of daily living (ADL) function and depression scale were assessed at 2 weeks before training, the time of beginning training and 3 months after training. **Results:** A total of 31 patients completed this study. Significant improvements in cognitive function, motor function of upper and lower limbs, manual dexterity and balance ability were noted after 3 months training. However, ADL function and depression scale showed no significant change. **Conclusion:** WiiTM-based virtual reality assisted rehabilitation are promising treatment for chronic stroke patients. Further studies with larger sample size and longer follow-up are warranted to help confirm our results and to determine whether this training program can be applied to patients with other neuromuscular diseases.

0501PP146

RELATIONSHIP BETWEEN MUSCLE STRENGTH OF THE UPPER LIMBS AND PROPULSION CHARACTERISTICS OF POWER-ASSISTED PUSHRIM-ACTIVATED WHEELCHAIR

Yu-Hsiang Huang¹, Yang-Hua Lin¹, Alice MK Wong^{1,2},
Jyh-Yuh Ke², Chung-Hsien Kuo³, Jiung-Woei Liaw⁴

¹Department of Physical Therapy & Graduate Institute of Rehabilitation Science, Chang Gung University, ²Department of Physical Medicine and Rehabilitation, Chung Gung Memorial Hospital, ³Department of Electrical Engineering, National Taiwan University of Science and Technology and ⁴Department of Mechanical Engineering, Chang Gung University (Taiwan)

Background: A power-assisted pushrim-activated wheelchair (PAPAW) is a wheelchair activated manually with the assistance by driving motor power. Proper muscle strength of the upper limbs is required to use PAPAW. However, there has been insufficient information regarding to the muscle strength of upper limbs required by those who need PAPAWs. **Purpose:** To explore the relationship between the upper limb muscle strength and propulsion characteristics during propelling PAPAW. **Methods:** Thirty young able-bodied participants were recruited in this study. The muscle strength of upper limbs was measured with manual hand-held dynamometer. Pearson's correlation was used to examine the relationship between the muscle strength and propulsion variables of PAPAWs. **Results:** The initial pushing peak force significantly showed moderate positive correlation with the extensors of the upper limbs and hand grip ($r=0.412\sim0.694, p<0.05$). There were negative correlation between push frequency and shoulder horizontal abduction as well as wrist finger flexors ($r=-0.591, \sim0.666, p<0.05$) during steady-state propulsion. **Conclusions:** The relationship between the upper limb strength and propulsion characteristics was found in this study that the extensor groups of the upper limbs were important to initiate PAPAW, and the horizontal shoulder abductors with wrist and fingers flexors were associated with the pushing frequency necessary during steady state of PAPA propulsion. The information would be valuable as clinicians provide adequate rehabilitation plan.

0501PP147

DEVELOPMENT OF A 2-D HAPTICS INTERFACE FOR ASSESSMENT AND TREATMENT IN PATIENTS WITH ANKLE SPRAIN: A PRELIMINARY STUDY

Chueh-Ho Lin^{1,2}, Wen-Hsu Sung¹, Shun-Hwa Wei¹

¹National Yang-Ming University Department of Physical Therapy and Assistive Technology and ²Hung-Kuang University Department of Physical Therapy. (Taiwan)

Purpose: The purpose of this paper is to develop a two degree-of-freedom haptic interface system for ankle rehabilitation, which includes the game based training and perception assessment in people with ankle proprioception defect, and to compare the difference between the subjects with ankle sprain or not by this system. **Materials and Methods:** The ankle rehabilitation haptic interface system component has a supportive frame on knee and ankle joint, and a platform structure with two degree of freedoms was designed which allows the movements of the ankle joint though its full range of motion. The system can take three inputs from the platform: two axes titling at an angle of sagittal and coronal plane, the trigger of the handle, and communicate with a host PC through DAQ card and USB transformation. All signal processes were done by MatLab and USB transformation to allow user interactions with the assessment program and video-game training increase motivation of the user. Ten normal subjects and ten subjects had any experience of ankle sprain in the past year were recruited and assigned to each group to provide preliminarily clinical evidence of efficacy. All of these subjects were received the joint position test at four difference coupling directions. Student's t-test was used to examine the differences in joint position sense error (JPSE) value and coefficient of variance (CV) value collected by system between groups. The statistically significant level was set at 0.05. **Results:** The test of this system was validly ($r^2=0.99$ and 0.99) and observed change of 0.086° can be interpreted, with 95% confidence, as genuine. We found that the perception parameters obtained from the subjects in experimental group demonstrated the accuracy of active position sense (JPSE value) was higher than that of the joint of control group, especially in dorsiflexion-inversion ($2.4^\circ \pm 1.3^\circ, p<0.05$). However, variance reposition sense (CV value) was higher than that of the joint of control group, especially in plantarflexion-eversion ($17.6\% \pm 4.6\%, p<0.05$) and dorsiflexion-inversion ($17.4\% \pm 4.9\%, p<0.05$).

Conclusion: The study has developed a novel ankle evaluation and training system for people with ankle proprioception defect. The main advantages of this system were to use the footplate with two degree of freedom for quantitatively assessing patient's perception capability at ankle joint, and to indicate that system as well-established a diagnostic tool.

0501PP148

A NEW ANTERIOR ANKLE FOOT ORTHOSIS FOR HEMIPLEGIC PATIENTS

Xuanlin Shen, Yifei Qian, Jiguang Sun, Jianping Zhang, Ting Huang

Changshu No. 2 Hospital (China)

Purpose: To investigate the differences between a new kind of anterior ankle foot orthosis (AFO) and traditional posterior AFO in hemiplegic patients. **Materials and Methods:** A new kind of anterior AFO (our new invention, China Invention Patent: 200910031535.4) is made of polypropylene. Forty hemiplegic patients were divided into anterior AFO group and posterior AFO group randomly. Gait analysis was assessed. **Results:** The new kind anterior AFO is lighter, smaller and more comfortable than posterior AFO. Excessive ankle plantar flexions and inversion at stance and swing phase were decreased after wearing anterior or posterior AFO, and the posterior AFO improved better. The anterior AFO have a better ankle joint flexibility than posterior AFO. Walking speed of anterior AFO group was faster than posterior AFO group. **Conclusion:** This new kind anterior AFO is more effective than traditional posterior AFO for hemiplegic patients.

0501PP149

EVENT-RELATED POTENTIAL DURING DUAL-TASKING POSTURAL CONTROL: A COMPARISON BETWEEN STROKE PATIENTS AND NORMAL ADULTS

Jen-Suh Chern¹, I-Fang Tseng¹, Chiu-Ping Lu¹, Chia-Ling Chen^{1,2}

¹Chang Gung University and ²Chang Gung Memorial Hospital, Linkyo Branch (Taiwan)

Purpose: To investigate the cerebral activation pattern associated with postural control during dual-task performance in stroke patients. The study aims to: 1. understand the impact of side of stroke (left vs. right hemisphere stroke) on postural control performance; 2. compare the activation pattern of the cerebral cortex between single-task and dual-task performance; 3. investigate the changes of the cerebral cortex activation pattern in single-task and dual-task performance. **Materials and Methods:** Eleven left hemisphere stroke subjects, 12 right hemisphere stroke subjects and ten normal, age-matched subjects were recruit for study. Each subject was tesyed on 6 single- and/or dual-task conditions (2 postures x 3 task condition). The performance of postural tasks (center of pressure travel path length), cognitive tasks (reaction time and accuracy) and event related potential of the brain activation were studied. **Results:** The results of the ERP measures showed that FCz areas and P4 areas were primarily responsible for the postural control and cognitive tasks (mental rotation). Besides, in three groups demonstrate different ERP pattern in each experimental condition. Those results showed that the cerebral cortex injury after stroke had significant effects on postural control, especially in right hemisphere stroke. **Conclusion:** The findings indicate that postural control is not under automatic control, but requires more brain integration to achieve optimal performance. When the difficulty of task increased, the activation of the cerebral cortex that is in charge of postural control and mental rotation increased and the postural stability enhanced during dual-tasking conditions.

0501PP150

COMPARISON OF TREADMILL AND FLOOR WALKING IN A PATIENT WITH HEMIPARESIS

Takuya Yamada¹, Shin Yamada¹, Yurie Yamachika¹, Hirohumi Terabayashi¹, Tetsuo Ota¹, Akio Kimura¹, Sawako Nakajima²

¹Keio University Tsukigase Rehabilitation Center and ²Department of Biosciences and Informatics, Keio University (Japan)

Purpose: Many researchers suggest that treadmill training is effective in improving walking ability and functional balance of patients with stroke. However, marked instability of walking is frequently observed after introduction of this training because of differences in kinematic strategies between treadmill and floor walking. The purpose of this study was to identify biomechanical characteristics of treadmill walking in a hemiparetic subject. **Materials and Methods:** The subject was a 57-year-old male with left hemiparesis after a stroke 105 days ago. He could walk independently with a cane and had no experience of treadmill walking. The purposes and procedures of this study were fully explained to the subject, and informed consent was obtained. Following floor walking at self-selected comfortable speed, the subject walked on a treadmill. The treadmill speed was set according to the floor walking speed. Main outcome measures were gait cycle parameters (cadence, step length, stance and swing durations), electromyographies (EMGs) recorded from the tibialis anterior, gastrocnemius, and soleus muscles and the angle of ankle joint in the affected leg. **Results:** Cadence in treadmill walking was greater (93.0 steps/min vs. 47.4 steps/min) and step length was smaller (0.23 m vs. 0.45 m) than those in floor walking. Amplitude of EMGs activities in the gastrocnemius and soleus muscles were increased at the end of swing phase through the initial of stance phase on the treadmill. In addition, activity in the tibialis anterior muscle was decreased at the initial of stance phase, and planter flexion of the ankle joint was disappeared just after the initial contact. **Conclusion:** On the treadmill, over activity of planter flexor and under activity of dorsiflexor muscles were observed. These effects may deteriorate walking ability of patients with hemiparesis. Therefore, when we use the treadmill training for stroke patients, we should take more care to set appropriate treadmill speed especially at the beginning of the introduction. Usage of partial body weight support or electrical stimulation would help preventing the harmful effects of the treadmill training.

0501PP151

THE COMPENSATORY MECHANISM OF WALKING WITH PARALYSIS OF QUADRICEPS FEMORIS MUSCLE

Shao-Qin Gu, Guang-Xu Xu, Jian-an Li, Dian-Huai Meng, Hong-Xing Wang

Department of Rehabilitation Medicine, the First Affiliated Hospital of Nanjing Medical University (China)

Purpose: To analyze the compensatory mechanism of walking when quadriceps femoris muscle is paralyzed. **Materials and Methods:** Post-poliomyelitis clients with quadriceps femoris muscle strength measured grade 2 in manual muscle testing (MMT) in one leg were selected for the 'test group' in the knee-joint-control-impediment pathology model in this study. The gait pattern of the paralyzed leg was compared with the contra-lateral good leg, and also with that of the control group (normal subjects). The compensatory mechanism of the 'test group' with paralyzed quadriceps was studied. The total number of subjects studied were 20 having 10 in each group with age and sex matched. The 'test group' walked under various conditions: (a) wearing knee-ankle-foot orthosis(KAFO), (b) wearing ankle-foot orthosis(AFO) and (c) without orthosis. The control group walked without orthosis. The time-space parameters were collected by 3D-motion analysis system. The oxygen cost was

detected by a Cosmed K4b2 portable gas analysis system in order to evaluate the walking efficient. **Results:** Oxygen cost of 'test group' walking with KAFO, with AFO and without orthosis were 0.38 ± 0.06 , 0.26 ± 0.05 and 0.40 ± 0.06 ml/m/kg, respectively. Oxygen cost of the control group was 0.17 ± 0.04 ml/m/kg. Oxygen cost was significantly reduced when walking with AFO, compared to walking with KAFO and without any orthosis ($p < 0.01$) in the trial group. The oxygen cost in the control group was lower compared to the test group walking under all three conditions ($p < 0.01$). **Gait analysis:** The duration of swing phase of the affected lower limb in the test group wearing KAFO (43%) and without orthosis (42%) was longer than the opposite side (37%, 38%) and the control group (38%) wearing no orthosis ($p < 0.01$). The angle of extension of knee joint during the mid stance in the affected lower limb of the test group wearing AFO was greater than that of the opposite side and similar findings when comparing with the control group ($p < 0.01$). **Conclusion:** When the quadriceps femoris muscle is weakened, using AFO and slightly knee overextension can reinforcing the knee joint stability and improve the gait pattern.

0501PP152

A POSTER PRESENTATION ILLUSTRATING TWO INTERESTING CASE REPORTS OF IMPROVING FUNCTIONAL AMBULATION IN AMPUTEES AFTER PROSTHETICS FITTING

K Palaniappan, Yin Tjan Soon

Tan Tock Seng Hospital (Singapore)

Purpose: To illustrate a relatively rare case in our urbanised country of how a young male below knee amputee is able to participate in both rural fieldwork and community ambulation through the use of his below knee prostheses and a second case illustrating an elderly gentleman with concurrent below elbow and above knee amputation on the same side able to do functional ambulation with the help of prostheses. **Materials and Methods:** Detailed assessments including pre-morbid functions, expected goals of patients and their initial and post prostheses fitting Functional Independence Measures and Amputee Mobility Index were described. We highlight the problem solving and training involved in returning the desired functions to both patients. **Results:** Both our patients showed improvement in functional measures and were able to ambulate despite the loss of their limbs with rehabilitation and aid of carefully selected prostheses. Both returned to their desired participation in society. **Conclusion:** Careful selection of prostheses taking into consideration their limitations is important. The rehabilitation involved considerable problem solving and needs to be tailored to the individual goals of amputees.

0501PP153

EFFECTS OF BRACING ON JOINT POSITION SENSE OF UPPER-LIMB

Ju-Ying Chang¹, Kao-Chi Chung², Kuang-Che Liu², Jo-Tong Chen³

¹Department of Special Education, National Pingtung University of Education, ²Institute of Biomedical Engineering, National Cheng-Kung University and ³Department of Physical Medicine and Rehabilitation, College of Medicine, National Cheng-Kung University (Taiwan)

Purpose: Proprioception, assessed by joint position sense through active and passive positioning of the limb, contributes to dynamic joint stability and neuromuscular control for movements. Bracing has been reported to contribute to proprioceptive ability. The study is aimed to investigate the effects of two types of brace on shoulder and elbow joint position sense for the able-bodied during planar movements. **Materials and Methods:** Seven able-bodied aged from 21 to 26 years (7 male) with no history of upper-limb trauma and neuromuscular impairments were recruited in the study. All subjects were given informed consent to the experiments and the anthropomet-

ric data of upper limb were collected. The robot-aided system with five-bar-linkage manipulator was used for guiding and measuring upper-limb movement in the designated planar motion. The two-link and open kinematic chain was used to simulate the kinematic model of upper limb. During tests, the subject sat in front of the robot-aided system with shoulder joint being aligned to the base of manipulator and were asked to hold the end-effector of manipulator. The height of end-effector was adjusted approximately 5–10 cm below the shoulder joint individually. To eliminate the effects of audiovisual senses, the subjects were blindfolded and earplugs were inserted in the ear canal. The subjects were randomly tested under three conditions: 1) no bracing, 2) application of counterforce brace and 3) application of brace with epicondyle. Two different point-to-point movements, backward-right to forward-left and backward-left to forward-right, with approximately 25-cm in length were randomly tested. Firstly, the subjects' upper limb was passively moved at 10 cm/s in the predetermined point-to-point movement by manipulator for three repetitions. The subjects were then asked to repeat the movement as accurately as possible for three repetitions. Position data measured from the end-effector were sampled at 200 Hz. The corresponding shoulder and elbow joint angles were estimated through inverse kinematics. For each test, the absolute position errors and the absolute differences in joint angles between the target and reproduced movement were calculated. Two-way ANOVA was used to analyze the effects of bracing and movement directions on position errors and differences in joint angles. The significance level was set to be 0.05. **Results:** The results of statistical analysis have revealed the main effect of movement direction on the differences in elbow joint angle ($F = 9.124, p < 0.05$). The backward-right to forward-left movement showed less absolute position errors than those resulted from backward-left to forward-right movement. It suggested that the cross-joint muscles may affect individual joint position senses in different coordination patterns between shoulder and elbow. Among the three bracing conditions, there were no differences in joint position sense of elbow and shoulder joints and in the position errors of upper-limb endpoint. **Conclusion:** The contribution of the research emphasize on the applications of brace during different joint coordinate patterns. Applications of brace caused no effects on the elbow joint position senses for the able-bodied subjects. The joint position senses of adjacent joints may interact with each other due to the involvement of two-joint muscles.

0501PP154

THE EFFICACY OF SPECIALIZED SEATING/ POSITIONING ON SEVERE/PROFOUND CEREBRAL PALSY

Kuang-Che Liu¹, Kao-Chi Chung¹, Yun-Er Wang², Jo-Tong Chen², Ju-Ying Chang³

¹Institute of Biomedical Engineering, National Cheng-Kung University, ²Department of Physical Medicine and Rehabilitation, College of Medicine, National Cheng-Kung University and ³Department of Special Education, National Ping Tung University of Education (Taiwan)

Purpose: Specialized seating/positioning is usually prescribed for the children with severe to profound cerebral palsy (CP) to maintain proper sitting posture, to decrease abnormal reflexes, to avoid musculoskeletal deformities, to improve pulmonary function and to facilitate functional movements. The research is aimed to qualitatively and quantitatively investigate the efficacies of proper seating/positioning for individuals with severe to profound CP. **Materials and Methods:** A Single-Case Research Design was used to evaluate the long-term efficacy of specialized seating for six-month follow-up. Five subjects aged from 3 to 17 years with severe to profound cerebral palsy recruited from National Cheng Kung University Hospital participated in the research. All subjects were given informed consent to the experimental procedures prior to the tests. An adjustable positioning/evaluation system was implemented for anthropometric data measurement, systematical prescription of specialized wheelchair and body support devices for each subject. After intervention of the specialized wheelchair,

the subjects were allowed to sit on wheelchair at least three hours per day and were assessed biweekly through EMGs, ROM measures and Gross Motor Functional Measure Score (GMFM). Surface EMGs were used to record muscle activities from biceps brachii, triceps, neck extensor, back extensor, lumbar extensor, rectus abdominis, quadriceps and hamstrings. The EMG measures, sampled at 1,000 Hz, were full-wave rectified, filtered and integrated over a predetermined time to represent muscle activities for each muscle. The linear-regression-test-for-trends were applied for statistical analysis of changes in EMG parameters and ROM measures. **Results:** The clinical evaluated results show the intervention of seating/positioning through specialized wheelchair and body support devices leads to improved sitting posture, increased range of motion, decreased pathological reflexes and normalized muscle tone for all subjects. The results of EMG measures indicate that specialized seating/positioning could significantly improve pathologic neuromuscular control. The results indicate that proper sitting contributes significantly to relax the upper extremities. The spasticity of proximal joints like hip joints and knee joints are also improved. **Conclusion:** The seating/positioning prescription and follow-up evaluation provided significant information to clinical evidence. The improvement of normalizing muscle tone, decreasing pathological reflex and functional movement are agreed to the literature. The results of clinical observations and EMG data are invaluable information for further clinical research study and engineering technology development in special seating.

0501PP155

ROBOT-AIDED MEASUREMENT OF ENDPOINT KINEMATICS DURING UPPER-LIMB ACTIVE MOVEMENT IN THE POST-STROKE

Ju-Ying Chang¹, Jo-Tong Chen², Kao-Chi Chung³

¹Department of Special Education, National PingTung University of Education, ²Department of Physical Medicine and Rehabilitation, College of Medicine, National Cheng-Kung University and ³Institute of Biomedical Engineering, National Cheng-Kung University (Taiwan)

Purpose: Impaired motor control after stroke can be evaluated through characterizing changes of upper-limb endpoint kinematics during active movement and used as objective measures for clinical application. The research is aimed to investigate upper-limb endpoint kinematics for characterizing upper-limb active movement on the able-bodied and post-stroke subjects. **Materials and Methods:** Both able-bodied subjects (5 males and 5 females) with no history of neuromuscular impairments and ten individuals (7 males and 3 females) with hemiplegic stroke were recruited in this study. Before conducting tests, all subjects were given informed consent to the experimental procedures and the anthropometric data of upper limb were collected. The post-stroke subjects were evaluated by two clinical scales: Modified Ashworth Scale and Fugl-Meyer Sensorimotor Scale. Motor recovery status was determined by Brunnstrom's stage. The robot-aided system with five-bar-linkage manipulator was used for measuring upper-limb movement in the designated scenario of planer motion. During tests, the subjects sat in front of the robot-aided system with shoulder joint being aligned to the base of manipulator and rested their forearms on the arm supporter. The upper-limb endpoint (i.e. the hand) was attached to the end-effector of the manipulator and a chest strap was applied to limit torso movement. The height of end-effector was adjusted approximately 5–10 cm below the shoulder joint individually. The subjects were asked to actively perform point-to-point movement and move the end-effector for five repetitions as smoothly as possible according to the visual cue shown on the monitor. Changes of upper-limb coordinates were collected at 200 Hz. To assess the movement smoothness during active movement, both number of movement units (NMU) and normalized jerk cost (NJC) were estimated from the mean kinematic profiles. Movement deviations were calculated over each trial. All data were statistically analyzed

by using SPSS/PC package and significant level is set to be 0.05. The movement deviations and the NJC at x- and y- direction were analyzed by Mann-Whitney U test between the able-bodied and the post-strokes. **Results:** Results of Mann-Whitney U test showed significant differences in the movement deviation and NJC between the able-bodied and the post-stroke both at x- and y- direction. The stroke subjects demonstrated greater movement deviations and jerk cost while performing movement. Movement impairments which may be caused by abnormal muscle recruitment, weakness and altered spinal reflexes after stroke were showed by the upper-limb endpoint kinematic profiles. However, these robot-aided parameters were not significantly related to the clinical scales during active reaching movement. **Conclusion:** The impairments in active movement performed by the post-stroke can be quantitatively demonstrated by the active movement characteristics of upper-limb endpoint kinematics. The NJC seems to be the potential measures for the evaluation of upper-limb motor performance. These robot-aided parameters may be significant to biomechanics and fundamental movement sciences as well as clinical applications to stroke rehabilitation.

0501PP157

WALKING ABILITY AND ENERGY EXPENDITURE IN POST-STROKE PATIENTS WITH A ANKLE-FOOT ORTHOSIS

Junichi Kato¹, Yuji Azuma², Sou Okuyama², Noriaki Maeda³, Masahito Murakami⁴

¹Department of Internal Medicine, Hyogo Rehabilitation Center at Nishi-Harima, ²Division of Physical Therapy, Hyogo Rehabilitation Center Hospital, ³Division of Physical Therapy, Hyogo Rehabilitation Center at Nishi-Harima and ⁴Department of Physical Therapy, Kobe International University (Japan)

Background: In stroke, around 70 to 80% of patients regain walking function within a few months, although residual hemiparesis often involves an asymmetrical gait pattern. In particular, an ankle-foot orthosis (AFO) is used to correct spastic drop foot or equinus foot, which are both commonly seen in spastic stroke-related hemiparesis. Physical inactivity after stroke may contribute to cardiovascular and metabolic deconditioning, muscle weakness, and associated declines in physical and social functioning. **Objective:** The purpose in this study was to compare the gait velocity and gait energy cost on floor walking with and without a plastic AFO, and to investigate the cardiovascular and metabolic fitness variables in chronic stroke patients with hemiparesis. **Material and Methods:** Participants were 12 hemiparetic patients with a stroke at least 6 months earlier (10 male and 2 female; 47±8 years old). An ambulatory activity test was performed which involved walking for a total of 6 min at a self-selected speed with or without AFO. Before walking, each subject was fitted with a portable gas analyzer (VE2000 System :Medical Graphics Co.Ltd, USA) programmed for metabolic analysis through indirect calorimetry. The rate of oxygen consumption ($\dot{V}O_2$, in mL·min⁻¹), minute ventilation (L·min⁻¹), metabolic equivalent (METs), and heart rate (HR) in beats per minute (bpm) were continuously monitored during the 6-minute walking trial. The Physiological cost index: PCI (beats·m⁻¹) was calculated by dividing the difference between the steady-state walking and resting heart. **Results:** Walking speed: with and without AFO 27±11 vs 23±11 m/min, difference 20% ($p<0.05$). Oxygen consumption: with and without AFO 11.8±2.0 vs 12.0±1.9 ml/kg/min. Physiological cost index (PCI): with and without AFO 1.2±0.5 vs 1.6±0.8 beats/m ($p<0.05$). Energy expenditure cost: with and without AFO 0.6±0.3 vs 0.4±0.2 ml/kg/m ($p<0.05$). **Conclusion:** Use of AFO in patients with post-stroke may increase walking velocity and decrease energy cost during walking. **Conclusions:** AFO may decrease energy demands and have physiologically energy efficiency in walking in stroke patients and these obtained results in this study suggest that a stroke hemiplegia patient with motor disorder can improve gait ability by wearing AFO and also lower the energy consumption while waking.

POSTER PRESENTATIONS (MAY 2, 2010)

0502PP1

THE ELECTROPHYSIOLOGICAL CHANGES OF LOWER LIMBS IN SUBJECTS WITH SPINAL CORD INJURY**Hong-Xing Wang, Shao-Qin Gu, Wen-Hong Chen, Xiao Lu, Guang-Xu Xu, Tong Wang, Jian-An Li***The First Affiliated Hospital of Nanjing Medical University (China)*

Purpose: To investigate the electrophysiological changes of peripheral nerves and muscles of the lower limbs in patients with spinal cord injury. **Materials and Methods:** Standard sensory and motor nerve conduction were performed in tibial nerve, peroneal nerve to analyze distal motor latency (DML), compound muscle action potential (CMAP), sensory conduction velocity (SNCV) and amplitude (SNAP). Concentric needle electromyography was done in the bilateral tibial anterior, vastus medialis, lateral gastrocnemius and paraspinal muscles at L4–S1 level to record spontaneous activities. **Results:** Characteristics of nerve conduction: 94.7% patients had abnormal motor nerve conduction with decreased CMAP amplitude, prolonged distal motor latency and absent response. Abnormal sensory conduction was found in 15.8% patients, including slowed SNCV, small SNAP amplitude and no response. Tibial nerve: Single abnormal motor conduction was found in 47.4% patients and abnormal motor and sensory conduction coexisted in 10.5% patients. Abnormal motor conduction was seen in both sides (36.8% had no responses, 5.3% had decreased CMAP amplitude and 21.1% had decreased amplitude with prolonged DML). The characteristics of sensory conduction were unilaterally slowed SNCV and decreased SNAP amplitude. Peroneal nerve: Single abnormal motor conduction was found in 73.7% patients and abnormal motor and sensory conduction coexist in 15.8% patients. 84.2% patients had bilaterally abnormal motor conduction with no response (57.9%), decreased CMAP amplitude (21.1%) and both (5.3%). Unilaterally abnormal conduction was seen in 10.5% patients with decreased CMAP amplitude and delayed DML. The characteristics of sensory conduction showed slowed SNCV, decreased SNAP amplitude and no response in one or both sides. Spontaneous activities (SA), including fibrillations and positive sharp waves, were noted at variable degrees in all muscles examined. **Conclusion:** Axonal motor neuropathy and abnormal spontaneous activities in lower extremities were the main electrophysiological characteristics in patients with spinal cord injury. And there was no correlation between SA and the electrophysiological changes of peripheral nerves.

0502PP3

APPLICATION OF NEURAL ELECTROPHYSIOLOGIC STUDY TO LIMBS OF CRUSH INJURY PATIENTS**Qingqing Li, Dan Tang, Qinglin Xian***Guangzhou Industrial Rehabilitation Hospital (China)*

Objective: To evaluate objectively the traumatic condition of nerves and muscles on the limbs of 33 crush injury patients (three kinds of crush injury for earthquake, machine, road accident) by utilizing neural electrophysiological study. **Methods:** To check up needle electromyography, motor nerve conduction velocity, sensory nerve conduction velocity, electro-neurogram, sympathetic skin response of the affected limbs. **Results:** 1) The condition of nerve injury: 74 peripheral nerves injury altogether in different degree (median nerve 22, ulnar nerve 21, radial nerve 14, tibial nerve 7, peroneal nerve 7, axillary nerve 1, musculocutaneous nerve 1, femoral nerve 1), Injury of nerve plexus: 17 places (brachial plexus 9, lumbar plexus 4, sacral plexus 4), Injury of cervical nerve roots: 2 cases, spinal cord injury: 2 cases (cervical cord 1, sacral cord 1), dysautonomia: 17 cases. 2)

The condition of muscle injury: myofibrosis completely: 2 cases (gastrocnemius loss myoelectricity: 1, tibial anterior loss myoelectricity: 1), myofibrosis heavily: 1 (extensor indicis), myocele: 1 (vastus lateralis). **Conclusion:** Neural electrophysiological study can evaluate objectively, exactly, exquisitely and quantify the traumatic condition of nerves and muscles on the limbs of crush injury patients.

0502PP5

RESEARCH ON THE RELATIONSHIP BETWEEN OCULOMOTOR & ABDUCENS NERVE PARESIS AND VISUAL EVOKED POTENTIAL**Yong Yin¹, Yunxi Zhang², Yingzhou Hu³, Yingyi Ouyang¹, Xifang Zhang¹, Lei Pan¹, Xintian Hu³***¹The Department of Rehabilitation, The fourth Affiliated Hospital of Kunming Medical University, ²The Department of Neurology, The fourth Affiliated Hospital of Kunming Medical University and ³Kunming Institute of Zoology, CAS (China)*

Objective: Both vision and eye movement has been well studied for a long time. People get most of the information of environments through visual system. Eye movement is relative simple movement control system, and has also been well understood. However the interaction between visual sensory and eye movement is not very clear. The purpose of this study was to determine whether the movement eye could affect visual sensory by using visual evoked potential (VEP). **Methods:** The P100 component of visual evoked potential of 10 subjects has been recorded using Keypoint 4 channels electromyography equipment. The ten subjects suffers from oculomotor or abducens nerve paresis either caused by craniocerebral injury, multiple sclerosis, glioma, brain stem infraction, brain aneurysm or diabetes mellitus. **Results:** Eight of the ten subjects show abnormal VEP. The P100 components of four of them show non-crossed asymmetrical distribution, which indicates the damage of optic nerve happens before optic chiasm. The P100 components of the rest of the 8 subjects show crossed asymmetrical distribution, which indicates the damage happens after optic chiasm. Two of the ten subjects show normal VEP. **Conclusions:** The damage of eye movement system could cause abnormality of visual function. But the interaction pathway is still unclear. A possible mechanism could be that eye movement disorders not only affect the input of visual information, but also affect the input of eye position information, which subsequently affect the integrated function between cortex and subcortex nucleus. **Key words:** Eye movement disorder; visual sensory; visual evoked potential (VEP).

0502PP6

THE CHANGE OF HEART RATE VARIABILITY IN UREMIC PATIENTS WITH RESPECT TO METABOLIC SYNDROME, DIABETES MELLITUS AND HIGH -SENSITIVE C-REACTIVE PROTEIN LEVELS**Sui-Foon Lo^{1,3}, Shuan-Kuang Jung^{2,4}, Wen-Chi Chen⁴, Wei-Yung Lin⁴, Fun-Jou Chen⁴, Yung-Hsiang Chen⁴, Yung-Hsien Chang⁵***¹Department of Physical Medicine and Rehabilitation, China Medical University Hospital, ²Section of Nephrology, Taipei City Hospital, Yangming Branch, ³School of Chinese Medicine, China Medical University, ⁴Graduate Institute of Integrated Medicine, China Medical University and ⁵Graduate Institute of Acupuncture Science, China Medical University (Taiwan)*

Purpose: A decrease in heart rate variability (HRV) is known to be an independent predictor of mortality after myocardial infarction.

Metabolic syndrome (MetS), diabetes mellitus (DM) and high-sensitivity C-reactive protein (hs-CRP) levels are known to play important roles in cardiovascular morbidity and mortality. Therefore we investigated the HRV in uremic patients with respect to MetS (Asia definition of the National Cholesterol Education Program's Adult Treatment Panel III (NCEP-ATP III) and the International Diabetes Federation (IDF)), DM and hs-CRP levels to find out their correlation with cardiovascular risk in these patients. **Materials and Methods:** A cross-sectional cohort study involving 23 patients on maintenance hemodialysis. Patients with the following conditions were excluded: <40 years old, >75 years old, hemodialysis history <3 months; presence of cardiac arrhythmia, weak pulses, psychosis, infection or malignance. Each participant took a 20-min rest before the HRV evaluation with ANSWatch®. The test which last 7 min was taken 30 min prior to hemodialysis session. Data in ANSWatch® was downloaded to a notebook computer immediately following the test for review and storage. The blood sample was taken in the same day before hemodialysis. **Results:** Uremic patients with DM have higher fasting blood glucose (185.82 ± 105.22 vs 84.58 ± 15.92 mg/dl, $p=0.0097$), lower HDL (34.00 ± 6.16 vs 42.75 ± 12.38 mmol/l, $p=0.045$), higher triglyceride level (214.36 ± 110.33 vs 91.33 ± 44.06 mmol/l, $p=0.004$) and wider waist circumference (90.91 ± 10.31 vs 81.17 ± 7.09 cm, $p=0.015$) when compared to patients without DM. Similar biochemical findings also found in uremic patients with NCEP-ATP III Definition MetS when compared to patients without NCEP-ATP III Definition MetS. Decrements in HRV was found in uremic patients with NCEP-ATP III Definition MetS (14.88 ± 7.94 vs 24.50 ± 4.76 , $p=0.011$) and DM (13.27 ± 7.48 vs 21.17 ± 7.48 , $p=0.02$) when compared to patients without these conditions. The HRV was found to decrease gradually as the number of NCEP-ATP III Definition MetS components increased (24.50 ± 4.76 (1 or 2 components) vs 17.11 ± 9.45 (3 components) vs 12.38 ± 5.34 (4 or 5 components), $p=0.018$). **Conclusion:** Uremic patients with NCEP-ATP III Definition MetS and DM have similar adverse biochemical conditions and decrements of HRV which may increase the risk of cardiovascular disease. The lower HRV of these patients indicating the impairment of autonomic nervous function in these patients. In patients with NCEP-ATP III Definition MetS, the decreasing of HRV with increasing number of NCEP-ATP III Definition MetS components indicates the cumulative detrimental effect on autonomic nervous function increases with the severity of metabolic syndrome. Uremic patients with 4 or 5 components of NCEP-ATP III Definition MS have the lowest HRV which indicates the highest risk of cardiovascular disease in this patient group.

0502PP7

THE RELATIONSHIP AMONG CLINICAL, ELECTRODIAGNOSTIC AND ULTRASONOGRAPHIC FINDINGS IN ULNAR NEUROPATHY AROUND THE ELBOW

Yuka Kurihara¹, Toshiaki Furukawa¹, Michi Tochikura¹, Noboru Takanashi², Chieko Seto², Yui Ishii², Mayu Kato², Yoshihisa Masakado³

¹Department of Rehabilitation Medicine, Tokai University Hachioji Hospital, ²Department of Central clinical laboratory, Tokai University Hachioji Hospital and ³Department of Rehabilitation Medicine, Tokai University school of Medicine (Japan)

Purpose: There are increasing reports that ultrasonography (US) may be a useful complement in a neurophysiology laboratory. Enlarged nerve cross sectional area (CSA) is one of the abnormal findings in the US examination. The aim of this study is to determine possible correlations among the clinical characteristics, electrodiagnostic and ultrasonographic findings using the values of CSAs in ulnar neuropathy around the elbow. **Materials and Methods:** We performed electrodiagnostic and US examination in 41 patients (32 men and 9 women) (44 arms). In all these patients, a diagnosis for ulnar neuropathy was based on clinical characteristics: Complain of numbness or paresthesia or sensory disturbances in ulnar sensory

area and/or weakness or atrophy of the ulnar-innervated muscles. Patients also were excluded when electrodiagnostic studies or MRI gave evidence of a radiculopathy, plexopathy and polyneuropathy. Electrodiagnostic studies were as following: Motor conduction study was performed, recording from the ADM muscle. Sensory conduction study was performed, recording from the fifth finger. We used American Association of Electrodiagnostic Medicine (AAEM) criteria for diagnosis as abnormal: CMAPs under 5mV, SNAPs under 8 μ V, and MCV and SCV under 50 m/s. Needle electromyography studies were performed for the FDI, FDP, FCU muscles. About the US examination, reference values were from 31 normal volunteers (62 arms) about entire course of ulnar nerve and at 7 sites CSAs from wrist joint to axilla with the neurophysiologic evaluation. The values of CSAs were over the mean \pm 2SD as abnormal. **Results:** Twenty-three arms have sensory signs alone, and 21 arms have sensory-motor signs. Fifteen arms have muscle atrophy of ulnar-innervated muscles. Number of cases with a positive sonogram related to clinical and electrodiagnostic findings as follows: In 23 arms with just sensory sign, 7 arms showed localized lesions and 3 arms showed non-localizing abnormalities and 13 arms showed normal in electrodiagnostic studies. But with additional US studies, all of 7 arms, one of 3 arms and nine of 13 arms, showed localizing abnormalities, respectively. In the group of sensory-motor signs, 6 arms showed localized lesions, and 12 arms showed non-localizing abnormalities and 3 arms showed normal in electrodiagnostic studies. However with US examinations, 5 of 6 arms, 11 of 12 arms and 2 of 3 arms showed localized abnormalities, respectively. Thus 18 arms showed localizing abnormalities. In the group of muscle atrophy, only 4 arms showed localizing abnormalities in electrodiagnostic studies, but with additional US examination, all the last remaining 11 arms showed localizing abnormalities. In the group of just sensory sign, abnormalities of US studies were not only enlarged CSAs but normal CSAs for example ganglions, spur, dislocation, and being involved muscle. In the group of muscle atrophy, results of the electrodiagnosis studies were no-evoked sensory and motor action potential, small CMAP, late MCV showed non-localizing abnormalities, but in US studies we found localized abnormalities. **Conclusion:** With additional US examination, we could find the lesion even in the cases who showed no localizing abnormalities in the electrodiagnostic studies.

0502PP8

CHILDHOOD SUBACUTE INFLAMMATORY DEMYELINATING POLYNEUROPATHY: A CASE REPORT

Chia-Yu Hsu, Kuan-Wen Chen, Yao-Chia Chuang, Nan-Chang Chiu

Mackay Memorial Hospital (Taiwan)

Purpose: To report the first case of subacute inflammatory demyelinating polyneuropathy in Taiwan. **Materials and Methods:** Subacute inflammatory demyelinating polyneuropathy (SIDP) is an acquired immune-mediated peripheral polyneuropathy with clinical course between four to eight weeks. Rare childhood cases with SIDP had been described in current literature. We reported a nine-year-old boy with subacute inflammatory demyelinating polyneuropathy in Taiwan. Initial symptoms were characterized by weakness, pain and numbness of bilateral legs. No cranial nerve or autonomic system was involved. The cerebrospinal fluid contains much more protein than usual. In electrophysiological study, nerve conduction is markedly slowed or even blocked. No abnormality was found in brain CT and MRI. The disease reached its nadir at five weeks and had a good response to corticosteroids. The patient received rehabilitation program in outpatient settings with one year clinic follow-up. Three years follow-up visits were obtained from the medical records. **Results:** This was the first case report of childhood SIDP in Taiwan with complete clinical studies. All of the clinical presentations, laboratory data, electrophysiologic studies and image tools were compatible with childhood SIDP. Benign neurological recovery without relapse was correlated with electrophysiologic

evidence of demyelinating predominantly. Rehabilitation program might improve functional outcomes of patients with childhood SIDP. **Conclusion:** This is the first case report of children with SIDP in Taiwan. Electrophysiologic study is a powerful tool in determining the diagnosis and prognosis of childhood SIDP.

0502PP9

CORRECTION OF DISTANCE MEASURE ERROR BY ULTRASONOGRAPHY IN ULNAR NEUROPATHY AT THE ELBOW

Joon Shik Yoon, Sei Joo Kim, Byung Kyu Park, Kyu Hun Sim, Jung Mo Cho, Chan Woo Byun, Sun Jae Won, Jin Seok Jeong

Department of Physical Medicine and Rehabilitation, Korea University College of Medicine (Republic of Korea)

Purpose: To examine the change of ulnar conduction velocity across elbow segment by distance measure correction according to ultrasonographic finding, in ulnar neuropathy at elbow (UNE). **Materials and Methods:** Among the patients with clinical, electrodiagnostic evidence of UNE, the patients with ulnar nerve subluxation or dislocation confirmed by ultrasonography were recruited. First, ulnar conduction velocity was checked by conventional method, then the ulnar nerve around elbow was followed by ultrasonography, the distance across elbow segment was re-estimated. Additionally ultrasonographic finding of ulnar nerve was investigated. **Results:** Seven subjects (2 women, mean age 53.3 years) with 9 affected arms (2 subluxation, 7 dislocation) enrolled. The change of distance across elbow segment was 1.46 cm (from 10.2 cm to 8.7 cm), so the over-estimated ulnar conduction velocity was corrected by 6.8 m/s (from 48 m/s to 41.2 m/s). The mean location of maximal swelling point was 0.12 ± 0.47 cm above medial epicondyle and its mean cross-section area was 0.187 cm. **Conclusion:** Ultrasonography may be a useful tool for increasing accuracy and reliability of electromyography especially in the patients with UNE or UNE symptom.

0502PP10

GENERALIZED SCLEROMYXOEDEMA CAUSED BY PLASMA CELL PROLIFERATION WITH SECONDARY CARPAL TUNNEL SYNDROME – CASE REPORT

Shao-Chi Lu^{1,2}, Ming-Fu Hsieh¹, Hui-I Su¹, Yi-Lin Chen¹, Kao-Zhi Hsu¹, Wen-Chi Hou²

¹Department of Physical Medicine and Rehabilitation, Tri-Service General Hospital, School of Medicine, National Defense Medical Center and ²Department of Physical Medicine and Rehabilitation, Hualien Armed Forces General Hospital (Taiwan)

Purpose: We report a patient with scleromyxoedema and carpal tunnel syndrome treated successfully with rehabilitation program and photochemotherapy. An objective evaluation was carried out using nerve conduction study, serology data and histopathology. **Materials and Methods:** 68-year-old male felt itchy and harden sensation on four limbs accompanied with bilateral hands numbness (more involved on right side) for months. The symptoms exacerbated at night and painful sensation occurred on his bilateral palm and fingers progressively. He had major depression and panic syndrome regularly followed up at psychiatric department. He came to our outpatient department for further evaluation. On examination, several erythematous, pruritic indurated patches with excoriation on four limbs were found. Both Phalen test and Tinel sign had positive findings. There were no atrophy on bilateral thenar muscles and normal muscle power on both palmar abductor. Nerve conduction study was arranged and we also referred him to other department for further evaluation. **Results:** Nerve conduction study revealed prolonged peak latency (left wrist to 2nd digit: 5.9 ms; right wrist to 2nd digit: 5.1 ms), markedly reduced amplitude (left: $4.7 \mu\text{V}$; right: 1.5

μV) and reduced conduction velocity (left: 27.5 m/s; right: 23.7 m/s) of sensory nerve action potential (SNAP) in bilateral Median anti-sensory nerve study. Prolonged distal latency, reduced amplitude of compound muscle action potential (CMAP) in bilateral Median motor nerves were also found. The electrophysiological findings were indicative of carpal tunnel syndrome, bilateral (demyelination and axonopathy). Pathology report showed atrophy of epidermis and myxoid degeneration of dermis, mild perivascular lymphocytic inflammation associated with decrease of periadnexal adipose tissue of the skin tissue, which may be early change of scleroderma. Serology data revealed elevated Immunoglobulin G (1780 mg/dl), Immunoglobulin A (519 mg/dl), and kappa light chain (1910 mg/dl). Bone marrow biopsy exposed 10% plasma cell proliferation and polyclonality of kappa and lambda light chains. He underwent physical modalities and Psoralen + UVA (PUVA) therapy 6 J/cm^2 twice a week. Symptoms gradually improved after the regimen started for three months. **Conclusion:** We presented a case of scleromyxoedema accompanied with carpal tunnel syndrome treated successfully with rehabilitation program and photochemotherapy (PUVA).

0502PP11

IMPROVEMENT OF MEDIAN NERVE INJURY INDUCED BY INTRANEURAL STEROID INJECTION FOR CARPAL TUNNEL SYNDROME

Gi-Young Park¹, Hea-Woon Park¹, Jung-Gu Kwoon¹, In-Soon Kang¹, Sung-Uk Lee¹, Seoung-Kyu Kim², Jung-Hyun Park³

¹Department of Rehabilitation Medicine, Catholic University of Daegu School of Medicine, ²Department of Rehabilitation Medicine, Eulji University College of Medicine and ³Department of Rheumatology, Catholic University of Daegu School of Medicine (Republic of Korea)

Median nerve injury induced by carpal tunnel injection with local steroid is rarely reported complication of carpal tunnel syndrome. Early surgery for epineurectomy and extraction of deposited material has been usually recommended as the treatment of this complication. There has never been a report of serial ultrasonographic evaluation and nerve conduction study without surgical intervention. We are reporting a case of a 54-year-old woman with median nerve injury from a blind steroid injection for management of bilateral carpal tunnel syndrome. 1 ml of methylprednisolone mixed with 2% lidocaine was injected into her bilateral carpal tunnel by rheumatologist. During injection, she reported no pain or tingling sensation in her hand. After injection, she complained of new spontaneous shooting pains into her right thumb and lateral index finger superimposed upon her previous pain and numbness from carpal tunnel syndrome. She was referred to our outpatient clinic and we serially evaluated the her median nerve with ultrasonographic evaluation and nerve conduction study results. Ultrasonography showed hyperechoic focus in the lateral side of median nerve at the proximal carpal tunnel on transverse and longitudinal views. Color elastography showed a lesion with hard elastic pattern (red) involving the lateral side of median nerve. These findings suggest a white steroid crystal deposition in the median nerve. Her symptoms and ultrasonographic findings were agreed with topography of the median nerve. The nerve conduction study was performed and it revealed low amplitude of SNAP for right median nerve and prolonged onset latency of CMAP for bilateral median nerves. We offered non operative management with non-steroid anti-inflammatory drug and gabapentin. Following 6 months, her symptom was sufficiently improved and remained well. But the result of serial nerve conduction studies did not explain her conditions clearly. However ultrasonography follow-up's showed the disappearance of hyperechoic focus in the median nerve and elastography showed soft elastic pattern (green). It was correlated her changed symptoms. We assumed that the ultrasonography with elastography could be a good alternative tool in follow-up evaluation for nerve injuries. This case showed that median nerve injury induced by direct injection of steroid could be

treated conservatively, and intraneurally deposited crystal could be resolved spontaneously.

0502PP15

VALIDATING THE CEREBRAL PALSY QUALITY OF LIFE FOR CHILDREN (CP QOL-CHILD) FOR USE IN CHINESE POPULATIONS

Hui-Yi Wang¹, Cheng-Chang Cheng², Jen-Wen Hung³, Yun-Huei Ju¹, Jau-Hong Lin¹, Sing-Kai Lo⁴

¹Department of Physical Therapy, Kaohsiung Medical University, ²Department of Rehabilitation, Kaohsiung Medical University affiliated Hospital, ³Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital (Taiwan) and ⁴Faculty of Arts and Sciences, The Hong Kong Institute of Education (Hong Kong)

Purpose: To examine the psychometric properties of the Chinese version of Cerebral Palsy Quality of Life for Children (CP QOL-Child) questionnaire. **Materials and Methods:** This is a cross-sectional study. We performed forward (into Chinese) and backward translation of the CP QOL-Child (originally developed by Water et al in Australia) for: (i) the primary caregiver form (for parents of child with cerebral palsy (CP) aged 4–12 years); and (ii) the child self-report form (for children with CP aged 9–12 years). This instrument assesses seven domains of a child's life. A convenience sample of children with CP and their primary caregivers were recruited from rehabilitation departments, early intervention centers or special education schools in Southern Taiwan. Psychometric properties assessed included test-retest reliability, internal consistency, item discrimination, construct validity, and concordance between the forms of questionnaire. **Results:** We followed common translation procedures. The Chinese CP QOL-Child was completed by 145 parents and 44 children. Excellent test-retest reliability (ICC ranged from 0.74 to 0.97) and internal consistency (Cronbach's alpha ranged from 0.78 to 0.91) were obtained. Item discrimination analysis revealed a majority of the items have moderate to good discriminating power. Confirmatory factor analysis demonstrated distinguishable domain structure as on the original English version. Significant associations were found between lower QOL and more severe motor disability. Consistent with the English version, the highest correlation between primary caregiver and child forms on QOL was in the domain of functioning. **Conclusion:** Our results indicate that the Chinese CP QOL-Child appears to be valid for use in Mandarin-Chinese speaking children with CP.

0502PP16

CORRELATION BETWEEN FUNCTIONAL PERFORMANCE IN DEVELOPMENTALLY DELAYED CHILDREN AND CHILD AND PARENTAL QUALITY OF LIFE, AND FAMILY IMPACT

Ru-Lan Hsieh^{1,2}, Shih-Ching Chen², Hsiao-Yuan Huang³, Ming-I Lin⁴, Wen-Chung Lee³

¹Department of Physical Medicine and Rehabilitation, Shin Kong Wu Ho-Su Memorial Hospital, ²School of Medicine, College of Medicine, Taipei Medical University, ³Graduate Institute of Epidemiology, College of Public Health, National Taiwan University and ⁴Department of Pediatric, Shin Kong Wu Ho-Su Memorial Hospital (Taiwan)

Purpose: To examine the relationship between functional performance in developmentally delayed children and health-related quality of life (HRQOL) in these children and their parents, and family impact. **Materials and Methods:** A total of 49 children (35 male and 14 female) diagnosed with developmental delay and their parents participated in this cross-sectional study. Assessment tools for children were 1) Pediatric Outcomes Data Collection Instrument

for functional performance, 2) Child Health Questionnaire-Parent Form and Pediatric Quality of Life Inventory (PedsQL)-Generic Core Scale for HRQOL. Tools used for assessing parents included 1) WHOQOL-BREF for HRQOL, 2) PedsQL-Health Satisfaction Scale, PedsQL-Family Impact Module, Impact on Family Scale, and the Hospital Anxiety and Depression Scale for family impact. **Results:** Functional performance scores in children with developmental delay were significantly positively correlated with physical-HRQOL scores in these children (correlation coefficient: 0.5 to 0.9). Mild positive correlations were evident between functional performance scores and child age (correlation coefficient: 0.3), and parental HRQOL (correlation coefficient: 0.3 to 0.4) and health satisfaction (correlation coefficient: 0.4). Significant negative correlations were found between functional performance scores and family impact (correlation coefficient: 0.4 to 0.5), and parental anxiety (correlation coefficient: 0.3 to 0.5) and depression (correlation coefficient: 0.3 to 0.5). **Conclusion:** Better functional performance in children with developmental delays is associated with higher HRQOL in these children and their parents, and higher parental health satisfaction. Lower functional performance in these children is associated increased family impact, and parental depression and anxiety.

0502PP17

FUNCTIONAL PROGRESS OF DUCHENNE MUSCULAR DYSTROPHY WITH AGE IN KOREA

Moon Suk Bang¹, Sang Jun Kim¹, Jong Hee Chae³, Soo Kyoung Park², Joong Youp Lee², Jung Yun Kim¹, Il Young Jung¹

¹Seoul National University College of Medicine, Department of Rehabilitation Medicine, ²Seoul National University College of Medicine, Preventive Medicine and ³Seoul National University College of Medicine, Pediatrics & Adolescent Clinical Neuroscience Center (Republic of Korea)

Purpose: To see if the known parameter and scales would be available to apply to Korean DMD patients and to investigate if the functional progression which was evaluated by the known parameter would indeed reflect the natural course of Korean DMD patients well. **Materials and Methods:** We reviewed the medical records of 121 children with DMD, who had regularly visited the pediatric rehabilitation clinic at Seoul National University Hospital, from 2006 to 2009. Collected data were Brooke scale, Vignos scale, muscle powers checked by hand-held dynamometer, scoliosis angle, the passive range of motion (PROM) of ankle dorsiflexion, peak cough flow, and cardiac fractional shortening. **Results:** Brooke, Vignos scales correlate well with the functional changes of Korean DMD patients with increasing age. (Brooke scale (y1), age (x) $y1 = 0.3334x - 1.1938$, $R^2 = 0.397$, Vignos scale (y2) $y2 = 0.7935x - 3.0598$, $R^2 = 0.508$). The PROM of ankle dorsiflexion showed a linearly declining pattern. (right ankle PROM (y1), age(x) $y1 = -4.4248x + 34.828$, $R^2 = 0.3512$, left ankle PROM (y2) $y2 = -4.4366x + 35.107$, $R^2 = 0.3622$) Muscle powers, scoliosis angle, peak cough flow and fractional shortening of left ventricle showed diversities in their degree irrespective of age. **Conclusion:** The currently known parameters partially reflect the function or clinical change of DMD patients. However, it is so limited that the validity of this parameter is not satisfactory and some parameters do not have any relations with the change of age. When it comes to this, our next work should be designing the new functional scale which can reflect the functional progress with higher validity.

0502PP18

THE ANALYSIS OF SURFACE ELECTROMYOGRAM IN INFANT WITH BIRTH-RELATED BRACHIAL PLEXUS INJURY THROUGH FUNCTIONAL ELECTRICAL STIMULATION THERAPY

Qing Shang

The Rehabilitation Center in Children hospital of Zhengzhou (China)

Purpose: To analyze the EMG activity before and after functional electrical stimulation in infant with birth-related brachial plexus injury, and explore the role of surface electromyogram. **Materials and Methods:** To assess the changes before and after functional electrical stimulation on 30 cases of infant with birth-related brachial plexus injury in terms of clinical treatment and surface EMG. **Results:** The integrated electromyography was increased in functional position and voluntary contraction location of biceps brachii, radial wrist extensor muscles and ulnar carpal flexor muscle after the clinical treatment. **Conclusion:** The electrical stimulation can improve muscle tone and muscle strength in infant with birth-related brachial plexus injury. Surface EMG can be used as an objective evaluation methods which can appraisal the curative effect of electrical stimulation in infant with birth-related brachial plexus injury.

0502PP20

SURFACE ELECTROMYOGRAPHIC BIOFEEDBACK IN THE TREATMENT OF THE SPASTIC CEREBRAL PALSY

Shang Qing, Hui-Chun Zhang, L.V. Nan, Zheng-Yu Li
The Rehabilitation Center in Children Hospital of Zhengzhou (China)

Purpose: To evaluate the efficacy of Surface electromyographic (sEMG) biofeedback in the treatment of lower-limb spasticity in children with spastic cerebral palsy. **Materials and Methods:** From September 2007 to October 2009, a total of 36 with spastic CP (20 males, 16 females; mean age 9 ± 1.5 y, range 5-12 y; Muscle tone of the ankle plantar flexors was Modified Ashworth Scale level I+II) were randomly divided to sEMG biofeedback and control groups. sEMG biofeedback treatments were applied six times a week for a period of 6 weeks. In addition, the patients in both groups received a same rehabilitation protocol except sEMG biofeedback therapy. Modified Ashworth Scale (MAS), range of motion (ROM) of ankle, the gross motor function measure (GMFM) and surface EMG potentials were used at the beginning and at the end of treatment course respectively for the clinical assessments. **Results:** The results showed that there were statistically significant improvements in all variables in both groups, but the improvements of MAS, ROM of ankle, GMFM scores and sEMG potentials were significantly greater in the sEMG biofeedback group at the end of the treatment ($p < 0.05$). After treatment, the integrated electromyography (iEMG) of the gastrocnemius muscle were decreased in passive activities, but the iEMG were significantly lower in the sEMG biofeedback group. The iEMG of the tibial anterior muscle was increased in Self-contraction, but the iEMG in sEMG biofeedback group were significantly increased compared with the control group ($p < 0.05$). **Conclusion:** Our study demonstrates the potential benefits of sEMG biofeedback in conjunction with neurophysiologic rehabilitation technique to maximize the lower-limb function in children with spastic cerebral palsy. This system could be used for lower-limb spasticity rehabilitation training in children with spastic cerebral palsy. It could be combined with other training methods to promote recovery better.

0502PP21

CORRELATION OF HISTOPATHOLOGIC FINDINGS WITH MRI FINDINGS IN CONGENITAL MUSCULAR TORTICOLLIS

Shin-Young Yim¹, Jang-Hee Kim², Myong Chul Park³, Il Jae Lee³, Kyu-Sung Kwack⁴

¹Ajou Torticollis Clinic, Department of Physical Medicine and Rehabilitation, Ajou University School of Medicine, ²Department of Pathology, Ajou University School of Medicine, ³Department of Plastic and Reconstructive Surgery, Ajou University School of

Medicine and ⁴Department of Radiology, Ajou University School of Medicine (Korea)

Purpose: Pathogenetic mechanism of congenital muscular torticollis (CMT) remains elusive. There have been only a couple of reports on histopathologic findings of CMT, which were based on fine needle aspiration cytology of CMT. No study has investigated the correlation between histopathologic findings and neck magnetic resonance imaging (MRI) findings of CMT mass in sternocleidomastoid muscle (SCM). The purposes of this study were to elucidate both histopathologic findings and MRI findings and to analyze their correlation in order to investigate pathogenetic mechanism of CMT. **Materials and Method:** Histopathologic sections of CMT mass in SCM were reviewed for 35 subjects (22 men, 13 women; age at the time of surgical release 62.51 ± 85.51 month-old; range 5 month-old ~ 31 year-old) who underwent myectomy for CMT. Neck MRI findings were reviewed from 37 subjects whose neck MRIs were available among 24 subjects (20 men, 17 women; age at the time of neck MRI 59.73 ± 103.68 month-old; range 1 month-old ~ 38 year-old). There were 16 subjects who had both neck MRI and histopathologic sections. **Results:** 1) Regarding pathologic findings, all 35 subjects showed interstitial fibrosis and/or with presence of aberrant tendon-like, excessive dense connective tissue which was either well-arranged or disorganized (100%). There were 8 subjects (22.9%) who showed prominent fat infiltration. Abnormally coiled vessels and myxoid change of nerves were also noted. 2) On neck MRI, there were 34 out of 37 subjects (91.9%) who showed one or more low signal intensities within involved SCM muscle on T1- and T2-weighted images, which means collagen-rich tissue such as tendon or ligament. Three subjects (8.1%) showed only enlargement of the SCM without low signal intensity within the SCM. These findings were found at the sternal head of the SCM in 21 subjects (56.8%), clavicular head in 3 (8.1%), and both sternal and clavicular heads in 13 (35.1%). As subjects get older, some subjects showed atrophied unilateral SCM which was replaced with tendon-like, extensive dense connective tissue with little muscle tissue. **Conclusions:** The histopathologic findings and MRI findings showed good correlation in terms of fibrosis and aberrant dense connective tissue within SCM. These findings revealed that pathogenetic events for CMT during prenatal or perinatal period seem to end up with fibrosis with/without formation of aberrant tendon-like dense connective tissue within SCM during the muscle regeneration.

0502PP22

FACTORS ASSOCIATED WITH THE PROGRESS OF COGNITIVE, LANGUAGE AND MOTOR DEVELOPMENT IN CHILDREN WITH DEVELOPMENTAL DELAY

Rong-Bin Hong¹, Shih-Yin Yen¹, Hon-Yi Shi², Yi-Ru Chen¹, Hui-Shan Yu¹

¹Department of Physical Medicine and Rehabilitation, Chi Mei Medical Center, Yong Kang Campus and ²Graduate Institute of Healthcare Administration, Kaohsiung Medical University (Taiwan)

Purpose: Although substantial evidence has suggested that children with developmental delay benefit cognitively and socially from receiving early intervention, studies investigating the factors that might influence the progress of cognitive, language and motor development are surprisingly few. The aim of this study was to explore the predictors that influence the progress of cognitive, language and motor development after one year in children with developmental delay. **Materials and Methods:** All 231 children from January 2006 to October 2008 diagnosed with global developmental delay within a single developmental clinic were recruited into the study. Children with chromosome abnormality, cerebral palsy, neural abnormality, visual and hearing impairment were excluded. Generalised estimating equations (GEE) approach was applied to explore the predictors associated with cognitive, language and motor develop-

ment. The severity of cognitive developmental delay (1-average, 2-borderline, 3-delay) was rated in the first assessment and in the three-year follow-up assessment according to the score in Mental scale of Bayley Scales of Infant Development-II and Wechsler Preschool and Primary Scale of Intelligence-Revised. The severity of language and motor delay (1-average, 2-borderline, 3-delay) was rated based on the development quotient in Comprehensive Developmental Inventory for Infants and Toddlers. Socio-demographic data including age, gender, care giver, intermarriage, parental educational level, delivery mode, number of children and the type of early intervention setting were collected from chart review **Results:** Cognitive development correlated significantly with gender (particularly in boys), parents as care givers, maternal educational level, and intermarriage ($p < 0.05$). Severity of language delay after one year was negatively associated with maternal educational level and integrated education with special support. Severity of motor delay was positively associated with gender particularly in boys and vaginal birth ($p < 0.05$). Finally, age of developmental delay identification correlated with cognitive, language and motor development ($p < 0.05$). **Conclusion:** We found age, gender, care giver, maternal educational level, and intermarriage were correlated to cognition, language and motor development, which partially supported the previous studies. Issues regarding factors resulting in the differences were discussed.

0502PP23

PREDICTORS OF EFFECTIVENESS OF EARLY INTERVENTION ON CHILDREN WITH INTELLECTUAL DISABILITY

Der-Chung Lai¹, Yuh-Ming Hou¹, Jiun-Horng Liu¹, Hsiu-Chen Huang¹, Chung-Hsin Chiang², Yen-Cheng Tseng³, Shu-Fen Yao⁴

¹Chiayi Christian Hospital, ²National Cheng Chi University, ³Chang Jung Christian University, ⁴Early Intervention Reporting Referral Center of the Chiayi City and County (Taiwan)

Purpose: Early intervention to children with intellectual disability (ID) has been promoted in Taiwan for years, but the data on its effectiveness are still limited. **Materials and Methods:** In order to identify predictors of the effectiveness of early intervention, we recruited children who were treated at the Child Development Evaluation Center in a teaching hospital in Chiayi, Taiwan from 2001 to 2005. We included patients with ID who had two tests for Wechsler Preschool and Primary Scale of Intelligence-Revised. Data on the intervention between the two tests were collected by social workers at the Early Intervention Reporting Referral Center of the Chiayi City and County. We used the difference between the first test score (IQ1) and the second test score (IQ2) as the indicator of the effectiveness of intervention (IQ2–IQ1). **Results:** Muscle tenderness on days 0 and 14 [before exercise] was not different in the two groups. Muscle tenderness was significantly reduced [24.3 ± 4.8 mm] in the group that consumed BSP-201 as compared to the placebo group [47.4 ± 6.5 mm] at day 14 [immediately after, $p < 0.01$] and at day 16 [$p < 0.04$] after the exercise. None of the participants reported any adverse effects. **Conclusion:** The study results showed that early intervention can improve the IQ of children with ID, and the earlier the intervention the better. In addition, the effectiveness is more prominent in children with a low maternal educational level.

0502PP24

CONGENITAL THORACIC SCOLIOSIS PRESENTING AS TORTICOLLIS: A CASE REPORT

Tzu-Yi Chou, Pei-Yu Yang, Nai-Hsin Meng
Department of Physical Medicine and Rehabilitation, China Medical University Hospital (Taiwan)

Purpose: Torticollis is the third most common congenital musculoskeletal anomaly. The well known causes of nonmuscular torticollis in children included Klippel-Feil Syndrome, unilateral atlanto-occipital fusion, ophthalmologic disorder (strabismus), brachial plexus injury, central nervous system lesion. Congenital thoracic scoliosis as the cause of nonmuscular torticollis is very rare. We reported a case of congenital thoracic scoliosis presented as torticollis.

Case Report: A female infant with a history of congenital ventricular septum defect was noted to have wry neck (head tilt to left) since birth. She received rehabilitation program including positioning, stretching exercise of left sternocleidomastoid (SCM) muscle at local hospital but the symptom still persisted. She was brought to our clinic due to persisted torticollis at the age of 8-month-old. Physical examination showed head tilted to left side, turned to right side and mild facial asymmetry. There was no palpable mass over left SCM muscle. Soft tissue echo showed no hyperplasia and no fibrotic tissue over left SCM muscle. Spine x ray showed kyphoscoliosis of the thoracolumbar spine. Thoracic-lumbar spine CT was arranged which showed scoliosis of thoracic spine due to multiple vertebral segmentation failure at T1–8 level. Congenital scoliosis is a curvature of the spine and is resulted from malformations of the vertebra. The malformations include failures of formation (hemivertebra), failures of segmentation and combinations of these defects. It is common to see other congenital malformation in congenital scoliosis such as cardiac abnormalities (10%), genito-urinary abnormalities (25%), and intraspinal anomalies (40%). In our case, the scoliosis results from failure of segmentation of thoracic spine. She also has congenital heart disease. The treatment for congenital scoliosis depends on the progression of scoliosis. Surgery is indicated if the progression is aggressive. **Conclusion:** Congenital thoracic scoliosis is a rare cause of torticollis. Most of the muscular torticollis can be managed with good or excellent results. Nonmuscular cause of torticollis should be considered if there is no evidence of muscular origin torticollis or poor response to rehabilitation program.

0502PP25

THE PROGRESS OF CHILDREN WITH ARTICULATION AND PHONOLOGICAL DISORDERS COMBINING WITH SENSORY INTEGRATION DYSFUNCTION OR NOT

Li-Chen Tung^{1,2}, Ching-Chi Chen¹, Tsen-Jieu Ji¹, Ming-Fang Wang¹, Rong-Tai Liou³, Ching-Lin Hsieh⁴

¹Department of Physical Medicine and Rehabilitation, Chi-Mei Medical Center; ²Graduate Institute of Early Intervention, National Taichung University; ³Department of Physical Medicine and Rehabilitation, Chi-Mei Medical Center, Liou Ying Campus; ⁴School of Occupational Therapy, National Taiwan University (Taiwan)

Purpose: Articulation and phonological disorders are common communication problems in children. Sensory integration dysfunction means that the brain can neither effectively organize sensory stimulation nor provide correct information to oneself and the environment. Such a dysfunction could possibly lead to language delay or incorrect pronunciation, although empirical evidences are largely lacking. In order to clarify the impact of sensory integration dysfunction on children language impairment, the purpose of this study was to examine how sensory integration dysfunction would impact the effect of speech therapy on children with articulation and phonological disorders. **Materials and Methods:** The children were between 3.5 and 6 years old. Before receiving the therapy, the pre-school children with articulation and phonological disorders were screened by the Hearing and Developmental Screening test. Furthermore they received the below evaluations: the Sensory Integration Function Evaluation in Preschool Children and the Clinical Articulation Function Evaluation. The children only received speech therapy, including auditory discrimination, oro-motor training, and pronunciation localization. Three months after the therapy, we followed his/her articulation function as well as his/her total number of therapies. Based on their sensory integration function, we divided the children into normal

group and dysfunctional group for further analysis. **Results:** A total of 13 children (7 boys and 6 girls) participated in our study. The average month-age was 59.6 ± 7.8 and 7 of them were in sensory integration normal group and the other 6 in dysfunction group. Both groups had no significant difference between month-age, gender, and number of mistakes in pronunciation. Paired t test showed significant progresses ($p=0.001$) after treatment on both groups. One way ANOVA showed no significant differences ($p=0.232$) between these two groups after treatments. The total number of treatments received by the dysfunction group was significant higher than those of the normal group ($p=0.012$). **Conclusion:** Our preliminary study showed that children with articulation and phonological disorders show significant progress after speech therapy. However, we found no difference of treatment effect between the sensory integration dysfunctional group and normal group. It might be because of small sample size. In addition, the dysfunctional group requiring more times of therapies than the normal group indicates that the sensory integration dysfunctional children demand more intensive speech therapy. In the future, we suggest that such a research should recruit large sample size to increase statistical power. Furthermore, we suggest adding the sensory integration therapy into routine therapy program in order to promote effect of the therapy.

0502PP26

COMPARISON THE DEVELOPMENTAL PROFILES OF CHILDREN WITH PRADER-WILLI SYNDROME AND MENTAL RETARDATION/MENTAL DELAY

Chien-Min Chen¹, Chia-Ling Chen^{2,3}, Hung-Chih Hsu¹, Yi-Wen Chuang¹

¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, Chiayi, ²Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, Taipei. ³Department of Physical Therapy and Graduate Institute of Early Intervention, Chang Gung University (Taiwan)

Purpose: Prader-Willi syndrome (PWS) is a chromosome 15 genetic disorder and it could result in global developmental delay in children. If there is no genetic analysis, it is difficult for clinicians to distinguish children with PWS from children with mental retardation (MR)/mental delay (MD) only by obscure characteristics. The aim of our study is to distinguish them by analyzing their full spectrum of developmental functions. **Materials and Methods:** We recruited 10 children with PWS between the ages of 1 to 6 years and 17 MR/MD children, who were matched for age, gender, and scores of mental assessments were selected to be a comparison group. Revised-norm Chinese Children Developmental Inventory (CCDI) was used to survey the developmental functions. **Results:** The average developmental quotients of all domains in the children with PWS were lower than those in children with MR/MD. The differences of gross motor ($p=0.014$), situation comprehension ($p=0.035$), self help ($p=0.01$), and general development ($p=0.045$) domains between children with PWS and MR/MD were significant, while expressive language ($p=0.056$) between the two groups was nearly significant. **Conclusion:** These findings suggest that children with PWS have worse development functions in gross motor, situation comprehension, self help and general development than those of MR/MD. The data may help us to diagnose PWS at clinics and provide us the information to arrange therapy for children with PWS.

0502PP27

THE STUDY ON QUALITY OF LIFE IN CHILDREN WITH CEREBRAL PALSY

Zhenhuan Liu

Nanhai Affiliated Maternity & Children's Hospital of Guangzhou University of TCM (China)

Purpose: To investigate quality of life in children with cerebral palsy. **Materials and Methods:** Cross-sectional evaluation of chil-

dren with CP, children with common disease and healthy children. Quality of life was measured with the Pediatric Quality of Life Inventory Generic Core Scales, version. **Results:** There were 479 participants in all. 113 were children with CP of mean age 3.65 ± 2.15 years; 68 were boy. 52 were children with common disease of mean age 3.77 ± 1.83 years; 30 were boy. 314 were healthy children of mean age 4.46 ± 1.13 years; 177 were boy. Significant differences in mean scores favoring two peer groups were found for physical functioning (CP: 27.80 ± 22.61 , common disease: 89.12 ± 11.99 , healthy: 91.42 ± 36.58), social functioning (CP: 37.17 ± 23.44 , common disease: 88.46 ± 13.98 , healthy: 84.91 ± 16.25), and total score (CP: 76.44 ± 15.81 , common disease: 83.12 ± 10.54 , healthy: 86.57 ± 24.83) ($p < 0.01$). Means scores of Emotional functioning was significantly higher for the healthy group (83.28 ± 80.61) compared with CP children (55.88 ± 22.0) ($p < 0.05$). Means scores of school functioning was significantly lower for children with CP compared with two peer groups (CP: 55.00 ± 18.95 , common disease: 68.39 ± 13.65 , healthy: 83.66 ± 11.29) ($p < 0.01$). **Conclusion:** Cerebral palsy reduces children's quality of life in full-scale. General quality of life, physical functioning, social functioning and school functioning decrease significantly. Relatively, emotional functioning is less effected. Results suggest clinicians should assess and actively improve quality of life in children with CP.

0502PP28

EFFECT OF ACUPUNCTURE OF ANSHENBUNAO AND YIQITONGLUO METHOD ON NEURONAL APOPTOSIS AND PROTEIN EXPRESSION OF NERVE GROWTH FACTOR IN BRAIN TISSUES OF NEWBORN RATS WITH CEREBRAL PALSY

Zhenhuan Liu

Nanhai Affiliated Maternity & Children's Hospital of Guangzhou University of TCM CHINA (China)

Purpose: To study the effect of acupuncture Anshenbunao and Yiqitongluo method on apoptosis of hypoxic-ischemic cerebral neural cells, protein expression of nerve growth factor and the function of limbs in newborn rats, and analyze whether the effect is related with the time of acupuncture. **Materials and Methods:** The experiment was conducted in the Laboratory of Acupuncture & Massage as well as the Clean Laboratory of Experimental Animal Center of Guangzhou University of Traditional Chinese Medicine from August to October 2005. 109 young SD rats aged 7 days were selected. Rats recovered for 2 hours after ligation of left common carotid artery and then were put into a hyaline airtight container, in which there was homeothermal water of 37°C , and hypoxia gas (including 8% of O_2 and 92% of N_2) was infused in the container at the speed 1 L/min. Animals were taken out at 2.5 hours later, and the survival rats received behavioral assessment following 1-hour incubation. Rats unable to roll over, abnormal in balance or kept on turning left were taken as successful models ($n=72$). The rest 24 rats were taken as the sham-operation group: rats were only separated of the left common carotid artery without ligation or hypoxia treatment. Rats of successful modeling were randomly divided into 3 groups: hypoxic-ischemic + acupuncture group (group A), hypoxic-ischemic + acupuncture group (group B) and model group with 24 rats in each group. The acupoints of Baihui, Shuaigu to Jiaosun, Neiguan, Quchi, Zusanli, Yongquan were selected. Rats in group A were acupunctured at 24 hours after modeling, and only acupoints in four extremities were acupunctured in the first 7 days, while acupoints in head were also acupunctured from the 8th day. Rats in group B were acupunctured at both head and body on the 8th day. Rats of both groups were acupunctured rapidly at Neiguan and Yongquan with littlee blood and without retention, then head-acupoints, Quchi and Zusanli were acupunctured. Baihui, Shuaigu to Jiaosun, Quchi, Zusanli were connected with G6805-II electroacupuncture equipment with continuous wave at the frequency of 5–10 Hz for 10 continuous min once a day. Rats in group A were acupunctured for 20 continuous day. Rats in group B were continuously acupunctured for 13 days. Rats in the sham-operation group were interfered the same as group A. Rats in the model group only

received no treatment but grouping. The ventral surfaces of the upper limbs in rats were stuck with rubber cement at 7, 14, 21 days after operation, and the time of getting out of the rubber cement was recorded. At 21 days after operation, 10 rats were randomly selected from each group to conduct the following detection: in situ end-labeling (ISEL) and immunohistochemical method were adopted to measure the neuronal apoptosis in cortex of temple and hippocampus as well as the expression of nerve growth factor (NGF) in hippocampus respectively, and image analyzer was used to count the number of neuronal apoptosis and number of NGF that positive in expression under light microscope ($\times 400$). The differences were compared with Chi square test, and means were compared among groups with analysis of variance (F-q test). **Results:** Of 109 enrolled rats, 13 failed for failure modeling, and no one died in the sham-operation group. At 7 days after modeling, there were 2, 5 and 3 rats died in group A, B and model group respectively. At 7–14 days after modeling, there were 2, 2 and 4 respectively. At 17–21 days after modeling, they were 0, 0 and 2. Apoptosis of neurons in hippocampus frontal lobe stained with ISEL in group A and B were significantly decreased, and the differences in comparison with the model group were remarkable ($p < 0.05$). Moreover, the number of apoptosis in group A was obviously lower than group B ($p < 0.05$). Protein expression of NGF in neurons of hippocampus in rats: It was significantly reinforced in group A and B, while as to number and intensity, those were obviously greater and higher than sham-operation group and model group ($p < 0.01$), and those were obviously greater and higher in group A than group B ($p < 0.01$). At the 7th day after operation, the time of getting rid of rubber cement in group A was obviously shorter than in model group ($p < 0.01$). At the 14th day after operation, it was significantly long in model group than 3 other groups ($p < 0.05-0.01$). At the 21st day after operation, the function of upper limbs in rats of group A and B as well as model group were obviously ameliorated, and that of group A approached to normal level (there was no significant differences comparing with the sham-operation group, $p > 0.05$), whereas that of model group was longer than group A and sham-operation group ($p < 0.01$). **Conclusion:** Acupuncture can inhibit the apoptosis of hypoxic-ischemic neurocytes in brain, reinforce the expression of NGF in brain tissues of rats with hypoxic-ischemic damage and ameliorate the function of limbs, which has certain protective effects on hypoxic-ischemic damage, and the earlier the intervention is carried out, the better the effects are.

0502PP29

THE CURATIVE EFFECT OF RELIEVING SPASTICITY FOR CEREBRAL PALSY TREATED BY VIBROACOUSTIC BY THERAPY

Lihong Zhang

Nanhai Affiliated Maternity & Children's Hospital of Guangzhou University of TCM (China)

Purpose: To observe the curative effect of vibroacoustic therapy by relieving spasticity for Cerebral Palsy. **Materials and Methods:** 36 cases of Cerebral Palsy were treated by vibroacoustic therapy and listened to the Jiao Music for 30 min, we scale the adductor angle and popliteal fossa angle and foot dorsiflexion angle before and after for three times. To produce as an average figure. muscular tone in addition, including calculate the CSS. **Results:** No examinee has bad reaction. We find that the score of the Cars measurement is obviously discrepancy before and after the vibroacoustic therapy. $p < 0.05$ and the angles of most of the children is improved after the treatment. **Conclusion:** Vibroacoustic therapy can obviously relieve the spasticity for Cerebral Palsy, accordingly improve their limb functions.

0502PP30

THE CLINICAL STUDY OF THE CURATIVE EFFECT OF CHILDHOOD AUTISM TREATED BY HEAD ACUPUNCTURE

Zhenhuan Liu

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Nanhai Affiliated Maternity And Children's Hospital of Guangzhou University of TCM (China)

Purpose: In order to investigate the clinic effect of head acupuncture therapy on childhood autism. **Materials and Methods:** We have observed the clinical curative effect of 38 cases of childhood autism treated by head acupuncture. (31 male cases; 7 female cases; 3-11 of the age) We named this cure "9-acupoint Cure", which head acupuncture of Nine needles of intelligence five needles of forehead and Seushenchung acupoints. It takes 30 times, needling every other day, in each course of the treatment. After 2 year's followed up visiting and observing. **Results:** We find that the score of the Cars measurement is obviously discrepancy after and before the treatment, $p < 0.0$ and the electroencephalogram of most of the children is improved after the treatment. With 3 months' treatment, 16 cases have obvious effect (42.1%) 14 cases show the effect (36.8%) and only 8 cases show no effect (21.1%). After 2 years' followed-up visiting, we find that 14 children have gradually got recovered. **Conclusion:** The result shows that the head acupuncture therapy can obviously improve the solitary behaviour, communicative obstruction, logopathy of the childhood autism, the obstruction of visus communication and the emotion indifference.

0502PP31

THE RELATIONSHIP BETWEEN INTELLIGENCE DEVELOPMENT AND LEVEL OF GMFCS IN CHILDREN WITH CEREBRAL PALSY

Zhenhuan Liu, Ruiping Wan

Nanhai Affiliated Maternity And Children's Hospital of Guangzhou University of TCM (China)

Purpose: To investigate the level and structure of intelligence of children with cerebral palsy (CP). To analyze the relationship between intelligence development with severity degree (GMFCS) and clinical type. **Materials and Methods:** 18 children with CP were assessed using Gesell Developmental Scale (GDS) and Gross Motor Function Classification System (GMFCS) to test their developmental quotient (DQ) and severity degree (GMFCS), and the relationship between intelligence development with severity degree (GMFCS) and clinical type were analyzed. **Results:** 112 children had found with mental retardation among 118 cases, made up 94.9 percent. Score of motor behavior was the lowest and score of language behavior was the highest, the DQ of children of spastic type was higher than athetotic and mixed type, the DQ of children below level II (GMFCS) was higher than children above level IV (GMFCS), the DQ of children above level V (GMFCS) was lower than children below level III (GMFCS), all with statistical significance. **Conclusion:** Most children (94.9%) with CP have mental retardation. Their structure of intelligence is abnormal. Their motor behavior is the worse and the language behavior is the best. Severity degree (GMFCS) and clinical type influence intelligence development. The damage of intelligence is the most obvious in children with CP of mixed type. More serious of gross motor function in children with CP, more damage to intelligence.

0502PP32

CLINICAL OBSERVATION OF CHILDREN WITH CEREBRAL PALSY THERAPY BY TRADITIONAL CHINESE MASSAGE

Zhenhuan Liu, Yong Zhao, Lihong Zhang, Nuo Li, Wenjian Zhao

Nanhai Affiliated Maternity & Children's Hospital of Guangzhou University of TCM (China)

Purpose: Observation of traditional chinese massage therapy to improve the ankle's range of motion and the score of CSS of children with cerebral palsy. **Materials and Methods:** 286 children with the 2004 symposium on the development of cerebral palsy children cer-

bral palsy diagnostic criteria were treated by acupuncture massage along meridians, strengthening spleen and invigorating qi massage, chiropractic, foot bottom massage, segmental massage, promotive muscle strength massage and range of motion massage. The angle of dorsiflexion of foot were measured and the score of CSS were evaluated before and after the treatment. **Results:** According to the standardization, there were 106 cases with marked effect (37.40%), 172 cases with effective (59.16%) and 8 cases with no-effect (2.84%). There were obvious improvement of the ankle's range of motion and the the score of CSS ($p < 0.05$) after treatment 30 days. **Conclusion:** Traditional chinese massage therapy in children with cerebral palsy movement disorders will be satisfied with short-term effect, and there is convenient, inexpensive and inspection, etc, are worthy of further promotion and research.

0502PP33

ANALYSIS OF ERYTHROCYTE AGGREGATION AND NAILFOLD MICROCIRCULATION IN CHILDREN WITH CEREBRAL PALSY

Zhenhuan Liu, Xuguang Qian

Nanhai Affiliated Maternity and Children's Hospital of Guangzhou University of Traditional Chinese M (China)

Purpose: To study the haemorheology feature of children with cerebral palsy by erythrocyte aggregation and nailfold microcirculation. **Materials and Methods:** Erythrocyte aggregation of 73 children with cerebral palsy were tested by RBC observation and clinical data analytical system made by Beijing Lairun medical limited company and Tsinghua University image and graph research institute. Nailfold Microcirculation was also tested by microcirculation microscope of type WX-6. **Results:** Correlation test between the extent of cerebral palsy and Erythrocyte aggregation has been certified ($p < 0.05$). The difference of the obstacle of heightening erythrocyte aggregation between mild, moderate and severe groups were significant ($p < 0.01$). The erythrocyte aggregation of moderate and severe group was higher than that of mild group ($p < 0.05$). But there were no significant differences between moderate and severe group ($p > 0.05$). 97.22% of patients had obstacle of nailfold microcirculation including short and small loops, significant spasm of input branch, fewer loops, erythrocyte aggregation. There were no significant differences between mild, moderate and severe groups. **Conclusion:** Obstacle of nailfold microcirculation and erythrocyte aggregation generally existed in the children with cerebral palsy. The degree of erythrocyte aggregation was associated with the state of the illness: severer state.

0502PP34

TREATMENT OF CEREBRAL PALSY WITH SPEECH DISORDER BY LINGUISTIC TRAINING AND ACUPUNCTURE

Zhenhuan Liu

Cerebral Palsy of Rehabilitation Center, Nanhai Affiliated Maternity & Children's Hospital of Guangzhou University of Traditional Chinese Medicine (China)

Purpose: To study the best way to treat the children with cerebral palsy and speech disorder. **Materials and Methods:** 76 children with cerebral palsy and speech disorder were studied by randomized controlled trial since 2000. 38 children in treatment group was treated by speech therapy combined with sharpening mind and inducing consciousness acupuncture. The control group were treated only by speech therapy and one treatment course is 3 months. Sharpening mind and inducing consciousness acupuncture was used every other day and one treatment course is 30 times. **Results:** The clinical good improvement rate shows: the treatment group (27/38) 71%, control group (13/38) 34.44%, $X^2 = 10.34$, $p < 0.01$. The speech DQ after treatment shows: treatment group 56.36 ± 19.77 , control group 46.96 ± 15.63 $t = 2.524$, $p < 0.05$. **Conclusion:** The method of combination of the traditional Chinese medicine and the west medi-

cine is significantly better than that of simple speech therapy in the rehabilitation treatment of cerebral palsy with speech disorder.

0502PP35

THE CLINICAL APPLICATION AND EVALUATION OF INFANTILE MASSAGE OF TONIFYING BRAIN IN PREVENTION OF CEREBRAL PALSY

Zhenhuan Liu², Jianying Ding¹

¹Guangzhou University of TCM, ²Nanhai Maternity and Children's Hospital affiliated to Guangzhou University of TCM (China)

Purpose: To evaluate infantile massage of tonifying brain on brain damage syndrome children to prevent cerebral palsy. **Materials and Methods:** 43 high-risk infants with moderate-serious brain damage syndrome hospitalized between 2006-2008 were chosen to study. They were all age 2-6 months, and 19 cases age 2-3 months, 20 cases age 4-5 months, 4 cases age 6 months; 38 cases were mail, 5 cases were female; factors of high-risk in perinatal period include: intrauterine fetal distress 8 cases; fetal age: <32 weeks 4 cases, 32-34 weeks 2. 34-37 weeks 9 cases; small for date infant 3 cases; hypoxic-ischemic encephalopathy 12 cases; jaundice 18 cases; intracranial hemorrhage 6 cases; asphyxia 12 cases; pneumonia of newborn 3 cases; hyaline membrane disease 2 cases; respiratory failure 6 cases; hypoglycemia 3 cases; septicemia 2 cases; purulent meningitis 2 cases and other diseases such as premature rupture of membranes, sclerodema neonatorum and anaemia, etc. they were treated mainly with infantile massage of tonifying brain, such as attacking vital points of DU meridian, benefiting intelligence, strengthening the qi of spleen, chiropractics and thenar massage. Attacking vital points of DU meridian: to attack the 13 points of DU meridian to harmonize the yin and yang, replenishing qi and blood and invigorate original qi, this skill should be conducted 15-25min every time, once a day. Massage of benefiting the intelligence: to massage the points in head, face, body and limbs, such as shenting, bensen, sishencong, shenmen, tongli, meiguan, laogong and lianquan, in order to achieve the goal of promoting flow of qi and blood, dredging meridians, coordinating the function of zang and fu organs, as well as ren and du meridians to benefit intelligence. This skill should be conducted 20-30 min every time, once a day. Massage of strengthening the qi of spleen: Abdominal rubbing exercise, pushing abdominal Yin-Yang, pushing and kneading middle pigastrium, invigorating the spleen meridian, pushing stomach meridian, each skill should be conducted 100-200 times every time, once a day. Chiropractics: 20-30 min every time, once or twice a day. thenar massage: by stimulating the reflecting areas on the footplate of brain, cerebellum, heart and kidney to balance the function of the body, the skill include palpating, manipulation, pinching, and twisting. This skill should be conducted 10-15 min, once or twice a day. Assisted with herb medicated bath, five-elements music(heart, liver, kidney and spleen CD) listening treatment, physical therapy, audiovisual and early education. All the methods of therapy should be conducted 2-3 times every week, the course of treatment is 20 days, and the next course begin after 20 days' rest, 3 courses make up a great course of 3 months long. The development quotient (DQ) is tested in the beginning of the therapy, after 3 months' therapy, and after 1.5 year by Gesell development diagnosis table. The computerized tomography, brain-stem auditory evoked potential, visual evoked potential are checked before and after the therapy. **Results:** The DQ (SD) in the beginning, after 3 months, after 1.5 year are 35.25 ± 28.27 , 65.60 ± 13.50 , 74.63 ± 13.53 , the latter two compared with that before the therapy $p = 0.000$, DQ of five functional areas were all significantly higher than that in the beginning. After 3 months' and 1.5 year, 18 cases and 31 cases gain normal development respectively, 12 cases had sequela of development delay (DD), take 28.0% of all the 43 children, much lower than the reported data of 80-100%, between them, 11 cases had light and 1 case had moderate DD. After therapy, of the 20 cases with abnormal vision conduct path, 7 cases recovered, 1 case improved among the 11 cases re-examined; of the 19 cases with abnormal audition conduct path, 10 cases recovered, 2 cases improved among the 17 cases re-examined; of the 30 cases with maldevelopment of brain, 9 cases got normal development and 18 cases improved; Of

the 2 cases with encephalomalacia, 1 case improved; Of the 2 cases re-examined with intracranial hemorrhage, 1 case restored. **Conclusion:** To treat high-risk infants with BDS with infantile massage of tonifying brain can promote brain development, repair the injured nerve, enhance the development of motor and cognition, and can prevent the occurrence of cerebral palsy effectively.

0502PP36

CLINICAL OBSERVATION ON EFFECT OF CLEARING THE GOVERNOR VESSEL AND REFRESHING THE MIND NEEDLING ON HEAD SPECI AND CT SCANNING OF CHILDREN WITH CEREBRAL PALSY

Zhenhuan Liu

Nanhai Affiliated Maternity & Children's Hospital of Guangzhou University of Traditional Chinese Medicine (China)

Purpose: To investigate action and value of acupuncture in Cerebral Palsy rehabilitation. **Materials and Methods:** 100 spasm Cerebral Palsy patients from 2 to 7 years old were randomly divided into two groups. Acupuncture group: 50 patients were treated with head acupuncture and body acupuncture; Rehabilitation-training group: 50 patients were treated with physical therapy of Bobath and Vojta methods. **Results:** The total effective rate acupuncture and rehabilitation-training group were obvious higher than that of rehabilitation-training group. After treatment the DQ value of rehabilitation-training + acupuncture group were higher than that of rehabilitation group ($p < 0.01$). In acupuncture and rehabilitation-training group were higher than that of rehabilitation group ($p < 0.01$). In acupuncture and rehabilitation-training group, improvement rate of brain dysphasia, brain atrophy in skull CT and recovery normal rate of skull SPECT were obvious higher than that of rehabilitation-training group ($t = 4.731, t = 5.971, p < 0.01$). **Conclusion:** Acupuncture can obviously increase cerebral blood flow (CBF) and improve cerebral cell metabolism, promote partial or complete compensation of cerebral function and the restoration and function of plasticity of cerebral tissue in children with cerebral palsy.

0502PP37

A DEVELOPMENTAL TREND OF THE ANTICIPATORY POSTURAL CONTROL OF FORWARD REACHING IN STANDING

Pei-Yu Yang¹, Feng-In Yao², Hsiang-Chun Cheng^{3,4}, Rong-Ju Cherng^{2,3}

¹Department of Physical Medicine and Rehabilitation, China Medical University Hospital, ²Department of Physical Therapy, National Cheng Kung University, ³Institute of Allied Health Sciences, National Cheng Kung University, ⁴Department of Physical Therapy, Hung Kung University (Taiwan)

Purpose: The purposes of this study were to examine the effect of target distances on anticipatory postural control (APC) and the developmental trend of the effect of target distances on APC in a forward reaching task. **Materials and Methods:** Sixty three subjects, divided into 5 age groups (5–6, 7–8, 9–10, and 11–12 years old and young adults) participated in the study. Each subject performed a forward reach task to press a button which was placed at four distances adjusted by arm length and the maximal forward reach distance. The data of center of pressure (COP), free torque (Tz), reaction time (RT) and muscle activity were collected simultaneously. Main effects of age group, reaching distance, and their interaction were tested using a two-way ANOVA repeated measures. **Results:** The results showed that the latency of COP and Tz increased as reaching distance increased and as age decreased; the peak amplitude of COP and Tz increased as reaching distance increased and as age increased. RT was longer as reaching distance increased and as age decreased. No interaction effects were noted. However, after normalization of variables with

body height, the normalized latency and peak amplitude of APC were only affected by reaching distance but not by age. **Conclusion:** APC is affected by reaching distance, but not influenced by age. The larger the distance, the longer (occurring earlier) the latency and the bigger the amplitude of APC. Children at the age of 5–6 years may have fully developed the APC in standing while performing a forward reach task to the similar level as the young adults.

0502PP38

RELIABILITY OF CLASSIFICATION OF SAGITTAL GAIT PATTERN IN CHILDREN WITH BILATERAL SPASTIC CEREBRAL PALSY

Dong Jin Kim, Ki Jung Kim, Dong-Wook Rha, Eun Sook Park

Dept. and Research Institute of Rehabilitation Medicine, Yonsei Univ. (Republic of Korea)

Purpose: Classifications of abnormal gait patterns have been suggested to help clinicians understand the pathomechanism of gait abnormality and plan standardized care pathways in children with cerebral palsy (CP). Qualitative classifications based on clinical observation are commonly used because they can be done without expensive kinematic analysis equipment. However, there have been only a few studies discussing the reliability of video observation based classification. Therefore, we investigated the reliability of classification of sagittal gait patterns in children with bilateral spastic CP. **Materials and Methods:** Video clips of walking and sagittal kinematic data obtained by computerized motion analysis system of 91 children with bilateral spastic CP were reviewed individually by a single expert who has clinical pediatric rehabilitation experience in moreover 3 years and one resident educated on the classifications of gait patterns through the kinematic analysis and video observation. Abnormal gait patterns were classified into four groups using the method described by Rodda et al. (true equinus/jump gait/apparent equinus/crouch gait). Reproducibility of classification was analyzed between video observation and kinematic analysis. Reliability of classification between the two observers was also analyzed in terms of video observation and kinematic analysis. Weighted kappa statistics were used to summarize 'intra-rater' and 'inter-rater' repeatability. (by SAS 9.1.3). **Results:** According to analysis derived by the expert, group I (true equinus) and group II (jump gait) patterns showed higher reproducibility of classification than group III (apparent equinus) and group IV (crouch gait) patterns between video observation and kinematic analysis. According to analysis derived by the resident, only group I patterns showed higher reproducibility. Group I (true equinus) and group IV (crouch gait) patterns showed higher inter-rater agreement than group II (jump gait) and group III (apparent equinus) on kinematic analysis. Group III (apparent equinus) patterns showed lower inter-rater agreement than the other groups on analysis through video observation. The classification of gait patterns by the expert showed substantial reproducibility between video observation and kinematic analysis. ($k = 0.67, p < 0.001$), in contrast by the resident showed low reproducibility. ($k = 0.34, p < 0.001$) There also was substantial inter-observer reliability in kinematic analysis. ($k = 0.66, p < 0.001$). However, video observation showed low inter-observer reliability. ($k = 0.37, p < 0.001$). **Conclusion:** The gait classification based on video observation was substantial reproducibility with kinetic analysis in expert, but it was low agreement in resident. And video observation showed low inter-observer reliability.

0502PP39

VALIDITY AND RELIABILITY OF TROCHANTERIC PROMINENCE ANGLE TEST IN THE MEASUREMENT OF FEMORAL NECK ANTEVERSION IN CHILDREN WITH SPASTIC CEREBRAL PALSY

Dong-wook Rha, Eun Sook Park, Dong Jin Kim, Ki Jung Kim

Department and Research Institute of Rehabilitation Medicine, Yonsei University (Republic of Korea)

Purpose: In patients with spastic cerebral palsy (CP), the most common gait abnormality is the toe-in gait pattern, which is commonly concurrent with increased femoral neck anteversion (FA). Trochanteric prominence angle test (TPAT) is a clinical examination method commonly used for quantifying FA, but its validity and reliability have been rarely evaluated. This study was performed to evaluate the validity and the reliability of TPAT in children with spastic CP. **Materials and Methods:** We recruited 44 limbs of 22 children with bilateral spastic CP. Trochanteric prominence angle test (TRAT) is performed as following description. The patient is laid down in a prone position and the examiner stands on the left side of the patient in order to measure the right hip. The left hand is used to palpate the greater trochanter while the right hand internally rotates the hip, with the patient's knee flexed 90 degrees. At the point of maximum trochanteric prominence, representing the most lateral position of the trochanter, the angle is subtended between the tibia and the true vertical. In order to determine reliability, TRAT is performed by observer 1 and the angle between the tibia and the true vertical is measured and recorded by observer 2 using an angle finder. The roles are changed between the two observers, and the TRAT measurement is repeated. On a different day, TRAT was measured for the second time by observer 1 on the same patient, while observer 2 measured the trochanteric prominence angle. To determine validity, comparisons between the FA angles measured by TPAT and computerized tomography (CT) were assessed. Intra-class correlation coefficient were used to evaluate 'intra-rater' and 'inter-rater' reliability of TRAT. (by SAS 9.1.3) Pearson correlation coefficient were used to evaluate validity of the FA angles measured by TPAT and CT imaging. (by SAS 9.1.3). **Results:** TPAT showed very high intra-observer reliability (ICC, intraclass correlation coefficients=0.95) and good inter-observer reliability. (ICC=0.72-0.76) In terms of the concurrent validity, the correlation coefficient between the FA angles measured by TPAT and CT was 0.50-0.58. ($p < 0.001$) **Conclusion:** When depicting femoral anteversion by clinical examination, trochanteric prominence angle test showed reasonably high intra- and interobserver reliability. However, validity of trochanteric prominence angle test was moderate compared to computerized tomography measurements.

0502PP40

TEACHING PLAY SKILLS TO A CHILD WITH AUTISM : EFFECTS OF VIDEO MODELING

Yu-Chun Liu¹, Hua Feng², Chien-Chih Liao³, Li-Wei Chou^{1,4,5}, Hsun-Ying Chen¹

¹Department of Physical Medicine and Rehabilitation, China Medical University Hospital, ²Graduate Institute of Rehabilitation Counseling, National Changhua University Education, ³Department of Psychiatry, China Medical University Hospital, ⁴School of Chinese Medicine, College of Chinese Medicine, China Medical University, ⁵Department of Physical Therapy, China Medical University (Taiwan)

Purpose: This study evaluated the effectiveness of video modeling intervention on acquisition, maintenance and generalization of play skills to preschool children with autism. **Materials and Methods:** A multiple-probe across behaviors design was used to demonstrate experimental control in this study. A 3 years and 10 months old girl was participant in this research. The multiple-probe design was included from baseline, intervention, and stimulus generalization into maintenance. Independent variable was video modeling of the play skills, and dependent variables were three play skills as shopping, boarding a train and operating animal blocks. During intervention phrase, the child watched the video two times without experimenter-implemented reinforcement, and further prompting or correction procedures was not used during intervention. Experiment scenarios included verbal and motor responses were videotaped using adult models. In order to increase the ability of response generalization

in autism children, stimulus generalization training was applied to this study. **Results:** The results indicated that the child acquired the sequences of scripted verbal and motor responses quickly and generalized this performance across new stimuli (toys) and settings (home). In addition, the participant successfully engaged in the three scenarios with researcher during generalization probes. Scripted motor responses for the three tasks increase from a baseline level below 15 % to intervention and maintenance a stable level above 80%. Scripted verbal responses for the three tasks increase from a baseline level of 0 % to intervention and maintenance level above 80%. Respond generalization also found during intervention and maintenance phrases. This study illustrated that video modeling was an effective tool for teaching play skills to preschoolers with autism. **Conclusion:** The study showed favor results of video modeling on the effects of play skills for preschoolers with autism. The researchers excitedly found that the child displayed more symbolic reactions to the same toy and generate new playing skills through video modeling introduction. The results also indicated that the child has the behavior of taking turns and waiting because they can play with researcher and share the different roles in the scripts although their activities and language still based on the original playing scripts. It means they have upgraded to the advanced level of playing skill. In addition, the researchers found the child develop the learning property such as delayed mimic action and mimic language during the experiment. Based on the result and discussion, it is suggested that following two directions should be focus for future studies: the property of learning in the influence of learning of playing skill; the influence of social skills and language ability by increasing of playing skill.

0502PP41

A NEW EVALUATION METHOD OF STUDYING FIT AND UNFIT OF MOTOR FUNCTION IMPROVEMENT OF CEREBRAL PALSY RATS

Lan-Min Guo, Xiao-Jie Li, Li-Ping Tan

Children Neural Rehabilitation Laboratory of Jiamusi University, Rehabilitation Medicine College of Ji (China)

Purpose: Union applicates suspension test and improved BBB motor function assessment to Study fit and unfit of motor function improvement of cerebral palsy rats. **Materials and Methods:** 1) *Establishment of model and grouping:* 48 Wistar pregnant rats were consecutively injected with LPS (450 µg/kg) for two days on gestation 18 days. Control group pregnant rats were injected the same dose of saline. Selected randomly control group (A) neonatal rat ($n=60$), and LPS group ($n=120$), divided LPS group into intervention group B1 ($n=60$), and nonintervention group B2 ($n=60$). The intervention group was intervened early. The nonintervention group and the control group were raised routinely. 2) *Early intervention:* The 2 days rats of intervention group were early touched until 2 weeks, one week after birth were given enriched environment and two weeks were given generally load swimming training up to six weeks. 3. *Identification of cerebral palsy rats for 25-day-old:* the CP rats identified in the B1 group (B1CP) continued early intervening, the CP rats identified in the B2 group (B2CP) continued raising routinely. Selected 10 rats from group A as control group (A') raising routinely, others would be killed. The rats of 25 days in each group (A', B1CP, B2CP) were respectively carried out neurobehavior detection and improved BBB motor function assessments, and statistical analysis. 42-day-old control group rats in each group (A', B1CP, B2CP) were carried out suspension test and improved BBB motor function assessment, and statistical analysis. **Results:** 1) Neurological behavior test of 25-day-old neonatal rats, B1 group identified seven CP rats, B2 group identified thirteen CP rats. A group did not identify CP rats. 2) Comparison of the test results of the 25-day-old and 42 days of cerebral palsy rat in B1 group: suspension test, slopes test, open-field experiments, resist captured reaction $p < 0.01$, and others $p > 0.01$. Improved BBB motor function score $p < 0.01$; Comparison of the results showed no significant differences in cerebral palsy rats of B2 group and control group rats of 25-day-old and 42-day-

old. **Conclusion:** Using both suspension test and improved BBB motor function assessment to improve motor function of cerebral palsy rats caused by intrauterine infection is superior to the neurobehavioral detection.

0502PP42

THE EFFECTS OF EARLY INTERVENTION ON EXPRESSION OF S-100 PROTEIN AND CHANGES OF NEUROETHOLOGY IN FILIAL RATS WITH BRAIN INJURY

Wei Pang, Xiao-Jie Li, Lan-Min Guo

Children Neural Rehabilitation Laboratory of Jiamusi University, Rehabilitation Medicine College of Ji (China)

Purpose: To research the effects of early intervention on the expression of S-100 protein and changes of neuroethology in filial rats with brain injury. **Materials and Methods:** Wistar rats in intrauterine infection group received Lipopolysaccharide (LPS) intraperitoneal injection at the 18th and 19th day after pregnant, and the rats in normal saline group receive the same dosage of normal saline. Take the placenta for pathology detection after litter size. Take 30 filial rats from the normal saline group randomly as B group, and take 50 filial rats from intrauterine infection group as A group. Divided the A group into A1 group (intervention group, $n=20$) and A2 group (non-intervention group, $n=30$). 1 day after born, take 10 rats from A2 group and B group respectively, decapitated and take their brain to detect the expression of S-100 protein. 25 days after born, detect the changes of neuroethology in these group and thereafter decapitated, take their brain to detect the expression of S-100. **Results:** The placenta of rats in intrauterine infection group showed vascular engorgement, dropsy, and neutrophilic granulocyte soakage. Compared with B group, the expression of S-100 in A2 group was markedly increased ($p<0.01$) in 1 day-old rats. The most strong expression of S-100 appeared in A2 group, and the most weak expression appeared in the B group, the A1 group was between them. The differences between two group showed significant. In suspension experiment, postural reflex postural reflex, muscle tension test, involuntary movement test and open field test, the scores of A2 group were lowest, after intervention, the scores of these test in A1 group were higher than A2 group ($p<0.05$), but still lower than B group. Rats in A2 group spend more time than rats in A2 group and B group, after intervention, animal in A1 group did better than these in A2 group ($p<0.05$), but still spend more time than rats in B group. **Conclusion:** Intrauterine infection could induce brain damage of rats, and increase the expression of S-100. Early intervention could decrease the expression of S-100 and improve the rehabilitation of motion abnormality and dystrophy of rats induced by brain damage.

0502PP43

ASSESSMENT AND FEEDBACK TRAINING WITH THE BALANCE PERFORMANCE MONITOR IN CHILDREN WITH SPASTIC CEREBRAL PALSY

Lihua Zhang, Yanli Hu, Xiao-Jie Li, Zhimei Jiang, Lan-Min Guo, Wei Zhang, Caijun Jin

College of Rehabilitation Medicine, Jiamusi University (China)

Purpose: Recently, more and more people give attention to balance training. And beside traditional Bobath therapy, there's a way called feedback training with the Balance Performance Monitor (BPM). In children with cerebral palsy (CP), the main method to improve balance function is traditional Bobath therapy, and the former studies on feedback training with the BPM were based on a small population and the effects of this method on children with CP are not clear enough. So we assessed the balance function of a group of children with CP using the BPM, and treated them using feedback training for a certain period to see the effects of feedback training with BPM. **Materials and Methods:** 96 children were selected in The Rehabilitation center for child cerebral palsy, heilongjiang province

in March 2008 to March 2009 (64 were diplegia, 32 hemiplegia). All the children who were aged between 2-5 years were diagnosed as spastic cerebral palsy, and could stand alone for at least 30s. They were divided into 2 groups: experimental group and control group, each of them had 48 patients. Before the feedback training, we assessed the balance function of all the children using the BPM, and there's no difference between the 2 groups. Then we used both the Bobath therapy and the feedback training on the children in experimental group. And the children in the control group took just the Bobath therapy. Both treatments lasted for 2 months. After that, we re-assessed the balance function of all the children using the BPM. **Results:** In children with diplegia two-tailed, independent t test was used before the feedback training to compare the balance parameters (LNG, Envarea, Rectangular area, L/Earea, Gravity Excursion) between the experimental group and the control group, and there's no difference ($p=0.079$). matched pair t test was used to compare the balance parameters of the two groups before and after 2 months' feedback training, and there is difference with significance ($p<0.05$) in (LNG, Envarea, Rectangular area, L/Earea). But there's difference without significance ($p>0.05$) in (Gravity Excursion) between the experimental group and control group. According to the Two-tailed, independent t test, there's difference with significance in the balance parameters (except Gravity Excursion) between the experimental groups before and after feedback training ($p<0.05$). In children with hemiplegia, two matched pair t test results showed that there's difference with significance ($p<0.05$) in (Gravity Excursion) between the experimental group and the control group, but there's difference without significance ($p>0.05$) in other parameters. Two-tailed, independent t test on the (Gravity Excursion) before and after feedback training showed there's difference with significance ($p<0.05$), and there is difference without significance ($p>0.05$) in other parameters. **Conclusion:** Both Bobath therapy and feedback training can improve the balance function of children with spastic cerebral palsy. A treatment that combines the Bobath therapy and feedback training together is more effective than a treatment that uses only Bobath therapy.

0502PP44

THE RELATIONSHIP BETWEEN BMI (BODY MASS INDEX) AND THE SEVERITY OF DEVELOPMENT DELAY

Willy Chou, Wu Mei-Yi, Hui-Chun Juan, Mei-Zu Ko, Chien-Nan Yeh, Hing-Man Wu, Rong-Bin Hong

Department of Physical Medicine and Rehabilitation, Chi Mei Medical Center (Taiwan)

Purpose: To investigate the relation between body mass index and development delay severity. **Materials and Methods:** We collect the 944 data from the Conjoint Assessment Center for Children with Developmental Delay of Chi Mei Medical Center. We calculated body mass index (BMI; kg/m^2) from charted height and weight. We recorded cognition, gross motor function, fine motor function, speech, and social condition on the basis of clinical descriptions in clinic notes. Cognition is initially screened with RPDQ and then further evaluated according to age; if the age of the children is ≤ 4 -year-old, cognition is further evaluated with Baley mental scale record form; if the age of the children is > 4 -year-old, cognition is further evaluated with WPPSI-R. Speech is evaluated with two methods. **First method:** if the age of the children is < 3 -year-old, speech is evaluated with non-formal form; if the age of the children is between three to six, speech is evaluated with Preschool Language Scale (PLS); if the age of the children is between six to twelve, speech is evaluated with Child Language Scale (CLS); **Second method:** speech is evaluated with Comprehensive Developmental Inventory for Infants and Toddlers (CDIIT). Gross motor and fine motor are evaluated with CDIIT. Social development is evaluated with Chinese Child Development Inventory (CCDI). Associations were analysed with Pearson's distribution. **Results:** There is no significant difference between between BMI of children with development delay and cognition ($p=0.168$). If BMI of children with development delay is higher, speech development is better ($p<0.05$).

If BMI of children with development delay is higher, gross motor and fine motor are better ($p < 0.01$). If BMI of children with development delay is higher, social development is better ($p < 0.05$). **Conclusion:** If BMI of children with development delay is higher, speech, gross motor, fine motor, and social development are better.

0502PP45

PRELIMINARY INVESTIGATION OF EFFECTS OF WRIST HAND ORTHOSES TREATING CEREBRAL PALSY CHILDREN WITH ADDUCTION OF THUMB

Xiao-Jie Li, Zhi-Hai Lu, Shi-Ling Zhang, Li-Ping Wang
Children Neural Rehabilitation Laboratory of Jiamusi University, Rehabilitation Medicine College (China)

Purpose: To observe the effects of wrist hand orthoses treating cerebral palsy children with adduction of thumb. **Materials and Methods:** Patients with spastic hemiplegia were divided into experimental group (14 cases) and control group (15 cases) and the general materials of the two group has no significant difference. Children in the two group received routine rehabilitation training for 3 months. Children in experimental group wore wrist hand orthoses for 4–8h/day besides routine rehabilitation training. Evaluation index: PROM (passive abduction angle of carpometacarpal joints of thumb). FMFM scores: There were 10 terms in C region, scores: 0, 1, 2, 3. **Results:** The PROM was remarkably improved ($p < 0.05$), FMFM scores obviously increased ($p < 0.05$) in experimental groups. **Conclusion:** Wrist hand orthoses could improve spastic hemiplegia children's passive abduction angle of carpometacarpal joints of thumb and fine motor function. This research need to enlarge sample quantity and follow-up survey observe.

0502PP46

TWO MONTHS EFFECTS GENERATED BY WHOLE-BODY VIBRATION ON GROSS MOTOR PERFORMANCE OF CHILDREN WITH DEVELOPMENTAL COORDINATION DISORDER

Pei-Chi Hsiao¹, Jung-Tai Liu¹, Wan-Ju Chen¹, Willy Chou², Heng-Ju Lee³

¹Department of Physical Medicine and Rehabilitation medicine, Chi-Mei Medical Center Liouying Campus, ²Department of Physical Medicine and Rehabilitation, Chi-Mei Medical Center and ³Department of Physical Education, National Taiwan Normal University (Taiwan)

Purpose: The present study was conducted to determine the beneficial effect of whole-body vibration (WBV) exercise in addition to traditional pediatric rehabilitation therapy on bilateral coordination, balance, running speed and agility and strength of children with developmental coordination disorder (DCD). **Materials and Methods:** Thirty children (21 boys and 9 girls), aged 4.5 to 6.5 years, with developmental coordination disorder were randomly divided into experimental and control groups (15 subjects each). The experimental group received traditional rehabilitation plus whole body vertical vibration program, and the control group only received traditional rehabilitation. All the participants in both groups were similarly instructed to undergo pediatric rehabilitation therapy such as balance, coordination, and muscle strength training twice a week. Each time, these experimental group children received whole body vertical vibration stimulation for 30 seconds at a frequency of 30Hz and amplitude of 1.2 mm for at total of six times, followed by a 30-second break. WBV exercise was performed on an EN-Vibe 3444862 machine (Enraf-Nonius company, Holland). The period of this study was 2 months to evaluate the acute effects of WBV exercise. The gross motor performance at baseline and post-therapy were compared by Bruininks-Oseretsky Test of Motor Proficiency Scale II, which evaluated gross motor performance including bilateral coordination subtest, balance subtest, running speed and agility subtest, and strength subtest. **Results:** The mean age of the participants was 6.3 years (range

4.5–6.5 years). At baseline, there were significant negative correlations between age and bilateral coordination, balance, running speed and agility, and strength subtests. After 2-months therapy, children with DCD in experimental and control groups both had positive effects on gross motor performance by Bruininks-Oseretsky Test of Motor Proficiency Scale II. Comparing with baseline data, the post-therapy data of experimental group got 2.6 standard score improvement and control group got 1.43 standard score improvement on bilateral coordination subtest ($p = 0.44$), experimental group got 2.8 standard score improvement and control group got 0 standard score improvement on balance subtest ($p = 0.19$), experimental group got 2.53 standard score improvement and control group got 1.36 standard score improvement on running and agility subtest ($p = 0.41$), and experimental group got 3.33 standard score improvement and control group got 0.21 standard score improvement on strength subtest ($p = 0.038$). Traditional pediatric rehabilitation had positive effects on bilateral coordination, running speed and agility, and strength in children with DCD. Children with DCD who receive both WBV plus traditional rehabilitation get better improvement in strength performance. We also found WBV exercise was well tolerated and no serious adverse events were observed in any of the subjects during this 2-months WBV exercise program. **Conclusion:** The present study showed the beneficial effect of WBV exercise in addition to traditional pediatric rehabilitation therapy in improving the gross motor performance in the children with DCD. Low intensity and short duration WBV exercise was safe and well tolerated in the children with DCD.

0502PP47

FUNCTIONAL PERFORMANCE AT SCHOOL IN CHILDREN WITH DEVELOPMENTAL COORDINATION DISORDER USING DIFFERENT MOTOR TESTS

Yu-Wei Chen¹, Mei-Hui Tseng¹, Chung-Pei Fu²

¹School of Occupational Therapy, College of Medicine, National Taiwan University and ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital (Taiwan)

Purpose: Given the absence of gold standard for the assessment of motor skills, the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP) and the Movement Assessment Battery for Children (MABC) are the two most popular instruments used to identify children with developmental coordination disorder (DCD) in clinics and in research. Some researchers, however, found that the two motor tests did not identify the same children as motorically impaired so as to suggest that children with DCD identified by the different motor tests would present dissimilar performance. Since the impairment of DCD significantly interferes with academic achievement or activities of daily living. The study was, therefore, to explore possible differences in functional performance at school. **Materials and Methods:** The sample consisted of 207 children from 8 elementary schools in Greater Taipei (male: 125, female: 82; age 7.62 ± 0.81 years). Children with developmental disabilities and other neurological disorders were excluded. Twenty-five were identified as DCD exclusively by the BOTMP whereas 42 exclusively by the MABC. The functional performance at school was measured by 9 subscales of the physical task session in the School Function Assessment-Chinese Version (SFA-C). The association of each subscale of the SFA-C with the status of being identified as DCD was conducted by fitting two multivariate logistic regression models for the BOTMP and the MABC, respectively. **Results:** Children with DCD identified by the BOTMP were more likely to have low scores on the Recreational Movement subscale of the SFA-C after adjusting for the effects of the other covariates, such as demographic variables and other subscales, in the fitted final logistic regression model (Odds Ratio = 0.911 $p < 0.05$). Children with DCD identified by the MABC, on the other hand, were significantly associated with low scores on the Written Work after adjusting for the effects of the other covariates (Odds Ratio = 0.919, $p < 0.05$). **Conclusion:** The results verified the difference in the problems of functional performance at school among children identified as DCD by the two popular motor tests. Children with DCD identified by the MABC were more vulnerable

to poor writing performance than those identified by the BOTMP, in which the distinction between gross and fine motor items had been questioned. On the other hand, our result is consistent with previous study that poor motor proficiency measured by the BOTMP would affect children's participation in extracurricular physical activities, such as those in the Recreational Movement. Thus, clinicians should recognize the discrepant features of the two motor tests and clients' need for evaluating specific functional performance besides assessing motor problems, in order to design appropriate treatment plans.

0502PP48

THE EFFECT OF THE INTERACTIVE COMPUTER PLAY TRAINING IN CHILDREN WITH CEREBRAL PALSY: A SYSTEMATIC REVIEW

Wen-Yu Liu¹, Chia-Fa Liao¹, Yang-Hua Lin¹, Hen-Yu Lien¹, Alice M.K. Wong^{1,2}, Chih-Hsiu Cheng¹

¹Department of Physical Therapy & Graduate Institute of Rehabilitation Science, Chang Gung University and ²Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, Taoyuan Branch (Taiwan)

Purpose: The purpose of this study was to review the evidence relating to the effect of interactive computer play (ICP) training in children with cerebral palsy (CP). **Materials and Methods:** A systematic review was undertaken. The Pubmed, Medline, Cinahl, IEEE, and CEPS databases were electronically searched from inception 1995 to September 2009, using the keywords: computer game, virtual reality, virtual environment, cerebral palsy and/or child. Articles that met the study's inclusion criteria were required to: (i) be published in an English language peer reviewed journal, (ii) involve the use of ICP; and (iii) report body structures/functions and/or activity and participation oriented outcome measures. Two assessors independently assessed each study's quality using the single subject research design (SSRD) grading system by Logan et al. **Results:** A total of nine studies were included in this review. There were three case reports and six single subject research. Only one study was judged to be the Logan's moderate strength and the other studies were weak. All studies were the Level V quality of evidence. No adverse effect had been reported. Despite of low level of evidence, all studies demonstrated generally positive effect of the ICP training. **Conclusion:** The ICP is a potentially tool for the rehabilitation of children with CP. While the findings of this review were generally positive, the level of evidence is too low and the research quality is too weak to permit a definitive assessment of its effectiveness for children with CP. Further study in the form of rigorous controlled studies is warranted.

0502PP49

THE EFFECT OF WALKING SPEED ON THE GAIT OF CHILDREN WITH TOURETTE SYNDROME: A PRELIMINARY STUDY

Wen-Yu Liu¹, Pei-Hsuan Lin¹, Huei-Shyong Wang², Fuk-Tan Tang^{3,4}, Alice M.K. Wong^{3,4}, Hen-Yu Lien¹

¹Department of Physical Therapy and Graduate Institute of Rehabilitation Science, Chang Gung Univ, ²Department of Pediatric Neurology, Chang Gung Memorial Hospital, Children's Hospital, ³Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, Lin-Kao Branch and ⁴Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, Taoyuan Branch (Taiwan)

Purpose: To explore the effect of walking speed on the gait of children with Tourette Syndrome (TS). **Materials and Methods:** Twelve children aged 7–12 years voluntarily participated in this study. All the children were instructed to walk at the two self-selected speeds: "preferred" and "fast". Each child completed two successful trials of each walking condition. The gait parameters were collected using six cameras with the VICON 370 system (Oxford Metrics Limited,

Botley, Oxford), including walking velocity, cadence, temporal-spatial measures of gait and joint angular motion in gait performances. Statistical analysis was done by paired t test to explore the differences between two walking conditions. **Results:** Compared to the "preferred" condition, children with TS increased walking speed ($p < 0.001$), cadence ($p < 0.001$) and step length ($p < 0.001$) in the "fast" condition. Further, all the above changes in the "fast" condition were related to significantly more hip flexion ($p < 0.001$) and knee flexion ($p = 0.023$) in the early stance phase, more hip flexion ($p < 0.001$) and ankle dorsiflexion ($p < 0.001$) in the mid-swing phase, and decreased maximal hip extension ($p < 0.001$) in terminal stance phase. In addition, they demonstrated significantly earlier to achieve maximal ankle dorsiflexion in the mid-stance phase ($p < 0.001$). **Conclusion:** The results suggested that children with TS are capable to speed-up their walking velocities. According to the kinematic analyses, their gait performances were significant different between two conditions. They demonstrated more flexion in the "fast" speed walking. Further investigation including healthy control children is warranted.

0502PP50

OROS METHYLPHENIDATE IMPROVES THE VISUAL-MOTOR INTERGRATION IN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER

Li-Rong Lee¹, Jeng-Yi Shieh², Chi-Yung Shang³

¹Department of Physical Medicine and Rehabilitation, Hsin Kong Wu Ho-Su Memorial Hospital, ²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital and ³Department of Psychiatry, National Taiwan University Hospital (Taiwan)

Purpose: To examine if OROS methylphenidate (Concerta ER 18mg/tab) may improve the motor performance in children with attention deficit/hyperactivity disorder (ADHD). **Materials and Methods:** 23 children (6 to 8-year-old) were enrolled with the diagnosis of ADHD. They all had rehabilitation and 9 of them took OROS methylphenidate (18 to 36 mg/day) under prescription. Motor function was measured with Peabody Developmental Motor Scales-II (PDMS-2) before and after treatment. **Results:** After one year treatment, statistical analysis of the data indicated that children with ADHD all improved gross and fine motor performance in 5 subtests in PDMS-II. However, in 9 children having rehabilitation plus taking OROS methylphenidate, they had significant increased fine motor scores especially in the subtest of visual-motor integration ($p < 0.05$). **Conclusion:** In a dose ranging from 18 to 36 mg per day, OROS methylphenidate may improve the fine motor performance in children with ADHD especially in the subtest of visual-motor integration.

0502PP51

PILOT STUDY OF MIRROR THERAPY FOR SPASTIC CEREBRAL PALSY

Pornsawan Posawang¹, Ubonwon Wathanadilok¹, Arun Chirawatkul²

¹Sirindhorn National Medical Rehabilitation Centre, Ministry of Public Health and ²Konkean University (Thailand)

Purpose: To evaluate the effects of mirror therapy on upper extremity function of cerebral palsy. **Materials and Methods:** Eight children aged between 3–8 years diagnosed as spastic cerebral palsy were studied. They were 6 hemiplegia and 2 diplegia. The children who can follow two steps command and have more than 50 percent of difference in hand function tested by Modified Jebsen Taylor test were eligible to training. Training was done by an occupational therapist as 15+15 min session once a day, 5 days a weeks for 4 consecutive weeks. Outcome measurements were performed by another occupational therapist at day 0, 1 month and 3 months after day 0 on 1) time to perform Modified Jebsen-Taylor test of hand function 2) muscle tone by modified Ashworth scale 3) hand and arm muscle power 4) hand sensation 5)

ability of hand and arm control. **Results:** At post training, seven cases did Modified Jebsen-Taylor test of hand function with less time than the baseline. The time reduction was 26–285 seconds (average 110.14 seconds) or 7.14–52.97% of baseline (average 18.4%). But only three still had improvement at three months after day 0. The muscle power and ability of hand and arm control tends to improve at post training but still unchanged at three months after day 0. Hand sensation and muscle tone were not change from baseline. **Conclusion:** Mirror therapy technique probably improves hand function, muscle power and ability of hand and arm control in spastic cerebral palsy.

0502PP52

TREATMENT EFFICACY OF PHONOLOGICAL TREATMENT FOR BACKING PROCESS

Ming-Chun Li¹, Pao-Chuan Torng²

¹Department of Rehabilitation Medicine, Taipei Veterans General Hospital and ²Department of Speech and Hearing Disorders and Sciences, National Taipei College of Nursing (Taiwan)

Purpose: To investigate the treatment efficacy of different selection of target sounds for children with backing process, a common phonological process in Taiwan Mandarin-speaking children. **Materials and Methods:** Twenty-two preschool children from Nantou, Taiwan with backing process were recruited in the study. The children's error patterns include substitution of Mandarin alveolar stops /t, tʰ/; alveolar, alveopalatal, and retroflex fricatives /s, s, s/; and alveolar, alveopalatal, and retroflex affricates /ts, tsʰ, ts, tsʰ/ with velar stops and fricative /k, kʰ, x/. Two target sounds for treatment were selected based on the complexity of the target sound in the Mandarin sound system. The children with backing process were paired according to their error patterns and language abilities and randomly assigned to either a more complex target sound group (aspirated alveopalatal affricate /tsʰ/) or a less complex target sound group (aspirated alveolar stop /tʰ/). A treatment protocol with a discharge criterion, 80% accuracy of target sound at sentence level over three consecutive sessions was developed. Treatment outcomes were discussed based on number of treatment sessions, the percentage of PCC, occurrence of backing process (POBP), and the effect of generalization. **Results:** Results indicated that both groups had significant increase in PCC and decrease in POBP in words and spontaneous speech context. In the aspect of generalization, the results showed that there were significant treatment effect in target and untreated sounds in words and spontaneous speech context in both groups. However, the group that produced target sound /tsʰ/ required less number of sessions to reach the discharge criterion and had better intelligibility, less occurrence of backing process, and bigger local change in words. In addition, children in this group acquired more fronting sounds and suppressed more backing process during therapy sessions. **Conclusion:** This study proves that articulation/ phonological treatment can make overall changes in articulation/ phonological systems and selecting a more complex target sounds has better treatment efficacy.

0502PP53

IMPACT OF TASK CONSTRAINTS ON POSTURAL CONTROL PERFORMANCE IN CHILDREN WITH CEREBRAL PALSY AND TYPICALLY DEVELOPING CHILDREN

Yun-Huei Ju^{1,2}, Rong-Ju Cherng^{1,3}

¹Institute of Allied Health Sciences, College of Medicine, National Cheng Kung University, ²Department of Physical Therapy, College of Health Sciences, Kaohsiung Medical University and ³Department of Physical Therapy, College of Medicine, National Cheng Kung University (Taiwan)

Purpose: To examine the effects of task embedding different postural demands on postural control performance in terms of measurement of force plates in children with cerebral palsy (CP) and typically developing (TD) children. **Materials and Methods:**

Six children with diplegic CP and age-matched, gender-matched TD children participated in this study between March 2008 and October 2008. In Human motion lab, they were asked to perform seated reach tasks with 120% arm-length distance in three reaching directions (anterior, laterally, and medially). The reaching speed was modulated by a metronome at a rate of 46 beats/min for all participants. Postural control performance was measured with 2 force plates (underneath chair and feet) at a sampling rate of 150 Hz. A hand marker was captured with a motion capture system (sampling rate: 150 Hz) to define reaching events. Maximum excursion of center of pressure (COP) in anterior-posterior (AP) and medial-lateral (ML) directions, peak reaction force (RF) in three directions (AP, ML, and vertical), and mean AP_RF and vertical RF during hand acceleration and deceleration phases were presented during reach-out phase. Descriptive statistics and two-way MANOVA were used. Significant level <0.05 was used. **Results:** Maximum COP_AP excursion was greater in CP group than in TD and approaching significant difference ($F=3.79, p=0.06$). Direction effect was significant ($F=6.00, p=0.002$), but only existed in TD group. However, the interaction effect was not significant ($F=3.14, p=0.09$). Maximum COP_ML was greater in CP group than in TD group ($F=10.56, p<0.01$). All children showed greater max. COP_ML when reaching laterally and medially. Again, no interaction effect was noted. Regarding force data, only chair peak force_ML revealed group and direction effects (group: $F=5.22, p=0.03$; direction: $F=28.13, p<0.01$). Children with CP demonstrated higher peak force_ML compared with TD children. During acceleration phase of hand reach, children with CP showed a tendency of braking force on chair and pushing force on feet with great variability as reaching laterally and medially. TD Children showed braking force on chair with feet force oscillating around zero as reaching laterally. During hand deceleration, children with CP demonstrated apparent pushing force on chair and braking force on feet as reaching medially. TD children showed consistently pushing force on chair with feet force oscillating around zero. Regarding weight bearing force (vertical RF), children with CP showed a tendency of using greater amplitude of chair force (mean=84% of body weight) than TD children (mean=75% of body weight) during acceleration phase of hand reach ($F=3.61, p=0.065$). By contrast, children with CP tended to use less amplitude of feet force (mean=17% of body weight) than TD children (mean=25% of body weight) ($F=4.00, p=0.052$). During deceleration phase, the same trend was found. **Conclusion:** Our result showed that children with CP demonstrated exaggerated, inconsistent postural control performance in terms of force modulation and COP excursion when reaching in different directions. Children with CP seemly showed different strategies of force modulation between chair and feet compared with TD children. Less weight bearing by feet in children with CP during reach out was preliminary noted.

0502PP54

PARENT-CHILD INTERACTIVE READING: A COMPLETE READING CYCLE TO ENHANCE COMMUNICATIVE PARTICIPATION FOR CHILDREN WITH LANGUAGE DELAY

Yu-ting Huang, Pao-Chuan Torng

Department of Speech and Hearing Disorders and Science, National Taipei College of Nursing (Taiwan)

Purpose: To study the communicative participation of children with language delay and parent interactive reading strategy during parent-child reading. **Materials and Methods:** Six child and parent dyads were recruited to participate in a parent-child reading program. Children with language delay aged from 3; 1 to 3; 10 and their main care givers were participated over a two months time frame. Four picture books were utilized to collect data on the communicative participation of children and parent interactive reading skill during parent-child reading. One picture book was used for both pre- and post-test data collection. The other three were used for intervention. Parents were trained to use an interactive reading approach, the Complete Reading Cycle, to

enhance children communicative participation during parent-child reading. The Complete reading cycle includes four components: 1. Focus, 2. Query, 3. Response, 4. Feedback was instructed by Speech Language Pathologist via demonstration and discussion. Video and audio equipments were used to collect data during parent and children engaged in picture book interactions for 5 to 15 min. Quantity and quality methods were used to evaluate the children communicative participation and parent interactive reading strategy. **Results:** Results revealed a strong enhancement in both children communicative participation and parent interactive reading strategy using the Complete Reading Cycle in all six child parent dyads. Children with language delay were especially increase in communicative participation for query information during parent child reading. **Conclusion:** Findings support the use of parent child reading as an enhancement communication program. Both child and parent benefit in the growth of communication skills during this therapeutic intervention.

0502PP55

STUDY OF NARRATIVE SKILL IN CHILDREN WITH LANGUAGE DELAY

Ai-Ju Wu¹, Pao-Chuan Torng²

¹Department of Physical, Medical and Rehabilitation, National Taiwan University Hospital and ²Department of Speech and Hearing Disorder and Sciences, National Taipei College of Nursing (Taiwan)

Purpose: The purpose of this study is to determine the narrative skills in children with language delay and compare them with typical development children. **Materials and Methods:** 25 children with language delay and 24 children with normal language development between the age of 4:2 and 6:6 were recruited in this study. A picture book "I become a fire dragon" was used and the story was recorded as an audio file as a stimulus for the story retelling task. The story contained the story grammar components and were rewritten to be shorter which consisted of 1 episodes, 51 clauses, and 15 sentences. Children recalled story they read and then answered comprehension questions after retelling story. Stein and Glenn's (1979) story grammar were used to analyze the children's narratives. **Results:** The story retold by the language-delayed children contained fewer different words, shorter MLU and sentence complexity, and a lower frequency use of story grammar components than those of the control group. Also, the children with normal language scored significantly higher than those with language delay on the narrative level measured. **Conclusion:** the stories retold by children with language delay were similar to younger children, and their narrative skills may increase by age. But, the finding of this investigation indicated that the narrative skills in children with language delay fall behind their peers about two years.

0502PP56

COMPARING THE EARLY COMMUNICATIVE BEHAVIORS BETWEEN CHILDREN WITH SPECIFIC LANGUAGE IMPAIRMENT AND AUTISTIC DISORDER

Ching-Hsien Chang¹, Pao-Hsiang Chi², Pao-Chuan Torng¹, Chia-Ling Chen³

¹Department of Speech and Hearing Disorders and Science, National Taipei College of Nursing, ²Department of Special Education, National Taipei University of Education and ³Department of Rehabilitation, Chang Gung Memorial Hospital (Taiwan)

Purpose: To find the individual characteristics of early communicative behaviors in children with specific language disorder and autistic disorder, and in addition to conclude the related influencing factors between these groups. **Materials and Methods:** In this research, a total of 18

young children were observed and divided into 3 functional diagnosed groups, including children with specific language impairment, autistic disorder, and normal development. Children in delayed groups aged from 3;4 to 6;10, and children in normal development group aged from 0;11 to 1;6. Their language development stages are controlled in early and late one word stage based on the definition of Bates (1979). The Communication and Symbolic Behavior Scale Developmental Profile (CSBS DP) (Wetherby & Prizant, 2002) is used to collect the communication and symbolic behavior data. There are 7 domains in communicative behaviors observed in the study, and they are: 1) Communication Function; 2) Communication Means - Gestural; 3) Communication Means - Vocal; 4) Communication Means - Verbal; 5) Reciprocity; 6) Social-Affective Signaling; and 7) Symbolic Behavior). The individual group performances on communicative behaviors are compared with each other. The relationships among communication and symbolic behaviors and relevant factors are also analyzed in the study. **Results:** 1) Young children with specific language disorder had potentially lower frequency in vocalization, and in addition they are more limited in consonant inventory and syllable variety performances. 2) Young children with autism showed significant poorer skills in joint attention, reciprocity, gestural and vocal use. And the symbolic behavior also showed significant poorer performances in both inventory and complexity of action schemes in play comparing with other groups. Present results indicate 3 groups which demonstrate different communication patterns. **Conclusion:** Findings in individual characteristics in early communicative behaviors of children with specific language impairment and autistic disorder are equivalent to previous studies. Children with different diagnosis revealed different performances in certain behaviors.

0502PP57

NEUROMUSCULAR RESPONSES DURING WHOLE BODY VIBRATIONS OF DIFFERENT FREQUENCIES IN CHILDREN WITH CEREBRAL PALSY

Yung-Wen Tang¹, Jia-Hao Chang², Jau-Jia Lin³

¹School of Physical Therapy, ²Department of Physical Education and ³Department of Rehabilitation Medicine (Taiwan)

Purpose: The purpose of this study was to analysis the responses of muscle strength, flexibility, and muscle tone to different whole-body vibration (WBV) frequencies. **Materials and Methods:** Sixty children with spastic cerebral palsy stood to receipt two whole body vibrations in random order. These subjects had a mean age of 8.56 years (SD 3.14 years), height of 124.59 cm (SD 19.03), weight of 25.36 kg (SD 9.58). The vibration treatment lasted 60 seconds, with a 60 min rest between each treatment. The frequencies used in the experiment were 20, 30 Hz. A electro-goniometer was used to measure knee angle in pendulum test and the relaxation index (R2n) was analyzed to measure spasticity. A handheld dynamometer was used to measure maximum voluntary contraction (MVC) of quadriceps. Sit-to reach test was used to measure hamstring flexibility. Repeated measures ANOVA were used to test the effect of frequency factor. **Results:** Both WBV treatment lead to increase significantly in R2n ($p < 0.001$), percentage difference of MVC(MVC%) ($p < 0.001$), and sit-to-reach value ($p < 0.001$). Results of one-way repeated-measures ANOVA indicate significant effects of frequency on MVC ($F = 15.727, p = 0.001$) and sit-to reach value ($F = 24.577, p < 0.001$). MVC % value during 30 Hz vibration are greater than during 20Hz vibration. Sit-to reach value during 20 Hz vibration are greater than during 30Hz vibration. There are no significant effects of frequency on R2n ($F = 4.447, p = 0.052$). **Conclusion:** More inhibiting activation of antagonist muscles through Ia-inhibitory neurons was produced at 20 Hz in decreasing resistance around the joints and increasing flexibility. The better strength performance was found at 30 Hz, suggesting this frequency as the one eliciting the highest tonic vibration reflex response in quadriceps muscle during whole-body vibrations. We propose that 20 Hz vibration is the better mode for flexibility training and 30 Hz vibration is the better mode for strengthening training.

0502PP58

SPECTRUM OF MOTOR DEVELOPMENTAL DELAY**Chia-Ying Chung¹, Wen-Yu Liu², Chia-Ling Chen¹, Simon Fuk-Tan Tang¹, Shih-Wei Chou¹, Alice M.K. Wong¹**¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital and ²Department of Physical Therapy, Chang Gung University (Taiwan)

Purpose: To evaluate the spectrum of motor developmental delay. **Materials and Methods:** A total of 149 motor developmental delay children were enrolled. Children referred to the clinics of Physical Medicine and Rehabilitation Department in Chang Gung Memorial Hospital, Taiwan was undertaken. Eligibility requirements included being younger than 7 years of age and referral for the initial evaluation of motor delay. All children referred to the clinic underwent a formal multidisciplinary developmental assessment. **Results:** For 149 children with functional diagnosis as motor delay, the medical diagnosis encompass cerebral palsy ($n=74$), developmental coordination disorder ($n=14$), Down syndrome ($n=4$), Beals syndrome ($n=1$), neurofibromatosis syndrome ($n=1$), spinal muscular atrophy ($n=1$), Waardenburg syndrome ($n=1$), hereditary motor sensory neuropathy ($n=2$), brachial arch defect ($n=1$), spina bifida ($n=1$), arthrogyposis ($n=1$), mitochondria myopathy ($n=1$) were included. **Conclusion:** When a child has only, or primarily motor delays, developmental disorders that should be considered include cerebral palsy, developmental coordination disorder. Other medical diagnosis include genetic syndromes, spina bifida, spinal muscular atrophy, peripheral neuropathy and myopathy.

0502PP59

STUDY OF COMPREHENSIVE REHABILITATION THERAPY ON NURTURE CONDITIONS AND MEDICAL COSTS IN THE TREATMENT OF PATIENTS WITH DYSPHAGIA FOLLOWING STROKE**Xiangming Ye, Niang Zhou, Yuanjiao Wang**

ZheJiang Provincial Peoples Hospital (China)

Purpose: To explore the effect of comprehensive rehabilitation therapy on nurture conditions and medical costs in the treatment of patients with dysphagia following stroke. **Materials and Methods:** Eighty-seven patients with dysphagia were divided into interventional group (IG) and control group (CG). Comprehensive rehabilitation therapy include deglutition training, electric stimulation therapy and acupuncture therapy were used in IG, but were not used in CG. Nurture parameters include biochemistry index and body measurement index and medical costs were observed before and after one month in both two groups. **Results:** After one month, scores of deglutition function and nurture index were significantly higher in IG than that in CG, but medical costs decreased significantly in IG compared with CG. **Conclusion:** Comprehensive rehabilitation therapy improved deglutition function and nurture deterioration, but decreased medical costs in the treatment of patients with dysphagia following stroke.

0502PP60

THERAPEUTIC EFFECTS OF COMBINED THE PATTING ON FENGSHI POINT (GB31) WITH THE MERIDIAN-ACUPOINT MASSAGE ON 33 CASES OF LATERAL FEMORAL CUTANEOUS NEURITIS**Liansheng Li**

Department of rehabilitation Medicine, Xuanwu Hospital Capital Medical University (China)

Purpose: To observe the therapeutic effects in treating lateral femoral cutaneous neuritis of patting on fengshi point (GB31)

cooperating with the meridian-acupoint massage. **Materials and Methods:** Thirty patients were treated with patting on fengshi point (GB31) cooperating with the meridian-acupoint massage. **Results:** The cure rate and effective rate were 73.33% and 96.67%. **Conclusion:** Patting on fengshi point (GB31) combined with the meridian-acupoint massage has a satisfactory therapeutic effect on lateral femoral cutaneous neuritis.

0502PP62

THE EFFECTS ON HEART RATE VARIABILITY OF TRIGEMINAL TRANSCUTANEOUS ELECTRICAL STIMULATION IN HEALTHY SUBJECTS**Jiunn-Horng Kang^{1,2}, Fu-San Jaw¹, Shih-Ching Chen², Sung-Hui Tseng², Chien-Hung Lai², Allen Chia-Lin Hsu²**¹Institute of Biomedical Engineering, National Taiwan University and ²Department of Physical Medicine and Rehabilitation, Taipei Medical University Hospital (Taiwan)

Purpose: Although the mechanism is still not well-known, cranio-facial electrical stimulation has been suggested to be benefit in managing headache, anxiety and insomnia. Heart rate variability (HRV), known to be highly correlated with autonomic status, has been reported to be altered in above clinical conditions. We proposed the craniofacial stimulation could influence HRV. The objective of the study is to evaluate the change of heart rate variability after trigeminal transcutaneous electrical stimulation (TENS). **Materials and Methods:** The study has been approved by IRB of local institute. Thirty healthy participants were recruited in this study. Each subjects received 15-min of TENS for each supra-orbital and wrist area. The order of electrical stimulation for each subject was randomized selected. The frequency of TENS was set as 80 Hz and the current was set at individual maximal non-painful level. The subjects received electrical stimulation with supine position in a quiet room. Pre-stimulation and post-stimulation 5-min EKG were recorded with sampling frequency as 500 Hz and HRV were further analyzed with lead II in both frequency and time domains. Paired *t*-test was performed to analyze the HRV difference between the different stimulation sites. The alpha level was set as $p < 0.05$. **Results:** We found significantly decreased SDNN in time domain ($-10.5 \pm 21.65, p=0.013$) and decreased very low frequency (VLF) power in frequency domain ($-791.03 \pm 1905.92 \text{ nu.}, p=0.031$) in subjects who received trigeminal TENS compared to wrist TENS. In addition, we found significantly decreased SD2 ($-15.57 \pm 34.90, p=0.021$) in Non-linear Poincaré plot analysis when stimulation at trigeminal territory. **Conclusion:** The short-term trigeminal TENS could induce the specific change of HRV in healthy subjects. Decreased HRV and increased VLF power were associated with trigeminal TENS compared to wrist TENS. Further study is suggested to explore the clinical significance and application for our findings.

0502PP64

EFFICACY OF TRADITIONAL THAI MASSAGE ON PATIENTS WITH SCAPULOCOSTAL SYNDROME: A PRELIMINARY STUDY**Vitsarut Buttagat¹, Wichai Eungpinichpon^{1,3,4}, Uraiwon Chatchawan¹, Preeda Arayawichanon^{2,4}**¹School of Physical Therapy, Faculty of Associated Medical Sciences, Khon Kaen University, ²Department of Rehabilitation Medicine, Faculty of Medicine, Khon Kaen University, ³Research and Training Center for Enhancing Quality of Life of Working-Age People, Khon Kaen University and ⁴Back Neck and Other Joint Pain Research Group (Thailand)

Background: Scapulocostal syndrome (SCS) is a common chronic musculoskeletal pain syndrome which mainly affects the posterior shoulder area. The effects of traditional Thai massage (TTM) on SCS

have not been found. **Purpose:** To preliminarily determine the efficacy of TTM on pain intensity, pressure pain threshold and muscle tension associated with SCS. **Materials and Methods:** Ten patients (7 female, aged 21–31 yrs) were randomly allocated to receive 30-min session of either TTM or physical therapy (PT: ultrasound therapy and hot pack) for 9 sessions over a period of 3 weeks. Pain intensity (Visual analog scale: VAS), pressure pain threshold and muscle tension (VAS) were measured before and immediately after the first treatment session, 1 day after the last treatment session and 2 weeks after the last treatment session. **Results:** Results indicated that the TTM group showed a significant improvement in the pain intensity, pressure pain threshold and muscle tension after the first treatment session and at 1 day and 2 weeks after the last treatment session ($p < 0.05$). The PT group showed significant improvement in the pain intensity and muscle tension only after the first treatment session ($p < 0.05$). Moreover, there were significantly higher in the improvement of all of the outcome measures in the TTM group when compared with the PT group at 1 day after the last treatment session ($p < 0.05$) except for the pain intensity ($p = 0.09$) and at 2 weeks after the last treatment session ($p < 0.05$). **Conclusion:** We therefore conclude that TTM could be one of alternative treatments for this patient population.

0502PP65

GUA SHA (DERMAL SCRAPE) THERAPY- A NEGLECTED EFFECTIVE ADJUNCT REHABILITATION THERAPEUTIC MODALITY COMMONLY PRACTICED AMONG CIVILIANS

Shifang Zhou, Yu Jin

Dept. of Rehabilitation Medicine, 1st Affiliated Hospital of Nanjing Medical University (China)

Purpose: To introduce the Chinese traditional therapeutical modality Gua Sha as an effective adjunct rehabilitation therapeutical modality used in rehabilitation medicine. **Materials and Methods:** Through literature search covering the period of 1994–2007, a total 437 papers were analyzed, and supplemented by author's personal experience, and selective introduction of feasible evidence based cases. **Results:** 1) Explanation of terminology: Introduction of what Gua Sha means in China. The practice is using an appropriate tool to apply repeated scraping, or using fingers to exert pulling on the skin area to be treated. After the treatment process, the underneath of the relevant skin area will appear with red patches or oozing of blood under the skin. These post treatment marks called 'Sha' (means sand in Chinese) normally will be disappeared by itself in 2 to 5 days time without any residual evidence. 2) Possible mechanism of Gua Sha: 1) Adjustment of human body's imbalance, the most closely related subject to Gua Sha is the meridian studies. The human body has 12 meridians, 8 extrachannels and points and all these are interlinked again all meridians, points and internal organs are linked to each other and reflected at specific sites of skin respectively. So, when there is an illness, and apply Gua Sha over the respective skin area, the stimulation produced will create an adjusting process. Other than this, the blood oozed from the Gua Sha activity will undergo auto hemolysis. The hemoglobin produces mild stimulating effect which in turn can initiate adjustment process and provide therapeutic effect. 2) Improvement of blood circulation: Nielsen in 2007 used Laser Doppler Imaging to study the blood flow input of standardized skin surface areas each measuring 11mmX11mm. Comparing the areas treated by Gua Sha to controls, the results had shown the Gua Sha treated areas were obviously having a much faster blood flow reaching up to 400% at the highest value. The control areas did not show significant changes. These results were similar to those using acetylcholine. These studies are reproducible to explain that the blood capillaries were not damaged. 3) Several examples were presented: Here emphasis only the cases of common cold, bone and joint pain, respiratory and digestive system disorders treated by Gua Sha, showed its good effects, at the same time, combining introduction of personal experience. **Conclusion:** It obviously showed that Gua Sha has its theoretically basis and therapeutical effects, and the method used is relative simple, no

necessary of special tools and facilities, nor special requirement of physical environment, and has been accepted by patients. Although the mechanisms of Gua Sha are not fully understood, the indications of use is too wide in general, we still suggest that Gua Sha may introduce used in rehabilitation medicine.

0502PP66

THE REMOTE EFFECT OF ACUPUNCTURE OF LOWER EXTREMITIES APPLIED ON ADULTS WITH LATENT MYOFASCIAL TRIGGER POINTS IN UPPER TRAPEZIUS MUSCLES: A PILOT STUDY

Kuan-Ming Fang¹, Kai-Hua Chen¹, Wei-Chi Hsieh¹, Hung-Chih Hsu^{1,2}, Chu-Hsu Lin¹, Chang-Zern Hong³

¹Department of Physical Medical and Rehabilitation, Chang Gung Memorial Hospital, Chiayi, ²Graduate Institute of Clinical Medical Science, Chang Gung University, College of Medicine and ³Department Physical Therapy, Hung Kuang University (Taiwan)

Purpose: This controlled study was designed to investigate the remote effect of acupuncture of the lower extremities applied on adults with latent myofascial trigger points (MTrPs) in the upper trapezius muscles. **Materials and Methods:** Five adults with latent MTrPs in both upper trapezius muscles were randomized to receive acupuncture therapy or sham therapy at both Weizhong (UB-40) and Yanglingquan (GB-34) on either side. Each individual received one treatment weekly for a total of 2 weeks. The pressure pain threshold in the upper trapezius muscles, the opposite range of motion of cervical lateral bending, and the endplate noise (EPN) prevalence in the latent MTrPs of the upper trapezius muscles were assessed before and after each treatment. **Results:** In the experimental side, the opposite range of motion of cervical lateral bending was significantly improved after the second treatment ($p = 0.03$). The change in range of motion in the experimental side was also greater than that in the control side ($p = 0.04$). However, no statistically significant difference was observed in other parameters after each treatment in both sides ($p > 0.05$). **Conclusion:** Our study showed that acupuncture of the lower extremities improved cervical lateral bending. Thus a remote effect of acupuncture may exist.

0502PP67

SCIENTIFIC TRAINING AND SPORTS MEDICINE MODEL OF "TUINA GONGFA REHABILITATION"

Xiaodong Wang^{1,2}, Rufeng Wang³

¹School of Physical Education, Huazhong Normal University, ²Shanghai Yueyang Affiliated Hospital, Shanghai University of Traditional Chinese Medicine and ³Department of Physical Education, South-Central University For Nationalities (China)

Purpose: To analyze the basic principle of "Tuina Gongfa rehabilitation", the necessity of scientific training of rehabilitation, and the establishment of sports medicine model of "Tuina Gongfa rehabilitation". **Methods:** Using literature analysis, logical analysis, etc. **Results and Conclusion:** the basic principle of "Tuina Gongfa rehabilitation" is promoting the formation of compensatory mechanisms by ways of exercise. Its role is to maintain and restore the body's normal physiological function of mechanisms and development of compensatory function of the body. Only correct understanding of the objective laws of Gongfa training, can we grasp the scientific methods of Gongfa training. And then can guarantee the efficacy and safety of Gongfa training. Scientific training is necessary requirement of "Tuina Gongfa rehabilitation". the systematic application of sports medicine in the process of "Tuina Gongfa rehabilitation" can provide scientific and technological protection for Gongfa training. On the basic line of carrying out the plan of "Tuina Gongfa rehabilitation", we can establish the systematic application mode of sports medicine in scientific Gongfa training.

0502PP68

HOT PACK AND HOT HERBAL PACK: EFFECTS ON SIT AND REACH TEST, SKIN TEMPERATURE AND PLEASURE

Raoyrin Chanavirut, Salinee Neawla, Jindaporn Yimdee, Rungthip Chalermnan, Kluaymai Promdee
Khon Kaen University (Thailand)

Purpose: Thai herbal compress ball is a unique natural product of Thailand. At the original, it was designed in a ball shape with a diameter of 6-7 inches. It was used to relieve muscle pain and improve skin blood flow. However, because of its small size, it can't cover as large as treatment area as of those hot pack. Therefore, this study tries to compare the physiological affect of the newly designed hot herbal pack shape with a hot pack. The aim of this study was to evaluate the effect of hot herbal pack on flexibility of lower back and thigh muscle, skin temperature and pleasure compared with hot pack. **Materials and Methods:** Seventy healthy subjects were recruited from undergraduate student of Khon Kaen University, Thailand. All volunteers were randomly allocated into two groups; hot pack (HP) and herbal pack (HBP). Pre and post data in both groups composed of sit and reach test (SRT) and skin temperature from three sites; lower back, left and right thigh, measured by "Thermal imagers" (FLUKE) were recorded for analyze. HP or HBP was applied to each group over lower back and thigh for 20 min. During this process, minute by minute temperature was measured by a digital thermometer placed on buttock. In addition, HBP group was asked to fill up the questionnaire regarding temperature and pleasure levels post treatment. **Results:** There was no significant difference in general characteristics of both groups. SRT of all groups were increased (HP; 6.12 ± 5.80 to 7.65 ± 5.50 cm and HBP; 6.42 ± 6.31 to 7.74 ± 6.31 cm) but did not reach the statistical significance. Skin temperature from "Thermal imagers" was increased significantly ($p < 0.05$) when compared both within and between groups at average $3.20 \pm 0.93^\circ\text{C}$ and $3.83 \pm 1.21^\circ\text{C}$ for HP and HBP, respectively. At the 5th, 10th and 15th min, 65–80% of HBP subjects rated the feeling of "Hot" and rated "Comfortable warm" in 20th min. Furthermore, the smell of herbs was appreciated among HBP group. **Conclusion:** Based on this study, the increasing of skin temperature indicates that herb pack produces more potent effects than hot pack and produced no advert affect. Hence, a simple innovation that made from Thai herbs can be applied at home as a hot pack in term of superficial heat equipment. Future study should be focus on specific conditions such as myofascia pain syndrome or muscle tightness patient.

0502PP69

THE EFFECT OF PRE-OPERATIVE REHABILITATION IN HIGH RISK OPEN HEART SURGERY PATIENTS ON THE LENGTH OF HOSPITAL STAY

Willy Chou¹, Wen-Chih Lin¹, Chiao-Hsin Chen¹, Yi-Ru Chen¹, Cheng-Hsin Lin²

¹Department of physical medicine and rehabilitation, Chi Mei Medical Center and ²Department of cardiovascular surgery, Chi Mei Medical Center (Taiwan)

Purpose: To evaluate the effect of pre-operative education of diaphragmatic breathing and coughing techniques in high risk patient scheduled for elective open heart surgery on the length of post operative hospital stay. **Materials and Methods:** From March 2008 to April 2009, patients who were scheduled for elective open heart surgery by the same surgeon were enrolled. 27 patient who met the criteria for high risk was randomized into intervention group ($n = 13$) or control group ($n = 14$). Intervention group received diaphragmatic breathing and coughing technique education before surgery by the same physical therapist. All patient received the usual cardiac rehabilitation after surgery **Results:** Both groups

were comparable at baseline. By hospital discharge, post operative pulmonary complication developed in 8 (61.5%) patient in the intervention group, 12 (85.7%) in the control group ($p = 0.42$). One patient was re-intubated in the control group. The mean duration of postoperative hospitalization stay was reduced in the intervention group (6.03 ± 1.03 vs. 9.24 ± 3.29 day, $p = 0.018$). **Conclusion:** Diaphragmatic breathing and coughing technique education before open-heart surgery in high risk patient can shorten hospital stay and decrease cost of care.

0502PP70

CLINICAL APPLICATION OF LIGHT QUANTUM BLOOD THERAPY ON THE SUDDEN DEAFNESS

Xiao Fu

Third People's Hospital of Chongqing (China)

Purpose: To observe the therapeutic effect of light quantum blood therapy on the sudden deafness, and compared with the western medicine. **Materials and Methods:** 126 patients were randomly divided into light quantum blood therapy group and the drug group, with 63 cases in each group. By ultraviolet irradiation with blood therapy instrument and simultaneously treated with oxygenation, blood was transfused in the light quantum therapy group; while in the drug group, vein injection with 6% low molecular dextran, ATP and coenzyme A and oral Nimodipine Tablets, Gold Theragran was given. The changes and curative effects of the whole blood viscosity, plasma viscosity, hematocrit and fibrinogen before and after treatment were observed. **Results:** The total efficiency of light quantum blood therapy group was 91.37% better than the drug group which was 63.36% and the difference was statistically significant ($p < 0.05$). The difference of the index of whole blood viscosity, plasma viscosity, hematocrit and fibrinogen in light quantum blood therapy group before and after the treatment was statistically significant ($p < 0.05$); compared with the drug group, the difference of the whole blood viscosity, plasma viscosity and fibrinogen after the treatment was statistically significant ($p < 0.05$); The difference of the index of whole blood viscosity, plasma viscosity, hematocrit and fibrinogen in the drug group before and after the treatment was not statistically significant ($p > 0.05$). **Conclusion:** The therapy efficacy of light quantum blood therapy on the sudden deafness is significant and superior to drug therapy.

0502PP71

THE USE OF ACUPUNCTURE IN RELIEVING DIZZINESS, NAUSEA AND VOMITING AFTER CEREBELLAR STROKE – A CASE REPORT

Kwok Pui Leung¹, L.Y. Ng², W.L. Liu², Leonard S.W. Li¹

¹Department of Medicine, Tung Wah Hospital and ²Chinese Medicine Centre, Tung Wah Hospital (Hong Kong)

Purpose: Symptoms of dizziness, nausea and vomiting may be very disabling after acute cerebellar stroke. Medication likes prochlorperazine is helpful but has the drawback of slowing down the central adaptation process. Acupuncture is found to be effective in relieving chemotherapy induced and postoperative nausea and vomiting. We sought to explore whether similar acupuncture technique is helpful in reducing these symptoms. **Materials and Methods:** We report on a 66-year-old gentleman who presented with sudden collapse in mid-August 2009 and was found to have acute bilateral cerebellar infarcts. In the past, this gentleman was a known chronic hepatitis B carrier with hypertension and ischemic heart disease. He ran a very stormy acute stroke phase initially. He had obstructive hydrocephalus, which required ventricular shunting and respiratory failure due to aspiration pneumonia which required tracheostomy and intensive care. He was transferred to our rehabilitation unit at week 5 after stroke eventually. Tracheostomy was weaned off at week 9 after stroke. Patient remained bed and chair-fast because of severe dizziness and nausea whenever he changed his positions. Acupuncture was applied on Neiguang (PC6) of both forearms. Even reinforcing-reducing needling technique was

employed to achieve soreness, numbness and distension in the local areas. Needles were retained for 30 min and manipulated once every 10 min to intensify the needling sensation. The treatment was given once every other day, 3 times a week, for 2 weeks. Dizziness, nausea & vomiting were measured by global self rating (Nil or minimal, mild, moderate and severe) and Visual Analogue Scale (VAS) before and after treatment. **Results:** Patient reported remarkable improvements with dizziness and nausea reduced from severe grade to mild grade and VAS from 8 to 3. No complication was observed. **Conclusion:** Acupuncture by needling the Neiguang points is potentially beneficial. Further large-scale, randomized and controlled studies are warranted.

0502PP72

M-TEST (NEW TREATMENT, LIKE ACUPUNCTURE, BASED ON ASSESSMENT ON PHYSICAL MOVEMENT) CHANGES CERVICAL ALIGNMENT AND MOVEMENT: A PILOT STUDY

Yukihiro Tanimoto, Masazumi Mizuma, Nobuyuki Kawate, Mitsumasa Yoda, Naomi Yoshioka

Department of Rehabilitation Medicine, Showa University School of Medicine (Japan)

Purpose: Traditional Chinese Acupuncture (TCA) has been used treating motor dysfunction in East Asia for century. However, TCA is based on experienced knowledge, and lacked reproducibility. In Japan, TCA is widely used in complementary and alternative medicine, but fear inserting needles into skin often makes it keep at a distance. M-Test is new treatment based on TCA theory, but to confirm effective points, the assessment of physical movement is needed. There are 30 kinds of basic movement divided into 6 aspects. (Anterior of Upper extremities, Posterior of Upper extremities, Lateral-Medial of Upper extremities, Anterior of Lower extremities, Posterior of Lower extremities, Lateral-Medial of Lower extremities) We select meridians that should be treated and meridian points from 24 basic points after assessment. Moreover, aids not to insert into skin for treatment are used instead of the needles. The purpose of this study was to assess whether M-Test effected cervical static alignment and dynamic movement, using two dimensional operation analysis device. **Materials and Methods:** Four subjects with no present and past history of neck participated in this study. They moved their neck, flexion and extension, at standing position, and Cine-Radiographic measurement of lateral dynamic movement of cervical vertebrae was taken. Afterwards, M-Test was done and we selected meridian points they could move more easily. Similarly Cine-Radiographic measurement was taken. The images obtained from two measurements were analyzed with two dimensional operation analysis device (Hu-Tech Co.Ltd MMpro-2DdA). We compared the difference of lateral cervical static alignment and dynamic movement before and after M-Test. **Results:** To examine cervical flexion and extension in this study, we selected treatment points from anterior and posterior meridians. (Lung, Large Intestine, Spleen, Stomach, Heart, Small Intestine, Kidney or Bladder). In the subjects treated with anterior meridian points, cervical lordosis was more intense compared with before M-test and the range of motion toward flexion increased. In the subjects treated with posterior meridian points, cervical lordosis was less compared with before M-test and the range of motion toward extension increased. **Conclusion:** We conclude that M-test may change cervical static alignment and dynamic movement, and may effect on physical function.

0502PP73

HEALTH-RELATED QUALITY OF LIFE EFFECTS REPORTED BY OLDER ADULTS WITH KNEE OSTEOARTHRITIS FOLLOWING ACUPUNCTURE TREATMENT TARGETED TO PAIN AND SLEEP: A RANDOMIZED CLINICAL TRIAL

Wei Huang^{1,2}, Donald L. Bliwise², Claudine V. Carnevale³, Nancy Kutner²

¹Atlanta VA Medical Center, ²Emory University School of Medicine and ³Emory Rollins School of Public Health (United States)

Purpose: To investigate effects on health related quality of life (HR-QoL) perceptions of older adults with knee osteoarthritis (OA) following acupuncture targeted to knee pain and/or acupuncture targeted to poor sleep. **Materials and Methods:** *Design:* Randomized clinical trial with 2x2 factorial treatment structure. *Setting:* Outpatient clinic at an academic university. *Participants:* Twenty-two adults aged 55-86 (mean age = 72) with radiographically diagnosed knee OA, persistent knee pain more than 50% of the time by self report, and sleep disturbance as indicated by a global Pittsburgh Sleep Quality Index (PSQI) score of 5+. *Intervention:* True or sham acupuncture for poor sleep combined with true or sham acupuncture for knee pain. *Measurement:* Medical Outcomes Study Short Form-36 (SF-36), pain severity rating (Western Ontario and McMasters University Osteoarthritis Index), and global PSQI at baseline, post-intervention, and 1-month follow-up. **Results:** Subjects who received true acupuncture for knee pain and/or for poor sleep, compared to subjects who received only sham treatments, had more improvement in pain ratings ($p=0.03$) and global PSQI scores ($p=0.04$). True versus sham acupuncture for knee pain was associated with improved SF-36 ratings of general health ($p=0.03$) and vitality ($p=0.04$). True versus sham acupuncture for poor sleep was associated with improved SF-36 ratings of social functioning ($p=0.03$). **Conclusion:** In older adults with knee OA presenting with persistent knee pain and poor sleep, acupuncture for knee pain and/or for poor sleep may improve HRQoL perceptions.

0502PP74

THERAPEUTIC EFFECTIVENESS OF TRADITIONAL THAI MASSAGE ON PATIENTS RELATED WITH EPISODIC TENSION-TYPE HEADACHE

Chathipat Kruapanich¹, Uraiwon Chatchawan¹, Wichai Eungpinichpon¹, Kannikar Kongbunkiat²

¹School of Physical Therapy, Faculty of Associated Medical Sciences, Khon Kaen University and ²Department of Attending Physician of Emergency Medicine, Faculty of Medicine, Khon Kaen University (Thailand)

Background: Episodic tension-type headache (ETTH) is the most common type of headache. It leads to impairment in functional, emotional and social activities. At present, There are a few and insufficient strong methodology studies that examined the therapeutic effectiveness of traditional Thai massage (TTM) on ETTH. **Purpose:** To evaluate the immediate effects of TTM among patients with ETTH by comparing with non-treatment on headache pain intensity, pressure pain threshold and cervical range of motion. **Materials and Methods:** Ten patients were randomly allocated to receive 30-min for a single treatment of either TTM or control (resting). Headache pain intensity (Visual analog scale: VAS), pressure pain threshold (kg/cm²), and cervical range of motion (degree) were measured before and immediately after treatment. **Results:** Results indicated that the TTM group showed a significant improvement in the headache pain intensity, pressure pain threshold, cervical flexion and lateral flexion after treatment session ($p<0.05$). The control group showed only significant improvement in the headache pain intensity ($p<0.01$). However, all measures were not significantly different when compared between the groups. **Conclusion:** It is concluded that the TTM could be one of effective treatments for the patients with ETTH.

0502PP75

EFFECT OF ELECTROACUPUNCTURE ON ACUPOINTS OF DU MERIDIAN ON THE EXPRESSION OF NESTIN IN PERIINFARCT AFTER CEREBRAL ISCHEMIA

Xiaolin Huang, Xiaohua Han

Department of Rehabilitation Medicine, Tongji Hospital, Tongji Medical College (China)

Purpose: To investigate the effect of electroacupuncture (EA) on acupoints of Du Meridian on the expression of Nestin in periinfarct after cerebral ischemia. **Materials and Methods:** Forty-eight healthy male Wistar rats were divided into normal, model and EA group randomly. Furthermore, rats in each group were divided into 7d and 14d, 2 subgroups. Model of middle cerebral artery occlusion (MCAO) was established, followed by 7d or 14d of EA on acupoints of Baihui and Dazhui. The expression of Nestin in periinfarct was investigated in different time points and different groups by immunohistochemical technique and Western blot. **Results:** The result demonstrated that the expression of Nestin in EA group showed a significant increase compared with model group. What's more, much more Nestin-immunoreactive cells were detected in EA group on day 7 and the expression decreased on day 14. **Conclusion:** These findings indicate that EA on acupoints of Du Meridian has the potential to activate Nestin in the periinfarct region of the ischemic cerebral hemisphere and facilitate neuroregeneration.

0502PP76

QI GONG PRACTICE IN TREATING LUMBAR BACK PAIN

Ana Zikic^{1,2}, Rene Burkland^{1,2}, Dejan Nikolic^{1,2}

¹University of Traditional Chinese Medicine and ²Medical University of Belgrade (Serbia)

Purpose: To evaluate purpose of practising Qi Gong exercises in treating lumbar back pain disorders. **Materials and Methods:** From August 2008 to September 2009 we were using acupuncture to treat lumbar back pain of patient. We had two groups of patients. One experimental group, and other one where besides acupuncture we apply exercises named Shi Er Lian Shou (type of medical Qi Gong). All patients were divided in tree groups, according to diagnose and differentiations principles in TCM (Traditional Chinese Medicine): Group I- Kidney Qi deficiency, Group II-Kidney essence deficiency, Group III- Qi and blood deficiency. After 6 months of practicing we evaluate effects of our therapy. **Results:** In our group were 40 patients. All of them had a pain like symptom of lower back syndrome. We divided them in two groups. In second group they were advising to do half and hour of exercises in morning and evening. These movements are opening meridians and collaterals, improve circulation of Qi and blood, remove stasis, stop pain, balancing body and mind. They are specially designed for meridians of kidney, urinary bladder, gall-bladder. Presence of pain before and after treatments was marked from 1–5 (full-fill question-mark). There were significantly difference ($p < 0.05$) between Group I and Group II in decreasing lower back pain after therapy. From tree parts of Group II, in group which had Kidney –Qi deficiency syndrome were significantly difference ($p < 0.05$) in decreasing pain. **Conclusion:** Our results showed that using both methods significantly increase results of healing lumbar back pain. Qi Gong is kind of therapy which should be used continuously in every day life, like preventing and healing method.

0502PP77

A STUDY ON CONDITIONS AND CHARACTERISTICS OF MISSED APPOINTMENT: INFLUENCE FACTORS AFFECTING NO-SHOW RATES AT REHABILITATION

Yung-Nan Hsu

Chang-Hua Hospital (Taiwan)

Purpose: Rehabilitation is the medical discipline concerned with restoring and improving patients' function and quality of life. Physical therapists assist in the treatment of a variety of medical conditions such as muscle or tendon injuries, spinal cord injury,

neuropathies, stroke, brain injury, amputations. Physical therapy interventions are provided to disabled inpatients and outpatients. Each patient is randomly scheduled into one specific physical therapist. The patient shall see the the same physical therapist and attend each appointment for therapy. Missed appointments lost revenue and staff time. Missed appointments are costing rehabilitation services in our hospital 200,000 USD a year. This study aims to determine the factors affecting no-show rates, taking these parameters into consideration, appointment day of week, appointment day of month and physical therapists. **Materials and Methods:** In the double blind condition that neither physical therapists nor patients are informed during a period in nine months, we record all no-shows of 7 physical therapists at rehabilitation services in our hospital. Missed appointment characteristics were collated on 3 parameters, day of week, month of year and physical therapists. **Results:** The data indicated the higher no-show rate for Tuesday, Thursday, higher show rate for Monday, Wednesday and Friday. Higher no-show rate for February and higher show rate for July, August and September. The no-show rate between physical therapists has statistically significant difference. The data indicated $F = 11.915$, $p = 0.00$. **Conclusion:** Physical therapists affect no-show rates. The hospital shall consider intervention methods to reduce no-show rate, and build a reward system to encourage the physical therapist who has higher show rate.

0502PP78

APPLICATION OF SOCIAL REPRESENTATION THEORY AND ITS TECHNIQUE ON THE ASSESSMENT OF TEACHING EFFECTIVENESS IN REHABILITATION EDUCATION

Feng Lin, Zhongli Jiang

Department of Rehabilitation Medicine, Nanjing Medical University (China)

Purpose: Social representation theory is a theory for the social communication between members in different groups. Teaching process is also a communication between teacher team and student group. The present research was designed to explore the application of social representation theory and its word network analysis technique on the assessment of teaching effectiveness in rehabilitation education. **Materials and Methods:** In a course of Rehabilitation Medicine, the present study analyzed social representations of the fundamental concept of "rehabilitation" before and after completion of the course. Sixty one students including 28 women and 33 men participated in free evocation task for collecting cognitive elements of "rehabilitation". The students executed the task before the teaching process and do it again after the examination. Two evoked words networks were constructed for analyzing the structure of the social representation of "rehabilitation". On the application of the word network analysis technique, the global properties such as densities of the two networks and the local parameters such as three kinds of centralities (degree centrality, betweenness centrality and closeness centrality) of each cognitive element in the two networks were calculated. The k-core decomposition technique extracted central core of each network. Changes of social representation of "rehabilitation" were detected by drawing a comparison between the two networks. **Results:** The densities of networks were 0.0306 in the network before the teaching process and 0.0556 in the network after the examination. In the network before the teaching process, there was a central core composed of a 3-core including 12 words. In the network after the examination, there was a central core composed of a 4-core including 12 words. By comparison between these two central cores, this study revealed that before the teaching process the students' social representation of rehabilitation organized itself around the central concept of "health" and that the teaching process reorganized the social representation of rehabilitation on the basis of the central concept of "function". **Conclusion:** The results suggested that the social representation theory and word network analysis technique can provide a quick, qualified and visualized

approach for the assessment of course construction and teaching effectiveness in Rehabilitation Medicine.

0502PP80

WHY COMMUNITY REINTEGRATION OF DISABLED LARGELY FAILS IN PAKISTAN?

Farooq A. Rathore¹, Tayyab Rathore², Saeed Bin Ayaz¹

¹Spinal Rehabilitation Unit, Armed Forces Institute of Rehabilitation Medicine and ²Medical and Regulatory Affairs, Novartis (pvt) Ltd (Pakistan)

Purpose: To explore and identify the factors and barriers in the optimal community reintegration of persons with disability (PWDs) in Pakistan. **Materials and Methods:** This presentation is based on our 5 year experience of managing major and minor disabilities at the largest Rehabilitation institute in Pakistan. For this presentation we have considered only the major disabilities like SCI, Stroke, TBI and amputations. Informal in depth interviews were conducted with PWDs living in the community for more than one year and their attendants/ care givers presenting at our institute. Their attitudes and perceptions towards their disability were explored, response of their families was noted and social and mobility barriers were identified. **Results:** The following factors acting as barriers towards adequate community reintegration of these disabled in Pakistan were identified.

1. *Patient related factors and issues:* a) Poor motivation for independent living; b) Unrealistic expectations; c) Low educational status; d) Non availability of role models; e) Lack of peer support groups
2. *Inadequacies on the part of Health care professionals:* a) Poor/ No counseling; b) Poor understanding of disability; c) Lack of motivation towards disability management
3. *Social, Societal and Cultural issues:* a) Barriers to mobility; b) Barriers to socialization; c) Financial constraints; d) Lack of vocational and avocational opportunities; e) Stigmatization of disability; f) Social rejection by community
4. *Government and legislative issues:* a) Improper implementation of disability related laws; b) Underdeveloped infrastructure for community based rehabilitation; c) Non Governmental Organization (NGOs) with vested interests.

Conclusion: We conclude that in Pakistan, Disability remains a stigma and cultural norms are a major hindrance in the reintegration of a person with disability in the society. This is compounded by the fact that statistical data on disability is very scarce and unreliable. In Pakistan the disabled are generally disrespected and rarely function as useful members of society. There is a need to enforce the legislation regarding building design to ensure that the specifications that facilitate independent access by PWD, including toilet access, are implemented. Discrimination should be addressed, by education and legislation. It is a duty of medical professionals to assist the disabled in Pakistan improves their functioning, for their sake, and that of their country.

0502PP81

LEARNING ACHIEVEMENT OF GUIDED PROBLEM-BASED LEARNING IN OCCUPATIONAL THERAPY STUDENTS

Chia-Hui Hong^{1,2}

¹Graduate Institute of Science Education, National Taiwan Normal University and ²Jen-Teh Junior College of Medicine, Nursing and Management (Taiwan)

Purpose: Problem-based learning (PBL) is a student-centered approach, which helping students to integrate subject matter, promote self-directed learning. In PBL, problem-based of actual clinical cases make students to integrate subject matters, ease applying knowledge and lifelong learning. The study is first to involve occupational therapy junior college students in PBL curriculum, but these students are too young to learn independently. Guided PBL is efficiently to facilitate students to know the structure of learning

matter and having motivation to learn. By way of the scaffolding of tutor or peers can inspire latent energy of students. Varied PBL approaches affected the effectiveness of learning. The research questions of this study were identified: (1) whether different guiding tutorial of PBL lead to distinct learning outcome? And (2) what performance have distinction between different guiding groups? **Materials and Methods:** the research used the purposive sampling, 119 participations major in occupational therapy and joined the “psychiatric occupational therapy modality design topics” were selected. The small groups were composed of four to five students and they were together for 16 weeks. 21 small groups were randomly separated into two groups. A total of 11 small-groups were assigned to experimental group(62 students), more oral guided by in-depth discussion, assertive, facilitative and suggestive PBL (GPBL group) of tutor, while 10 small-groups were assigned to control group (57 students), students follow the learning schedule and tutor using general oral guided with students. Tutor didn’t offer idea to complete the project until students get solution from themselves (PBL group). PBL curriculum of occupational therapy modality design and PBL of Occupational therapy modality evaluation form were all developed by author, and validated by three experienced occupational therapy instructors. In pilot study, the inter-rater reliability of evaluation form was equaled to 0.862. The function of evaluation form was a formative assessment to check learning achievement of students after PBL curriculum. There were 15 items generate under three facets of evaluation form. Each item is worth six points. T-test and ANOVA were used in the analysis of the data. **Results:** The independent sample t-test showed significant difference between GPBL group and PBL group ($t(117)=7.640$, $p<0.000$) at significant level 0.05. The GPBL group outperformed the PBL group, especially at clinical reasoning, problem solving and modality design ability. It found that when tutor interjected in the right time, made use of assertive and suggestive guidance for GPBL group, the effect was more salient than using general guidance of PBL. **Conclusion:** Our results showed that: first, PBL is a student-centered learning approach, but regard students’ needs to provide just right guidance would make students master learning content quickly, integrate and apply knowledge. Second, the important elements of PBL included: problems, students and tutors. In order to cultivate lifelong learning, there is a need for long time participate in PBL of students and educate qualify experts in the content of tutors; provide students with appropriate guiding are the most basic to make PBL curriculum success.

0502PP82

DEVELOPMENT OF REHABILITATION SERVICES IN JIANGSU PROVINCE OF CHINA

Qiuye Gao¹, Jianan Li¹, Shaoqin Gu¹, Xia Zhang², Sijing Chen²

¹Department of Rehabilitation Medicine, 1st Affiliated Hospital of Nanjing Medical University and ²Nanjing Medical University (China)

Purpose: To elucidate development of rehabilitation services at provincial level in China during past 22 yrs, **Materials and Methods:** A survey through questionnaires was down from 222 general hospitals with rehabilitation services and 19 rehabilitation hospitals in Jiangsu Province, China, in October, 2009. **Results:** Jiangsu Province is one of the most advanced provinces in China and has population of 76 million. There was no rehabilitation department 22 yrs ago in Jiangsu Province except some services for physical modalities. Since establishment of Jiangsu Association of Rehabilitation Medicine, 84.2% of general hospitals developed rehabilitation departments with 1805 inpatient beds in total (3.6% of total hospital beds. Specialized rehabilitation services included 179 physical therapy, 86 occupational service, 63 speech therapy, 28 P&O, 187 traditional Chinese therapy in rehab and 83 rehabilitation psychology. Orthopedic rehabilitation, neuro-rehabilitation, geriatric rehabilitation, pediatric rehabilitation and pain management were conducted in most of services but

only small portion of cardiopulmonary and cancer rehabilitation services. Early rehabilitation intervention is conducted in all of provincial hospitals but only 51% in district hospitals. Manpower in rehabilitation field included 148 attending doctors and 521 junior doctors, 153 PT, 139 TCM therapist, 62 OT, 33 ST and 11 P&O. Compared with advanced countries, the capacity of rehabilitation services and manpower is at lower level even though the development is dramatic. **Conclusion:** The rehabilitation services in Jiangsu Province have been developing rapidly during past 22 years with great potential.

0502PP83

EDUCATION NEEDS OF PATIENTS AND THEIR FAMILY MEMBERS IN REHABILITATION DEPARTMENTS

Juan Jin, Li Zhou, Hui Ding

Department of Rehabilitation Medicine, 1st Affiliated Hospital of Nanjing Medical University (China)

Purpose: We assess the education needs of rehabilitation theory for patients and their family members, carried out planned education activities for them to increase their understanding of rehabilitation theory skills, raise their exercise awareness so that patients can exercise actively, health behavior be carried out and quality of their life be elevated. **Materials and Methods:** Forty-eight patients or family members in our department was enrolled. Twenty-eight of them are male with remaining twenty female. The average age is forty-nine years. Information was collected by using questionnaire. **Results:** Sixty percent of all surveys wants rehabilitation within first three days after being hospitalized, with twenty-nine and thirty-one percent expect it hold before they leave and at other times. Individual teaching is the most favourite education form, and other forms like centered lecture are also popular among certain groups of surveys. Doctors and therapists, rather than nurses are the people patients or family members want to learn rehabilitation knowledge from. **Conclusion:** Rehabilitation education, composed of rehabilitation theory, skill and training methods given at different stages, under the guidance of doctors, therapists and nurses, in the form of individual teaching and centered lecture should be given to patients and their family members.

0502PP84

ASSESSMENT AND COMPARISON OF CLINICAL MANPOWER BETWEEN MEDICAL CENTERS AND REGION HOSPITALS IN TAIWAN

Willy Chou, Shu-Han Yang, Chern-Chern Sui, I-Min Lo, Michael Lee, Chai-Wei Chan

Chi-Mei Medical Center (Taiwan)

Purpose: To set up a reference norm comparison between hospitals is available for implementing the requirement of the Six Missions of hospital accreditation encouraging medical centers to present something different from others as much as possible. **Materials and Methods:** We downloaded data from government website of physician supply from 79 Taiwanese medical centers and region hospitals, and then adopted both exploratory factor analysis and Rasch model to examine unidimensionality of physician manpower characteristics to form an appropriate scale measuring hospital performance in physician supply. **Results:** We found that 1) Four kinds of physicians such as internal, surgery, Obstetrics and Gynecology, pediatrics reached 50% of total physician supply in big hospitals; 2) the Ferguson discrimination delta for the study physician supply scale is 0.97; 3) over one third of Taiwanese regional hospitals perform excellent over general medical centers. **Conclusion:** The

16-item physician supply scale measures a single construct. Our work supports that the scale is valid and reliable, and is worthy of that effective task. Further research should be carried out to confirm these results congruent to practices in clinical settings.

0502PP85

EDUCATION REHABILITATION OF CHILDREN WITH MENTAL RETARDATION

Zhenhuan Liu

Nanhai Affiliated Maternity and Children's Hospital of Guangzhou University of Traditional Chinese Medicine (China)

Purpose: To seek effective methods of home education for the rehabilitation of children with mental retardation and improve the life quality of handicap children. **Materials and Methods:** 86 children aged range from 3 to 9 years with mental retardation were treated with home education rehabilitation. After acquired the general information and requirements of home education rehabilitation, training of home education rehabilitation were given to the parents in accordance with "Portage early education course", "early education project of Chinese children", "family rehabilitation training/massage VCD", "handbook of home rehabilitation for the children with cerebral palsy". In order to understand the psychological development feature of children with mental retardation and work out the individualization home education rehabilitation program, each child was regularly assessed and guided. The education rehabilitation program was enforced by the parents guided by the rehabilitation doctors and the intelligence development state was tested regularly. **Results:** The results showed that after systemic home education rehabilitation, the intelligence and adaptive behavior of children with mental retardation could be improved ($p < 0.001$). 21 children were excellence, 55 were effective, 6 were better than before and 4 were ineffective. 20 children were adopted to elementary education organization. **Conclusion:** Stable and practical individualized home education rehabilitation service for the children with mental retardation can promote the healthy development of cognition, speech, social adaptation.

0502PP86

APPLICATION OF A TEACHING MODEL OF SYSTEM-BASED LEARNING AND PROBLEM-BASED LEARNING IN REHABILITATION FOR MEDICAL STUDENTS

Zhen Huang

Peking University First Hospital (China)

Purpose: To improve the comprehensive abilities of medical students. **Materials and Methods:** A teaching model of system-based learning (SBL) and problem-based learning (PBL) has been used since 2006 instead of discipline-based learning in the past. The course of rehabilitation has been added to neurological system panel and musculoskeletal system panel in year 4 of eight years' undergraduate education. The reforms of teaching model included joined preparation of a panel course by the teachers from different discipline, small group teaching, joined case discussion, clinical observation and case analysis in the same panel, PBL teaching and examination, PBL teaching in English and community-based rehabilitation observation. **Results:** The SBL & PBL model has more advantages, such as matching the clinical thinking way, strengthening the concept of whole patient management, reducing the lectures and optimization the curriculum, improving the students' skills of self-learning and communication, enhancing the future doctors' understanding of the importance of rehabilitation and facilitating more collaborations between departments by joined course preparation. **Conclusion:** SBL & PBL model matches the requirements for future doctors much more.

0502PP87

THE ACTIVITY PERFORMANCE AND SATISFACTION OF LABORS WITH HAND INJURY AFTER WORK-HARDENING PROGRAM

Hsiao-Wei Hsu¹, Min-Yuan Yu¹, Jer-Hao Chang², Jui-Kun Chang³

¹OT, Rehabilitation Department, Kaohsiung Chang Gung Memorial Hospital, ²Occupational Therapy Department, National Cheng Kung University and ³OT, Rehabilitation Dept, Kaohsiung Chang Gung Memorial Hospital (Taiwan)

Purpose: Hand injuries are the most common work-related injuries and tend to cause various disabilities in daily activity. The hand impairment also frequently influences the individual's quality of life. The purpose of this study is to evaluate the training effect of work hardening program on activity performance and satisfaction. **Materials and Methods:** Fourteen labors with occupational hand injury were referred to work hardening program for the purpose of return-to-work. Twelve were males and two were females. Their average age at the time of work hardening program was 40 years old (range: 19–61 yrs). The average time from injury to receive work hardening program was 26.72 weeks (range: 3.29–76.57 wks). The average duration of the training program was 7.64 weeks (range: 4–10 weeks). All cases had full scores in The Barthel index. Statistical analysis was performed using paired-t test to examine the difference of Frenchay Activities Index (FAI) and Health related quality of life (HRQL) before and after work hardening program. **Results:** The results showed that all cases had great improvement in activity performance and life satisfaction. The statistically significance presented in FAI ($p=0.0006$) and HRQL ($p=0.0018$). **Conclusion:** Work hardening program was effective in helping the labors with occupational hand injury to acquire good functional performance in daily activity and also the satisfactory quality of life.

0502PP88

AN INQUIRY INTO THE CAREER ORIENTATION OF THE STUDENTS IN DEPARTMENTS OF OCCUPATIONAL THERAPY: A UNIVERSITY IN SOUTHERN TAIWAN TAKEN AS EXAMPLE

Ping-Chia Li¹, Chin-Hsuan Liu², Posen Lee¹

¹Department of Occupational Therapy, I-Shou University and ²Department of Occupational Rehabilitation, Kai-Suan Hospital (Taiwan)

Purpose: Occupational therapy is a profession integrating art and science. Occupational therapists are required to deeply understand the past and current conditions of the clients they handle as well as future expectations, in order to ensure mutual communication and a rehabilitation treatment plan that is designed to meet individual needs. However, there is no relevant literature concerning the characteristics of the students in departments of occupational therapy. This study aims to probe into their career orientation as a reference for the teaching of occupational therapy and to provide suggestions for students' career options based on their aptitudes. **Materials and Methods:** The questionnaire used in this study is the Career Interest Inventory (CII-R for College), which is a paper pencil test and can be completed in 20–30 min. The test results can elicit six average scores: pragmatic, scientific, humanistic, interpersonal, commercial, and clerical to reveal personal interests and aptitudes. The samples of this study were 106 students from the department of occupational therapy in a university in southern Taiwan, with 32 freshmen, 38 sophomores, and 36 juniors; 45 were males and 61 were females. The average age is 20.7. **Results:** All of the participants did the questionnaire. Based the score ranking, the career orientation could fall within 6 categories: pragmatic, scientific, humanistic, interpersonal, commercial, and clerical, representing 6 types of aptitude. The highest three percentages arranged sequentially according to the highest score each participant acquired, were interpersonal (54.8%), humanistic

(26.2%), and scientific (11.9%). **Conclusion:** The results show that the highest percentage in the “interpersonal” category reveals the good social skills commonly possessed by the questionnaire participants. The second highest is “humanistic”. Those with the highest scores in this item possess abilities related to art, creation, expression, and intuition. The third highest is “scientific”; those with the highest scores in this item tend to use intelligence and analytical ability to observe, reason, assess and judge to solve problems. The major clients for an occupational therapist are the children and the patients with physical and mental problems. The interpersonal, humanistic and scientific inclinations of the participants are in line with the work content of an occupational therapist, so most of them have the potential to work as occupational therapists. Accordingly, this study suggests that the Career Interest Inventory can help the students in departments of occupational therapy better understand their own career orientation so that they can more appropriately determine their career options.

0502PP89

A STUDY OF THE STUDENTS' PHYSICAL AND MENTAL ADJUSTMENT IN DEPARTMENT OF OCCUPATIONAL THERAPY: A UNIVERSITY IN SOUTHERN TAIWAN TAKEN AS EXAMPLE

Ping-Chia Li¹, Chin-Hsuan Liu², Posen Lee¹

¹Department of Occupational Therapy, I-Shou University and ²Department of Occupational Rehabilitation, Kai-Suan Hospital (Taiwan)

Purpose: Since occupational therapy is a profession providing services for people, in order to satisfactorily handle the work, it is necessary for the therapists to possess high quality communication ability and a mature personality that can handle stress, emotions, and personal relationships on their own. So far, there is no literature discussing how the students in departments of occupational therapy become physically and mentally adjusted to the school life during their learning process. Accordingly, this study probes into the conditions of students' adjustment in a school environment in the hope that teachers can better understand students' adjustment problems and help them to have a smoother school life. **Materials and Methods:** This study is conducted with the College Students' Adjustment Checklist (2nd Version) as the questionnaire. The samples are the freshmen, sophomores and juniors in the department of occupational therapy (20.7 years old on average), in which there are 32 freshmen, 38 sophomores, and 36 juniors, totaling 106 students, with 45 males and 61 females. All of the participants took the questionnaire test, and based on the score ranking of each question, the physical and mental adjustment conditions could be discussed in terms of 10 categories: living problem, time management problem, career problem, learning problem, family problem, interpersonal problem, affection problem, emotion problem, spirit problem as well as physical problem. Higher scores mean higher degrees of problem in each item. **Results:** The results show that, among the problems, the highest percentage falls within time management problem (31.6%), then interpersonal problem (20.4%) and learning problem (10.8%), signifying that what annoys the students most are time management and daily life, followed by problems of networking and personal relationship, and stress from schoolwork. The worry of physical problem had the lowest scores; the second and third lowest were worries over emotion problem and spirit problem, respectively, signifying that they had the least impact on the life of the university students. **Conclusion:** Since the results reveal time management as the most annoying problem for the students in departments of occupational therapy, teachers can integrate this issue into the courses related to student counseling. Students' schedules after school also need proper exploration. As for the worry over personal relationships, the results show the students have difficulty networking and need to strengthen their social skills. Regarding the worry over learning, the juniors on average had higher scores than did sophomores and freshmen. It may be that the juniors have more professional courses to study and face the upcoming internship in

hospitals in the senior year. Teachers can provide instructions to the students about solutions to these problems to help them better adjust themselves to the school life and optimize the teaching effects.

0502PP90

A CLUSTER ANALYSIS ON THE CARE STATUS OF THE INJURED WORKERS ACCORDING TO THE TRANSFERRING PATTERNS IN KOREA

Goo Joo Lee, Byung-Mo Oh, Sang Yoon Lee, Keewon Kim, Tai Ryoan Han

Department of Rehabilitation Medicine, Seoul National University College of Medicine (Republic of Korea)

Purpose: This study was performed to analyze the differences in demographic characteristics, days of care, and medical cost of industrial disaster victims according to the transferring patterns by using cluster analysis. **Materials and Methods:** Data were extracted from Electronic Data Interchange database of Korea Workers' Compensation and Welfare Service. The subjects were 4,581 patients approved as industrial disaster victims between Jan 1, 2006 and Dec 31, 2006 who were suffered from the ischemic stroke, hemorrhagic stroke, intervertebral disc disease and spinal fracture. We categorized each disease group into 3 to 6 subgroups according to the number of admissions by K-means cluster analysis, then compared the differences in demographic characteristics, days of care, and medical cost within each subgroup. Finally, we divided them into early discharge group and late discharge group, which were determined by specialist of this field, and compared the same variables. **Results:** Ischemic stroke was divided 3 subgroups (I~II subgroup: early discharge group, III subgroup: late discharge group), both hemorrhagic stroke (I~IV: early discharge group, V: late discharge group) and intervertebral disc disease (I~II: early discharge group, IV~V: late discharge group) were divided 5 subgroups, spinal fracture was divided 6 subgroups (I~III: early discharge group, IV~V: late discharge group). All of the 4 diseases had 1 to 3 subgroups which showed longer hospitalization and more medical cost than the others ($p < 0.05$). Especially in the case of spinal fracture group, it showed that 3 early discharge groups with shorter hospitalization tended to admit to lower medical institute and 3 late discharge groups with longer hospitalization to higher medical institute ($p < 0.001$). **Conclusion:** This study was the first cluster analysis according to transferring patterns of industrial disaster victims. We found some remarkable subgroups, using K-means cluster analysis according to the number of admissions.

0502PP91

DETERMINANT OF STROKE INPATIENT COST IN CHRONIC REHABILITATION WARDS IN TAIWAN.

Allen Chia-Lin Hsu¹, Alice M.K. Wong², Shih-Ching Chen¹, Wei-Han Chang², Jyh-Yuh Ke², Shih-Wei Chou²

¹Taipei Medical University Hospital and ²Chang Gung Memorial Hospital (Taiwan)

Purpose: Stroke is a disease with severe consequences which impose a considerable socio-economic burden on patients and society. In developed countries, stroke patients alone generate about 3–4% of the direct costs within the health care system. The cost of rehabilitation and long-term care of disabled stroke survivors is expected to rise even further because of the increasing number of the aging population and declining stroke case-fatality rates. The aim of the paper is to evaluate the factors that may influence costs of stroke patients and to estimate the expected increasing cost. **Materials and Methods:** This study was conducted at a local general hospital including 249 rehabilitation beds which is one of the main general hospitals for the urban section and surroundings of Taipei. In 156 patients satisfied the WHO criteria for definition of stroke, demographic and clinical data were collected. (Including principal diagnosis, length of hospital stay, comorbid conditions, infection and catheter intubation days. A multivariate linear regression analysis was then performed to determine factors with an

independent influence on the inpatient cost. **Results:** The mean cost and length of hospital stay in our study were 108365.80 New Taiwan Dollars (SD=53825.90) and 50.92 days (SD=20.57) respectively. On multivariate analysis the significant predictors associated with cost were: (i) length of hospital stay ($R^2=0.739$) (ii) nasogastric tube intubation days ($R^2=0.161$) (iii) consultation times ($R^2=0.008$) (iv) endotracheal tube intubation days ($R^2=0.007$) and (v) Foley catheter intubation days ($R^2=0.004$). **Conclusion:** In our study, length of hospital stay is still the most important determinant of stroke patient cost in rehabilitation wards as previous study. However, unlike in the other countries, 99% of total population in Taiwan was covered by the National Health Insurance. As a result, stroke patients and their family tend to stay at hospitals for better medical care and length of hospital stay, therefore, is not an under-controlled factor based on medical principle. So, early removal of unnecessary catheter and prevention of medical complications may be the more important factors for better control of increasing costs of stroke patient rehabilitation in Taiwan.

0502PP92

A STUDY ON THE USE OF TIME BY STROKE PATIENTS – A COMPARISON WITH THE RESULTS OF THE NATIONAL TIME-USE SURVEY

Hideyasu Watanabe, Fumihito Kassai, Masazumi Mizuma

Showa University School of Medicine (Japan)

Introduction: Although the Barthel Index, FIM, and other methods have been widely employed to assess the ADL of patients in clinical practice, few health care institutions assess the lifestyle of outpatients at home. Therefore, we conducted a time-use survey involving stroke patients attending our hospital to examine their lifestyle, and compared the results with those of the 2005 National Time-Use Survey (NHK Broadcasting Culture Research Institute). **Subjects:** The subjects were twenty-seven stroke patients (twenty-one males and six females) without severe impairment of higher brain functions or dementia attending our hospital on foot. Their mean age was 62.8 ± 10.0 . Three years and five months had passed on average after the onset of the disorder: seventeen cerebral infarction, nine cerebral hemorrhage, one subarachnoid hemorrhage, nine right hemiplegia, and fourteen left hemiplegia cases, and four patients without hemiplegia. The mean FIM score was 110.9 ± 11.3 . **Methods:** We distributed a survey form to the patients and asked them to complete and return it by mail. They described their activities performed during the most typical day on the survey sheet with a time scale bar (unit: 15 min) and the names of daily activities, as samples, printed on it. Based on their responses, we calculated the time spent on each activity. **Results:** Based on the 2005 National Time-Use Survey, we classified their ADL into essential (basic daily activities), necessary (those they are required or obliged to perform), and optional activities. The lifestyle of stroke patients was similar to that of unemployed people. When compared to healthy people in their sixties, stroke patients spent longer hours sleeping, eating, caring for themselves, and other essential daily activities, and less time to enjoy conversations and develop relationships. They did not spend much time watching TV, reading newspapers, or enjoying their hobbies. **Discussion:** The assessment and understanding of the lifestyles of stroke patients, by comparing them to those of healthy people of the same age, helped improve lifestyle-based advice for outpatients with disorders.

0502PP93

REHABILITATION EFFECT OF CERVICAL SPONDYLOPATHY BY CHANGING MODE OF LIFE

Xuya Zhou

Zhongnan Hospital, Wuhan University (China)

Purpose: To observe the rehabilitation effect of cervical spondylopathy by changing mode of life. **Materials and Methods:** A total

60 patients with cervical spondylopathy of arteria vertebralis-type and 60 patients with cervical spondylopathy of radix nervi-type were divided into 2 groups randomly. The patients in the trial group were treated by changing mode of life, chiropractic treatment and drug treatment, while those in the control group were treated by chiropractic treatment and drug treatment only. The therapeutic duration was 4 weeks in both groups. The clinical effects in the two groups were observed after treatment. **Results:** There was statistical significance in effect of the patients with cervical spondylopathy after intervention between the two groups. **Conclusion:** Changing mode of life can promote rehabilitation for the patients with cervical spondylopathy of arteria vertebralis-type and radix nervi-type, and it is one of the important methods for cervical spondylopathy.

0502PP94

THE PREVALENCE ANALYSIS OF ISCHEMIC AND HEMORRHAGIC STROKE IN THE ELDERLY POPULATION AND CORRELATION STUDY WITH LOCAL AVERAGE TEMPERATURE: A HOSPITAL-BASED CROSS-SECTIONAL STUDY IN SOUTHERN TAIWAN

Hung-Chih Hsu^{1,2}, Chia-Ling Chen¹, Kai-Hua Chen¹, Yi-Wen Chuang³

¹Department of Physical Medicine and Rehabilitation, ²Graduate Institute of Clinical Medical Sciences and ³Chang Gung Memorial Hospital (Taiwan)

Purpose: Stroke is a commonly encountered neurologic disorder in the elderly population in Taiwan, but the prevalence and extent of severity is not clear. Previous studies suggest there might be an association between weather pattern and risk for ischemic stroke. **Materials and Methods:** We conducted a cross-sectional study by reviewing the stroke patients who admitted to Chang Gung Memorial Hospital for six years period (Jan 2003–Dec 2008), and patients over 60 were recruited for study. Comparative studies including type of stroke, gender, length of admission, peak prevalence age were analyzed. Local average temperatures were also calculated for correlation. **Results:** 6733 patients reviewed, 3583 (53.2%) were over sixty years. Among them, 1089 (30.4%) were hemorrhagic and 2494 (69.6%) were ischemic. The female to male ratio is 0.77 (477/612) in ischemic stroke and 0.81 (1123/1371) in hemorrhagic stroke. The average length of admission is 11.51–12.22 days (95% confidence interval) in ischemic and 11.25–13.85 days in hemorrhagic stroke patients. The peak prevalence age is 76 in ischemic and 71 in hemorrhagic stroke patients. The regression analyses of prevalence in stroke patients over 60 and local temperature are: R square 0.095 in 2003, 0.099 in 2004, 0.259 in 2005, 0.068 in 2006, 0.015 in 2007, 0.003 in 2008, respectively. **Conclusion:** The patients between 70–80 are 1.4 times more likely to have stroke than those between 60–70, 2.14 times than those between 80–90. Above 60, the overall prevalence of ischemic stroke is about 2.3 times more than hemorrhagic stroke. Men are about 1.5 times more likely to have stroke than women. The peak prevalence age is older in ischemic than hemorrhagic stroke. The severity hemorrhagic stroke is statistically significant more than ischemic stroke, according to length of admission ($p < 0.05$). In stroke patients over 60, there is no significant correlation between the prevalence and local average temperature.

0502PP95

FALL, FALL EFFICACY, AND ISOKINETICS STRENGTH IN OLDER COMMUNITY DWELLERS

Shun-Ping Cheng¹, I-Ju Chen², Hsin-Pei Yin¹, Cheng-Liang Chow³

¹Lo-Sheng Sanatorium, Department of Health, Executive Yuan, ²School of Nursing, National Yang-Ming University and ³Department of Physical Medicine & Rehabilitation, Veteran General Hospital-Taipei (Taiwan)

Purpose: To explore status and the relationships of isokinetic strength, fall efficacy and fall among aged adults. **Materials and Methods:** A cross-sectional research design was used. Eight communities and 1175 older adults aged more than 65 were selected by using random and systematic sampling, respectively. Ninety six subjects aged from 65 to 79 ($M = 70.07$) participated in this study. The Biodex system 3 was used to test knee extension and flexion strength of the dominant leg which occurred at a speed of 60 degree angular velocity. Peak torque, total work, and power recorded to represent the strength status. The Fall Assessment Survey was used to survey the personal information, falls, and fall efficacy (FE) of the participants. **Results:** The mean scores of peak torque, total work, and power of the knee extensor and flexor were reported. Strength differences were identified between genders and exercise frequencies. No correlation between peak torque, work, the power of the knee extensor and flexor and the number of falls was identified. However, peak torque, total work, and power of the knee extensor and flexor were all positively correlated with each FE item ($r = 0.287-0.517$, $p < 0.001$). The strength of the knee extensor had a stronger impact on FE than knee flexor. The score of FE associated with the number of fall. The strength of the knee extensor explained 22.5% to 26.3% of the fall efficacy score variances. **Conclusion:** This project was the first study to investigate the isokinetic strength and fall experiences of aged adults. The knee extensor was found to have a more important role than the knee flexor in FE. This implied training for quadriceps strength will decrease the fall tendency among aged adults. Recruiting more cases, eliminating the recall bias, and explore the causal effects among strength, fall and FE were recommended in the future.

0502PP96

RISK FACTORS OF FALL-RELATED INJURIES AMONG ELDERLY PEOPLE: A NATIONWIDE STUDY FROM TAIWAN

Clement SH Yang^{1,4}, Chung-Chao Liang^{1,4}, Hung-Yu Cheng^{1,5}, Peilin Wu², Chieh-Yu Liu³

¹Department of Physical Medicine and Rehabilitation, Buddhist Tzu Chi General Hospital, ²Institute of Rehabilitation Counseling, National Taiwan Normal University, ³Department of Nursing, National Taipei College of Nursing, ⁴College of Medicine, Tzu Chi University and ⁵Institute of Pharmacology and Toxicology, Tzu Chi University (Taiwan)

Purpose: Fall-related injuries are believed to be the cardinal cause of disabilities and deaths among the community-dwelling elderly. The aim of this study was to explore the risk factors for fall and consequent injuries among the older adults in Taiwan. **Materials and Methods:** The data were from the 2005 National Health Interview Survey (NHIS) in Taiwan. The inclusion criteria were: (1) older adults aged 65 years and older, (2) self-reported who had history of falls in 2005. The interview survey was conducted by well-trained interviewers, and information such as demographics, domestic environment safety, chronic illness, anthropometric assessment, and fall-related injuries history were collected. Results were expressed in terms of mean \pm standard deviation for continuous data, and counts and percentage for categorical data. The contingency table analysis and stepwise logistic regression were adopted for investigating risk factors of fall-related injuries among the elderly. Because the 2005 NHIS adopted unequal probability sampling design, the sampled participants needed to be weighted by sampling weight. Therefore, the resulted odds ratios were estimated by weighted logistic regression model. All statistical analysis were performed using SPSS version 17.0 (SPSS Inc., Chicago, IL, USA), and a p -value < 0.05 was considered statistically significant. **Results:** A total of 579 old adults of 2005 NHIS were selected. After weighted estimation by using sampling weights for Taiwanese population, there were estimated about 295,679 older adults who had history of falls in 2005. The results showed that the single elder adults had statistically significant higher risk of fall-related injuries than coupled ones [OR = 1.13, 95% CI = (1.11, 1.16)], osteoporosis [OR = 1.49; 95% CI = (1.46, 1.52)], body mass index (BMI) [OR = 1.02; 95% CI = (1.02, 1.02)], fracture

history after 50 years of age [OR=16.94; 95% CI=(16.57–17.33)], daily activities on higher floors (\geq four floors) [OR=1.39; 95% CI=(1.35, 1.43)]. Besides, female older adults had statistically significant less risk of fall-related injuries than male [OR=0.86, 95% CI=(0.84, 0.88)], handrail in the bathroom [OR=0.76, 95% CI=(0.74, 0.78)], small bathroom space [OR=0.60, 95% CI=(0.56, 0.63)], exercises [OR=0.56, 95% CI=(0.54, 0.57)], education [OR=0.41 (higher vs. lower educational levels), 95% CI=(0.40, 0.42)], age [OR for young-old vs. old-old = 0.82, 95% CI=(0.80, 0.84)], daily activities on lower floors (\leq three floors) [OR=0.73; 95% CI=(0.71–0.75)]. **Conclusion:** Previous fracture history after 50 years old was recognized as the major risk factor of fall-related injuries for the elderly. Besides, single status, osteoporosis, high BMI, and daily activities on higher floors were also needed to be noted. Furthermore, protective factors included gender, environmental modifications, exercises, education, advanced age and daily activities on lower floors. These identified factors should be accentuated to diminish future morbidity and mortality related to fall injuries among older adults, and future experimental studies were needed for evaluating the influences of these identified factors.

0502PP97

THE EFFECTS OF A SENSORIMOTOR TRAINING IN THE REGULATION OF POSTURAL BALANCE IN OLDER ADULTS.

Meng-Tien Wu¹, Yuan-Shuo Chan²

¹Zhi-Shan Senior Home and ²Department of Adapted Physical Education, National Sport University (Taiwan)

Purpose: Aging is a period of constant change, especially the function of the neuromuscular system declines rapidly after the 6th decade. Neuromuscular deterioration with aging contributes to impairments in postural control and increased fall risks in older adults. Looking at postural stabilization, numerous studies have highlighted the role of vision with increasing aging. Therefore, the aim of this study was to analyze the effects of a six-week sensorimotor training performed on an unstable platform. **Materials and Methods:** Forty-three healthy older adults (divided into a sedentary group and a training group, mean 70.5 years) took part in a six-week training program (three times a week, involving gross and fine motor activities, coordination, auditory-motor match, visual-motor translation, etc). Posturomed® system was used to measure body sways before and after training. Postural control in various conditions was measured including standing naturally with eyes closed and open. Analysis was done using the SPSS 12.0 statistical software. For descriptive statistics, a paired *t*-test and one way ANOVA were conducted. **Results:** Results revealed that the sensorimotor training group could significantly decrease the sagittal Y and total body sway distance on standing naturally with eyes closed, but not with eyes open, ($p < 0.05$) after six weeks of training. The control group did not show any significant changes. **Conclusion:** The most important finding from this study suggests that the tested six-week sensorimotor training protocol significantly contributed to an increase of balance control ability when eyes were closed.

0502PP98

THE CLINICAL EFFECT OF ACUPUNCTURE COMBINED WITH EXERCISE THERAPY FOR THE ELDER PATIENTS WITH KNEE OSTEOARTHRITIS AND ANALYSIS OF X-RAYS

Xinchun Dong, Jiayan Zhao, Kaihua Zhai, Boyu Liu
The Third Hospital Xinxiang Medical University (China)

Purpose: Through the analysis of X-ray changes in search of elderly knee osteoarthritis effective treatment methods. **Materials and Methods:** 120 cases of elderly knee osteoarthritis patients were randomly divided into acupuncture group (40 cases), in the exercise group (40 cases), acupuncture plus exercise (40) three groups, acupuncture, ex-

ercise therapy, acupuncture and sports therapies, the 1st day, 2 months of treatment. Before and after the treatment of 3 months, 6 months, the knee is taken, routine, and observe the curative effect. **Results:** the acupuncture plus exercise of greater efficiency in the exercise group and acupuncture group ($p < 0.01$), and acupuncture group and exercise therapy has no obvious difference between groups ($p > 0.05$). After treatment for 3 months, 6 months to use again anti-inflammatory drugs, acupuncture and recurrence of the exercise therapy group significantly lower acupuncture group and exercise therapy group ($p < 0.01$), acupuncture group compared with the exercise therapy group, but no recurrence rate reduced significantly ($p > 0.05$). Acupuncture plus exercise therapy of joint gap narrowed better than the other two groups ($p < 0.05$). **Conclusion:** The acupuncture and exercise therapy in elderly patients treated knee osteoarthritis synergy and affections are reversed the trend of radiculopathy.

0502PP99

DO ELDERLY MEN OR WOMEN DO BETTER IN ACUTE INPATIENT REHABILITATION?

San San Tay¹, C. George Kevorkian²

¹Division of Rehabilitation Medicine, Changi General Hospital (Singapore) and ²Department of Physical Medicine and Rehabilitation, Baylor College of Medicine (United States)

Purpose: To describe and compare the dermographics and functional outcomes of elderly male and female patients who underwent inpatient rehabilitation in an acute tertiary hospital in the United States. **Materials and Methods:** Retrospective cohort study. The inpatient rehabilitation database was reviewed for the period between November 2005 to December 2007. There were 1182 complete records, of which 741 belonged to elderly patients. The primary outcome measures were FIM gain, FIM efficiency. Other outcome measures included the rehabilitation length of stay and discharge destinations. **Results:** There were 741 patients who were 65 years or older. 40.9% were male. The average age of the elderly males was 76.9 \pm 6.9 years and the average age of the elderly females was 77.3 \pm 7.1 years. The average FIM gain was 16.2 \pm 10.8 points in elderly males and 18.4 \pm 9.7 in elderly females. The FIM efficiency was 1.63 \pm 1.2 and 2.09 \pm 1.3 respectively. The difference in the FIM gain and efficiency between the two groups was significant. 66.4% of the elderly patients were discharged home. The rate of discharge home in single males and females were 38.1% and 65% respectively. 39.5% of widowers went home, compared to 61% in widows. The average length of stay in the inpatient rehabilitation unit was 11.5 \pm 5.2 days in elderly men and 10 \pm 4.7 days in elderly women and this difference was significant. **Conclusion:** The difference in FIM gain and rate of discharge home in elderly males and females is significant. Females appear to do better than males. Making social services more available to single men or widowers may help them reintegrate into the community.

0502P100

EFFECTS OF WEIGHT-SHIFT TRAINING FOR IMPROVING ELDERLY DYNAMIC BALANCE ABILITY

Chen-Yang Kao¹, Wen-Hsu Sung¹, Chueh-Ho Lin^{1,2}, Shun-Hwa Wei¹

¹National Yang-Ming University Department of Physical Therapy and Assistive Technology and ²Hung-Kuang University Department of Physical Therapy (Taiwan)

Purpose: Purpose of this study included 1) comparing ability of weight-shifting and dynamic limit of stability (LOS) between elderly and adult subjects, 2) investigating whether weight-shift training could increase LOS on elderly subjects, and 3) investigating whether LOS incensement could transfer into daily functions. **Materials and Methods:** Study design: An experimental study, single blind, randomized controlled trial. **Subjects:** 15 adults aged 18–30 and 29 old

adults over 65 years fitting the inclusion criteria would be recruited and randomized into experimental group ($n=15$) or control group ($n=14$). **Intervention:** Conventional balance rehabilitation program plus visual feedback weight-shift training, 3 times a week for 6 weeks. Training effect will be evaluated by assessing the dynamic balance performance and clinical tests. **Statistical analysis:** Independent t test was used to compare COP measurements of adults and elderly. Paired t test was used to compare two groups of elderly (training and control group) and the two measurement periods (pre-training and post-training). The statistically significant level was set at 0.05. **Results:** Adults were found to have better dynamic balance performances than elderly. Elderly subject obtained significant improvement in LOS area, sway velocity, and maximal displacement both on anterior and lateral direction after 6 weeks weight shifting training. Additionally, after 6 weeks of weight-shift training, elderly subjects showed improving their daily function that included increasing 23.9% of Berg balance scores; decreasing 23% seconds of TUG test, and increasing 24% functional reach test when comparing with previous test. **Conclusion:** To avoid fall accident occurring in older persons, weight-shifting training can be implicated on them due to improving their balance function. Weight-shifting training alternated older persons' dynamic balance function. This alternation also can help them improving certain activities of daily functions.

0502PP101

BIOMECHANICAL COMPARISONS OF LOWER LIMB MUSCLE POWER AMONG HEALTHY ELDERLY, FALLING ELDERLY AND YOUNG ADULTS DURING PERFORMING SIT-TO-STAND AND SQUATTING MOVEMENT

I-Chung Cheng¹, Shun-Hwa Wei¹, Chueh-Ho Lin^{1,2}, Wen-Hsu Sung¹

¹National Yang-Ming University Department of Physical Therapy and Assistive Technology and ²Hung-Kuang University Department of Physical Therapy (Taiwan)

Purpose: The purpose of this study was to investigate the difference of lower limb muscle power among three groups, elder with fallen, healthy elderly and young adults, during performing STS and squatting movements. **Materials and Methods:** Forty-two subjects voluntarily participated in this study. A single-axis force plate, data acquisition (DAQ) system and LabVIEW software were used to evaluate biomechanical parameters among the tested movement. One-way ANOVA associated with Scheffe multiple comparisons were used to exam parameter differences among three tested groups. **Results:** Comparing with young adults during STS movement, elder risk fallers were found decreasing 53% ($p < 0.05$) of muscle power in the lower extremities. Healthy elders, however, only decreased 25% ($p < 0.05$). Similar comparison but in squatting, elder risk fallers decreased 30% ($p < 0.05$) of the functional strength and 69% ($p < 0.05$) of power in the lower extremities. However, healthy elders only decreased 21% ($p < 0.05$) of the functional strength and 40% ($p < 0.05$) of power. **Conclusion:** Deterioration of strength and power in lower extremities might lead elder persons having high fall incidence. Since muscle power involved quick force generation in order to maintain adequate leg stiffness, muscle power of lower extremities was important for elder persons. Based on the evidence in the present study, in order to decrease the incidence of fall accident among elder persons, we thought power rehabilitation of the lower extremities in elder persons was extremely important.

0502PP102

THE STUDY OF PHYSICAL REHABILITATION OUTCOME IN THE ELDERLY PATIENT WITH KNEE OSTEOARTHRITIS DURING 2006–2008

Simona Darciana Birsan, I Mircea, F Bodog
Oradea University of Medicine (Romania)

Purpose: To study effectiveness of rehabilitation treatment for treatment knee osteoarthritis in the elderly patients. **Materials and Methods:** This study including 50 ambulatory patients with radiologically verified knee OA and a visual analogue scale (VAS) total pain score > 175 mm of 500 mm on the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain scale despite treatment with acetaminophen or nonsteroidal anti-inflammatory drugs. Exclusion criteria included grade IV radiologic changes, inflammatory arthropathy, a baseline study knee tense effusion, chondrocalcinosis, and severe varus or valgus. We divided participants into two groups: the first group 30 patient sedentary who walked five or more miles weekly and effectuated electrotherapy (TENS) and the second group who walked less than five miles weekly and effectuated just kinetotherapy and hidrokinetotherapy. **Results:** Analysis of the results showed the second group reduced pain and improve health-related quality of life than the first group. **Conclusion:** A kinetotherapy and hidrokinetotherapy program seems to benefit patients with knee arthritis. It may also delay or prevent complication.

0502PP103

STUDY ABOUT EFFICIENCY TREATMENT OF ELDERLY PATIENTS IN BALNEAR TREATMENT FELIX SPA

Simona Darciana Birsan¹, I. Mircea¹, M. Chiriac²

¹Ordea University of Medicine and ²University of Oradea (Romania)

Purpose: To determine the quality of life in elderly patients. **Materials and Methods:** Baile Felix Spa was certified in 1658, profiled in particular on the treatment of locomotor diseases. The climate is gentle, continental temperate and thermal mineral waters have temperature between 41–49 C, being bicarbonated sulphate, calcium, sodium, silicious, oligomineral. On the point of terms of value index of stress skin relaxing months are March to May and October. Osteoarthral elderly is not synonymous with degenerative vertebral peripheral arthrosis. The elderly not necessarily involved in the process of arthrosis but all changes are morfofunctional normaly on the individuals throughout life. Study was conducted in front of a group of 200 patients with diseases of the locomotory system. The treatment was applied varied according to the state. Lot of 125 patients studied had performed therapeutic cure, 50 and 25 cure prophylactic course of recovery. **Results:** Evaluation results were made after clinical criteria: pain events, local functional disorders (joint mobility, muscle troficity). **Conclusion:** The results were assessed at the end of cure for those who have curative treatment and recovery; the prevention belt will be appreciated in time. It noted an evolution of the patients better because joining harmonious natural factors with physical therapy agents.

0502PP104

IS THE EFFECT OF POWER TRAINING SUPERIOR TO STRENGTH TRAINING ON PHYSICAL PERFORMANCES OF THE COMMUNITY-DWELLING OLDER ADULTS-A META-ANALYSIS

Tzu-Wen Chen, Pay-Shin Pay-Shin, Wen-Yu Liu, Shou-Chuang Liu

Graduate Institute of Rehabilitation Science, Chang Gung University (Taiwan)

Background and Purpose: Strength training (ST) is often used to aim to enhance muscle (m.) performance of the elderly. However, power training (PT) is advocated recently to be an important component in older adults' training program due to the feature of emphasizing speed of m. contraction. But, is the effect of PT superior to ST on physical performance outcomes of the community-

dwelling older adults? **Methods:** Published studies from 1990 to May 2009 were included by using electronic and manual search according to the follow criteria 1) elderly lived in communities and age ≥ 60 y/o, 2) Control group received ST, 3) PT group did as fast as possible in concentric phase and within 2~3sec in eccentric phase, 4) Outcome measurements included assessment of m. performance or functional performance, 5) Study design was randomized control trial. The comprehensive Meta-analysis (V.2) software was used to calculate the effect size (Hedges' g), its 95% confidence interval, the Cochran's Q for homogeneity, sensitivity analysis, publication bias and to draw the forest plot. Adapting random or fixed effect model was according to homogeneity test results of the included studies. **Results:** A total of 13 studies were included in the analysis. The results of the meta analysis showed that PT can improve older adults' physical performance significantly than the ST in lower extremity m. power ($Q=111.9$, Hedges' $g=2.190$, 95% CI = 0.983~3.397, $p<0.05$, fail safe $n=285$), sit to stand ($Q=6.127$, Hedges' $g=0.909$, 95% CI=0.575~1.242, $p<0.05$, fail safe $n=36$) and gait speed (Hedges' $g=0.441$, 95%CI=0.120~0.762, $p=0.007$, fail safe $n=6$). **Conclusions:** The results support that PT program can improve physical performance in community dwelling older adults significantly more than ST programs do.

0502PP105

DEPRESSIVE SYMPTOM AND PHYSICAL FUNCTION DECLINE IN THE COMMUNITY-DWELLING ELDERLY

Meng-Tieh Chen¹, Hsu-Min Tseng², Huey-Shinn Cheng³, Shin-Chang Su¹, Tzu-Wen Chen¹, Syu-Han Liou¹, Shou-Jhuang Liou¹, Pay-Shin Lin¹

¹Graduate Institute of Rehabilitation Science, Chang Gung University, ²Graduate Institute of Health Care Management, Chang Gung University and ³Chang Gung Memorial Hospital, LinKou Medical Center (Taiwan)

Background and Purpose: The purposes of the study are to investigate the relationships between the depressive symptoms and the physical function (strength, speed, endurance, and balance) in the community-dwelling elderly in Taiwan, and to investigate the impact of changes in the physical function on the depressive symptoms over a 1-year-period. **Methods:** One hundred ninety one volunteered community dwelling older adults who can walk independently (including walking with devices) were recruited into this study. After signing the consent form, each subject accept face-to-face interview and self-report for basic data. Geriatric Depressive Scale – Short Form 15 (GDS-SF15) and Mini-mental state examination (MMSE) were assessed. Physical function tests were evaluated. The whole procedures were repeated again at follow-up in 1 year later. **Results:** Prevalence of depressive symptom in the study population is 23.9%. At baseline, the functional performance of TUG, Six-MWT, 30s-STs and OLS were significantly correlated with depressive symptoms ($\rho=-0.221, -0.224, -0.178, 0.222, p<0.05$, respectively) in univariate analyses. In multivariate analysis, only the association of Six-MWT and depressive symptoms remained significant (HR=0.994, Wald=4.465, $p<0.05$). However, with adjustment, without regular exercise and poor self-reported health status became significantly correlated with depressive symptoms (HR=5.902, 3.855, Wald=13.160, 9.226, $p<0.05$, respectively) cross-sectionally. The longitudinal data showed significant difference of the TUG between different depressive groups ($F=2.734, p=0.045$). There is an interaction between different depressive groups and time ($F=2.889, p=0.037$) in the Six-MWT. 30s-STs showed significant differences between different depressive groups ($F=3.921, p=0.010$), and between pre-post tests ($F=5.237, p=0.023$). **Conclusion:** In our study population, health and exercise status were associated with depressive symptoms better than physical function tests cross-sectionally. Changes of depressive symptom status were significantly associated with the lower-extremity (L/E) function longitudinally. Remitted depression group showed significant improvements in L/E function tests.

0502PP106

THE VARIATION OF MAGNETIC RESONANCE SPECTRUM OF LACTATE AND PHOSPHOCREATINE/CREATINE AFTER CEREBRAL ISCHEMIA/REPERFUSION IN RATS AT DIFFERENT TIMES.

Wan-Shun Wen^{1,2}, Wei-Jing Liao¹, Xiang-Ming Ye², Wan-Tong Yang¹, Bo Bi¹, Ni Wei³, Guo-Dong Zhang¹, Cheng Jiang¹

¹Department of Rehabilitation Medicine, Zhongnan Hospital, Wuhan University, ²Department of Rehabilitation Medicine, Zhejiang Provincial People's Hospital and ³Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences (China)

Purpose: To study the regulation of magnetic resonance spectrum of Lactate (Lac) and Phosphocreatine/Creatine (PCr/Cr) after cerebral ischemia/reperfusion in rats at different times. **Materials and Methods:** 32 male Wistar rats, weighting 160-200g, were randomly divided into normal control group and operation group, operation group included MCAO group, sham-operation group, and simple-infarction group, every group had eight rats. We chose proton magnetic resonance spectroscopy to analysis areas under the waves of Lactate and Phosphocreatine/Creatine and compared the data of the accumulated areas under the waves. All the groups were under the constant observation of MRS. **Results:** Compared with normal control group and sham-operation group, the wave of Lac appeared after ischemia in MCAO group, descended temporarily after reperfusion then kept the trend of rise; the wave of Lac appeared after ischemia in simple-infarction group, maintain the level at sometime then changed the trend of rise. The wave of PCr/Cr descended significantly after ischemia in MCAO group, then descended significantly again after reperfusion, maintain the low level; The wave of PCr/Cr descended significantly after ischemia in simple-infarction group, and maintain the low level all the time. **Conclusion:** The variation of magnetic resonance spectrum of Lactate and Phosphocreatine/Creatine after cerebral ischemia/reperfusion in rats can reflect the energy metabolites in head well. Whether reperfusion or not can not change the deficiency of energy.

0502PP107

EFFECTIVENESS OF FUNCTIONAL ELECTRICAL STIMULATION ON NEUROGENESIS AND BFGF, EGF EXPRESSION IN SUBGRANULAR AND SUBVENTRICULAR ZONE OF RATS WITH STROKE

Yun Xiang¹, Tie-bin Yan¹, Zhi-qiang Zhuang¹, Dong-mei Jin¹, Yuan Peng², Yan-nan Fang³

¹Sun Yat-sen Memorial Hospital of Sun Yat-sen University, ²the First People's Hospital of Guangzhou and ³the First Affiliated Hospital of Sun Yat-sen University (China)

Purpose: To investigate the therapeutic effect of functional electrical stimulation (FES) on rats behavior and to explore impacts of FES on endogenous neural stem cells (NSC) and basic fibroblast growth factor (bFGF), epidermal growth factor (EGF) in subgranular zone (SGZ) and subventricular zone (SVZ) of rats with stroke. **Materials and Methods:** One hundred and eight rats were randomly allocated into FES, placebo stimulation and sham-operated group with 36 in each group. Following the surgery of middle cerebral artery occlusion (MCAO), rats in FES group were treated with FES device for 3d, 7d or 14d. At each assessment point, behavior evaluation was carried out and nestin positive cells in the SGZ and SVZ were observed while protein expression and gene transcript of bFGF and EGF were measured. **Results:** Rats in FES group exhibited a significantly improved behavioral performance at 14d when compared to placebo stimulation group ($p<0.05$). Nestin positive cells in SGZ and SVZ of rats in FES group increased

significantly when compared to placebo stimulation group at 7d and 14d ($p < 0.05$) while protein and gene expressions of bFGF and EGF were also up-regulated significantly at the same assessment point ($p < 0.05$). **Conclusion:** FES could facilitate the behavioral recovery of paralyzed limb, promote proliferation of endogenous NSCs and up-regulate bFGF, EGF expression which may be one of the mechanisms of FES to initiate the neuronal plasticity of rats with acute cerebral infarction.

0502PP108

RUNNING EXERCISE EXHIBITED BENEFICIAL EFFECT TO CHRONIC KIDNEY DISEASES

Chiung-Chi Peng¹, Hsin-Ying Lu¹, Ying-Ru Chen¹, Tzu-Chi Lin¹, Chiu-Lan Hsieh², Robert Y. Peng³, Kuan-Chou Chen⁴

¹China Medical University, ²National Changhua University of Education, ³Hungkuang University and ⁴Taipei Medical University Shuang Ho Hospital (Taiwan)

Purpose: To investigate the strategy in view of rehabilitation to ameliorate chronic kidney diseases (CKD). Although regular exercise (RE) has become a favorable non-pharmacological intervention for treating the systemic metabolic syndromes, documented intervention of RE in the doxorubicin (DOX)-induced CKD model is still lacking. **Materials and Methods:** CKD in SD rats were induced by s.c. 8.5 mg DOX/kg and divided into six groups: the control and the DOX-treated groups with or without RE running at 30 m/min (for 30-min or 60-min/day, 3 days/week). Blood and urine were collected for biochemical analysis, sera were ELISA tested for the oxidative stress, inflammatory cytokines, and profibrotic growth factors. After a three-month span of experiment, kidneys and hearts were excised and subjected to pathological examinations. **Results:** Running RE significantly decreased levels of cholesterol and triglyceride. Serum albumin decreased steadily but insignificantly. Concomitantly, improved creatinine clearance was seen to occur in a dose-responsive manner. In contrast, the urine protein levels were totally unaffected. In addition, RE running (60 min) significantly altered the oxidative stress status. For level of SOD, the SOD/DOX-treated group had 7.56 U/ml compared to 10.63 U/ml of DOX/60 min exercise group. For level of TBARS, the DOX-treated group revealed a level 9.78 μ M, comparing to the DOX/60 min exercise group, which was reduced to 4.74 μ M. Concomitantly the inflammatory markers were downregulated, level of IL6 in DOX-treated group exhibited 18.50 ng/ml; while level of DOX/60 min exercise group was reduced to 17.48 ng/ml. **Conclusion:** RE running can be a potential alternative treatment or an adjuvant remedy for treating CKD.

0502PP109

IMPACT OF MOTOR SKILL TRAINING AND ENVIROMENT ON BEHAVIOR OF RATS

Xiaojun Zhu, Tong Wang, Jin Wang, Xiaojing Ding

Department of Rehabilitation, the First Affiliated Hospital of Nanjing Medical University (China)

Purpose: To evaluate the impact of motor skill training and enriched environment on behavior of rats. **Materials and Methods:** 52 male SD rats were randomly assigned to 4 groups: (1) Motor skill training group: rats running in a rotating cage (5 r/min) for 10 min/day and training on acrobatic task for 1h/d (M group, $n = 13$), (2) Enriched environment group: rats being housed in enriched environment for 2h/d (E group, $n = 13$), (3) Co-intervention group: rats with motor training plus enriched environment (R group, $n = 13$), (4) Control group: rats without any intervention (C group, $n = 13$). Each group of rats were bred in common way and had a two-week experiment. Body weight (BT), open field test (OFT) and sugar consumption test (SCT) were measured before

(V0) and after 2 weeks (V2) of experiment. **Results:** 1) At V0, there were no significant differences in BT, the latency and total score of OFT among 4 groups, the sugar consumption / weight (SC/W) in M group was higher than in E group ($p < 0.01$). 2) BT in each group at V2 were increased significantly than those at V0 ($p < 0.01$), but there were no significant differences among groups or between interventional groups and C group at V2. 3) The OFT latency, which longer in M group than in C group ($p < 0.05$), was shorter in E and R groups than in C group ($p < 0.05$) at V2, but there was no significant difference between E and R groups. In all assessments, only OFT latency in E group after intervention was significantly shorter than before intervention ($p < 0.05$). Analysis of variance (ANOVA) showed that only the enriched environment have effects on the OFT latency of rats ($p < 0.05$). 4) The OFT total score of each group decreased significantly after intervention than before intervention ($p < 0.01$), and the score in E group was significantly higher than in M group at V2 ($p < 0.01$). But there were no significant differences between interventional groups and control group at V2. 5) There were no significant differences in SC/W among each group at V2, but ANOVA showed that enriched environment had positive effects on S /W of rats ($p < 0.05$). Only SC/W in E group after intervention was significantly increased than before intervention ($p < 0.05$). **Conclusion:** Enriched environment can increase the alertness and delighted mood in rats. Both enriched environment and motor skill training contribute to stable emotion in rats.

0502PP110

THE EFFECT OF DETRAINING ON LEUKOCYTE AND IT'S DERIVATIONS IN ELITE MALE KARATE KA

Mohammad Javad Deylam¹, Mohammad Ali Gheraati^{2,3}, Abolfazl Deylami⁴

¹Ali Abad Katool Branch, Islamic Azad University, ²Pasteur Institute of Iran, ³Sports Medicine Research Center, Tehran Medical Sciences University and ⁴Chaloos Branch, Islamic Azad University (Islamic Republic of Iran)

Purpose: Various effects of physical activity on immune system and contradictory operations of diseases on training and performance are debatable topics that must be searched widely. A wide range of studies have investigated about variable effects of training, but a few researches have investigated about the effects of detraining on immune factors. To determine an aspect of this notion, we studied about effects of detraining on leukocyte and some of it's derivations like lanfosit, eozonofil and notrofil in elite male karate ka. **Materials and Methods:** we selected 20 elite male karate (22.4 \pm 1.3 years old) with international awards randomly who were volunteered to participate in the experiment (60 days hard training). The questionnaire of disease was filled and the personal anthropometrical information like height (Seca Instrument), weight (Camry Instrument) and fat percentage (Launch Caliper; Jackson-Polkas three point way) was taken before and after detraining period. The first blood donation was taken immediately after the last session of training period and it repeated after 21 days detraining. The group was denied to use any drug and supplement requested to use only those common nutrition program (they had to report those daily nutrition program). The amount of factors accounted by Cell-Counter Instrument (Beckman Z-1). Obtained data analyzed by paired *t*-test. All results have shown as mean \pm SEM. In all statistical comparisons, $p < 0.05$ was considered as the significant difference. **Results:** A significant difference was found in the amount of leukocyte concentration after-detraining in comparison with before-detraining period ($p < 0.05$). But regarding to the concentration of lanfosit, eozonofil and notrofil in after-detraining test, these differences were not significant compared to the last session of training. **Conclusion:** As a reason of some increases in leukocyte, the results suggest

that a three-week detraining enhances the amount of leukocyte which is known as main immune factor. On the other hand, it can be claimed that detraining may decrease the side-effects of hard training on body immune system so that it cause an increase in general health. It can be recommended that this research repeat in long-term and/or short term period in men and women, and under the experimental supervision of detraining period.

0502PP111

EFFECT OF ACUPUNCTURE IN RAISING THE CONTENT OF MONOAMINE NEUROTRANSMITTER IN BRAIN TISSUE OF CEREBRAL PALSY RATS

Zhenhuan Liu, Yong Zhao

Nanhai Affiliated Maternity and Children's Hospital of Guangzhou University of TCM (China)

Purpose: To detect the content of monoamine neurotransmitter in hippocampus, cortex, nucleus basalis of Meynert and brain stem of rats with cerebral palsy. **Materials and Methods:** To observe if acupuncture can change the content. To approach the mechanism of action of acupuncture in treating CP rats. Design: Through ischemia and hypoxia to make models of CP rats. After acupuncture treatment, rats are decapitated to get their brains. Separate all required regions of the brain and detect the content of monoamine neurotransmitter by spectrophotometer. Participants and Setting: 85 7-day-old rats are selected (11.5~18.4 g, 12.6±2.1g). Refer to literature to build models. Divide all successful models (72 rats) into 3 groups randomly (One with acupuncture I, One with acupuncture II, One without treatment). Besides, set up another group of sham operation (24 rats). **Materials and Methods:** Randomized controlled trial First group: Begin the acupuncture 24 hours after the operation. Second group: Begin the acupuncture a week later. Third group: without treatment. Fourth group: with sham operation. Outcome measures 1) death of rats; 2) content of monoamine neurotransmitter in brain tissue. Statistical methods: SPSS12.0 (Chi square test and ANOVA). **Results:** Compared with the group of sham operation, CP rats' content of dopamine (DA) and 5-hydroxytryptamine (5-HT) in nucleus basalis of Meynert, and their content of norepinephrine (NE) in brain stem are all lower. After acupuncture treatment the above-mentioned monoamine neurotransmitter all rise obviously. **Conclusion:** Raising the content of monoamine neurotransmitter could be one conceivable mechanism of action of acupuncture in treating CP rats.

0502PP112

CHARACTERIZATION OF AQUAPORIN GENES EXPRESSION IN INTESTINE OF HEAT STROKE RAT MODEL

Yen-Tsun Chen¹, Cho-Dang Tsai¹, Willy Chou²

¹Department of Physiology and Biophysics, National Defense Medical Center and ²Department of Rehabilitation, Chi-Mei Medical Center (Taiwan)

Purpose: Heat stroke is a dangerous disease that causes multiple organs failure including temperature-control disorders, central nervous system lesions and affects the liver, kidney and blood coagulation. Heat stroke patients are cool down and water supply as soon as possible, if the saving in time will be able to save lives. In this study we used rat model to evaluate the change of aquaporins in intestine during heat stroke condition, aquaporins are water channels playing an importance role for water osmosis to enter cells and tissues, and histological variation of aquaporins expression was shown in this study. **Materials and Methods:** 1)

Animal model of HS. The right femoral artery of rats were cannulated with polyethylene tubing (PE 50), under anesthesia (urethane 0.6 g/kg plus pentobarbital 30 mg/kg), for blood pressure monitoring. Core temperature (T_{co}) was monitored continuously by a thermocouple inserted into the rectum, while both mean arterial pressure (MAP) and heart rate (HR) were continuously monitored with a pressure transducer. The T_{co} of the anesthetized animals were maintained at about 36°C except in the heat stroke experiments. Unconscious, unrestrained rats were exposed to an ambient temperature (T_a) of 40±0.5°C in an incubator, in the absence of food and water, until a maximum T_c of 40.5°C was attained (period of the time : 1hr). Following removal from the heat incubator, food and water were provided ad libitum during undisturbed recovery at T_a of 25±1°C. 2) *Histological evaluation of intestine injury.* Melt paraffin off slides at 65°C for 20 min then treated with Xylene. Moreover treat with 100% EtOH twice. Air dry slides and stain with H&E stain kit (Novolink). 3) *Reverse transcription-polymerase chain reaction (RT-PCR).* Total RNA was extracted from tissues using TRIzol Reagent, followed by cDNA synthesis using oligo dT and reverse transcriptase. 4) *Immunohistochemistry.* Wash OCT embedded slides with PBT (Phosphate Buffer Saline with 0.02% Tween 20). Add primary antibody in blocking buffer, to each slide Cover and store slides at 4°C overnight. Wash slides with PBST. Add diluted secondary antibody in blocking buffer and incubate for 90 min. Wash slides with PBST then mount slides. **Results:** Aquaporin 1, 3, 5, 7, 8, 9, and 11 were expressed in rat small intestine. Detection mRNA by RT-PCR that aquaporin 1, 3 mRNA expression were decreased and aquaporin 7, 8, and 11 mRNA expression were increased in the condition of heating 60mins to recover for 0 hr, 1 hr and 6 hr. In immunohistologic results shown that aquaporin 1 and 3 were found in endothelial cell, enterocytes and epithelial cells after heating and aquaporin 7, 8, and 11 were increased at crypt after heating. **Conclusion:** Aquaporin 1 and 3 were found in endothelial cell of villi and disappeared after heating shown the damage of intestine, and aquaporin 7, 8, and 11 were increased at crypt of intestine after heating. The role of aquaporin 7, 8, and 11 expressed in crypt of intestine after heat stroke will be further studied.

0502PP113

UNIFORM DESIGN METHOD FOR OPTIMIZING PROPORTION OF FERULATE AND ANGELICA POLYSACCHARIDES ON ANGIOGENESIS

Wan Can^{1,2}, Ling-Li Liu¹, Wei-Jing Liao¹, Xiang Cui¹

¹The Department of Rehabilitation Medicine, Zhongnan Hospital of Wuhan University and ²The Department of Rehabilitation Medicine, Guangxi Zhuang Autonomous Region People's Hospital (China)

Purpose: To define the optimum dosage of two main ingredients in angelica on angiogenesis. **Materials and Methods:** 36 male SD rats were randomly divided into eight groups: the therapeutic groups (according to the uniform design table U6*(64) and the applying table, grouping six groups, n=5), the control group (n=3) and the ischemia group (n=3). To screening the expression of vascular endothelial growth factor (VEGF), angiopoietin-1 (Ang-1) and angiopoietin-2 (Ang-2) protein after middle cerebral artery occlusion (MCAO) for 2 hours by adopting uniform design methods for the best limited selection and optimization. **Results:** 86.250–102.500 mg/kg sodium ferulate with 25.417–96.875 mg/kg angelica polysaccharides could increase the expression of VEGF, decreased the ratios of Ang-1 and Ang-2 facilitating angiogenesis, while improved the expression of Ang-1 in choroid plexus to protect brain blood barrier (BBB) at the time of 22 h after reperfusion. **Conclusion:** Sodium ferulate and angelica polysaccharides possess bilateral regulation role to angiogenesis and vasopermeability in space and quantity at the earlier period of cerebral ischemia.

0502PP114

NEGATIVE PRESSURE MAY PROMOTE MIGRATION IN WOUNDED CELLS

Chih-Chin Hsu^{1,2}, **Wen-Chung Tsai**^{1,2}, **Jannie Ying-Syuan Chen**^{1,2}, **Carl Pai-Chu Chen**¹, **Simon Fuk-Tan Tang**^{1,2}, **Jong-Shyan Wang**³

¹Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital and ²Graduate Institute of Rehabilitation Science, College of Medicine, Chang Gung University (Taiwan)

Purpose: Negative pressure wound therapy has recently gained popularity in chronic wound care. This study attempted to explore effects of different negative pressures on cell migration in wound healing process. **Materials and Methods:** The electric cell-substrate impedance sensing technique was used to create a 5×10^{-4} cm² wound in the confluent monolayer Madin-Darby canine kidney cells and continuously monitor cell migration activities. The wounded cells were separately cultured in a self-constructed negative pressure incubator at ambient pressure and negative pressures of 75 mmHg, 125 mmHg and 175 mmHg. The effective time, complete wound healing time, healing rate, cells radius and wound area over time in cells at different pressures were evaluated. Traditional wound-healing assays were prepared for fluorescent staining of cells viability, tight junctions and actins. **Results:** The effective time (1.25 ± 0.27 h), complete healing time (1.76 ± 0.32 h), healing rate (2.94 ± 0.62 cm²/h), cell radius (11.5 ± 0.2 m) at complete wound healing of cells treated at negative pressure of 125 mmHg were significantly different from those at other three pressure conditions. Nearly total loss of tight junction activities and prominent cell migration features were identified in cells at the specific negative pressure. **Conclusion:** The study has established a cellular model for observing cell migration at different pressures uninterruptedly. Loosening of cell-cell junctions may induce actin assembly to enhance cell migration at negative pressure of 125 mmHg.

0502PP115

THE EFFECT OF PRE-OPERATIVE REHABILITATION IN HIGH RISK OPEN HEART SURGERY PATIENTS ON THE LENGTH OF HOSPITAL STAY

Willy Chou¹, **Wen-Chih Lin**¹, **Cheng-Hsin Lin**², **Chiao-Hsin Chen**¹, **Yi-Ru Chen**¹

¹Department of physical medicine and rehabilitation, Chi Mei Medical Center and ²Department of cardiovascular surgery, Chi Mei Medical Center (Taiwan)

Purpose: To evaluate the effect of pre-operative education of diaphragmatic breathing and coughing techniques in high risk patient scheduled for elective open heart surgery on the length of post operative hospital stay. **Materials and Methods:** From March 2008 to April 2009, patients who were scheduled for elective open heart surgery by the same surgeon were enrolled. 27 patient who met the criteria for high risk was randomized into intervention group ($n=13$) or control group ($n=14$). Intervention group received diaphragmatic breathing and coughing technique education before surgery by the same physical therapist. All patient received the usual cardiac rehabilitation after surgery. **Results:** Both groups were comparable at baseline. By hospital discharge, post operative pulmonary complication developed in

8 (61.5%) patient in the intervention group, 12 (85.7%) in the control group ($p=0.42$). One patient was re-intubated in the control group. The mean duration of postoperative hospitalization stay was reduced in the intervention group (6.03 ± 1.03 vs. 9.24 ± 3.29 day, $p=0.018$). **Conclusion:** Diaphragmatic breathing and coughing technique education before open-heart surgery in high risk patient can shorten hospital stay and decrease cost of care.

0502PP116

PROSTHETIC NEED IN TAIWAN FROM 1997 TO 2006

Wai Keung Lee

Department of Physical Medicine and Rehabilitation, Tao Yuan General Hospital, (Taiwan)

Purpose: To describe the prosthetic need in Taiwan from 1997 to 2006 (10 years). **Materials and methods:** This study is based on the data from the National Health Insurance Research Database (NHIRD) provided by the Bureau of National Health Insurance (BNHI) and managed by the National Health Research Institute (NHRI) in Taiwan. The sampling proportion of inpatient and outpatient data is 1 to 20 and 1 to 500 respectively. The sample size for each month was proportional to the amount of data for that month. **Results:** The crude amount of prostheses range is from 12,000 to 72,000. With the highest and lowest being 1998 and 2000 respectively. The gender ratio is male higher than female. It ranges from 2:1 to 1:1. The age distribution is: above 41 years old is 76.4%; above 51 years old is 83.6%; above 71 years old is 27.3%. **Conclusion:** The estimated average need of prostheses was about 33,000 per capita in Taiwan for 1997 to 2006. The older the age group, the higher the demand.

0502PP117

3 YEARS FOLLOW-UP OF THE REHABILITATION OF TRANSTIBIAL AMPUTATION CAUSED BY NECROTIZING SOFT TISSUE INFECTIONS : A CASE REPORT

Wai Keung Lee, **Shih-Kun Chang**, **Yau-Wai Wai**, **Won-Jean Lin**, **Huei-Yu Lo**, **Kien-Jung Wang**

Department of Physical Medicine and Rehabilitation, Taoyuan General Hospital, Department of Health, Executive Yuan (Taiwan)

Purpose: To follow-up the rehabilitation of transtibial amputation caused by necrotizing infections. **Materials and Methods:** To report a 50 year-old man who suffered from left transtibial amputation and split thickness skin grafts due to necrotizing soft tissue infections was trained to overcome the following problems: 1. Poor endurance, cardiopulmonary function and muscle strength of bilateral lower limbs. 2. The loss of dorsiflexion in the right ankle that resulted from excision of the anterior tibialis muscle. 3. The fragility of the skin on the left stump as a result of the split thickness skin graft. 4. The irregular shape of the stump for prosthetic fitting. **Results:** After a 3-year follow-up, the patient can walk with a regular cane 8 hrs per day. The ADL is independent. The most common problem of the silicon socket is over-sweating, but it subsides after 1 year of fitting. The satisfaction rating changes from the initial 5 to 8 on a 10-point scale (being the maximum) after 3 years. **Conclusion:** It is suggested to prescribe the above prosthesis for the transtibial amputation caused by necrotizing soft tissue infections.

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