結合防震技術與超音波測量舌體於中文聲母音標發音之結果

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Abstract

BACKGROUND: To apply the cushion-scanning technique (CST) and B+M mode ultrasonography in quantitative analysis of tongue movement during production of Mandarin consonants. The twenty-one syllable initial consonants were testing targets. METHODS: Thirty-four normal persons (18 female, 16 male) were enrolled in this study. Each individual was asked to enunciate each consonant according to the phonetic symbols on the paper shown, and to read each consonant three times at the rate of one consonant per second. A noninvasive diagnostic technique, computer-assisted B-mode plus M-mode ultrasonography, was used in combination with the CST to assess their tongue movement. The sonographic signals were recorded on a video recorder and then transferred to a personal computer via a frame grabber for digital assessment. RESULTS: Artifact-free images were obtained. M-mode images show an amplitude-time diagram while B-mode images reveal midsagittal tongue configuration. The average of the range of tongue movement in male speakers during production of the consonant ㄅ，ㄆ，ㄇ，ㄈ，ㄉ，ㄊ，ㄋ，ㄌ，ㄍ，ㄎ，ㄏ，ㄐ，ㄑ，ㄒ，ㄓ，ㄔ，ㄕ，ㄖ，ㄗ，ㄘ and ㄙ was 9.02;6.77;7.05;7.02;7.51;6.88;7.21;6.93;13.48;12.84;5.39;4.54;5.61;4.44;4.11;4.20;3.12;3.76;5.17;3.81 and 3.28 mm respectively. That in female speakers was 6.51;5.42;5.09;5.44;5.62;5.38;4.79;6.75;10.07;9.46;4.17;4.31;4.92;3.89;5.51;4.59;3.70;3.84;2.88;3.67;3.07 and 3.62 mm respectively. Patterns of tongue movement and configuration were found to be consistent for these normal speakers during consonants production. CONCLUSION: The computer-assisted B-mode plus M-mode ultrasonography in combination with the cushion-scanning technique provides a standardized and objective ultrasound examination for the clinical investigation of tongue movement during consonant articulation. Real-time observation, as well as quantitative measurement of tongue movement during articulation is readily available. It is our aim to continue applying this tool on future patients to reach a new realm in the field of future speech research.