Automatic Spinal Fracture Diagnosis and Surgical Management based on 3D Image Analysis and Reconstruction of CT Transverse Sections

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摘要

Abstract

This paper describe an image analysis method that uses automatic algorithms for the evaluation of 3D geometry of vertebral bones and spinal anatomic curve in the diagnosis of compression and burst fractures. The method uses a radial B-spline curve to approximate the ellipse-like vertebral body on a transverse section with a concave feature to evaluate the compression of the canal, and infers the anatomic curve of a vertebral body by linearly regressing the centers of B-spline approximate ellipse-like boundaries of the transversal sections passing the vertebral body. This method, then, calculates the reduced angle and height for recovering the compression fracture by comparing the regressed centerlines of neighboring bodies of the fracture body with the normal spinal anatomic curve. The prototype system can be used as a qualitative and quantitative toll for the diagnosis of compression and burst fractures using transverse sections, and for the instruction to plan accurate surgicale surgical procedures. An example demonstrates the fractured spine can be accurately diagnosed and instructed to operate by our method that achieved anatomic stability, released the syndrome of nerve compression and bone pain.