

A 3D Finite Element Analysis of the Second Cervical Vertebra (Axis) to Study the Odontoid Fracture

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Abstract

Considering the life threatening consequences of the cervical spine injuries, the study of its biomechanical behavior has become important. The most common axis (second cervical vertebra) injury is called odontoid fracture, the majority of which is type II or dens fracture. In this study, an exact 3D finite element model of axis was developed and analyzed. To evaluate the stress distributions in the odontoid process during type II injuries, pressure loads were applied on the dens at locations where it is likely to come into contact with the surrounding neck construct. Results indicate stress concentration in the odontoid junction with the vertebral body, which suggests that there is a possibility of occurring type II fracture in the case of impaction of odontoid with atlas anterior arch, lateral masses and transverse ligament.

Keywords: Cervical vertebra; Odontoid fracture; Finite element analysis; Stress distribution

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¹ Axis; 2nd Cervical Vertebra
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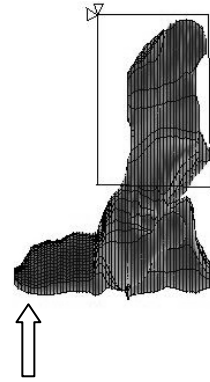
⁷ Computer Tomography
¹¹ MSC.PATRAN

⁸ DICOM
¹² Young's module

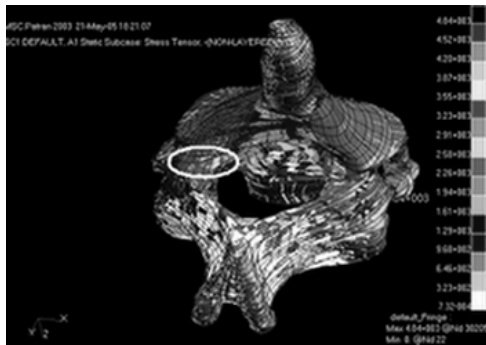
⁹ Mimics
¹³ Mega Pascal

¹⁰ IGES
¹⁴ MSC.NASTRAN

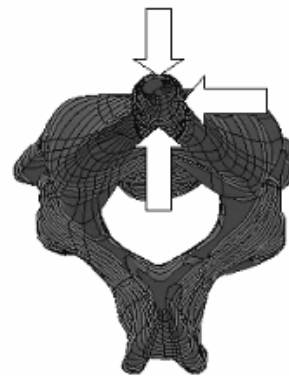
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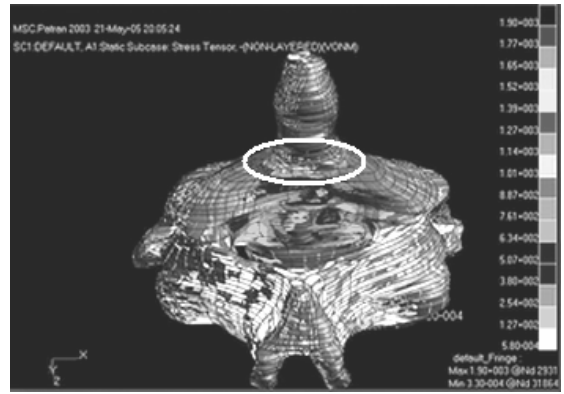
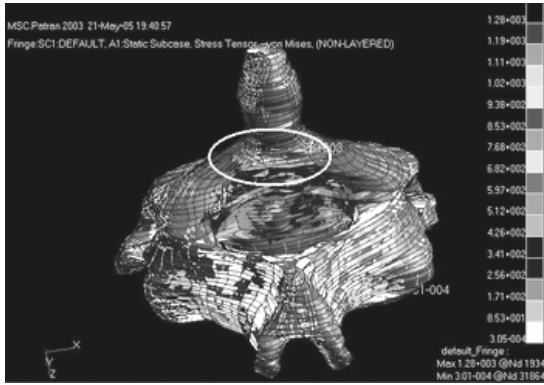


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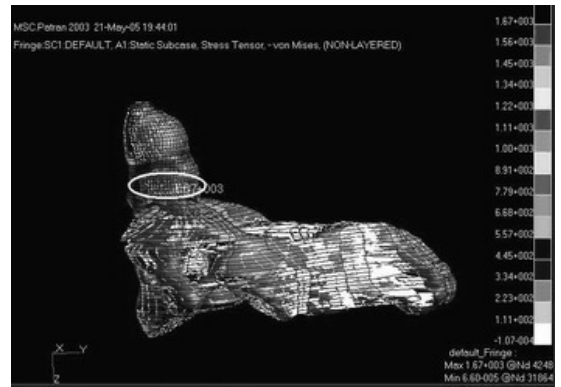
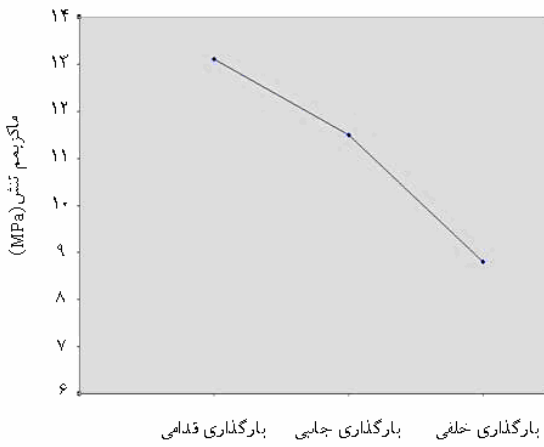
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