FINAL PROJECT

FINITE ELEMENT ANALYSIS OF STRENGTH AND STIFFNESS OF INJURED AND IMPLANTED THORACOLUMBAR

Submitted as One of the Requirements for Completing a Bachelor's Degree Education

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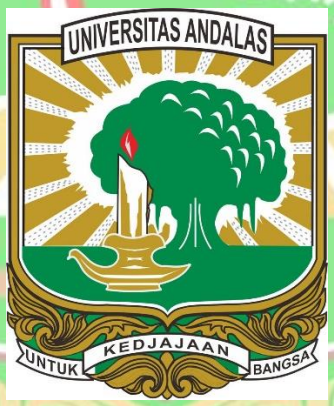

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ABSTRACT

Thoracolumbar is the most often fractured part in the spine. Thoracolumbar fracture results from several axial loading of the spine usually due to fall, vehicle accident, etc. Thoracolumbar fracture can lead to some serious injuries like significant disability, deformity and neurological deficit. Posterior instrumentation with pedicle screw and rods had been the most used method for surgical stabilization. Surgical treatment of thoracolumbar fracture was aimed to decompress the neural tissue, stabilize the columns, which requires rigid fixation. Spinal instrumentation has recent advances over the years and today's spinal surgeon is well equipped to rigidly fix the spine with the complex cases. Normal, injured and implanted thoracolumbar are modelled in 3D design software and imported to MSC Marc Mentat to simulate with 500 N compressional load and 7.5 N.m moment to analyze the strength and stiffness of the models with comparing the displacement and the von Mises stress in the simulation. There were some significant differences between the displacement of normal, injured and implanted thoracolumbar. The displacement of thoracolumbar increases after injury and make it more unstable, and after implanting the implant, the displacement is decrease and make thoracolumbar more rigid. The von Mises stress of injured thoracolumbar is higher than normal thoracolumbar which high stress happened in fracture L1. After adding the implant, the von Mises stress reduce at fracture L1. Implanting the implant makes the stress higher at the implant especially in pedicle screw.

Keywords: Thoracolumbar, Fracture, Spinal Implant, Biomechanics, Finite Element Analysis.