



GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

MECHANICAL ENGINEERING PROGRAM

MSc Thesis Defense

YEDİTEPE SPINE MESH: MODELING AND VALIDATION OF A PARAMETRIC FINITE ELEMENT MODEL OF THE LUMBAR SPINE

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(Thesis Supervisor: Asst. Prof. Dr. Ali Fethi OKYAR)

Date & Time : Monday, July 6th 2020, 2:00 pm

Place: <https://meet.google.com/tra-eqsi-ahz>

All interested are cordially invited.

ABSTRACT

Finite element analysis is a powerful tool that is often used in order to study the biomechanical response of the lumbar spine. Anatomical meshes that are used for such analysis are often fixed, hence preventing the tuning of morphometrical parameters. The primary objective of this study was to develop a segmented finite element model and a parametric finite element model that would allow the independent tuning of previously determined morphometrical parameters of the L4 L5 spinal level. An extensive verification procedure was applied via convergence studies. As our validation metrics, moment-rotation curves, intradiscal nuclear pressures, and facet joint contact forces were collected from these both models, as well as the data from the literature, and compared with each other in order to validate our models. Segmented finite element model was observed to be in a good agreement with the literature, therefore, validated for all of our validation metric predictions. The parametric finite element model, on the other hand, was observed to be in a good agreement with the segmented finite element model, and with the literature, for its moment-rotation curve predictions and intradiscal nuclear pressure predictions. Facet joint contact forces were observed to be overpredicted by the parametric finite element model. Future study on the facet joint geometry and inclusion of the non-symmetric nature of the vertebrae geometry was proposed as a future study.

BIOGRAPHY

Oğulcan Güldeniz is an MSc Student at the Mechanical Engineering Program of Yeditepe University. He graduated from Mechanical Engineering Dept, Yeditepe University, in 2018. He did her internship at the University of Twente, the Netherlands in Biomechanical Engineering Dept., and the Manipal University of Technology, India, in the Aeronautical & Automobile Engineering Dept. After his completion of MSc. studies, he will seek for a relatable Ph.D. position to continue his studies in Biomechanics.