
Guo, Li-Xin; Teo, Ee-Chon

*Journal of Spinal Disorders & Techniques. 19(2):118-124, April 2006*

**Abstract:**
Objectives: A three-dimensional finite element (FE) model of the lumbar spine L3-L5 segment, the ligaments of which were assumed to be nonlinear materials, was established based on the actual vertebra geometry to investigate the influence of the injury lumbar spine on its adjacent components on the condition of whole-body vibration. Several injury conditions of the spine components were assumed, such as facetectomy, nucleotony, and removal of bony posterior elements.

Methods: The dynamic FE analyses were carried out for those FE conditions under cyclic compression loads at the frequencies of 5 and 10 Hz. Then a comparison between the dynamic results and the static results was conducted to analyze the influence of both the nucleus injury and the facet joint injury on the adjacent intervertebral discs.

Results and Conclusions: The results indicate that the lumbar spine exhibits not only vertical vibration but also the flexion-extension motion during vibration. The denucleation will cause high stress and large disc bulge on the disc annulus under vibration. The facet joints of lumbar spine can limit the motion amplitude of flexion-extension and protect both the posterior regions and the posterolateral regions of disc annulus from large strain and stress during vibration. The facet joint removal will increase the stress of disc annulus by around 15% at the posterior region for the conditions of nucleotomy or no vibration. The stress of annulus circumference is higher at the posterolateral region than that of other regions of annulus circumference, and the facet joint removal may exacerbate the intervertebral disc degeneration on the condition of whole-body vibration.