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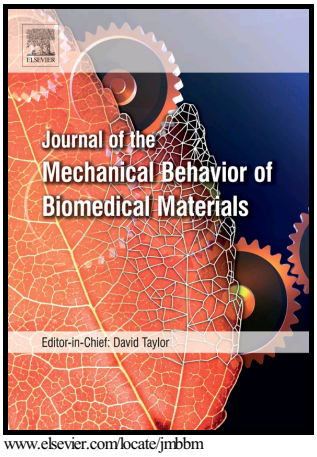

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Fatigue responses of the human cervical spine intervertebral discs

Narayan Yoganandan[1,2*], Sagar Umale[2], Brain Stemper[2], Bryan Snyder[3]

[1]Department of Neurosurgery, Medical College of Wisconsin, Milwaukee, WI

[2]Department of Orthopaedic Surgery Medical College of Wisconsin, Milwaukee, WI

[3]Center for Advance Orthopaedics Studies, Beth Israel Deaconess Medical Center, Boston, MA

∗Corresponding author at: Narayan Yoganandan, PhD Professor of Neurosurgery and Orthopaedic Surgery Chair, Biomedical Engineering Department of Neurosurgery Medical College of Wisconsin Milwaukee, WI 53226. Tel.: +414-384-3453; Fax: 414-955-0115. yoga@mcw.edu

Abstract

Numerous studies have been conducted since more than fifty years to understand the behavior of the human lumbar spine under fatigue loading. Applications have been largely driven by low back pain and human body vibration problems. The human neck also sustains fatigue loading in certain type of civilian occupational and military operational activities, and research is very limited in this area. Being a visco-elastic structure, it is important to determine the stress-relaxation properties of the human cervical spine intervertebral discs to enable accurate simulations of these structures in stress-analysis models. While finite element models have the ability to incorporate viscoelastic material definitions, data specific to the cervical spine are limited. The present study was conducted to determine these properties and understand the responses of the human lower cervical spine discs under large number of cyclic loads in the axial compression mode. Eight disc segments consisting of the adjacent vertebral bodies and the disc joint along with the longitudinal ligaments were subjected to compression, followed by 10,000 cycles of loading at 2 or 4 Hz frequency by limiting the axial load to approximately 150 N, and