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Author(s)	Von Forell, GA; Stephens, TK; Samartzis, D; Bowden, AE
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LOW BACK PAIN: A BIOMECHANICAL RATIONALE BASED ON "PATTERNS" OF DISC DEGENERATION

Gregory A. Von Forell, PhD (1); Trevor K. Stephens (1); Dino Samartzis, DSc (2); Anton E. Bowden, PhD (1)

(1) Dept of Mechanical Engineering, Brigham Young University, Provo, UT, USA (2) Dept of Orthopaedics and Traumatology, University of Hong Kong, Pokfulam, Hong Kong, SAR, China

INTRODUCTION: Due to the complex etiology of low back pain, it is often difficult to identify the specific factors that contribute to the symptoms of a particular patient. Disc degeneration is associated with the development of low back pain, but its presence is not always synonymous with symptoms. However, studies have suggested that "patterns" of disc degeneration may provide insight into such pain generation rather than the overall presence of degenerative changes. Specifically, individuals with contiguous multilevel disc degeneration have been shown to exhibit higher presence and severity of low back pain as compared to patients with skipped-level disc degeneration (i.e. healthy discs located in between degenerated discs). The objective of the present work was to determine how patterns of multi-level disc degeneration influence the biomechanical behavior of the lumbar spine.

METHODS: Biomechanical differences between clinically reported patterns of degeneration were analyzed using nonlinear finite element models of the lumbar spine. Thirteen separate patterns were simulated under normal physiological loading conditions in each of the primary modes of spinal motion.

RESULTS: The results showed that stresses and forces of the surrounding ligaments, facets, and pedicles at certain vertebral levels of the spine were generally lower in than skipped-level disc degeneration cases than in the contiguous multi-level disc degenerations cases even when the skipped-level contained more degenerated discs.

DISCUSSION: To our knowledge, this is the first study to illustrate the biomechanics of specific patterns of disc degeneration of the lumbar spine. Utilizing a multi-level disc degeneration model, our study provides insights as to why various patterns of disc degeneration throughout the lumbar spine may affect motion, as well as deformation of soft tissue structures that may have bearing in the clinical pathway of pain generation.