Biomechanical Evaluation of the Verteloc™ Facet Stabilization System - An in vitro Study

M. Kodigudla¹, V. Palepu¹, V. Kaul¹, V. Goel¹, H. Elgafy², S. Kutnik², T. Vestgaard³
¹University of Toledo, Bioengineering, Toledo, OH, United States, ²University of Toledo Medical Center, Orthopedic Surgery, Toledo, OH, United States, ³VG Innovations, Inc., Winston-Salem, NC, United States

Introduction: Spinal stenosis is one of the major causes of back pain. The treatment options for low back pain may range from conservative treatment to instrumented fusion. Allograft-based facet stabilization system (FSS), as an alternative to posterior pedicle screw instrumentation, is currently being explored by clinicians. The dual geometric dowel implant is placed in between the facets while they are distracted. This allows for compression fit of the implant when the surgical instruments are removed. The purpose of this study is to demonstrate the biomechanical stability of the facet stabilization system (FSS) compared to pedicle screw system (PSS).

Material and methods: Six fresh-frozen ligamentous motion segments (3 L2-3 and 3 L4-5) were procured. The cranial (L2 or L4) and caudal (L3 or L5) ends of each motion segment were potted using bondo (a 2-part epoxy resin). Loads were applied at the cranial end while the caudal end was fixed to the base of the testing apparatus. Specimens were subjected to pure moments (up to 8Nm) in flexion (flex), extension (ext), right and left lateral bending (rb & lb), and right and left axial rotation (rr & lr). Motion (ROM) of L2 or L4 vertebral body with respect to the fixed vertebra was tracked using the Optotrak motion measurement system (NDI, Waterloo, Canada).

Results: In comparison to intact, the motion of the spine stabilized with FSS reduced in ext (59%), flex (55%), lb (42%), rb (31%), lr (12%) and rr (22%), Figure 2. The corresponding values for spine stabilized with PSS were: ext (59%), flex (63%), lb (47%), rb (32%), lr (31%) and rr (48%).
The data demonstrates FSS provides comparable stabilization in flexion/extension, lateral bending and axial rotation to traditional methods (i.e., PSS). Stabilization was significant in all modes, except axial rotation. Statistically, there was no significant difference between the two stabilization systems evaluated in this study.

**Discussion:** The FSS is effective in restricting facet joint movement and thereby decreases the motion across segment. This method may provide stabilization and fixation for minor instabilities, which can allow the joint to fuse through integration with the allograft. This study demonstrates that the load-displacement responses of the FSS are similar to existing methods of stabilization.

Figure 2: Mean and SD motion at 8 Nm for the Intact, Facet Stabilization System (FSS) and Pedicle Screw System (PSS)

[Figure 2]