**Does the Design and Configuration of Transverse Connectors Effect the Stability of Posterior Instrumentation in a Cervical Laminectomy Model?**

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**INTRODUCTION:** Posterior spinal instrumentation provides increased stability while achieving high fusion rates. Transverse connectors are frequently used as part of long bilateral rod instrumentation constructs 1, 2. However, in the cervical region, the optimal design, number, and the location of transverse connectors for multilevel fusion is not known. The present study focuses on evaluating two transverse connector designs on the biomechanical stability of a long segment posterior instrumentation in the cervical spine and also addresses the clinical question on the location and number of the connectors.

**METHODS:** Seven human cervico-thoracic (C2-T1) cadaver spines were dissected, avoiding disruption of spinal ligaments, joints and disks. Transverse connectors with two different designs, Top-Loading (TL) which tightly clamps onto the rod with a set screw and Head-to-Head (HH) connector which connect directly onto the heads of the polyaxial screws, were tested in three different configurations (Figure 1). Lateral mass screws with bilateral rods (PI) from Ellipse™ Stabilization System [Globus Medical] were instrumented from C3-C7. Each spine was initially tested in the intact condition. After intact testing, all the spines were sequentially tested in the order 1) PL; 2) TL I; 3) TL II; 4) TL III; 5) HH I; 6) HH II; 7) HH III. A wide en-bloc laminectomy was then performed from C3-C7 and the above mentioned sequence was repeated. An unconstrained pure moment of 1.5 Nm was applied to all the spines mounted on a 6 DOF spine simulator. Range of motion (ROM) in flexion, extension, lateral bending and axial rotation was measured using Optotrak Certus (NDI, Inc. Waterloo, Canada) motion analysis system. Statistical analysis was performed using one way ANOVA with a significance of p<0.05.

**RESULTS:** All instrumented constructs, significantly reduced ROM compared to intact condition (p<0.05). Adding PI significantly reduced ROM by 77.2% in flexion, 75.6% in extension, 86.6% in lateral bending, 86.1% in axial rotation pre-laminectomy and by 75.4% in flexion, by 76% in extension, by 80.6% in lateral bending and by 76.4% in axial rotation post-laminectomy (PL) compared to intact condition (p<0.05). Transverse connectors significantly reduced ROM only in PL axial rotation, compared to PL PI (Figure 2). Statistically, no significant difference was observed between the HH connector and the TL connector in any loading directions. For all different configurations tested, HH III, TL II, and TL III configurations significantly reduced the ROM by 12.9%, 11.9%, and 11.9%, respectively in axial rotation, compared to the PL PI construct (p<0.05).

**DISCUSSION:** The biomechanical advantage of transverse connectors, as expected, was significant only in axial rotation. The two transverse connectors’ configuration at the distal and proximal end of the multi-level fusion construct had the highest stability compared to using only one transverse connector or midway two transverse connectors in a laminectomy model. This biomechanical stability offered by the different configurations of transverse connectors maybe useful to surgeons especially when instrumenting long posterior cervical constructs.

**REFERENCES:**