Evaluation of Interlaminar Lumbar Instrumented Fusion (ILIF) in a Sheep Model

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Introduction: Numerous conservative and non-conservative care treatments have been presented for management of neurogenic claudication secondary to degenerative lumbar stenosis. Research suggests that surgical intervention for this pathology yields better results than the non-surgical option. However, degenerative stenosis predominantly affects the elderly population, who because of preexisting comorbidities do not tolerate large surgical procedures and the inherent risks and morbidities associated with traditional surgical techniques. The most frequently utilized surgical techniques include interbody arthrodesis and posterolateral fusion, and less commonly, but growing in popularity, interlaminar/interspinous fusion procedures. ILIF is a minimally disruptive, assisted decompression and fusion procedure that uses an interlaminar spacer and a spinous process plate.

Methods: 8 sheep received an interspinous process translaminar procedure at L2-3 and L4-5 and were grouped into four different treatment categories, where all groups included an allograft spacer: Group I (n=4 levels) with a biologic in all levels, Group II (n=4 levels) with a biologic and interspinous plate, Group III (n=4 levels) with an interspinous plate only (no biologic), and Group IV (n=4 levels) with an allograft spacer alone (no biologic). The sheep were anesthetized and radiographed 3 months after surgery (to follow progression of fusion) and then humanely euthanized 6 months postoperatively. The spines were explanted and a full histological and radiographic (plain films and CT) evaluation was conducted to assess fusion.

Results: 16 spinal levels were treated. The operative segment was determined to be solidly fused if there was continuous new bone formation between the spinous processes or between two adjacent laminae. Bony fusion was unequivocal in 4/4 of the operative levels in both Groups I and II. However, upon visual inspection, there was notably greater volume of bone formation with a more radiodense appearance in those specimens where fusion was supplemented with an interspinous plate (Group I). Bony fusion was seen radiographically in 2/4 of the operative levels in the Groups III and IV (those levels without a biologic).

Conclusions: ILIF is a less disruptive approach to traditional instrumented posterior lumbar decompression and fusion. In a sheep model, radiographic and histopathologic fusion was well demonstrated. This procedure results in a fused segment in the lumbar spine when treated in conjunction with an allograft spacer, a spinous process plate, and a biologic.