Clinical: Lumbar Fusion (i.e. MIS, TLIF, XLIF, Axial LIF, ALIF)

Alterations in Disc Height, Foraminal Height and Foraminal Width Following One- and Two-Level AxiaLIF: A Radiological Analysis

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Background context: Degenerative changes of the lumbar motion segment often lead to stenosis of the spinal canal or neuroforamen. Axial lumbar interbody fusion (AxiaLIF) is intended to indirectly increase and stabilize foraminal dimensions by restoring disc height in patients with degenerative disc disease, thereby relieving axial and radicular pain.

Purpose: To investigate the effects of AxiaLIF on anterior disc height, posterior disc height, foraminal height and foraminal width as well as to determine the effectiveness of this minimally-invasive technique for indirect decompression and restoration of disc height.

Study design: Retrospective linear radiological analysis study.

Patient sample: 81 patients who met the inclusion criteria and underwent a 360 degree lumbar interbody fusion at L4-S1 or L5-S1 with AxiaLIF between November 2008 and May 2010.

Outcome measures: Change in anterior lumbar disc height, posterior lumbar disc height, foraminal height and foraminal width.

Methods: All patients who underwent a 360 degree lumbar interbody fusion at L4-5 and L5-S1 with AxiaLIF between November 2008 and May 2010 were included. The preoperative and 3-month postoperative digital radiographs were reviewed and analyzed. Disc heights were measured in the planes of the anterior and posterior surfaces of the adjacent vertebral bodies. Foraminal height was measured as the maximum distance between the inferior margin of the pedicle of the superior vertebra and the superior margin of the pedicle of the inferior vertebra. Foraminal width was measured as the shortest distance between the edge of the superior facet of the caudal vertebra and the posterior edge of inferior endplate of the cranial vertebra. Potential magnification error between pre- and post-operative radiographs was corrected using the anterior vertebral height of L5 vertebra.

Results: Our study shows that there is a mean increase of 42.0% in posterior disc height (PDH) at L4-5 and 21.5% in anterior disc height (ADH) at L4-5 and PDH mean increase of 33.6% and 16.3% in ADH at L5-S1 in 2-level AxiaLIF cases. Similarly the mean change in foraminal height (FH) was 12.6% at L4-5 and 10.8% at L5-S1 in 2-levels AxiaLIF. The mean change in foraminal width (FW) at L4-L5 was 19.9% and 29.1% at L5-S1 in 2-levels AxiaLIF. In the single level AxiaLIF group, the mean change in PDH was 43.1%, the ADH change was 17.5%, the average change in FH was 14.4%, and mean change in FW was 25.3%. The change is reflected as a percentage of the preoperative value. All changes from preoperative to postoperative values were statistically significant.

Conclusions: AxiaLIF appears to be an effective minimally invasive device to increase disc height and neuroforaminal area. Our findings appear equivalent to anterior lumbar interbody fusion and transformaminal lumbar interbody fusion in terms of indirect decompression and increase in disc height. This, in combination with the added benefit of preserving the annulus, anterior longitudinal ligament, and posterior longitudinal ligament, suggests the AxiaLIF is an excellent alternative for this patient population. However, additional follow-up studies are necessary to confirm the long-term ability of the implant to maintain fusion and preserve the improvements in disc and foraminal area.