Effect of Transforaminal Lumbar Interbody Cage Position for Patients with Coronal Disc Asymmetry

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INTRODUCTION:

Transforaminal lumbar interbody fusion (TLIF) with pedicle screw fixation is a common procedure for achieving interbody arthrodesis. TLIF can maintain intervertebral height and lordosis while providing disc space bony fusion. Despite its strengths, Takashi et al. found that standard placement of TLIF cages in the center of the intervertebral disc has worse radiological outcomes in patients with greater severity of coronal imbalance. The aim of this study is to investigate the effect of an lateralized TLIF placement, in the lateral third of the disc space, as a method to achieve coronal plane correction.

METHODS:

Adult patients who underwent a single level TLIF at a single-center institution were identified. Segmental as well as L1-S1 cobb angle and L1-S1 lordosis was measured at baseline, and at 6-week, 1-year, and 2-year follow-ups. Cage placement was classified as lateralized (placement of cage in the lateral third of disc space) or standard (placement of cage in the central third of disc space, Figure 1) by assessing AP radiographs from 6-week follow-up. Association between lateralized vs standard lumbar cage placement and postoperative cobb angle correction was evaluated using multivariate linear regression. Multivariate linear regression was used to evaluate this association while controlling for BMI, age, gender, and CCI score. Sensitivity assessment was performed by repeating this analysis exclusively on patients who received single level TLIF at L4-L5. Effect of cage placement on L4-L5 cobb angle and L1-S1 cobb angle on these patients was evaluated using multivariate linear regression. Multivariate linear regression was also used to evaluate the association between symmetry of cage placement and correction of L1-S1 lordosis. Effect of symmetric vs asymmetric cage placement on incidence of cage subsidence and rate of pseudoarthrosis was evaluated using chi square analysis.

RESULTS:

In total, 501 patients with single level lumbar fusion were included with a mean age of 61.2 years, mean CCI of 2.69, and 55.0% of female sex. Preoperatively, mean L1-S1 cobb angle was 4.4°, and postoperative cobb angle had a mean of 3.8°. Preoperative, mean L1-S1 lordosis was 49.46°, and postoperative lordosis had a mean of 48.9°. In this cohort, 108 (21.6%) patients received lateralized cages. Multivariable linear regression model controlling for age, gender, BMI, and CCI revealed that lateralized cage placement was associated with greater correction of L1-S1 Cobb angle (3.93° vs 3.15°, $p = 0.014$). Assessment of cobb angle correction only in patients fused at L4-L5 showed a correlation between lateralized cage placement and increased postoperative L1-S1 Cobb angle correction (3.77° vs 2.75°, $p = 0.025$). Assessment of association between cage placement location and L4-L5 Cobb angle correction showed that lateralized cage placement was associated with increased cobb angle correction (2.8° vs 2.08°, $p = 0.033$). Assessment of lordosis correction showed no significant association with cage location (- 0.99° in the lateralized group vs. - 0.73° in the standard group, $p = 0.819$). Chi square analysis of cage placement and incidence of subsidence in L4-L5 fusion patients found a higher rate of subsidence in lateralized placed cages (9.5% asymmetric vs 2.1% symmetric, p = 0.05). There was no statistically significant difference in the rate of pseudoarthrosis between groups (5.2% lateralized vs 5.3% standard; p=0.98).

DISCUSSION AND CONCLUSION:

Lateralized TLIF cage placement may provide greater coronal plane correction in patients with segmental disc asymmetry when compared to standard cage placement, and appears to be achieved without compromising sagittal correction. These results may assist with optimized cage placement in patients with asymmetric lumbar disc collapse.

Figure 1: Figure to demonstrate standard TLIF cage placement (A) compared to an lateralized TLIF cage in the lateral third of the intervertebral disc