A Biomechanical Study of OLIF with Unilateral and Bilateral Fixation

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INTRODUCTION

Due to its tissue sparing surgical approach, oblique lumbar interbody fusion (OLIF) has become increasingly more common as compared to existing methods for obtaining a solid lumbar fusion. OLIF is an anterolateral approach for lumbar intervertebral fusion that avoids trans-psoas surgery and the attendant risks of muscular and neurologic injury. Implementation of minimally invasive surgery with the OLIF approach motivated the development of cage designs that are compatible with relatively smaller incisions. There remain questions as to the degree of adjunctive fixation required, if any, to achieve acute stability with anterior and/or posterior fixation options. Accordingly, the effect of cage footprint on acute stability with the OLIF approach was investigated along with the effect of augmenting the cage implantation with combinations of either an anterior plate or pedicle screw fixation.

The following surgical conditions were tested:

(1) **Cage** only,

(2) **Bilateral** pedicle screws and rods,

(3) **Bilateral** pedicle screws and rods and a **2 hole plate** (obliquely placed),

(4) **Ipsilateral unilateral** pedicle screws and rods and a **2 hole plate** (obliquely placed);

(5) **Contralateral unilateral** pedicle screws and rods and a **2 hole plate** (obliquely placed).

Introduction (Continued)

The objective of this study was to determine the contribution of unilateral or bilateral rod fixation to the acute stability obtained with cages inserted using an OLIF approach to the lumbar spine.

METHODS

Six human cadaveric lumbar (L1-L5, 43.8 +/- 9.75 yrs.; 0.87 +/- 0.20 gHA/cm2) spine sections were utilized in this project. The spines were tested using a standard kinetic protocol in flexion-extension, right-left lateral bending, and axial rotation to +/- 6 N-m . Cages (OLIF-25, Medtronic, Memphis, TN) were placed in the L3-L4 intervertebral space.

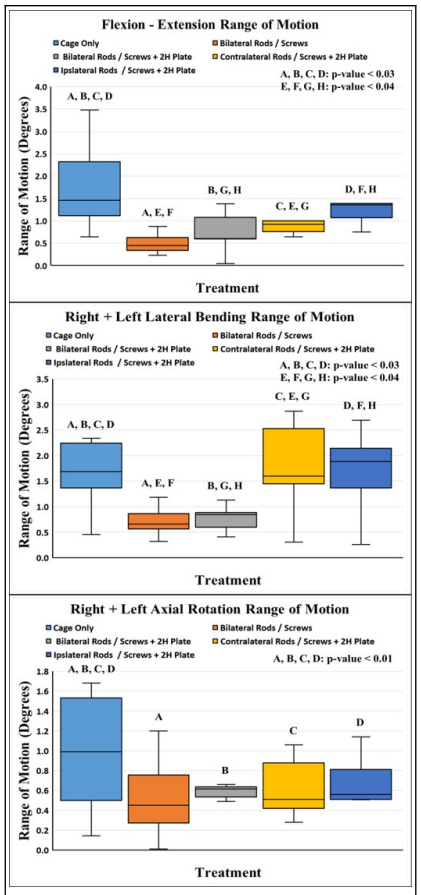

Figure 1: Range of motion (ROM) data. The data are represented as interquartile ranges with one standard deviation error bars. The "x" symbol represents the mean group value and horizontal line represents the median group value. Statistical differences ($p<0.05$) are noted by shared letters between conditions.

CONCLUSION

The data indicate that unilateral pedicle screws and rod with oblique plate fixation closely approximates bilateral pedicle screw hardware as an adjunctive fixation for cages inserted with an OLIF approach.

LEARNING OBJECTIVES

Participants should be able to identify the effects of OLIF fixation with unilateral and bilateral fixation.

RESULTS

All of the instrumented spines demonstrated significantly ($p<0.03$) reduced flexion-extension, axial rotation and lateral bending ROM as compared to the intact case. The flexion-extension and lateral bending ROM with the bilateral pedicle screw and rod construct (with or without a plate) was significantly reduced ($p<0.04$) as compared to the cage alone as well as the two unilateral pedicle screw and rod constructs, however these differences were all less than 1 degree. The cage alone demonstrated significantly ($p<0.01$) greater axial rotation ROM as compared to all the other fixation scenarios.