

Iliac Screws May Not Be Necessary in Long Segment Constructs with L5-S1 ALIF: Cadaveric Study of Instrumentation Strain

Randall Hlubek MD; Jakub Godzik MD MSc; Anna Newcomb; Jennifer Lehrman BSE MS; Michael Bohl MD; Samuel Harrison Farber; Bernardo Andrada MD; Brian P. Kelly PhD; Jay D. Turner MD, PhD [Barrow Neurological Institute]

Introduction

Lumbosacral pseudoarthrosis and instrumentation failure is common with long segment constructs. Optimizing lumbosacral construct biomechanics may help to reduce failure rates. The influence of iliac screws and interbody type on lumbosacral stability and instrumentation bending strain is not well established.

Methods

Fourteen human cadaveric spine (L1 -ilium) specimens were prepared and potted at L1 and ilium. Specimens were equally divided into either an L5-S1 ALIF or TLIF group. All specimens underwent testing in the following conditions: 1) Intact 2) L2-S1 Pedicle Screw Fixation (PSF) 3) L2-ilium (PSF-I) 4) PSF+ALIF (ALIF-S) or TLIF (TLIF-S) 5) PSF-I + ALIF (ALIF-I) or TLIF (TLIF-I). Pure moment bending (7.5Nm) in flexion(F), extension(E), lateral bending (LB), axial rotation (AR) and axial compressive (C) loads(400N) were applied to all conditions and range of motion (ROM), SS, and RS were measured. Statistical comparisons were performed using one-way ANOVA (p<.05).

ALIF-S and TLIF-S provided similar decreases in ROM as TLIF-I (p>.05). Compared to PSF, iliac screws significantly decreased SS during bending in all directions (p<.01) except lateral bending (p>.16) but increased RS in flexion and extension (p<.03). ALIF-S provided similar decreases in SS as TLIF-I in all directions (p>.40). TLIF-S had more SS than TLIF-I in F,E,AR (p<.02). ALIF-S had significantly less rod strain than TLIF-I in F,E,C (p<.02) while TLIF-S had less rod strain only in E (p=.04). Compared to PSF-I, ALIF-I decreased the RS (p<.03) but TLIF-I did not have a significant effect (p>.64).

Conclusions

Results

Iliac screws diminish SS during pure moment bending in all directions except LB but increase RS. ALIF-S provides comparable decreases in SS as TLIF-I and has significantly less RS, perhaps obviating the need for iliac fixation in long segment fixation. Iliac screw induced RS is only significantly reduced with ALIF but not TLIF.

Learning Objectives

By the conclusion of this session, participants should be able to:

1)Understand the impact of ALIF, TLIF, and iliac screws on range of motion, sacral screw strain, and rod strain at the lumbosacral junction

2) Understand that iliac screws decrease sacral screw

strain but increase rod strain

3) Understand that ALIF but notTLIF is protective of the increasedrod strain induced by iliac screws

4)Understand that ALIF with sacral screws only has a comparable biomechanical profile to the posterior only construct TLIF with supplemental iliac screw fixation

References

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