Biomechanics of Lumbar Lateral Interbody Fixation Augmented with Pedicle Screws, Facet Screws, or Spinous Process Plate

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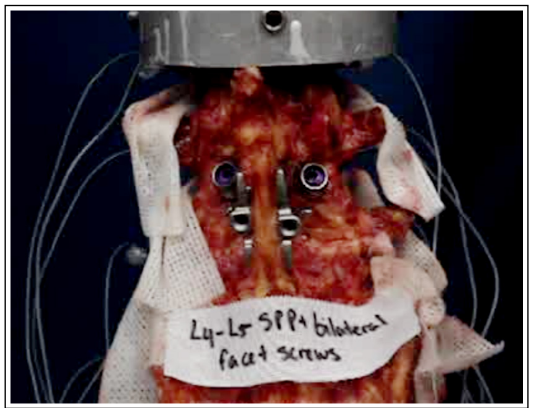
Introduction

Posterior stabilization adds rigidity after placement of a lumbar lateral (trans-psoas) interbody cage (SLIFT) that may aid in fusion and avoid cage dislodgement and subsidence. Three options for additional stabilization are pedicle screw-rod fixation (PS), transfacetopedicular screws (FS) and spinous process plate (SPP). It is unclear how constructs with these components compare in terms of the relative stability offered. The goal of this in vitro study was to quantify and compare the stabilizing potential at L4-L5 of constructs that include a lateral interbody cage (SLIFT), PS, FS, and SPP fixation.

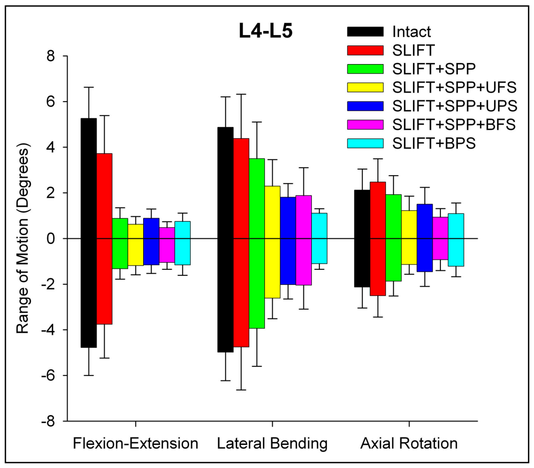
Methods

Fourteen human cadaveric lumbar (L3-S1) specimens were studied, with procedures performed at L4-L5. The range of motion (ROM) was assessed at L4-L5 during flexion, extension, axial rotation, and lateral bending. Flexibility tests were performed by applying nonconstraining nondestructive pure moments (7.5 Nm) while recording 3D specimen motion optoelectronically. Specimens in Group 1 were tested (A) intact, (B) after SLIFT, (C) after SLIFT+SPP, (D) after SLIFT+SPP+unilateral FS (UFS), and (E) after SLIFT+SPP+bilateral FS (BFS). Specimens in Group 2 were tested (A) intact, (B) after SLIFT, (C) after SLIFT+SPP, (D) after SLIFT+SPP+unilateral PS-rod fixation (UPS), and (E) after SLIFT+bilateral PS-rod fixation (BPS). Data was analyzed using RM-ANOVA with non-paired comparisons.



Results

All constructs that included posterior augmentation resulted in significant reduction in ROM relative to intact ($p<0.05$, One-Way ANOVA/Holm-Sidak), except SLIFT+SPP during axial rotation ($p=0.43$) and SLIFT+SPP+UPS during axial rotation ($p=0.073$). During flexion and extension, there was no significant different among constructs in the stability offered. During lateral bending and axial rotation, SLIFT+SPP allowed significantly greater ROM than all other constructs except SLIFT+SPP+UPS ($p<0.05$).



Conclusions

At the loads studied, it was found that there was no statistically significant difference in the ROM allowed by SLIFT+SPP+UFS, SLIFT+SPP+BFS, and SLIFT+BPS, indicating that each of these three constructs should provide an approximately equivalent environment for fusion.

References

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Learning Objectives

By the conclusion of this session, participants should be able to discuss the stabilizing potential at L4-L5 of constructs that include a lateral interbody cage (SLIFT), and posterior fixation including pedicle screws, facet screws and fixation with a spinous process plate.