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

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Background Context

Posterior stabilization adds rigidity after placement of a lumbar lateral (trans-psoas) interbody cage (S-LIFT) that may aid in fusion and avoid cage dislodgement and subsidence. Three options for additional stabilization are pedicle screw-rod fixation (PS), transfacet pedicle screws (FS) and spinous process plate (SPP). It is unclear how constructs with these components compare in terms of the relative stability offered.

Purpose

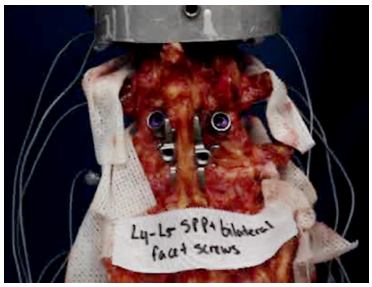
The goal of this in vitro study was to quantify and compare the stabilizing potential at L4-L5 of constructs that include a lateral interbody cage (S-LIFT), PS, FS, and SPP fixation.

Study Design/Setting

Nondestructive repeated-measures in vitro flexibility test with non-paired comparison of stability of 6 constructs.

Patient Sample

Fourteen human cadaveric lumbar (L3-S1) specimens were studied, with procedures performed at L4-L5.



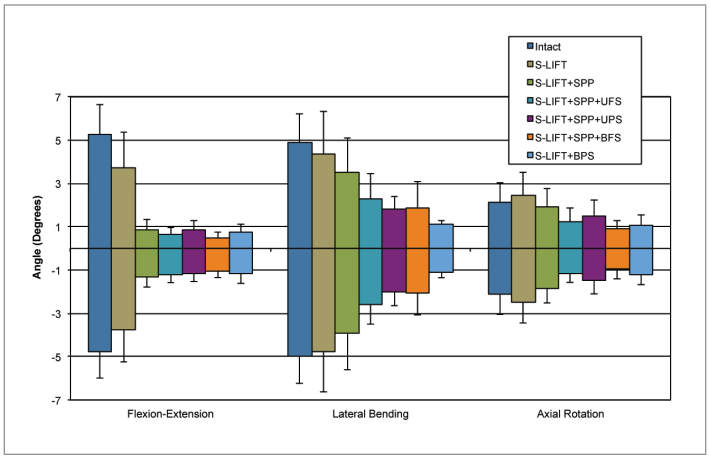
FacetFuse MIS Screw System and Inspan Spinous Process Plate System
(SpineFrontier, Inc.) MA, USA

Outcome Measures

Range of motion (ROM) was assessed at L4-L5 during flexion, extension, axial rotation, and lateral bending.

Methods

Flexibility tests were performed by applying nonconstraining nondestructive pure moments (7.5 Nm maximum) while recording specimen motion optoelectronically in 3D. Specimens in Group 1 were tested (A) intact, (B) after S-LIFT, (C) after S-LIFT+SPP, (D) after S-LIFT+SPP+unilateral FS (UFS), and (E) after S-LIFT+SPP+bilateral FS (BFS). Specimens in Group 2 were tested (A) intact, (B) after S-LIFT, (C) after S-LIFT+SPP, (D) after S-LIFT+SPP+unilateral PS-rod fixation (UPS), and (E) after S-LIFT+bilateral PS-rod fixation (BPS).



Results

All constructs that included posterior augmentation resulted in a significant reduction in ROM relative to intact ($p<0.05$, One-Way ANOVA/Holm-Sidak), except S-LIFT+SPP during axial rotation ($p=0.43$) and S-LIFT+SPP+UPS during axial rotation ($p=0.07$). During flexion and extension, there was no significant difference among constructs in the stability offered. During lateral bending and axial rotation, S-LIFT+SPP allowed significantly greater ROM than all other constructs except S-LIFT+SPP+UPS ($p<0.05$).

Discussion & Conclusion

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

References

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**Pending Publication*

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