

Evaluation of Two Novel Integrated Stand-Alone Spacer Designs Compared with Anterior and Anterior-Posterior Single-Level Lumbar Fusion Techniques: An *In Vitro* Biomechanical Investigation

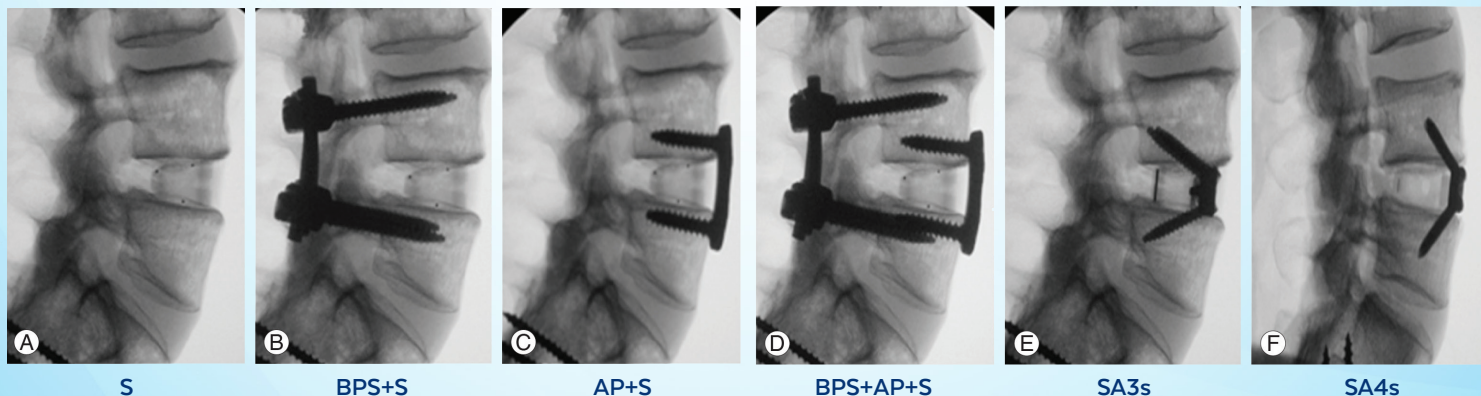
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OBJECTIVE: The study compared the biomechanics of integrated three-screw and four-screw anterior interbody spacer devices and traditional techniques for treatment of degenerative disc disease.

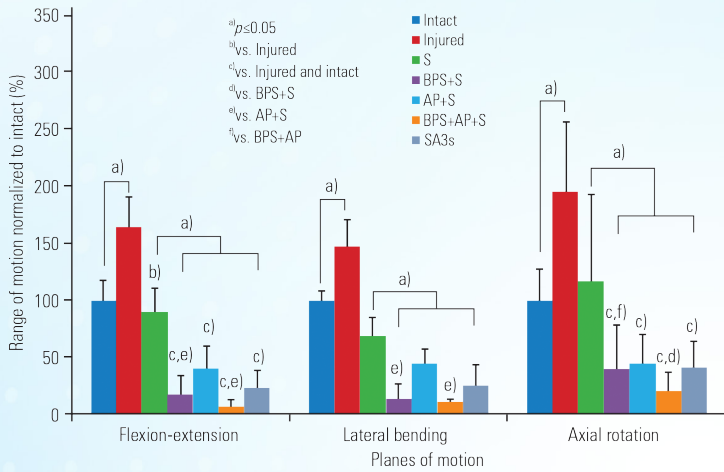
METHOD: Fourteen cadaveric lumbar spines were divided randomly into two equal groups (n=7). Each spine was tested intact, after discectomy (injured), and with PEEK interbody spacer alone (S), anterior lumbar plate and spacer (AP+S), bilateral pedicle screws and spacer (BPS+S), circumferential fixation with spacer and anterior lumbar plate supplemented with BPS, and three-screw (SA3s) or four-screw (SA4s) integrated spacers. Constructs were tested in flexion-extension (FE), lateral bending (LB), and axial rotation (AR). Researchers performed one-way analysis of variance and independent t-testing ($p < 0.05$).

Lateral Radiographs

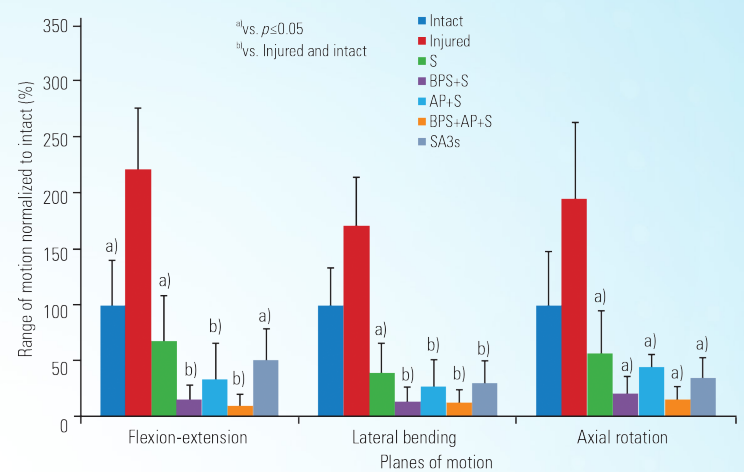


S: CONTINENTAL® ALIF TPS spacer. BPS+S: REVERE® Bilateral Pedicle Screws with CONTINENTAL® ALIF TPS spacer. AP+S: CITADEL® Anterior Lumbar Plate with CONTINENTAL® ALIF TPS spacer. BPS+AP+S: REVERE® Bilateral Pedicle Screws with CITADEL® Anterior Lumbar Plate and CONTINENTAL® ALIF TPS spacer. SA3s: INDEPENDENCE® Integrated three-screw ALIF spacer. SA4s: SynFix-LR Integrated four-screw ALIF spacer.

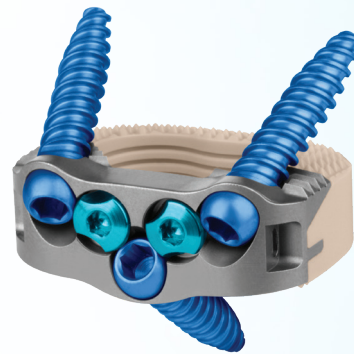
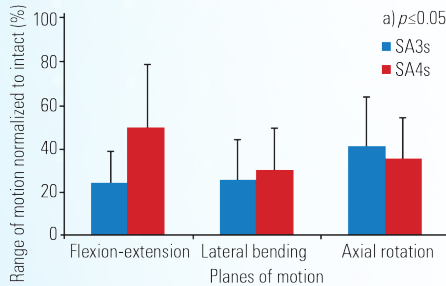
Three-Screw Stand-Alone Spacer vs. Traditional Fixation



Four-Screw Stand-Alone Spacer vs. Traditional Fixation



Range of Motion: Three- and Four-Screw PEEK Spacers



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Stand-Alone ALIF Spacer

- Instrumented constructs showed significantly decreased motion relative to the intact spine except for the spacer-alone construct in FE and AR ($p \leq 0.05$).
- SA3s showed significantly decreased range of motion (ROM) compared to the plate and spacer construct in LB ($p \leq 0.05$) and comparable ROM in FE and AR.
- The three-screw design increased stability in FE and LB with no significant differences between integrated spacers or between integrated spacers and BPS+S in all loading modes.

CONCLUSION: In this biomechanical study, integrated spacers provided fixation statistically equivalent to traditional techniques. Comparison of three-screw and four-screw integrated anterior lumbar interbody fusion spacers revealed no significant differences; however, the longer, larger footprint interbody spacer with three-screw design increased stabilization in FE and LB. The diverging four-screw design showed marginal improvement during AR.



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