

Do Facet Screws Provide the Required Stability in Lumbar Fixation? A Biomechanical Comparison of the Boucher Technique and Pedicular Fixation in Primary and Circumferential Fusions

Amit Agarwala, MD¹; Brandon Bucklen, PhD²; Aditya Muzumdar, MS²; Mark Moldavsky, MS²; Saif Khalil, PhD²

¹Panorama Orthopedics & Spine, Golden, CO, USA; ²Globus Medical, Inc., Audubon, PA, USA

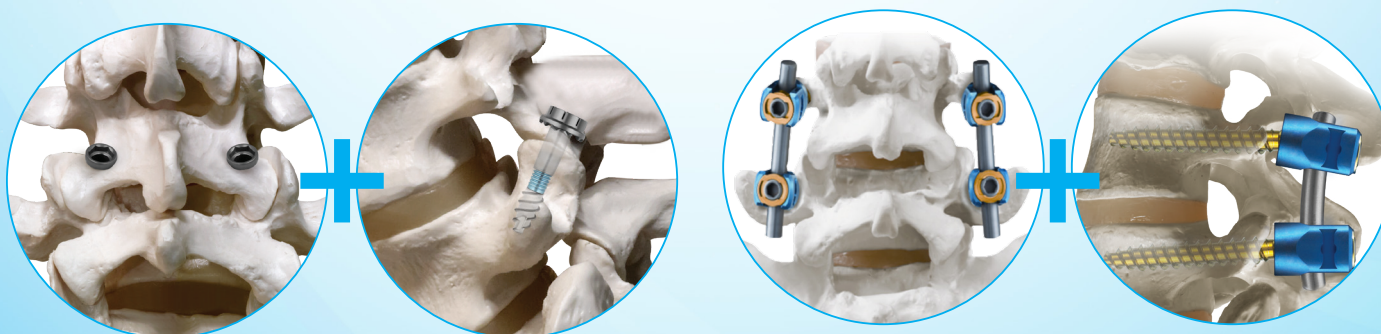
Clin Biomech 27(1):64-70, 2011.

OBJECTIVE: This study aimed to ascertain the relative strength of transfacet pedicle screws (TFPS) like those in the ZYFUSE[®] Facet Fixation System compared to bilateral pedicle screws (BPS), with and without supplemental ALIF (Spacer, Spacer+Plate).

METHOD: Two groups of seven fresh frozen human cadaver lumbar spines (L3-S1) were tested by applying pure moments of $\pm 6\text{Nm}$. Range of motion (ROM) was obtained at L4-L5 for single-level experiments in flexion-extension (FE), lateral bending (LB), and axial rotation (AR) modes. Each specimen in both groups was tested in a primary fixation environment and subsequently in a circumferential fusion environment in the following modes: (1) intact; (2) posterior fixation (PF) alone; (3) PF and radiolucent interbody fusion using the CONTINENTAL[®] ALIF System; (4) PF and interbody spacer with a two hole anterior plate CITADEL[®] Anterior Lumbar Plate System; (5) interbody spacer and plate alone; (6) interbody spacer alone; and (7) injured (anterior discectomy L4-L5). TFPS in the ZYFUSE[®] Facet Fixation System and traditional pedicle screws in the REVERE[®] Stabilization System were used as PF in groups A and B, respectively.

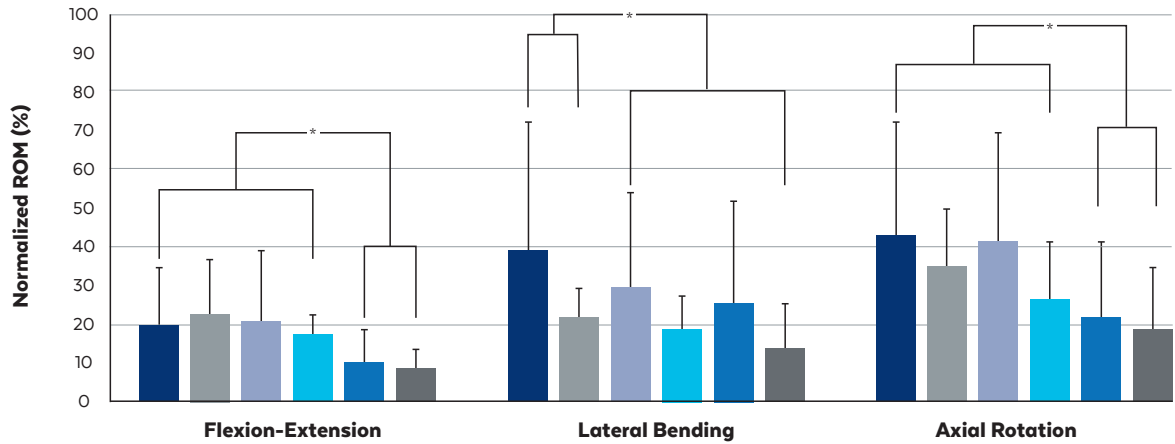


ZYFUSE[®]
Facet Fixation System



Group A (TFPS) facet screws, left, and group B (BPS) pedicle screws and rods, right, in an L4-L5 segment

ROM and Two-Factor ANOVA Significances of Fixated Level Normalized to Intact Group (100%)



■ TFPS	20±14	37±34	41±22
■ BPS	24±11	22±7	34±15
■ TFPS + Spacer	21±16	29±27	40±28
■ BPS + Spacer	16±9	17±11	26±17
■ TFPS + Spacer + Plate	10±9	24±27	22±22
■ BPS + Spacer + Plate	8±5	15±10	18±18

RESULTS:

- The two groups were combined in order to compare pedicle screw fixation and facet screw fixation in an ALIF and non-ALIF model.
- The ZYFUSE® Facet Fixation System resulted in reduced motion (20%) when compared to BPS (24%) in FE in the non-ALIF model, but had an increased ROM in LB (37% vs. 22%) and AR (41% vs. 34%).
- In the ALIF model, the ZYFUSE® Facet Fixation System exhibited larger average motions than BPS with a spacer (FE, 21% vs. 16%; LB, 29% vs. 17%; AR, 40% vs. 26%) and with a spacer and plate (FE, 10% vs. 8%; LB, 24% vs. 15%; AR, 22% vs. 18%).
- The ZYFUSE® Facet Fixation System tended to provide greater stabilization than pedicle screw fixation in FE (80% vs. 73%), but less in LB (65% vs. 73%) and AR (59% vs. 62%).

CONCLUSION:

In this study, the biomechanical performance of the ZYFUSE® facet screws when compared to pedicle screws resulted in similar flexibility in FE with, on average, higher flexibilities in LB and AR. All constructs, of either PF type, resulted in a statistically significant reduction in ROM compared to healthy intact spines.

