

# Posterior Augmentation of an Anterior Lumbar Interbody Fusion: Minimally Invasive Fixation Versus Pedicle Screws In Vitro

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## Abstract

### Study Design

An in vitro biomechanical comparison of four posterior fixation techniques in the setting of an anterior lumbar interbody fusion (ALIF).

### Objective

To compare the initial stability, in terms of range of motion and neutral zone, provided by pedicle screws, facet screws, translaminar facet screws, and H-graft plus interspinous cables in the presence of an anteriorly placed femoral ring allograft.

### Summary of Background Data

Pedicular fixation has been used to increase ALIF fusion rates but has also been linked with increased morbidity. Alternative posterior fixation options are available, but comprehensive biomechanical comparisons of these techniques do not exist.

### Methods

Twelve cadaveric lumbar motion segments were loaded to 5 Nm in unconstrained flexion-extension, lateral bending, and axial torsion. Specimens were tested intact, after ALIF, and after applying pedicle screws, translaminar screws, facet screws, and H-graft plus cables. The resulting neutral zones and ranges of motion were measured.

### Results

The mean ( $\pm$ SEM) range of motion for each construct in flexion-extension was as follows: intact:  $6.39^\circ$  ( $\pm 0.47^\circ$ ); ALIF alone:  $3.31^\circ$  ( $\pm 0.22^\circ$ ); (ALIF+) pedicle screws:  $0.6^\circ$  ( $\pm 0.06^\circ$ ); facet screws:  $0.75^\circ$  ( $\pm 0.12^\circ$ ); translaminar screws:  $0.61^\circ$  ( $\pm 0.09^\circ$ ); and H-graft:  $1.74^\circ$  ( $\pm 0.26^\circ$ ). Pedicle, translaminar facet, and facet screws significantly decreased range of motion and neutral zone compared to ALIF alone in flexion-extension, lateral bending, and axial torsion (all at  $P < 0.04$ , except translaminar screws in torsion neutral zone where  $P = 0.09$ ). H-graft decreased flexion-extension range of motion and neutral zone only ( $P < 0.01$ ) and resulted in a significantly greater neutral zone than pedicle and facet screws in torsion and lateral bending neutral zones ( $P < 0.03$ ).

### Conclusions

In the ALIF setting, facet screw and translaminar screw techniques, which may be associated with less morbidity than pedicle screws clinically, provided initial posterior stabilization similar to pedicular fixation in this in vitro study.

