

Short Segment Spinal Instrumentation with Index Vertebra Pedicle Screw Placement for Pathologies Involving the Anterior and Middle Vertebral Column is as Effective as Long Segment Stabilization with Cage Reconstruction: A Biomechanical Study

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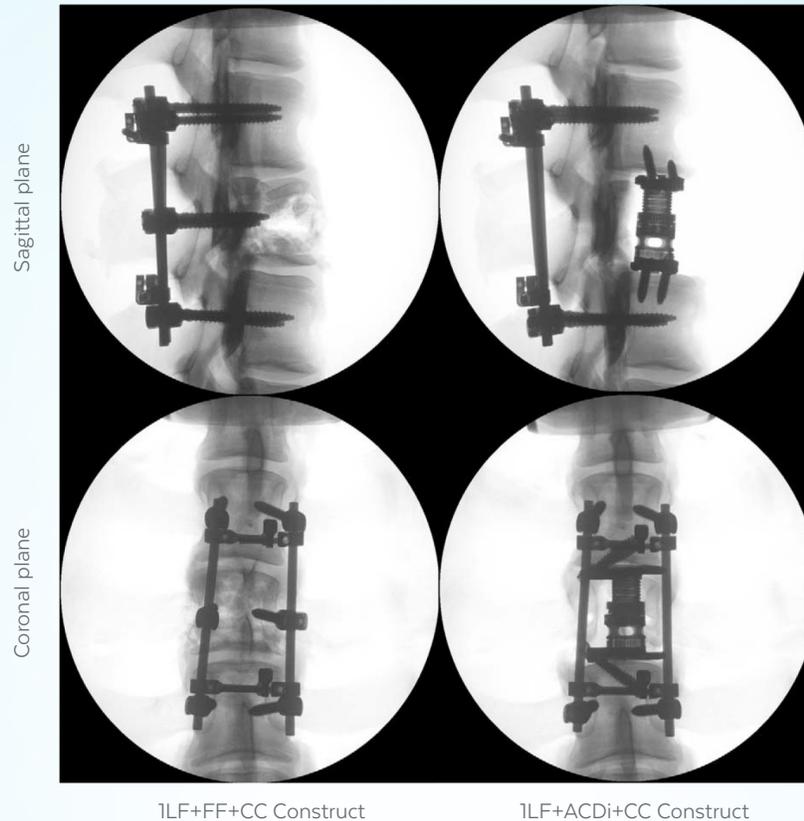
OBJECTIVE: The aim of the study was to compare single segment posterior instrumentation and fracture-level screws with single-level/multilevel posterior fixation and corpectomy in a simulated, unstable burst fracture model.

METHOD: Six cadaveric bovine spines (T11-L5) were tested in flexion, extension, lateral bending (LB), and axial rotation (AR) following a simulated burst fracture at L2. Posterior instrumentation included one level above/below (1LF) and two levels above/below fracture level (2LF), intermediate or index screws at fracture level (FF), and cross-connectors above/below fracture level (CC). Anterior corpectomy devices included the FORTIFY® I Integrated Corpectomy Spacer System (ACDi) / FORTIFY® Corpectomy Spacer System (ACD). Constructs were tested in the following order: (1) Intact; (2) 1LF; (3) 1LF and CC; (4) 1LF and FF; (5) 1LF, CC, and FF; (6) 2LF; (7) 2LF and CC; (8) 2LF and FF; (9) 2LF, CC, and FF; (10) 2LF and ACD; (11) 2LF, ACD, and CC; (12) 1LF and ACDi; and (13) 1LF, ACDi, and CC.



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RESULTS:

- During flexion, all constructs except 1LF reduced motion ($P < 0.05$) relative to the intact condition. Anterior support increased stability, but no significant differences were found between constructs ($P > 0.05$). Every construct reduced motion in extension, though no significant differences were found between constructs and the intact condition ($P > 0.05$).
- During LB, all constructs reduced motion ($P < 0.05$) relative to the intact condition; multilevel constructs further reduced motion ($P < 0.05$) compared to all constructs except 1LF+FF.
- No construct returned AR motion to the intact condition, with significant increases in motion for 1LF+ACDi, 2LF+ACD, and 2LF+ACD+CC ($P < 0.05$).
- In AR, cross-connectors and fracture screws reinforced each other in posterior-only constructs, providing the most stable single and multilevel constructs.

CONCLUSION:

In this study, only multilevel posterior instrumentation with and without anterior support provided increased stability in lateral bending. Short segment posterior instrumentation with fracture-level pedicle screws may be a viable technique for non-neoplastic pathologies that would otherwise require anterior column reconstruction.