

A Comparative Study of Management of Thoracolumbar Fractures by Short-Segment Versus Long-Segment Posterior Pedicle Screw Fixation

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Abstract

Background: The optimal fixation strategy for unstable thoracolumbar fractures remains controversial. While short-segment fixation preserves more motion segments and reduces surgical morbidity, long-segment fixation may provide superior biomechanical stability and reduce implant-related complications.

Methods: A prospective randomized study was conducted on 30 patients with unstable thoracolumbar fractures treated between September 2019 and August 2021. Patients were equally allocated to short-segment fixation (n=15) or long-segment fixation (n=15). Clinical outcomes were assessed using the ASIA neurological grading, Denis pain and work scales, and Oswestry Disability Index. Radiological evaluation included Cobb's angle, anterior vertebral body height, and anterior vertebral body compression percentage. Operative duration, blood loss, radiation exposure, and implant-related complications were also compared.

Results: Both groups demonstrated comparable neurological recovery and functional outcomes with no significant differences in ASIA grade, Denis pain score, Denis work scale, Oswestry Disability Index, anterior vertebral body height, or anterior vertebral body compression percentage. Short-segment fixation was associated with significantly lower blood loss (428.3 mL vs 735 mL), shorter operative time (121 vs 173 minutes), and fewer C-arm exposures (10.7 vs 20.1). Long-segment fixation achieved significantly better maintenance of kyphosis correction at one year (mean Cobb's angle 6.2° vs 8.4°) and no implant failures, whereas four patients (26.7%) in the short-segment group developed implant failure during follow-up.

Conclusions: Both fixation methods provide satisfactory neurological and functional outcomes in unstable thoracolumbar fractures. Short-segment fixation offers the advantages of reduced operative time, blood loss, and radiation exposure, whereas long-segment fixation provides superior maintenance of sagittal alignment and significantly lowers the risk of implant failure. The choice of fixation should be individualized according to fracture characteristics and patient-specific factors.