

The Biomechanical Consequences Of Rod Reduction Following Facetectomy In The Lumbar Spine

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Introduction

Residual mismatch between pedicle screw-rod constructs is frequently encountered and corrected through rod reduction tools or by readjustment of the screw depth. This study sought to investigate the biomechanical effects of rod reduction and screw re-insertion on the lumbar spine following facetectomy.

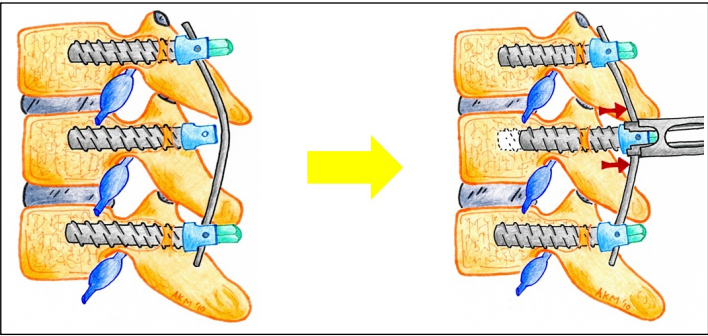
Methods

Nine (n=9) three-segment, human lumbar spine specimens were tested following facetectomy. Pedicles were instrumented with 6.5mm screws and insertional torque (IT) was measured during screw placement. On the left side, a rod with no residual rod-screw mismatch was placed. Then, on the right side an intentional 5mm rod-screw mismatch was contoured and reduced using a rod-reduction device. To simulate screw repositioning, one screw was backed out and reinserted while re-insertional torque was measured. Screws were pulled out “in line” with the screw axis to determine pullout strength (POS) in Newtons (N).



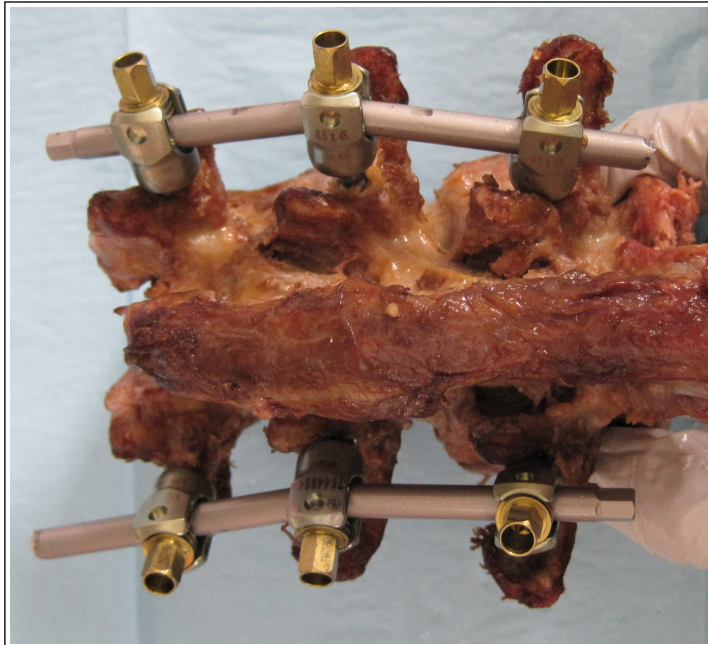
Results

Rod reduction significantly decreased pedicle screw POS compared to controls ($961 \pm 352\text{N}$ versus $613 \pm 563\text{N}$). Two of nine screws (22.2%) had outright failure during rod reduction. Screw reinsertion did not significantly decrease POS ($943 \pm 352\text{N}$ versus $803 \pm 422\text{N}$) despite having a significant decrease in IT compared to control IT ($9.56 \pm \text{in-lbs}$ versus $6.38 \pm 4.61 \text{in-lbs}$).



Conclusions

As in the thoracic spine, rod reduction decreases lumbar pedicle screw POS. Increasing the flexibility of the spine, through total facetectomy, does not negate the effects of rod reduction. Despite a significant decrease in IT, screw repositioning/reinsertion did not decrease POS, suggesting that a decreased IT does not affect biomechanical fixation strength. Surgeons should avoid rod reduction devices as they result in decreased screw fixation.



Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe lumbar facetectomy, 2) Discuss the factors affecting pedicle screw fixation strength, 3) Describe the biomechanical consequences of rod reduction in the lumbar spine

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