

# Thoracic Spine Degeneration Impacts Reciprocal Changes and Proximal Junctional Kyphosis (PJK) Following Correction of Adult Spinal Deformity (ASD)

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**INTRODUCTION:** Degeneration in the thoracic spine, especially immediately proximal to the uppermost instrumented vertebrae (UIV), represents a critical point of vulnerability in ASD surgery. Understanding its impact on radiographic outcomes could guide surgical planning.

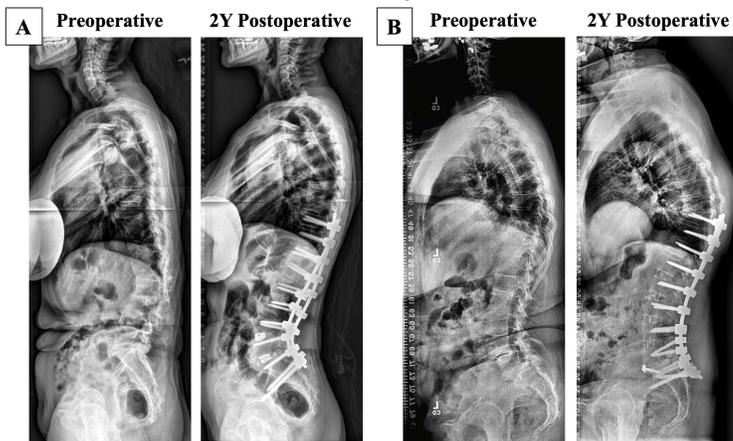
**METHODS:** Primary ASD patients who underwent correction surgery with a UIV between T9-L1 and an LIV at S1/iliac were included. Thoracic spine (T1-L1) degeneration was assessed radiographically using Kellgren-Lawrence (KL) grading. Global thoracic spine degeneration was defined as >1 degenerated arcs (>2 levels with KL grade 3+ in T1-T5, T5-T9, or T9-L1). Proximal zone degeneration was defined as KL grade 3+ in the two levels above the UIV. Patients without any degenerated levels in the thoracic spine served as controls. Demographics, spinopelvic alignment, and junctional changes were compared pre- and post-op.

## RESULTS:

In total, 151 degenerated and 72 control patients were included. Preop, degenerated patients had higher mean age (65.7 vs 62.6 yrs), higher TK (36.1 vs 27.6°), lower PI-LL (15.9 vs 24.1°), and higher LL (38.6 vs 32.2°) (p<0.05). Six-week postop, they had lower reciprocal kyphotic changes in the unfused thoracic spine (1.6 vs 5.8°, p=0.02). Two-year postop, they had a more kyphotic PJA (17.5 vs 14.4°, p=0.04) and higher PJK rates (38 vs 24%, p=0.04). Proximal zone sub-analysis revealed that two-year PJA (-18.9 vs -16.2 vs -14.4°) and PJK rates (43 vs 32 vs 24%) incrementally decreased from proximal zone degeneration to distal zone degeneration to control patients (p<0.05). Multivariate logistic regression revealed that presence of proximal zone degeneration predicted two-year PJK (OR=2.1, p=0.04); however, addition of PJK prophylaxis into this model attenuated this relationship (OR=1.8, p=0.14).

## DISCUSSION AND CONCLUSION:

Thoracic spine degeneration was associated with smaller reciprocal kyphotic changes in the unfused spine but larger two-year proximal junctional angle. Proximal zone degeneration was further associated with higher junctional failure rates. Meticulous selection of the UIV proximal zone in thoracolumbar deformity surgery may improve surgical outcomes.



**Figure 1.** Preoperative and 2-year postoperative standing lateral radiographs demonstrating (A) no landing zone degeneration and (B) landing zone degeneration with subsequent development of proximal junctional failure.