



Radiographic Predictors of Proximal Junctional Kyphosis after Long Segment Thoraco-Lumbar Fusion for Adult Spinal Deformity

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Learning Objectives

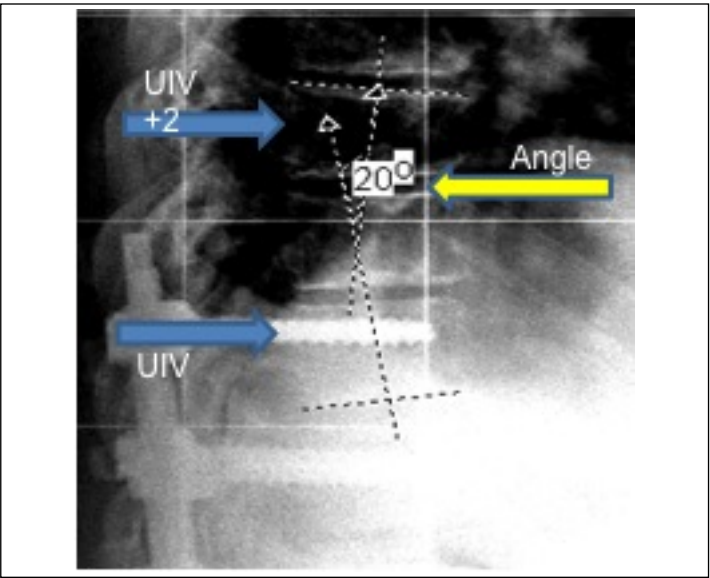
1. To study the incidence and risk factors of PJK in spinal deformity surgery.
2. To identify radiographic predictors of PJK in spinal deformity surgery
3. To assess the clinical implications of PJK

Introduction

Proximal junctional kyphosis (PJK) is a frequent complication after long segment thoraco-lumbar fusion for adult spinal deformity (ASD) with potentially significant impact on clinical outcome. The reported incidence of PJK is wide -ranging, while the etiology and risk factors of PJK remain poorly understood. The purpose of this study, therefore, was to determine the incidence and radiographic predictors for PJK occurrence after adult spinal deformity surgery at a single institution, neurosurgical department.

Methods

We performed a retrospective analysis of consecutive adults (age ≥ 21 years) that underwent long segment thoraco-lumbar fusion (≥ 7 vertebrae) for ASD at a single institution, neurosurgical department between 2008-2013. Pre-operative and post-operative clinical and radiographic data were evaluated. Radiographic measurements included thoracic kyphosis (TK), lumbar lordosis (LL), sagittal vertical axis (SVA), pelvic incidence (PI), pelvic tilt (PT), and sacral slope (SS). The proximal junctional angle was determined at the angle between the inferior enplate of upper instrumented vertebra (UIV) and the superior enplate of the vertebral body 2 levels above the UIV. PJK was defined by this 2 criterias: 1. postoperative junctional angle of 10° or more, 2. and at least 10° greater than the corresponding preoperative measurement.



Results

Sixty-five patients met inclusion criteria with a mean age of 65 years. Average follow up was 1.2 years. Thirty-eight (59%) patients developed PJK at last follow up, with four (6%) requiring additional surgery to treat PJK. Older age at time of surgery and greater pre-operative thoracic kyphosis predicted post-operative PJK occurrence ($p < 0.0001$ and $p < 0.042$, respectively). Not surprisingly, fracture at the proximal level of the construct was also associated with PJK ($p < .0001$). Radiographic parameters of ideal deformity correction such as SVA < 50 mm, PT < 200 , and PT-LL $< \pm 100$ were not associated with lower incidence of PJK.

	No PJK	PJK	P-value
Age	59 (13)	69 (7)	$< .0001$
Fracture	0 (0)	8 (21)	$.017$
Pre proximal junction angle $^\circ$	11 (9)	7 (6)	.034
Post proximal junction angle $^\circ$	15 (7)	28 (9)	$< .0001$
Change in proximal junction angle (post-pre) $^\circ$	4 (5)	21 (7)	$< .0001$
Post SVA (mm)	75 (50)	83 (50)	.246
Pre Pelvic Incidence	58 (10)	56 (14)	.185
Post Pelvic Tilt $^\circ$	26 (8)	29 (12)	.309
Pre Thoracic Angle $^\circ$	32 (17)	41 (20)	$.042$
Post Thoracic Angle $^\circ$	42 (12)	54 (14)	$.002$
Change in Thoracic Angle (post-pre) $^\circ$	10 (13)	11 (15)	.760
Change in Lumbar Angle (post-pre) $^\circ$	6 (18)	9 (20)	.467
Post PI-LA $^\circ$	19 (11)	14 (16)	.151

Conclusions

Radiographic PJK occurs commonly after long segment thoraco-lumbar surgery for adult spinal deformity. Older age and greater pre-operative thoracic kyphosis are associated with higher risk of PJK. Incidence of revision surgery to treat clinically significant PJK, however, remains low. This study suggest that we need a better understanding of preoperative thoracic kyphosis as a possible predictor of PJK.

References

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