

Thoracic Kyphosis Increases but Cervical or Lumbar Lordosis Does Not Change Through the Unfused Segments After Surgical Correction of Lenke Type 5 and 6 Curves

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INTRODUCTION: Lenke Type 5 and 6 adolescent idiopathic scoliosis (AIS) patients who undergo deformity correction typically have fusion levels spanning the thoracolumbar and lumbar regions, which is known as a selective fusion. Over time, the compensatory, non-structural curves in the upper thoracic region will correct in the coronal plane. Currently, no previous research has studied the compensatory changes over time in the sagittal plane, namely cervical lordosis, proximal thoracic kyphosis, and distal lumbar lordosis in unfused segments. In this study, we investigated the sagittal balance compensatory changes in the unfused vertebral levels proximal and distal to the instrumentation and fusion over time.

METHODS: A retrospective review of prospectively collected multi center AIS databases was performed. Inclusion criteria was patients with Lenke type 5 or 6 curves who underwent posterior instrumentation and fusion. 194 patients from 10 institutions were initially identified. 192 patients with 2 year follow up and 94 patients with 5 year follow up were included in the final analysis. Radiographic clinical parameters were measured preoperatively and at postoperative year 1, 2, and 5. Radiographic measurements were performed and confirmed by three authors. The levels fused were recorded and unfused segments were measured prior to and after fusion at postoperative visits. Changes in cervical lordosis, proximal thoracic kyphosis, and distal lumbar lordosis were measured. Statistical analysis was performed with SAS and alpha was set at $P < 0.05$ to declare significance.

RESULTS: Lenke type 5CN (n=147) was the most common curve type. T10 to L4 were the most frequently fused levels (n=54) followed by T11 to L3 (n=38) and T9 to L3 (n=34). Patients underwent an average 5-level fusion (range 3-9). No significant changes in cervical lordosis from preop to postop year 5 occurred. On average, from preop to 1 year postop there was 0.6° loss of cervical lordosis. From postop year 1 to 2 cervical lordosis increased an average 3° and from year 2 to 5 decreased 1.4°. Thoracic kyphosis proximal to UIV increased significantly from preop 29.1° to 32.7° at 5 years postop. Kyphosis increased an average of 2° from preop to postop year 1, 1° from postop year 1 to 2, and 1° from year 2 to 5. Lordosis distal to LIV had no significant changes; 1° of lordosis was lost from preop to postop year 1, with no change in lordosis from postop year 1 to 2, or 2 to 5.

DISCUSSION AND CONCLUSION: Thoracic kyphosis proximal to the UIV in Lenke type 5 and 6 curves increases significantly postoperatively by a mean of 3.6°, with the largest change occurring during the first year, and a slower rate of progression thereafter. No significant compensatory changes occurred in cervical lordosis or in the unfused distal lumbar lordosis secondary to curve correction.

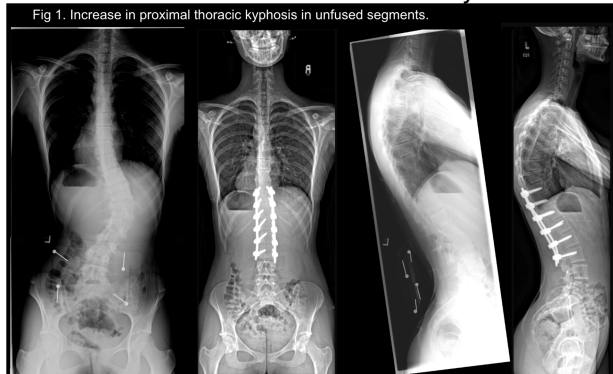


Fig 1. Increase in proximal thoracic kyphosis in unfused segments.

Table 1. Demographics and surgical details of patients included in the analysis.

Lenke Curve Types	Number	Fusion Levels			
		T8-L2	T8-L3	T8-L4	
5CN	147	1	3	4	
6CN	20	6	4	42	
5C+	9	6	5	68	
5C-	12	3	6	58	
6C+	2	34	7	15	
6C-	2	10	8	6	
5AN	2	T10-L2	3	9	1
		T10-L3	54		
		T10-L4	23		
		T11-L3	38		
		T11-L4	11		
		T12-L3	4		
		T12-L4	1		