

Spinal growth tethering around the apical vertebrae leads to asymmetric growth as a mechanism of spinal deformity correction in kyphosis and scoliosis

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LOE: Case control or retrospective comparative study-Level III

Purpose: A novel non-fusion method in spinal growth tethering aims to create growth in the vertebrae that results in gradual deformity correction. This method utilizes a posterior approach around the peaked wedged vertebrae in early onset scoliosis (EOS).

Methods: The study consisted of a board-approved institutional retrospective review of the X-rays and 3D CT scans of 17 patients (4 scoliosis, 11 kyphosis, 2 kyphoscoliosis)

All patients had early onset scoliosis. Patients either underwent posterior tethering proximal and distal to the peak of the deformity as an adjunct to distraction-based growth-friendly, or the Shilla implants. The same surgeon performed both procedures.

The rate of change was calculated for the wedged apical vertebrae at the concave and convex heights in scoliosis and kyphosis . Control group had the same parameters measured for the vertebrae outside the tethering effect.

Cobb angle and spinal height was also calculated.

Results: Mean follow up time: 50.8 months

Mean age at surgery: 61 months

Table 1. Results within the tether:

Measurement	Average pre-op length	Average last follow-up length	Increase Percentage	P-value
Concave vertebrae, mm	7.45	12.41	79.6%	P <0.005
Convex vertebrae, mm	13.67	16.76	27.2%	P <0.005
Ratio	0.55	0.76	20%	P <0.005

Table 2. Results outside the tether:

Measurement	Average pre-op length	Average last follow-up length	Increase Percentage	P-value
Concave vertebrae, mm	10.64	14.37	42.7%	P <0.005
Convex vertebrae, mm	13.18	17.65	37.3%	P <0.005
Ratio	0.8	0.82	1.8%	P = 0.064

Table 3. Cobb angle and spine length measurements:

Type	Pre-op (min to max)	Last follow-up (min to max)	P-value
Scoliosis angle	51.0 (20 to 100)	43.8 (16 to 89)	P = 0.057
Kyphosis angle	56.1 (27 to 81)	21.5 (10 to 62)	P < 0.005
Spine length, mm	250.1 (183.7 to 324)	292.27 (229.4 to 373.2)	P < 0.005

Conclusion: Posterior tethering in EOS will asymmetrically modulate the apical vertebrae, correcting the deformity with non-fusion technique

Significance: this non fusion method depends on vertebral modulation with gradual correction of scoliosis and kyphosis which decrease the need of added procedures like apical fusion , doing anterior release for kyphosis and osteotomy for scoliosis .

