Matched Comparison of Non-Fusion Surgeries for Adolescent Idiopathic Scoliosis: Posterior Dynamic Distraction Device and Vertebral Body Tethering

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INTRODUCTION: Non-fusion procedures for adolescent idiopathic scoliosis (AIS) treatment are growing in popularity. Two devices received limited HDE approval for clinical use by the FDA in 2019: posterior dynamic distraction device (PDDD) and vertebral body tether (VBT). Although treatment indications are similar, there is no comparative study of the outcomes for these devices. We hypothesize that PDDD will have better operative metrics while curve correction will be comparable between the devices.

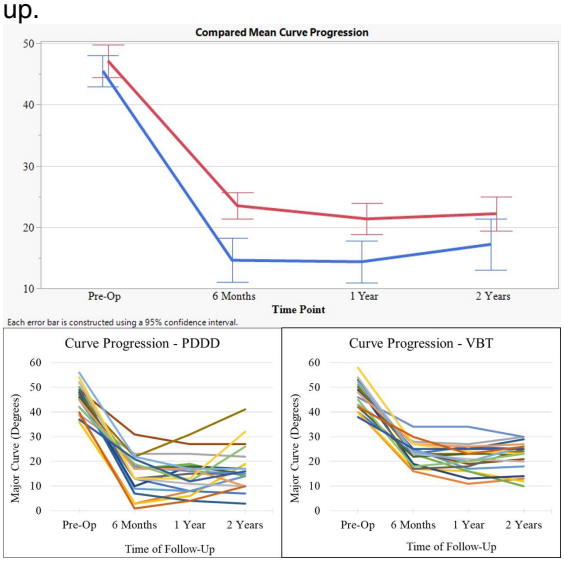
METHODS: AIS patients who met criteria for PDDD were prospectively enrolled in this matched multicenter comparative study. Inclusion criteria were Lenke 1 or 5 curves, preoperative major Cobb angle 35°- 60°, correction to ≤30° on bending radiographs, and thoracic kyphosis <55°. Patients were matched by age, sex, Risser, curve type and magnitude to a single-center cohort of VBT patients, and results were compared to 2-years.

RESULTS:

20 PDDD patients were matched to 20 VBT patients. There was no difference in preoperative major Cobb angle, age, curve type (90% thoracic curves), Risser, or sex. Blood loss was significantly higher in the VBT cohort (88 vs. 36 ml, p<0.001). Operative time was longer in the VBT cohort, 177 vs. 115 min (p<0.001), as was length of stay (2.9 vs. 1.2 days, p<0.001).

Postoperative curve measurement and percent correction at 6 months were better in the PDDD cohort (15° vs. 24°, p<0.001; 68% vs. 50%, p<0.001). At 1-year, the patients in the PDDD cohort had improved Cobb angles (14° vs. 21°, p=0.001). At two-year follow-up the correction was improved in the PDDD cohort, with a mean primary curve measurement of 17° for PDDD and 22° for VBT (p=0.043). At 1 and 2-year follow-up there was no significant difference in T5-T12 kyphosis (34° at two-years, p=0.819). At latest follow-up, 3 PDDD patients underwent revision surgery with replacement of the device, 2 for curve progression and 1 for implant breakage; there was one reoperation in the VBT group to address overcorrection.

DISCUSSION AND CONCLUSION: PDDD demonstrates better index correction, reduced operative time, less blood loss, and shorter length of stay but higher rates of revision compared to a matched cohort of VBT patients at two-year follow-up.



Radiographic Outcomes	PDDD (N=20)		VBT (N=20)		P-value
	Average	Std Dev (Range)	Average	Std Dev (Range)	
Preop Coronal Curve	46°	6° (36-56)	47°	6° (38-58)	0.358
6 Month Coronal Curve	15°	8° (1-31)	24°	5° (16-34)	**<0.001**
1 Year Coronal Curve	14°	7° (4-31)	21°	5° (11-34)	**0.0014**
2 Year Coronal Curve	17°	9° (3-41)	22°	6° (10-30)	**0.043**
% Correction at 6 Months	68%	17% (37-97)	50%	11% (26-68)	**<0.001**
% Correction at 1 Years	69%	16% (34-92)	54%	14% (26-74)	**0.003**
% Correction at 2 Years	62%	19% (13-94)	52%	14% (30-80)	0.081
Preop Kyphosis	20°	9° (7-39)	18°	13° (0-43)	0.538
6 Month Kyphosis	33°	9° (17-49)	24°	11° (5-42)	**0.005**
1 Year Kyphosis	34°	11° (19-61)	33°	10° (10-52)	0.701
2 Year Kyphosis	34°	9° (15-53)	34°	9° (12-50)	0.819