

Combined Anterior Thoracic Vertebral Body Tethering and Posterior Lumbar Tethering Results in Quicker Return to Sport and Activity Compared to Posterior Spinal Instrumented Fusion in Patients with Adolescent Idiopathic Scoliosis

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INTRODUCTION:

Fusionless surgery for the treatment of skeletally immature patients with idiopathic scoliosis has the theoretical benefit of preserved motion. Combined anterior thoracic vertebral body tethering and lumbar posterior tethering (VBT/LPT) is one option for fusionless surgery. However, little is known about how VBT/LPT compares to posterior spinal instrumentation and fusion (PSIF) with respect to return to activity and sport. The purpose of this study is to compare patient-reported physical activity between VBT/LPT and PSIF with minimum two-year follow up.

METHODS:

In this retrospective cohort study, consecutive skeletally immature patients with idiopathic scoliosis and a thoracic and lumbar curve magnitude ≥ 40 degrees who underwent either VBT/LPT or PSIF from 2015 – 2019 were included. The primary outcome was rate of returning to sport. Secondary outcomes included ability to bend and satisfaction with sport performance as well as weeks until return to sport, school, physical education (PE) classes, and running.

RESULTS:

This study compared 10 patients who underwent VBT/LPT and 12 who underwent PSIF, with similar age and sex distributions between the groups. VBT/LPT patients reported significantly faster return to sport (13.5 weeks vs. 27.9 weeks, $p=0.04$), running (13.3 weeks vs. 28.8 weeks, $p=0.02$), and physical education class (PE) (12.6 weeks vs. 26.2 weeks, $p=0.04$) compared to PSIF patients. VBT/LPT patients also reported that they had to give up activities due to their ability to bend at lower rates than PSIF patients while reporting “no changes” in their ability to bend after surgery at higher rates than PSIF patients (0% vs. 4% giving up activities and 70% vs. 0% reporting no changes in bending ability for VBT/LPT and PSIF, respectively, $p=0.01$).

DISCUSSION AND CONCLUSION: A greater percentage of patients who underwent VBT/LPT faster rates of returning to sport, running, and PE. In addition, VBT/LPT patients were less likely to have to give up activities due to bending ability after surgery and reported no changes in their ability to bend after surgery more frequently than PSIF patients. Long-term studies are needed to further delineate relationships between an earlier return to sport and complications after VBT/LPT.

Table 1. Demographic and Baseline Characteristics for Combined Anterior Thoracic Vertebral Body Tethering (VBT) and Posterior Lumbar Tethering (LPT) and Posterior Spinal Instrumentation and Fusion (PSIF).

Demographic	VBT/LPT	PSIF	P Value
Age	12.5 (1.2)	12.1 (1.3)	0.81
Female Gender	10 (100%)	11 (91.7%)	1.00
Follow-up (Weeks)	84 (14.0)	81 (13.5)	0.54
Preoperative			
Cobb Angle	47.0 (5.0)	47.0 (5.0)	0.99
Risser Stage	4 (40%)	4 (33.3%)	0.64
T12 to S1 Curve	4 (40%)	4 (33.3%)	0.64
Postoperative			
Cobb Angle	7.0 (2.0)	7.0 (2.0)	0.88
Risser Stage	4 (40%)	4 (33.3%)	0.64
T12 to S1 Curve	4 (40%)	4 (33.3%)	0.64
Cobb Angle	7.0 (2.0)	7.0 (2.0)	0.88
Risser Stage	4 (40%)	4 (33.3%)	0.64
T12 to S1 Curve	4 (40%)	4 (33.3%)	0.64

Table 2. Comparison of Postoperative Parameters for Combined Anterior Thoracic Vertebral Body Tethering (VBT) and Posterior Lumbar Tethering (LPT) and Posterior Spinal Instrumentation and Fusion (PSIF).

Parameter	VBT/LPT	PSIF	P Value
Average Postoperative Cobb Angle	7.0 (2.0)	7.0 (2.0)	0.88
Cobb Angle	7.0 (2.0)	7.0 (2.0)	0.88
Risser Stage	4 (40%)	4 (33.3%)	0.64
T12 to S1 Curve	4 (40%)	4 (33.3%)	0.64
Cobb Angle	7.0 (2.0)	7.0 (2.0)	0.88
Risser Stage	4 (40%)	4 (33.3%)	0.64
T12 to S1 Curve	4 (40%)	4 (33.3%)	0.64

Table 3. Patient-Reported Return to Activity and Sport (Weeks) for Combined Anterior Thoracic Vertebral Body Tethering (VBT) and Posterior Lumbar Tethering (LPT) and Posterior Spinal Instrumentation and Fusion (PSIF).

Activity	VBT/LPT	PSIF	P Value
Return to school	9.0 (2.0)	9.0 (2.0)	1.00
Time to return to school weeks	13.5 (2.5)	13.5 (2.5)	0.99
Return to PE	9.0 (2.0)	9.0 (2.0)	0.99
Time to return to PE weeks	13.3 (2.5)	13.3 (2.5)	0.99
Return to PE classes	9.0 (2.0)	9.0 (2.0)	0.99
Time to return to PE classes weeks	12.6 (2.5)	12.6 (2.5)	0.99
Return to running	9.0 (2.0)	9.0 (2.0)	0.99
Time to return to running weeks	13.3 (2.5)	13.3 (2.5)	0.99
Return to sports	9.0 (2.0)	9.0 (2.0)	0.99
Time to return to sports weeks	13.5 (2.5)	13.5 (2.5)	0.99

Table 4. Patient-Reported Ability to Bend After Surgery for Combined Anterior Thoracic Vertebral Body Tethering (VBT) and Posterior Lumbar Tethering (LPT) and Posterior Spinal Instrumentation and Fusion (PSIF).

Ability to Bend	VBT/LPT	PSIF	P Value
Reported no changes in bending ability	7 (70%)	7 (58.3%)	0.99
Reported changes in bending ability	3 (30%)	5 (41.7%)	0.99
Gave up activities	0 (0%)	2 (16.7%)	0.99
No changes in bending ability	3 (30%)	3 (25.0%)	0.99

Table 5. Patient-Reported Satisfaction with Sport Performance for Combined Anterior Thoracic Vertebral Body Tethering (VBT) and Posterior Lumbar Tethering (LPT) and Posterior Spinal Instrumentation and Fusion (PSIF).

Satisfaction	VBT/LPT	PSIF	P Value
Reported no changes in satisfaction	7 (70%)	7 (58.3%)	0.99
Reported changes in satisfaction	3 (30%)	5 (41.7%)	0.99
Satisfied	3 (30%)	3 (25.0%)	0.99
Dissatisfied	0 (0%)	2 (16.7%)	0.99

Table 6. Patient-Reported Ability to Bend After Surgery for Combined Anterior Thoracic Vertebral Body Tethering (VBT) and Posterior Lumbar Tethering (LPT) and Posterior Spinal Instrumentation and Fusion (PSIF).

Ability to Bend	VBT/LPT	PSIF	P Value
Reported no changes in bending ability	7 (70%)	7 (58.3%)	0.99
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Gave up activities	0 (0%)	2 (16.7%)	0.99
No changes in bending ability	3 (30%)	3 (25.0%)	0.99