## 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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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.

Demogra		(N-IR)	PNF (%-12)	PiVale
Ap		127 / 1.4	13.7 n 1.6	9.11
Female Gender		18 (189%)	12 (199%)	1.60
			2.5 × 1.2 (2 to	8.34
Follow-99 (cm)				
		7 (78%)	4 (33%)	
Prosperative Rinser Stuging				9.804
			2 (17%)	
Presperative Open T	rirudiste Curtilege	7 (78%)	2 (21%)	8.64
		2 (20%)	1 (8%)	
Pentoperative Risser Stagling		7 (78%)	10 (83%)	9,825
	- 5	1.08%	1.0%	
Protoporative Op Cartil		1089	9.0%)	9.53
		10:1/250	10.1000	
Lexis Class	disorten	30:7(79%)	50.1 GMo	9.25

	VELT-PT (N-10)	ESSE (N-28)	P-valu
Average Prosperative Main Thoracie Curve	30 ± 9 (40 to 20)	57 ± 14 (40 to 75)	6.288
Arrange Prosperative Thorseolombon Lumbur Curve	45 × 5 (40 to 50)	52 × 14 (40 to 90)	6.487
%Main Thorsele Correction at First Erect Post-op	47 ± 13	68 = 13	6-993
NTherscokenber/Lember Correction at First Exect Peet-up	51 n 18	77 n 13	6.992
Sense February Correction of Most Record Feibre up	41 to 29	69 × 18	6.091
NTheraudenbur Lambur Correction at Most Recent Fellow-up	99 ÷ 21	78 = 15	6.93
# Revision Surgeries	4 (40%)	1.0%	6.221

	VSTAPT (N-18)	PSIF (%-12)	Posis
Ecturard to school	30 (30m/r)	12 (180%)	1.00
Time to return to school, works	59+16	13 4 3.1	6.279
Some to PE	9,9950	12 (160%)	6504
Time to return to FE, wodo	126+17	362+19.8	6.04
Vesting a backpark	7 (79%)	1(79%)	6.927
Time to rearing backpack, reaks	18.1 + 14.8	203 / 13.6	6.39
Ability to res	10110667	110000	6.35
Time to return running, works	133+53	38.6 + 28.1	6.00
Farticipair in Sports Prosperatively	19/30 (300%)	11(92%)	6.904
Rostarted Sports	19/30/19860	11 (169%)	1.00
Time to return to spect, weeks	133154	27.9 x 19.7	6.04

	VHTSPT		PRIF	
	Contact (N-10)	Necourary (N-T)	Cretez (N=00)	Nescostar (N=8)
Fature within 1-3 months	7 (99%)	5(11%)	4(485)	5 (60%)
Estern 3-6 months	3 (30%)	2 (29%)	1 (18%)	0 (04.0)
Ertora 6-12 months	0 (0%)	0.9950	3 (38%)	3 (32%)
Brians >12 months	0 (0%)	0.0%)	E (PE)	0 (014)

	VNTILPT (N-00)	PSF (N=10)	P.Valo
Artecus Enoposticu Local			
Lever level/leisenity	1099	1(2%)	6,627
Same or higher level intendry	TONG	9(195)	
Performance in Specificativity Relate and After Surgery			
Best	10%	3 (2%)	6441
Seme	TORNA	5187%	
Wiest	1089	4 (9/%)	
Satisfacion with ability in participate in Special acidities new			
Directional	1089	9,850	
Fairly Satisfied	10%	1 (9%)	1
Settified	7099	518990	6,994
Yory setimed	4 (40%)	51850	
Do you had Hindared with Sportschalleddox dos to the Surgery?	1(9%)	1(29%)	6.927
Bid you have to change positions in your Sport following surgery?	180150	18 (369)	6135
Semptons experienced While Exclusiving in Sports			
Pain	4 (40%)	4 (30%)	6.79

	VEGAPE	PSEF	P-Yate	
Ability to bond	(%-18)	(%-12)		
that to six on artistics	0.000	4/3950	_	
Minimal changes, could still positions med activities	1/200	1000		
			8.81	
Ya ekango	7(9%)	4-950		
Symptomic capacitance in Duliy Life				
Pain	6(8%)	400%	8.60	
Everaged \$654.56Sees	3000	100%	1.90	
How door your back fied below and after Surgery?				
Mark varu	1089	40%		
Somewhat worse	1089	10150	8.754	
About the came	1089	1000		
Slightly bather	3-0890	1089		
Mach better	1000	50850		
Selgische Experiences				
Are you satisfied with the controls efforts after surgest."	416 (88%)	H-90%	4.1	
Do you have insure with Hersider Height?	1000	107%	8.334	
Woold andorra surveys arein	1,990			