COPYRIGHT © BY THE JOURNAL OF BONE AND JOINT SURGERY, INCORPORATED HOERNSCHEMEYER ET AL. ANTERIOR VERTEBRAL BODY TETHERING FOR ADOLESCENT SCOLIOSIS WITH GROWTH REMAINING. A RETROSPECTIVE REVIEW OF 2 TO 5-YEAR POSTOPERATIVE RESULTS http://dx.doi.org/10.2106/JBJS.19.00980 Page 1

## The following content was supplied by the authors as supporting material and has not been copy-edited or verified by JBJS.

Patient	Time Since Surgery; FU Length	Lenke Type; Tether Curve Apex	Tether Levels; Subgroup Type	Pre-Op Sanders; Risser; Fels	Pre-Op (P°, M°, L°); Flexibility; Kyphosis, Lordosis (°); SVA	1 <sup>st</sup> Erect; 1 yr.; Latest Post-Op (P°, M°, L°)	Kyphosis (°), Lordosis (°), SVA at 1 <sup>st</sup> Erect; 1 yr.; Latest Post-Op	Latest Post- Op Sanders; Fels; FU Length	Broken Tether; Time to Break; Levels Broken; Location	Revision; Time Since Index Surgery; Latest Pre-Revision (P°, M°, L°)	Successful	Comments
001	5.7; 5.2	1B; T8	T5-T11; TB	3; 1; 12.7	19, 47, 39; 23; 39, 52; Neutral	20, 21, 20; 15, 19, 16; 11, 21, 17;	37, 35, Neutral; 40, 54, Neutral; 31, 31, Neutral	8; 17.8; 5.2	None	No	Yes	Diagnosed with Beals Syndrome
002	5.5; 5.0	2A; T10	T6-L1; MT	2; 1; 11.5	44, 44, 22; 15;47, 68; Neutral	35, 17, 5; 22, -7, 19; 15, -5, 20	17, 38, Neutral; 30, 68, Positive; 22, 40, Neutral	8; 16.7; 5.0	1; 5.2; T11-T12; Above Apex	No	Yes	Proximal thoracic curve that corrected over a five-year period; broken tether
003	4.9; 4.0	1A; T8	T5-T12; MT	3; 1; 12.2	26, 61, 38; 29; 31, 64; Neutral	27, 36, 34; 16, 36, 32; 	29, 59, Neutral; 40, 53, Neutral; 		1; 1.8; T8-T9; At Apex	Yes; 2.7; 28, 60, 42	No	Not enough initial correction despite bending $< 30^\circ$ ; 30 lb. weight gain; broken tether lead to progression at 28°, 60°, and 43°; received PSF
004	4.5; 4.3	1AR; T10	T6-L1; LT	3; 0; 11.4	22, 51, 29; 28; 40, 65; Negative	20, 36, 15; 27, 28, 6; 	22, 61, Negative; 20, 72, Neutral; 		2; 1.8 and 3.3; T10- T11 and T11-T12; At and Below Apex	Yes; 3.7; 34, 69, 31	No	Progressed below the level of the tether from T12-L3; also 2 areas of broken tether with resultant curves at 34°, 69°, 31°; received PSF
005	4.2; 4.2	1A; T10	T6-T12; MT	3; 0; 10.3	22, 43, 29; 12; 39, 66; Neutral	11, 11, 10; 12, 4, 3; 3, -21, -46 *	41, 61, Neutral; 40, 63, Positive; 30, 60, Positive	6; 16.0; 4.2	1; 2.8; T6-T7; Above Apex	Yes; 2.5; 6, -20, -29		Overcorrection causing development of thoracolumbar curve; too much initial correction; stasis during skeletal maturation; received tether- extension into lumbar spine; skeletally immature
006	4.1; 4.0	5C; L1	T10-L3; LTL	4; 1; 12.3	2, 26, 42; 21; 40, 69; Neutral	2, 20, 15; 22, 14, 22; 15, 15, 6 *	29, 38, Positive; 35, 58, Neutral; 30, 55, Neutral	8; 17.4; 3.4	2; 3.8; T12-L1 and L1-2; At Apex	Yes; 3.8; 3, 22, 35	Yes	Revised tether due to pain and continued curve progression; visualized two broken tethers intraoperatively; tether extension at T10; screw replacement at T11 and T12 due to lack of bicortical purchase; treatment for pain prior to revision included activity modification and physical therapy; competitive sport player
007	4.1; 1.4	1A; T8	T5-T11; MT	4; 1; 13.0	14, 45, 28; 23, 45, 80; Neutral	7, 24, 20; 4, 20, 19; 	57, 85, Positive; 55, 81; Neutral	6; 15.5; 1.4				Lost to FU. Not included in statistical analyses.
008	3.9; 3.4	1A; T9	T6-L1; MT	5; 3; 12.8	23, 54, 37; 25; 15, 39; Neutral	18, 21, 18; 15, 19, 14; 13, 29, 17	19, 30, Positive; 21, 41, Neutral; 25, 55, Neutral	8; 18.0; 2.8	None	No	Yes	
009	3.8; 2.7	5C; T12	T10-L2; LTL	4; 2; 13.1	5, 31, 50; 25; 43, 60; Positive	14, 28, 20; 14, 17, 16; 9, 18, 16	28, 41, Neutral; 39, 60, Neutral; 35, 60, Neutral	8; 18.0; 2.7	None	No	Yes	FU scheduled for this month

Table 1. Preoperative and postoperative patient-specific measures for those with a minimum postoperative follow-up of two years.

## Copyright $\ensuremath{\mathbb O}$ by The Journal of Bone and Joint Surgery, Incorporated

HOERNSCHEMEYER ET AL.

ANTERIOR VERTEBRAL BODY TETHERING FOR ADOLESCENT SCOLIOSIS WITH GROWTH REMAINING. A RETROSPECTIVE REVIEW OF 2 TO 5-YEAR POSTOPERATIVE RESULTS http://dx.doi.org/10.2106/JBJS.19.00980

Page 2

Patient	Time Since Surgery; FU Length	Lenke Type; Tether Curve Apex	Tether Levels; Subgroup Type	Pre-Op Sanders; Risser; Fels	Pre-Op (P°, M°, L°); Flexibility; Kyphosis, Lordosis (°); SVA	1 <sup>st</sup> Erect; 1 yr.; Latest Post-Op (P°, M°, L°)	Kyphosis (°), Lordosis (°), SVA at 1 <sup>st</sup> Erect; 1 yr.; Latest Post-Op	Latest Post- Op Sanders; Fels; FU Length	Broken Tether; Time to Break; Levels Broken; Location	Revision; Time Since Index Surgery; Latest Pre-Revision (P°, M°, L°)	Successful	Comments
010	3.7; 2.2	3C; T8, L2	T6-T11 and T11-T3; TTB	7; 4; 15.3	21, 48, 50; 26, 27; 60, 59; Positive	28, 30, 18; 9, 18, 16; 18, 34, 34	50, 40, Positive; 50, 63, Neutral; 55, 70, Neutral	8; 18.0; 2.2	1; 2.1; L1-L2; At Apex	No	No	Curve progression due to broken tether; this patient was skeletally mature at the time of the index procedure based on the definition provided herein
011	3.7; 1.0	1A; T9	T5-L1; MT	2; 0; 9.8	32, 65, 37; 38, 43, 64; Neutral	29, 23, 17; 22, 27, 24; 	25, 50, Positive; 40, 65, Neutral; 	3; 10.8; 1.0				Lost to FU. Not included in statistical analyses.
012	3.6; 3.0	5C; L2	T11-L3; LTL	5; 3; 16.3	6, 27, 47; 28; 40, 48; Neutral	11, 19, 21; 20, 27, 27; 11, 29, 41	35, 45, Neutral; 45, 50, Neutral; 45, 45, Neutral	8; 18.0; 3.0	1; 3.0; L1-L2; At Apex	No	No	Curve progression due to broken tethers
013	3.6; 2.4	1B; T9	T6-T12; TB	3; 0; 11.9	32, 53, 43; 30; 40, 70; Negative	24, 18, 25; 24, 17, 20; 23, 21, 22	40, 50, Neutral; 42, 57, Neutral; 44, 58, Neutral	7; 16.4; 2.4	1; 2.5; T9-T10; At Apex	No	Yes	Braced the lumbar curve; FU scheduled for this month
014	3.6; 3.2	1A; T9	T6-T12; MT	7; 4; 17.5	25, 49, 39; 30; 46, 57; Negative	26, 29, 19; 20, 32, 28; 22, 29, 26	49, 54, Neutral; 44, 61, Negative; 45, 55, Negative	8; 18.0; 1.4	None	No	Yes	Success likely due to no broken tethers; this patient was skeletally mature at the time of the index procedure based on the definition provided herein; competitive sport player
015	3.5; 3.0	1B; T9	T6-T12; TB	4; 1; 13.1	30, 46, 32; 28; 49, 64; Neutral	13, 19, 20; 12, 18, 20; 19, 20, 21	40, 50, Negative; 45, 68, Negative; 35, 55, Negative	7; 16.7; 2.6	1; 2.7; T9-T10; At Apex	No	Yes	Braced the lumbar curve; FU scheduled for this month
016	3.5; 3.5	1A; T9	T6-T12; MT	3; 1; 12.8	23, 42, 17; 12; 30, 67; Neutral	11, 13, 4; 8, 8, 2; 8, 13, 2	33, 45, Positive; 40, 75, Neutral; 30, 55, Neutral	8; 16.9; 3.5	None	No	Yes	
017	3.5; 3.0	5C; L1	T10-L3; LTL	5; 1; 13.5	13, 31, 57; 27; 20, 58; Negative	10, 15, 2; 10, 16, 2; 16, 19, 21	20, 41, Positive; 15, 46, Neutral; 15, 40, Neutral	8; 15.3; 3.0	1; 2.0; L2-L3; Below Apex	No	Yes	Curve progression due to broken tether; competitive sport player
018	3.3; 3.0	1A; T9	T6-L1; MT	5; 4; 14.0	30, 46, 28; 17; 40, 60; Neutral	20, 14, 18; 22, 11, 8; 23, 17, 8	35, 40, Neutral; 25, 45, Neutral; 30, 50, Neutral	8; 18.0; 2.0	None	No	Yes	Success likely due to no broken tethers
019	3.3; 3.0	1AR; T9	T6-L2; LT	3; 0; 11.7	35, 70, 30; 28; 50, 69; Negative	25, 32, 15; 15, 18, -20; 8, 15, -21 *	45, 50, Neutral; 47, 57, Neutral; 45, 55, Neutral	7; 15.1; 3.0	None	Yes; 1.9; 8, 16, -26	Yes	Overcorrection in lumbar spine requiring revision; tether release from T11-L2
020	3.3; 3.1	1B; T8	T6-T12; TB	5; 4; 13.3	14, 55 ,46; 22; 30, 70; Neutral	4, 27, 36; 6, 23, 19; 1, 19, 23	20, 59, Neutral; 25, 57, Neutral; 30, 50, Neutral	8; 16.4; 3.1	None	No	Yes	Left thoracic curve; braced the lumbar curve
021	3.2; 3.1	1AR; T10	T6-L2; LT	7; 4; 17.7	30, 52, 25; 11; 29, 46; Neutral	20, 20, 5; 12, 16, 9; 16, 21, 16	28, 45, Neutral; 28, 46, Neutral; 30, 50, Neutral	8; 18.0; 2.2	None	No	Yes	Based on the new guidelines for inclusion, this patient was skeletally mature at the time of the index procedure based on the definition provided herein
022	3.2; 3.1	1A; T9	T6-L1; MT	3; 0; 11.6	25, 51, 23; 14; 25, 70; Neutral	12, 11, 4; 4, 6, 5; 16, -10, 7	16, 61, Neutral; 20, 70, Neutral; 30, 60, Neutral	6; 14.7; 3.1	1; 2.6; T8-T9; At Apex	No		Overcorrection at distal end of tether; skeletally immature

## Copyright $\ensuremath{\textcircled{O}}$ by The Journal of Bone and Joint Surgery, Incorporated

HOERNSCHEMEYER ET AL.

 $\label{eq:scaling} Anterior \ Vertebral \ Body \ Tethering \ for \ Adolescent \ Scoliosis \ with \ Growth \ Remaining. \ A \ Retrospective \ Review \ of \ 2 \ to \ 5-Year \ Postoperative \ Results \ http://dx.doi.org/10.2106/JBJS.19.00980$ 

Page 3

Patient	Time Since Surgery; FU Length	Lenke Type; Tether Curve Apex	Tether Levels; Subgroup Type	Pre-Op Sanders; Risser; Fels	Pre-Op (P°, M°, L°); Flexibility; Kyphosis, Lordosis (°); SVA	1 <sup>st</sup> Erect; 1 yr.; Latest Post-Op (P°, M°, L°)	Kyphosis (°), Lordosis (°), SVA at 1 <sup>st</sup> Erect; 1 yr.; Latest Post-Op	Latest Post- Op Sanders; Fels; FU Length	Broken Tether; Time to Break; Levels Broken; Location	Revision; Time Since Index Surgery; Latest Pre-Revision (P°, M°, L°)	Successful	Comments
023	3.2; 3.0	1A; T8	T6-T12; MT	3; 0; 12.3	24, 60, 30; 16; 55, 80; Negative	12, 28, 25; 3, 16, 27; 3, 11, 24 *	30, 53, Neutral; 38, 67, Neutral; 40, 60, Neutral	7; 15.6; 3.0	None	Yes; 2.7; 5, 12, 18	Yes	Adding on of thoracolumbar curve requiring tether release from T10-T12; 30 lb. weight gain
024	3.2; 3.1	1C; T9	T6-T12; TB	5; 2; 13.9	16, 46, 39; 28; 35, 55; Neutral	7, 20, 27; 8, 20, 32; 3, 26, 33	25, 52, Neutral; 38, 55, Neutral; 50, 55, Neutral	8; 18.0; 2.0	None	No	No	Untethered lumbar curve greater than 30°, which was braced given preoperative flexibility and skeletal maturity status
025	3.2; 3.1	1B; T9	T6-L1; TB	5; 4; 14.6	11, 47, 38; 25; 25, 50; Neutral	5, 28, 30; 6, 28, 32; 3, 35, 36	25, 50, Neutral; 20, 50, Neutral; 30, 55, Neutral	8; 18.0; 3.1	2; 1.3 and 2.5; T9- T10 and T10-11; At and Below Apex	No	No	Broken tether at apex leading to loss of correction
026	3.1; 3.0	1C; T9, L2	T5-T11 and T11-L3; TTB	5; 2; 13.5	25, 54, 47; 28, 11; 35, 50; Neutral	18, 18, 3; 12, 14, 4; 11, 28, 25	25, 35, Neutral; 27, 41, Neutral; 45, 30, Neutral	8; 16.3; 3.0	1; 2.4; L1-L2; At Apex	No	Yes	Broken tether following motor vehicle accident leading to curve progression; competitive sport player
027	3.1; 2.2	1B; T8	T5-T12; TB	5; 3; 13.4	27, 45, 31; 20; 35, 68; Negative	15, 25, 22; 10, 15, 22; 12, 14, 20	40, 52, Neutral; 30, 51, Neutral; 30, 50, Neutral	7; 16.4; 2.2	None	No	Yes	Braced the lumbar curve; FU scheduled for this month
028	3.0; 2.5	1C; T8, L2	T5-T11 and T11-L3; TTB	3; 0; 12.3	19, 43, 40; 26, 20; 35, 78; Negative	12, 20, 16; 11, 13, 4; 8, 10, 6	35, 65, Positive; 40, 75, Neutral; 45, 60, Neutral	7; 15.0; 2.5	None	No	Yes	Well balanced double tether
029	2.9; 2.2	1AR; T11	T6-L3; LT	4; 2; 14.2	20, 50, 5; 25; 35, 32; Negative	20, 24, 2; 24, 28, 3; 24, 26, 3	30, 74, Positive; 35, 70, Negative; 28, 80, Negative	7; 17.6; 2.2	None	No	Yes	Competitive sport player
030	2.8; 2.5	1A; T9	T5-L1; MT	5; 3; 13.9	12, 50, 36; 22; 47, 74; Neutral	6, 27, 24; 7, 27, 29; 13, 25, 24	51, 66, Positive; 40, 75, Negative; 30, 75, Neutral	8; 18.0; 2.5	None	No	Yes	
031	2.8; 2.6	1C; T8	T5-T11; TB	6; 4; 16.8	24, 45, 32; 14; 30, 66; Neutral	14, 26, 24; 14, 21, 24; 16, 31, 27	32, 73, Positive; 40, 55, Neutral; 35, 55, Neutral	8; 18.0; 2.6	1; 2.0; T8-T9; At Apex	No	No	High-level wrestling activity; broken tether; braced the bottom curve given preoperative flexibility and skeletal maturity status; competitive sport player

Note: the flexibility traction curve measure was only measured for curves that were surgically instrumented; patients that underwent a posterior spinal fusion following unsuccessful vertebral body tethering do not have reported Cobb Angles at Latest Follow-Up; patients that have not attained skeletal maturity are not reported as successful or unsuccessful. Time Since Surgery = the number of years following VBT; FU Length = the latest clinical follow-up visit calculated from the date of the index procedure;  $PT^\circ$ ,  $MT^\circ$ , and  $L^\circ$  = Cobb Angle, measured in degrees (°), of the proximal thoracic, main thoracic, and lumbar regions; \* = Latest Post-Op Cobb Angle following surgical revision; SVA = sagittal vertical axis, P = Positive SVA, N = Neutral SVA, and NG = Negative SVA. The following variables are all reported in years (yrs.): Time Since Surgery, Fels Skeletal Age, and Time Since Index Procedure.