VERTEBRAL BODY TETHERING VS SPINAL FUSION: LOOKING BEYOND THE RADIOGRAPHICAL OUTCOME

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Introduction

Adolescent Idiopathic Scoliosis (AIS) is a growth defect of the spine that primarily occurs in pre-pubertal children and is surgically treated when a curve exceeds 50° [1]. Presently, spinal fusion (SF) surgery is established as the gold-standard treatment modality for patients with AIS [1]. Although, SF is associated with successful long-term outcomes in terms of deformity correction, it is also associated with a loss of spinal motion at the fused levels [1]. Therefore, fusionless treatments of progressive curves might be appealing, especially in the skeletally immature. Vertebral Body Tethering (VBT) is a fusionless growth-modulating technique for skeletally immature AIS patients with good curve control in selective indications [2]. Although the radiographic outcome, in the form of curve correction, is usually inferior to modern SF [2], potential advantages over spinal fusion have been reported in terms of function [1]. Nevertheless, comparative objective measurements of the degree of preservation of motion associated with both techniques are as of yet scarce. The aim of the present study is, therefore, to objectively measure and compare the postoperative trunk mobility, activity levels and functional outcome scores between VBT patients and SF patients.

Methods

From our prospective study sample, we matched 8 VBT patients based on curve type (Lenke classification), gender and follow-up duration with 8 SF patients. Preoperatively (Pre-OP), three months postoperatively (Post-3M) and one year postoperatively (Post-1Y) patients completed the following patient reported outcome measures (PROMs): SRS-22 (scored from 0-5), International Physical Activity Questionnaire (IPAQ) (scored from 0-5) and pain intensity scale (scored from 0-10. Furthermore, at both timepoints the patients performed a spinal deformity-specific motion analysis [3] that was captured using a 10-camera motion capture system (VICON Motion systems Oxford, UK) and consisted of a seated maximal trunk flexion. Maximal trunk flexion (°) was calculated using the markers placed on C7 and the pelvis. A one-way ANOVA ($p<0.05$) was performed to identify differences between groups.

Results

Radiographically, the main cobb angle correction from Pre-OP to Post-OP was significantly ($p<0.05$) greater for the SF group (Pre-OP = 55.1°; Post-1Y = 12.5°) compared to the VBT group (Pre-OP = 53.6°; Post-1Y = 27.9°). In terms of the PROMs, no significant differences were found between groups in both the overall SRS-22 score (SRS-22 score: Post-3M: VBT = 4.1 vs. SF = 4.0; and Post-1Y: VBT = 4.2 vs. SF = 4.3), as well as the subdomain 'function' (SRS-Function: Post-3M: VBT = 4.2 vs. SF = 3.9; and Post-1Y: VBT = 4.5 vs. SF = 4.5). Both groups had little to no pain Post-OP (VAS-score: VBT = 0.1 vs. SF = 0.2). In addition, no significant differences in Post-1Y physical activity levels were identified on the IPAQ (VBT = 2.2 vs. SF = 2.1). In terms of trunk flexion, the loss of forward flexion from Pre-OP to Post-3M was significantly ($p<0.05$) greater for the SF group (SF: 31% reduction vs. VBT: 15% reduction) compared to the VBT group, from which they partially recovered at Post-1Y (Figure 1).

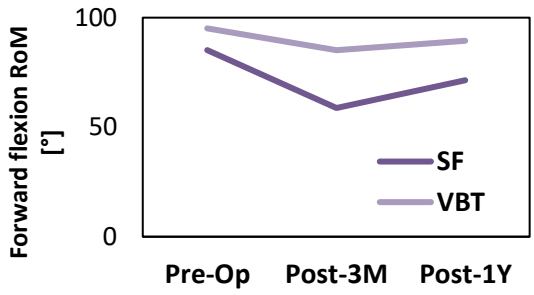

Figure. 1. The average forward trunk range of motion (RoM) for the VBT and SF at all three timepoints (Pre-Op, Post-3M and Post-1Y).

Discussion

The present study aimed to integrate a radiographical comparison with an objective comparison of VBT and SF on the functional level. Even though SF patients have a superior radiographic outcome, this contrasts with improved spinal mobility during forward flexion in the VBT patients, which was not captured in the PROMs. These advantages of VBT should be further investigated in view of treatment selection in skeletally immature AIS patients whose curves progressed beyond the range of bracing.

References

1. Pehlivanoglu et al, Spine Deformity, 9:1175-1182, 2021.
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3. Severijns et al, Spine J, 20:934-946, 2020.