What Makes a Successful Vertebral Body Tethering?

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INTRODUCTION: Vertebral Body Tethering (VBT) is a non-fusion alternative for management of pediatric scoliosis that allows for growth and flexibility of the spine. Interest in this procedure as an alternative to spinal fusion continues to grow. However, current rates of revision for VBT range 14%-25%. Current indications for VBT are skeletally immature AIS patients with a flexible major curve of 30-65 degrees and failure of bracing. This study aims to evaluate perioperative factors influencing the success of VBT. We hypothesize that lower preoperative Cobb and greater intraoperative correction correlate with successful VBT.

METHODS: Our study employed retrospective review of 87 patients aged 9 to 16 that underwent VBT surgery at our institution for 2-year surgical outcomes. Success of VBT was defined as a major Cobb less than 35 degrees and no re-operation at the two-year follow-up. 70 patients were considered successful (80%), 17 patients were considered unsuccessful (20%). The peri-operative factors associated with these patient populations were stratified and compared to evaluate potential characteristics for predicting VBT outcomes. Evaluations of significance were performed via two-sample t-tests.

RESULTS:

Perioperative factors such as BMI, age, Risser/Sanders score, pre-operative major Cobb, percent correction on bending films, and percent correction at 3 months post-operative visit were considered in evaluation of contributors to tethering outcomes. Of the 17 patients not considered successful 4 had suspected cord breakage and 8 (9%) underwent reoperation, with 3 of the reoperations due to overcorrection.

The VBT patients who were successful showed significantly higher percent correction at first erect (45% compared to 37%, $p<0.01$), lower preoperative major Cobb angles (50.5 compared to 56.2, $p<0.01$), and preoperative greater height (159 cm compared to 154 cm, $p=0.02$). They also demonstrated significantly better correction by lower Cobb angles at 3 months compared to the unsuccessful group (27.7 compared to 34.9, $p<0.01$). Values for pre-operative kyphosis, correction with bending, weight, Risser score, and Sanders score did show differences between the patient groups but did not reach significance.

DISCUSSION AND CONCLUSION:

Patients with lower major Cobb angles, greater standing height, and with greater pre-operative correction tended toward better outcomes at 2-year follow-up. These results indicate a need for maximizing intraoperative correction and selecting patients that would most likely see success with VBT. Further analyses addressing patient characteristics and indications for optimizing tether outcomes would benefit this area of study.

VBT has a success rate of 80% at the time of this study. Evaluating patient characteristics to limit adverse outcomes and need for reoperation would benefit patients, their families, and their healthcare team.

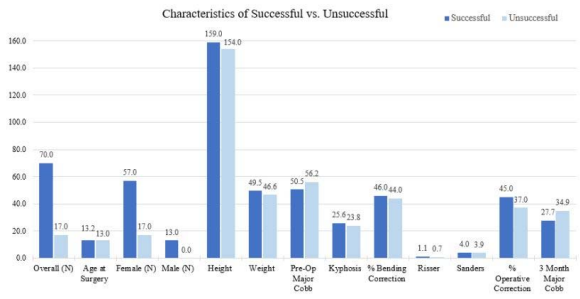

Figure 2: Comparison values of successful and unsuccessful VBT patients.

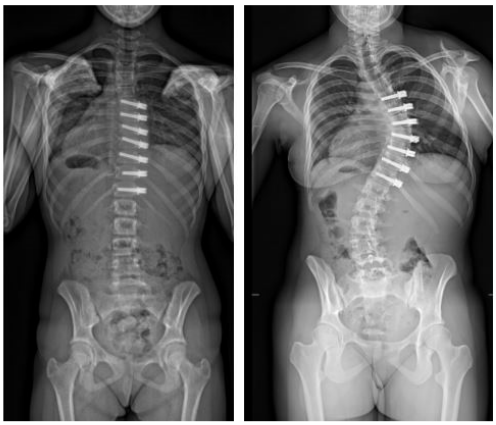

Figure 1: Successful (Left) and unsuccessful (Right) VBT patient radiographs at 2-year follow-up.