Vertebral Body Tethering (VBT) for Scoliosis

Surgery for severe scoliosis has improved dramatically over the last 50 years. With modern treatment, patients can expect to spend just a few days in the hospital. Their curves can be corrected about 70% or more. Within a few months, they can return to all their normal activities. There is only a small chance of needing another surgery. Despite these successes, scoliosis surgery does not give a normal spine.

Standard scoliosis surgery is a spinal fusion. This is where the spine is permanently stiffened in a straighter position. This way the curve cannot return. The results of this treatment have been very good even 20 or more years after surgery. Still, we have concerns about our patients having a stiff spine. This may make it hard for some to return to all their earlier activities. If the fusion includes much of the lower part of the spine, we are concerned that the stiffness will wear out this part of the spine more quickly and result in arthritis.

The ideal surgery for severe scoliosis would be one that straightens the spine without causing stiffness or degrading over time. Vertebral body tethering (VBT) was conceived to help the spine straighten with growth. It is based on a tried and true concept within pediatric orthopedics - that of guided growth. If a child has crooked legs, we can insert a device over the growth plate on the bowed side. This acts to limit growth. Any growth on the opposite side, will slowly straighten the leg.

Spinal growth can be controlled in a similar way by VBT. Growth on the outside of a scoliosis curve is slowed by placing a tether. This tether is flexible and allows the spine to move. The inside part of the curve can grow more easily and gradually straighten out the curve. This type of correction requires that the spine continue to grow.

In 2019, the U.S. Food and Drug Administration (FDA) approved the first tethering device for the spine for use in humans. Metal bone screws are placed into the spine. A flexible cord is attached to these screws and acts as a tether. A group of 57 patients was followed for over 4 years. Seven patients (12%) needed a second surgery. Two patients had spinal fusion surgery. Twelve patients had overcorrection where the spine curved opposite to the original curve. Only six needed more surgery for overcorrection[1].

We are still learning which patients do best with tethering. Patients should still be growing. If a patient is too young (and has too much growth left) when tethered, their curve may overcorrect. This can make a new curve going the opposite direction. If they are too old, the curve may not correct enough. There should be a “sweet spot” that avoids both these problems. It is hard to know when a child is the perfect age. Doctors use x-rays of the hands to tell how mature a patient is, but this method is not perfect.

The FDA says VBT is for growing patients with very flexible, thoracic curves measuring between 30 and 65 degrees. The patient should have failed or was unable to tolerate bracing. There is not much data on tethering for lumbar curves. Based on this, only a small percentage of patients are good candidates for VBT.

Many questions remain about how VBT will hold up over time. Because the spine can still move after VBT, the tether could eventually break. In addition, the long-term effect of tethering on the spine is not known. The screws could come loose. The discs may also degenerate more quickly over time. The longest study of VBT was only four years past surgery and showed about half with a broken tether. This resulted in 40 percent having another surgery[2].

We are not sure whether VBT will have a role in treating adults with scoliosis. A tether could theoretically work in adults but this effect would be much less powerful than the effect in a growing patient. So far, there have been no published reports about the safety or benefit of spine tethering in adults. Any use of tethers for scoliosis correction in adults is considered experimental and without FDA approval in the United States.

Summary (in children with a scoliosis):

- Spinal fusion gives much better correction
- Spinal fusion has less complications
- Spinal fusion has less chance of needing another surgery
- Spinal fusion has a long record of success
- VBT has faster early recovery
- VBT retains more flexibility

The risks and benefits of VBT should be discussed carefully with your physician. VBT should only be considered when standard nonoperative treatments do not work.

References

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2. Newton PO, Kluck DG, Saito W, Yaszay B, Bartley CE, and Bastrom TP. Anterior spinal growth tethering for skeletally immature patients with scoliosis: a retrospective look two to four years postoperatively. J Bone Joint Surg Am (2018) 100(19):1691-1697.

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