Editorial

Spine shortening of tethered cord

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Tethered cord syndrome (TCS) is a complex entity that may result from a variety of pathological conditions. Professor Kokubun\(^6\) was the first to treat adult TCS by shortening the spinal column with a pedicle subtraction osteotomy and this report represents an update of his experience. Eight patients with lipomyelomeningoceles were treated with a spine-shortening osteotomy and fusion at the thoracolumbar junction and followed for 6 years. Only 1 patient had a prior release of the tethered cord. Symptom progression was halted in 2 patients and the remaining 6 experienced initial improvement. This benefit was not durable as 4 of the 6 patients developed recurrent symptoms. One patient deteriorated neurologically 1 year after surgery and required reoperation to release arachnoidal adhesions at the site of the osteotomy. Unfortunately, this did not result in improvement.\(^7\)

Adults with neurological dysfunction and/or pain due to a tethered cord are candidates for surgical intervention. Generally, operative management focuses on correction of the primary lesion producing the tether: thickened filum terminale, diastematomyelia, lipomyelomeningocele, postoperative adhesions, and others. Direct release of the tethered cord produces symptomatic improvement in 80% of patients.\(^3,9\) Intraoperative neurological monitoring minimizes the risk of neurological injury. The most common complications arising from a primary intradural release of a tethered cord in adults by experienced surgeons are infection and CSF leak (approximately 10%).\(^1,4\)

Recurrent tethering of the spinal cord following primary release may occur. Reoperation for recurrent cord tethering is difficult and associated with an increased risk of complication compared with primary surgery.\(^4\) In this setting, shortening of the vertebral column by subtraction osteotomy may be preferable in selected patients.\(^4\) Subtraction osteotomies may also be considered when surgical intervention is required in a region superior to the site of tethering in patients with multiple pathologies.\(^5\)

One major concern of using spinal shortening for the primary approach is the failure to maintain long-term benefit. This failure may be related to the 2-cm limit for spinal column shortening, as the conus is often displaced caudally much more in patients with symptomatic TCS. Enthusiasm for this operative strategy should also be tempered by the fact that pedicle subtraction osteotomies are large complex procedures that carry significant risk.\(^2,5,10\) The authors are to be congratulated for presenting an honest report of their experience, but at this time spinal subtraction osteotomy should be considered for recurrent tethering until its role as a primary procedure for TCS is further defined.

Disclosure

Dr. Traynelis is a consultant to Medtronic, Inc., and United Health Care, and is a patent holder with Medtronic.

References

Response

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We thank Dr. Traynelis for his comments. We also thank Drs. Fehlings and Arvin,2 Dr. Hsieh et al.,4 and Dr. Miyakoshi et al.,6 for kindly referring to our Japanese-language article6 and acknowledging that spinal-shortening osteotomy for patients with TCS is our original concept.

Dr. Traynelis stated that spine-shortening osteotomy, for the present, should be considered solely for recurrent cord tethering. He believes that untethering should be performed in primary cases because symptomatic improvement can be expected in 80% of patients. The results of TCS surgery depend on the tethering pathology, the preoperative duration and severity of neural deficits, and the completeness of the spinal cord tension reduction without damage to the neural tissue. The outcome of untethering, when performed in children and when conducted for a tight filum terminale, has been rather good. In contrast, when preformed in adult patients with severe and long-standing symptoms caused by lipomyelomeningocele or postrepair myelomeningocele, the results have been reported to be poor with improvement of only 6%–14%.3 Furthermore, attempting to completely untether the transitional or dorsal type of lipomyelomeningocele carries a significant risk of symptom deterioration due to neural tissue damage.1 Therefore, we believe that while a tight filum terminale or the caudal type of lipomyelomeningocele may be a good indication for untethering, the transitional or dorsal type of lipomyelomeningocele, or a postrepair myelomeningocele can be better managed with spine-shortening osteotomy. We fully agree with Dr. Traynelis’ comment that spine-shortening osteotomy should be considered for pathologies requiring surgical intervention cranial to the site of spinal cord tethering.

Dr. Traynelis mentioned the difficulty in reoperation for recurrent cord tethering and its increased risk of complication as the reasons for his consideration of using the spine-shortening procedure instead. In addition, we would like to stress that spine-shortening osteotomy should be considered for cases with recurrent tethering once new neural symptoms appear, without taking a wait-and-see attitude, even in adolescents and maybe even in younger children.

Of course, spine shortening has the potential risk of damaging the neural tissues. In our series, we had 1 patient whose neurological status gradually deteriorated after surgery. The reason for this deterioration was unknown. To minimize the functional loss due to the possible nerve root injury, the osteotomy is performed in the T-12 or L-1 vertebra. As Ikenaga et al.,4 stated from their experience in pedicle subtraction osteotomy for correction of thoracolumbar kyphosis, adequate surgical training lowers the risk of intraoperative complications and can prevent them. We believe that spine-shortening osteotomy involves less risk of neurological complications than untethering.

The failure to maintain long-term benefit is another concern in our study. One of the possible reasons why our spine-shortening osteotomy did not produce as good results as we hoped is that the tethered spinal cord in adult patients may have been stretched over a long period of time, and thus, it may have already undergone irreversible changes. In addition, as Dr. Traynelis remarked, the 2 cm or so of shortening may not be enough to maintain low spinal cord tension under repetitive tensile stress from spinal motion after surgery.

In conclusion, spine-shortening osteotomy is a promising procedure for management of TCS even though there are still some questions regarding its indication, suitable timing, and surgical techniques, as well as the optimal length of shortening.

References


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