Correction of thoracic kyphosis with Ponte osteotomy

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Introduction

Surgical management for thoracic kyphosis is recommended when the kyphosis is greater than 75° or with disabling pain despite conservative management, especially in those who have an unacceptable cosmetic appearance.

Surgical treatment of stiff kyphotic deformity may combine anterior release with posterior instrumentation and fusion. However, if the patient is skeletally immature with anterior spinal growth remaining and the kyphosis corrects to less than 50° on hyperextension lateral radiographs, a posterior instrumented fusion with the segmental instrumentation systems can be considered. The increasing use of pedicle screws combined with Ponte (shortening) osteotomies may be considered in cases where an adjuvant anterior release would have been previously considered.

This is an illustrative case of a posterior corrective osteotomy and instrumented fusion to correct a flexible thoracic kyphosis.

Case description

The patient is a 14-year-old girl with a painless progressive deformity of spine of 3 years duration. Clinically she had a flexible thoracic hyperkyphosis and a compensatory exaggerated lumbar lordosis. Neurology was normal. She also had Marfanoid features, with ligamentous laxity.

The radiographs show a negative sagittal balance with a thoracic hyperkyphosis of 85° correcting to 37°. The lumbar lordosis measures 65°. There is mild wedging of the 10th to the 12th thoracic vertebra.

The plan was to use rigid posterior spinal instrumentation to achieve cantilever correction of the flexible deformity with a Ponte osteotomy at the apex for additional correction.

Surgical procedure

Under general anesthesia, the patient was placed prone on bolsters on a radiolucent table and the spine exposed subperiosteally through a standard midline approach. Pedicle screw instrumentation was inserted with a supralaminar hook at T2 to form a claw construct. The claw prevents implant pull out. At least three levels caudally and cephalad to the apex require to be instrumented to achieve adequate corrective forces on the spine.

At the level of the osteotomy the inferior facets of the cephalad vertebra were excised with an osteotome to expose the articular cartilage of the inferior articular facet. The overlapping spinous process of the cephalad vertebra was then excised with a rongeur. The ligamentum flavum was excised with a Kerrison rongeurs beginning in the midline and proceeding laterally toward the remaining facets. This was continued laterally through the superior articular process of the caudal vertebrae out into the

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foramen to complete the osteotomy. Cephalad and caudal widening of the osteotomy was performed as indicated. It is important to undercut the leading margins of the cephalad and caudal lamina so as to avoid impingement on the cord while closing the osteotomy.

Two rods were contoured to the normal sagittal spine contour. The rods were placed in the proximal anchors, and the anchors compressed toward the apex. By careful cantilever bending the rods were sequentially introduced into the caudal anchors. Finally segmental compression toward the apex of kyphosis was applied. Posterior fusion was performed with posterior element decortication, and autologous bone grafting.

Post-op procedure

Postoperatively, the patients are allowed to as pain allows with a TLSO, which is worn for 3 months.

The radiographs are assessed for magnitude of correction of deformity and restoration of normal spinal sagittal balance. Follow up radiographs are assessed for implant position, fusion and maintenance of correction.

Discussion and conclusion

The pre-operative radiographs are assessed for magnitude, extent (levels) and flexibility of kyphosis, and global sagittal balance to aid in choosing fusion levels. The levels of posterior fusion and instrumentation should have the entire kyphosis and include one level cephalad, to the proximal

end vertebra of the kyphosis down to and including the first lordotic disc space.

A Ponte osteotomy is a posterior column shortening technique for the correction of kyphosis. The advantages of the posterior only technique described include that it is a single-stage procedure, there are no complications from a thoracotomy or thoracoscopy and there is no surgical interference with anterior blood supply to the spinal cord. The posterior spine is shortened rather than the anterior spine lengthened, thereby increasing safety. An average correction of 9.3° per osteotomy (range 5.9–15) has been reported. It should be emphasized that the disc spaces should be open anteriorly to allow good correction. 51–60% correction of the kyphotic deformity in Scheuermann's disease has been reported using the all posterior technique [1–3].

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