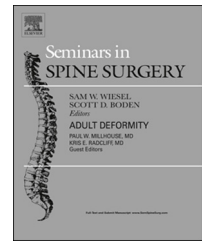


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Strategies for recalcitrant/recurrent thoracic curves

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ABSTRACT

Patients with a previously fused thoracic curve that has remained and is accompanied by pain and cosmetic deformity may be treated with complex revision surgery. Strategies include multiple posterior osteotomies—with or without anterior release, pedicle subtraction osteotomy, or vertebral column resection. Large residual rib prominences can be approached with multi-rib thoracoplasty. However, the potential complication rate of these procedures can be considerable, and thus, a clear and thorough discussion regarding treatment objectives is strongly recommended.

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Primary thoracic curves are the most common type of scoliosis that receives treatment in the adolescent population.¹ Success rates in terms of coronal plane curve correction using modern three-dimensional techniques range from 70% to 80%. Satisfaction rates, in terms of body image success, are equally positive with scores improving almost universally.^{2,3}

There remain instances, however, whereby, despite treatment as an adolescent, curve progression can be seen that can leave the adult with a cosmetically unsatisfactory deformity, pain, and dysfunction.⁴ Children treated with first- or second-generation instrumentation—Harrington, Luque, etc.—especially if done so with significant remaining anterior growth (crankshafting), can present with not only a recurrence but worsening of their original thoracic curve, now ossified. When non-operative measures such as physical therapy, medication, or changes in lifestyle have been unsuccessful, discussions can be had regarding possible surgical treatment.

The principles of surgery would be primarily that of both some degree of curve correction and concomitantly, some improvement in pain and function. However, a fused spinal column presents significant challenges in many ways, if one is considering altering the alignment, influenced by not only the degree of curvature but the biology of the bone, the

medical condition of the patient, especially from a cardiopulmonary standpoint, and the technical expertise of the treating surgeon.

However, there do exist treatment options that can be tailored for the appropriate situation that can have a positive impact on both the morphology of the spine and the functionality of the patient as well.

1. Pre-operative assessment

The pre-operative assessment of a patient with a fixed and fused, recalcitrant thoracic curvature begins essentially as one would any spinal deformity, with a careful physical and neurological examination. In addition, however, one should pay particular attention to areas of potential increased pain such as that could be seen with a pseudarthrosis or a fracture, even if instrumentation is present.

A thorough medical examination should include careful assessment of the patient's cardiac condition. Patients with a history of coronary artery disease or significant risk factors, e.g., age, smoking, and high cholesterol, may require beta blockage during the perioperative period to reduce the risks of intra- or post-operative myocardial damage. Patients with

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Fig. 1 – A 36-year-old female s/p thoracic spine fusion in adolescence with complaints of curve deformity, pain, and rib prominence. (A) Pre-operative clinical view, (B) pre-operative anterior-posterior radiograph, (C) pre-operative lateral radiograph, (D) post-operative anterior-posterior radiograph, (E) post-operative lateral radiograph, and (F) post-operative clinical view.

diabetes must have their glucose well controlled, as well as patients with hypertension.

The pulmonary capacity also needs to be carefully assessed, as many have curves from adolescence with hypokyphosis or frank lordosis in their thoracic region, and prolonged anesthesia may present a problem for recovery.^{5,6} Individuals treated with a transthoracic approach to the spine are at an increased risk for post-operative pulmonary complications.^{5,7} Some individuals may be seeking correction of their residual thoracic curve for both functional and

respiratory purposes. VC, FVC, and FEV1 tests have been shown to be the most sensitive toward predicting post-operative pulmonary recovery. However, enthusiasm for dramatic pulmonary improvement should be guarded, as multiple authors have described little or modest improvement in post-operative spirometries.^{8,9}

Radiological assessment will include full spine x-rays in both coronal and sagittal planes as well as flexibility bending x-rays of the unfused spine. The latter is quite important if significant correction of the thoracic curve is expected. A

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