

TECHNICAL NOTE

Pedicle Subtraction Osteotomy in a 5-Year-Old Child with Congenital Kyphosis

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Vertebral anomalies may also distort the normal regional or global spinal alignment and necessitate some therapeutic interventions. Hemiepiphysiodesis is a traditional procedure usually described for these young patients but in more severe cases some type of osteotomy seems to be necessary. In this technical note, we describe a 5-year-old boy with failed previous hemiepiphysiodesis surgery, who was successfully treated with one level pedicle subtraction osteotomy. This procedure not only corrects the kyphotic deformity at the time of the procedure (not relying on future spinal growth), but also avoids more hazardous anterior approach.

Key words: Children, Congenital Kyphosis, Pedicle subtraction osteotomy

Introduction

Congenital anomalies of the spine are complex syndromes that are usually associated with abnormality in other parts of the body (1). Vertebral anomalies may also distort the normal regional or global spinal alignment and necessitate some therapeutic interventions (2). As these disorders are usually unresponsive to bracing, in cases with unpleasant alignment, progressive deformity, or neurologic deficit, surgery is indicated (1, 2).

Hemiepiphysiodesis is a traditional procedure usually described for these young patients and mostly relies on growth tethering and gradual deformity correction as the child grows up (3). This procedure is usually performed on the convex (tension) side of the deformity and probability of the successful fusion varies (2, 3). In this note, we describe pedicle subtraction osteotomy to restore normal alignment in a 5-year-old patient with severe congenital kyphosis.

Technical Note

A 5-year-old boy presented with low back deformity. His deformity was increasing clinically and on imaging study. He had Type III congenital kyphosis (According to Winter et al.) at L2-L3 vertebrae (1). Standing

radiographs denoted a significant L1-L4 kyphosis (+25°) [Figure 1]. Physical examination and magnetic resonance imaging revealed no associated neurologic abnormality. He was treated by posterior hemiepiphysiodesis (with one additional level at proximal and distal to the involved segments) associated with a weak posterior tension band fixation device [Figure 2].

Later follow-up visit 18 months after the intended surgery revealed that the primary treatment was unsuccessful and kyphotic deformity aggravated to L1-L4= +45° instead of a normal negative value for lumbar lordosis [Figure 3]. Neurologic exam was still unremarkable.

We should do something to stop the progression of deformity. Normal lumbar lordosis is -40 to -60° and this means that an apparently lumbar kyphosis of -45°, actually is a severe kyphosis equivalents with -90° (4). This time, the patient was operated with isolated posterior approach comprising PSO, fusion, and pedicular screw fixation to stabilize the osteotomized spine [Figure 4]. Postoperatively, the patient was mobilized two days later with a rigid orthosis for more assurance. We did not encounter any significant intra- and postoperative complication and blood transfusion was not necessary at all. We did not use any device for

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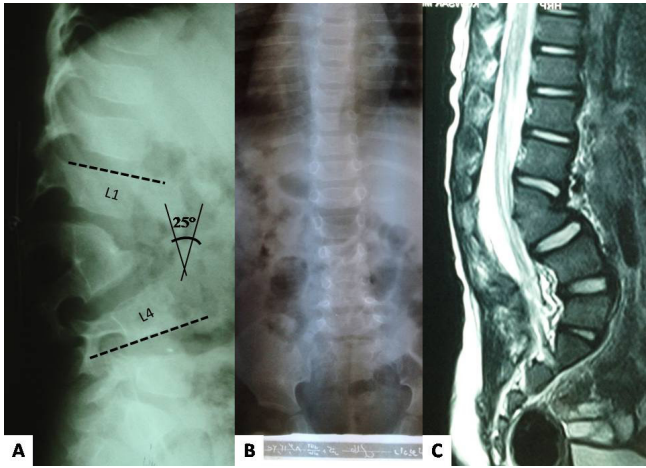


Figure 1. Preoperative plain radiographies (A and B) and MRI scanning (C) of the patient with congenital kyphosis Type III.

transverse connection in order to not tethering the future horizontal growth. Currently, we followed-up the patient for 28 months and observed no adverse events.

Discussion

Classically, in surgical treatment of congenital kyphosis, isolated posterior spinal fusion is usually successful for the kyphosis less than 50-55 degrees. In deformities more than 55°, it is often argued that combined anterior and posterior approach is more effective and produces more consistent consequences (1, 2). Anterior procedure comprised anterior release, temporary distraction, strut grafting, and fusion. This additional procedure has also some disadvantages including increased morbidity, risk of injury to the major blood vessels or viscerae, and complications associated with bone graft harvesting (5). Besides, this anterior approach can't correct the

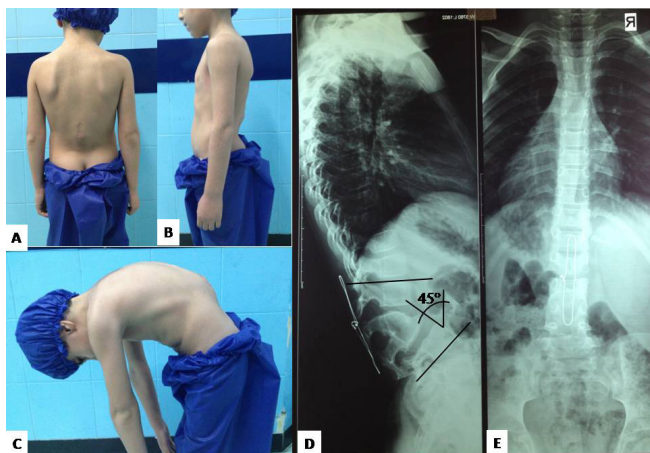


Figure 3. Follow-up photographs (A to C) and radiographies (D and E) at 18 months later reveal failure of the primary operation. Lumbar kyphosis increased to +45°.

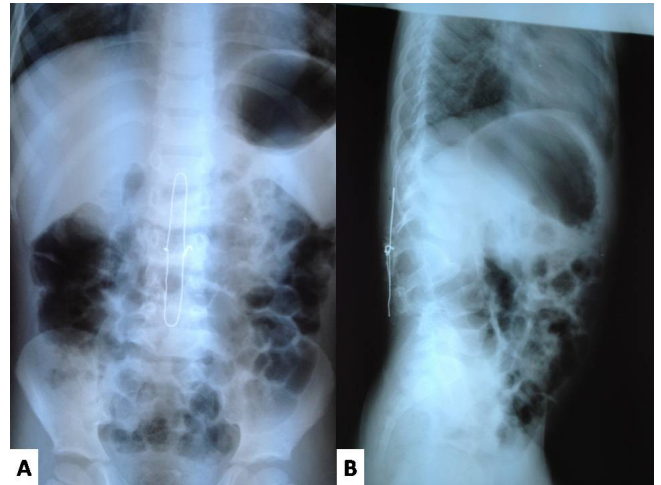


Figure 2. Postoperative plain radiographies (A and B) of the child that was operated with posterior hemiepiphysiodesis and tension band wiring.

deformity significantly and major deformity correction relies on the future growth of the spine, provided that posterior extensive fusion has been successful to tether the posterior growth. As the previous posterior fusion failed, we decided to correct the deformity with pedicle subtraction osteotomy (PSO).

Generally, spinal osteotomies are used in adult patients with significant spinal deformity like flat back syndrome or ankylosing spondylitis. This type of procedure has been rarely reported to be performed on such an immature patient (6, 7). The key point in this delicate surgical technique is to maintain the segmental vessels intact. In case of injury, control of bleeding from a posterior approach would be very difficult or even impossible. Therefore, these vessels should be first dissected with a

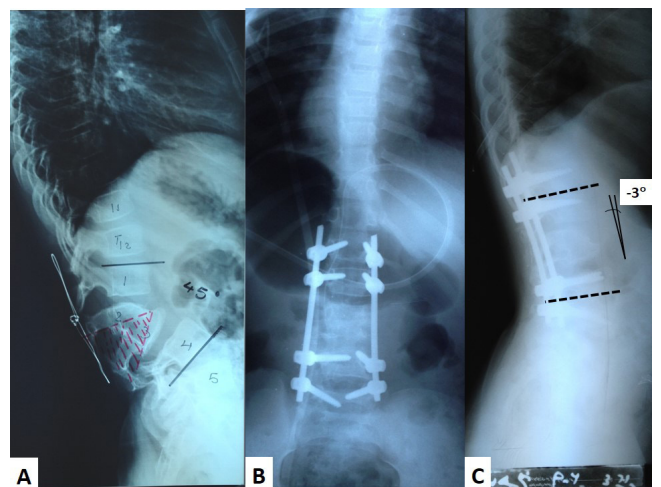


Figure 4. Preoperative plain radiography was demonstrated to show the surgical planning. Shaded area was resected to close the osteotomy (A). Postoperative radiographies (B and C) show excellent lumbar alignment and rigid stabilization.

small Cobb or Penfield elevator and then, lateral cortex of the vertebral body should be hugged with a Leksell Rongeur instead of using a sharp osteotome (8).

Although the long-term follow-up of the patient is still unavailable, but PSO seems to be an efficient and reliable procedure for those patients unresponsive to more traditional spinal procedures. This procedure not only corrects the kyphotic deformity at the time of the

procedure (not relying on future spinal growth), but also avoids more hazardous anterior approach.

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