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Lumbar hemivertebra resection by posterior approach for congenital scoliosis

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Learning targets

- To learn the approach to the lumbar vertebral body after transverse process removal,
- To learn the technique for posterior approach for complete lumbar hemivertebra and adjacent discs resection,
- To identify and obtain the correction goal: parallel endplates below and above the resection area,
- To identify the strategy to obtain and maintain correction and fusion,
- To learn the three rod technique fixation and identify its advantages.

Introduction

Hemivertebra is the most frequent cause of congenital scoliosis. Many procedures have been traditionally described to treat this pathology, including in situ posterior or anterior-posterior fusion with or without instrumentation, combined anterior and posterior convex hemiepiphysiodesis and hemivertebra excision with fusion. The latter technique can be performed by either a combined anterior and posterior approach, or a single posterior approach [1–3].

Case description

The patient is a 10-year-old boy with a right lumbar congenital scoliosis, due to a right fully segmented hemivertebra of L2. The scoliosis was discovered recently after medical examination in school.

The Cobb angle was 45°. Lateral bending X-rays showed no modification of the Cobb angle in relation to the fixed deformity.

Hemivertebra resection by a posterior only approach was decided with a short instrumentation from L1 to L3, using the three rods technique [2] (Fig. 1).

Surgical procedure

The surgery was performed under motor-evoked potentials and somatosensory-evoked potentials neuro-monitoring. After a standard midline incision, a full thickness subperiosteal dissection going laterally to the transverse processes is performed to expose the hemivertebra and the vertebra above and below with care taken to limit dissection to the concerned levels as spontaneous fusion after exposure only is common in young children. Inferior facetectomies of L1 and L2 are performed to provide maximum flexibility to the

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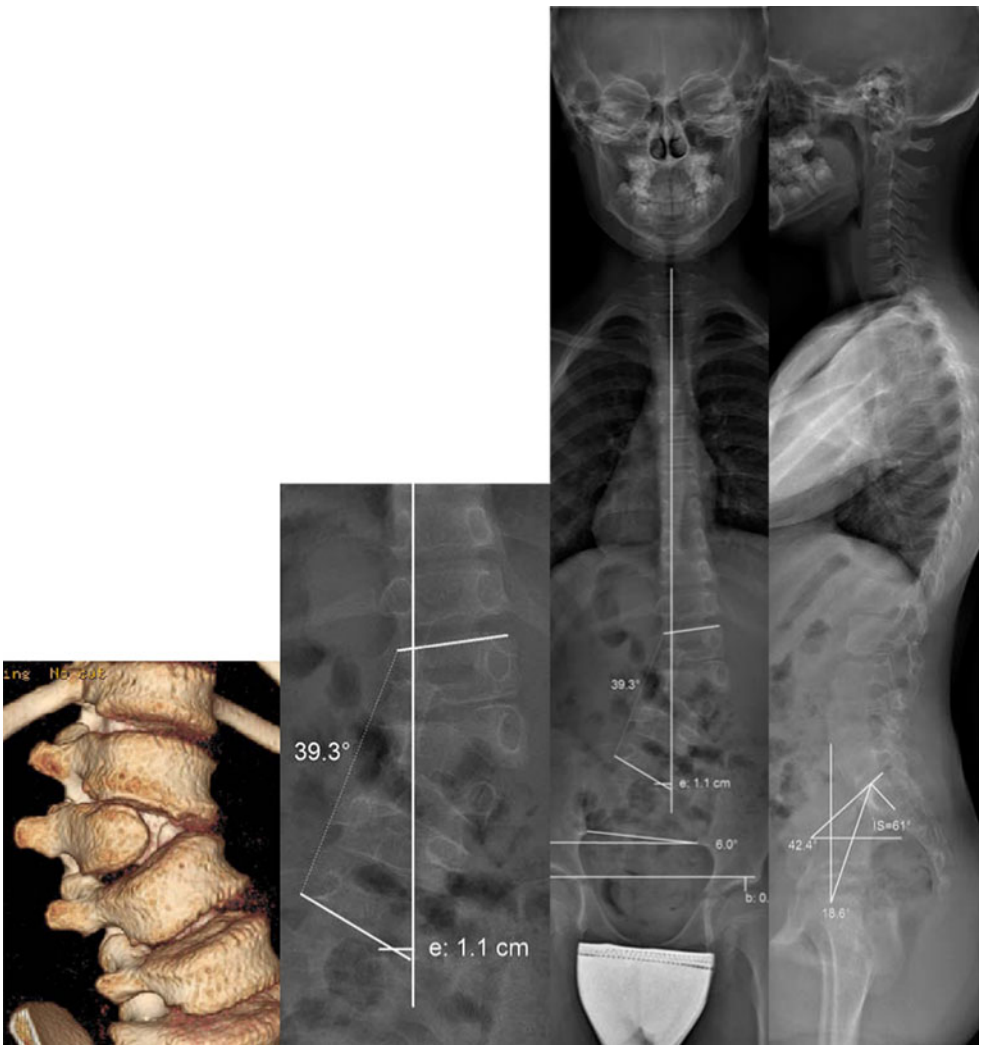

Fig. 1 Pre-operative CT scan and EOS X-rays showing L2 right hemivertebra and congenital scoliosis

spine. The spinous processes are also resected, and the bone recovered prepared for use as a graft at the end of the procedure. Pedicle screws are then placed in L1 and L3, followed by a supralaminar down going hook on the lamina of L1 and an infralaminar up going hook on the lamina of L3, both on the convex side. Resection is first performed by removing the hemilamina and transverse process of L2. Both foramens, above and below the hemivertebra are opened by removing the superior articular processes. A Cobb elevator is placed outside the lateral portion of the hemivertebra and moved anteriorly to the anterolateral quadrant. The hemivertebra pedicle is removed with a rongeur and the nerve roots above and below are identified. Venous bleeding in the epidural space should be controlled by bipolar cautery. The body of the hemivertebra is removed using osteotoms, including the discs above and below. This must include the concave disc material, with smooth retraction of the dural sac. Careful removal of all disc and cartilage material is essential to obtain fusion and to completely stop the spinal growth at the concerned level. Concave side disc removal and concave side facetectomies are necessary to obtain a good release with complete curve correction. The goal of the correction is to obtain parallel endplates at the levels adjacent to the hemivertebra.

Two rods are then placed into the laminar hooks and the screws on the convex side. Gradual compression is done to close the resection site with careful control of the exiting nerve roots and dura. The screws and hooks are fixed after complete closure; the third rod is then placed on the concave side and blocked.

The anterior interbody contact was good and therefore anterior column bone grafting was not necessary.

Fluoroscopy control showed a good correction as planned, with parallel L1 superior and L3 inferior endplates. Decortication of the posterior elements is then done and autograft from the resected vertebra is applied.

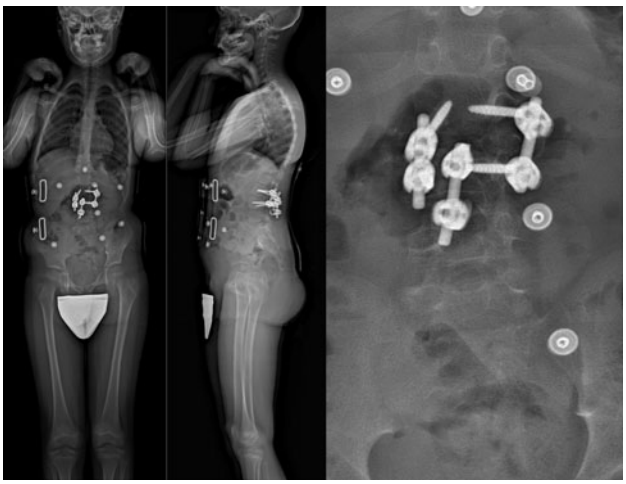

Fig. 2 45 days postoperative EOS X-rays showing complete scoliosis correction after posterior hemivertebra resection

Haemostatic agent was used at the end of the surgery due to important epidural bleeding.

Postoperative information

The patient is able to stand up on day 3 after a control X-ray. At day 6, a lumbar brace is fitted and worn for 2 months to avoid motoric complications that are more frequent in older children [2].

The postoperative X-ray showed an improvement of the Cobb angle of 3°.

In congenital scoliosis, early diagnosis and early intervention is mandatory to achieve a successful treatment (Fig. 2).

Discussion and conclusion

Posterior hemivertebra resection is one option of treatment of congenital scoliosis in children. Compared to convex epiphysiodesis, hemivertebra resection allows better correction with shorter fusion. Compared to the double approach, this technique achieves the same result with less morbidity but is technically more demanding.

The aim of the treatment is to achieve a straight spine with respect to sagittal contour, and as short a construct as possible. This can be achieved by transpedicular instrumentation even in patients as young as 1 year old [1]. The 3 rods technique combining hooks and pedicle screws allow for gradual and complete closure of the excision site, avoiding the problem of implant failure that has been described in the literature. Complete disc and cartilage removal, anterior bony contact either by direct contact or by bone grafting, complete correction of the deformity and solid fixation are the guaranty for a good long-term result.

Conflict of interest None.

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