Case Report

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Pediatric CHANCE fracture treated by lumbar lacing technique: a case report

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Abstract

This paper presents the case of an 7-year-old girl victim of a road accident. The neurological examination revealed a conscious patient without any sensory or motor deficit and she had intense lumbar pain. The lumbar computed tomography scan found a chance fracture at the level of L3. the patient was operated under general anaesthesia with a sublaminar lacing fixation of L2–L3 similar to the lacing of C1C2 in upper cervical trauma. The follow-up was good The control X-ray was satisfied with a complete reduction and restoration of the lumbar lordosis and the patient was discharged from the hospital on the fifth day following the intervention. this article shows that sublaminar lacing can be as effective as pedicle screw fixation, thus preserving bone growth

Keywords: case report, fracture, lacing, lumba, paediatric spine trauma

Introduction

Paediatric spine trauma is rare, with paediatric patients suffering only 2–5% of all spinal injuries. This is attributed to the proportionally larger head size in children, in addition to their weaker supportive soft tissue structures in comparison to those of adults. Thus, only an estimated 0.6–0.9% of all spinal trauma cases are paediatric Thoracic and lumbar spine injuries[1]. The most common cause of thoracolumbar paediatric spine trauma is motor vehicle accidents, which lead to 33–58% of all injuries[2]. Here we report a case of paediatric lumbar trauma in 7-years-old girl with a chance fracture requiring surgical management.

Case report

A 7-year-old girl, right handed, living in a rural region, was brought by ambulance to our emergency department following a road traffic accident accident collision of two cars the passenger was in the back seat without a seat belt the car was travelling at 135 km/h. There is no history suggestive of any mental or physical illness.

HIGHLIGHTS

- This paper presents the case of an 7-year-old girl victim of a road accident. The neurological examination revealed a conscious patient without any sensory or motor deficit and she had intense lumbar pain.
- The lumbar computed tomography scan found a chance fracture at the level of L3. the patient was operated under general anaesthesia with a sublaminar lacing fixation of L2–L3 similar to the lacing of C1C2 in upper cervical trauma. The follow-up was good The control X-ray was satisfied with a complete reduction and restoration of the lumbar lordosis
- Spinal fractures in children are less frequent than in adults and their management is specific to each age group our study reports a new experience with this technique of lumbar lacing in the chance fracture to preserve spinal growth.

At admission, his GCS scores were 15/15. reactive symetric pupil hemodynamically and respiratory stable with no sensory or motor deficit she presented with an intense lumbar pain and a right frontal wound. A full body scan was performed showing a depressed skull fracture in the right side (Fig. 1). associated with a fracture of L3 on the lumbar computed tomography scan classified as B2 in the AO spine fracture classification CHANCE fracture (Fig. 2).

The girl was initially referred to the operating room where she was operated on for her cranial fracture which went well without any postoperative complication then a second time for her lumbar fracture the day after. We opted for a surgical treatement fixation and reduction by a lacing the L2L3, technique smilar to a classic lacing of C1C2 in order to preserve the spinal growth.

The operation was performed under general anaesthesia by our professor after the paravertebral muscles had been roughened a polyester braid was passed under the l3l2 blade the whole thing was sealed with a PEEK system (Fig. 3).

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Figure 1. CT scan: right frontal depresses skull fracture. CT, computed tomography.

Figure 2. CT scan: fracture of L3 classified as B2 in the AO spine fracture classification CHANCE fracture. CT, computed tomography.

the follow-up was good the without sensitivo or motor deficit the control X-ray showed a good lumbar reduction (Fig. 4).

The patient was discharged from hospital 5 days after the operation with a brace for 3 month and was seen again 6 months later in consultation without any abnormality and good X-ray control (Fig. 5).

This case has been reported in line with the 2020 SCARE guidelines {3}.

Discussion

Infants and young children may be more likely to sustain injuries from flexion and extension because of the numerous differences between the adult and paediatric spinal columns. Their heads are proportionally larger than their bodies, and their neck muscles are underdeveloped. They also naturally lack ossification, elasticity, and ligamentous laxity. They are more mobile but less stable due to their smaller facet joints that are oriented more horizontally. Due to these biomechanical differences, children between the ages of 0 and 8 have a higher risk of SCIWORA, or spinal cord injury without radiographic abnormality.

In the paediatric spine, hyperextension and hypermobility can result in a sudden dislocation and spontaneous reduction, with a damaged spinal cord but a normal-looking vertebral column on radiographs. SCIWORA has been found in as many as 20% of children, but its prevalence in adults is much lower, at 1%. In this age group, spinal cord injury is less severe because the vertebral column is more adult-like, has stronger osseoligamentous formation, and better protects the spinal cord.

A particular kind of flexion-distraction injury that is frequently associated with severe abdominal trauma is seat belt injuries. A compression or chance-type fracture and a small bowel

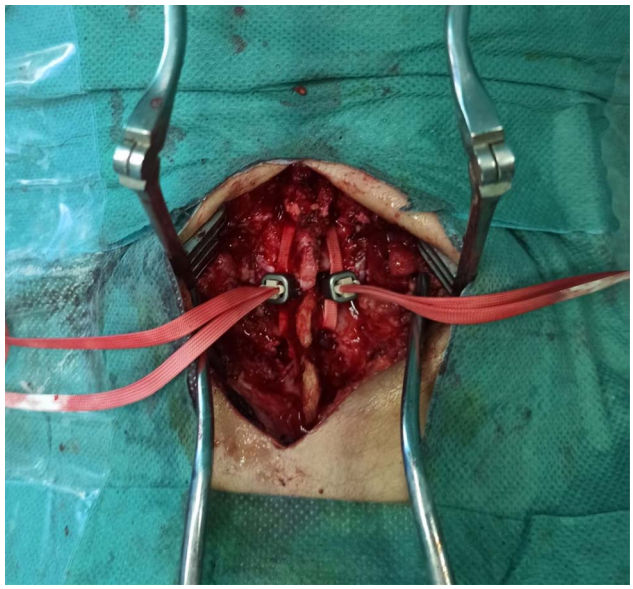

Figure 3. Per op lacing l2l3.

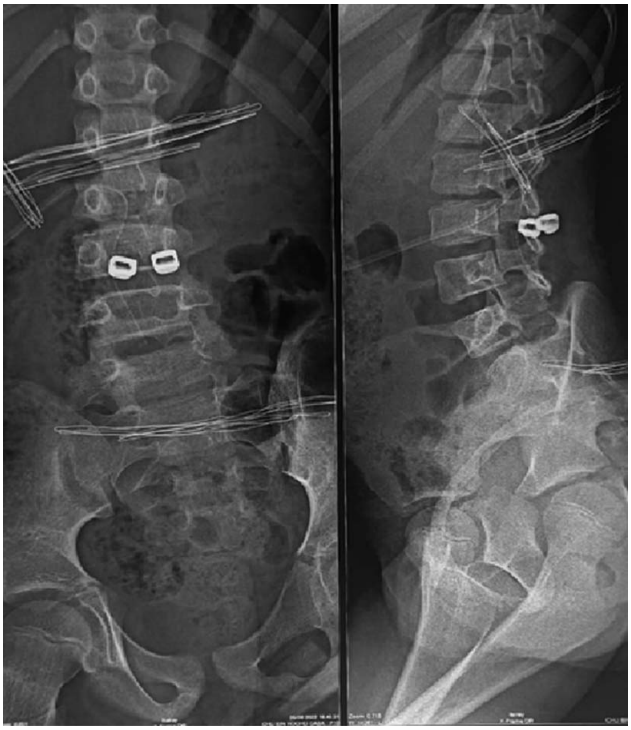

Figure 4. Face and profil control X-ray showed a good lumbar reduction.

mesenteric tear or perforation are typical examples. The thoracic spine is shielded from horizontal displacement by the rib cage, but there is little protection against longitudinal distraction that can result from these injuries. Due to children's tendency to sit further over the edge of the seat, the mechanism involves moving the lap belt toward the anterior abdominal wall.

In paediatric patients, the most ordinarily impacted levels are L2 and L3 contrasted and the thoracolumbar intersection in grown-ups like our case[3]. The fact that the paediatric spinal column is significantly more elastic than the spinal cord and dura makes it more likely that a neurologic injury will occur. Santschi and colleagues[4] examined 28 children with seat belt syndrome

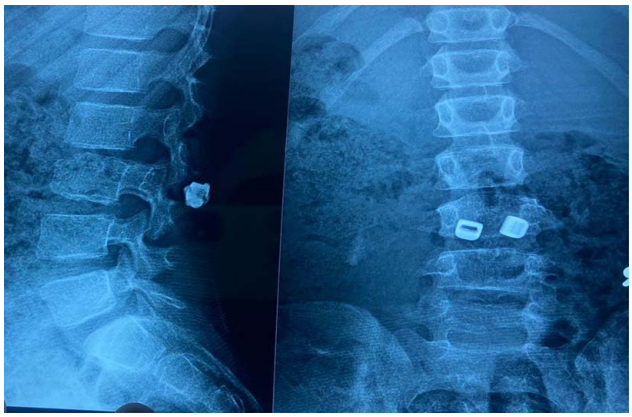

Figure 5. Face and profil control X-ray 6 month later showed a good lumbar reduction.

Table 1

Thoracolumbar injury classification and severity scoring system.

Feature	Score
Morphology type	
Compression	1
Burst	2
Translational/rotational	3
Distraction	4
Neurologic involvement	
Intact	0
Nerve root	2
Cord, conus medullaris	2
Incomplete injury 1 1	
Cauda equina	3
PLC	
Intact	0
Injury suspected/	2
Indeterminate	
Injured	3
Treatment recommendation	
Nonsurgical	0–3
Surgeon's choice	4
Surgical	> 4

and discovered that 43% had a spinal cord injury, which was associated with a wide range of fractures beyond the typical chance fracture. Because 50% of patients also present with significant abdominal injury (the nutcracker phenomenon, in which the head of the pancreas, third segment of the duodenum, and left renal vein are crushed between the superior mesenteric artery and aorta), patients with this pattern of injury require special consideration, including a comprehensive trauma survey.

For each of the fracture patterns that have been discussed thus far, the authors suggest only one methodical strategy. There are three factors that determine whether arthrodesis is required and whether surgery is necessary: the need for neural elements to be decompressed, the stability of the injury or deformity, and the possibility of healing in the long run. The authors recommend using the Thoracolumbar Injury Classification and Severity (TLICS) score, which has recently been validated in children[5] and can also guide conservative or surgical management. Stability, on the other hand, can be determined by a variety of rules (Table 1).

Chance fractures typically require surgical treatment. The question that needs to be answered is whether or not conservative

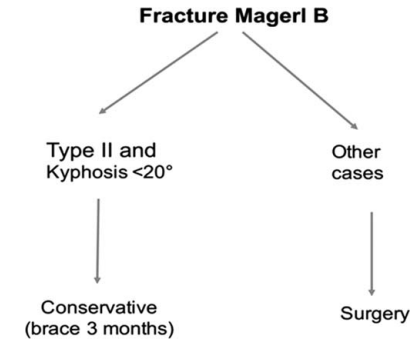

Figure 6. Descision tree for magerl B in children.

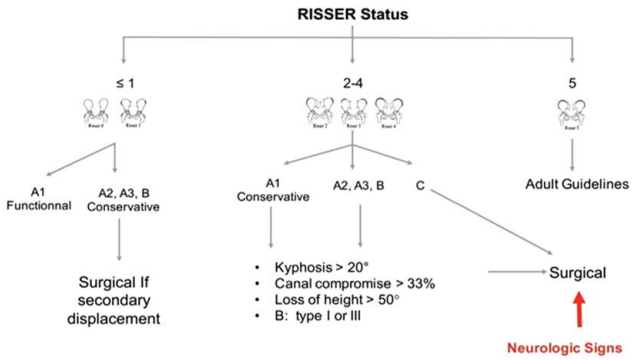

Figure 7. Descision tree according to RISSER scale.

treatment can manage a Chance fracture. In his description of the prince, Chance advocated for conservative treatment. When there is no significant ligament damage, hyperextension of the spine results in almost 100% anatomical reduction and a favourable prognosis. When Chance fracture is purely osseous, Gordon and Sayama also recommended conservative treatment. Finally, when kyphosis was less than 20°, Glassman recommended conservative treatment.[6–11] When kyphosis was 30° or greater, surgery was suggested. When Chance fracture is entirely ligamentous, treatment is surgical[12] (Figs. 6, 7), and ligament injury should be evaluated.

in our case we retained the surgical indication of a fixation by posterior approach considering the instability of the patient due kyphosis angle was 24° and 5 in TLICS score. We opted for a lacing fixation l2l3 technique similar to that of the lacing of c1c2 with the

Figure 8. L3 chance fracture with 24° in kyphosis angle.

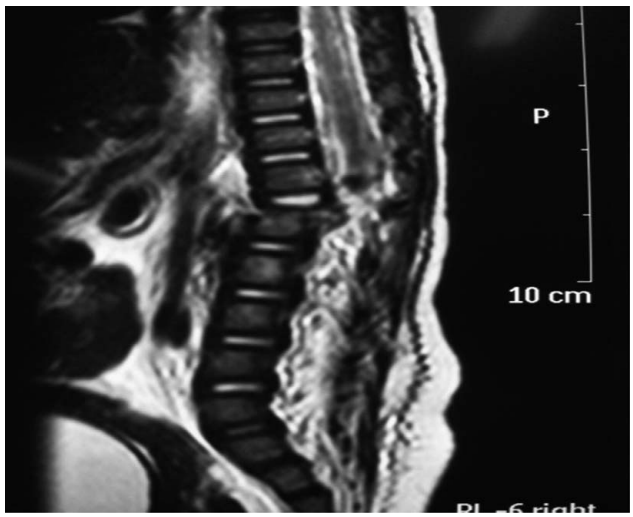

Figure 9. Thoracolumbar MRI shows Chance fracture at the T12–L1 levels.

jazz lock device. The radiological control post op immediately and at 6 months was good the patient no neurological complications. Few studies are talking about this technique in the lumbar level the literature we found a case done it by the Department of Neurosurgery Onofre Lopes University in Brazil in 2016 with 5 months old child who presented a chance fracture of D12 (Fig. 8).

An interspinous absorbable "wire" (polyglactin) fixation technique was performed, resulting in good spinal alignment. Postoperatively, the patient was kept in bed for 90 days. There was no change in neurologic status. At 36-month follow-up the patient had developed scoliosis (Figs. 9, 10, 11)[13].

In our case the alignment is still present we used a thick non-absorbable braid and we always keep in touch with the patient for a close radiological control

Figure 10. Face and profil postoperative X-ray confirms spinal alignment.

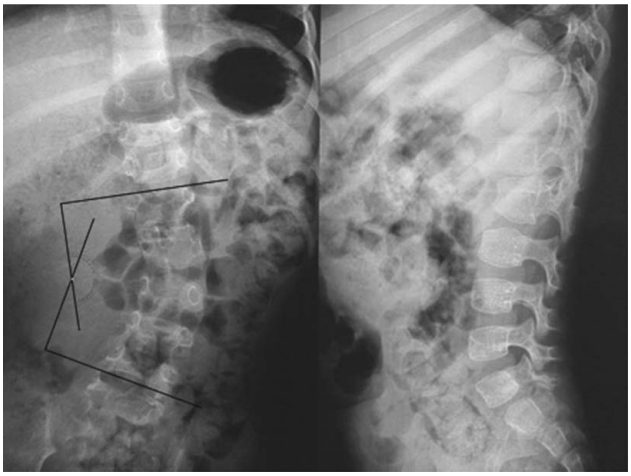

Figure 11. Face and profil late follow-up radiography confirms scoliosis (30° Cobb angle).

Conclusion

Spinal fractures in children are less frequent than in adults and their management is specific to each age group our study reports a new experience with this technique of lumbar lacing in the chance fracture to preserve spinal growth a prospective studies must be done to know the value of this one in the surgical management of paediatric spinal fractures.

Ethical approval

Written informed consent was obtained from the parents for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Consent

None.

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Author contribution

M.Y.H.: writing the paper. M.M.: corresponding author and writing the paper. I.F.: study concept. A.J.: study concept. A.L.: correcting the paper.

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