Spontaneous Reduction of a Traumatic L2-L3 Subluxation without Fracture in a 14-Year-Old Boy

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Key Words

Child • L2-L3 subluxation • Spontaneous reduction

Abstract

Objective: To report a rare case of lumbar vertebral subluxation associated with spontaneous reduction in an adolescent treated conservatively. **Clinical Presentation and Intervention:** A 14-year-old male victim of a snowboard accident, which caused a lumbar spinal injury, was referred to the emergency room with significant lumbar pain. Neurologic examination was normal. Radiographic assessment at admission showed a unilateral left lateral subluxation of the L2-L3 vertebrae without associated fractures. These findings were confirmed by CT scan and a surgical management was decided. The preoperative MRI performed 24 h after the accident, however, revealed the spontaneous reduction of the subluxation, and an associated tear of the quadratus lumborum and the psoas muscles on the right side at the level of L2, L3 and L4. Following these findings conservative treatment with a plaster brace for 2 months was carried out. The brace was removed after 2 months. The patient had no pain and the range of motion of his lumbar spine was normal. Three months after injury, sports activities were resumed. At follow-up of 24 months, the patient was free of pain and radiographs showed a right positional bending without rotational or translation anomaly. **Conclusion:** To date, this is the

first case of subluxation without fracture in a child, presenting without neurological deficit and where spontaneous reduction occurred. In this case, conservative treatment was effective and the outcome at 2-year follow-up was excellent.

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Introduction

Injury of the spinal column is relatively uncommon in the pediatric and adolescent population (birth to 16 years of age) [1, 2]. The types of spinal injuries seen in children are different from those in adults because of the higher elasticity of the vertebral column in this age group. Pediatric patients have anatomical spinal differences that offer significant protection against trauma and result in unique patterns when injury does occur [2, 3].

Spinal injuries can be classified in four categories on the basis of radiological criteria: (1) fracture of the vertebral body or posterior elements without subluxation, (2) fracture with subluxation, (3) spinal cord injury without radiological abnormalities (SCIWORA), and (4) subluxation without fracture [2, 4, 5]. More than 60% of major spinal injuries in children occur in the cervical spine, with compression fractures due to hyperflexion being the most common pattern [5]. Subluxations without fracture

that are detectable radiologically represent only a small percentage of pediatric spinal injuries. They are most frequently localized in the cervical spine where the horizontal orientation of the facet joints offers additional protection from dislocations [2, 4].

The purpose of this report was to present a case of traumatic lumbar subluxation without fracture and neurological deficits, in which spontaneous reduction occurred and where conservative treatment was applied.

Case Report

A 14-year-old boy was the victim of a snowboard accident in which he sustained an injury of the lumbar spine. He was immediately referred to our Emergency Department. In the emergency room, he was conscious and reported severe low back pain.

Physical examination showed tenderness in the region of L3 and L4 with important muscle spasm in the left lumbar region. The neurological examination was normal. Anteroposterior and lateral lumbar spine radiographs demonstrated lateral displacement of the second lumbar vertebra on the third (fig. 1). Vertebral bodies of L2 and L3, inferior articular facets of L2, and superior articular facets of L3 were shown to be intact.

Fig. 1. Anteroposterior lumbar spine radiograph demonstrated a lateral displacement of the second lumbar vertebra on the third. Vertebral bodies of L2 and L3, inferior articular facets of L2, and superior articular facets of L3 were shown to be intact.

Fig. 2. CT of the lumbar spine with three-dimensional reconstruction, anterior view (a) and posterolateral view (b). Subluxation of vertebral bodies without fracture. Widening of the articular space between L2 and L3 with facet subluxation (arrow).

Fig. 3. Coronal (a) and axial (b) MRI spin echo T₂-weighted images with fat saturation. Spontaneous reduction of subluxation. Tear of quadratus lumborum (black arrow) and psoas muscles (white arrow) on the right side at the level of their L2, L3 and L4 vertebral body insertions. All bony elements and disks were intact.

Fig. 4. Anteroposterior radiograph of the lumbar spine 24 months after his accident. Complete realignment of the lumbar spine.

Fig. 5. Anteroposterior bending and lateral flexion/extension radiographs at 2 years.

articular facets of L3 were shown to be intact. Computed tomography (CT) of the lumbar spine shows a left unilateral subluxation of L2 on L3 vertebral bodies without fracture (fig. 2).

Twenty hours after injury, magnetic resonance imaging (MRI) was ordered in planning for the surgical treatment. This, however, showed a spontaneous reduction of the subluxation, a ligamentous disruption at the level of the articulation between L2 and L3 with widened articular space and periarticular hematoma. Additional findings were those of contusion of the L2 and L3 spinous processes, hematoma within the intraspinal ligament and tear of the quadratus lumborum and psoas muscles on the right side at the level of their L2, L3 and L4 vertebral body insertions. All bony elements and disks were intact (fig. 3). In view of these findings, a conservative treatment was selected with a spinal plaster jacket to be worn for 2 months. On the 3rd day after the injury the patient left the hospital without pain and without neurological symptoms. The plaster jacket was removed after 2 months. Clinical examination showed a normal range of motion of the lumbar spine with no pain and with normal standard X-rays. After 3 months, the patient was allowed to return to sports. At the last follow-up, 24 months after his accident, the patient was still pain-free and the radiographic controls showed a positional bending but without rotational or lateral displacement (fig. 4, 5).

Discussion

The reported frequency of spinal injuries in the pediatric population (birth to 16 years old) is variable, ranging from 3 to 5% of all vertebral fractures [1, 2]. There are studies reporting the possibility that some of the injuries are overlooked, owing to the relative mildness of symptoms, and difficulty in performing the physical examination and eliciting pain in a young child [6]. The spine of children up to the age of 9 years is immature. In older children the spine does not resemble the adult spine until late adolescence (15–17 years). The group aged 10–14 years represents an intermediate stage of development and in this age group specific patterns of injury occur. An increased mobility secondary to ligamentous laxity, immaturity of the paraspinal musculature, shallow horizontal orientation of the facet joints, particularly in the upper cervical spine, incompletely ossified wedge-shaped vertebrae with incompletely formed and flattened uncinate processes, greater height of the intervertebral disks,

and a larger head-to-torso ratio [2, 4, 7, 8] are all features acting in concert to render the pediatric spine inherently hypermobile. This spinous hypermobility may actually offer some protection against bony injury but makes the vertebral column more susceptible to ligamentous injury and SCIWORA [5, 9]. In fact, the elasticity of the ligaments and joint capsule in this age group allows significant stretching in all directions without tearing. Dislocation without fracture is rare. Its reported incidence in large series varies between 2 [4] and 10% [2] of all cases of spinal injury and is frequently localized in the cervical vertebrae [1, 2, 4]. In the relevant literature we found only 1 case of vertebral lumbar dislocation without fracture in the pediatric population [10]. Patients with subluxation were reported to present a higher incidence of neurologic injury than did patients with fracture alone [2, 5, 10]. Our patient suffered a traumatic subluxation of the lumbar spine, between the L2 and L3 vertebrae, with accompanying disruption of the posterior articular ligaments with right psoas and quadratus lumborum tear, at the level of the muscular insertion to L2, L3 and L4. This traumatic rupture of the L2/L3 capsular ligament probably caused an unbalanced reflex contralateral muscular contraction, which was responsible for the L2 on L3 left-side subluxation. Another interesting feature of this case is the spontaneous reduction of the lumbar injury. In general, pediatric patients with vertebral column injury are considered to have a good prognosis [8]. This relatively good outcome is probably related to the rapid healing properties of bone and ligaments in children. Studies performed

on large series reported that most of these patients could be effectively managed nonoperatively, and the reported incidence of failure was 3% [2]. Surgical treatment is indicated for unstable injuries, significant subluxation without fracture, injuries with a malalignment of the vertebral column, spinal cord compression in patients with neurological deficits, particularly if these are incomplete, and injuries that remain unstable after nonoperative treatment [2, 8, 11]. We decided to treat this patient conservatively because of the spontaneous reduction of the subluxation and the absence of neurological deficit. In the case of traumatic spinal dislocation with a rupture of capsular and ligamentous structures a column realignment is adequate with immobilization in a plaster jacket long enough to allow the soft tissue to recover. However, if after the conservative management there is evidence of segmental instability (lateral flexion/extension and anteroposterior bending radiographs), surgical stabilization should be considered. In the case we report, the clinical and radiological outcome was very satisfying at 2 years' follow-up.

Conclusion

To date, this is the first case of subluxation without fracture in a child, presenting without neurological deficit and where spontaneous reduction occurred. In this case, conservative treatment was effective and the outcome at 2-year follow-up was excellent.

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