

Chance-Type Fracture of L1 with Entrapment of the Cauda Equina

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Abstract

A patient is presented who sustained a motor vehicle accident while wearing a seat belt. Due to life-threatening intraabdominal lesions, a Chance-type fracture of L1 and a subluxation of C6/C7 were diagnosed and treated surgically with a certain delay. The retention of urine and fecal incontinence could be explained as being due to a partial entrapment of the cauda equina at the level of the fractured pedicle of L1 on the right side with an associated injury of the conus medullaris.

Key Words

Motor vehicle accident · Seat belt · Chance fracture · Entrapment · Cauda equina · Incontinence

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Introduction

The Chance-type fracture, also known as seat-belt injury or transverse bicolonn fracture [1], remains an uncommon injury to the thoracolumbar spine [2–7]. A combination of a Chance-type fracture and an injury to the cervical spine is even more uncommon [8]. Although neurologic deficits are rare [1], other associated injuries are frequently reported.

We present a seat-belt injury with life-threatening intraabdominal lesions. Furthermore, there was a Chance-type fracture of L1 (type C2.2.1) in combination with an injury to the cervical spine. The urinary problems and fecal incontinence observed could be due to an entrapment of the cauda equina at the fractured pedicle of L1 on the right side together with a compression of the conus medullaris.

Case Study

J.P., a 30-year-old man, was involved in a high-speed motor vehicle accident. He was the driver wearing a seat belt. In the emergency department, a laceration of the scalp, a subluxation at the level of C6/C7 (Figure 1), an undisplaced fracture of the acetabulum and sacroiliac joint on the right side, and a pneumothorax on the left were diagnosed. A chest tube was inserted to treat the pneumothorax. A hemoperitoneum necessitated an urgent abdominal exploration. Multiple lacerations of the liver and spleen explained the excessive intraabdominal bleeding. A temporary packing of the liver and a splenectomy were performed. A few serosal tears of the ascending and transverse colon were left untouched. The undisplaced fracture of the pelvis was treated conservatively. An anteroposterior radiograph of the thoracolumbar spine, taken after hemodynamic stabilization of the patient, showed posterior element injuries at the level of L1 with signs of distraction and rotation: fracture of the spinous process, lamina and both pedicles. Furthermore, there were a fracture of the transverse process on the left and a different projection of the spinous processes above and below the fracture, indicating a type C lesion [1] (Figure 2). The Chance-type fracture was stabilized posteriorly 2 days after admission, using a posterior internal fixator. During the same intervention, the subluxation C6/C7 was stabilized anteriorly by means of a structural bone graft and an Atlantis plate and screws (Sofamor Danek, Memphis, TN, USA).

During his stay in the intensive care unit, the patient complained of sensory disturbances and a muscle weakness at the right lower extremity. Clinically, there was no voluntary anal contraction or sensation. A CT myelography with coronal reconstructions showed a shift of the

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Figure 1. Lateral radiograph of the cervical spine. Spinous process widening at the level of C6/C7 (arrow): subluxation.

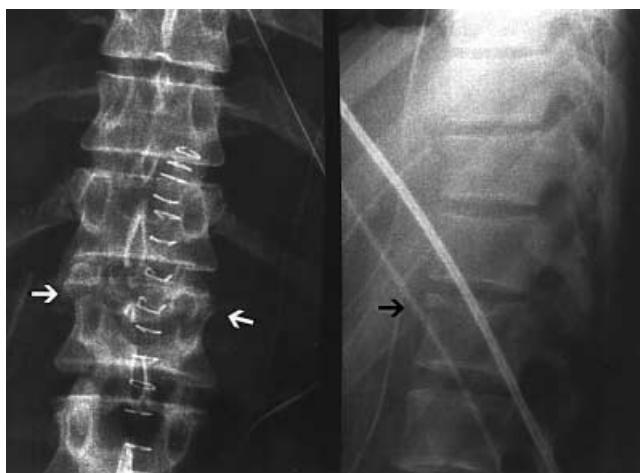


Figure 2. Chance-type fracture of L1, type C2.2.1: fracture of the spinous process, lamina and both pedicles (arrows) with signs of distraction on the anteroposterior view. Fracture of the transverse process on the left and projection of the spinous processes in another plane above and below the fracture: type C lesion. Benign compression fracture at the superior aspect of the vertebral body (arrow) on the lateral view with posterior column disruption, not well visualized.

conus terminalis to the right with signs of compression and in close continuity of the fractured pedicle of L1 (Figures 3a and 3b).

During a neurosurgical exploration, after a laminectomy at the level of L1 and partially of T12, a posttrau-

matic longitudinal tear of the dura on the right became evident. Several nerve roots of the cauda equina protruded from the laceration and were entrapped at the pedicle fracture. Some were sectioned, while some could be released. After repositioning of the nerve roots, a duraplasty using Gore-Tex (Gore & Associates, Flagstaff, AZ, USA) was performed to close the laceration of the dura.

At follow-up, 6 months after the initial trauma, the patient did not experience any neurologic deficit at the right lower extremity. The retention of urine and fecal incontinence remained.

Discussion

In 1948, G.Q. Chance [9] described a traumatic spinal injury as a “horizontal splitting of the spine”, which has since come to be known as the Chance fracture. In 1965, the first such fracture was described by Howland et al [10] in a passenger as a result of a lap seat belt during a motor vehicle accident. Gertzbein & Court-Brown [11] noted the association of a compression or burst component in addition to the posterior column disruption.

The mechanism of such an injury is a force acting on a flexed spine at the moment of accident, which violently bends it further, causing fracture of the anterior column with or without compression, and tension splitting or horizontal fracture of the posterior column. If, at the same time, the mid-column in between, the fulcrum, is also injured and shifted forward, a Chance-type fracture will be the result [5].

Motor vehicle accidents are a major cause of flexion-distraction injuries, especially when seat belts are not properly applied [12]. Chance-type fractures may rarely occur after a fall [13], in cases of an ankylosing spondylitis [14], or after pedicle screw insertion [14].

The association of thoracolumbar fractures and abdominal injuries after a motor vehicle accident is well documented [10, 12, 16–20]. In the presence of Chance-type thoracolumbar flexion-distraction lesion, Anderson et al [12] noticed a life-threatening intraabdominal trauma in 65% of the patients. In a study by Beaunoyer et al [16] 38% of patients presenting with a lumbar fracture required a laparotomy.

Higher-priority procedures can delay the diagnosis of spinal fractures [21, 22]. Anderson et al [21] mentioned 24% of thoracolumbar fractures, diagnosed after the patients had left the emergency department. There-

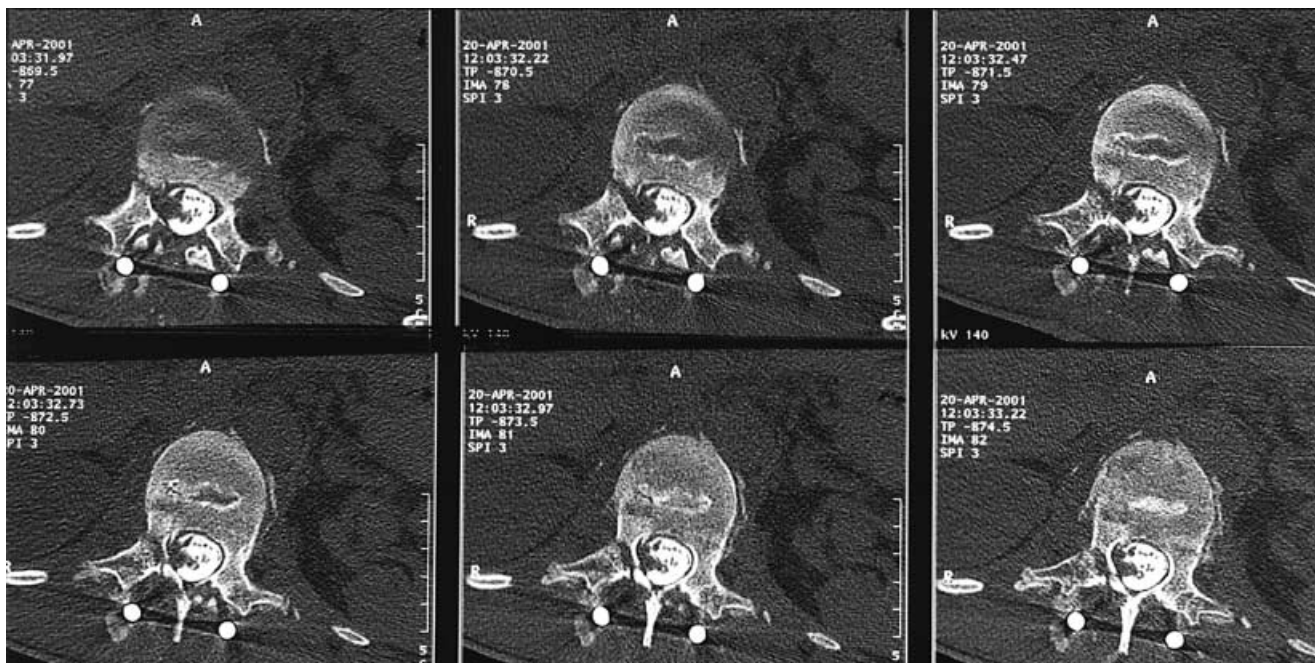


Figure 3a



Figure 3b

Figures 3a and 3b. Consecutive axial CT myelography images (a) with a coronal reconstruction image (b). A burst component is present at the level of the vertebral body with a fracture of both pedicles. Displacement of the conus medullaris to the right with signs of compression. Enlarged subarachnoid space on the left. Entrapment of neural structures at the fracture site.

fore, such patients should receive spinal precautions until more complete evaluation can be performed. Several steps may prevent misdiagnosis. An anteroposterior radiograph may show spinous process widening, perhaps facet subluxation, and a widened interlaminar interval [23]. A CT scan should be performed utilizing thin sections (2–3 mm) to avoid missing the fracture [23]. Similar to spinal injuries, abdominal injuries can also be missed on initial evaluation [18].

Chance-type fractures are rarely associated with a neurologic deficit. If existing, they are usually presented in the literature as case reports [10]. In the presence of a permanent incontinence, the conus medullaris [24–26] and lower cauda equina [26] should be examined [28].

A true “bony” Chance fracture is considered a stable fracture pattern and will usually heal uneventfully. However, an operative stabilization is indicated to control the progressive kyphosis when the posterior ligaments are involved or in fracture cases associated with a significant neurologic injury or intraabdominal injuries [18, 23].

The purpose of this report is to promote awareness of the complexity of seat-belt injuries. A Chance-type fracture is frequently associated with life-threatening lesions but also rarely with other spinal injuries or neurologic deficits. In the presence of a neurologic deficit, a

thorough physical examination and radiographic evaluation of the fracture pattern should be done. When an unexplained neurologic deficit occurs, an MRI or a CT myelography can be conclusive to clarify the problem and to take the right decisions.

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