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Clinical Images

A Quarterly Column

Chance Fracture of the Lumbar Spine

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INTRODUCTION

A classic Chance fracture is manifested by a horizontal fracture through the spinous process and/or lamina, extending through the pedicle and vertebral body with ligamental damage isolated to the posterior ligamental complex. Compression of the anterior vertebral body at the involved level is typical. This fulcrum-type fracture results from hyperflexion of the thoracolumbar junction, resulting in distraction of the posterior and middle elements.[1,2] The Chance fracture is also called the seat belt fracture because of its frequent association with lap belt usage in motor vehicles.[3]

Radiographic workup usually begins with anteroposterior and lateral views of the spine. Computed tomography (CT) is then used to better evaluate the bony anatomy. The role of magnetic resonance imaging (MRI) in the diagnosis of Chance fractures is debatable; however, its ability to further characterize soft tissue injuries of the spinal canal is invaluable.[4]

HISTORY

Emergency medical services presented a 13-year-old male with no significant past medical history to the emergency room with complaints of severe low back pain, abdominal pain, and chest pain after being involved in a motor vehicle accident. The patient was a restrained passenger in a vehicle traveling 40 mph before it abruptly came to a stop. On physical examination, the patient had contusions coinciding with the location of the seat belt. Vital signs were stable and the neurologic examination was unremarkable.

RADIOGRAPHIC APPEARANCE

CT of the spine and abdomen identified an L1 Chance fracture and multiple soft tissue injuries, including a lacerated liver and spleen, blunt trauma to the pancreas, and left renal injury (Figures 1 and 2). MRI showed a large epidural hematoma at the same level and mild spinal cord edema (Figure 3).

DISCUSSION

Chance fractures almost exclusively occur at the thoracolumbar junction (T11-L2). Approximately two-thirds of all spine injuries involve this region because of the larger disc spacing; floating or absent ribs at the lower thoracic and upper lumbar levels, respectively; and obliquely oriented facet joints.[1,2]

Figure 1. Computed tomography is a sagittal 2-dimensional reconstruction acquired from standard axial imaging of the lumbar spine demonstrating a horizontal fracture through the body, pedicle, pars interarticularis, and spinous process with approximately 1.1 cm of distraction. An anterior wedge compression fracture is at same level.

Figure 2. Computed tomography is a sagittal 2-dimensional reconstruction acquired from standard axial imaging through the spinous process with distraction of the lumbar spine showing a flexion-distraction–type injury with extension of the fracture into posterior element.

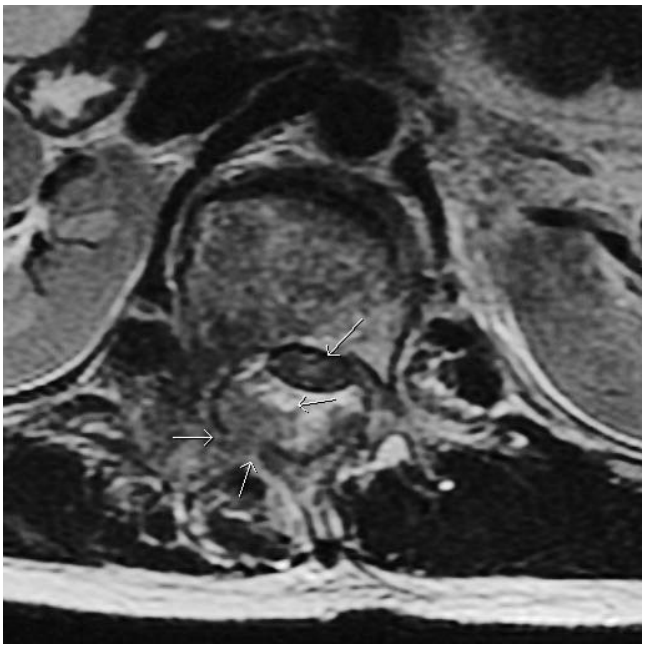

Figure 3. Axial FRFSE (fast relaxation fast spin echo) T2-weighted magnetic resonance image demonstrates central cord edema, posterolateral epidural hematoma, and a fracture involving the lamina of L1. The most anterior arrow demonstrates the spinal cord. The remaining (more inferiorly oriented) arrows outline the laminar fracture and hematoma.

In the past, fractures of the thoracolumbar spine were predominantly secondary to seat belt injuries in patients who wore 2-point restraints. Today these injuries more commonly occur after a fall from a height, but also can occur, although to a lesser extent, with a 3-point restraint.[2,5] The pattern of injury can be explained by the 3-column concept of the spine first described by orthopedic surgeon Francis Denis in 1976.[3] The anterior column involves the anterior longitudinal ligament, anterior annulus, and anterior two-thirds of the vertebral body. The middle column is made up of the posterior one-third of the vertebral body, posterior annulus, and posterior longitudinal ligament. The posterior column is formed by the posterior elements and posterior ligamentous complex.

In Chance fractures, severe flexion forces produce horizontal fractures with distraction secondary to failure of all 3 columns.[5] These injuries are classified as unstable because at least 2 of the 3 columns outlined in the Denis 3-column concept are disrupted. When this disruption occurs, abnormal segmental motion can result in an increased incidence of soft tissue injury.[6] Contusions of the conus medullaris and/or cauda equina can cause neurological complications. The incidence of neurologic sequelae such as incontinence, leg pain, weakness, and numbness is approximately 15%.[2] Chance fractures are unique with respect to other flexion injuries of the spine because the incidence of associated intraperitoneal injuries—involving primarily the pancreas, duodenum, and mesentery—is reported to be as high as 50%. Consequently, an abdominal CT is recommended for all patients with anterior abdominal wall signs consistent with a seat belt injury.[1] Frank ruptures of the large and small bowel are also common.

Treatment options for the fracture itself include reduction by external manipulation and immobilization in hyperextension. Aside from the possibility of some residual back pain, healing usually takes place without any complications. In a minority of patients with more severe injuries or in obese patients, operative fixation by posterior spinal fusion and autologous bone grafting may be necessary for stabilization. Untreated cases have a higher likelihood of progressing to kyphosis and/or constant back pain.

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