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NEUROLOGY
Case Report

Thoracolumbar Burst Fracture: A New Type with Combined Injury Mechanisms a Case Report

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Abstract

There are general agreements on the mechanisms by which different types of spinal fractures are produced. Burst fractures are generally considered to be caused by axial loading force, usually combined with flexion.

Patient and Method: This study describes a new type of burst fractures caused by combination of axial load, flexion-distraction, and sharing force.

Results: In this type of burst fractures, we can see a new radiographic data including: widening of interspinous space, driving of the pedicles through the body, distraction of posterior and middle columns.

Conclusion: this new type of burst fracture should direct our attention for the importance of modification of the old classifications for burst fractures.

Aim: to report a new not previously described type of burst fractures to present a combination of mechanisms can share in producing the burst fractures.

Keywords: *Burst Fracture; Flexion-Distraction; Shear; Mechanism*

Introduction

In the last few years, spinal cord injuries have become one of the most important problems in traumatology because of increased number of injured patients and severity of the neurological deficits.Although there are many contrversies concerning the lesion, there is general agreement on themechanisms by which different types of the lesions are produced.

In the thoracolumbar region, burst fracture is generally considered to be caused by axial loadingforce, frequently comined with flexion. This crushes the vertebral body, fracturing both anterior and posterior cortices, retro pulsing fragments into the spinal canal. It is usually caused by severe trauma (fall, motor vehicle accident). The typical burst fracture shows damage to the superior and inferior cortices as well as loss of vertebral body height anteriorly and posteriorly, pedicle widening and protrusion of bone fragments into the spinal canal. There is also lamina or facet fracture.

Recent studies revealed that burst fractures may occur as a result of flexion distraction mechanism. We describe a case of a previously unreported type of burst fracture occurred due to combination of compression, flexion distraction, and posteroanterior shearing forces.

Case Report

A 42-year- old male was admitted to Tohoku University Hospital after falling from height in a sitting position. Neurologic examination revealed weakness of the left lower limb muscles ranging from G+ to F-, hypesthesia and numbness of both thighs and legs. Ankle jerk was diminshed bilaterally [1].

An anteroposterior plain radiograph showed a fracture of the body of the first lumbar vertebra, bilateral transverse pedicular fractures, bilateral vertical laminar fractures, and increased T12- L1 interspinous distance (Figure 1) [2]. A lateral radiograph showed an increased sagital width, decreased anterior vertebral height (36%), decreased middle vertebral height (32%), increased posterior vertebral (7.7%), And wedging of 29 degrees (Figure 2) [3]. Sagittal tomograms showed distraction of the posterior and middle columns, compression of the anterior column, and forward shift of the upper half of the posterior and middle columns (Figure 3).

Figure 1: *Plain anteroposterior radiographshowing L1 burst fracture with some increasae in interpedicular distance, bilateral transverse pedicular fracture, increased T12-L1 interspinous distance.*

Figure 2: *Plain lateral radiograph showing a fracture with decreased anterior vertebral height, increased posterior vertebral height, and wedging of the L1 body.*

Figure 3: *Sagittal tomogram showing distraction and frontal shift of the posterior elements of the L1.*

Computarized tomographic (CT) scan showed the first lumbar vertebra with right transverse process fracture, bilateral vertical laminar fractures, the two pedicles pushed anteriorly inside the vertebral body, narrowing of the spinal canal (25%), obliqe fracture line between anterior and middle thirds of the vertebral body, and another fracture line at the conjunction of the pedicles with the laminae. CT also showed right L1-2 facet joint dislocation (Figure 4 a,b,c) [4].

Figure 4A: *CT scan-Right transverse process fracture of L1, forward movement of the pedicles with the resultant narrowing of the spinal canal.*

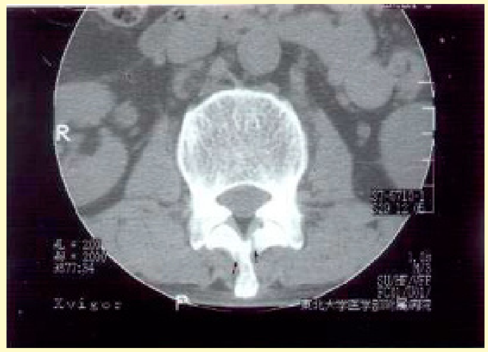

Figure 4B: *CT scan-Bilateral vertical laminar fracture of L1.*

Figure 4C: *CT scan-Dislocation of the right L1-2 facet joint.*

Magnetic Resonance Imaging (MRI) showed intact anterior, posterior longitudinal (PLL) and supraspinous (SSL) ligaments while intraspinous ligament (ISL) was injured (Figure 5). The patient was treated surgically through a posterior midline approach. L1-2 interspinous ligament was found to be elongated and attenuated but not torn. L1-2 laminae were removed, T12-L1 and L1-2 facetectomy and L1 pediculectomy were done to expose the dural sac and L1 nerve root, T12-L1 and L1-2 discectomy were performed and transpedicular screw fixation using Cotrel-Dobousset system was applied between T12 and L2 with posterolateral fusion using iliac autograft .

Figure 5: *MRI (T1) showing intact ALL, PLL, SSL, and injury of ISL.*

Discussion

Burst fractures typically involve injury of the anterior and middle columns of the vertebra because of compression force which is usually accompanied by variable degrees of flexion. Gertezbein [5] postulated a mechanism of injuryresulting burst fracture of the vertebral body associated with a distraction injury of the posterior elements. Tani [9], explained the mechanism of the same type of burst Fracture based on a new theory motion axis of fracture. Our reported case showed a unique pattern of burst fracture resulted from unusual combination of three injury mechanisms: flexion-distraction, compression, and anteroposterior shear. There are two main fracture planes in the body of the first lumbar vertebra: one passes through the spinous process to end few millimeters anterior to the posterior vertebral body wall leading to failure just anterior to the pedicles (this can be explained by flexion-distraction mechanism which could be supported by elongation and attenuation of the interspinous ligament between L1 and L2 spinous processes found intraoperatively). The second fracture plane passes from the superior end plate, through the middle of the vertebral body to end at the anterior part of the inferior end plate (this can be explained by axial loading force which is supported by decrease of the anterior and middle heights of the L1 vertebral bodyin the lateral radiograph more than 30% and displacement of the T12-L1 disc material into the L1 vertebral body in the MRI) [6].

The super added posteroanterior shearing force(counteracted by the axial compression force) lead to anterior movement of the upper half of the posterior column and the pedicles anteriorly with the resultant anterior spinal canal narrowing in contrary to the usual burst fractures where spinal canal is compromised due to retropulsion of the annulus fibrosus or the vertebral body. It is impossible to explain this kind of the lesion by the usual mechanism which is responsible for burst fractures. In this type, combination of axial compresion, flexion-distractio, and shearing forces were responsible.

Hyperextension associated with excessive axial loading has been invoked to explain fracture-dislocation of the spine but the findings in our patient are completely different from such cases. Shearing forces have been described also as a responsible for fracture-dislocations in the thoracolumbar spine and there is usually marked translational displacement of the vertebra. But in such cases, the upper trunk was directly sheared off the more caudal part and was displaced anteriorly. In our patient, the shearing force was applied directly to the middle of the first lumbar vertebra [7]. In fracture-dislocation of the lumbar spine, when shearing force is directly applied to a motion segment of the spine, the lower vertebrae are projected forwards. The upper part of the trunk then suffers secondary hyperextension. Protection of the spine against this force is mediated by soft tissue: posterior muscles, supraspinous andinterspinous ligaments, joint capsules, ligaments of the joints between the articular processes, ligamentum flavum, disc, anterior and posterior longitudinal ligaments. Rupture of the capsule of the joints between the articular processes allowed the superior articular processes to be disengaged from the inferior articular processes of upper vertebra and the whole vertebra slip forward. The fracture most often occurred at the junction of the pedicles with the body permit further slipping. In our case, there is no dislocation between two vertebrae in amotion segment but the displacement occur between upper and lower halves of the first lumbar vertebra with unilateral dislocation of the facet joint and bilateral transversepedicular fractures [8]. Because of translational nature of the fracture and injury of the posterior elementsdue to distraction, surgical interference was indicated through posterior decompression by L1 laminectomy and pediculectomy with application of Cotrel- Doubousset pedicular screwing system between T12 and L2 vertebrae.

Bibliography

1. Abe E., *et al*. “Thoracolumbar burst fracture with horisontal fracture of the posterior column”. 22.1 *Spine* (1997): 83-87.
2. Denis F. “The three column spine and its significance in the classification of acute thoracolumbar injuries”. *Spine* 8.8 (1983): 817-831.
3. Ferguson RL and Allen BL. “A mechanistic classification of thoracolumbar spine fractures”. *Clinical Orthopaedics and Related Research* 189 (1984): 77-88.
4. Fredrickson BE., *et al*. “Vertebral burst fractures: An experimental, morphological, and radiographic study”. *Spine* 17.9 (1992): 1012-1017.

5. Gertezbein SD and Court-brown CM. "Flexiondistraction injuries of the lumbar spine". *Clinical Orthopaedics and Related Research* 227.4 (1988): 52-60.
6. Holdsworth F. "Fractures, dislocations, and fracturedislocations of the spine". *The Journal of Bone & Joint Surgery* 52-A (1970): 1534-1551.
7. Jeanneret B., *et al*. "Burst-Shear- Flexion-Distraction Injuries of the lumbar spine". *Journal of Spinal Disorders* 6.6 (1993): 473-481.
8. McAfee PC., *et al*. "The value of computed tomography in thoracolumbar fractures". *The Journal of Bone & Joint Surgery* 65.4 (1983): 461-473.
9. Tani M., *et al*. "Flexion injuries of thoracolumbar spine with disruption of its posterior element: The classification based on the theory of the motion axis of fractures". *Rinsho Seikei Geka* 285 (1993): 495-503.

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