

# Traumatic lumbar disc herniation mimicking epidural hematoma

## A case report and literature review

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### Abstract

**Rationale:** We report a rare case of traumatic lumbar disc herniation mimicking epidural hematoma.

**Patient concerns:** A 39-year old man presented with acute bilateral leg and back pain, following a crushing injury caused by a crane collapse.

**Diagnosis:** A computed tomography scan revealed multiple compression fractures of the thoracolumbar spine, including a burst fracture of the L4 vertebral body. Magnetic resonance imaging (MRI) showed an epidural mass, extending longitudinally and causing dural sac compression behind the L3 vertebra. The mass had isosignal intensity on T1-weighted imaging and showed mixed high and low signals on T2-weighted imaging. On the basis of the patient's clinical history and imaging findings, our provisional diagnosis was an epidural hematoma following major trauma.

**Interventions:** An emergency L3 laminectomy was performed with percutaneous screw fixation of L3-5. Intraoperatively, 3 large herniated disc fragments were found at L3 with no evidence of hematoma.

**Outcomes:** The patient recovered normal motor function after surgery. At the last follow-up, 3 years after surgery, there was no residual neurological deficit apart from intermittent lower back pain.

**Lessons:** In cases where MRI findings reveal an epidural lesion with a longitudinal shape, similar to an epidural hematoma, with mixed signal intensity on T2-weighted images and high peripheral signal intensity on T1-weighted images, traumatic disc herniation should be included in the differential diagnosis.

**Abbreviations:** MRI = magnetic resonance imaging, SI = signal intensity.

**Keywords:** disc herniation, epidural hematoma, MRI, trauma

## 1. Introduction

Disc herniation is relatively rare in lumbar spinal trauma. Previous experimental studies have used finite element modeling to demonstrate that the bone is the most vulnerable structure in

the spine.<sup>[1,2]</sup> Therefore, the bone is more susceptible to injury than disc or soft tissue in lumbar spinal trauma. Some studies have reported incidents of disc herniation following spinal trauma. However, most disc herniations are located in the cervical spine, and traumatic lumbar disc herniation is still a rare occurrence. In magnetic resonance imaging, the signal intensity (SI) of the intervertebral disc depends on the water content. Traumatic disc herniations or ruptured discs generally have high SI on T1-weighted magnetic resonance imaging (MRI) and low SI on T2-weighted MRI.<sup>[3]</sup> However, epidural hematomas, which frequently occur in cases of spinal trauma, have low SI on T1-weighted MRI and high SI on T2-weighted MRI.<sup>[3]</sup> Previous reports cite cases of intraoperatively confirmed disc herniations, mimicking epidural hematomas. In these cases, epidural hematomas were diagnosed according to the clinical history and MRI findings of the patient.<sup>[3-5]</sup> To our knowledge, the present case is the fourth report of intraoperatively confirmed disc herniation following a preoperative diagnosis of epidural hematoma presented in the literature. In this report, we present a rare case of traumatic lumbar disc herniation mimicking epidural hematoma.

## 2. Case report

A 39-year-old man was transferred to our institute 3 hours after a crushing injury caused by a crane collapse. The patient complained of acute back pain and pain radiating from both legs. The patient had no specific medical history apart from an

Editor: N/A.

There was no role of the funding bodies in the design of the study or in writing the manuscript.

Informed written consent was obtained from the patient for publication of this case report and accompanying images.

The authors declare that no competing interests exist.

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Medicine (2019) 98:18(e15438)

Received: 12 December 2018 / Received in final form: 21 March 2019 /

Accepted: 2 April 2019

<http://dx.doi.org/10.1097/MD.0000000000015438>



**Figure 1.** The initial sagittal CT image (A) and axial CT image (B) revealed a compression fracture of the L2 vertebral body and a burst fracture of the L4 with encroachment of the spinal canal. CT = computed tomography.

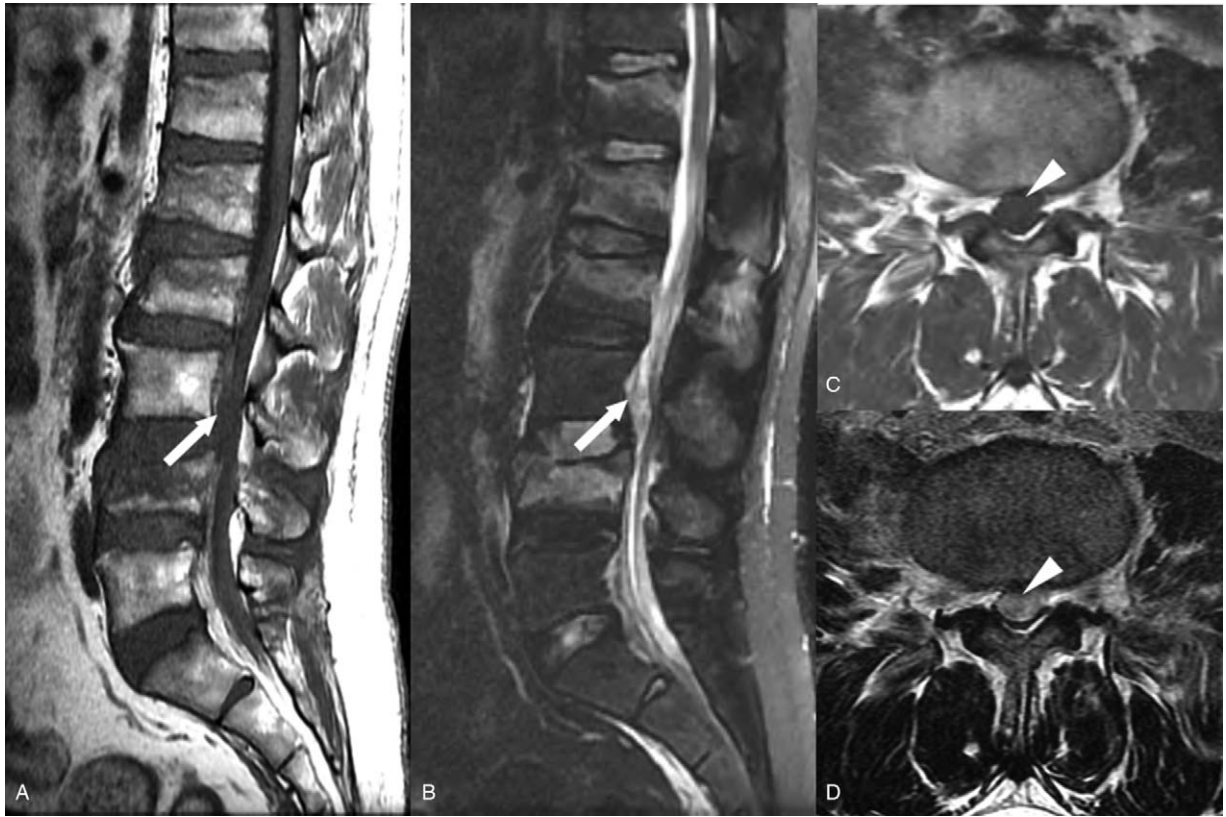
appendectomy performed about 30 years ago. Manual muscle testing and bilateral assessment of the deep tendon reflexes in the extremities revealed the following results: iliopsoas (4/4), quadriceps (4/4), tibialis anterior (5/5), extensor hallucis longus (5/5), flexor hallucis longus (5/5), patellar tendon reflex (normal/normal), and Achilles tendon reflex (decreased/ decreased). Sensory function testing of the lower limbs revealed a bilateral tingling sensation at L3, primarily on the right side, and sensory loss in the L4 dermatome. The patient did not present any symptoms of bowel or bladder dysfunction. The laboratory results were within normal limits: hemoglobin of 14.6 g/dL, a prothrombin time of 11.7 seconds, and a partial thromboplastin time of 30.6 seconds. Plain radiographs showed a clear compression of the L4 vertebral body and a suspected compression of the L2 vertebral body. A CT scan revealed a burst fracture of the L4 vertebral body and a mild compression fracture of the thoracolumbar junction, including T12, L1, and L2 (Fig. 1). An MRI showed an epidural mass-like lesion at the L3 level that was compressing the dural sac. The lesion was predominantly isointense on T1-weighted MRI, with some high peripheral SI. On T2-weighted MRI, the lesion had a mixture of high and low SI, which appeared as longitudinal mass with tapering ends at the L3 level (Fig. 2). In addition, the lesion appeared to be separated from the hyperintense edematous L3-4 intervertebral disc by low SI boundaries on T2-weighted MRI. A

provisional diagnosis of epidural hematoma was reached, based on the patient's clinical history and MRI findings. However, an alternative diagnosis of ruptured disc fragments associated with hemorrhage could not be excluded.

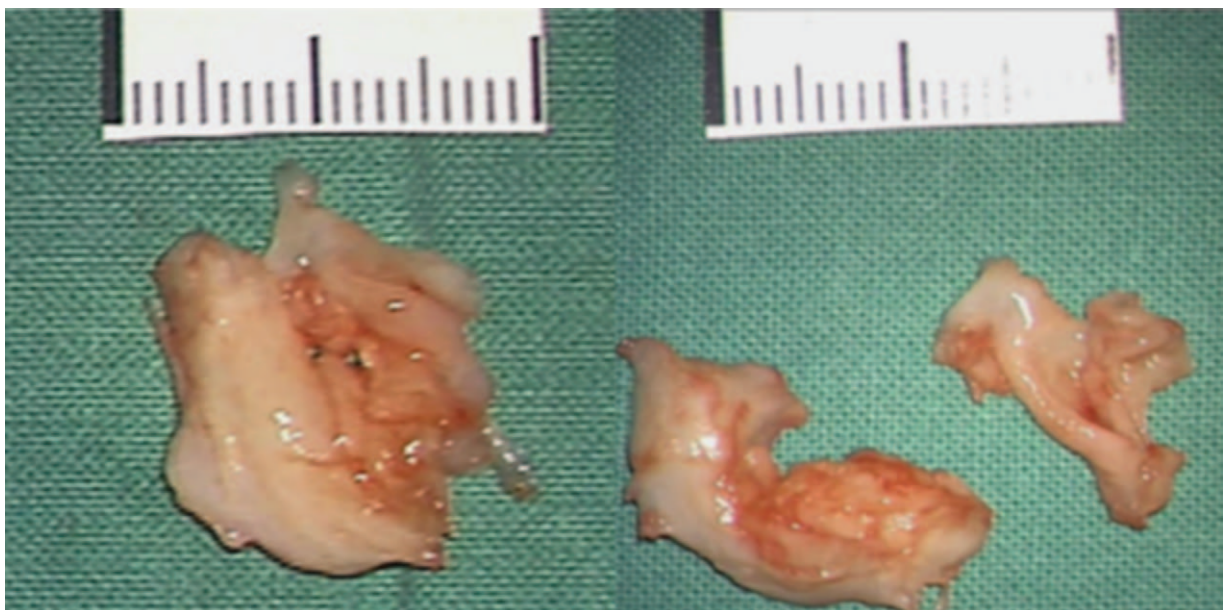
The patient underwent right hemilaminectomy at the L3 level. Following medial retraction of the dural sac and the right L3 rootlet, 3 large ruptured disc fragments were found, with no evidence of hematoma. We removed the ruptured disc and explored the epidural space for other compression lesions. Examination of the fragments confirmed that they were degenerative disc materials. There was no evidence of hematoma (Fig. 3). Using a bone impactor, the posteriorly displaced fragments of L4 were pushed anteriorly, followed by percutaneous pedicle screw fixation at L3-5, using the Apollon system's pedicle screw system (Solco Medical, Seoul, South Korea) (Fig. 4). The postoperative clinical course was uneventful with a marked improvement in neurological symptoms. The patient recovered normal motor function 17 days after surgery. At the last follow-up, 3 years after surgery, there was no residual neurological deficit apart from intermittent lower back pain.

### 3. Discussion

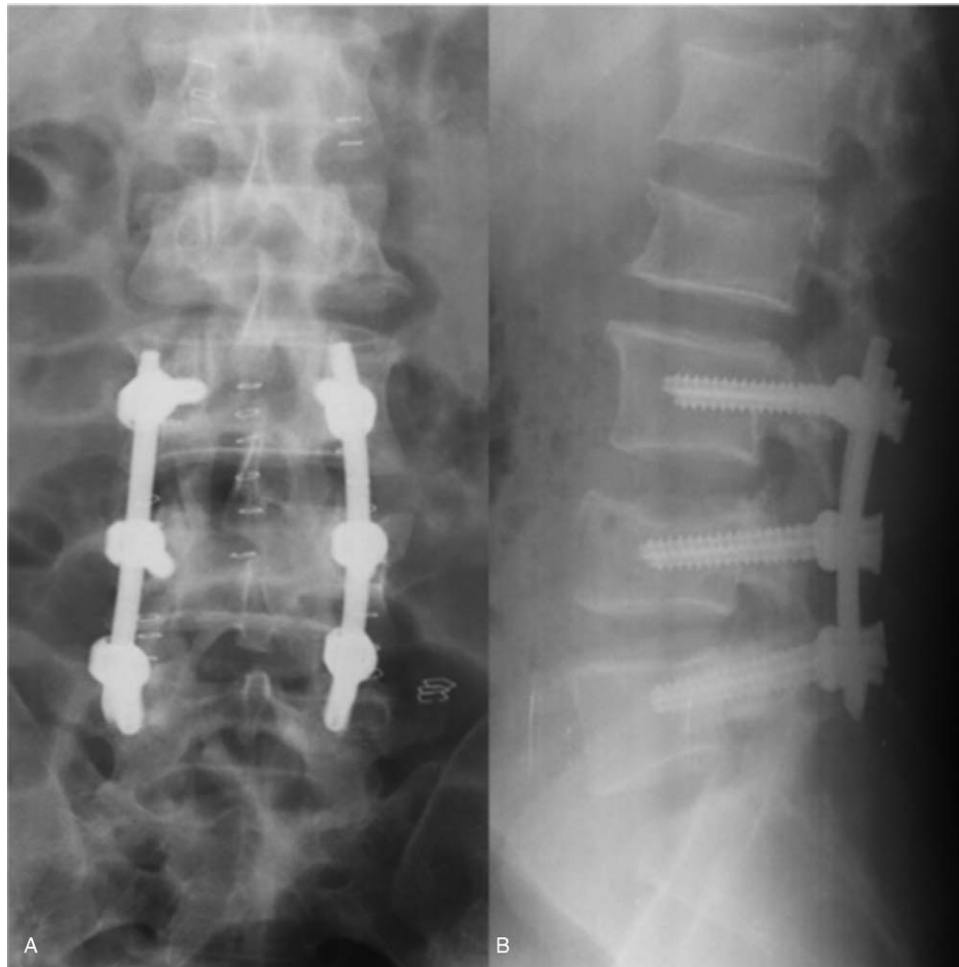
Intervertebral discs play a pivotal role in the biomechanical function of the spine. They allow motion, permitting spinal



**Figure 2.** Sagittal T1-weighted (A) and T2-weighted (B) MRI showed a longitudinal epidural mass with tapering tips at the L3 level (arrow). The mass presented with a predominantly isointense signal intensity on the T1-weighted image (A) and a mixture of high and low signal intensities on the T2-weighted image (B). Axial T1-weighted (C) and T2-weighted (D) MRI showed that the dural sac was flattened and posteriorly displaced by the ventral mass (arrowhead). MRI = magnetic resonance imaging.



**Figure 3.** Operative photographs showing the disc material, which was removed in 3 pieces.



**Figure 4.** L-spine anteroposterior (A) and lateral (B) plain radiographs, taken immediately after surgery, showing screw fixation at L3-5.

flexibility, and distribute shock across the spinal column.<sup>[6]</sup> The nucleus pulposus, the gel-like centric section of the disc, is usually hydrated. It consists of water in a matrix of proteoglycans, collagen, and other proteins.<sup>[7,8]</sup> Aging and degeneration cause the water content of the disc to decrease, changing the MRI SI. In young and healthy adults, the disc usually has a high SI on T2-weighted images and a low SI on T1-weighted images. However, discs that have undergone degenerative changes have low SI on both T2-weighted and T1-weighted images.

Disc herniation, which is the leakage of nucleus pulposus through tears in the wall of the annulus fibrosus, can occur due to degenerative changes and/or trauma. However, traumatic disc herniation is relatively rare. In a previous study, the incidence of disc herniation associated with spinal trauma was reported to be 0.4%.<sup>[9]</sup> Moreover, because herniated intervertebral discs are usually found in the cervical region, traumatic lumbar disc herniation is even less common.<sup>[10,11]</sup> Traumatic disc herniations usually have a low SI on T2-weighted images and a high SI on T1-weighted images.<sup>[3]</sup> In contrast, acute epidural hematomas have a high SI on T2-weighted images and a low SI on T1-weighted images.<sup>[3]</sup> Morphological changes to the disc or signal alterations on MRI can occur; however, this depends on the severity of the impact to the intervertebral disc. Sander et al. classified traumatic intervertebral disc lesions into 4 categories, ranging from grade 0

(uninjured) to grade 3 (displacement—the most severe form of injury).<sup>[12]</sup> In the grade 2 category of Sander study, if the intervertebral disc presents with a high SI on T2-weighted images caused by edema, it may be difficult to differentiate traumatic disc herniation from epidural hematoma. There have been reports of herniated discs causing and coexisting with epidural hematomas, making it more difficult to distinguish between the 2.<sup>[13,14]</sup> In previous studies, cases of disc herniation with accompanying hematoma have been reported, as well as a case of a hematoma within a ruptured disc.<sup>[13,15]</sup> However, cases that were preoperatively identified as epidural hematomas using clinical and MRI findings, which were later identified as traumatic lumbar disc herniation without evidence of intraoperative hematoma are rare. To our knowledge, there have been 3 reports of this type of presentation in the previous literature. A summary of previous cases is shown in Table 1. In our patient, the herniated disc showed a mixture of high and low SI on the T2-weighted images and an iso SI with a high signal rim on the T1-weighted images similar to the SI of acute epidural hematoma, as reported in previous cases.<sup>[3,4]</sup> The herniated disc appeared as a longitudinal epidural mass with tapering tips at the L3-4 level and there was no definite continuity with the intervertebral disc space on both T1 and T2 weighted sagittal images. The provisional diagnosis performed based on trauma history and MRI findings

**Table 1****Review of clinical and MRI findings of disc herniation mimicking an epidural hematoma in the literature.**

Author/yr	Patient's age/sex	Trauma history	Level of disc herniation	T1WI	T2WI	Disc herniation pattern	Additional findings
Jain et al/2018 <sup>[4]</sup>	50/M	Hit his back on a tree branch	L 2–3	Iso	Mixed (low/high)	Ventral to dura Upward migration*	Some peripheral hyperintensity on T1WI Longitudinal shape
Kil et al/2017 <sup>[5]</sup>	57/M	Epidural nerve block	L 2–3	Iso	Low	Dorsolateral to dura Protrusion	
Song et al/2012 <sup>[3]</sup>	23/M	Traffic accident	L 4–5	Low	Mixed (high/low)	Ventral to dura Upward migration*	High signal rim around mass on T1WI Longitudinal shape*
Kim et al (present case)/2018	39/M	Crushing injury due to crane collapse	L 3–4	Iso	Mixed (high/low)	Ventral to dura Upward migration	Some peripheral hyperintensity on T1WI Longitudinal shape

dura=dura mater, MRI=magnetic resonance imaging, T1WI=T1-weighted image, T2WI=T2-weighted image.

\*This is based on the figures in that paper, but the authors did not describe these findings in the body or figure legends in their paper.

was a spinal epidural hematoma; however, the possibility of hematoma associated with disc herniation could not be excluded. Surprisingly, intraoperative findings revealed a pure ruptured disc fragment without hematoma. When reviewing our patient's MRI, the SI of L3-4 nucleus pulposus appeared hyperintense on T2-weighted images as observed for an epidural mass, and unlike adjacent discs with a low SI. This may be a clue that could potentially be used to distinguish disc herniation from epidural hematoma. Bearing in mind that about 50% of traumatic disc herniation occurs either at the level of injury or 1 level above or below the injury site,<sup>[3]</sup> because the most severe burst fracture occurred in the L4 vertebral body, the observed intervertebral disc herniation at the L3-4 level is understandable. There have been limited reports of disc herniation accompanying lumbar or lumbosacral dislocation.<sup>[16,17]</sup> Hyperflexion of the lumbar spine is believed to be the most common cause of lumbar dislocation.<sup>[18]</sup> Therefore, disc herniation mimicking epidural mass should be one of the differential diagnoses in patients with hyperflexion injuries and a possible epidural mass. In conclusion, traumatic disc herniation should be included in the differential diagnosis if there is a longitudinal epidural lesion with mixed SI on T2-weighted images and high peripheral SI on T1-weighted images similar to epidural hematoma in lumbar spinal trauma patient.

### Author contributions

**Conceptualization:** Jung-Kil Lee, Soo-Han Kim.

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**Writing – original draft:** Ju-Hwi Kim.

**Writing – review and editing:** Bong Ju Moon, Jung-Kil Lee.

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