Radicular interdural lumbar disc herniation

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Abstract Intradural lumbar disc herniation is a rare complication of disc disease that is generally diagnosed only during surgery. The mechanism for herniated disc penetration into the intradural space is not known with certainty, but adhesion between the radicular dura and the posterior longitudinal ligament was suggested as the most important condition. The authors report the first case of an intradural lumbar disc herniation without subdural penetration; the disc hernia was lodged between the two radicular dura layers. The patient, a 34-year-old soldier, was admitted with a 12-month history of low back pain and episodic left sciatica. Neurologic examination showed a positive straight leg raising test on the left side without sensory, motor or sphincter disturbances. Spinal CT scan and MRI exploration revealed a left posterolateral osteophyte formation at the L5–S1 level with an irregular large disc herniation, which migrated superiorly. An intradural extension was suspected. A left L5 hemilaminectomy and S1 foraminotomy were performed. The exploration revealed a large fragment of disc material located between the inner and outer layers of the left S1 radicular dura. The mass was extirpated without cerebrospinal fluid outflow. The postoperative course was uneventful. Radicular interdural lumbar disc herniation should be suspected when a

swollen, hard and immobile nerve root is present intraoperatively.

Keywords Intradural disc herniation · Intradural lumbar disc · Magnetic resonance imaging · Spinal nerve root compression

Introduction

Intradural lumbar disc herniation (IRLDH) was first described by Barbera in 1984 as a serious complication of intervertebral disc rupture [1]. Since then, 22 cases have been reported, but their preoperative diagnosis is still a challenge [3–5, 8, 10]. To our knowledge, we present the first case of an IRLDH in which a disc fragment was lodged between the two radicular dura layers without subdural extension.

Case report

This previously healthy 34-year-old man suffered from low back pain with episodic left sciatica for 1 year. The condition worsened in recent weeks, and the pain gradually increased with difficulty in walking, but without sphincter dysfunctions. There was no history of trauma or injury. Examination on admission revealed a positive straight leg raising test on the left side without sensory or motor disturbances. Osteotendinous reflexes were present. Computed tomographic (CT) exploration showed a left posterolateral osteophyte formation associated with a large disc herniation at the L5–S1 level (Fig. 1). An MRI examination was performed and displayed left herniated

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Fig. 1 Axial lumbar spinal CT scan; parenchymatous (a) and bone windows (b) showing a left posterolateral osteophyte formation associated with a large disc herniation at the L5–S1 level

disc at L5–S1 with posterolateral irregular fragment causing anterior epidural compression. (Fig. 2).

The patient underwent surgery, and a left unilateral laminectomy of L5 was performed. The left S1 root was enormously dilated, hard and immobile. At that time, we presumed the MRI-visualized mass to be a neurinoma. After enlargement of the foraminotomy, the dura of the S1 nerve root was opened longitudinally on the posterior side. No clear lesion was seen between the nerve fibers; however, a hard fixed mass was felt through the anterior radicular dura. On the anterolateral side of the nerve root, the dura was found adherent to the posterior longitudinal ligament and to the posterior osteophytosis. After careful retraction of the radicular dura, a disc fragment was seen

Fig. 2 T2W MRI axial (a) and para-sagittal images (b) showing a left herniated disc at L5–S1 with posterolateral irregular fragment causing anterior epidural compression

through a small penetrated hole (4 mm in diameter) on the ventral side of the radicular dura. This dural defect was enlarged to about 6 mm and a bigger disc fragment was found and removed. When the decompressed nerve root was mobilized, there was no cerebrospinal fluid outflow. It was obvious that the last sequestered fragment was lodged between the internal and external nerve root dural sleeves (Fig. 3). Finally, the remainder of the disc material at the L5–S1 level was removed and the posterior durotomy was repaired. The patient's subsequent evolution has been entirely satisfactory. He was discharged on the 8th post-operative day without any neurological deficit.

Discussion

Lumbar disc herniation (LDH) complicated by fragments in the intradural space is a rare occurrence representing less than 1% of all LDHs; about a third of these patients have previously undergone surgery for LDH [7].

Mut in 2001 suggested the following classification for intradural disc herniations [3]. Type A: herniation of a disc

Fig. 3 Schematic drawing of the surgical findings showing the precise localization of the herniated disc inside the interdural space (between the internal and external nerve root dural sleeves) of the left S1 nerve root

into the dural sac; type B: herniation of a disc into the dural sheath in the preganglionic region of the nerve root. Type B was named intradiscal disc herniation, which is much less frequent: about 22 cases were previously reported [10]. In our presentation and in contrast to previous description, disc fragment was located between the inner and outer radicular dural sleeves without subdural extension. Only one case was remotely similar to that of our patient; the LDH was found inside the dural wall within the left lateral recess of L1, but away from the radicular dura [2].

The term of “pseudointradiscal” disc herniation was previously suggested by Ozer when the disc herniation penetrated only the outer wall of the dura [5]. But in our patient, as in Klopfenstein’s presentation, the disc hernia was lodged between the internal and external dura layers, so the term of interdural disc herniation is preferable.

In our department, with more than 1,200 operated cases of LDH between 1999 and 2007, we have already seen some cases of severe swelling of lumbar nerve root by a disc extrusion giving the impression that the fragment was within the nerve root. But on gentle separation of the dura, it was always possible to remove the fragment from under the nerve root.

It is difficult to formulate a theory from the ethiopathogenic point of view to explain total intradural disc penetration. It was suggested that adhesions between the anterior dura and the posterior longitudinal ligament have a congenital origin or could be caused by chronic disc protrusions, osteophytoses, inflammatory process, trauma or previous surgery [3–5, 8–10]. Some authors postulate that osteoligament degenerative processes produce adherence between the content of the elements of the epidural space and the dura mater, dural ischemia and weakening of the walls of the dura adhering to the posterior longitudinal

ligament. The action of bending, stretching or vibratory forces tears the debilitated dura with fragments of the prolapsed disc penetrating into its interior as suggested by Maldonado [7].

For partial intradural disc penetration, Klopfenstein suggested that the disc fragment partially migrated through the dura without sufficient force to penetrate the inner dural layer [2]. Perhaps, transdural sheath migration would be complete with time. Consequently, our presentation probably does not reflect a new pathological “entity”, but an intermediate phase in the way of a complete intradural disc herniation. However, this theory fails to explain how a large disc penetrates through the narrow dural nerve root. We think that osteophyte formation may play an important role.

All cases of intradiscal disc herniation were found at the L5–S1 level with only one exception [4, 10]. S1 root has a longer intracanalicular portion, and may be more prone to disc fragment penetration.

There are no differentiating clinical signs between an extradural and intradural LDH, though the severity of neurological deficit is higher in the latter group [6].

Routine MRI reveals extruded disc material, and its localization and adhesion to the posterior longitudinal ligament. Making a diagnosis of intradiscal disc herniation is a challenge. Unfortunately, the diagnosis is typically made intraoperatively as seen in our case. However, an IRLDH may be suggested on MRI when a round-shaped sequestered fragment appears intradural in connection to the disc space. In our presentation, MRI exploration did not allow us to see the disc fragment sequestered between the dura layers.

These rare complications of LDH generally respond quite well to surgical management under high-magnification operating microscope. Surgeons must be forewarned of the potential for a radicular interdural lumbar disc herniation.

Conflict of interest statement None of the authors has any potential conflict of interest.

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