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Three-level thoracic disc herniation: case report and review of the literature

Received: 2 August 1995
Revised: 19 October 1995
Accepted: 7 November 1995

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Abstract A rare case of three-level thoracic disc herniation with associated neurological impairment, including motor, sensor and urinary disturbances, is reported. The diagnosis and localization of the level of cord compression were mainly based on the clinical examination supported by the findings of magnetic resonance imaging and somatosensory evoked potentials. An anterolateral transthoracic approach at the uppermost affected level was selected for removal of all herniated discs, with the use of a surgical microscope; the

resected rib was used for intervertebral fusion. An improvement in the patient's subjective and neurological condition was already apparent a few months after the operation, and solid fusion was roentgenographically found at all operated levels. The use of a surgical microscope allows complete removal of the herniated disc while avoiding wide vertebrectomy and associated iatrogenic damage to the spinal cord.

Key words Thoracic disc herniation · Thoracotomy

Introduction

The reported incidence of thoracic disc herniation varies between 0.6 and 4% of all disc herniations. After an extensive search of the previous literature we found only 27 cases of two-level thoracic disc herniation [1, 5–7, 9, 18, 19]. The use of magnetic resonance imaging (MRI) in recent years has led to an increasing number of cases being reported.

We report a rare case of three-level thoracic disc herniation in a patient who was operated using a transthoracic approach and surgical microscope. We believe that the right choice of surgical approach to the thoracic spinal cord plays a vital role in the overall success of treatment of such a herniation.

Case report

A 34-year-old housewife was admitted with a 13-month history of mild pain in the upper thoracic spine with radiation to the scapulae,

weakness, numbness in the lower extremities, paraesthesia in the trunk and lower extremities from level T6 downwards and urinary incontinence. She had no history of spinal trauma. The patient had been unable to walk or control her trunk for approximately 1 month. On admission, neurological examination revealed diminished superficial sensation distally to the T6 dermatome with decreased response to pinprick. There were no abdominal reflexes, whereas the deep tendon reflexes were found to be increased in the lower extremities. The Babinski reflex was positive bilaterally. Somatosensory evoked potentials showed bilateral anomalies of central sensory conduction through the thoracic spinal cord. MRI revealed disc protrusion at T5–6, T8–9 and T9–10 (Fig. 1). The posterior migration of the nucleus pulposus was most prominent at T8–9 (Fig. 2). The patient elected to undergo disc excision through an anterolateral transthoracic approach with excision of the left fifth rib. All three thoracic discs were carefully excised using a microscope, and complete decompression of the thoracic spinal cord was achieved. Interbody fusion using bone grafts from the resected rib was performed at all three levels. The patient was mobilized in a wheelchair with a plaster jacket 1 week after the operation. Neurological findings improved gradually, and 4 months after surgery the woman showed an improvement in her neurological symptoms, as she was able to walk with short steps on Canadian crutches without orthoses. No further improvement was observed during a 2-year follow-up.

Fig. 1 Preoperative magnetic resonance (MR) image of the thoracic spine demonstrating the three disc herniations (T5-6, T8-9 and T9-10)

Fig. 2 Preoperative MR image at the T9-10 level demonstrating a centrally located disc herniation with compression of the thoracic spinal cord (arrow)

Discussion

The location of disc herniation in the thoracic spine is not common [13, 15]. Its prevalence is the same in both sexes; it occurs more frequently from the fourth through the sixth decades of life [13, 19]. Thoracic herniation is most frequently found in the lower thoracic spine, usually below T8-9 and can be central, lateral or posterolateral [13]. Trauma is implicated in 20% of patients with symptomatic thoracic disc herniation [3]. In our patient, there was no previous history of spinal trauma.

Compression of the thoracic spinal cord usually appears gradually and is associated with varying degrees of neurological symptoms including pain, numbness in the lower extremities, weakness, paraesthesia and sphincter dysfunction [13, 19]. Thoracic disc herniation associated

with disc extrusion in the vertebral canal is well demonstrated on MRI but less well demonstrated on CT [3, 7, 12-14, 20, 21]. With the routine use of MRI for diagnosis of disc herniation, thoracic disc herniation is nowadays more frequently diagnosed before neurological deficit has been established. In multi-level thoracic disc herniations, however, the problem remains of identifying which herniation is responsible for the symptoms of the patient. Although MRI is indeed a useful diagnostic tool for detection of thoracic disc herniation, some other pathologic conditions (e.g. tumors, spondylitis, arthritis) should also be considered in the differential diagnosis. Calcification of the thoracic disc at the level of herniation, associated with intervertebral disc narrowing and end plate sclerosis, is not infrequently seen on plain roentgenograms of the thoracic spine. Such radiographical findings were only partially found in our reported case.

The treatment of choice for thoracic disc extrusion, in particular when it is associated with myelopathy, is surgery. Removal of the extruded thoracic disc through posterior and posterolateral approaches by laminectomy with or without disc removal has been previously reported [9, 11]. The success rate of the posterior approach was very low, with only 29% of patients registering an improvement in their symptoms, whereas 50% of the patients operated on with laminectomy showed an overall neurological deterioration of 50% [10, 16, 21, 22]. Costotransversectomy, the posterolateral method for removal of extruded thoracic disc, seems to be more effective than laminectomy in terms of both the patient's subjective condition and neurological improvement [7, 10, 13, 19, 21, 22].

Two-level thoracic disc herniation is a very rare condition and only 27 cases have been previously described [1, 2, 5, 7-10, 18, 20]. To our knowledge, no previous case of three-level symptomatic thoracic disc herniation has been

reported. We have described the first reported case of a three-level thoracic disc herniation associated with significant myelopathy. Patients under 40 years old are more frequently affected by the condition, which was also the case in our patient. The symptoms of two-level thoracic disc herniation did not differ from those with single-level herniation, including myelopathy and sensory, motor and sphincter symptoms; all our patients developed such symptoms in accordance with the previous literature. Pain located in the interscapular thoracic area, associated with low back pain, has been previously reported in association with thoracic disc herniation, but was not present in our patient.

Two-level thoracic disc herniation occurred in contiguous vertebral discs in 20 out of 27 cases previously reported. In our case not all levels of disc herniation were contiguous. In 19 out of 27 reported cases of multi-level thoracic disc herniation, the discs affected were located between T7 and T10. Two out of the three discs operated on in our patient were also located between these segments. It has been previously postulated that the T9 and T10 segments have increased stress concentration for biomechanical reasons [9]. On the other hand, anatomical factors may create weakness in the intervertebral ligaments at these same levels [17]. Plain roentgenograms

and technetium bone scans are not useful and not specific for the diagnosis of disc herniation. On the other hand a combination of myelography, MRI and CT, or MRI and CT alone, can provide both an accurate imaging diagnosis and the landmarks for surgical excision of the disc.

Thus preoperative evaluation, including meticulous neurological examination, supported by MRI and somatosensory evoked potentials [16], is of major importance for accurate evaluation of the level of lesion and degree of spinal cord involvement. To our knowledge, neither somatosensory evoked potentials nor MRI alone are able to distinguish accurately the level of the thoracic disc responsible for the symptoms in cases of multiple thoracic disc herniations. Thoracotomy, with complete excision of the rib corresponding to the uppermost affected level, offers an excellent approach not only to the level of the excised rib but also to several levels below it. The excised rib should always be disarticulated at the costotransversal joint in order to allow a better approach to the posterolateral part of the herniated disc. A surgical microscope has for many years been routinely used by us for removal of thoracic discs because it allows better inspection of the fine structures around the spinal cord, thus avoiding further disturbances to the cord circulation.

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