

Thoracic Intradural Disc Herniation: Key Considerations in Operative Management

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Abstract

Purpose: A case presentation of intradural T11/12 disc with particular reference to the operative management, to emphasise the importance of identifying these rare cases and identify important operative considerations.

Method: An 80 year old gentleman presented clinic with acute onset back and leg pain. He described pain in the L4 dermatomal distribution to both legs, with normal bladder and bowel function. Lower limb power was normal, L3/4 reflexes were reduced and there were no signs of cord compression. MRI was performed which demonstrated a T11/12 disc prolapse with a possible intradural element.

Results: The patient underwent elective T11/12 discectomy. Neurosurgical assistance was requested due to suspicion of an intradural disc. On entering the spinal canal there was only a small amount of disc material found which was removed. Pedicle subtraction was performed to allow access anterolaterally but no disc fragment was found. Durotomy was performed and a large soft tissue mass was found intradurally with extensive adhesions to both dura and spinal cord. This was carefully dissected free and removed. Samples were sent for intra-operative frozen section. This confirmed degenerative disc only.

Conclusions: Clinical findings may not correlate with MRI findings in these rare cases due to the intradural nature of the disc material. Intradural discs are extremely rare, especially in the thoracic region. Cases should be undertaken jointly with neurosurgical colleagues in case durotomy is needed. Intraoperative frozen section should be strongly considered as the clinical appearance may strongly mimic that of neoplastic disease.

Keywords: Dural, Disc, Tumour, Durotomy, Thoracic

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Introduction

Intradural disc herniation is found in only 0.3% of cases of disc herniation. The majority of these (>95%) are found in the lumbar region, with fewer than 5% occurring in the thoracic region [1,2]. While imaging occasionally raises suspicion of an intradural component to a herniated disc, the majority of cases are diagnosed intraoperatively [1-6]. We describe a case of an intradural thoracic disc herniation at T11/12 diagnosed intraoperatively. The disc material was indistinguishable macroscopically from malignancy and the use of frozen section for immediate confirmation of diagnosis was essential in the management of this rare case.

Case Report

An 80 year old gentleman was referred to the outpatient clinic with a 3 month history of back and leg pain. The patient was normally fit and well, with a past medical history of prostate cancer diagnosed 9 years previously following trans-urethral resection of the prostate and was undergoing surveillance with no known progression of disease.

The patient described pain in the L4 dermatome distribution in both legs, with no associated motor weakness and normal bladder and bowel function. The patient mobilised with two elbow crutches but his physical activity was limited due to pain. Lower limb power and sensation was normal. Quadriceps reflexes were reduced bilaterally, with normal ankle reflexes and down-going plantars. There were no long tract signs.

Lumbar spine radiographs showed a degenerative lumbar scoliosis concave to the right which had not previously been identified. MRI spine (including thoracic and lumbar regions as per local radiology protocol) revealed a peripherally enhancing 15x10x10 mm ovoid lesion extending from the T11/12 intervertebral disc down behind the T12 vertebral body, displacing the spinal cord towards the right and pushing the dura posterolaterally (**Figure 1**). There was also posterior disc bulging at L2/3, L3/4 and L4/5 (**Figure 1**) with central canal stenosis. The majority of the thoracic lesion was seen to be extradural (**Figure 2**, as indicated by the left arrow) but a small component appeared to perforate through the dura and into the cerebrospinal fluid (CSF) space (**Figure 2** right arrow). MRI findings were most consistent with an intradural disc fragment however the possibility of an atypical dural tumour such as a meningioma was raised.

CT scan of the spine was also obtained to look for disc calcification but there was no evidence of this.

As there was concern regarding the possibility of a dural tumour, the patient underwent an elective T11/12 discectomy, postponing intervention on the symptomatic L2-4 pathology. Neurosurgical assistance at the time of surgery was requested due to the suspicion of an intradural disc on MRI. An operating microscope and spinal cord monitoring were used due to the possibility of an intradural component.

T11/12 hemilaminectomy and flavectomy was performed. A small amount of disc material was found posterior to the cord

which was removed. Pedicle subtraction was performed to allow access to the anterolateral canal but no disc fragment could be visualised and the dural tube was seen to be sealed off anteriorly with no evidence of disc prolapse. Durotomy was performed by the neurosurgeon and a large, non-calcified soft tissue mass was found intradurally with extensive adhesions to both dura and spinal cord (**Figure 3**). This was carefully dissected free and removed (**Figure 4**). It was felt that stabilisation of the degenerative lumbar spine was not indicated during the procedure and both the anterior column and contralateral side remained intact. We estimated the risk of future instability to be around 10%, which the patient was willing to accept.

The macroscopic appearance of the mass was consistent with a neoplastic lesion. Samples were therefore sent for intra-operative frozen section to establish the exact pathology, as the presence of tumour would have necessitated a much larger resection. Histological examination confirmed degenerative and necrotic disc with no evidence of malignancy. After the disc fragments were excised the dura was closed and the procedure completed.

The patient made an uneventful post-operative recovery and was discharged after 1 week. At 6 month follow up the patient was independently mobile and had no back or leg pain, with normal bladder and bowel function. He was therefore discharged from follow up as it was evident that his symptoms were not related to the lumbar pathology visible on MRI.

Discussion

Spinal disc herniation is a common pathology; peak incidence occurs in the 5th decade and is associated with age related degeneration of the annulus fibrosis [7]. Herniation at the thoracic level is relatively uncommon [8] and can be asymptomatic with MRI and CT myelogram studies on asymptomatic patients showing the prevalence to be as high as 37% [9]. When symptomatic the presenting features include radicular pain, axial pain and myelopathy. The clinical presentation can be variable and whilst radicular pain is traditionally along the path of the intercostal nerves, lower thoracic discs can mimic lumbar symptoms in the



Figure 1 Sagittal MRI showing protrusion of possible disc material at T11/12 and L2/3, L3/4 and L4/5.

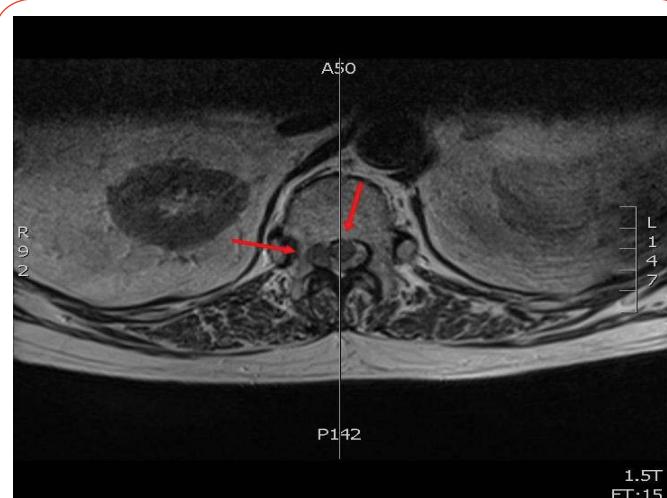


Figure 2 Axial MRI showing prolapsing lesion extradurally (left arrow) and intradurally (right arrow) material.

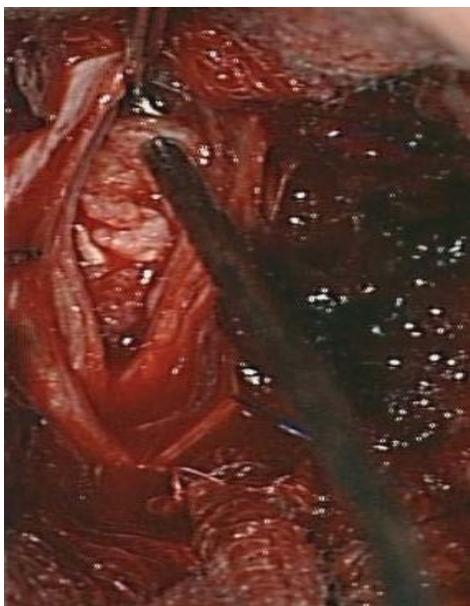


Figure 3 Intradural soft tissue mass at durotomy.



Figure 4 Dura post-excision of soft tissue mass.

groin and lower extremity [10].

Thoracic disc herniations are often self-limiting and conservative treatment with activity modification, physiotherapy and analgesia is often effective. Surgical intervention is indicated when there are signs of cord compression or thoracic radiculopathy that is unresponsive to conservative management.

The smaller space within the thoracic spinal canal makes thoracic discectomy more technically challenging than that in the lumbar or cervical region. Additionally, the tenuous blood supply to the spinal cord and its limited tolerance to any manipulation increase the risk of injury. Many surgical approaches have been described based on characteristics of the disc and its location in relation to

the spinal cord. An anterolateral approach is usually employed for medially located large calcified discs, whereas noncalcified or lateral discs are suitable for posterior excision [10-12]. A transthoracic approach aided with video assisted thoracic surgery (VATS) can also be used for centrally herniated discs [13].

The pathogenesis of intradural discs is not clearly understood, but has been associated with dural adhesions between the posterior longitudinal ligament and the annulus fibrosis [14,15]. A high index of suspicion for an intradural disc should be raised when operative findings fail to correlate with clinical findings [1], such as in this case when no disc material could initially be identified in the spinal canal. The use of pre-op CT [3,4] in the assessment of suspected intradural disc herniation is essential to guide operative technique as extreme care is required to avoid disturbance of the spinal cord in the case of a calcified intra-dural disc. In our case there was no evidence of disc calcification on CT, however if this were the case an anterolateral transthoracic approach would have been employed.

If MRI shows both an intradural thoracic disc and a concurrent disc at the level of symptoms then, given the non-specific nature of symptoms associated with thoracic discs, it may be difficult to clarify which level is accounting for the presenting problem. In our case the pre-operative MRI findings were most consistent with an intra-dural disc fragment however the suspicion of an atypical dural tumour was raised, prompting surgical intervention at this level. The uncertainty of the aetiology of the lesion on both pre-operative imaging and intra-operative excision led to the use of histopathology frozen section to aid diagnosis and surgical management, a technique which is strongly advised in any case which is suspicious of neoplasia. We would strongly recommend co-ordination with the local pathology service when performing surgery on similar cases to ensure it is available if needed.

This particular case highlights both the technical and non-technical complexities in managing suspected intradural disc surgery. The presence of two operating surgeons allows for combined expertise and aids complex decision making. A surgeon with experience and familiarity with intradural surgery is also vital if durotomy and intradural dissection of a disc fragment is needed. Use of spinal cord monitoring is advocated strongly [16-19].

The patient must also be consented appropriately in these cases and counselled at length about the procedure and the small chance of unexpected findings.

Conclusion

These cases are potentially complex from a clinical, radiological and operative viewpoint. Two surgeons operating is strongly recommended, at least one of whom should have intra-dural expertise, and experience of spinal primary tumour surgery. Pre-operative radiological investigation is vital with both CT and MRI, along with expert interpretation of these films.

Despite extensive preparation there will always be an element of uncertainty to these cases, even during surgery. The role of histopathology was vital for this patient and we would suggest consideration of this prior to surgery when undertaking these rare but potentially complex cases.

References

- 1 Epstein NE, Syrquin MS, Epstein JA (1990) Intradural disc herniations in the cervical, thoracic, and lumbar spine: report of three cases and review of the literature. *J Spinal Disord* 3: 396-403
- 2 Negovetić L, Cerina V, Sajko T (2001) Intradural disc herniation at the T1-T2 level. *Croat Med J* 42: 193-195.
- 3 Almond LM, Hamid NA, Wasserberg J (2007) Thoracic intradural disc herniation. *Br J Neurosurg* 21: 32-34.
- 4 Stone JL, Lichtor T, Banerjee S (1994) Intradural thoracic disc herniation. *Spine (Phila Pa 1976)*. 19: 1281-1284.
- 5 D'Andrea G, Trillo G, Roperto R (2004) Intradural lumbar disc herniations: the role of MRI in preoperative diagnosis and review of the literature. *Neurosurg Rev* 27: 75-80.
- 6 Jain SK, Sundar IV, Sharma V, Goel RS, Gupta R (2013) Intradural disc herniation- a case report. *Turkish Neurosurgery* 23: 389-391.
- 7 Chowdhary UM (1987) Intradural thoracic disc protrusion. *Spine (Phila Pa 1976)*12: 718-719.
- 8 Del Grande F, Maus TP (2012) Imaging the intervertebral disc: Age related changes, herniations and radicular pain. *Radiologic Clinic of North America* 4: 629-649.
- 9 Moore KL, Agur AMR, Dalley AF (2007) Essential clinical anatomy (3rd edn). Baltimore, Williams & Wilkins.
- 10 Deckey JE, Devlin VJ (2012) Spine Secrets Plus (2nd edn). Thoracic disc herniation and stenosis. Mosby, Missouri.
- 11 Arts MP, Bartles RH (2014) Anterior or Posterior approach of the thoracic disc herniation? A comparative cohort of mini-transthoracic versus transpediculae discectomies. *Spine J* 4: 1654-1662
- 12 R.J. Bransford, F. Zhang, C. Bellabarba, M.J. Lee (2010) Treating thoracic-disc herniations: do we always have to go anteriorly? *Evid Based Spine Care J* 1: 21-28.
- 13 C.B. Stillerman, T.C. Chen, W.T. Couldwell (1998) Experience in the surgical management of 82 symptomatic herniated thoracic discs and review of the literature. *J Neurosurg* 88: 623-633.
- 14 Burke TG, Caputy AJ (2000) Treatment of thoracic disc herniation: evolution toward the minimally invasive thorascopic technique. *Neurosurg Focus*, Department of Neurosurgery, The George Washington University, Washington DC.
- 15 Yildizhan A, Pasaoglu A, Okten T, Ekinci N (1991) Intradural disc herniations pathogenesis, clinical picture, diagnosis and treatment. *Acta Neurochirurgica* 110: 160-165.
- 16 Kobayashi K, Imagama S, Matsubara Y, Yoshihara H, Hirano K, et al. (2014) Intradural disc herniation: radiographic findings and surgical results with a literature review. *Clin Neurol Neurosurg* 125: 47-51.
- 17 Whitmore RG, Williams BJ, Lega BC, Sanborn MR, Marcotte P (2011) A patient with thoracic intradural disc herniation. *J Clin Neurosci* 18: 1730-1732.
- 18 Wang AM, Zamani AA (1986) Intradural herniation of thoracic disc: CT metrizamide myelography. *Comput Radiol* 10: 115-8.
- 19 Pajewski TN, Arlet V, Phillips LH (2007) Current approach on spinal cord monitoring: the point of view of the neurologist, the anaesthesiologist and the spine surgeon. *Eur Spine J* 16: 115-129.