

Extraforaminal lumbar herniated disc mimicking foraminal tumor: Case report, literature review, and the role for minimally invasive approach for resection

ABSTRACT

Herniated discs in the lumbar spine are common, however, extraforaminal disc herniations are less frequently encountered. Occasionally, rare disc herniations can mimic other pathologies such as nerve tumor. We present such case and a review of similar cases in the scientific literature. A 71-year-old male who presented with back pain and right-side sciatic pain. Magnetic resonance imaging revealed a fusiform enhancing 3 cm × 2 cm lesion that was concerning for a nerve sheath tumor. A minimally invasive lateral trans-psoas approach was performed for a biopsy that revealed disc fragments and a full resection was performed. The patient's symptoms improved at follow-up. Although uncommon, extraforaminal disc herniations can be mistaken for peripheral nerve tumors on imaging. The spine surgeon should remain vigilant about these entities and plan the surgical treatment accordingly.

Keywords: Herniated disc, lumbar radiculopathy, minimally invasive surgery, nerve sheath tumor, trans-psoas approach

INTRODUCTION

Disc herniations are very common in the adult population. Disc herniation is generally centrally located while far lateral disc herniations, both foraminal and extraforaminal, comprise 7%–10% of all lumbar disc herniations.^[1] Within this group, extraforaminal disc herniations are less common and account for 3%–4% of the cases.^[2,3] These discs can simulate other pathologies (retroperitoneal lesions, nerve sheath tumors) given their location which prompts the spine surgeon to remain vigilant and plan accordingly the surgical treatment.

We present a case report of a patient with an extraforaminal (likely intraneural) disc herniation in the lumbar spine that mimicked a peripheral nerve sheath tumor on imaging that successfully resected via a minimally invasive (MIS) approach. We also present a literature review of the few similar cases previously reported.

CASE REPORT

A 71-year-old Vietnamese retired man presented with back and right leg pain in a radicular pattern. His symptoms were

worse with standing, bending, and twisting. The patient experienced pain at nighttime while sleeping. The patient underwent trigger point injections without any relief.

The past medical history was significant for hyperlipidemia and prior surgeries included knee arthroscopy. Past social history: 2 cigarettes per day. Medication history: Atorvastatin 40 mg daily, acetylsalicylic acid 81 mg daily, glucosamine chondroitin plus Vitamin D daily, sildenafil.

His vital signs were within the normal limits during the visit. Body mass index of 23.9 kg/m².

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Physical examination: patient was alert, no acute distress. Well nourished, well developed. There were no abnormal findings on the general physical examination.

Neurological examination revealed 4/5 weakness on the right iliopsoas, normal on the left side. The rest of the muscle groups had normal strength. The patient had 1+ patellar reflex on the right, normal reflexes on the left. He had a normal sensory exam.

The magnetic resonance imaging (MRI) of his lumbar spine was reviewed [Figures 1 and 2]. The MRI shows expected degenerative changes for his age, and an extraforaminal right L4-5 ring-enhancing mass, suspicious for a nerve sheath tumor.

Given his history, neurological examination, and MRI findings suspicious of a nerve sheath tumor, surgery was recommended. The goals of surgery included obtaining definitive tissue diagnosis, improvement in neurologic symptoms, and return of normal neurologic function. Before surgery, gabapentin was prescribed for managing neuropathic pain.

Given the location of the lesion, we proposed a minimally invasive, shallow-docking, trans-psoas approach to fully visualize the tumor, obtain tissue for pathology, and achieve a resection. Other approaches including traditional open, retroperitoneal, and posterior approaches were considered but felt to be less successful at achieving the surgical goals.

Operation

The patient was placed on lateral decubitus with the right side up. Intraoperative neuromonitoring was used to reduce the risk of lumbar plexus injury. Using fluoroscopy, the L4-5 space was identified, and a transverse incision was marked. Using the technique described by Acosta *et al.*^[4] supra-psoas shallow docking (previously described for lateral interbody fusion), we divided the abdominal muscles until the retroperitoneal space was identified and access via blunt dissection until the psoas muscle was identified. Once fluoroscopy confirmed the appropriate level, the retractors were placed in a “shallow dock” technique so that the retractors were not fully deployed against the spine at the disc level using blunt dissection, the psoas muscle fibers were separated until a well-circumscribed mass was identified [Figure 3]. Direct stimulation of the capsule at 8 mA was performed, but the entire surface of the exposed tumor would stimulate the hip flexor and the knee extensors. Therefore, a “safe” entry zone to this mass was not readily identified. However, given the concern of a tumor, an intraneural exposure and resection were then performed.

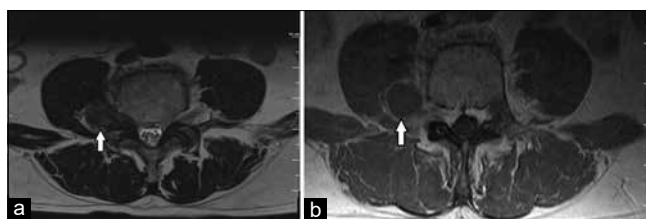


Figure 1: (a) Axial T2 image showing a round lesion (arrow) in the extraforaminal space in close contact with the psoas muscle. (b) Axial T1 contrast image showing a well-circumscribed lesion with ring enhancement (arrow) again notes in the extraforaminal space and with different intensity in comparison with the thecal sac and its contents

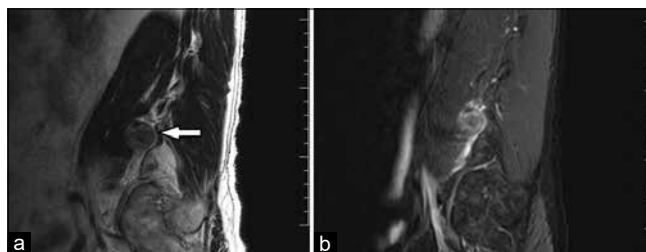


Figure 2: (a) Parasagittal T2 images showing a round lesion (arrow) in close contact with the psoas muscle. (b) Parasagittal T1 with contrast images showing again a well-circumscribed lesion in the extraforaminal space. Notice that the spinal cord or disc space is not visible as this lesion extends lateral to it



Figure 3: Intraoperative photo with the microscope showing the microdissection of this lesion (arrowhead) away from the psoas muscle (arrows)

The capsule was coagulated over an approximately 1 cm area, and open sharply with #11 blade, a small piece was taken for frozen pathology. The initial specimen appeared to be consistent with fibrocartilage material and cartilaginous endplate. The pathologist agreed that the specimen did not appear to be consistent with malignancy, therefore, debulking of the lesion was initiated. The debulking was carried out gently with angled curettes, ball probe, nerve hook, straight pituitary rongeurs until the entirety of the mass had been resected. The internal decompression technique left a thin capsule. Direct stimulation of the capsule continued to cause similar motor activity. The wound was then closed in layers in a standard fashion.

Postoperative follow-up

The patient was admitted after surgery. His radicular pain resolved after surgery, but on follow-up, he developed hyperesthesias and slightly worse hip flexor weakness (4/5). He required increased doses of gabapentin to manage the postoperative pain. By 8 weeks after surgery, his hyperesthesia and motor weakness had largely resolved.

A postoperative MRI at 4 months demonstrated complete resection of the lesion [Figure 4], and minimal changes of the psoas muscle. At 6 months, the patient remained with mild neuropathic pain controlled with gabapentin, but no residual weakness.

Final pathology report

Myxochondroid material with scant nerve and fibrous tissue, consistent with herniated nucleus pulposus was identified. There were no signs of malignancy [Figure 5].

DISCUSSION

Malignant peripheral nerve sheath tumors are the sixth-most common soft-tissue sarcoma.^[5] Overall peripheral nerve sheath tumors account for 12% of the benign and 8% of the malignant soft-tissue neoplasms.^[2,6] In comparison, extraforaminal disc herniation composes 3% of the far lateral disc herniations. During the evaluation of the patient with radicular pain and back pain imaging is a fundamental step. Common imaging characteristics of peripheral nerve tumors are: fusiform shape, split-fat sign (peripheral rim enhancing on MRI), present on entering and exiting nerve.^[6] In this case, the MRI findings showed some of these characteristics (fusiform shape, contrast enhancement on the periphery) which were concerning for a peripheral nerve tumor, the size of the lesion was also suspicious for a nerve tumor. This lesion measured approximately 3 cm × 2 cm which makes a herniated disc this large less likely. Similarly, the case by Eckardt *et al.*^[7] the mass was 2 cm × 2 cm which made them suspicious for a tumor rather than a disc herniation this large. Given all this, our initial assumption was this was a peripheral nerve tumor. The goal of the surgery was to perform a biopsy

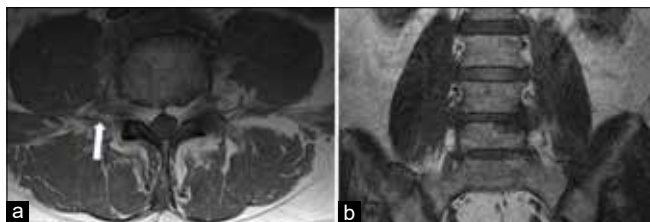


Figure 4: Postoperative spine magnetic resonance imaging. (a) Axial postcontrast T1 images now with the lesion completely removed (arrow points at the location of the lesion preoperatively). (b) Coronal images again showing complete removal of the lesion

to confirm the diagnosis but once the intraoperative findings suggested that this was a disc herniation our goal became now a full decompression of the nerve. Unique to our case is the use of minimally invasive spine technique for the resection of the mass. Given the advance in spine surgery, lateral access via a trans-psoas approach is used routinely in the last few years. We used the “shallow-docking” technique which allowed for full visualization of the mass distal to the disc itself, minimal retraction of the psoas muscle, and a safe resection with intraoperative neuromonitoring. By accessing this mass laterally there was no disruption to any of the posterior ligamentous, muscular, or spinal anatomy. This likely preserved the patient’s spine stability, thus avoiding the need for a spinal fusion.

Given the rarity of this type of disc herniations we performed a literature using MEDLINE (via PubMed) with the following search criteria: (extraforaminal[All Fields] AND disc[All Fields] AND („hernia“[MeSH Terms] OR „hernia“[All Fields] OR „herniation“[All Fields])) AND („nerve sheath tumour“[All Fields] OR „nerve sheath neoplasms“[MeSH Terms] OR („nerve“[All Fields] AND „sheath“[All Fields] AND „neoplasms“[All Fields]) OR „nerve sheath neoplasms“[All Fields] OR („nerve“[All Fields] AND „sheath“[All Fields] AND „tumor“[All Fields]) OR „nerve sheath tumor“[All Fields]).” This search yielded 3 results. Additional references from the Cusimano *et al.*^[8] were also added for a full comprehensive review of the prior published cases in the last 35 years. These articles are presented in Table 1.

Interestingly, the case by Sharma *et al.*^[1] shows how difficult to access these lesions can be. They did their surgical approach in two stages requiring two surgical days (anterior and

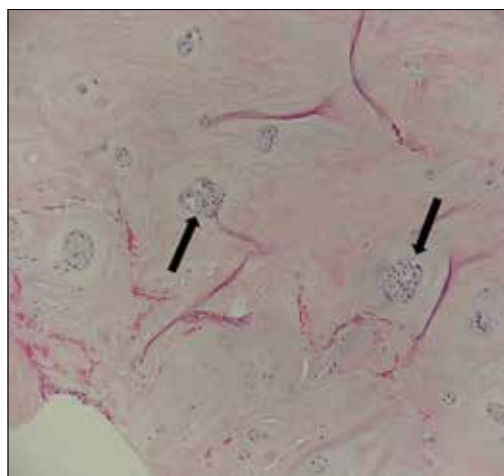


Figure 5: Microscopic picture of a hematoxylin and eosin staining of the sample of the lesion. The chondrocytes are noted in lacunae (arrows) and can be seen surrounded by a dense collagen matrix. These findings are compatible with a fibrocartilage such as the intervertebral disc

Table 1: Literature review and comparison between other reports

Article	Country	Presentation	Spine level	Preliminary diagnosis	Surgery	Outcome	Pathology
Savitz <i>et al.</i> , 1982 ^{[9]*}	USA	Two patients "Bilateral L5 radiculopathy, S1 radiculopathy"	-	"Intradural neoplasm L4"	-	-	-
Eckardt <i>et al.</i> , 1985 ^[7]	USA	42 male back pain, numbness posterolateral right thigh and medial calf	L4-L5	"Retroperitoneal neoplastic process"	"Through a lateral oblique abdominal incision, the retroperitoneum was explored"	Immediate pain relief, back to work 6 months	"Degenerating disc material without evidence of a neoplastic process"
Cusimano <i>et al.</i> , 1995 ^[8]	Canada	42 male with left leg pain and numbness medial knee.	L3-L4	Schwannoma	"Lateral approach"	Pain free and returned to work	"Degenerated intervertebral disc with fibro blasts on the periphery that represented re active change"
Bakar <i>et al.</i> , 2009 ^[10]	Turkey	46 female back pain and right leg pain knee and medial tibial region	L4-L5	"Nerve sheath tumor"	Posterior. "L4 hemilaminectomy, right L4 and L5 facetectomies"	At 9 months pain free but remained with absent knee jerk reflex	"Degenerated disc material with a wide peripheral neovascularization zone"
Sharma <i>et al.</i> , 2012 ^[11]	USA	55 male right lower extremity pain and weakness. Intense sharp pain radiating down the thigh into the dorsum of his right foot	L5-S1	"benign mass or a low-grade malignancy"	1 st surgery: "transabdominal, trans peritoneal route." 2 nd surgery: "right complete L5-S1 facetectomy, subtotal discectomy, and instrumented fusion (...) L5 and S1"	18 months pain free but remained with 3/5 dorsiflexion and EHL 2/5	"fibrocartilaginous matrix with reactive changes, consistent with a prolapsed disc"
This case	USA	71M back pain and pain in the lateral aspect of the right thigh and calf	L4-L5	Peripheral nerve sheath tumor	MIS trans-psoas approach	At 6 months initial severe pain improved some neuropathic persists but motor exam normal	Herniated nucleus pulposus

*The data for Savitz *et al.*^[9] was gathered from Cusimano *et al.*^[8] article as we were unable to find a full text source despite multiple attempts in different literature databases

posterior). In the case by Bakar *et al.*^[10] their approach included two full facetectomies which destabilize the spine requiring fusion. Eckardt *et al.*^[7] performed a maximally invasive lateral approach to the retroperitoneum requiring mobilization of the vena cava and ligation of two lumbar arteries and veins. In our case, given the favorable L4-L5 location the trans-psoas MIS approach was very suitable. This technique allows minimal disruption of the retroperitoneal structures, a small and safe corridor for resection, and the opportunity to achieve a full resection. In addition, a more minimal invasive approach allowed the patient to be discharged one day after surgery.

Comparing the different cases reported up to date [Table 1], postoperative neuropathic pain is not uncommon after removing the disc herniations in this location. Not unexpectedly, the patient reported in this case also experienced hyperesthetic-type pain, different than the original radicular pain, but was successfully managed with gabapentin. This may be due to long-standing nerve compression plus surgical manipulation. Bakar *et al.*^[10] reported delayed neuropathic pain after 2 weeks requiring steroids and eventually improving at last follow-up.

At this time, there is no definitive explanation as to the location of this disc herniation. Cusimano *et al.*^[8] proposed

that the disc herniation damages the neural sheath, and this then allows the disc fragment to enter the nerve root which will explain why it appears as a fusiform lesion of the nerve on imaging. This hypothesis was also supported by Sharma *et al.*^[11] similar hypotheses are in place for migration/embolization of disc fragments to vascular structures where fragments of nucleus pulposus enter the spinal vasculature and increase intradiscal pressure propel them.^[11,12] Nonetheless, a proven theory for extraforaminal disc herniation within the nerve remains elusive.

CONCLUSION

Although rare, extraforaminal disc herniation can mimic nerve sheath tumors on imaging. The spine surgeon should remain vigilant about this entity. MIS techniques including lateral, trans-psoas, shallow docking approaches present a unique opportunity to address these types of discs herniations.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that

his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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