

Case Report

Ganglion Cyst of the Posterior Longitudinal Ligament Causing Lumbar Radiculopathy

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Degenerated conditions such as herniated disc or spinal stenosis are common etiologies of lumbar radiculopathy. Less common etiologies include spinal extradural cyst such as synovial cysts and ganglion cysts. Ganglion cyst of the posterior longitudinal ligament (PLL) of the spine is a rare entity that can result in classical sciatica. Posterior longitudinal ligament cyst has no continuity with the facet joint and has no epithelial lining. Two young male patients presented with unilateral sciatica and were found to have intraspinal cystic lesions causing lumbar radiculopathy. Magnetic resonance imaging demonstrated rounded, cystic lesions (i.e., hypointense on T1- but hyperintense on T2-weighted images) adjacent to minimally dehydrated, nonherniated disc spaces in both cases. These patients underwent posterior decompression and cysts were excised, and their sciatic symptoms were completely resolved. Histological examination showed typical features of ganglion cysts in these cases.

KEY WORDS : Ganglion cyst · Intervertebral disc · Posterior longitudinal ligament.

INTRODUCTION

Lumbar disc herniation is a common etiology causing radiculopathy. Such lesion usually has a signal equivalent to that of the adjacent degenerative disc : i.e., isointense or hypointense on both T1- and T2-weighted imaging¹⁴). On the other hand, a spinal extradural cyst is a rare cause of such radiculopathy. Extradural cysts within the lumbar spinal canal are usually classified as synovial cyst, PLL cyst, or ligament flavum (LF) cyst based on their location⁶), origin^{1,21}), and pathologic features⁷). Cystic lesion located in the PLL but lacking epithelial lining and continuity with the PLL is classified as PLL cyst.

We herein describe two patients with sciatica caused by an extradural cyst originating from the PLL. All cysts were hypointense on T1-weighted images, hyperintense on T2-weighted images, and rim enhanced after gadolinium administration.

CASE REPORT

Case 1

A 35-year-old male presented with 9-month history of left leg pain which increased gradually and exacerbated with ambulation, and extended from the lateral thigh to the dorsum of the calf. The pain had become severe over next one month, especially at night, and was not relieved by non-steroidal anti-inflammatory drugs. Physical examination showed limited motion of the lumbar spine. Straight leg raise capacity was diminished to 40 degrees on the left. Sensory, motor and deep tendon reflex were normal and symmetrical. Magnetic resonance imaging (MRI) revealed a rounded, extradural lesion behind the upper body of L4, causing significant thecal compression and displacement. The adjacent L3-L4 disc height was reduced and exhibited a minor degree of dehydration; nevertheless, the facet joints were normal. The cyst was hypointense on T1-weighted images, hyperintense on T2-weighted images. After administration of gadolinium-DTPA, peripheral enhancement was observed. No cyst-disc communication was apparent on T2-weighted MRI scans (Fig. 1). The patient underwent an L3 hemi-laminectomy and excision of the extradural cyst. The cyst was found to compress the left L4 nerve root and the dural sac (Fig. 2). For internal decompression, we

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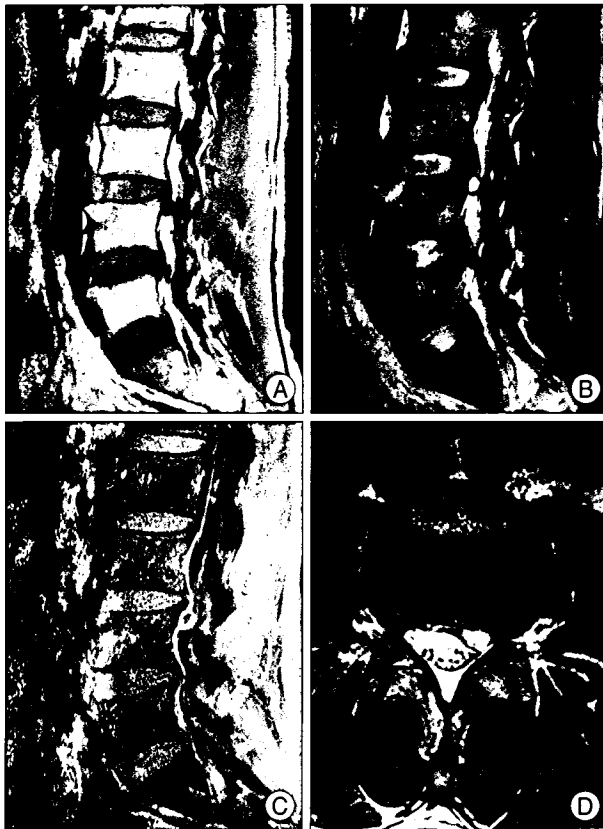


Fig. 1. Preoperative magnetic resonance imaging findings. A : Sagittal T1 image, demonstrating a cystic lesion at the L4 upper vertebral body level. The cyst shows a low signal intensity. B : Sagittal T2 image. The cyst shows a high signal intensity. The L3/L4 disc spaces exhibit minor features of degeneration and do not communicate with the cyst. C : Sagittal T1 postcontrast image, demonstrating uniform rim enhancement. D : Axial T2 images, the cyst lies ventrally within the left lateral recess and is observed to cause significant dural and nerve root compression.



Fig. 2. Intraoperative photomicrograph of a cyst. The L4 root (R) is deviated medially by the retractor at the disc space level. The cyst (C) extends caudally and attached to the posterior longitudinal ligament (PLL) of the L3-L4 disc space contains.

performed excision of the cyst. The cyst originated from the PLL at the L4 level. After complete removal of the cyst, no obvious communication with the disc space was apparent and microdiscectomy was performed. On the pathological examination, the cyst was lined by fibrous connective

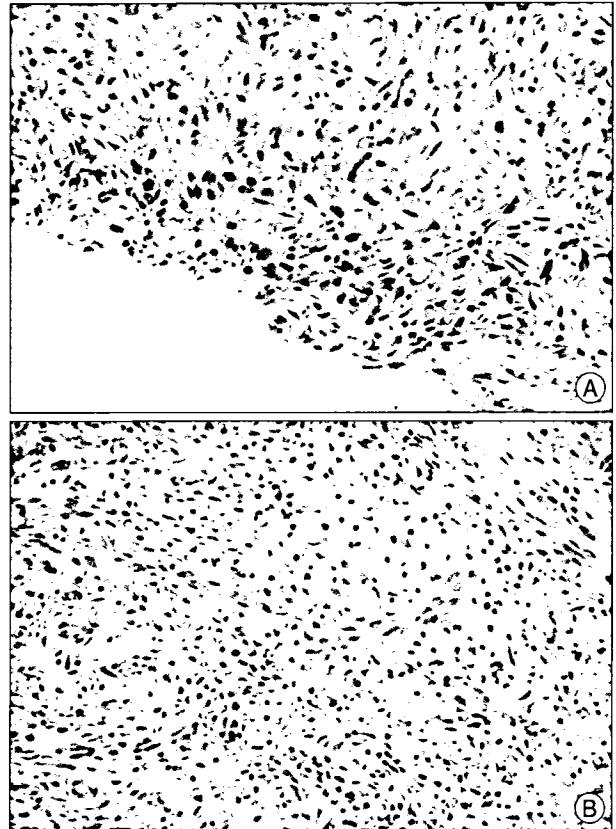


Fig. 3. Photomicrographs of the cyst specimen. A : The wall is lined by nonsynovial flattened cells and is surrounded by a dense inflammatory cell infiltrate that included fibrin, red blood cell and hemosiderin-laden macrophages (H&E, $\times 100$). B : Cyst wall composed with granulation tissue, red blood cell, and infiltrating macrophages (H&E, $\times 200$).

tissue without synovial layers. There was evidence of inflammatory cell infiltration, red blood cell and myxoid degeneration in the fibrous wall (Fig. 3). Based on these macroscopic and microscopic results, the diagnosis of a ganglion cyst originating from the PLL was made. After operation, the patient showed an excellent recovery, with full resolution of radiculopathy. On postoperative Day 10, he was able to return to his daily activity without any restrictions.

Case 2

A 36-year-old male was admitted to the hospital with a 4-month history of left leg pain ascending from the anterolateral calf to the posterolateral aspect of the hip. The pain was constant but exacerbated by movement. There was no history of trauma or associated constitutional symptoms. Straight leg raising capacity was reduced to 45 degrees on the left, but findings of the neurological examination and other routine investigations were otherwise normal. MRI disclosed a rounded, extradural lesion behind the cephalad body of L4, which was hypointense on T1 and hyperintense on T2. The contiguous L3/L4 disc space was mildly dehydrated, herniated but of normal height, and the facet

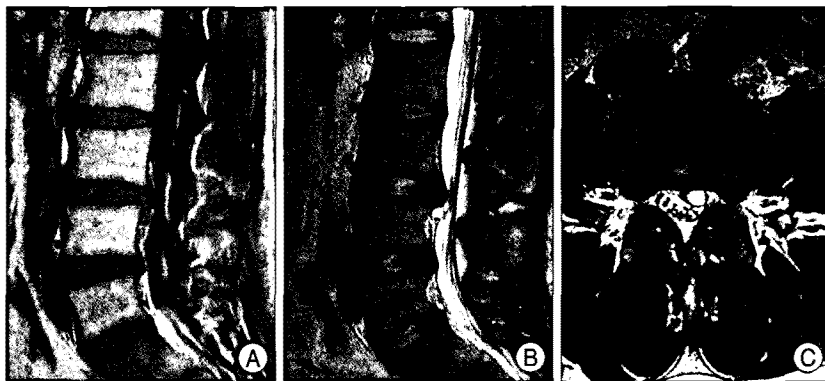


Fig. 4. A : Sagittal T1 images show cystic lesion with low signal intensity at L3-4 level. B and C : T2-weighted sagittal and axial images show oval-shaped cyst with high signal intensity and no continuity with the facet at L3-4 level.



Fig. 5. Photomicrographs of a posterior longitudinal ligaments cyst with fibrous connective tissue and absence of epithelial tissue lining. Cyst wall is admixed with fibrin, red blood cell, and macrophages (H&E, $\times 200$).

joints were normal (Fig. 4). The pain disturbed his daily life. As a result, a surgical operation was performed. Through a left L3-L4 fenestration, a tense cystic lesion was found intimately adherent to the PLL beneath the left L4 nerve root. Pathologically, the wall was lined by non-synovial flattened cells and surrounded by a dense, mononuclear, inflammatory cell infiltrate that included eosinophils and macrophages (Fig. 5). After complete removal of the cyst, there was no obvious communication with the disc space. From these microscopic and macroscopic results, the diagnosis of a ganglion cyst originating from the PLL was made. After surgery, there was immediate resolution of the left-sided sciatica, which has been sustained at one month follow-up.

DISCUSSION

Ganglion cyst of the PLL is a very rare entity of intraspinal ganglion cysts, which have been described elsewhere^{4,9,19}. Up to now, only 10 cases of ganglion cysts originating from the PLL have been previously reported¹¹. Most cases of ganglion cysts of the PLL are reported in 20- to 30-year-old

males, especially in athletes^{9,13,16}.

The pathogenesis of the PLL cysts is not understood, but may involve repetitive trauma, facet arthrosis, spondylolisthesis, myxomatous degeneration of the connective tissue, increased hyaluronidase production and accumulation of viscous myxoid material²⁰. The loading exerted by degenerated intervertebral disc on the PLL may also be a factor in the development of ganglion cyst of the PLL^{5,16}. Some ganglion cysts of the PLL contain serous fluid and others contain mucinous²⁰.

These cysts may also contain blood, hemosiderin, and even air. Trauma has been implicated in the development of ganglion cysts of the PLL⁴, which mainly occur in young, athletic men with a history of recurrent injuries. Extradural lumbar spinal cystic lesions are usually classified as synovial cyst, ganglion cyst, PLL or LF cyst based on their location⁶, origin,^{1,21} and pathologic features⁷. All these lesions are hypointense on T1, hyperintense on T2, and frequently rim enhanced after intravenous gadolinium administration¹³. The terms spinal synovial and ganglion cyst are used interchangeably, but these two lesions can be clearly distinguished by the presence or absence of a synovial lining membrane. Cystic lesion located on the internal and posterolateral side of the spinal canal, continuous with the facet joints, and lined with epithelial tissue is classified as synovial cyst^{15,17}. Cystic lesion located at the periarticular area but the lacking epithelial lining and continuity with the synovial cavity is classified as ganglion cyst¹⁵. Cystic lesion embedded in the inner surface of the LF with no epithelial lining or continuity with the facet joint synovium is classified as LF cyst¹³, and cystic lesion located in the PLL with the same properties is classified as PLL cyst¹¹. These lesions usually present with common symptoms of radiculopathy, neurologic claudication, myelopathy, neurological deficit, and even cauda equina syndrome^{10,12}.

Magnetic resonance imaging appears to offer the best performance for visualizing these cysts. The MRI aspects of the ganglion cysts of the PLL have been reported in the literature^{4,19}. In every case, the cyst showed a hypointense on T1 and hyperintense on T2. The location of cystic mass was at the left or right anterior epidural space at the posterior surface of lumbar body on axial and sagittal images. Shino et al.¹⁹ and Baba et al.⁴ reported the MRI aspect of the cyst after gadolinium injection : as in our case, peripheral enhancement of the cyst was observed. On CT scans, these lesions appear as round masses in the anterior epidu-

ral space, with low density compared with the adjacent disk, and no enhancement following contrast administration¹³. A ganglion cyst of the PLL should be considered among the differential diagnoses of intraspinal lesions causing lumbar radiculopathy.

In general, ganglion cyst of the PLL has some properties that distinguish from juxtafacet cysts.

First, juxtafacet cysts exhibit no sex predilection (or, if anything, a female bias). Most cases of ganglion cyst of the PLL have been curiously restricted to 20- to 30-year-old males, especially in athletes¹⁷. Second, ganglion cyst of the PLL exhibit uniform MRI appearances (i.e., hypointense on T1, hyperintense on T2) unlike ganglia in general or juxtafacet cysts^{14,17}. Finally, ganglion cyst of the PLL do not originate from synovial joints or synovium-lined tendon sheaths. This promotes primary myxoid degeneration as the sole "fluid" source and might explain why significant size fluctuations (or postoperative recurrences) have not yet been reported.

Management of a ganglion cyst of the PLL is similar to that of a herniated nucleus pulposus. Spontaneous regression is rare. Conservative treatment includes bed rest, oral analgesics, and physical therapy. Controversies on minimal invasive versus open surgical treatment of lumbar spinal cysts still remain. Various minimal invasive methods have been applied for lumbar spinal cyst including CT or endoscopy guided needle aspiration². Surgical treatment is the gold standard in patients with intractable pain and neurological deficit^{15,17}. The cyst wall should be removed to avoid recurrence. Recurrence is very rare after total cyst excisions¹⁸. Surgical treatment with complete cyst excision is associated with immediate and delayed risks¹⁰. Cysts may adhere any tissue in the spinal canal, so surgeons must be alert to cerebrospinal fluid fistula at the end of operation. Larger cyst is more likely to adhere to the dura mater⁸.

CONCLUSION

We described a rare case of a ganglion cyst originating from the PLL. Magnetic resonance imaging appears to offer the best performance for visualizing these cysts. Ganglion cyst of the PLL is a treatable lesion and should be considered among the differential diagnoses of intraspinal lesions causing radiculopathy/neurogenic claudication. Cysts compressing a nerve root should be removed surgically.

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