Spinal Ganglion Cyst of Lumbar Posterior Longitudinal Ligament

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Abstract

Among the various benign intraspinal cystic lesions, ganglion and synovial cysts are rarely found and reported in the literatures. Even though it is believed that ganglion and synovial cysts can be differentiated with or without presence of synovial lining and communication with facet joint, it is difficult to differentiate between them clinically and both terms have been used interchangeably to describe the cysts which developed from connective tissue of the spine. The authors analyzed five rare cases of spinal ganglion cyst which originated from posterior longitudinal ligament of the lumbar spine and discuss about the clinical, radiological, and surgical findings. We also discuss about the pathogenetic mechanisms of the cyst.

Introduction

Materials and Methods

Between January 1, 1998, and August 31, 1999, five patients with ganglion cysts were evaluated by the neurosurgery department for lower extremity radiculopathy. Each patient underwent magnetic resonance imaging (MRI). All patient underwent partial hemilaminectomy and cyst excision. The presence of ganglion cyst was confirmed by the pathologic findings. Clinical and radiological characteristics were analyzed.

Results

There were 4 men and 1 woman with a mean age of 24 years (range, 18-30 years). The lesion were located at
L3/4 in 2 cases, L4/5 in 2 cases and L5/S1 in 1 case.

The lesions were left-sided in four patients and right-sided in one patient. All patients complained of back pain and sciatica almost same as herniated disc. The duration of these symptoms were 2-18 months. In all cases the symptoms were progressive and did not respond to conservative care. MRI findings showed that the cyst was located posterolateral to vertebral body compressing the nerve root dorsally and disc adjacent to cyst was degenerated in all cases. The cyst was also located just caudally adjacent to degenerated disc in all cases (Table 1).

**Case:**

30 year old man was admitted because of low back and leg pain for 9 months. He suffered from lifting injury in his low back 2 years ago and suffering from mild low back pain thereafter. A straight leg raising maneuver was positive at approximately 70 degree on the left side. There were no other motor, sensory, or reflex change. Magnetic resonance imaging (MRI) showed an intraspinal extradural space-occupying lesion just caudal to L4/5 disc space on the left side. The round lesion was isointense on a T1-weighted image and hyperintense on a T2-weighted sequence suggesting cystic lesion (Fig. 1). The adjacent L4/5

### Table 1. Summary of cases

<table>
<thead>
<tr>
<th>Case No</th>
<th>Sex</th>
<th>Age</th>
<th>Duration</th>
<th>Location</th>
<th>Disc pathology on MRI</th>
<th>Operation</th>
<th>Trauma hx.</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>m/30</td>
<td>9mo</td>
<td>L4/5 Lt</td>
<td>L4/5 degeneration and protrusion Lt</td>
<td>En bloc resection</td>
<td>-</td>
<td>19mo pain resolved</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>m/20</td>
<td>6mo</td>
<td>L4/5 Lt</td>
<td>L4/5 degeneration and protrusion Lt</td>
<td>Piecemeal resection</td>
<td>-</td>
<td>12mo pain resolved</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>f/18</td>
<td>12mo</td>
<td>L3/4 Lt</td>
<td>L3/4 degeneration only</td>
<td>Piecemeal resection</td>
<td>-</td>
<td>6mo pain resolved</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>m/26</td>
<td>3mo</td>
<td>L5/S1 Lt</td>
<td>L5/S1 degeneration and protrusion Lt</td>
<td>Piecemeal resection</td>
<td>-</td>
<td>12mo pain resolved</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>m/29</td>
<td>9mo</td>
<td>L3/4 Rt</td>
<td>L3/4 degeneration and protrusion Rt</td>
<td>Piecemeal resection</td>
<td>-</td>
<td>3mo mild numbness ( )</td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 1.** Magnetic resonance imaging findings. The cystic lesion showing a isosignal intensity on T1 weighted image (left) and high signal intensity on T2 weighted image (right) at the level of L5 vertebra.
intervertebral disc was degenerated and slightly protruded posterolaterally same side as cystic mass (Fig. 2). Surgical exposure of the L4/5 area was achieved through a partial hemilaminectomy on the left side. No abnormality of L4/5 facet joint was found and the ligamentum flavum appeared normal. After dissection and retraction of L5 root, dark brown colored cystic mass was detected lying anterior to dura and nerve root causing significant compression on the root. The mass was tightly adherent to posterior longitudinal ligament and seemed to be originated from the ligament. Microsurgical dissection was done between cystic mass and root and en bloc resection was performed (Fig. 3). After removal of the cyst, cyst was cut and dark thick proteinaceous material was found in the cyst. Histologically, the resected sample consisted of thick fibrous capsule with myxoid degeneration. The inner wall of the cyst did not contain synovial lining cells. These findings were consistent with a ganglion cyst originating from the posterior longitudinal ligament (Fig. 4). The patient was ambulatory 1 day after surgery without leg pain and was completely well at the latest follow-up visit 1 year after surgery.

Discussion

A variety of cystic lesions may develop within the spinal canal, including perineural cyst, arachnoid cyst, dermoid or epidermoid cyst, neurenteric cyst, synovial and ganglion cyst. In contrary to ganglion cyst usually develop in the connective tissue around the peripheral joint and tendon, intraspinal ganglion cyst is not common and have been rarely reported in the literature. The first report of intraspinal ganglion cyst was by von Gruker in 1880. Vosschulte and Borger were the first to report associated nerve root compression secondary to juxtafacet cysts in 1950. Intraspinal cyst formation from the spinal connective tissue has been separated into two distinct types, synovial and ganglionic. In contrast to synovial cysts are identified by their pseudostratified columnar synovial cell lining and are thought to arise from periarticular tissue, more specifically for facet cyst, ganglion cysts have no synovial cell lining.
and no communication with facet joint. But the synovial
cyst sometimes lose its connection with synovium of joint
causing difficulty in distinction from a ganglion cyst. And also because they often have a similar pathogenesis,
overlapping histopathology, and similar population, some
authors use the terms spinal synovial and ganglion cysts
synonymously and sometimes they are called collectively
as juxta-facet cysts. Soren in 1966 described the de-
velopmental stages of ganglion cysts and stated that in the
final stage fibrocytes form an incomplete lining that that
resembles the synovium of the joint capsule. This make
distinguishing between the ganglion and synovial cyst di-
ficult. But there is no clinical significance in distingui-
shing between ganglion and synovial cysts because their
treatment and prognosis are the same.

Ganglion cyst can be developed from any connective
tissue of the spine. They have been found in the facet joint,
ligamentum flavum, interspinous ligament, lumbar an-
nulus, and the quadrate ligament of odontoid in the liter-
atures. And there are two previous articles that report ganglion
cysts originated from posterior longitudinal ligament.
The symptoms of the ganglion cyst are variable. They
can be found incidentally without symptoms, but they usu-
ally cause back pain, sciatica in the lumbar cyst, or some-
times myelopathy in the thoracic or cervical cyst. Sometimes
hemorrhage within the cyst may initiate acute back and
radicular pain or may dramatically increase existing pain.
In our cases, symptoms and signs were same as lumbar
disc herniations, causing sciatica and nerve root tension
sign because the cyst was located ventral to nerve root
compressing the root dorsally. During surgery, author did
not perform discectomy even though the disc was bulged a
little because author thought patient's sciatica was due to
compression by the cyst, not by the disc bulging itself. And
postoperatively patient's sciatica was relieved in all 5 cases.

The preoperative diagnosis of the cyst can be made from
MRI. MRI typically show the extradural cystic lesion, sh-

Fig. 3. Intraoperative finding showing the cyst which is an-
terior to the L5 root, tightly adherent to posterior lon-
gitudinal ligament and located just caudally adjacent
to the L4/5 disc.

Fig. 4. Photograph of the gross specimen showing dark re-
ddish colored cystic mass with thick fibrous capsule (upper) and histologic specimen showing thick fib-
rinous tissue in the lesion wall and myxoid degeneration
inside the cyst (lower).
owing isointense T1 and a hyperintense T2 pattern. But the signal intensity pattern on MRI can be variable according to the variable composition of the cysts. In our series, authors were suspicious about the lesion to be sequestered disc on plain CT scan in two cases. But MRI revealed cystic mass lesion posterolateral to the vertebral body. So MRI appears to be the most reliable diagnostic examination for this lesion.

There are several theories about the pathogenesis of the cyst in the previous literatures. But the exact pathogenesis is still unclear. Theories include 1) extrusion of synovial fluid from a defect in the joint capsule, 2) myxoid degeneration of cyst formation in collagenous connective tissue, 3) increased production of hyaluronic acid by fibroblasts, and 4) nonspecific proliferation of mesenchymal cells. And abnormal and increased motion also appear to have some role in many ganglion and synovial cyst by far the most common vertebral area for ganglion and synovial cyst is lumbar and more specifically between L4/5, which is associated with the greatest range of movement in the lumbar region.

On reviewing our cases, authors could find one interesting finding on MRI. All the cysts were located posterolateral to vertebral body and just caudally located to the disc space. And the discs adjacent to the cysts also showed degenerative bulging. The direction of the cyst were left side in 4 cases and right in 1 case. There were associated disc degeneration in all cases and disc bulging in 4 cases. And there was an interesting finding that direction of the cysts were coincided with direction of disc bulging in 4 cases. From these characteristic findings on MRI, authors speculated that these findings strongly suggest ganglion cyst which developed from posterior longitudinal ligament are closely related with disc degeneration. And it is supposed that disc degeneration may play an important role in the formation of the cysts or disc degeneration may be the precursor to the cystic degeneration of posterior longitudinal ligament of the lumbar spine even though all the disc degeneration is not the precursor of the cyst. And these explanations that disc injury is associated with cyst formation were mentioned by Baba, but he did not draw conclusion about this pathogenetic mechanism of ganglion cyst of posterior longitudinal ligament.

The differential diagnosis of synovial cyst includes a herniated nucleus pulposus, especially a free sequestered disc fragment. Neurofibroma, hematoma, meningioma, abscess, lipoma, perineural and arachnoid cyst also may be included in the differential diagnosis. Perineural and arachnoid cyst may be distinguished from ganglion cyst with myelography in that there may be delayed filling of the cyst with contrast medium. Pathologically ganglion cyst consisted with fibrous tissue capsule and some myxoid degeneration in the cyst. And also hemosiderin, inflammatory cells, or macrophage may be seen in the histologic specimen. These findings were all compatible with our cases. But we could find cystic wall could be variable in thickness and fluid content was also variable from serous to mucinous in gross finding.

### Conclusion

Five cases of ganglion cyst which caused same symptoms and signs as those of lumbar disc herniations were excised successfully. MRI and operative findings suggested spinal ganglion cyst of posterior longitudinal ligament were closely associated with disc degeneration which imply disc degeneration or herniation may play an important role in the pathogenesis of ganglion cyst.

### References

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요추 후종인대에서 발생한 결절종

요추부 후종인대에서 발생한 결절종

노성우·임승철·이호규·강신광

= 국문 초록 =

요추부 후종인대에서 발생한 결절종 (sacrocaudal node)의 증상은 호흡곤란, 통증, 요통 등이 있으며, 대부분의 경우 MRI를 통해 확진할 수 있었다. 이들 중 5건에서는 자세한 병리학적 소견을 관찰할 수 있었다. 결절종은 주로 요추 부위후군 (sacrocaudal node)의 병리학적 소견을 보이며, MRI를 통해 확진할 수 있었다. 이들 5건에서는 자세한 병리학적 소견을 관찰할 수 있었다. 결절종은 주로 요추 부위후군의 병리학적 소견을 보이며, MRI를 통해 확진할 수 있었다.