Ligamentum Flavum Hematoma in the Lumbar Spine
—Case Report—

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Abstract
A 62-year-old male presented with low back pain and gait difficulty beginning 1 month before consulting our institute. He had no history of lumbar spine surgery or lumbar puncture. However, he might have suffered forgotten back injury while practicing martial arts. Magnetic resonance imaging showed a heterogeneous intensity mass lesion with a cystic component at the L3–4 levels. The lesion was totally removed through a hemilaminectomy. Intraoperative and histological findings confirmed the diagnosis of old hematoma with granulomatous change in the ligamentum flavum. Postoperatively, his low back pain and gait difficulty resolved within a few days.

Key words: hematoma, ligamentum flavum, lumbar spine

Introduction
Ligamentum flavum hematoma (LFH) is very rare in the lumbar spine, with only previously reported six cases.1,3–6) The clinical characteristics of LFH are quite different from those of spontaneous spinal epidural hematoma: spontaneous spinal epidural hematoma becomes symptomatic in the acute stage, whereas LFH takes a subacute or chronic course.5) Surgical removal of LFH provides excellent results.3,6) However, the exact mechanism of LFH has not been clarified. Here, we describe a case of LFH and discuss the clinical features, the mechanism of LFH, and magnetic resonance (MR) imaging findings.

Case Report
A 62-year-old male presented with low back pain and gait difficulty in September 2003. He consulted our hospital 1 month after the onset. There was no history of significant antecedent trauma, lumbar surgery, anti-platelet/coagulation therapy, or lumbar puncture. Laboratory data excluded any bleeding tendency. However, he had practiced martial arts as an amateur, so he might have experienced a forgotten minor back injury in practice or training.

Physical examination showed tenderness in the paraspinal region at the level of the middle lumbar spine. Although he complained of weakness in his right lower limb, the muscle strength test was normal. Neurological examination found no other abnormality. MR imaging showed hypertrophy of a facet and the ligamentum flavum, and a mass lesion at the L3–4 levels (Fig. 1A). These hypertrophic changes were considered to be degenerative. The lesion appeared as an area of heterogeneous signal intensity on both T1-weighted and T2-weighted images. The margin of the lesion appeared as hypointense, and the central part as hyperintense on T2-weighted images (Fig. 1B, C). The former part was considered to be the solid component, and the latter part was regarded as the cystic component. The solid component was depicted as slightly hyperintense compared to the spinal cord, whereas the cystic component was hyperintense compared to...
Fig. 1 A: Preoperative sagittal T2-weighted magnetic resonance (MR) image showing a mass in the dorsal side of the spinal canal at L3–4 levels. B: Axial T1-weighted MR image showing a mass lesion (arrows), with heterogeneous signal intensity, in the spinal canal. C: Axial T2-weighted MR image showing the margin of the lesion (arrow) as hypointense, considered to be the solid component, and the right side of the lesion (asterisk) as hyperintense, thought to be cystic. D: Axial T1-weighted MR image with gadolinium-diethylenetriaminepenta-acetic acid showing moderate enhancement of the solid part of the lesion. E: MR myelogram clearly revealing a mass lesion (arrowheads) compressing the cauda equina.

Fig. 2 Photographs of the intraoperative findings. A: After partial removal of the laminae at L3–4 levels, the ligamentum flavum with granulomatous change (asterisks) was exposed. B: The cystic component was punctured and aspirated. Old hematoma could be seen through the transparent lumen of the catheter (arrows).

the cerebrospinal fluid on T1-weighted images. The solid part was moderately enhanced after administration of gadolinium-diethylenetriaminepenta-acetic acid (Gd-DTPA) (Fig. 1D). MR myelography, heavily T2-weighted fast spine-echo imaging with fat suppression, clearly revealed a hyperintense mass compressing the cauda equina (Fig. 1E).

He had continuous low back pain and subjective gait difficulty, so surgical treatment was indicated. Surgical removal was performed through a left
hemilaminectomy at the L3–4 levels. After partial removal of the laminae, the ligamentum flavum with granulomatous change was exposed (Fig. 2A). Piecemeal removal of the granulomatous lesion exposed the cystic component. Puncture of the cyst allowed easy aspiration of the brownish fluid, suggesting old hematoma (Fig. 2B). The bottom of the lesion had moderately adhered to the dura mater, but was dissected and removed completely without causing a dural tear.

Histological examination of the specimen verified degenerative collagen tissue with infiltration of lymphocytes in the elastic fiber. Combined with the intraoperative findings, the final diagnosis was old hematoma in the ligamentum flavum with granulomatous change (Fig. 3).

The patient’s postoperative course was uneventful. His low back pain and gait difficulty resolved completely within a few days after the operation. MR imaging obtained 7 days after the operation confirmed total removal of the lesion and effective decompression of the dural sac (Fig. 4). The patient was discharged without neurological deficit.

Discussion

The seven reported cases of LFH, including the present case, are described in Table 1.1,3–6) The most distinctive characteristic is that all patients were male. The patients were aged from 30 to 67 years (mean 54.1 years). All patients except ours had a history of back injury or an episode of triggering the disease. Although no distinctive episode was clear in our case, the patient might have suffered repeated minor back injury during martial arts training, and such a forgotten back injury might have been the trigger causing LFH. After the injury or trigger, LFH takes several weeks or months to become symptomatic.

All hematomas were found in the middle or lower lumbar spine, and the neurological symptoms were quite amenable to surgical treatment. Preoperative MR imaging in our case suggested that the lesion had arisen to the left of the ligamentum flavum, and that the cyst had extended contralaterally. Although bilateral laminectomies were performed in some cases, our case of LFH was removed easily via a left hemilaminectomy.4–6) If the preoperative imaging study can identify the origin of the hematoma or localization, a unilateral approach might be sufficient for surgical removal and decompression.

In our case, preoperative MR imaging showed hypertrophy of the facet and the ligamentum flavum. Intraoperative findings confirmed granulomatous tissue and old hematoma within the hypertrophic ligamentum flavum. Histological examination of the lesion revealed degeneration and
Table 1 Summary of reported and present cases of ligamentum flavum hematoma

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Author (Year)</th>
<th>Age (years)/Sex</th>
<th>Estimated cause or trigger</th>
<th>Interval before admission</th>
<th>Level</th>
<th>Treatment</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sweasey et al. (1992)</td>
<td>43/M</td>
<td>minor back injury</td>
<td>2 mos</td>
<td>L4–5</td>
<td>surgery</td>
<td>good</td>
</tr>
<tr>
<td>2</td>
<td>60/M</td>
<td>acute leg pain during work</td>
<td>more than 3 wks</td>
<td>L2–3</td>
<td>surgery</td>
<td>good</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cruz-Conde et al. (1995)</td>
<td>67/M</td>
<td>physical exertion</td>
<td>not mentioned</td>
<td>L4–5</td>
<td>surgery</td>
<td>good</td>
</tr>
<tr>
<td>4</td>
<td>Mahallati et al. (1999)</td>
<td>30/M</td>
<td>acute low back pain during housework</td>
<td>5 mos</td>
<td>L3–4</td>
<td>surgery</td>
<td>good</td>
</tr>
<tr>
<td>5</td>
<td>Yuceer et al. (2000)</td>
<td>67/M</td>
<td>acute low back pain during housework</td>
<td>6 wks</td>
<td>L2–3</td>
<td>surgery</td>
<td>good</td>
</tr>
<tr>
<td>6</td>
<td>Hirakawa et al. (2000)</td>
<td>50/M</td>
<td>fall from a height</td>
<td>7 mos</td>
<td>L4–5</td>
<td>surgery</td>
<td>good</td>
</tr>
<tr>
<td>7</td>
<td>Present case</td>
<td>62/M</td>
<td>minor back injury, suspected</td>
<td>unknown</td>
<td>L3–4</td>
<td>surgery</td>
<td>good</td>
</tr>
</tbody>
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granulomatous change of the ligamentum flavum. As suggested previously, the mechanism of LFH may depend on the following characteristics. Minor back injury or mechanical stress in the lumbar spine, such as that caused by housework or exercise, might cause a tear in the degenerative ligamentum flavum. The ligamentum flavum has poor vascularity, so bleeding is subtle and the inflammatory reaction progresses gradually. In the middle or lower lumbar spine, the main content in the dural sac is the cauda equina. At these levels, tolerance to a compressing mass is much higher than at other levels of the spine where the spinal cord is located in the theca. Therefore, gradual formation of hematoma or granuloma in the lumbar spine takes weeks or months to become symptomatic.

LFH may arise from minor back injury or mechanical stress in daily life, so why is LFH so rare? Occurrence of a tear or bleeding in the ligamentum flavum might not be so rare. However, due to the poor vascularity in the ligament, most hemorrhages probably cease before forming a hematoma. If a hematoma is formed, it might be absorbed spontaneously. Such possibilities can partially explain the rare occurrence of LFH. The decisive factor allowing certain small injuries in the ligament to become symptomatic hematomas remains unclear.

In our case, MR imaging depicted the solid part of the lesion as slightly hyperintense compared to the spinal cord on T1-weighted images, and hypointense on T2-weighted images. This solid part was moderately enhanced after Gd-DTPA administration. These MR imaging findings seem to be consistent with those of granuloma. The content of the cyst was hyperintense on both T1- and T2-weighted images. Hyperintensity in intracerebral hematomas on both T1- and T2-weighted images indicates free methemoglobin outside the red blood cells. In our case, the hyperintensity of the cyst seemed to represent resolving hematoma, as in intracerebral hematomas. MR myelography clearly showed a cystic mass lesion compressing the cauda equina. This modality may be useful for preoperative evaluation. Gd-DTPA administration enhanced the solid part of the lesion. MR imaging with Gd enhancement was described in two previous cases. The lesion was well enhanced after Gd-DTPA administration in one case, but no significant enhancement was obtained in another. In the former case, MR imaging was performed 7 months after the back trauma. In the latter case, LFH became symptomatic 6 weeks after the causative event. The appearance of enhancement by Gd-DTPA seems to reflect the process of granuloma formation in the LFH.

MR imaging is the best modality for the diagnosis of LFH. LFH is a rare entity, but should be taken into consideration as a delayed complication of back injury or acute low back pain, especially in middle-aged male patients.

References

4) Mahallati H, Wallace CJ, Hunter KM, Bilbao JM, Clark


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