Ligamentum Flavum Hematoma in the Lumbar Spine

—Case Report—

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Abstract

A previously healthy 45-year-old woman presented with ligamentum flavum hematoma manifesting as radicular leg pain. Neurological examination findings were consistent with L-5 root compression. An old hematoma inside the degenerated ligamentum flavum was drained. The cyst showed no connection to the facet joint. Complete resection of the mass was performed, resulting in excellent pain relief. The most common cystic lesion in the lumbar spine is synovial cyst associated with the facet joints, but ligamentum flavum hematoma should be included in the differential diagnosis. The preoperative diagnosis can be based on computed tomography and magnetic resonance imaging findings of degenerative thickening of the ligamentum flavum associated with a fluid component.

Key words: ligamentum flavum, hematoma, cyst, disc herniation, lumbar spine

Introduction

Lumbar radiculopathy may be caused by a soft tissue mass, most commonly herniated intervertebral disc. Cysts in the epidural space, though less common, can manifest as symptoms similar to those caused by disc herniation. Epidural cysts are usually synovial cysts or ganglion cysts associated with the facet joints.^{5,8,9)} Ligamentum flavum hematoma is an extremely rare cause of nerve root compression. We treated a 45-year-old woman with a ligamentum flavum hematoma compressing the nerve root at the left L4-5.

Case Report

A 45-year-old woman experienced severe shooting pain from the left gluteus muscle to the posterolateral region of the left thigh when she lifted a dinner table. She underwent conservative therapy prescribed by a local physician for 3 months, but her symptom did not improve. On admission, neurological examination found 4/5 strength in the left tibialis anterior and the left extensor hallucis longus muscles, and hypesthesia in the left L-5 and S-1 sensory distributions. Deep tendon reflexes in the

Fig. 1 Lateral radiographs in flexion-extension revealing no significant instability.

lower extremities, and bladder and bowel function were normal. The straight leg-raising test was positive at 45 degrees on the left. Lateral radiography in flexion-extension showed no significant instability (Fig. 1). Computed tomography (CT) revealed a unilateral hypertrophic ligamentum flavum containing a round, slightly low-density mass near the juxtaarticular region (Fig. 2A). T₁-weighted magnetic resonance (MR) imaging revealed an isointense lesion associated with a diffusely thickened ligamentum flavum at L4-5 on the left, and

Fig. 2 (A) Computed tomography scan revealing fluid collection (arrowhead) associated with bulging of the ligamentum flavum (arrow) at the juxtaarticular portion. (B) T₁-weighted magnetic resonance (MR) image revealing an isointense mass associated with a hypertrophic ligamentum flavum (arrow) occupying the posterolateral portion of the spinal canal at L4-5. (C) T₂-weighted MR image showing a well-demarcated hyperintense lesion. (D) T₁-weighted MR image with gadolinium-diethylenetriaminepenta-acetic acid showing peripheral enhancement of the mass.

T₂-weighted MR imaging revealed a hyperintense lesion (Fig. 2B, C). The peripheral portion of the mass was well enhanced after intravenous administration of gadolinium-diethylenetriaminepenta-acetic acid (Gd-DTPA) (Fig. 2D).

The patient underwent surgery for decompression of the spinal canal and resection of the lesion. After L4-5 partial laminectomy, the thickened ligamentum flavum was incised. The ligamentum flavum had partially adhered to the dural theca, and contained a dark brownish fluid which was aspirated. The remaining thickened ligamentum flavum was removed. There was no calcification or ossification of the ligamentum flavum. After resection of the mass, the L-5 nerve root became mobile. As the facet joint remained intact, no fixation was added. The operative findings were consistent with ligamentum flavum hematoma compression of the L-5 nerve root.

Histological examination showed degeneration of the ligamentous fibers with hyalinoid changes.

Fig. 3 Photomicrographs of the surgical specimen showing thickening and degeneration of the collagenous fibers and hyalinoid changes of the ligamentum flavum (A: hematoxylin-eosin stain, original magnification $\times 25$) and proliferation of small vessels (B: hematoxylin-eosin stain, original magnification $\times 30$).

Proliferation of small vessels was seen in the degenerated ligamentum flavum, but no vascular anomalies were observed (Fig. 3).

The patient's postoperative course was uneventful. Immediately after surgery, she became asymptomatic except for slight numbness in the left L-5 region. Follow-up examination 12 months later found she was neurologically intact and symptom-free (Fig. 4).

Discussion

Ligamentum flavum hematoma is very rare, with only six reported cases (Table 1).^{2,3,7,10,12} All patients were men aged from the 40s to the 70s. Our patient is the first female patient, and her age was in the 40s. All patients had a history of minor trauma, and the ligamentum flavum hematoma was located in the

lumbar spinal canal. All patients experienced acute onset of shooting leg pain after minor trauma. The pathogenesis of ligamentum flavum hematoma is considered to originate from minor trauma such as flexion or extension motion, physical exercises, or heavy lifting involving the back. Transmission of increased intra-abdominal pressure after minor trauma to the very small, thin-walled blood vessels in the degenerated ligamentum flavum might lead to rupture of these vessels.⁷⁾ Disruption of the vessels in the degenerated ligamentum flavum may occur due to excessive stretching force on the back.¹⁰⁾ In the present case, we speculate that rupture of the

Fig. 4 Postoperative T₂-weighted magnetic resonance image showing good decompression of the L-5 root with total removal of the ligamentum flavum hematoma.

proliferated small vessels in the degenerated and hypertrophic ligamentum flavum occurred after lifting a dinner table, causing acute leg pain by entrapping the L-5 root with an old hematoma in the ligament which remained unabsorbed and thus produced the persistent symptoms.

The differential diagnosis of ligamentum flavum hematoma includes synovial cyst, ganglion cyst, and other cystic lesions.^{1,4,6,11)} MR imaging typically shows a well-circumscribed extradural cystic lesion as isointense or slightly hypointense with peripheral enhancement after administration of Gd-DTPA on T₁-weighted images, and hyperintense on T₂-weighted images. Synovial cysts, ganglion cysts, and ligamentum flavum cysts typically occur in the posterolateral spinal canal or lateral recess, so differentiation is difficult based on only the shape or intensity of the cysts on preoperative neuroimaging.⁸⁾ CT and MR imaging in our case showed that thickening of the ligamentum flavum associated with a fluid component is suggestive of ligamentum flavum hematoma. Hypertrophic and hyalinoid changes of the ligamentous tissue contain proliferations of small vessels as part of the degenerative processes. These small vessels may be the origin of hemorrhage under high abdominal pressure, as in the present case.^{7,10)} Therefore, we emphasize that degenerative thickening of the ligamentum flavum associated with a fluid component on CT or MR imaging is indicative of ligamentum flavum hematoma.

Ligamentum flavum hematoma is typically treated surgically with partial laminectomy, excision of the degenerated ligamentum flavum, and removal of the hematoma. Resection of the hematoma and the ligamentum flavum, and posterior fixation has been performed.^{2,3)} However, we suggest that microsurgical laminectomy and medical facetectomy provide an adequate operating view to remove ligamentum flavum hematoma, making additional fixation unnecessary. Since ligamentum flavum hematoma has

Table 1 Cases of ligamentum flavum hematoma

Author (Year)	Age (yr), Sex	Level	Etiology	Treatment	Outcome
Sweasey et al. (1992) ¹⁰⁾	43, M	L4-5	minor back injury	total resection	excellent
	60, M	L2-3	stepped up onto box	total resection	excellent
Cruz-Conde et al. (1995) ²⁾	67, M	L4-5	physical exertion	total resection with fixation	excellent
Minamide et al. (1999) ⁷⁾	76, M	L3-4	stood upon a train seat	total resection	excellent
Yuceer et al. (2000) ¹²⁾	67, M	L2-3	repaired a car	total resection	excellent
Hirakawa et al. (2000) ³⁾	50, M	L4-5	fell down from 1.5 m height	total resection with fixation	excellent
Present case	45, F	L4-5	lifted a table	total resection	excellent

no attachment to the facet joints, the stability of the lumbar spine can be regarded as intact. After internal decompression to evacuate the hematoma, the ligamentum flavum collapses and separation of the dural theca is easy. Surgery resulted in excellent outcomes in all patients.

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