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## Case Report

# MR Imaging of a Hemorrhagic and Granulomatous Cyst of the Ligamentum Flavum with Pathologic Correlation

Houman Mahallati, Carla J. Wallace, K. Michael Hunter, Juan M. Bilbao, and Arthur W. Clark

**Summary:** Cysts of the ligamentum flavum are uncommon causes of neurologic signs and symptoms and usually are seen in persons over 50 years of age. We report a case of an epidural cyst located in the ligamentum flavum, which contributed to spinal stenosis in a 30-year-old man. Radiologic features were similar to those of a synovial cyst, but synovium was not identified histologically. The imaging and pathologic features were unusual, including hemorrhage and a fibrohistiocytic reaction with giant cells.

The most common soft-tissue mass causing lumbar radiculopathy is a herniated intervertebral disk. Cysts in the epidural space, though less common, often present with symptoms similar to those caused by disk herniations. Most of the epidural cysts reported in the literature are synovial or ganglion cysts related to the facet joints (1). Far less common are cysts of the ligamentum flavum. We report a case of a cyst of the ligamentum flavum with imaging and pathologic evidence of hemorrhage and giant cell response associated with the cyst.

## Case Report

A 30-year-old man presented in October 1995 with a 5-month history of pain in the lumbar area, buttock, and right leg. The previous July, while cleaning a bathtub, he had made a twist, felt a snap in his back, and experienced acute onset of back pain. Subsequently, he noted right buttock and leg pain, and numbness in the right anterior thigh and dorsum of the foot involving portions of the L3, L4, and L5 dermatomes. The pain did not improve substantially with conservative therapy. The symptoms were all aggravated by standing, walking, and lumbar flexion, and were relieved by lying down. Findings at clinical examination were normal except for limited lumbar flexion.

MR imaging at the L3–L4 level showed a round, T2 hyperintense mass in the posterior aspect of the spinal canal displacing the dural sac anteriorly and resulting in moderate stenosis of the spinal canal, along with advanced osteophyte

formation involving both facet joints (Fig 1A–C). Signal within the lesion on T1-weighted images was suggestive of intralesion hemorrhage. The lesion was believed to represent a synovial cyst. There was also disk degenerative change at the L4–L5 and L5–S1 levels, with less marked central stenosis at L4–L5, and a left paracentral disk herniation at the latter level causing mild central canal stenosis but no right-sided compression. Contrast-enhanced images were not obtained.

Because of the multilevel neurologic and imaging findings, bilateral laminectomies of L3, L4, and L5 were undertaken. The lesion was found to arise from the dorsal ligamentum flavum near the midline and was excised in toto with its ligamentous attachment intact. The patient's postoperative course was uneventful, with complete resolution of symptoms.

The material submitted for pathologic analysis was a dark brown, moderately firm piece of tissue measuring 2.0 cm × 0.8 cm × 0.7 cm. Histologic examination revealed a connective tissue structure with a central zone of debris surrounded by a histiocytic reaction, including giant cells (Fig 1D). Hemosiderin pigment was found at the periphery of the central zone of debris. In a still more peripheral zone, there was a large component of elastic fibers (normally abundant in the ligamentum flavum) undergoing dissolution at multiple sites, often in association with a granulomatous reaction, again including giant cells (Fig 1E). An occasional giant cell contained fragments of elastic fibers, and, rarely, a deposit of Congo red-positive material consistent with amyloid, could be identified at the same site (Fig 1F). These deposits had an intense red-green birefringence under polarized light, which together with the Congo red staining is pathognomonic of amyloid. All stains for acid-fast bacilli, fungi, and other organisms were negative. The changes were interpreted as hemorrhagic and degenerative, with the cellular reaction probably secondary, presumably in response to the degenerating elastic fibers and other connective tissue elements, a phenomenon also seen in giant cell arteritis.

## Discussion

Cysts in the spinal canal can impinge upon and displace neural structures and can lead to neurologic symptoms. These symptoms can mimic those caused by herniation of intervertebral disks (2–5). The nomenclature of cysts in the spinal canal is somewhat unclear in the literature. Some authors refer to cysts that communicate with facet joints and contain synovium in their lining as synovial cysts, whereas cysts that are composed of myxoid material but do not have synovial lining or a connection to the joint are referred to as ganglion cysts (6, 7). In our case, we found no microscopic evidence of synovium, supporting the conclusion that the lesion in this case was not a synovial cyst. Instead, the cystic changes in this lesion support a relationship to ganglion cyst, although the cellular reaction is distinctive.

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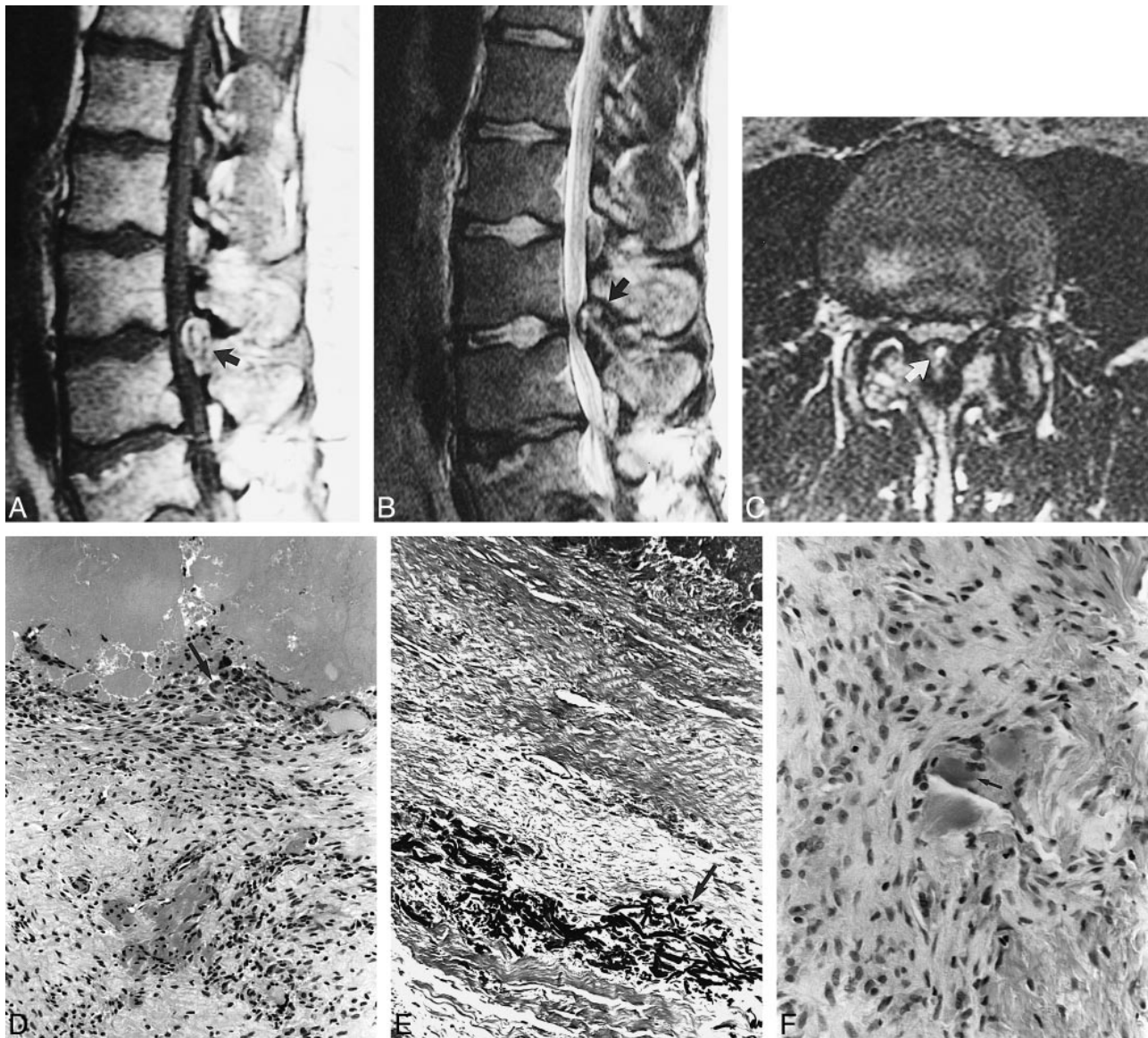


FIG 1. 30-year-old man with 5-month history of pain in the lumbar area, buttock, and right leg.

A–C, Sagittal T1-weighted (500/10/3 [TR/TE/excitations]) (A) and T2-weighted (4200/100/3) (B) MR images through the L3–L4 level (C) show an ovoid lesion in the mid-posterior spinal canal at L3–L4 (arrow) causing moderate central spinal stenosis. Lesion is largely hyperintense on T1- and T2-weighted images and has a hypointense rim on T2-weighted sequences. There is bilateral facet joint degenerative change at this level but the lesion is not contiguous with the facet joint. A developmentally small spinal canal and disk degenerative change at L4–L5 and L5–S1 are also noted. (The disk herniation was left paracentral on axial images through L5–S1 [not shown]).

D–F, Histopathologic sections.

D, Degenerative debris at top is surrounded by a cellular reaction including giant cells (arrow) (hematoxylin-eosin, original magnification  $\times 190$ ).

E, Disrupted elastic tissue (arrow) of the ligamentum flavum is seen in one of the zones peripheral to the hemorrhagic debris. Although from a different microscopic field, the orientation is similar to that in D, with the hemorrhagic debris in the upper portion of the photo (elastic trichrome, original magnification  $\times 190$ ).

F, Amyloid is seen within a giant cell (arrow). An adjacent section stained for elastic tissue showed fragments of elastica within a giant cell at this site, suggesting intracellular co-localization of amyloid and elastica fragments in some giant cells (Congo red, original magnification  $\times 380$ ).

The ligamenta flava are found in pairs, one on each side, connecting the spinal laminae, and forming part of the posterior wall of the vertebral canal. Laterally, these ligaments fuse with the articular capsules and form one boundary of the intervertebral foramina. Cysts of the ligamentum flavum are

rare. They are different from synovial and ganglion cysts in that they arise from, or are partially embedded in, the ligamentum flavum rather than being closely related to the facet joint. They may be simple ganglion cysts, but at times may have more complex pathologic features, as in this case, and



cannot all be described by a single pathologic term. Thus, in this discussion, they are described simply by their anatomic location.

Epithelioid histiocytes and giant cells were conspicuous in this case and warrant the descriptive term granulomatous. The remarkable histiocytic and giant cell reaction presumably represents an idiosyncratic response to the degenerative changes. Despite the rarity of reports in the literature, histiocytic and giant cell reactions to degenerative changes in disks and ligaments are seen occasionally in diagnostic pathology practice (B. Curry, personal communication; personal observations).

Although it may be difficult to distinguish between ligamentum flavum cysts and synovial cysts on imaging studies, such a differentiation may be helpful to the surgeon, as the former are easier to resect. They are removed by standard laminectomy procedures with en bloc resection of lamina and ligamentum flavum along with the cyst and do not require exploration of the facet joint.

A well-defined, round, T2 hyperintense extraaxial lesion in the posterior or lateral spinal canal has a broad differential diagnosis, including synovial cyst, ganglion cyst, herniated disk, infectious (eg, cysticercosis or hydatid) cyst, arachnoid cyst (rare in the lumbar spine), and neoplasm (cystic degeneration in a neurofibroma or schwannoma), or possibly a cystic bone lesion (3). Although herniated disks can migrate to a posterolateral position, they are far more common in the anterior half of the spinal canal. Ganglion cysts and synovial cysts are usually found in the posterolateral spinal canal or lateral recess and are adjacent to the facet joint (8); they generally originate posteriorly.

Pathologically, both synovial cysts and ligamentum flavum cysts can contain hemorrhage (1, 3, 8), but we have found only one reference to hemorrhage in a synovial cyst at MR imaging (4) and no reference to blood products in ligamentum flavum cysts on imaging studies. Hemorrhage helps to exclude disk fragments and most neoplasms, but does not differentiate synovial from ligamentum flavum cysts; however, synovial cysts remain clearly outside the ligamentum flavum and are typically attached to the facet joint, whereas ligamentum flavum cysts are attached to or located within the ligament. Evidence of attachment to the facet joint or the ligament may be helpful in distinguishing between these two lesions.

The histologic findings in the present case suggest that chronic degenerative changes in the ligamentum flavum were followed by hemorrhage, which may have occurred in July at the acute onset of back pain. Pathologically, hematoma within the ligamentum flavum is rare, but has been reported in at least three cases (9, 10). Antecedent degenerative changes in the ligament probably create the conditions necessary for hematoma formation, because the normal ligamentum flavum is highly resistant to injury (10).

To our knowledge, there is only one previous report of a ligamentum flavum lesion with a giant cell response (11). The histologic findings in the present case were compared with that granuloma, and differed in several ways. The present case appeared to be subacute, with obvious evidence of resolving hemorrhage, whereas the previously reported lesion was more chronic, with prominent palisading features to the granuloma, and no evidence of hemorrhage.

The amyloid deposits in the present case are unusual, but such deposits have been found, often associated with degenerating elastic fibers, in about 10% of ligamentum flavum specimens from surgery in older patients with herniated disks or spinal stenosis (12), and do not indicate that the patient has amyloidosis. In our case, the amyloid may have been a reflection of the vigorous chronic inflammatory process elicited by the lesion, possibly from a component of the degenerating elastic fibers.

## Conclusion

Evidence from the present case and previous reports suggests that degenerative changes in the lumbar ligamenta flava can be followed by hemorrhagic, granulomatous, or cystic change. These pathologic processes must be considered in the differential diagnosis of posterolateral spinal canal lesions, even in relatively young adults. MR evidence of hemorrhage within these lesions increases the likelihood of degenerative cysts. Preoperative recognition of the location may expedite the surgical approach.

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