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HEMATOMA OF LIGAMENTUM FLAVUM CAUSE TO DROP FOOT

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ABSTRACT

Ligamentum flavum hematoma is a very rare entity that can occur in any part of the spine. Etiology is still unclear while the minor trauma and ligamentum flavum degeneration are the potential suspects. Patients can present with either radiculopathy or myelopathy according to the location. MRI is the most important tool for the proper diagnosis. The differential diagnosis include juxtafacet cysts, disk herniation and spinal cord tumors. Treatment is usually surgical with favorable surgical outcomes. Ligamentum flavum hematoma should be kept in mind in the differential diagnosis of intraspinal cystic lesions that lead to neurological deficits.

Key words: Ligamentum flavum, hematoma, drop foot, intraspinal cyst

Level of evidence: Case report, Level IV

INTRODUCTION

Foot drop due to lumbar radiculopathy is commonly seen as a result of disk herniation, spondylosis, tumor and abscess formation [14-15,18]. Less frequent is ligamentum flavum pathologies including hypertrophy, calcification, buckling and cyst formation [2,17]. We report an extremely rare case of ligamentum flavum hematoma (LFH) that leads to foot drop.

CASE REPORT

History and Neurological Examination

A 55-year-old male patient was admitted to our neurosurgery department with the chief complaints of buttock pain and foot weakness on the right side. His right buttock pain that has been radiating to his right leg and foot had started nearly 2 months ago. And 2 days ago, he had noticed that he could not move his right foot towards himself. He has no history of any systemic illness, trauma or anticoagulant treatment. His neurological examination revealed paresis of the right foot and toe dorsiflexion (tibialis anterior muscle 2/5 and extansor halluces longus 1/5 strength on manual muscle testing) and hypoesthesia of right L4/L5 dermatomes. Deep tendon reflexes of the lower extremities were normal as well as bladder and bowel function. Straight leg raising test was negative.

Imaging

Lumbar MRI demonstrated an ovoid mass lesion that 25 was compressing the right L5 root. The lesion was hypointense on T1 weighted images and hyperintense on T2 weighted images. Minimal enhancement was noted after contrast injection.

Operation

Patient underwent decompression surgery under general anesthesia. A 3-4 cm long median skin incision was made on the level L4-5. After the right fascia was dissected, muscles were retracted by the help of a Casper retractor. Under the operating microscope, the inferior half of the L4 lamina was removed by preserving facet joint. Any cyst was not observed related with the facet joint. The ligamentum flavum was identified as a thick, solid, brownish mass that was firmly adherent to the thecal sac. It was removed completely following the releasing of adhesions from thecal sac microsurgically. Satisfactory decompression of right L5 root was obtained. Any disk herniation or tumor mass was not found. Posterior

instrumentation was not necessary since the facet joint remained intact.

Pathological Findings

Histopathological examination showed presence of fresh hemorrhage affecting the ligamentous and synovial connective tissue.

Postoperative Course

The patient had immediate pain relief early after surgery. Neurological examination demonstrated normal strength at anterior tibial and 4/5 muscle strength at extensor hallucis longus muscles at 1 month follow-up.

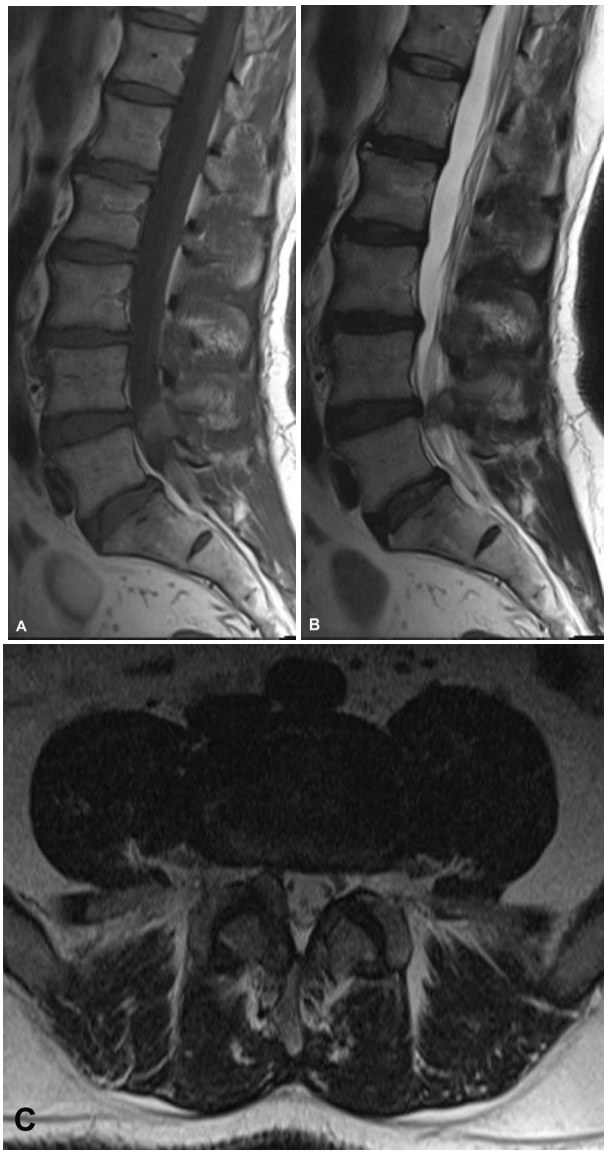

Figure 1. Posterior epidural mass lesion is seen that is hypointense on **(a)** sagittal T1-weighted MR image and heterogenous on **(b)** sagittal T2-weighted MR image. This mass lesion exerts significant compression to right L5 root **(c)** Axial T2-weighted MR image.

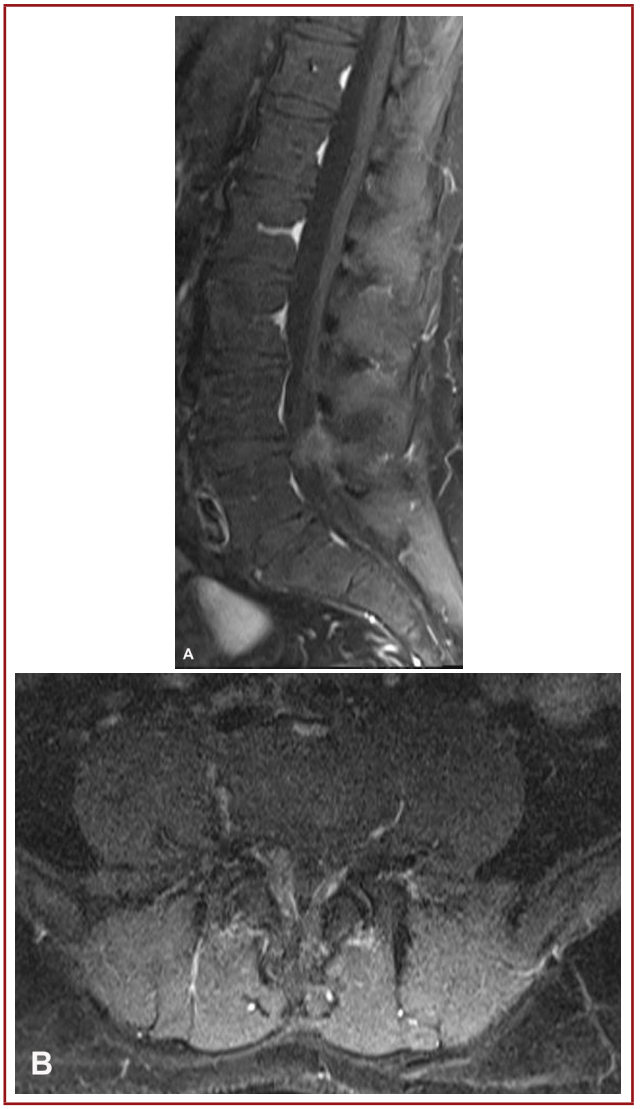

Figure 2. T1-weighted **(a)** Sagittal and **(b)** axial images show weak enhancement after contrast injection.

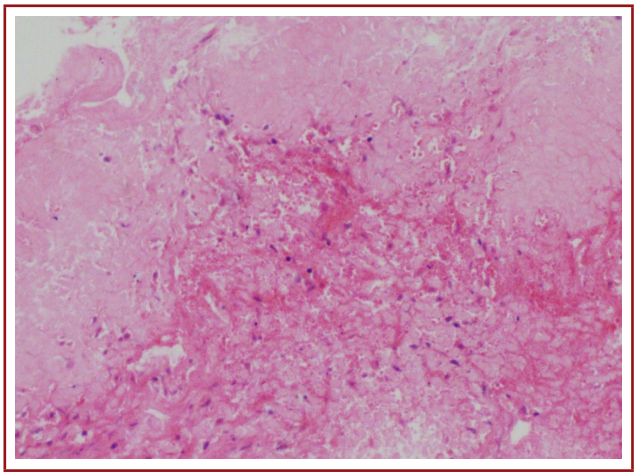

Figure 3. Histopathological examination demonstrate presence of erithrocytes in ligamentous connective tissue (Hematoxylin and Eosin x200).

DISCUSSION

Ligamentum flavum (LF) is a discontinuous structure starting from C2 vertebra to sacrum [4,14]. It extends from the middle portion of the superior lamina to the cranial part of the inferior lamina. Laterally, it fuses with the facet joint capsule [11,14,17]. It helps to maintain an upright posture and resume an upright posture after bending [14,18]. LF is a well-defined elastic structure that includes elastic (80 %) and collagen (20 %) fibers and contains a few thin walled blood vessels in young healthy adults [14]. However, increased collagen consistency and more blood vessels are seen in the degenerative LF [14].

Ligamentum flavum hematoma (LFH) is an extremely rare entity that was reported first by Sweasey et al in 1992.14 Since then, there are various publications reporting LFH in the cervical, thoracic and lumbar regions of the spine [1,3,5-9,13-14,18]. Analysis of previous case reports demonstrated that LFH has some significant properties as follows; the lumbar region especially lower segments are the most affected part of the spine. Most patients are middle aged or elderly males with the history of hypertension. Trivial trauma precedes the onset of symptoms [4,18]. Our patient is also a middle-aged man but no history of trauma or any systemic illness exists. Similar to the literature, L4-5 level is affected in our patient.

The exact mechanism of the hematoma development in ligamentum flavum is still unclear. However, some mechanisms have been proposed to explain. The most popular mechanism involves the rupture of the tiny and irregular blood vessels in the ligamentum flavum that occurs secondary to increased abdominal and spinal epidural pressure after a minor trauma even sneezing and straining [14-15,18]. The second suspected mechanism explains the hematoma formation by the blood flow from the facet joint to the degenerated ligamentum flavum forming hematoma inside [2,10].

Nishida et al blamed the synovial hyperplasia with an increased number of capillary vessels at the facet joint capsule as the source of hematoma [11]. However, confusion was present about how the blood goes from the facet joint to the degenerated LF until the study of Wilby et al [17]. In their clinicopathologic study, they demonstrated bursa-like channels originating from the medial aspect of facet joints, where the joint capsule is a part of the ligamentum flavum, and extended within the ligamentum flavum in variable lengths [17]. Thus, the pathophysiology of the synovial cysts on the ligamentum flavum and the LFH has been better understood.

Magnetic resonance imaging (MRI) is the most important tool in order to diagnose LFH [7,14-15,18]. In some doubtful cases, CT scans could also be ordered as supplements to MRIs. The intensity of the lesion on MRIs can demonstrate some changes according to the deoxyhemoglobin or methemoglobin contents of the hematoma. In other words, stage of the hematoma is the main determinant on the intensity of the MRI [7,14-15,18]. In most LFH cases, mass lesions are hyperintense on T1 weighted MR images while heterogeneous intensity is seen on T2 weighted images. Peripheral enhancement can be observed after the administration of contrast material.

The differential diagnosis of LFH include juxtafacet cysts (synovial cyst, ganglion cyst, degenerative micro cysts and osteophyte impingement cysts), disk herniation and spinal cord tumors [17]. Since juxtafacet cysts all look like similar on imaging methods, it is not easy to differentiate this lesions based on only the morphology or contrast enhancement. Synovial cysts have an extensive synovial cell lining and they are either communicated directly with the facet joint or located in the ligamentum flavum far away from the facet joint but connected to it via bursa-like channel [17]. Ganglion cysts do not communicate with joints. They lack a special cellular lining and contain viscous fluid [17].

Although a herniated disk fragment can migrate to a posterior or posterolateral location in spinal canal, they are much more common in the anterior part. Furthermore, LFHs are incorrectly diagnosed as spinal cord tumors since LFH has a round shape on MRI. However, LFH is always attached to the ligamentum flavum and shows weak enhancement after contrast injection [15,17].

Treatment consists of both conservative and surgical methods. Patients who are experiencing severe pain in spite of narcotic analgesic therapy and patients withsignificant neurologic deficits are good candidates for surgical treatment [1,3,5,8,18].

Surgical techniques consists of both open and microsurgical techniques [1,3,5,8,16,18]. Furthermore, recent reports also indicated that endoscopic surgery could also be a reasonable alternative to classic methods [12]. If the LFH is located on the midline on MRI, total laminectomy can be performed to resection of LF. However, if the lesion is settled paracentral near the facet joint, fenestration under the operating microscope can be the best option in order to preserve facet joint and dissect the LF from the thecal sac without dural tear occur [16]. Surgical outcomes are almost excellent [1,4-5,7-9,14-16,18].

Literature search shows a few numbers of patients suffering from LFH in a wide spectrum of L5 radiculopathy from sciatica only to severe neurological deficits [3,5,7]. To the best of authors' knowledge, our report is the second case with a foot drop that developed secondary to LFH in the English literature. Different from the first report, our patient was diagnosed and operated via microsurgery just 2 days after the symptoms' onset. Thus, more favorable and faster outcome was achieved in terms of neurological deficits.

In conclusion, ligamentum flavum hematoma is a very rare entity. It can occur in any region of spine from axis to sacrum. It should be kept in mind in the differential diagnosis of intraspinal cystic lesions that lead to neurological deficits.

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