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## Compressive myelopathy due to *Ligamentum flavum* hypertrophy leading to spastic paraplegia: A care report

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### Abstract

*Ligamentum flavum* hypertrophy is a condition in which the *Ligamentum flavum* (LF) thickens causing spinal canal narrowing producing symptoms of spinal cord compression leading to compressive myelopathy. Clinically *Ligamentum flavum* hypertrophy can present as asymptomatic or low back pain, paresthesia, neurological claudication, paraparesis with or without autonomic and, bowel and bladder disturbances. Diagnosis is based primarily on imaging techniques such as CT scan and MRI scan. We chose to present this case of 46 yrs female having compressive myelopathy due to *Ligamentum flavum* hypertrophy at D9 to D12 level causing progressive spastic paraparesis without bowel and bladder involvement. Patient was managed with laminectomy and decompression done at D9 to D12 level with excellent functional outcome.

**Keywords:** Spinal canal stenosis, *Ligamentum flavum* hypertrophy, laminectomy, decompression, MRI

### Introduction

Spinal stenosis refers to the narrowing of the spinal canal anywhere along its axis. It is most common in the cervical and lumbar areas [1-3]. This condition can cause significant discomfort, interfere with activities of daily living, and may result in progressive disability [4, 5, 6]. With increasing longevity of humankind, degenerative diseases of the spine and its sequelae are bound to have an immense negative impact on the global front [1-2]. There are several causes of spinal stenosis causing compressive myelopathy one of which is *Ligamentum flavum* hypertrophy. Ligamentum flava (singular, *Ligamentum flavum*) are a series of ligaments that connect the ventral parts of laminae of adjacent vertebrae. Hypertrophy of *Ligamentum flavum* is thought to be mostly from fibrosis caused by the accumulation of mechanical stress with the aging process, especially along the dorsal aspect of the *Ligamentum flavum* [7]. Previous authors have suggested various hypotheses to explain the mechanism of LFH, although the incidence of LFH in spinal stenosis remains unknown [8, 9, 10].

### Case Report

46 year old female patient with no previous significant medical history or family history presented with low back pain which was insidious in onset and progressive in nature. Pain was dull aching in nature and radiating to bilateral lower limbs, no diurnal variation. Pain was associated with hypertonia and hypoaesthesia over bilateral lower limbs with difficulty in walking. Patient was unable to walk since last 15 days without support. Neurological examination showed normal motor strength, deep tendon reflexes and sensations in upper limb. A 2/5 motor strength in lower limb bilaterally with hypertonia, hyperreflexia with Babinski sign were present. Informed consent was taken from the patient regarding the case report related data collection and publication of accompanying images. Patient was explained in detail about the nature of her disease, treatment plan and prognosis. Patient was admitted in our institution and CT Dorsolumbar spine and MRI Dorsolumbar spine was done. MRI DL spine suggested the patient to have focal hypertrophy of *Ligamenta flava* causing central canal stenosis and cord compression at D9-D10, D10-D11, D11-D12 levels. She was posted for spinal canal decompression procedure.

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Intra operatively she was found to have *Ligamentum flavum* adherent to dura. She was operated by laminectomy and decompression at D9 to D12 levels. Patient was followed up monthly for next 3 months and then 3 monthly for next next 6 months. On follow up patient there was pain relief, neurological status improved, muscle power increased gradually and patient was able to walk without support in 3 month. Paresthesia and numbness also got relieved.

### Discussion

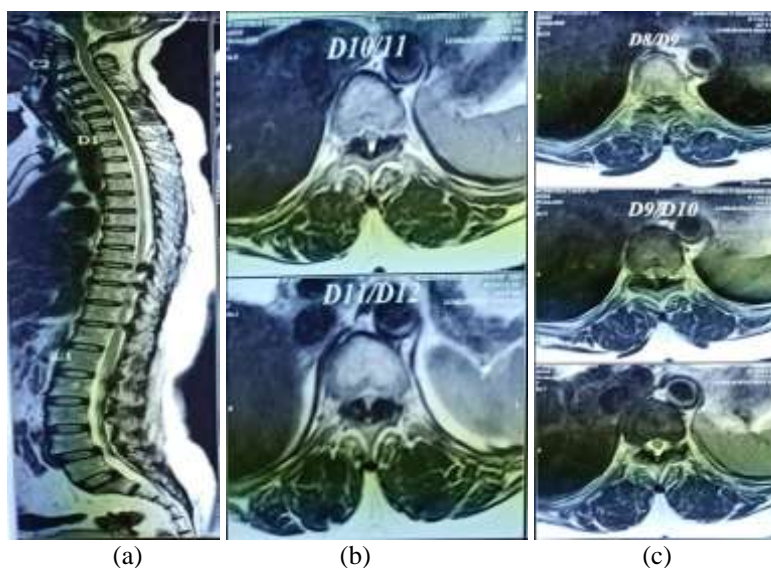
Joints between vertebrae are reinforced and supported by numerous ligaments; one of them is the *Ligamentum flavum* (LF). Ligamenta flava are attached to the front of the upper lamina above and to the back of the lower lamina below<sup>[11]</sup>. As connective tissue, they affect the intrinsic stability of the spine, control intervertebral movement, and maintain a smooth surface of the posterior dural sac<sup>[7]</sup>.

Degeneration of the *Ligamentum flavum* can cause increase in the size of the ligament leading to spinal canal stenosis and root pain<sup>[12]</sup>. Enlargement of the ligament may be generalized, although sometimes it is unilateral, and it probably results from two factors; injury and scar tissue.

Normal ligaments are composed entirely of yellow elastic fibers and grossly have considerable elasticity. It seems likely that at the time of the injury, whether minor or severe, rupture of some of the elastic fibers of the ligamenta flava occurs, allowing them some degree of expansion. Subsequently, as repair takes place, scar tissue is formed with further enlargement of the ligaments, resulting in compression of the nerve roots<sup>[13]</sup>. Due to the slow progression of the disease, the diagnosis may be significantly delayed. Given the potentially devastating effects of this condition, rapid diagnosis and treatment are essential for positive outcomes<sup>[14]</sup>.

MRI in the sagittal plane are important in demonstrating hypertrophy of the *Ligamentum flavum* and can provide accurate measurements of its thickness<sup>[15]</sup>. It has been suggested that *Ligamentum flavum* thickness is usually less than 4 mm in normal individuals<sup>[16, 17]</sup>.

This patient had focal hypertrophy of *Ligamentum flavum* causing central canal narrowing and significant spinal cord compression at D8/9, D9/10, D10/11 and D11/12 levels. The spinal cord shows diffuse hyper intense signals and atrophy favours changes of myelomalacia.



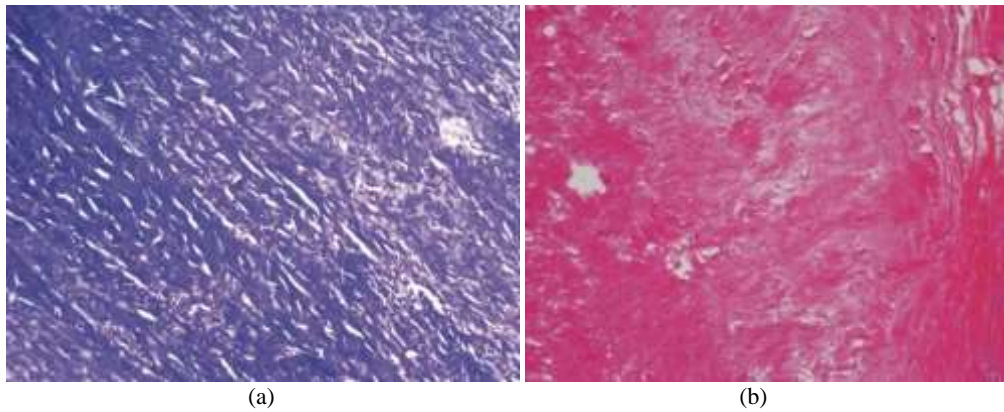
**Img 1:** [MRI images of dorsal spine showing dorsal cannal compression at D8-12]

As *Ligamentum flavum* hypertrophy in our patient was causing significant neurological deficit and patient was unable to walk without support, laminectomy and decompression was planned. She was operated under general anaesthesia in prone position with incision over back. Patient was advised extensive physiotherapy in post op period. There was gradual improvement in patients neurological status in post op period with returning of grade 5/5 power in bilateral lower limb. In 10 month follow up patient is able to walk without support,

stand on one leg, climb stairs without support.

### Histology

Histological analysis showed that the elastic fibre area decreased and collagen area increased in LF. The elastic fibers were fragmented, disorganized, and focally lost, accompanied by the proliferation of collagen fibers. Masson's trichrome staining showed a large area was stained blue, indicating the presence of massive fibrosis



**Img 2:** [histological images of dissected specimen of *Ligamentum flavum*]

### Conclusion

Surgery as a treatment of choice in *Ligamentum flavum* hypertrophy causing of canal stenosis at dorsal spine level

managed with laminectomy and decompression gives excellent neurological results.



**Img 3:** [Clinical photograph of the patient having grade V muscle power in both lower limbs]

**Consent** – Written informed consent was taken from the patient regarding the case report related data collection and publication of accompanying images.

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