Degenerative lumbar spinal stenosis

- Clinical evaluation and finite element analysis of bone cement-augmented anterolateral screw fixation versus percutaneous bilateral pedicle screw fixation co-applied with oblique lumbar interbody fusion for single-level lumbar degenerative diseases with osteoporosis
- Uniportal Full Endoscopic Posterolateral Transforaminal Lumbar Interbody Fusion
- Simultaneous two-level minimally invasive lumbar laminectomy performed with dual tubular retractor systems in a 93-year-old under spinal anesthesia: illustrative case
- Robot-assisted versus navigated spinal fusion surgery: a comparative multicenter study on transpedicular screw placement accuracy and patient outcomes
- Predicting intraoperative blood loss risk in severe lumbar disc herniation patients undergoing PLIF: a multicenter cohort study using ensemble learning
- The hidden asymmetry: facet joint tropism as a clue to spinal malalignment and muscle degeneration in adult spinal deformity
- Comparison of Biportal Endoscopic Technique and Conventional Unilateral Laminectomy for Bilateral Decompression (ULBD) for Multi-Level Degenerative Lumbar Spinal Stenosis in Elderly People
- A decade-long trends in ligamentum flavum hypertrophy among spinal stenosis patients: A comparative analysis of incidence and patterns

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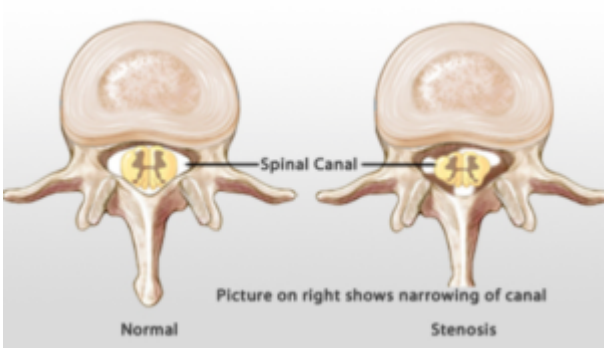
Degenerative lumbar spinal stenosis is the most frequent cause of low back pain and/or sciatica in the elderly patient.

The importance of the relationship between clinical presentation and imaging study, especially magnetic resonance imaging (MRI), is emphasized. Prior to treatment indication, it is necessary to identify the precise location of pain, as well as the differential diagnosis between neurological and vascular lameness. Conservative treatment combining medications with various physical therapy techniques solves the problem in most cases, while therapeutic testing with injections, whether epidural, foraminal or facetary, is performed when pain does not subside with conservative treatment and before surgery is indicated. Injections usually perform better results in relieving sciatica symptoms and less in neurological lameness. Equine tail and/or root decompression associated or not with fusion is the gold standard when surgical intervention is required. Fusion after decompression is necessary in cases with segmental instability, such as degenerative spondylolisthesis. When canal stenosis occurs at multiple levels and is accompanied by axis deviation, whether coronal and/or sagittal, correction of axis deviations should be performed in addition to decompression and fusion, especially of the sagittal axis, in which a lumbar lordosis correction is required with techniques that correct the rectified lordosis to values close to the pelvic incidence [1)]



Definition

Can be defined as a decrease in the size of the dural sac and spinal canal caused by arthritic changes of the facet joints, disc herniation combined with osteophytes and spinal nerve root compression.

Developmental lumbar spinal stenosis is a maldevelopment of the dorsal spinal elements involving short pedicles and a trefoil bony spinal canal that increases the likelihood of neural compression at an earlier age.

The clinical definition includes “buttock or lower extremity pain, which may occur with or without low back pain, associated with diminished space available for the neural and vascular elements in the lumbar spine“ [2].

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dimensions are crucial for diagnosing the severity of stenosis and guiding treatment decisions. Here are the key pathological dimensions typically evaluated:

1. Spinal Canal Diameter Normal Range: The normal diameter of the lumbar spinal canal typically ranges from 12 to 15 mm in the sagittal plane. Stenosis: Narrowing is generally classified based on the degree of canal diameter reduction: Mild Stenosis: Canal diameter between 10 and 12 mm. Moderate Stenosis: Canal diameter between 8 and 10 mm. Severe Stenosis: Canal diameter less than 8 mm. 2. Central Canal Area Normal Range: The cross-sectional area of the central canal is usually greater than 100 mm^2 in the lumbar region. Stenosis: Significant reduction in the canal area can indicate stenosis: Mild Stenosis: Central canal area between 75 and 100 mm^2. Moderate Stenosis: Central canal area between 50 and 75 mm^2. Severe Stenosis: Central canal area less than 50 mm^2. 3. Neuroforaminal Width Normal Range: The normal width of the neural foramina (the openings where the nerve roots exit the spine) is generally around 10 to 15 mm. Stenosis: Neuroforaminal narrowing is categorized as: Mild Stenosis: Foramina width between 8 and 10 mm. Moderate Stenosis: Foramina width between 6 and 8 mm. Severe Stenosis: Foramina width less than 6 mm. 4. Disc Height Normal Range: The normal height of the intervertebral discs is variable but generally around 10 to 15 mm. Degeneration: Reduced disc height indicates degenerative changes: Mild Degeneration: Disc height reduction up to 25%. Moderate Degeneration: Disc height reduction between 25% and 50%. Severe Degeneration: Disc height reduction greater than 50%. 5. Facet Joint Osteophytes Normal Findings: Facet joints should be smooth with no bony outgrowths. Degenerative Changes: Presence of osteophytes or bone spurs on facet joints can contribute to stenosis: Mild Changes: Small osteophytes without significant encroachment. Moderate Changes: Larger osteophytes causing moderate

narrowing of the canal. Severe Changes: Large osteophytes causing significant narrowing and potential nerve compression. 6. Ligamentum Flavum Thickness Normal Range: The thickness of the ligamentum flavum is typically less than 3 mm. Degenerative Changes: Hypertrophy (thickening) of the ligamentum flavum can contribute to stenosis: Mild Hypertrophy: Thickness between 3 and 5 mm. Moderate Hypertrophy: Thickness between 5 and 7 mm. Severe Hypertrophy: Thickness greater than 7 mm. These dimensions are assessed through imaging techniques such as MRI and CT scans to determine the severity of the stenosis and plan appropriate treatment. Accurate measurement of these dimensions helps in understanding the extent of spinal canal narrowing and the potential impact on neurological structures.

General information

Key concepts

● caused by hypertrophy of facets and ligamentum flavum, may be exacerbated by bulging disc or spondylolisthesis, may be superimposed on congenital narrowing

● most common at L4–5 and then at L3–4

● symptomatic stenosis produces gradually progressive back and leg pain with standing and walking that is relieved by sitting or lying (neurogenic claudication)

● symptoms differentiated from vascular claudication which is usually relieved at rest regardless of position

● usually responds to decompressive surgery (sometimes with fusion) or interspinous spacer

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Lumbar spinal stenosis (LSS) is a chronic degenerative disease with pain in the back, buttocks and legs aggrevated by walking and relieved after rest without associated vascular disease of lower extremities observed in patients between 50 and 60 years.

Lumbar spinal stenosis (LSS) and low-grade degenerative spondylolisthesis are frequently associated with facet joint degeneration, considered the main cause of low back pain.

The evidence available in the literature regarding the causes, diagnosis and treatment of lumbar spine stenosis can be confusing, as no level I recommendations can be provided yet based on current data [3].

History

Elsberg [4] described the successful decompression of lumbar spinal stenosis in 1911.

In 1949, Henk Verbiest first proposed the concept of stenosis in spinal canal, lumbar intervertebral

foramen; that is, lumbar spinal stenosis (LSS) [5) 6)].

In 1973, Epstein identified lateral recess stenosis as another cause of canal narrowing [7)]. It was not until 1975 with the evolution of cross-sectional imaging and 1980's advances in CT and later MRI, that it became apparent that the soft tissue ligaments were a major cause of primary and also secondary stenosis.

Epidemiology

see Lumbar spinal stenosis epidemiology.

Classification

see Lumbar spinal stenosis classification.

Etiology

Growth in the facet joints, ligamentum flavum hypertrophy, disc degeneration, osteophytes and spondylolisthesis, all impinging on the spinal canal and intervertebral foramen cause the spinal canal to narrow down, and consequently result in spinal cord and nerve root compression [8)].

A narrow spinal canal or spinal lateral stenosis can compress the central canal spinal cord, cauda equina, or nerve root, causing axonal disruption as a result of the pressure, neurohormone function disorders, and expansion of nerve sheath, resulting in the obstruction of blood flow, venous restriction, tissue hypoxia, and localized stasis, which stimulate the nerve endings and generate the symptoms of low back pain.

Risk Factors

see Lumbar spinal stenosis risk factors

Pathophysiology

Although lumbar spinal stenosis often presents as a degenerative condition, some patients present with symptoms from lifelong narrowing of the spinal canal. These patients have congenital stenosis (CS) and present with symptoms of stenosis at a younger age. CS patients often have a distinct pathophysiology with fewer degenerative changes but present with multi-level involvement. In the setting of neurological symptoms, decompression-alone while preserving stability, has been proposed for both patient populations.

Clinical features

see Lumbar spinal stenosis clinical features.

Diagnosis

see Lumbar spinal stenosis diagnosis.

Scales

see Lumbar spinal stenosis scales.

Differential diagnosis

see Lumbar spinal stenosis differential diagnosis.

Treatment

see Lumbar spinal stenosis treatment.

Outcome

see Lumbar decompression surgery for spinal canal stenosis outcome.

Case series

Degenerative lumbar spinal stenosis case series.

Case reports

A 60-year-old Japanese man diagnosed with acromegaly at 28 years old had difficulty walking due to worsening back pain. He had been treated with somatostatin analog since 57 years old, but his pain and numbness continued to worsen. Lumbar magnetic resonance imaging showed disc bulging at L3/4 and 4/5, and he was diagnosed with lumbar spinal canal stenosis due to hypertrophy of the yellow ligament. Patients with acromegaly may complain of osteoarthropathy, so we must pay attention to the symptoms of spinal canal stenosis in collaboration with orthopedic specialists [9)]

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