

Spinal stenosis

What is spinal stenosis?

Spinal stenosis is caused by narrowing of the spinal canal or neural foramina producing root ischaemia and neurogenic claudication.^[1]

Stenosis of the spinal canal is most often caused by a combination of loss of disc space, osteophytes and a hypertrophic ligamentum flavum. Not all patients with narrowing develop symptoms. However, the narrowing may progress to cause compression of the spinal nerves and/or [spinal cord compression](#).

Spinal stenosis most often affects the lumbar and/or the cervical spine. Symptomatic stenosis of the thoracic spine is very uncommon. However, having asymptomatic cervical and/or thoracic stenosis seems to be common in elderly patients with symptomatic lumbar stenosis.^[2]

Cervical spinal stenosis^[3] ^[4]

Cervical stenosis occurs in 9% of people aged over 70 years.^[5] The lower cervical segments are commonly affected by spinal stenosis but the upper cervical segments are only rarely affected.^[6]

The most characteristic symptoms are neck pain with a restricted range of movement of the neck, instability of gait, loss of fine motor control of the upper limbs, weakness and sensory disturbance in upper and lower limbs, and urinary urge incontinence. Examination may reveal motor and sensory disturbance in the upper limbs and upper motor neurone signs in the lower limbs (weakness, increased tone, increased reflexes, and positive Babinski sign).

Conservative treatments include physiotherapy, epidural injections, non-steroidal anti-inflammatory drugs (NSAIDs) and other medicines for pain relief as required. There is little evidence for the efficacy of conservative treatments. Surgical options include anterior discectomy and fusion, anterior corpectomy and fusion, arthroplasty (in highly select cases), posterior laminectomy (with/without fusion) and laminoplasty.

For more information see separate [Cervical Spondylosis](#) and [Neck Pain \(Cervical Disc Disorders\)](#) articles.

The remainder of this article is about lumbar spinal stenosis.

How common is spinal stenosis? (Epidemiology)^[7]

- Spinal stenosis is common. The exact incidence is unknown but symptomatic lumbar stenosis is thought to occur in approximately 10% of the population.^[5]
- The true incidence is higher because spinal stenosis may be asymptomatic or cause minor symptoms.
- In the Framingham population study, 19-47% of Americans over the age of 60 years had evidence of anatomical spinal stenosis on cross-sectional imaging, depending on the criteria used.
- The prevalence of diagnosed lumbar spinal stenosis is expected to continue to increase with the ageing of the population and increased use of advanced imaging.

Risk factors

The most common cause is degenerative arthritis of the spine.^[8] Other much less common risk factors include:

- Congenital narrowing of the spinal canal (much less common than degenerative).
- Hyperparathyroidism.
- Paget's disease of bone.
- Ankylosing spondylitis.

- Cushing's syndrome.
- Acromegaly.

Spinal stenosis symptoms (presentation)

See also the separate [Examination of the Spine](#) article.

- Lumbar spinal stenosis is a clinical syndrome of pain in the buttocks or lower extremities, with or without back pain. The condition is often exacerbated by standing, walking, or lumbar extension. It is relieved by forward flexion, sitting, or lying flat.^[7]
- Gradual onset of unilateral or bilateral leg pain (with or without back pain), numbness, and weakness developing after the patient walks a predictable distance. Affected patients may have less difficulty walking uphill rather than downhill.
- About half of all patients present with back pain, which is usually bilateral and diffuse over the buttocks.
- Neurogenic intermittent claudication: leg fatigue and/or weakness and leg numbness and/or paraesthesiae.
- Pain:
 - Bilateral leg pain with burning or cramping. Involves the buttocks and thighs and spreads to the feet.
 - The neural canal and neural foramen are narrowed with the spine in backward extension and opened in forward flexion; neural compression is usually intermittent and provoked by lying prone or extending (arching) the lumbar spine, and when upright, particularly when walking.
 - Cycling does not usually cause significant problems.
 - The pain is usually relieved by sitting, leaning forward, putting the foot on a raised cushion or stool, or lying supine.
- Assessment requires a complete motor and sensory neurological examination, which is often normal.

- Lower limb vascular examination is also necessary to rule out vascular claudication.

Differential diagnosis

Cauda equina syndrome

- This is caused by any narrowing of the spinal canal that compresses the nerve roots below the level of the spinal cord.
- It may be due to trauma, disc herniation, spinal stenosis, spinal neoplasms, and inflammatory or infectious conditions.
- Features of [cauda equina](#) compression include low back pain, unilateral or bilateral sciatica, saddle and perineal anaesthesia, bowel and bladder disturbances, and weakness, sensory deficits and reduced or absent reflexes in the legs.
- Cauda equina compression usually requires urgent surgical decompression.

Other conditions to consider when assessing a patient with suspected spinal stenosis include:

- Other causes of back pain.
- [Peripheral arterial disease](#).
- Spinal tumours: benign, malignant and metastatic.
- Large central disc herniation.
- Spondylolisthesis: degenerative lumbar vertebral subluxation.
- Lumbar spine trauma or vertebral fracture.
- Epidural abscess.
- Inflammatory arachnoiditis.

Investigations

- Lumbar spine X-ray:
 - Initial assessment for a possible alternative diagnosis.
 - Degenerative spine changes: disc space narrowing is a poor predictor of symptoms.
 - May demonstrate underlying abnormality – eg, occult spina bifida, spondylolisthesis.
- Lumbar spine MRI (the preferred investigation) or CT scan:
 - MRI is the first choice because myelography is invasive. ^[9]
 - CT myelography is an alternative if MRI is not available. ^[5]

Spinal stenosis treatment and management ^[10] ^[11]

There is currently little evidence regarding the relative benefits of conservative or surgical intervention for lumbar spinal stenosis. ^[12]

Conservative measures

Non-surgical management consists of NSAIDs, physiotherapy and epidural steroid injections. However, moderate and high-quality evidence for non-operative interventions is currently lacking. ^[13]

- Weight reduction if overweight.
- Physiotherapy with forward flexion exercises.
- NSAIDs; other medication for pain relief as appropriate.
- Evidence suggests that epidural injections with local anesthetic alone or with both local anaesthetic with steroids offer short- and long term-relief of low back and lower extremity pain for patients with lumbar central spinal stenosis. ^[14]
- Medications for neuropathic pain (amitriptylline, gabapentin or pregabalin) may be needed.

Surgery

Both low back pain and stiffness and neurogenic claudication usually improve with appropriate conservative treatment. However, surgical intervention is occasionally indicated for patients not responding to conservative measures.^[15] However, there is currently little evidence on the efficacy of surgery for lumbar spinal stenosis.^[16]

- The relative efficacy of various surgical options for treatment of spinal stenosis remains uncertain. Decompression plus fusion is no more effective than decompression alone. Interspinous process spacer devices result in higher re-operation rates than bony decompression.^[17]
- Evidence suggests that active rehabilitation following surgery for lumbar spinal stenosis is effective in improving both short-term and long-term (back-related) functional status.^[18]
- Interspinous distraction procedures:
 - Involve the insertion of a device that is implanted between the spinous processes that reduces backward movement at the symptomatic level (most commonly L3-L5) but allows forward movement and unrestricted axial rotation and lateral bending.
 - The guidance from the National Institute for Health and Care Excellence (NICE) is that these procedures are effective for carefully selected patients in the short and medium term, although failure may occur and further surgery may be needed.^[19]

Prognosis

The prognosis of conservative treatment is generally good for most patients. One study found about half of patients did not have any restriction of usual activities of daily living on long-term follow-up.^[20]

One study found that patients with lumbar spinal stenosis experience rapid symptom reduction after surgery but usually still experience mild-to-moderate pain and disability five years later.^[21]

There is no evidence for any significantly different outcome when comparing conservative and surgical interventions.^[12]

Further reading

- [Lumbar Stenosis](#); Wheeless' Textbook of Orthopaedics
- [Raja A, Hoang S, Patel P, et al](#); Spinal Stenosis. StatPearls, Jan 2022.

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