

Lumbar Spinal Stenosis (Central Canal Stenosis)

A patient guide

In brief: Lumbar spinal stenosis refers to narrowing of the spaces within the lower spine through which the nerves travel. When the narrowing affects the central spinal canal, it crowds the bundle of nerve roots known as the cauda equina and classically produces a symptom pattern called neurogenic claudication: a bilateral heaviness, aching, cramping, or pins and needles in the buttocks and legs that comes on with standing and walking and tends to ease with sitting or leaning forward. It is largely a condition of later life, driven by the gradual wear-and-tear changes that thicken ligaments, enlarge the small spinal joints, and bulge the discs. This page describes what central lumbar spinal stenosis is, how it is distinguished from conditions that resemble it, what the imaging and research literature report, and how the evidence around its management is generally understood.

What central canal stenosis is, and what sets it apart

Central lumbar spinal stenosis is narrowing of the central canal of the lower spine, the channel that houses the cauda equina. Crowding of these nerve roots is what gives the condition its characteristic picture. The literature describes neurogenic claudication as the hallmark: a posture and activity dependent discomfort in both legs, often described as heaviness, tiredness, burning, or tingling, that builds with upright walking or prolonged standing and settles with sitting, squatting, or flexing forward. Many patients describe leaning on a supermarket trolley or a walking frame to extend their walking distance, the so-called shopping-trolley sign, because forward flexion opens the canal and relieves the crowding.

This central pattern is what distinguishes the condition from several entities with which it is frequently confused.

****Lateral recess stenosis**** involves narrowing at the side of the canal, where a nerve root traverses on its way to exit a level lower down. Compression here tends to produce a more focal, one-sided, radicular pain following the path of a single nerve, rather than the diffuse bilateral leg symptoms of central stenosis.

****Foraminal stenosis**** is narrowing of the bony exit tunnel, the foramen, through which a nerve root leaves the spine. It compresses the exiting root and again typically gives a more focal, dermatomal pain pattern rather than the broad claudicant picture.

****Degenerative disc disease**** describes wear within the disc itself and is generally associated with axial, discogenic back pain felt centrally in the lower back. It is not, in itself, nerve compression, and it does not typically produce the leg-dominant claudication of central stenosis, although the two often coexist.

****Vascular claudication****, arising from narrowed leg arteries rather than spinal nerves, can mimic the leg discomfort of stenosis. The literature notes several distinguishing features: vascular claudication tends to ease simply by standing still, whereas neurogenic claudication often requires sitting or forward bending; vascular disease is frequently accompanied by diminished or absent foot pulses; and the postural element differs. The bicycle and shopping-cart tests are described as useful discriminators, since a flexed posture (cycling, or leaning on a trolley) relieves neurogenic symptoms but does little for a vascular cause, while a purely effort-related pattern that resolves with rest in any posture points toward the circulation.

Why the canal narrows: pathoanatomy

The narrowing of central stenosis is usually the product of several degenerative changes acting together. Hypertrophy (thickening) of the ligamentum flavum, the elastic ligament lining the back of the canal, is a major contributor, as is enlargement of the facet joints (facet hypertrophy) with associated cyst formation. A bulging or protruding disc adds to the encroachment from the front. These changes commonly occur alongside a degenerative spondylolisthesis, a slip of one vertebra forward on the one below, which further reduces the canal diameter. The combination crowds the cauda equina, particularly when the spine is extended and the canal is at its narrowest.

A long-standing distinction in the literature is between congenital or developmental stenosis and acquired or degenerative stenosis. Some individuals are born with a constitutionally narrow canal, described by Verbiest in the 1950s, who proposed numerical thresholds for the canal diameter below which symptoms became likely. In such people, comparatively modest degenerative change may be enough to produce symptoms, since the canal had little reserve to begin with. Acquired degenerative stenosis, by contrast, develops over time from the wear-and-tear processes described above and accounts for the majority of cases seen in later life.

How common it is

Central stenosis is predominantly a condition of older adults and becomes increasingly common with age, particularly beyond the age of 65. Population data, including analyses from the Framingham cohort reported by Kalichman and colleagues, describe a prevalence of radiologically defined stenosis that rises steadily with advancing age. An important and consistently emphasised point in the literature is that radiological stenosis is frequently present in people who have no symptoms at all. The narrowing seen on a scan therefore does not, by itself, establish that a person's leg symptoms arise from it, a theme returned to below in the discussion of imaging.

How it tends to behave over time

The natural history of central lumbar spinal stenosis is generally described as benign and slowly progressive rather than rapidly deteriorating. Longer-term observational studies, including those of Johnsson and of Amundsen and colleagues, report that many patients remain broadly stable over years, that some improve, and that abrupt severe decline is uncommon. The literature consistently notes that a period of conservative, non-operative management does not appear to compromise the results of surgery undertaken later if symptoms warrant it, since outcomes after delayed surgery have not been shown to be materially worse.

The recognised exception is cauda equina syndrome, a rare but serious situation in which severe compression of the nerve bundle produces symptoms such as loss of bladder or bowel control, numbness in the saddle area, and significant leg weakness. This is described in the literature as a medical emergency and stands apart from the slowly evolving course of typical stenosis.

Clinical presentation

The presentation is dominated by neurogenic claudication, as described above: bilateral, posture-dependent leg symptoms that worsen with standing and walking and improve with flexion. Patients often report that walking uphill, or pushing a trolley, is easier than walking downhill or standing upright, because the uphill and flexed postures open the canal. Walking distance before symptoms appear is frequently variable from day to day. Back pain may or may not be present, and when it is, it is often less prominent than the leg complaint. Distinguishing the picture from vascular claudication, as outlined earlier, rests on the postural pattern, the response to standing still versus sitting, and the state of the leg pulses.

What imaging shows

Magnetic resonance imaging (MRI) is described in the literature as the key investigation for visualising the central canal, the nerve roots, and the soft tissues that contribute to narrowing. Several descriptive measures are used to characterise the degree of stenosis. The Schizas grading system classifies the appearance of the cauda equina on axial images from grade A, where cerebrospinal fluid is clearly visible around separated nerve roots, through to grade D, where the roots are crowded together with no visible fluid. Measurements of the dural sac cross-sectional area are also used, with thresholds in the region of below 75 to 100 square millimetres commonly cited as indicating significant narrowing. The nerve-root sedimentation sign, which describes whether nerve roots settle to the back of the canal in the lying position, is another descriptive marker reported in the literature.

Because conventional MRI is usually performed lying down, some narrowing that appears only on standing or with the spine loaded may be underestimated. Axial-loaded MRI and upright or positional MRI are described as techniques that can unmask such dynamic stenosis. A recurring caveat throughout the imaging literature is that the correlation between the imaging appearance and a patient's symptoms is imperfect: marked narrowing can be seen in people without symptoms, and symptoms can be significant where the imaging looks only modestly abnormal. The clinical picture and the imaging are therefore considered together rather than either alone.

What the evidence says about management

The evidence base for managing central lumbar spinal stenosis has been summarised in guidelines, including the North American Spine Society (NASS) evidence-based guideline edited by Kreiner and colleagues. A general theme of that and related literature is that the evidence supporting any single conservative modality is limited, and that no specific non-operative treatment has been shown to be clearly superior.

Epidural steroid injection has been studied directly. The LESS trial reported by Friedly and colleagues compared epidural injection of steroid plus local anaesthetic against local anaesthetic alone and found little additional benefit from the steroid component, a finding frequently cited when the limited and short-lived effect of injections is discussed.

For surgery, the stenosis arm of the SPORT study reported by Weinstein and colleagues compared decompressive surgery with non-operative care. In the as-treated analysis, which groups patients by the treatment they actually received, surgery was associated with greater improvement. The literature emphasises an important caveat: there was substantial crossover between the assigned groups, so the intention-to-treat comparison (grouping patients by their original assignment regardless of what they received) was less clear-cut, and the longer-term follow-up reported by Lurie and colleagues at eight years described some convergence between the groups over time. The distinction between as-treated and intention-to-treat findings is part of why the magnitude of surgical benefit is described with care.

A specific area of debate concerns the situation in which central stenosis coexists with a degenerative spondylolisthesis: whether decompression alone is sufficient, or whether adding a spinal fusion improves results. The SLIP trial suggested an advantage to adding fusion, whereas the Swedish trial reported by Forsth and the Norwegian NORDSTEN-DS trial reported by Austevoll and colleagues found that decompression alone produced results comparable to decompression with fusion in many patients. The prevailing reading of this body of work is that stable, low-grade (grade I) slips often do well with decompression alone, while the role of fusion is considered on an individual basis where there is instability or other specific features.

In terms of surgical technique, minimally invasive approaches, including unilateral-approach bilateral decompression in which both sides of the canal are decompressed through a single small opening, are described as achieving results comparable to traditional open surgery with less tissue disruption and morbidity. Across the surgical literature, the need for further surgery over the years that follow (reoperation) is reported across a broad range, roughly 10 to 35 per cent depending on the population and length of follow-up.

Outlook

The prognosis for the claudicant leg symptoms of central stenosis is generally described as favourable over the short to medium term, whether managed conservatively or surgically, with surgery tending to produce more rapid and greater relief in those with significant, persistent symptoms. Axial back pain, where present, is reported to respond less reliably than the leg symptoms. Over the longer term, some narrowing and some symptoms may partially regress, and many patients remain stable, consistent with the broadly benign natural history described above.

Common questions

What is lumbar spinal stenosis?

It is narrowing of the spaces within the lower spine through which the nerves pass. When the narrowing affects the central canal, it crowds the bundle of nerve roots called the cauda equina, which is what produces the characteristic leg symptoms described in the literature.

What is central canal stenosis specifically?

Central canal stenosis refers to narrowing of the main central channel of the spine, as distinct from narrowing at the sides (the lateral recess) or in the exit tunnels (the foramina). It tends to affect several nerve roots together rather than a single root.

What is neurogenic claudication?

Neurogenic claudication is the classic symptom pattern of central stenosis: a bilateral heaviness, aching, cramping, or pins and needles in the buttocks and legs that comes on with standing and walking and eases with sitting or leaning forward.

Why does leaning forward or sitting help?

Bending the spine forward, by sitting, squatting, or leaning on a trolley, opens the central canal and relieves the crowding of the nerve roots. This is why many patients report the so-called shopping-trolley sign, finding they can walk further when leaning on a trolley or frame.

How is it different from vascular leg pain?

Vascular claudication arises from narrowed leg arteries rather than spinal nerves. The literature describes it as easing simply by standing still, often accompanied by reduced or absent foot pulses, whereas neurogenic claudication tends to require sitting or forward bending to settle. The bicycle and shopping-cart tests help distinguish the two, since a flexed posture relieves the neurogenic but not the vascular pattern.

How is it different from sciatica or a slipped disc?

Sciatica from a slipped (herniated) disc typically compresses a single nerve root and produces a focal, one-sided pain following that nerve's path. Central stenosis more often produces diffuse, bilateral, posture-dependent leg symptoms affecting several roots together. The two can, however, overlap.

What is lateral recess and foraminal stenosis?

Lateral recess stenosis is narrowing at the side of the canal where a nerve root traverses, and foraminal stenosis is narrowing of the bony exit tunnel through which a root leaves the spine. Both tend to compress a single root and produce more focal, radicular symptoms than central stenosis.

What causes the canal to narrow?

The narrowing usually results from several degenerative changes together: thickening of the ligamentum flavum, enlargement of the facet joints, and bulging of the disc, often alongside a degenerative slip of one vertebra on another. These wear-and-tear processes crowd the nerve roots within the canal.

The full set of questions and answers, with references, is available on the condition page.