

# Spinal Canal Stenosis

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Spinal canal stenosis is a condition in which part or all of the entire spinal canal is stenosed. The causes of stenosis may be divided into primary, secondary and combined<sup>(1)</sup>. Primary stenosis may be subdivided again into congenital, resulting from congenital vertebral malformations, or developmental resulting from defective postnatal development of the lumbar vertebrae. Developmental stenosis includes patients with achondroplasia, and those with a constitutionally small spinal canal. Secondary or acquired stenosis results when the spinal canal is compromised by various disorders such as degenerative spondylosis, spondylolysis and spondylolisthesis, previous trauma such as burst fractures of the spine resulting in retropulsed fragments of bone impinging on the spinal canal, and iatrogenic causes. Combined stenosis refers to cases in which secondary narrowing of the spinal canal occurs in patients with pre-existing stenosis.

Degenerative spinal stenosis is by far the most common, the general incidence of symptomatic stenosis ranging from 1.7% to 8%<sup>(2)</sup>. Symptomatic stenosis typically occurs in patients in the fifth to seventh decades of life. There appears to be no sex predominance, though degenerative spondylolisthesis has been found to be four times more common in women<sup>(3)</sup>. It has been reported<sup>(4)</sup> that 95% of patients with lumbar spinal stenosis presented with back pain, 91% claudication, 71% leg pain, 33% weakness, and 12% voiding disturbances. In the same study, the authors reported that the L5 root was involved in 91%, S1 in 63%, L1 to L4 in 28%, and S2 to S5 in 5%. Only 35% of their patients had single root involvement, the others having multiple roots involved.

The clinical presentation is often diagnostic. Most patients report a long history of intermittent back pain with progressive leg symptoms. The lower extremity symptoms often start at the back and radiate down the buttocks and legs in a radicular fashion. The leg symptoms may comprise pain, aches, heaviness or numbness, paraesthesia or sensations of weakness. Symptoms are typically worsened by walking or standing and this is referred to as neurogenic claudication. Sitting

or squatting or keeping the lumbar spine in a flexed position relieves the symptoms. Examination of the spine may reveal a loss of lumbar lordosis and decreased spinal range of motion especially in extension. The straight leg raising test (SLR) is often not reduced as SLR is an indicator of nerve root tension and is usually positive only when compression or irritation of the nerve root is acute such as in a case of acute prolapsed disc herniation. Motor examination is often normal while deep tendon reflexes may be normal or decreased. Sensation is often decreased in a radicular fashion. Careful assessment of the peripheral pulses including the dorsalis pedis and posterior tibial pulses is important as some patients with peripheral vascular disease present with similar claudication symptoms. However, the two conditions of spinal stenosis resulting in neurogenic claudication and peripheral vascular disease resulting in vascular claudication may be coexistent. Other conditions causing lower extremity pain such as degenerative joint disease of the hip and knee should also be excluded by careful examination.

When investigating patients with spinal stenosis, plain AP and lateral radiographs of the lumbar spine are often the initial investigation of choice. These simple X-rays are valuable in ascertaining the severity of lumbar spondylosis, as many patients with significant spinal stenosis often will demonstrate radiological changes of decreased disc height and osteophytic formation. Occasionally, standing lateral X-rays of the lumbar spine will demonstrate instability in the form of spondylolisthesis, a condition in which there is forward shift of one vertebra on the one below. A more reliable method of assessing spinal stability would be the use of flexion and extension stress lateral radiographs of the lumbar spine. Slippage of more than 25% to 30% of vertebral body width is rare. Plain X-rays are also useful in excluding isthmic spondylolisthesis, a condition in which there is a break in the pars interarticularis, and in assessing whether there is concomitant degenerative scoliosis. In the event that conservative management of the patient's symptoms fails, further investigation would be required to confirm

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the diagnosis of spinal stenosis, and assess the severity of canal compromise. At this time, magnetic resonance imaging (MRI) scans are the preferred mode of investigation. MRIs however are expensive and very sensitive. In one study, 21% of asymptomatic individuals aged 60 to 80 years had MRI evidence of spinal stenosis<sup>(5)</sup>. A less commonly used method of imaging spinal stenosis is computed tomography (CT) in combination with myelography. CT-myelography is especially useful in evaluating the severity of dynamic nerve compression on flexion-extension views in patients with spondylolisthesis. It is also often preferred where there is distorted anatomy such as in patients with a combination of degenerative scoliosis, spinal stenosis and spondylolisthesis. Electromyography (EMG) reveals abnormalities in as many as 80% of patients with spinal stenosis<sup>(6)</sup>. The presence of these abnormalities may support the diagnosis of spinal stenosis, but their absence does not exclude the diagnosis. EMGs are particularly useful when the presence of peripheral neuropathy is suspected.

In the management of patients with degenerative spinal canal stenosis, conservative treatment is usually the first choice. Conservative measures include medications such as nonsteroidal anti-inflammatory drugs (NSAIDs), analgesics including the narcotics, muscle relaxants, physical therapy, manipulation, braces or corsets, epidural steroid and/or facet injections. Johnson et al<sup>(7)</sup> studied the progression of symptoms over four years in 32 patients with lumbar stenosis who either refused or were not medically cleared for decompressive surgery. The symptoms of 70% of the patients were unchanged at follow-up, with 15% better, and 15% worse. In the Maine Lumbar Spine Study<sup>(8)</sup>, four-year outcomes were available on 52 patients with spinal stenosis that were treated conservatively and 67 patients treated surgically. Fifty-two percent of the conservatively treated patients reported that their predominant symptom, either back or leg pain, were better. However, only 42% of this conservatively treated group were satisfied with their status. In the surgical group, 70% were better, and satisfaction rate at four years was 63%. Amundsen et al<sup>(9)</sup> studied a cohort of 100 patients with symptomatic lumbar stenosis given surgical or conservative treatment and followed for 10 years. After a period of four years, excellent or fair results were found in half of the conservatively treated patients and in 80% of the surgically treated patients.

Many different surgical procedures for spinal stenosis have been described. They include decompression procedures such as laminectomy and

laminotomy operations, decompression procedures coupled with fusion of the motion segment, and decompression coupled with fusion and instrumentation. Surgery for lumbar stenosis has been successful in relieving pain and returning patients to their activities of daily living in 60% to 85% of patients depending on the criteria for success<sup>(10)</sup>. Thus between 20% to 40% of patients do not benefit<sup>(11)</sup>. Various predictors for surgical outcome for spinal stenosis have been studied. Factors that have been associated with unsuccessful outcomes include advanced age, multiple comorbidities, association with multiple level spinal instability, and association with degenerative scoliosis and duration of symptoms. Katz et al<sup>(11)</sup> studied 199 patients who were operated upon for lumbar stenosis, and found that the most powerful preoperation prognostic factor, even after control for comorbidity, physical functional capacity, depression, age, individual surgeon, and other factors, was the simple question: "How would you rate your health?". Patients who rated their health as poor before surgery had two- to three-fold worse scores at follow-up than those who rated their health as excellent. In the current paper published in this issue of the Singapore Medical Journal, the authors<sup>(12)</sup> have reported their results of surgery on 68 patients with lumbar spinal stenosis aged 60 years and above, with a mean follow-up of eight years. Sixty-eight percent of their patients were rated as excellent and good. These results are consistent with those reported in the literature. **SMD**

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