# Lumbar spinal stenosis magnetic resonance imaging

- Validity and accuracy of swespine data on surgery for central lumbar spinal stenosis and lumbar disc herniation: a cohort study of 796 patients
- Lumbar Intraspinal Calcium Pyrophosphate Deposition: A Comprehensive Case Study
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- Magnetic Resonance Imaging Predictors of Surgical Difficulty in Transforaminal Endoscopic Lumbar Discectomy for Far-Lateral Disc Herniation Under Local Anesthesia

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Lumbar spine magnetic resonance imaging is most commonly used for the clinical assessment of degenerative lumbar central canal spinal stenosis.

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There is high interobserver- and intraobserver agreement between radiologists and spine surgeons for preoperative MRI findings of lumbar spinal stenosis. However, the interobserver agreement is not optimal for the evaluation of facet joint osteoarthritis [1)].

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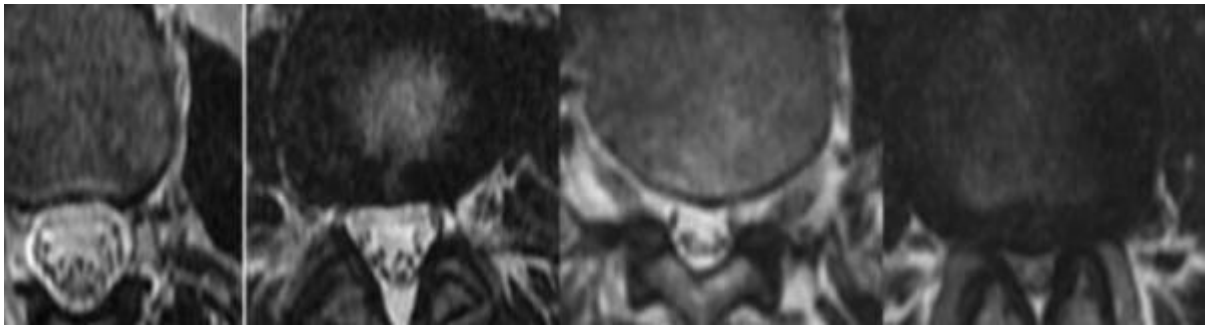
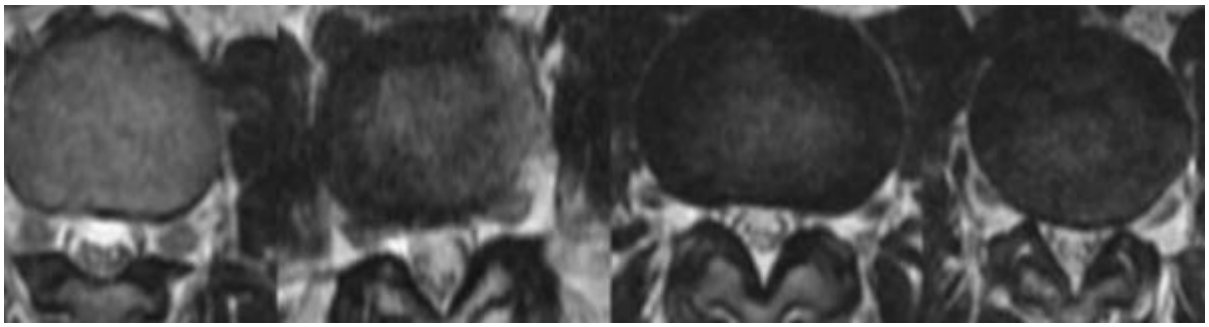
In 2022 Elfadle et al. concluded that there is a good correlation between the Pfirrmann grading system, and the Combined Task Forces of the North American Spine Society grading system for Lumbar Disc Pathology. It also reported five qualitative imaging criteria that should be radiologically reported for patients with suspected lumbar spinal canal stenosis.

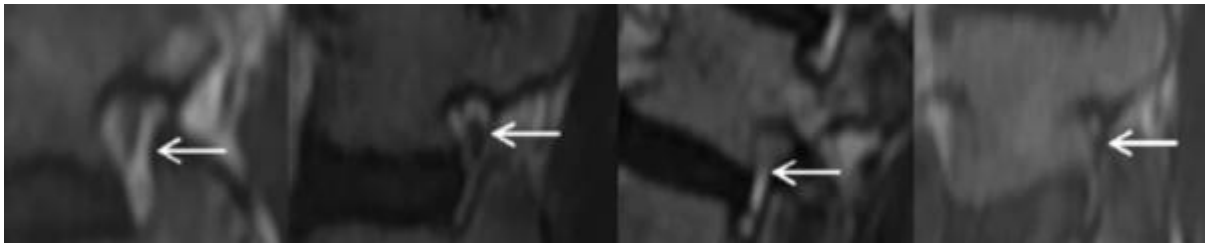
These criteria included central canal compromise



Lateral spinal canal grades

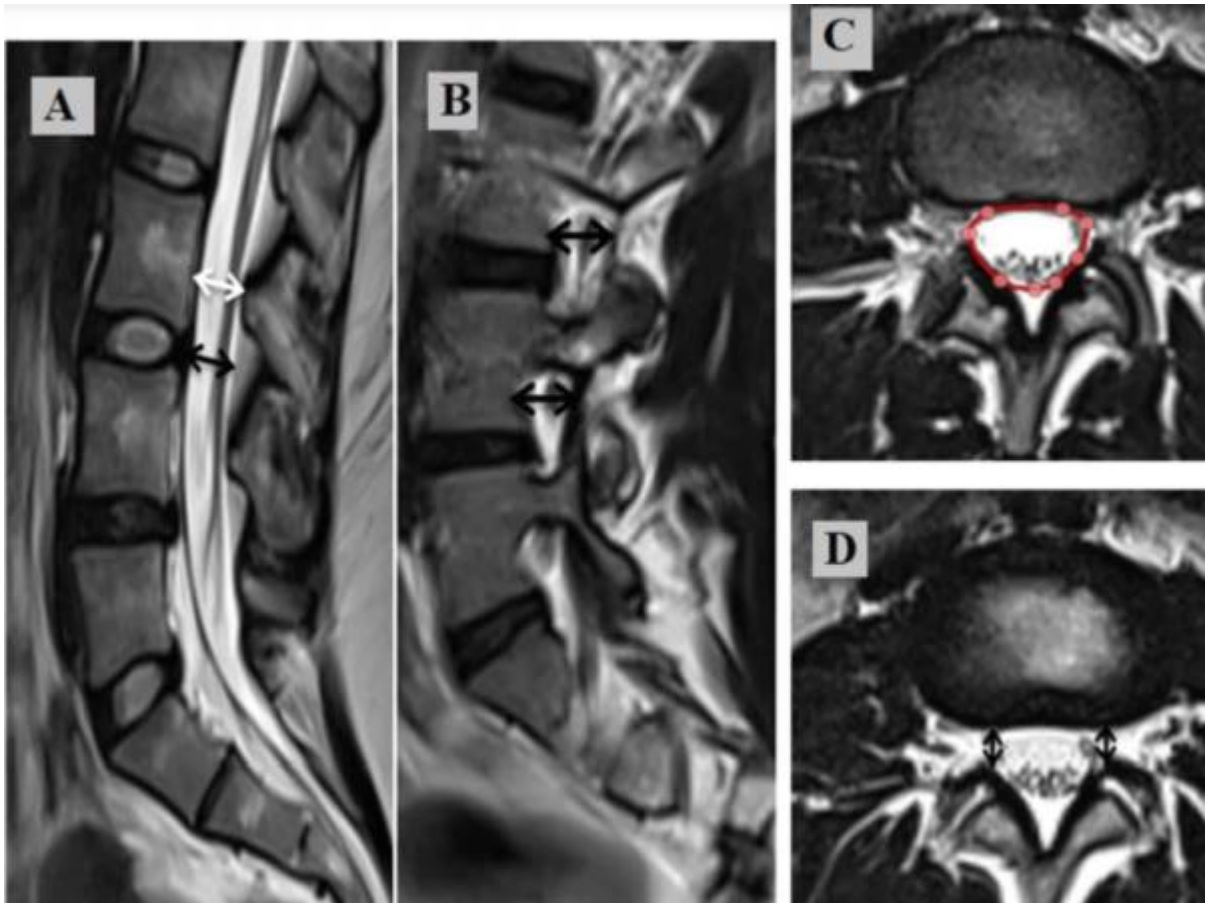


Lumbar foraminal stenosis grades



The relation between cauda equina and lumbar cerebrospinal fluid (CSF), compression of a nerve root in both lumbar lateral recesses and both intervertebral foramen zones compromise and impingement of the nerve root. According to these imaging parameters central, both lateral, and both lumbar foraminal stenosis are classified into 4 grades from grade 0 (no stenosis) to grade 3 (severe stenosis).

MR lumbar spinal canal and foraminal measures




A Mid-sagittal antero-posterior (AP) diameter of dural sac (white arrow) and degree of stenosis at the

disc level (black arrows)

B diameter of intervertebral foramen (black arrows)

C the cross-sectional area of the dural sac

D right and left lateral recesses heights (black arrows)

Quantitative measures of the lumbar spinal canal reflect the severity of lumbar spinal canal stenosis and nerve root compression [2) 3)].

## Serpentine pattern nerve roots

Serpentine pattern nerve roots

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In a systematic review in 2012 the results suggested that a considerable proportion of patients may be classified incorrectly by MRI for lumbar disc herniation and spinal stenosis. However, the evidence for the diagnostic accuracy of MRI found by a systematic review is not conclusive, since the results could be distorted due to the limited number of studies and large heterogeneity [4)].

It is a quantitative diagnosis that is made when an individual's measurement is outside the normal range. Thus, the criteria for lumbar central canal spinal stenosis should be compared from an analysis of a normative distribution of measurements [5) 6)].

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Although a number of studies have evaluated the reliability of certain MRI characteristics, a comprehensive evaluation of the reliability of MRI readings in spinal stenosis is lacking.

Fifty-eight randomly selected MR images from patients with SPS enrolled in the Spine Patient Outcomes Research Trial were evaluated. Qualitative ratings of imaging features were performed according to defined criteria by 4 independent readers (3 radiologists and 1 orthopedic surgeon). A sample of 20 MRIs was reevaluated by each reader at least 1 month later. Weighted kappa statistics were used to characterize intra- and inter-reader reliability for qualitative rating data. Separate quantitative measurements were performed by 2 other radiologists. Intraclass correlation coefficients and summaries of measurement error were used to characterize reliability for quantitative measurements.

Intra-reader reliability was higher than inter-reader reliability for all features. Inter-reader reliability in assessing central stenosis was substantial, with an overall kappa of 0.73 (95% CI 0.69-0.77). Lumbar foraminal stenosis and nerve root impingement showed moderate to substantial agreement with overall kappa of 0.58 (95% CI 0.53-0.63) and 0.51 (95% CI 0.42-0.59), respectively. Subarticular zone stenosis yielded the poorest agreement (overall kappa 0.49; 95% CI 0.42-0.55) and showed marked variability in the agreement between reader pairs. Quantitative measures showed inter-reader intraclass correlation coefficients ranging from 0.58 to 0.90. The mean absolute difference between readers in measured thecal sac area was 128 mm (13%).

The imaging characteristics of spinal stenosis assessed in this study showed moderate to substantial

reliability; future studies should assess whether these findings have prognostic significance in SPS patients [7].

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In a meta-analysis, CT and MRI were found to have similar accuracy for the assessment of central stenosis [8].

By using a combination of magnetic resonance imaging (MRI) and computed tomography (CT) of the lumbar spine, it is possible to distinguish between spinal stenosis caused by bone compression and specific soft tissue epidural intraspinal lesions that cause localized spinal canal stenosis and neural compression. Examples include facet cysts and yellow ligament hypertrophy [9].

Because imaging findings of lumbar spinal stenosis (LSS) may not be associated with symptoms, clinical classification criteria based on patient symptoms and physical examination findings are needed [10].

Boden et al., performed magnetic resonance imaging on sixty-seven individuals who had never had low back pain, sciatica, or neurogenic claudication. The scans were interpreted independently by three neuro-radiologists who had no knowledge about the presence or absence of clinical symptoms in the subjects. About one-third of the subjects were found to have a substantial abnormality. Of those who were less than sixty years old, 20 per cent had a herniated nucleus pulposus and one had spinal stenosis. In the group that was sixty years old or older, the findings were abnormal on about 57 per cent of the scans: 36 per cent of the subjects had a herniated nucleus pulposus and 21 per cent had spinal stenosis. There was degeneration or bulging of a disc at at least one lumbar level in 35 per cent of the subjects between twenty and thirty-nine years old and in all but one of the sixty to eighty-year-old subjects. In view of these findings in asymptomatic subjects, they concluded that abnormalities on magnetic resonance images must be strictly correlated with age and any clinical signs and symptoms before operative treatment is contemplated [11].

# Lumbar spinal stenosis magnetic resonance imaging General University Hospital of Alicante Cases.

Left convexity thoracolumbar scoliosis.

Chronic anterior wedge fracture of the L1 vertebral body.

Signs of spondyloarthrosis and diffuse dorsal and lumbar discarthrosis more marked at the L2-L3 level, where it is also associated with marked Modic type I changes.

Right L1-L2 posterolateral protrusion with mild involvement of the foramina.

Wide-based posteromedial hernia with right lateralization of the L2-L3 disc that moderately-severely affects the right foramen, imprinting on the right L2 emerging root with probable root involvement of the same. Likewise, at this level there are signs of multifactorial vertebral canal stenosis moderated by facet convergences, hypertrophy of the ligamentum flavum and the aforementioned herniated disc. Broad-based posteromedial protrusion of the L3-L4 disc with partial involvement of the foramina. Broad-based posteromedial protrusion of the L4-L5 disc with severe involvement of both foramina, predominantly right. In addition to this level, slight signs of multifactorial canal stenosis can also be seen.

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