MRI LIES—OR DOES IT?

Correlating Lumbar Imaging With the Patient in Front of You

Clinical Presentation • Physical Examination • MRI • Special Tests

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Conflict of Interest

I have no conflicts of interest to disclose.

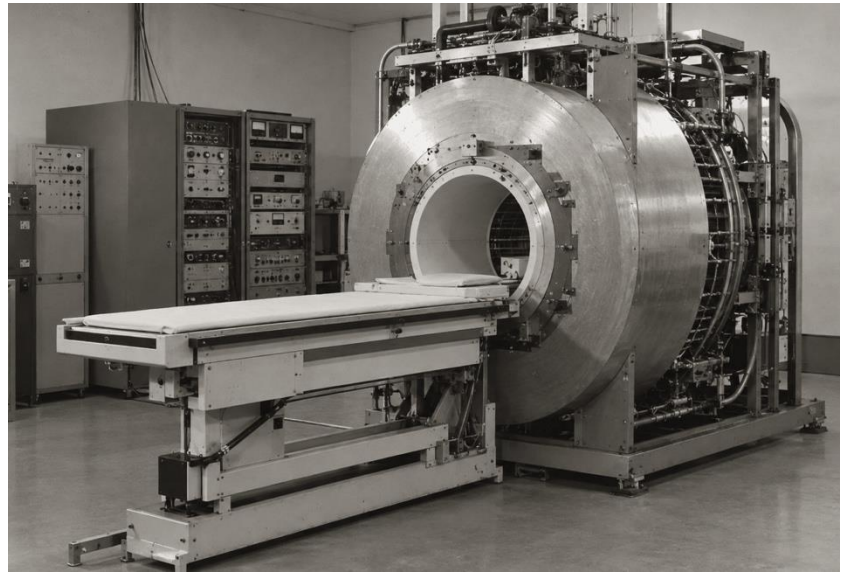
MRI: a revolution in seeing the spine

FROM DISCOVERY TO CLINICAL PRACTICE

1973 — Paul C. Lauterbur demonstrates MR image formation using magnetic-field gradients.

1980s — Clinical MRI expands, transforming noninvasive assessment of spinal discs and neural structures.

2003 — Paul C. Lauterbur and Sir Peter Mansfield share the Nobel Prize in Physiology or Medicine.



Early experimental MRI system

Illustrative reconstruction—not an archival photograph

WHAT MRI ADDED TO SPINE CARE

Soft-tissue contrast
Discs, marrow, neural structures

Multiplanar localization
Canal, lateral recess, foramina

Noninvasive evaluation
Reduced dependence on myelography

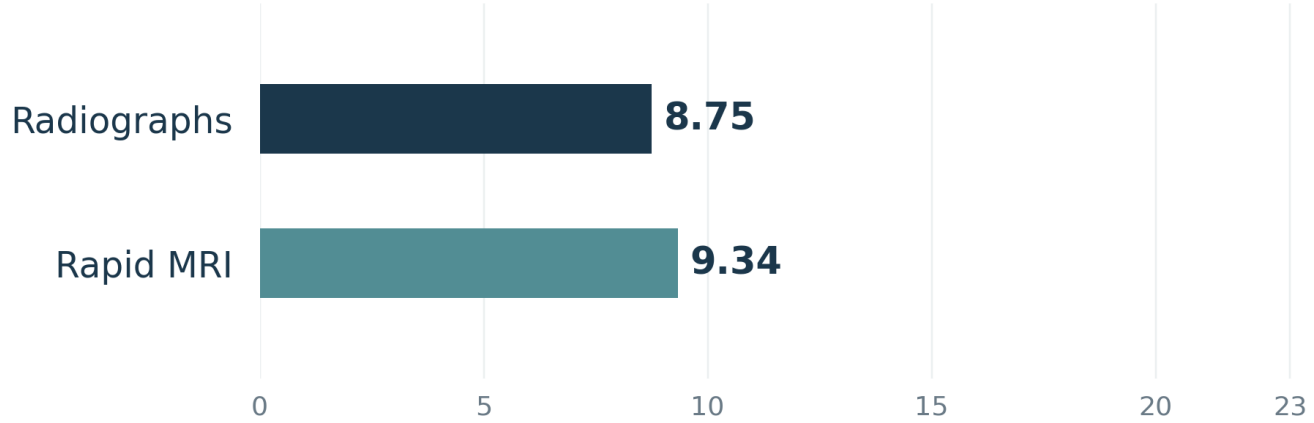
MRI transformed what we can see. It does not establish which abnormality causes pain.

History: Lauterbur PC. Nature. 1973;242:190-191; Nobel Prize in Physiology or Medicine 2003; refs 19–20. Image: AI-generated illustrative reconstruction.

More imaging detail does not guarantee better outcomes

12-month back-related disability

Modified Roland score (0–23; lower scores = less disability)



Adjusted difference (radiographs − rapid MRI): −0.59 points

95% CI, −1.69 to 0.87; P = .53 | No statistically significant difference

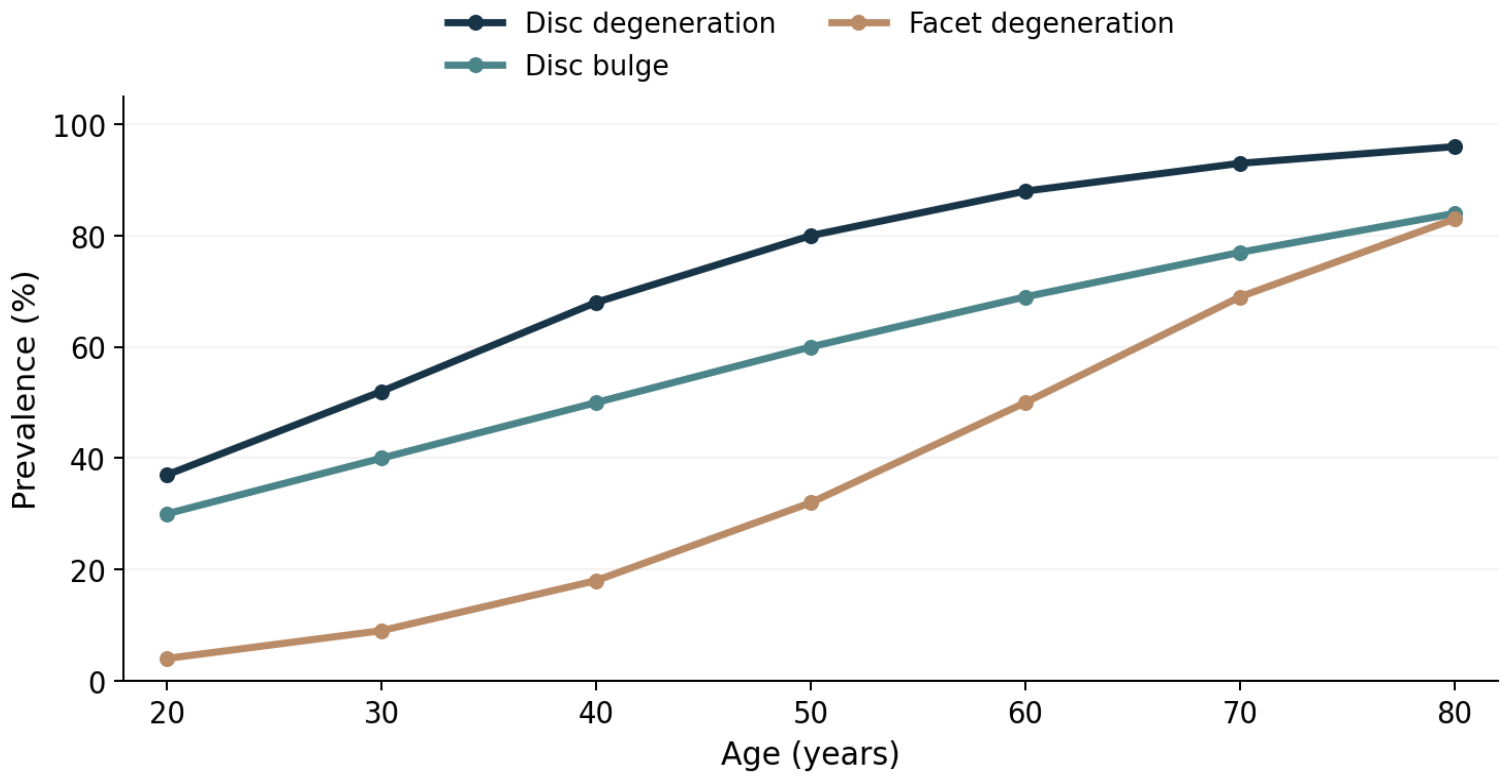
PAPER AT A GLANCE

- Randomized trial: 380 adults referred for lumbar radiographs.
- Rapid, limited MRI vs radiographs; 89% assessed at 12 months.
- MRI improved reassurance (74% vs 58%); disability was similar.
- Surgery: 10 vs 4 (P = .09); difference not statistically significant.

The diagnostic power of MRI is extraordinary, but the clinical value of imaging depends on how and when we use it.

Jarvik et al. JAMA. 2003;289:2810-2818 (ref 21). Randomized trial; plotted 12-month mean scores.

Degenerative MRI findings in asymptomatic adults



STUDY AT A GLANCE

33 studies · 3,110 pain-free adults

32 MRI studies; 1 CT study

Age-specific modeled estimates

PREVALENCE: AGE 20 → AGE 80

Disc degeneration	**37% → 96%**
Disc bulge	**30% → 84%**
Facet degeneration	**4% → 83%**

CLINICAL INTERPRETATION

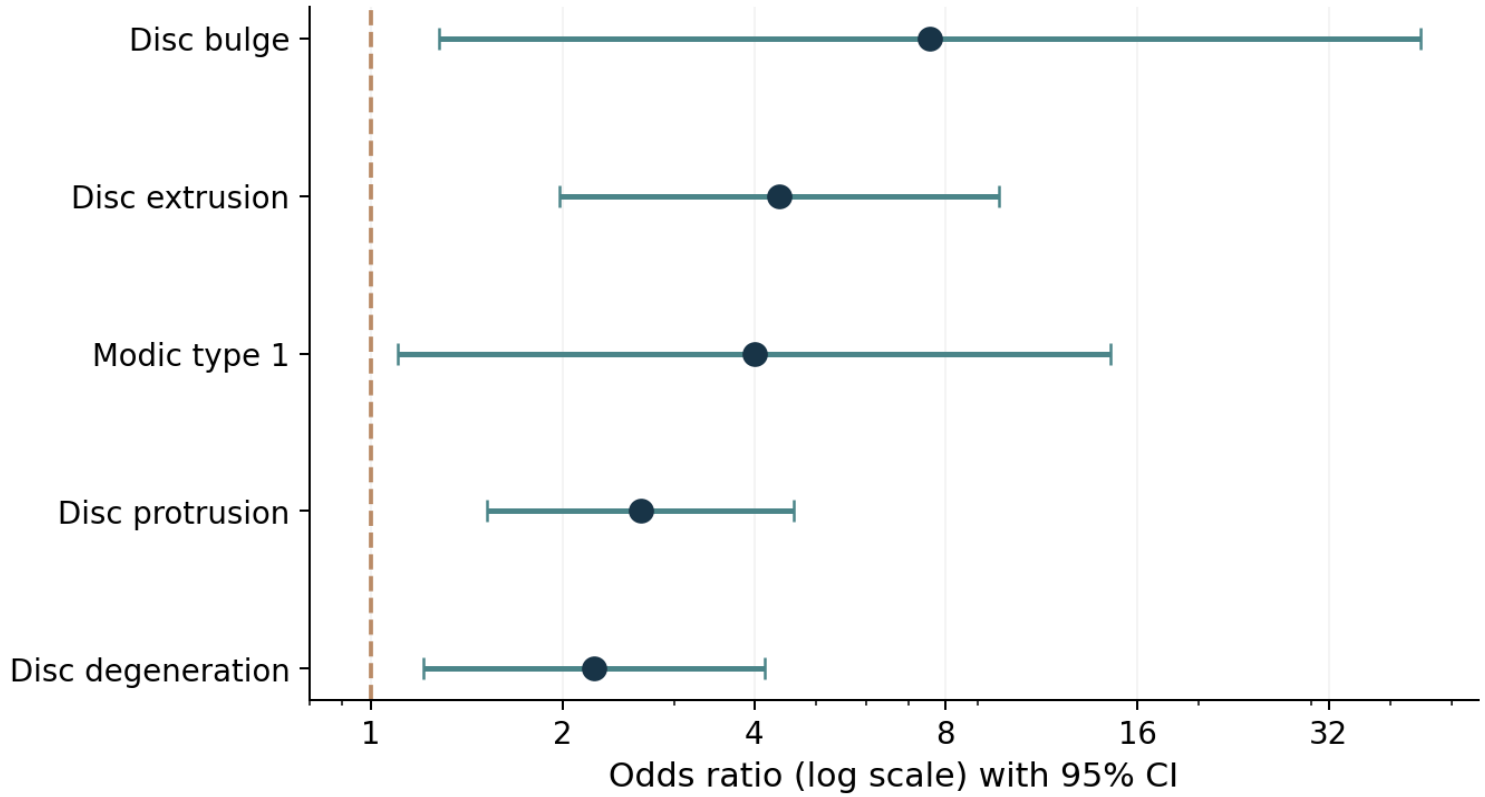
Common findings do not establish the pain generator.

At age 80, 96% of asymptomatic adults have disc degeneration. An abnormal MRI does not establish the pain generator.

Brinjikji et al. AJNR Am J Neuroradiol. 2015;36:811-816 (ref 1). Modeled estimates; asymptomatic populations only.

Not All MRI Findings Are Incidental

Brinjikji et al., 2015 | Systematic review and meta-analysis



STUDY AT A GLANCE

- 14 studies; random-effects meta-analysis
- 3,097 adults ≤50 years: 1,904 symptomatic; 1,193 asymptomatic

DISC BULGE OR 7.54

95% CI 1.28–44.56 · wide uncertainty

- Disc bulge, extrusion, Modic 1, protrusion and degeneration associated with pain
- Associations cannot establish causation or identify the symptomatic level

MRI abnormalities can be associated with pain without necessarily being the source of pain. Clinical concordance remains essential.

Brinjikji et al. AJNR Am J Neuroradiol. 2015;36:2394–2399 (ref 2). Odds ratios and 95% CIs reconstructed.

Establishing Clinical Concordance

01	CLINICAL PRESENTATION	**What clinical syndrome am I treating?** Pain pattern, temporal course, provocation and relief, function, red flags
02	PHYSICAL EXAMINATION	**Can I anatomically localize the symptoms?** Gait, strength, reflexes, sensation, neural tension signs, and assessment for mimics
03	IMAGING FINDINGS (MRI)	**Does the imaging provide a plausible anatomical explanation?** Level, laterality, central vs lateral recess vs foraminal disease, nerve root involvement
04	SPECIAL TESTS	**What remaining diagnostic uncertainty can I resolve?** EMG/NCS, selective diagnostic injections, tests that may change management

Clinical concordance increases diagnostic confidence.
Discordance should prompt reconsideration before intervention.

Proposed clinical reasoning framework; component evidence reviewed in subsequent sections.

Does the MRI add up?

Clinical presentation

Back, buttock, and thigh symptoms; worse standing or walking, improved by sitting or flexion.

Physical examination

Limited walking tolerance; extension-provoked symptoms. Assess gait, strength, sensation, and reflexes.

MRI findings

Multilevel degeneration with marked L3–4 canal narrowing on this sagittal image; correlate with axial views.

Special tests

Use EMG/NCS or diagnostic injections selectively when localization or a competing diagnosis remains uncertain.



MRI provides the anatomy; clinical concordance gives clarity

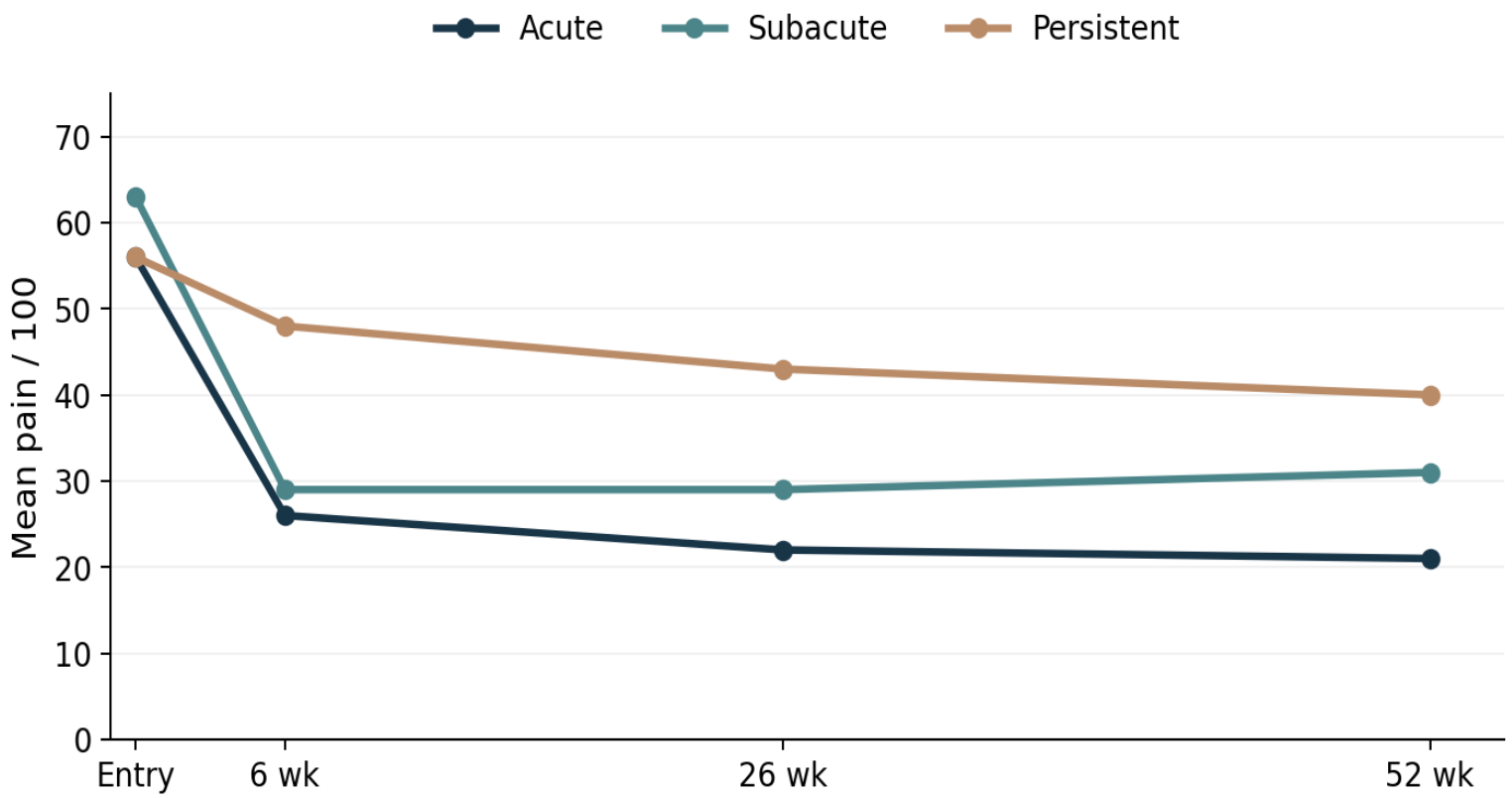
Clinical presentation first clue to interpret complex MRI

Clinical syndrome	Typical presentation	Distinguishing features
Radicular pain	Often unilateral, radiating leg pain with paresthesias	Root-pattern symptoms; cough or sneeze may aggravate
Neurogenic claudication	Leg pain or heaviness with standing and walking	Sitting or forward flexion usually brings relief
Back-dominant pain	Predominantly axial; activity or position dependent	Symptoms rarely identify one anatomical generator
Peripheral neuropathy	Distal bilateral burning, tingling, or numbness	Stocking pattern; symptoms may occur at rest or at night
Hip pathology	Groin or anterior-thigh pain; sometimes referred to knee	Weight-bearing symptoms; difficulty with shoes or socks
Vascular claudication	Exertional leg pain, commonly calf predominant	Improves with rest without requiring lumbar flexion

The history establishes the suspected syndrome. MRI should test that hypothesis—not create it.

Clinical synthesis; references 7–9, 11.

The Time Course Matters: Natural History of Low Back Pain



WALLWORK ET AL. | CMAJ 2024

DESIGN

95 reports, 60 cohorts (17,974 patients); 47 cohorts in the meta-analysis.

EARLY COURSE

Acute/subacute pain improved most in the first six weeks.

PERSISTENT PAIN

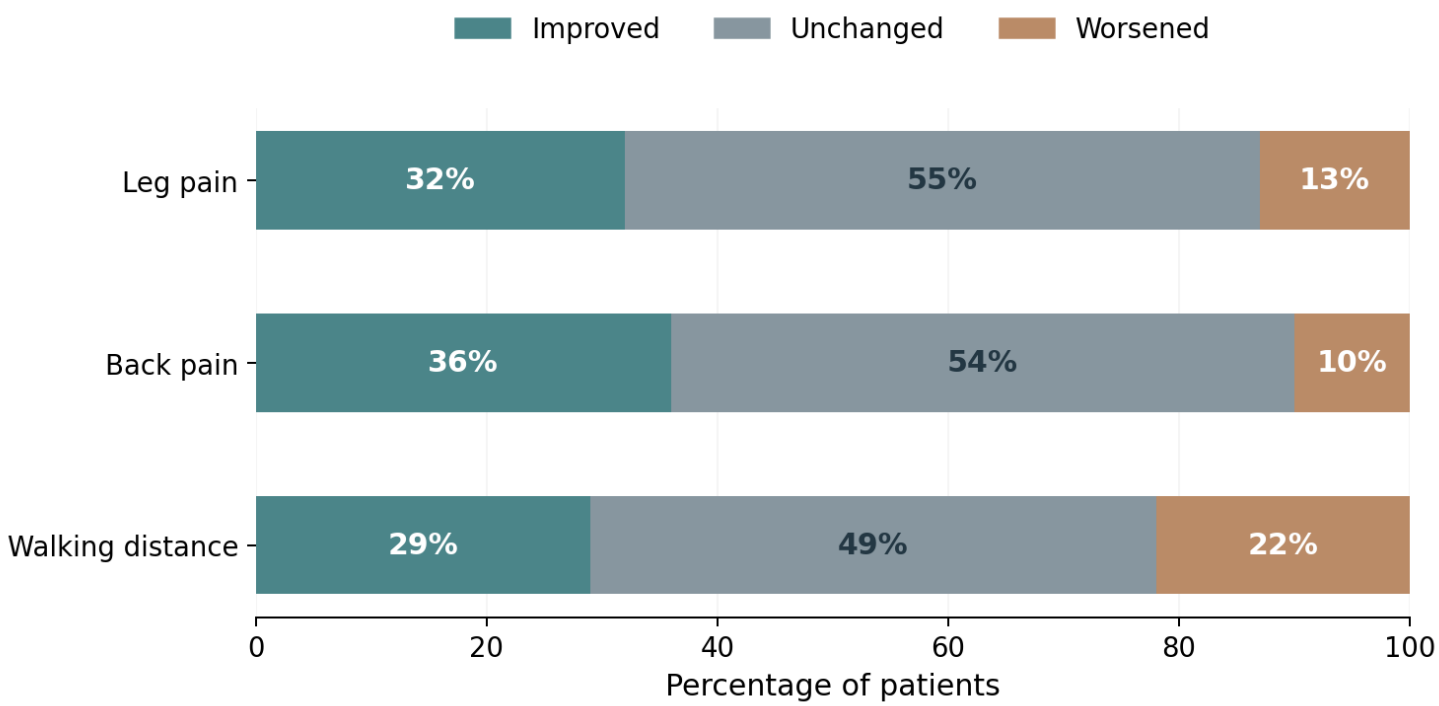
Persistent pain improved less; certainty was very low.

Nonspecific low back pain; not a direct prognosis for radiculopathy or stenosis.

A patient's clinical trajectory provides information that a single MRI cannot.

Wallwork et al. CMAJ. 2024;196:E29-E46 (ref 3). Pooled model estimates; nonspecific low back pain.

Lumbar Stenosis Often Remains Stable When Symptoms Are Tolerable



Wessberg & Frennered, 2017

PROSPECTIVE NONOPERATIVE COHORT

146 patients
Clinical central stenosis; surgery deferred because symptoms were tolerable.

Median 3.3-year follow-up
89% response among patients eligible for questionnaire follow-up.

7% reconsidered for surgery
Only 10 of 146 had the decision not to operate revised.

MRI severity: limited prognostic value
Dural sac area <0.5 cm² was linked to less spontaneous improvement; not a validated surgery threshold.

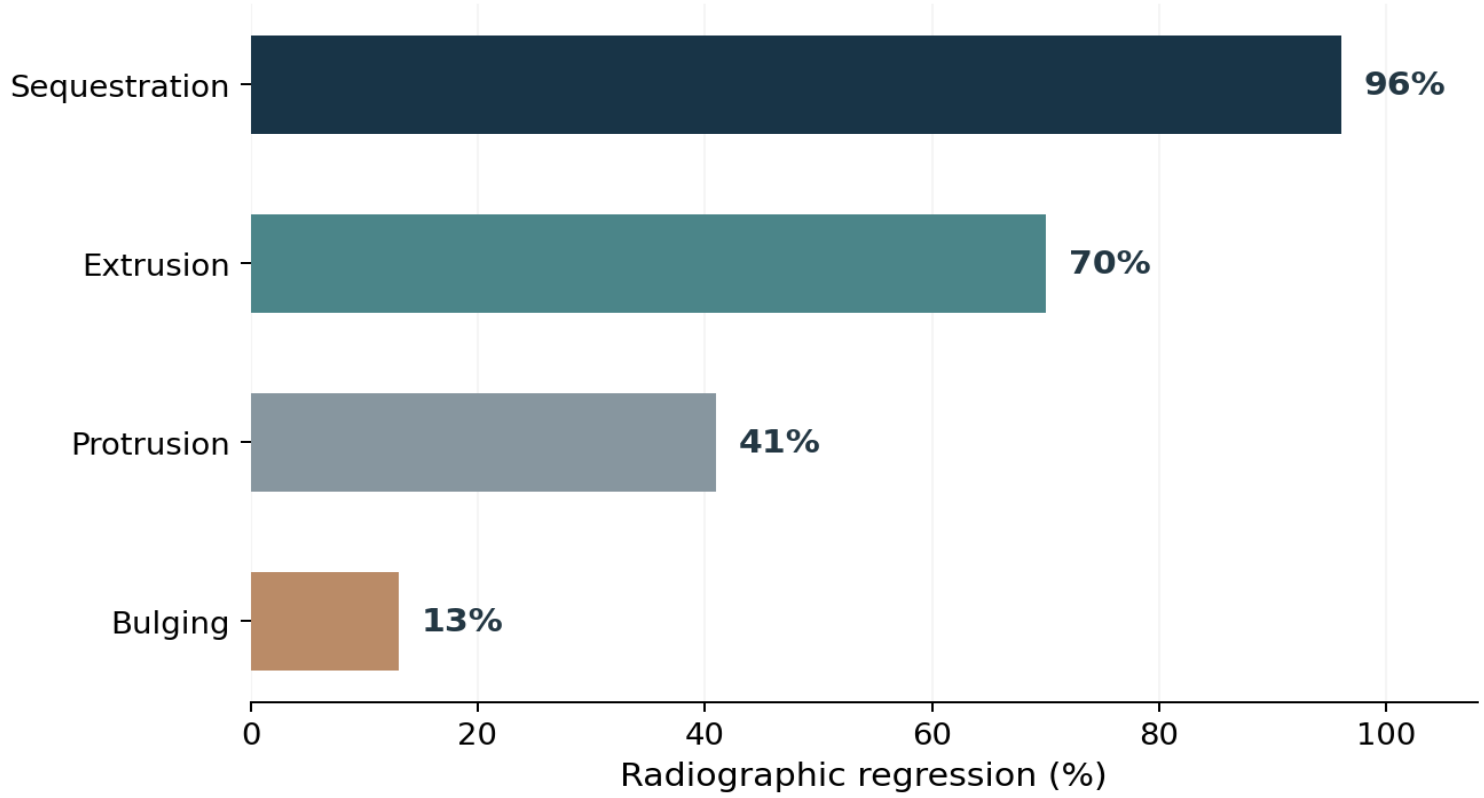
87% leg pain stable or improved

22% walking distance worsened

Symptoms can remain stable despite stenosis; disc herniations can regress on MRI without surgery.

Wessberg P, Frennered K. Eur Spine J. 2017;26(10):2536-2542. doi:10.1007/s00586-017-5075-x. Ref 6.

Disc Herniations Can Regress Without Surgery



CHIU ET AL. | 2015

31 eligible studies; 9 provided morphology-specific estimates. Conservatively managed patients.

REGRESSION = SHRINKAGE

Herniated material becomes smaller on follow-up MRI. A residual herniation may remain.

COMPLETE RESOLUTION

Herniated fragment no longer visible: 43% of sequestrations and 15% of extrusions.

These percentages describe MRI change, not symptom recovery.

The MRI can improve without surgery. Does the patient recover—and does surgery change that?

Chiu et al. Clin Rehabil. 2015;29:184-195 (ref 4). Graph: radiographic regression by herniation morphology.

MRI Anatomy and Clinical Recovery: Two Distinct Outcomes

el Barzouhi et al., 2013 • Repeat MRI at 1 year (267 patients) • Surgery and conservative care in the same cohort

1 ANATOMY ON MRI

By treatment actually received (as-treated)

MRI finding	Surgery	Conservative
Herniation still visible	21%	60%
Root compression still visible	16%	39%
Baseline root compression resolved*	82%	60%

**Resolution refers to change from baseline among those with root compression at baseline.*

Compression = structural narrowing on MRI (not EMG findings).

2 CLINICAL RECOVERY

Patient-reported favorable recovery rates by MRI appearance at 1 year

MRI appearance at year 1	Patient-reported favorable recovery
Herniation still visible on MRI	85%
No herniation visible on MRI	83%

Each percentage is the recovery rate within that MRI group; they do not add to 100%.

Recovery was similar despite different MRI appearances at 1 year (P = .70).

Patients frequently recovered despite persistent disc herniation on MRI.

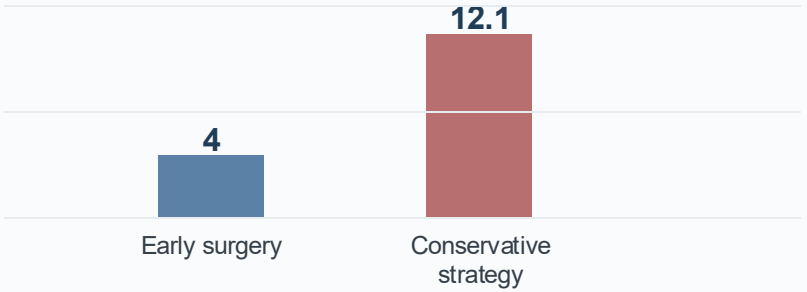
Radiographic resolution was not required for perceived recovery. Next: Does surgery change how quickly patients recover?

el Barzouhi A, et al. N Engl J Med. 2013;368:999-1007. doi:10.1056/NEJMoa1209250.

Peul Randomized Trial: Early Surgery Speeds Recovery

Median time to recovery

Faster recovery with early surgery (HR 1.97; P<.001)



Peul et al., 2007 — RCT

283 patients with 6–12 weeks of severe sciatica and concordant disc herniation.

Early surgery: scheduled within 2 weeks of randomization (actual mean 2.2 weeks).

Conservative strategy: 6 more months of care, with earlier surgery if needed.

Among conservatively assigned patients, 39% had surgery (mean 18.7 weeks).

Outcome	Early surgery	Conservative strategy
Randomized patients	141	142
Underwent surgery within 1 year	**89%**	**39%**
Median time to recovery	**4.0 weeks**	**12.1 weeks**
Cumulative recovery probability by 1 year	**95%**	**95%**

95% is cumulative recovery over follow-up; 39% assigned conservative care eventually had surgery.

Earlier surgery speeds relief; symptoms and patient goals guide treatment timing.

Peul et al. N Engl J Med. 2007;356:2245-2256. Reference 5.

Clinical Patterns Narrow the Differential

A constellation of clinical clues can be more informative than any isolated symptom or MRI finding.

Leading diagnosis	History that raises suspicion	Exam clue
Neurogenic claudication	Leg pain/heaviness with standing or walking; sitting or flexion helps	Posture-dependent gait tolerance
Vascular claudication	Exertional discomfort, often calf-dominant; relief with rest while upright	Pulses; consider ABI
Hip pathology	Groin or anterior-thigh pain; difficulty with shoes or socks	Painful/restricted hip rotation
Sacroiliac / pelvic pain	Posterior pelvic or buttock pain; may refer into the thigh	SI provocation maneuvers

NADEAU ET AL., 2013 | THE COMBINATION OF SYMPTOMS IS THE DIAGNOSTIC CLUE

LR+ 13

NEUROGENIC — FOUR FEATURES TOGETHER

Standing provokes · sitting relieves · above-knee symptoms · shopping-cart sign

LR+ 20

VASCULAR — TWO FEATURES TOGETHER

Calf symptoms · relief by stopping while standing

LR+ = positive likelihood ratio for the combined pattern—not an individual symptom. Small study (n=53); wide confidence intervals.

When historical clues converge, they strengthen the working diagnosis; examination tests that hypothesis.

Nadeau et al. Can J Surg. 2013;56:372-377 (ref 8); Metcalfe et al. JAMA. 2019 (ref 10); Saueressig et al. JOSPT. 2021 (ref 15).

Next: Can the Examination Support the Syndrome?

A focused examination should do more than reproduce pain. It should test the history and look for competing explanations.

01 LOCALIZE

Myotomal strength, reflexes, sensory asymmetry

Does the exam support a particular root?

02 REPRODUCE

Straight-leg raise, femoral stretch, gait or extension provocation

Can I reproduce the reported syndrome?

03 CHALLENGE

Hip range of motion, vascular pulses, SI provocative tests

Is a nonspinal source more likely?

HISTORY → EXAMINATION → MRI CONCORDANCE

Concordant findings increase confidence; a normal examination does not exclude radiculopathy.

Clinical diagnostic framework. Root localization and diagnostic-test limitations are reviewed in the following slides (refs 9, 10, 15).

Can the Examination Help Localize the Symptomatic Nerve Root?

Root	Motor / functional testing	Reflex / sensory findings	Neural tension
L2–L3	Hip flexion; sit-to-stand	Anterior thigh / medial knee	Femoral stretch
L4	Quadriceps; ankle dorsiflexion	Patellar reflex; medial shin / ankle	Femoral stretch
L5	EHL; hip abduction; heel walking	Dorsum of foot / great toe; no reliable reflex	Straight-leg raise
S1	Single-leg heel raises; toe walking	Achilles reflex; lateral foot	Straight-leg raise

Suri et al.: **L4 patellar reflex asymmetry: LR+ 7.7** **L5 hip-abductor weakness: LR+ 11**

Wide confidence intervals; reference standard was MRI-defined nerve root impingement.

No single sign reliably identifies the symptomatic root. Concordant motor, sensory, reflex, and provocative findings strengthen localization.

Suri P, Rainville J, Katz JN, et al. Spine. 2011;36(1):63-73. Reference 9.

Physical Examination: Specific Findings Help; Normal Findings Don’t Exclude

Examination finding and MRI reference region	Sensitivity	Specificity
Straight-leg raise — L5–S1	**69%**	**84%**
Femoral stretch — L2–L4	**50%**	**100%**
Hip-abductor weakness — L5	**29%**	**97%**
Achilles reflex asymmetry — L5–S1	**29%**	**96%**

Suri et al.: n=54; regional L2–L4 / L5–S1 tests and an L5-specific test; reference standard was MRI-defined root impingement.

Positive findings
Highly specific findings can substantially strengthen a suspected root level.

Negative findings
Limited sensitivity means a normal examination cannot exclude root impingement.

Combining tests: L2–L4

Femoral stretch OR sit-to-stand: 72% sensitivity • 90% specificity • LR+ 7.0

A positive exam can strengthen MRI concordance; a normal exam does not exclude clinically important radiculopathy.

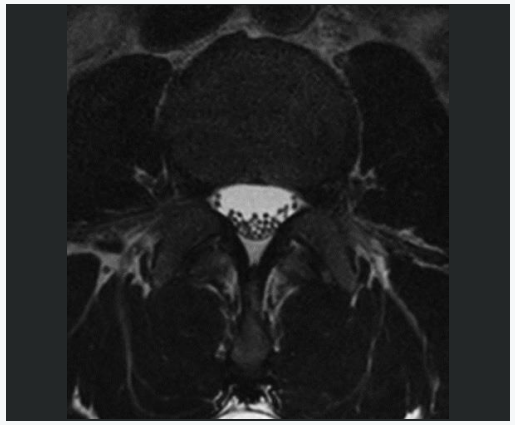
Study limitation: small cohort; MRI-demonstrated root impingement—not independently confirmed symptomatic radiculopathy—was the reference standard.

Suri P, Rainville J, Katz JN, et al. Spine (Phila Pa 1976). 2011;36(1):63-73. Ref 9.

Lee Grading: Lumbar Central Canal Stenosis

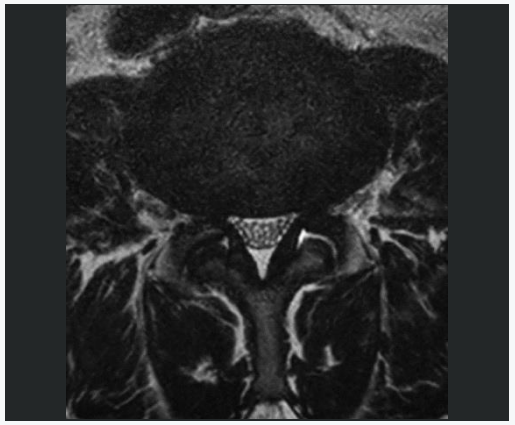
AXIAL T2 | Grade by loss of CSF space and cauda equina crowding

Grade 0
Normal



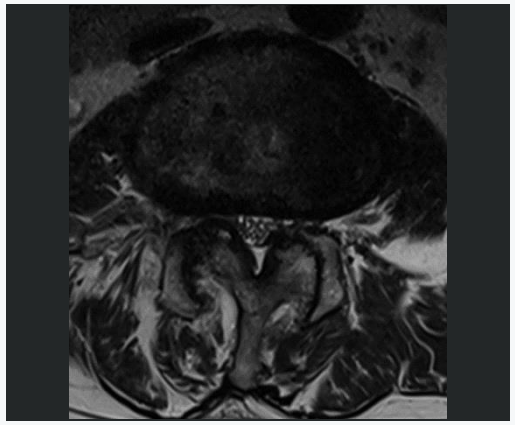
CSF preserved; rootlets individually identifiable.

Grade 1
Mild



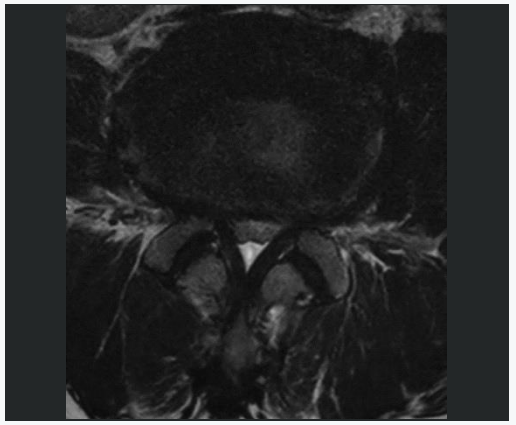
Anterior CSF partly lost; all rootlets remain separate.

Grade 2
Moderate



Some cauda equina rootlets aggregate and cannot be separated.

Grade 3
Severe



Marked CSF effacement; rootlets crowd into one bundle.

MRI grading describes anatomy. Even grade 3 narrowing requires concordant symptoms and examination to establish clinical significance.

MRI images: Seo J, Lee JW. Korean J Radiol. 2023;24(3):224-234. Fig 1. CC BY-NC 4.0. Ref 7.

Lee Grading: Lumbar Neural Foraminal Stenosis

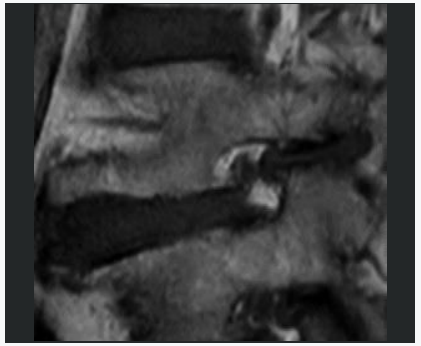
SAGITTAL T1 | Grade by loss of perineural fat and exiting-root shape

Grade 0
Normal



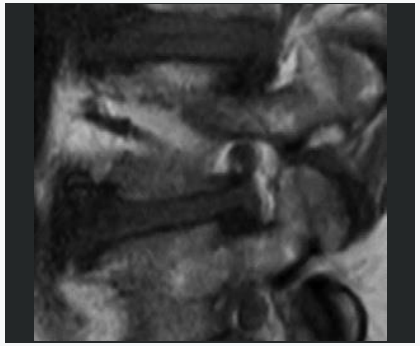
Fat preserved around root.

Grade 1
Transverse



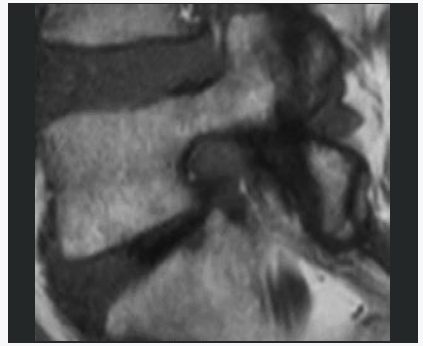
Opposing-side fat loss; root shape preserved.

Grade 1
Vertical



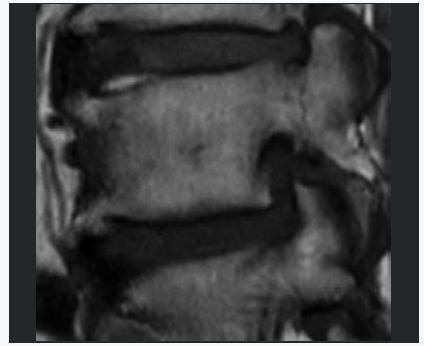
Opposing-side fat loss; root shape preserved.

Grade 2
Moderate



Fat lost vertically and transversely; root not deformed.

Grade 3
Severe



Visible exiting-root collapse or deformation.

LEE GRADING DOES NOT CLASSIFY LATERAL RECESS STENOSIS: assess the traversing root separately.

At L4–5: foraminal narrowing → exiting L4 root; lateral recess narrowing → traversing L5 root.

MRI images: Seo J, Lee JW. Korean J Radiol. 2023;24(3):224-234. Fig 3. CC BY-NC 4.0. Ref 7.

What Can MRI Tell Us About the Pain Generator?

NEURAL COMPRESSION SYNDROMES

MRI helps localize a suspected neural lesion

Suspected diagnosis	Clinical presentation	MRI contribution	Important limitation
Radiculopathy	Radiating leg pain; possible neurologic deficit	Root compression, level and laterality	Root contact does not establish symptomatic radiculopathy
Neurogenic claudication	Standing/walking intolerance; relief in flexion	Central stenosis and cauda equina crowding	MRI severity imperfectly predicts symptom severity

AXIAL LOW BACK PAIN GENERATORS

MRI may suggest a structure, but seldom establishes causation

Facet-mediated pain	Predominantly axial pain; nonspecific features	Facet arthrosis or effusion	Degeneration alone does not establish facetogenic pain
Disc-associated pain	Back-dominant pain; sometimes referred pain	Disc degeneration and annular fissures	These findings are common in asymptomatic adults
Vertebrogenic pain	Chronic axial low back pain	Modic type 1/2 endplate changes may support	An imaging biomarker does not prove causation

MRI can identify plausible pain generators, but an abnormal structure is not necessarily the source of pain.

Evidence synthesis: asymptomatic imaging, stenosis grading and axial pain literature (refs 1, 2, 7, 14–16).

Axial Back Pain: MRI Findings Are Clues

MRI finding	Evidence	Clinical implication
Facet arthropathy	Facet consensus guidelines: weak or no evidence that MRI/CT can identify painful facet joints before diagnostic blocks. [14]	Facet arthrosis or effusion alone should not determine selection for medial branch procedures.
Disc degeneration / annular fissure	Annular fissure association with back pain: OR 1.79 (95% CI 0.97–3.31; P=.06) in adults 50 years or younger. [2]	A fissure or degenerative disc does not independently establish discogenic pain.
Modic type 1/2 changes	Pooled differences by Modic status: only 0.38/10 for back pain and 2.52/100 for ODI—below clinical importance. [16]	Endplate changes may support a vertebrogenic hypothesis; they do not confirm causation.

IMPORTANT NUANCE | VERTEBROGENIC PAIN

In the INTRACEPT RCT, patients with chronic axial pain and Modic 1/2 changes (L3–S1) benefited from basivertebral nerve ablation vs standard care. Treatment-selection value does not make Modic changes a stand-alone diagnostic test. [23]

MRI may guide treatment selection without definitively establishing the source of axial low back pain.

References 2, 14, 16, 23.

Bringing the Pieces Together: The Role of Special Tests

History, examination, and MRI establish the working diagnosis. Focused tests can strengthen it.

01 EMG / NCS

Physiologic evidence

Corroborate motor-root dysfunction and distinguish radiculopathy from peripheral neuropathy.

02 Diagnostic blocks

Concordant response

A targeted anesthetic response can support the suspected pain generator and refine treatment planning.

03 Treatment planning

Actionable information

Use a test when the result could change the diagnosis, treatment target, or next step.

HISTORY + EXAM + MRI → FOCUSED SPECIAL TESTS → GREATER CONFIDENCE

Used selectively, special tests bring the clinical picture together and guide more confident treatment decisions.

Clinical framework; diagnostic-test evidence on subsequent slides (refs 11, 13, 14).

EMG/NCS — Adding Physiologic Evidence to MRI

Clinical question	What electrodiagnostic testing can contribute
Is there physiologic motor-root dysfunction?	Needle EMG can identify denervation and reinnervation patterns in a myotomal distribution.
Radiculopathy or peripheral neuropathy?	Nerve conduction studies can detect distal sensory abnormalities and length-dependent neuropathy.
Root lesion or focal nerve entrapment?	EMG/NCS helps distinguish radiculopathy from peroneal, tibial, and other mononeuropathies.
Which root is involved in multilevel disease?	Myotomal abnormalities and chronicity can support localization when appropriate muscles are sampled.

HIGH SPECIFICITY

A positive study strengthens evidence for motor axonal radiculopathy.

MODEST SENSITIVITY

A normal study cannot exclude sensory-predominant or early radiculopathy.

Clinical example: bilateral distal numbness + multilevel stenosis + stocking sensory loss → evaluate for neuropathy.

EMG/NCS adds value when it answers an unresolved question and the result can change management.

Dillingham TR, et al. Muscle Nerve. 2020;62:462-473. Reference 11.

MRI and EMG: Different Questions, Complementary Answers

MRI

ANATOMICAL EVIDENCE

Identifies the location and morphology of a potential compressive lesion. Findings may be incidental.

EMG/NCS

PHYSIOLOGIC EVIDENCE

Evaluates motor-axon root dysfunction and competing neuropathies. May be normal in sensory-only radicular pain.

40.8%

SAME LEVEL + SIDE

Montaner-Cuello et al. (2024) | 142 patients with suspected radiculopathy

Agreement required MRI and EDX to identify involvement at the same spinal level and on the same side.

Not the percentage of MRI-positive levels "confirmed" by EMG; neither test was an independent gold standard.

Test pattern	Possible clinical interpretation
MRI+ / EMG+	Concordant structural and motor-axon findings may strengthen localization to the same root.
MRI+ / EMG−	Compression is visible, but motor axonal injury is not demonstrated; sensory irritation remains possible.
MRI− / EMG+	Physiologic root dysfunction without a clear MRI correlate; reassess imaging and competing diagnoses.

Interpretation patterns are clinical reasoning examples, not a validated algorithm from the study.

When MRI and EMG agree, confidence may increase; when they differ, the findings can refine the diagnosis.

Montaner-Cuello A, et al. Diagnostics. 2024;14(12):1258. Reference 12.

Selective Nerve Root Blocks: Supporting Surgical Level Selection

BEYNON ET AL., 2019 | 3 POSTOPERATIVE-OUTCOME COHORTS (6 STUDIES REVIEWED)

SENSITIVITY

90.9% 95% CI 83.1–95.3%

Of patients who later improved after surgery, 90.9% had a positive block.

SPECIFICITY

22.0% 95% CI 7.4–49.9%

Of patients who did not improve after surgery, 22.0% had a negative block.

A positive block = substantial short-term relief of familiar radicular pain after local anesthetic. The outcome reference was surgery—not needle-placement accuracy.

SURGICAL DECISION POINT	HOW THE BLOCK CAN HELP
When to consider a block	Multilevel disease or an unclear symptomatic root before surgery.
Meaningful positive response	Marked relief of familiar radicular pain within the anesthetic window.
Surgical level selection	A concordant block supports choosing that root for decompression.
Technical quality matters	Contrast-guided targeting and limited spread improve interpretability.

Evidence caveat: pooled specificity was low and all six studies had high risk of bias; a positive response supports, but doesnot guarantee, surgical benefit.

A strong, concordant block supports the proposed surgical target and potential benefit.

Beynon et al. BMJ Open. 2019;9:e025790 (ref 13). Yeom et al. AJNR. 2008;29:1017-1023 (ref 24).

Diagnostic Blocks: Adding Confidence in Axial Pain

Targeted anesthetic responses may clarify axial pain when imaging cannot.

SUSPECTED GENERATOR	TARGETED TEST	WHAT CONCORDANT RELIEF ADDS
Facet-mediated pain	Lumbar medial branch block	Supports facet innervation involvement and helps select patients for medial branch RFA.
SI joint complex pain	Image-guided intra-articular anesthetic injection	Supports an intra-articular SI contribution when familiar pain improves in the anesthetic window; does not test all extra-articular sources.

SAUERESSIG ET AL., 2021 | SI JOINT PROVOCATION TEST CLUSTERS

LR+ **2.13** LR− **0.33**

Negative clusters are more useful for reducing suspicion than positive clusters are for confirming SI pain.

5 studies · very low-certainty diagnostic evidence

Interpretation depends on accurate targeting, controlled anesthetic spread, and relief of the patient's familiar pain.

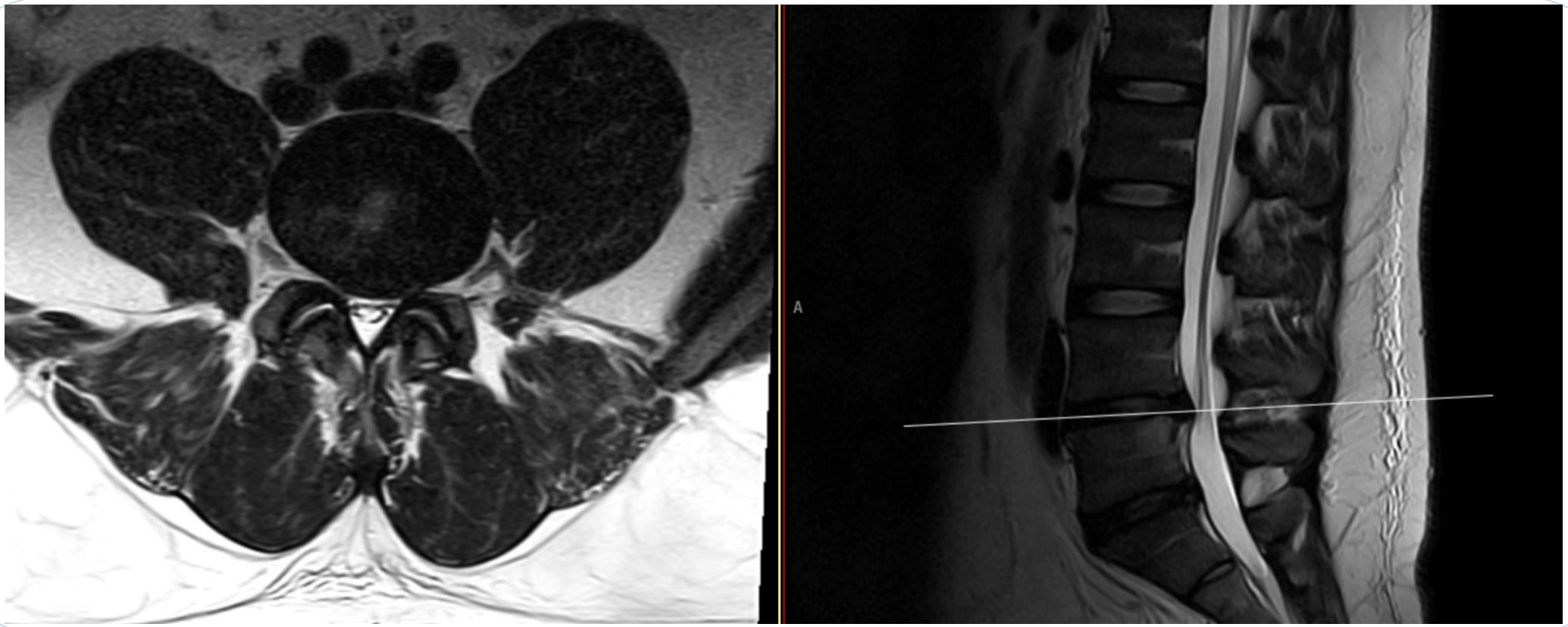
A concordant diagnostic block can strengthen the suspected diagnosis and guide treatment selection.

Cohen et al., 2020 (ref 14); Saueressig et al., 2021 (ref 15); McCormick et al., 2025 (ref 25).

When MRI Fits—and When It Doesn’t: Discordance

CASE A | DISCORDANCE

Insulin-treated diabetes · Bilateral burning feet · Stocking sensory loss and generalized hyporeflexia



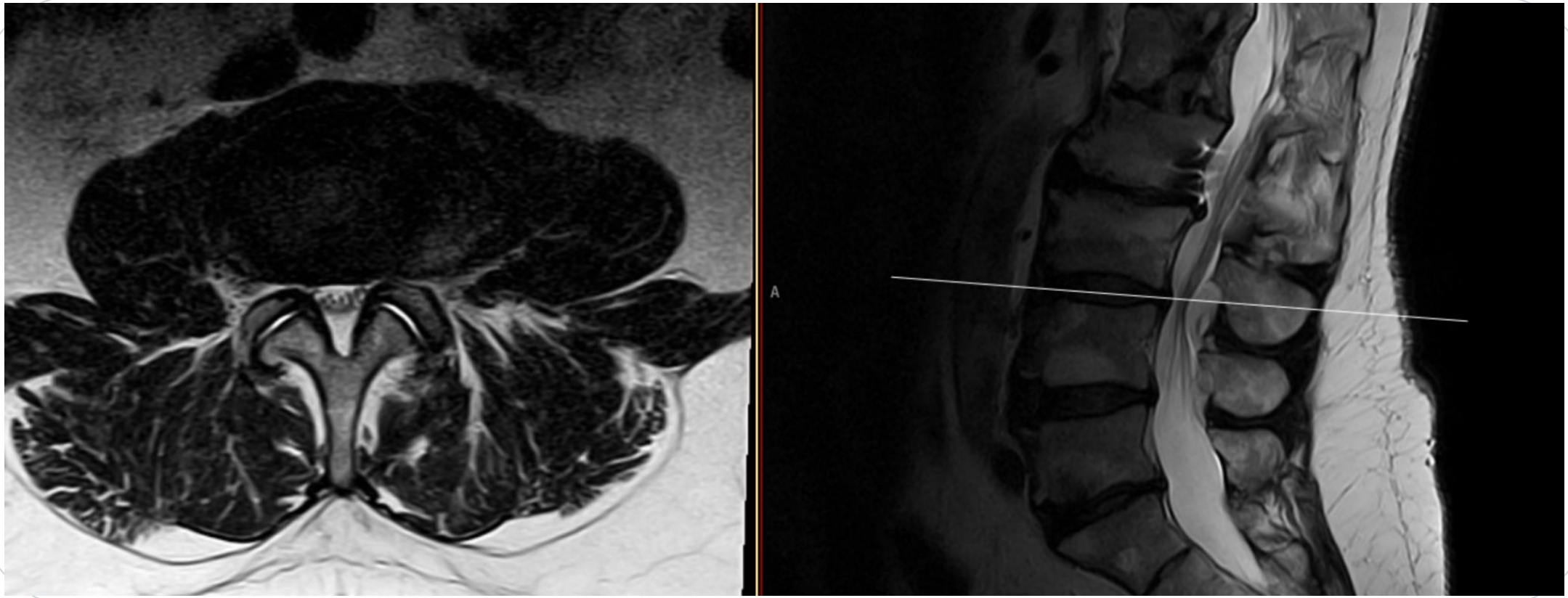
Multilevel stenosis on MRI does not explain every symptom; EMG/NCS can test for peripheral neuropathy.

Illustrative composite cases with deidentified MRI.

When MRI Fits—and When It Doesn’t: Concordance

CASE B | CONCORDANCE

Right L5-pattern pain · EHL weakness · Right L4–5 lateral recess stenosis · EMG-confirmed L5 radiculopathy



Concordant relief after L4–5 interlaminar ESI further supports the suspected right L5 pain generator.

Illustrative composite cases with deidentified MRI.

Bring the four pieces together before intervention

01	02	03	04	05
Presentation	**Examination**	**MRI findings**	**Special tests**	**Treatment**
What syndrome and trajectory?	Can I localize or identify a mimic?	Does anatomy fit the suspected generator?	Would results change localization or care?	Act on concordance, goals and risk

Red flags supersede the routine pathway

Possible cauda equina syndrome, progressive major neurologic deficit, infection, malignancy or acute fracture require urgent assessment.

MRI informs the diagnosis and the plan. Neither should be made from MRI alone.

Clinical synthesis; urgent evaluation scenarios per ACR Appropriateness Criteria (ref 17).

MRI Doesn't Lie—It Changed What We Can See

Powerful anatomical imaging has transformed diagnosis and operative planning.

DETECTING SPINAL INFECTION

97%

Sensitivity

93% specificity

Native vertebral osteomyelitis; IDSA guideline evidence (ref 26).

DETECTING SPINAL METASTASES

93%

Sensitivity

85% specificity

Per-patient meta-analysis: 25 studies, 3,102 patients (ref 27).

WHAT MRI GIVES SPINE CARE

A noninvasive anatomic map

Discs, nerve roots, marrow, and soft tissues

Multiplanar surgical planning without ionizing radiation (ref 28)

Diagnostic performance for infection and metastases is not evidence that MRI alone identifies degenerative pain generators.

The diagnostic power of MRI is extraordinary, but the clinical value of imaging depends on how and when we use it.

Berbari et al., 2015 (26); Harlianto et al., 2025 (27); Levent et al., 2025 (28).

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