



Non-CME Webinar Series
designed with the trainee in mind

first Tuesday of the month



When to Order and How to Interpret? Imaging in Pain Medicine

Rene Przkora, M.D., Ph.D.
Division of Pain Medicine
Department of Anesthesiology
University of Florida



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Disclosures

- Chief, Pain Medicine Division, University of Florida College of Medicine, Gainesville, FL
- Director, Pain Medicine Fellowship, University of Florida College of Medicine, Gainesville, FL
- Past President and Board Member, Association of Pain Program Directors (APPD)
- Committee member: American Society of Anesthesiologists, American Society of Regional Anesthesia and Pain Medicine, Society of Academic Associations of Anesthesiology and Perioperative Medicine, and American Society of Interventional Pain Physicians
- Board member, Florida Society of Interventional Pain Physicians
- NIH funding
- Educational grants from Boston Scientific, Abbott, and Medtronic
- Post-marketing industry grants from Abbott and Boston Scientific



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1. Spinal Epidural Hematoma 2. Lumbar Disc Herniation

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Spinal Epidural Hematoma

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Back Pain – Red Flags – Immediate Evaluation(!):

- New neurological deficits (including extremities)
- Progressive neurological deficits
- Saddle anesthesia
- Anal sphincter weakness



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Spinal Epidural Hematoma:

- Spinal epidural hematoma is a collection of blood in the potential space between the dura and the periosteum.
- Usually venous in origin.
- Etiology:
 - spontaneous: most common (especially in the context of a bleeding disorder or anticoagulation)
 - trauma
 - iatrogenic, for example lumbar puncture, epidural anesthesia



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Spinal Epidural Hematoma:

Is an EMERGENCY

When remotely considering it, order imaging!



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Spinal Epidural Hematoma Diagnostic Imaging:

As the hematoma can expand over several segments, the entire spine should be imaged.



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Spinal Epidural Hematoma Diagnostic Imaging:

CT

non-contrast: hyperdense (50-70 HU) extradural mass

MRI – recommended diagnostic tool!

Signal characteristics will vary on the age of the blood.



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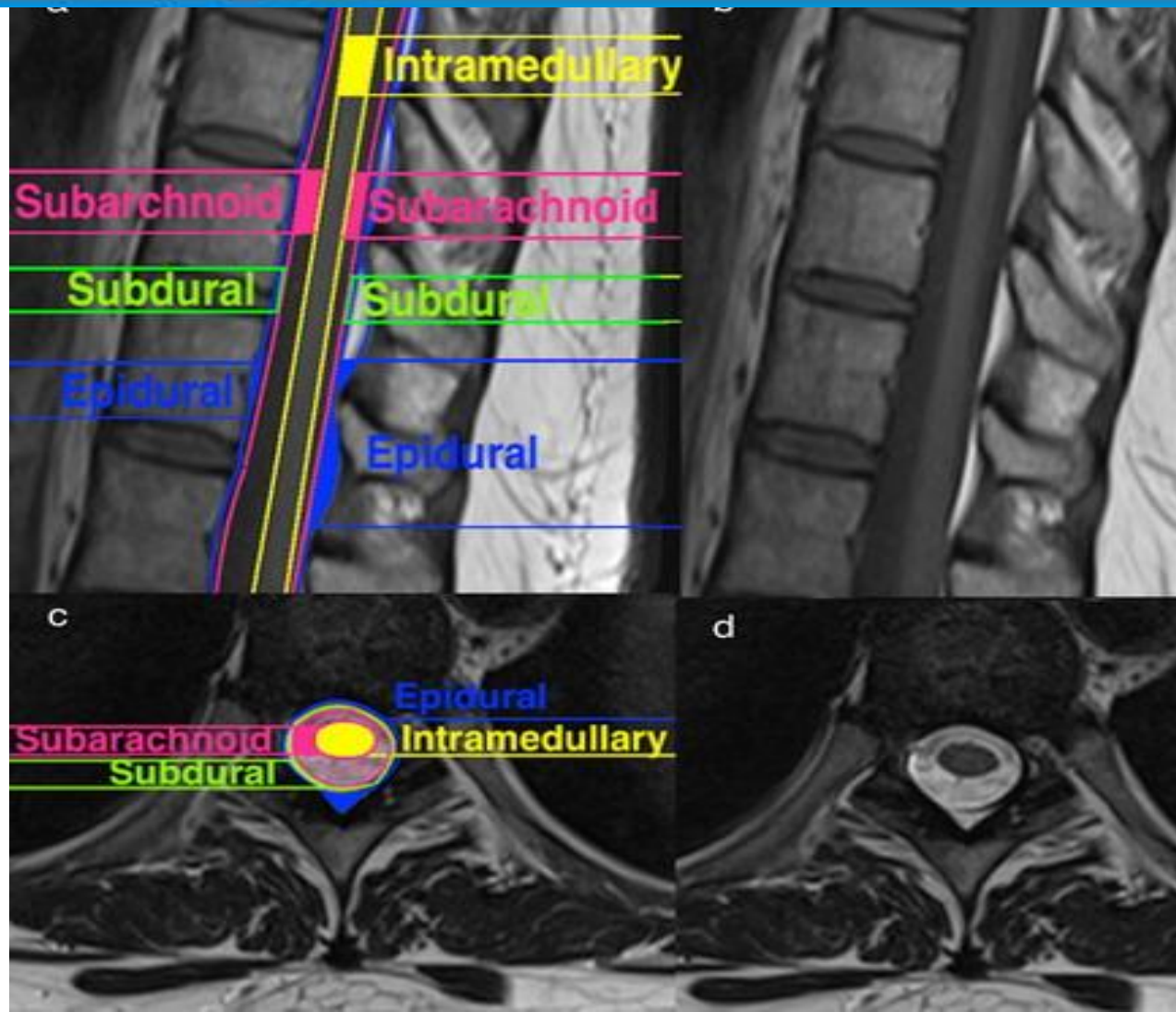
Stage	Time	Component	T1	T2
Hyperacute	<24 h	Oxyhaemoglobin	Hypointense	Hyperintense
Acute	1–3 days	Deoxyhaemoglobin	Isointense	Hypointense
Subacute–early	3–7 days	Intracellular methaemoglobin	Hyperintense	Hypointense
Subacute–late	1–2 weeks	Extracellular methaemoglobin	Hyperintense	Hyperintense
Chronic	>2 weeks	Haemosiderin	Hypointense	Hypointense



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Spinal Anatomy:

Figure 1. Sagittal T1 (a) with annotations depicting the meningeal spaces and (b) unannotated.

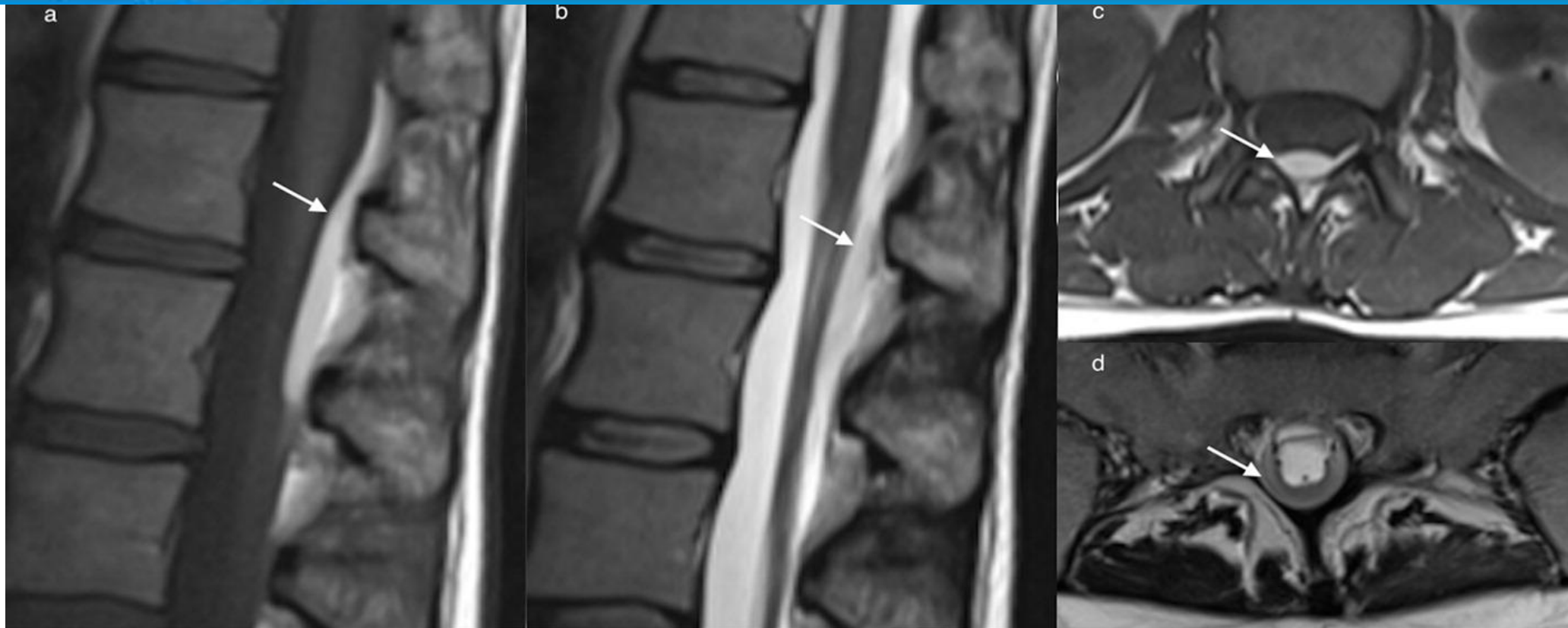
Axial T2 (c) with annotations depicting the spinal meningeal spaces and (d) unannotated.



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Spinal Epidural Hematoma:

Figure 2. Sagittal T1 (a) and T2 (b) weighted images and axial T1 (c) and T2 (d) weighted images of the lumbar spine depicting a posterior epidural haematoma (white arrows). Loss of the normal epidural fat signal in the posterior epidural space is a useful locational sign. Bulging of the dura into the canal may be seen as a smooth thin hypointense line displaced by the haematoma.



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ADDITION:

Spinal Subdural Hematoma:

- A subdural hematoma occurs in the potential space between the dura and arachnoid mater.



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Spinal Subdural Hematoma:

Figure 6. Axial (a, b) and sagittal (c) T2 imaging demonstrates subdural haematoma extending from C7 - T5 posteriorly, surrounding the cord at the T1 level (a). The haematoma is persistent on multiple sequences, including GRE, and causes mass effect on the cord (b), differentiating it from CSF flow artefact. Normal epidural fat is helpful to establish the presence of subdural haematoma. The inner contour of a subdural hematoma may be irregular, and is often concave.



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Spinal Epidural Hematoma Diagnostic Imaging: CT

CT

non-contrast: hyperdense (50-70 HU) extradural mass



Source: Internet



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Lumbar Disc Herniation

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Lumbar Disc Herniation – When to Order Imaging:

Symptoms (pain) not improving

Neurological deficits

Treatment planning

Uncertainty in the diagnosis

Preferred Technique: MRI



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Bulging versus Herniated Disc:

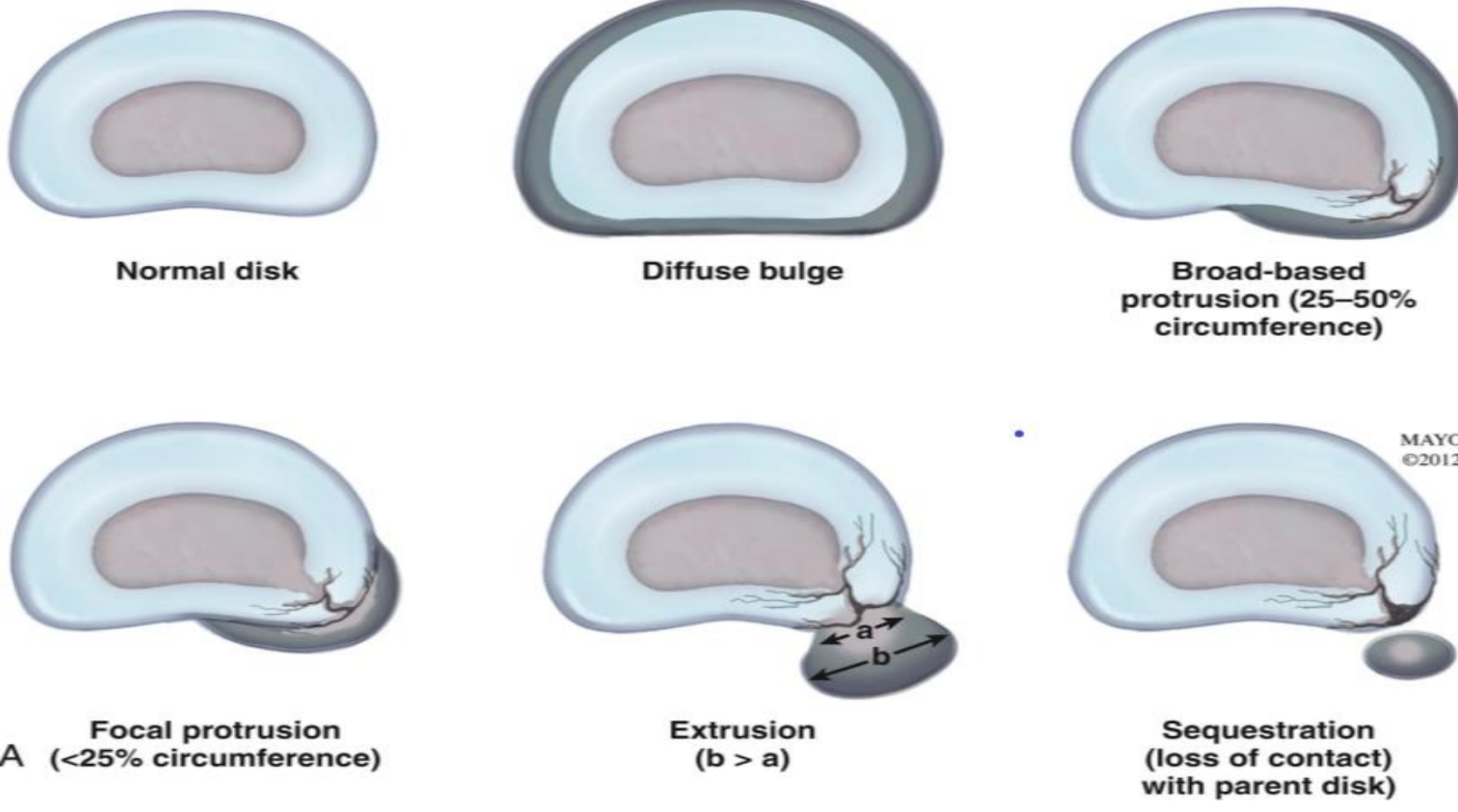
Bulging Disc:

Generalized displacement of the disc over 25% of the circumference of the disc (symmetric or asymmetric)

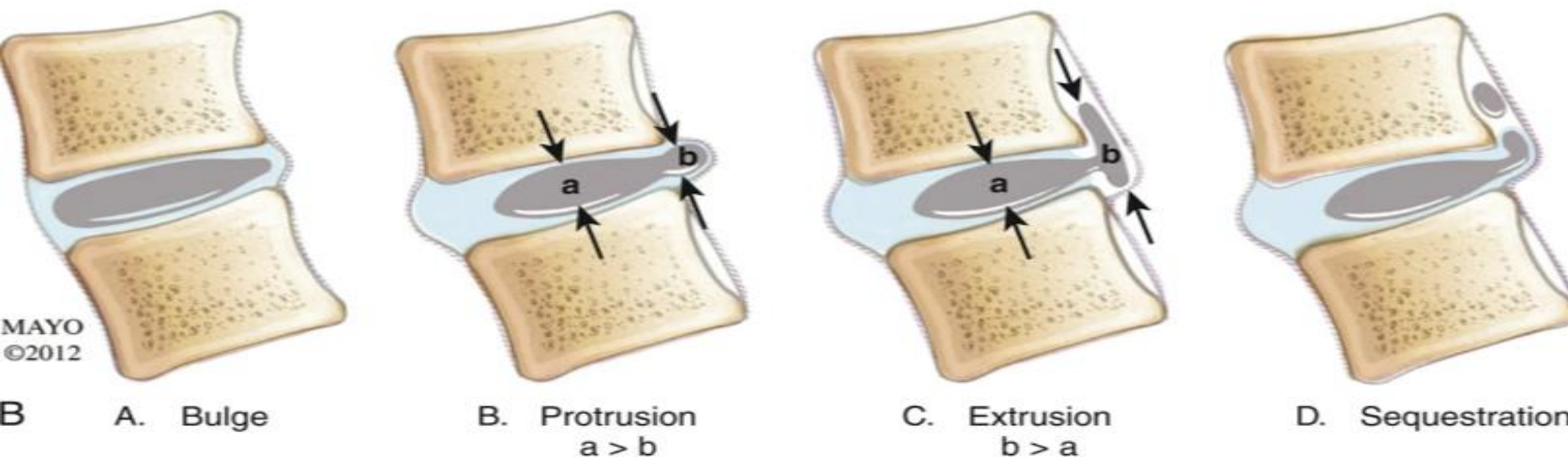
Herniated Disc:

Localized or focal displacement of disc material of less than 25% of the disc circumference in the AXIAL plane.

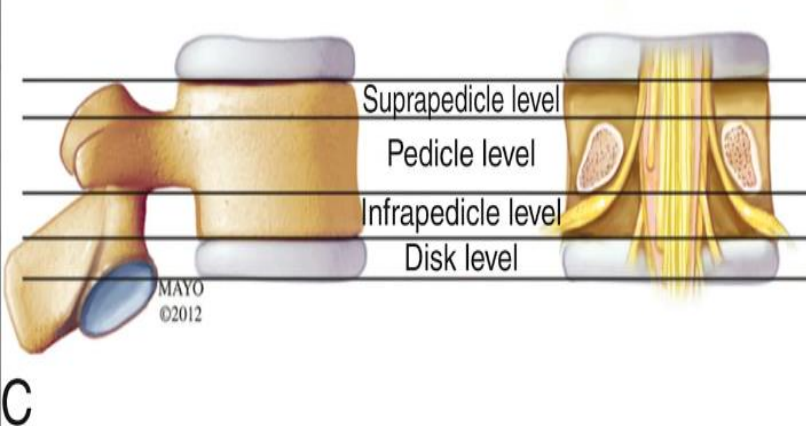
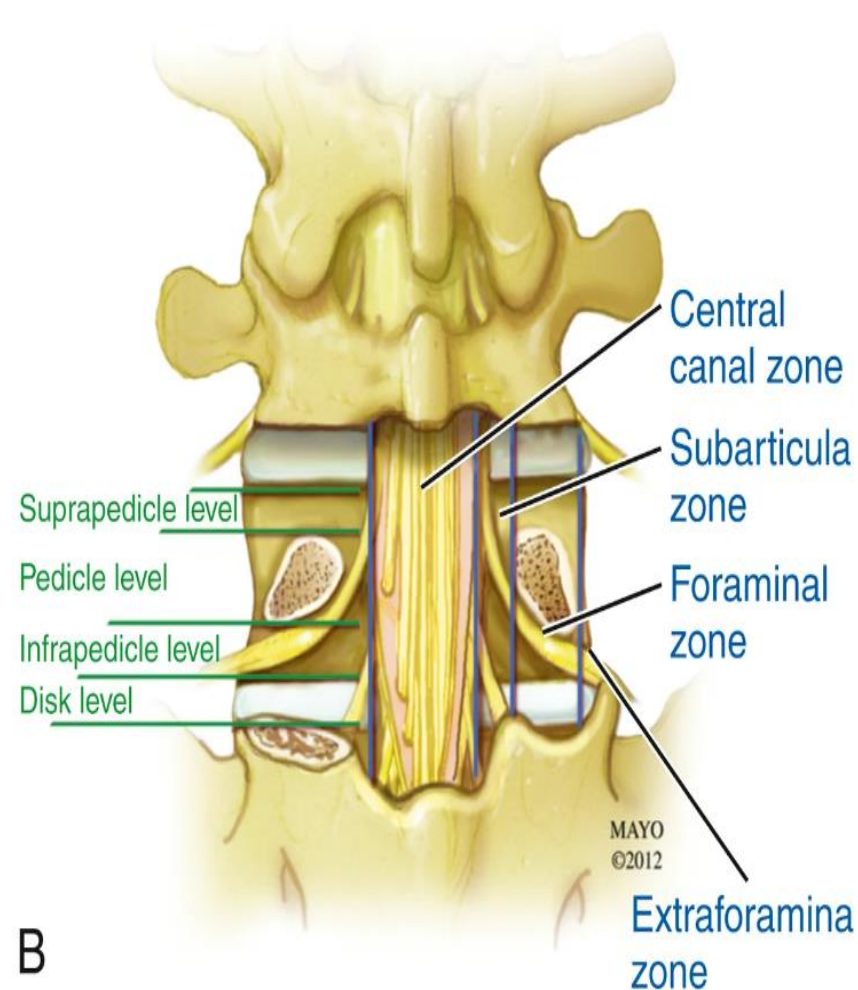
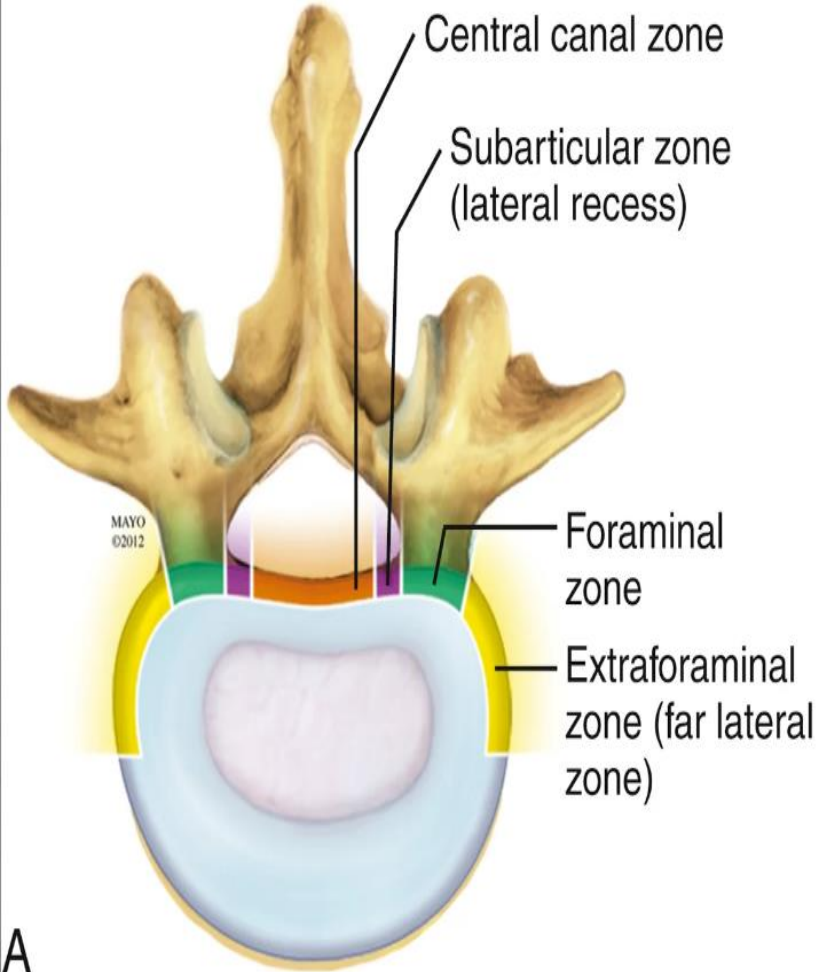
Benzon, Honorio, M. et al. Practical Management of Pain. Available from: Elsevier eBooks+, (5th Edition). Elsevier - OHCE, 2014.



Disc: Bulging and herniation definitions: Axial (A) and sagittal (B) planes.



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Zones and levels of disk displacement.

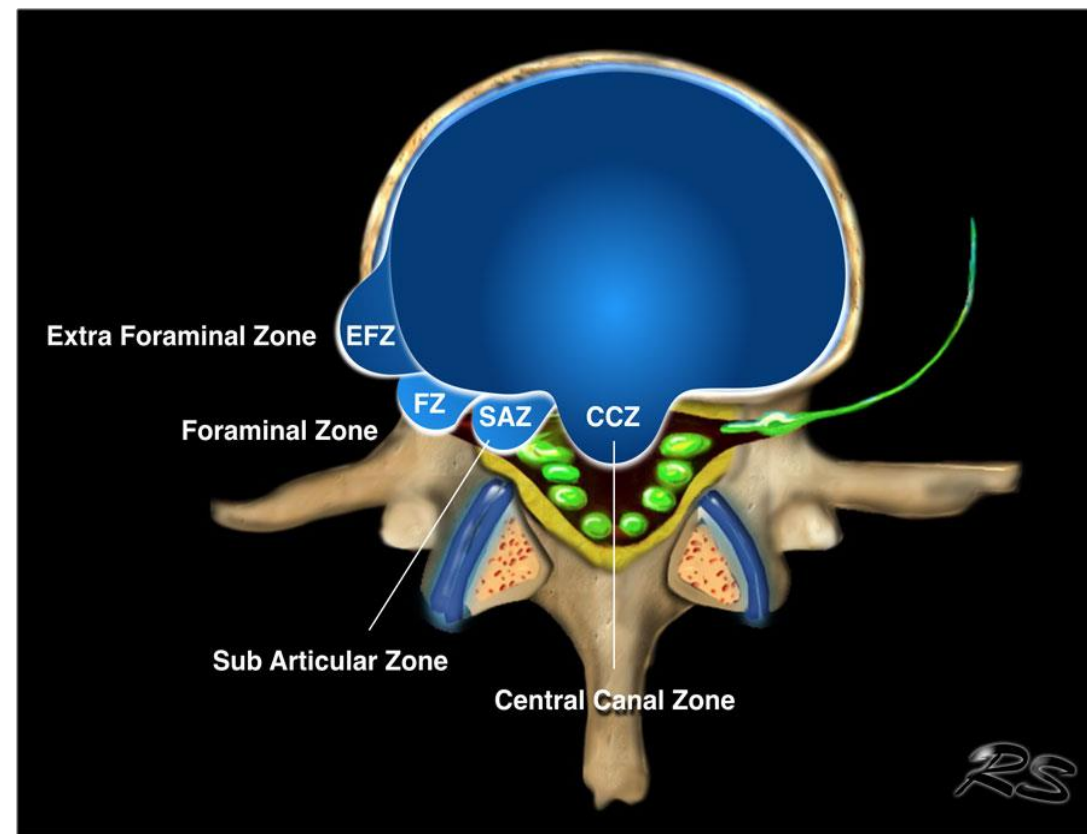
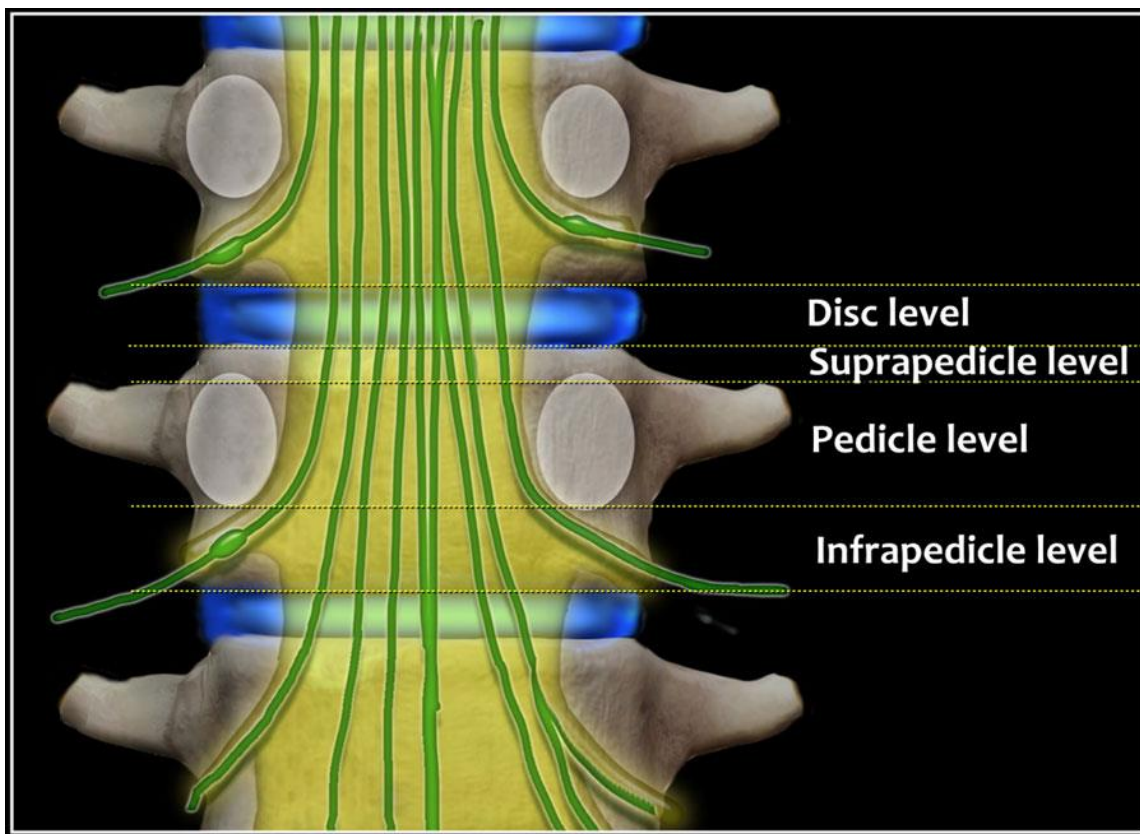
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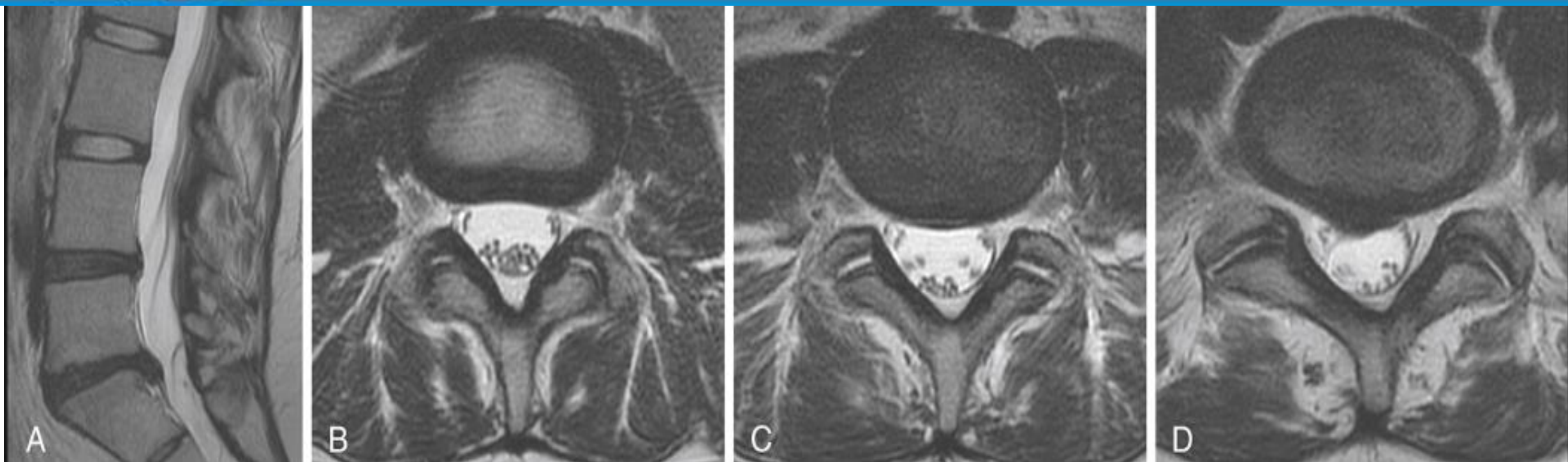
<https://radiologyassistant.nl/neuroradiology/spine/lumbar-disc-nomenclature-2-0>



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Sagittal T2 MRI (A) and axial T2 images at L3-4 (B), L4-5 (C), and L5-S1 (D) disks demonstrate a normal L3-4 disk, a central protrusion at L4-5, and a right central extrusion with caudal migration at L5-S1.

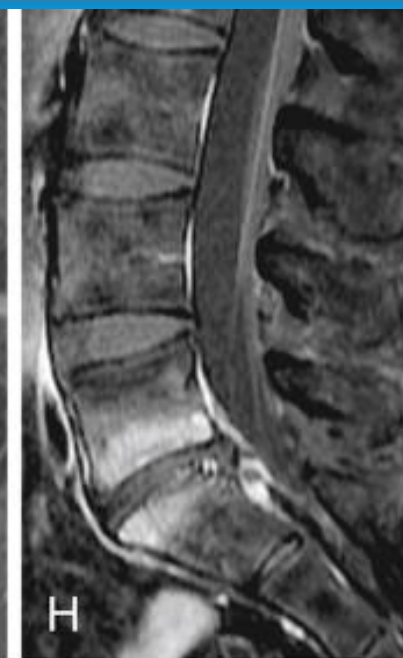
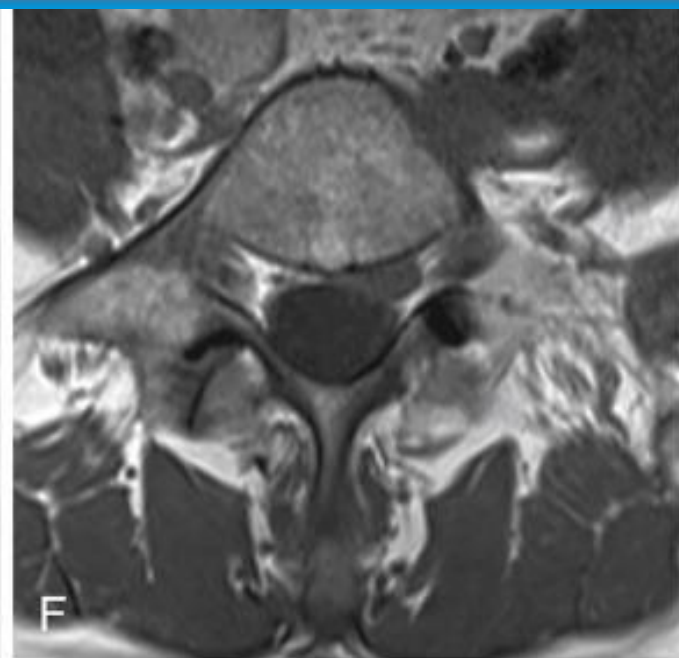
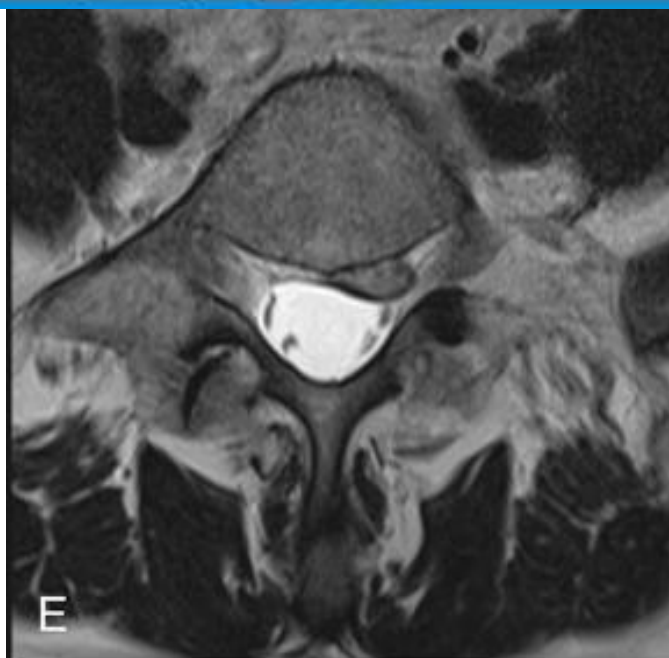
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Axial T2 (E) and T1 (F) MRI images at the S1 end plate level demonstrate a left-sided sequestered disk fragment contacting the thecal sac. Fat-saturated T1 axial image (G) and sagittal image (H) show that much of the apparent disk herniation enhances and is inflammatory reaction about a small disk fragment. Enhancing Modic I change is present.

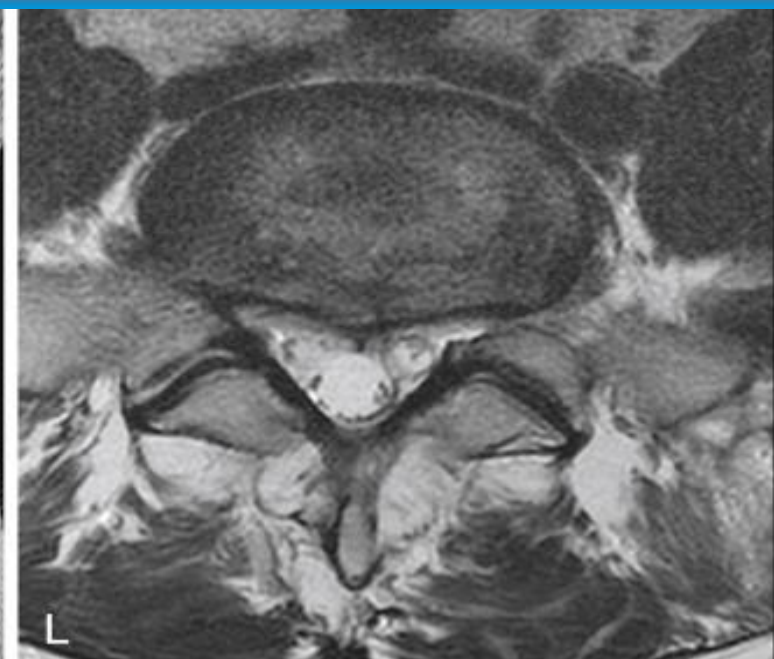
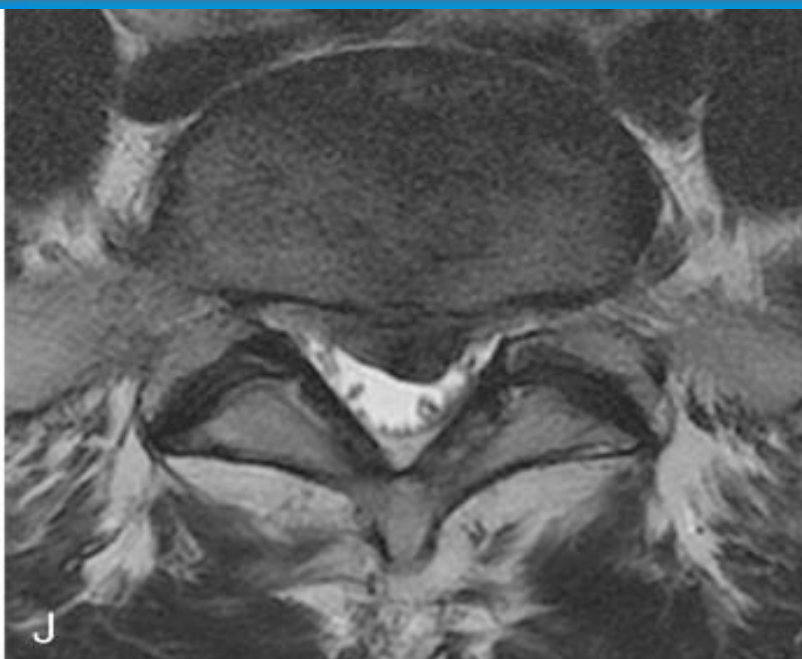
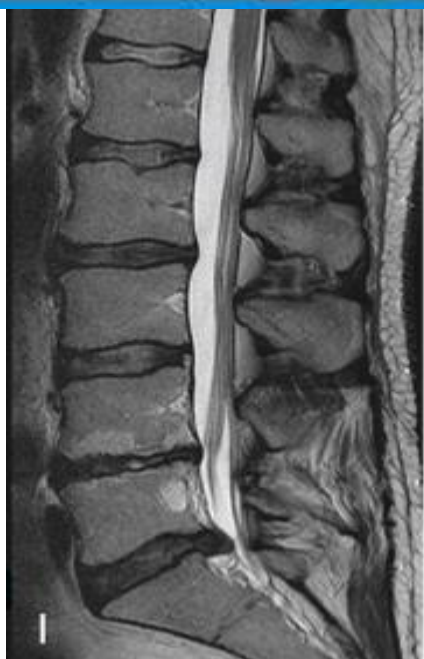
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A patient with left S1 radicular pain due to an L5-S1 disk extrusion (I, J). He returned 4 years later with new L5 distribution pain and was reimaged (K, L). Note that the L5-S1 extrusion has completely resolved; ([L] is at the identical level as [J]) and a new L4-5 extrusion has developed. The natural history of disk extrusion is resolution.

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- Thank you
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