

IMAGING OF LUMBOSACRAL SPINE

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LOW BACK ACHE

- Back pain that does not extend below iliac crest
- Acute VS chronic
- Diagnostic triage

Non specific low back pain

Specific low back pain

Sciatica and radicular pain



LAGS

RED

Fracture

Age>70

H/o osteoporosis

Trauma

Corticosteroid use

Tumour

Age>50

Unexplained weight loss

Incontinence

H/o previous cancer

Infection

H/o fever, chills

Recent skin / urinary infection

Immunosuppression

Recent spine surgery

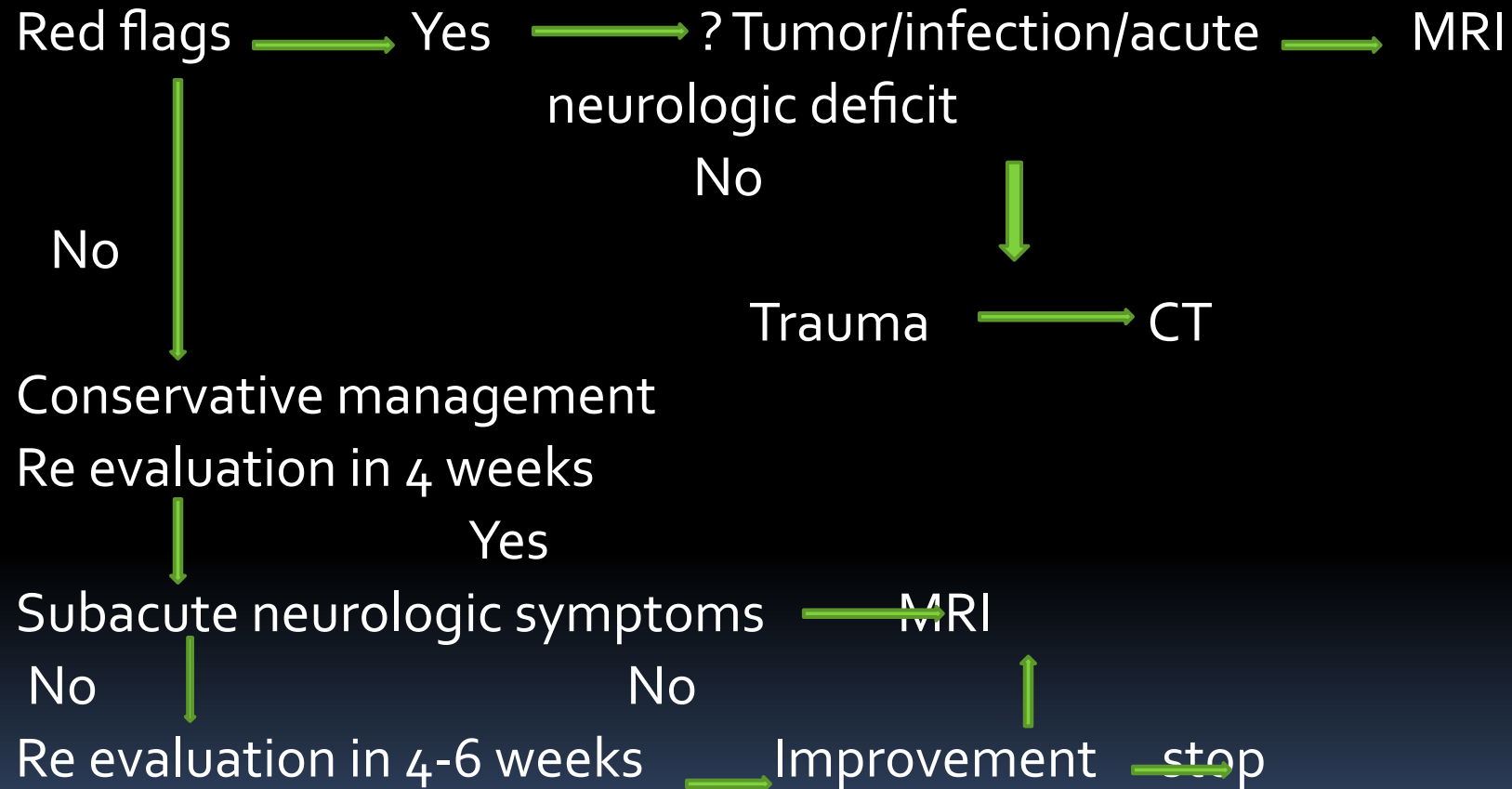
Neurologic

Sciatica

New onset urinary or fecal

Abnormal neurological signs

DIAGNOSTIC ALGORITHM





IMAGING MODALITIES

- Radiograph
- CT
- MRI
- Myelography
- CT myelography
- Discography
- Bone Scan

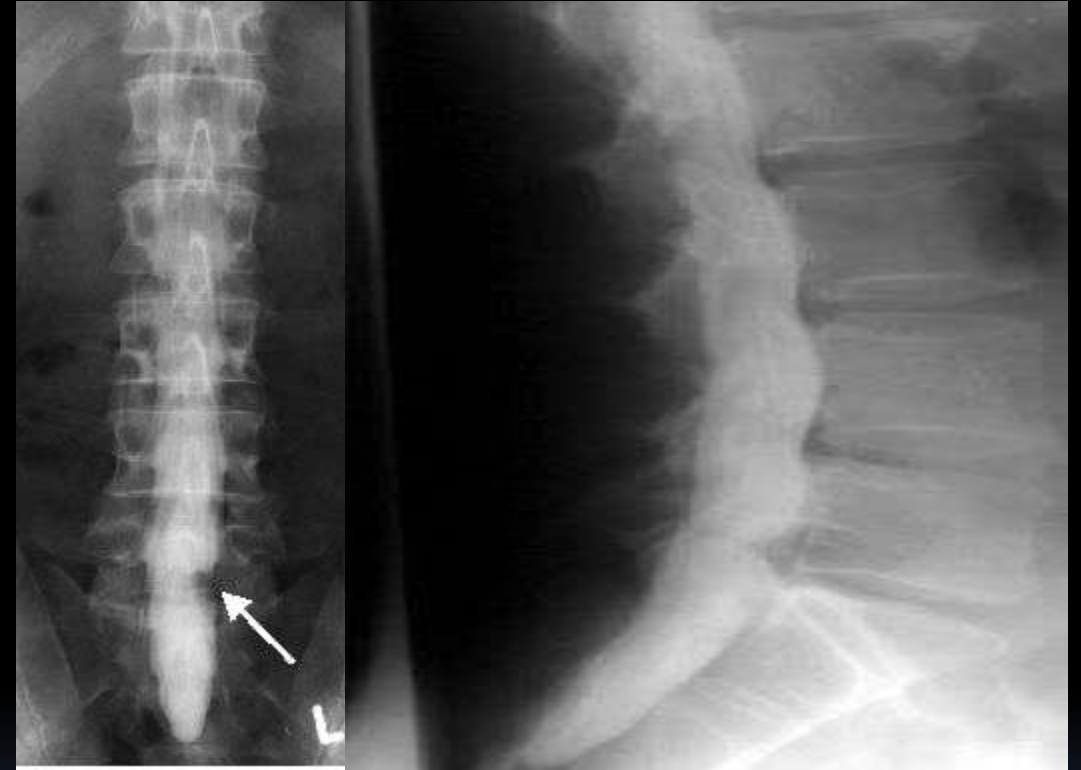
RADIOGRAPH

- Initial Investigation
- Alignment
- Assessment of bony density
- Disc and vertebral height
- Fracture
- Bony deformity
- Sacroilitis



MYELOGRAPHY

- Injection of contrast into subarachnoid space(L3-L4)
- Level of obstruction/filling defect
- Spinal cord tumours
- Nerve root injuries
- Herniated disc
- Cysts
- Replaced by CT/MRI



DISCOGRAPHY

- To prove that pain is of discogenic origin
- Fine needle inserted to centre of disc under fluoro guidance
- Contrast injected to stress the disc
- Patients pain response recorded
- Assess actual morphology of disc



Diagnose annular tears

CT

Best for:

Bony spinal stenosis

Fractures

Tumours

Calcification and air

- Poor differentiation of soft tissue within spine
- Radiation issues

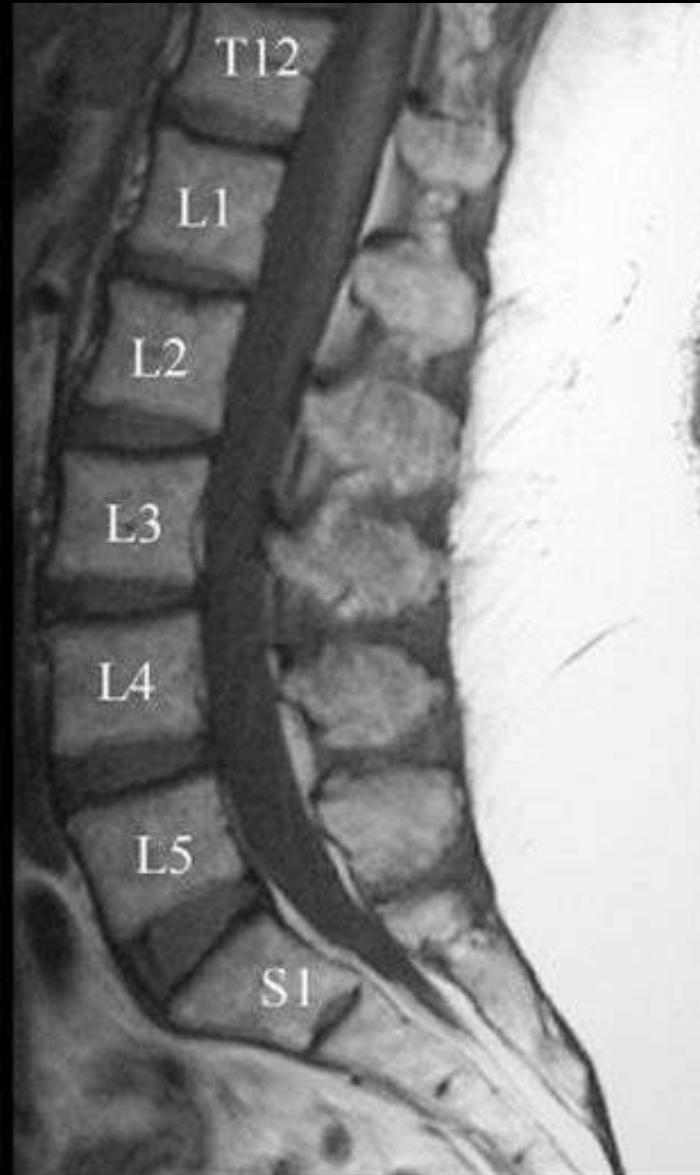


MRI

Best for

- Soft tissues
- Bone marrow
- Spinal canal and foramen
- Collapse- Benign or malignant
- Screening for
 - Cauda equina syndrome
 - Spinal cord injury, radiculopathy
 - Vascular anomalies





TARGET

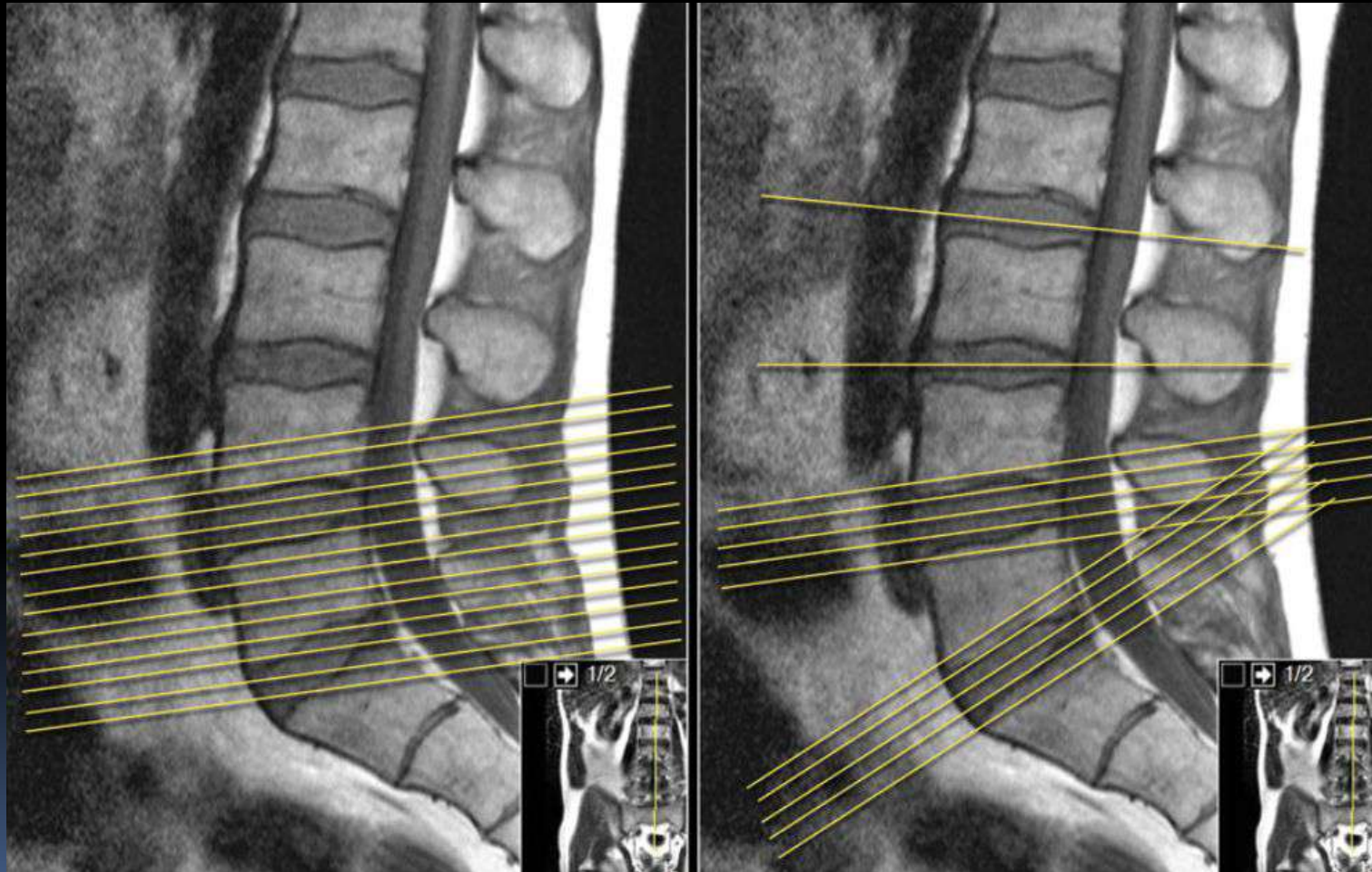
ORTHO

(C) www.targetortho.com

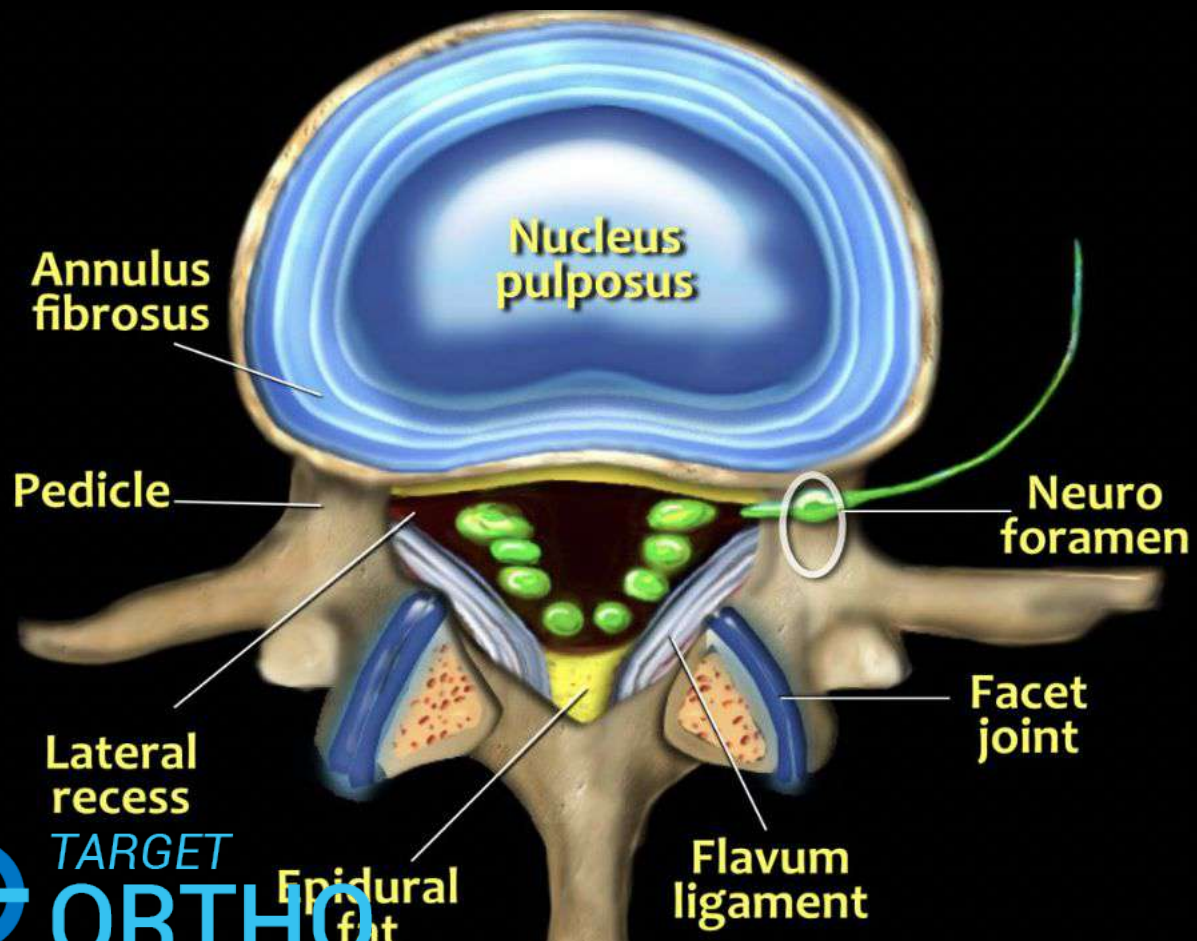
T1 Mid-sagittal

T1 Parasagittal

Acquisition of axial sections



AXIAL ANATOMY



VERTEBRAL OSTEOCHONDROSIS

Disc thinning and hyaline degeneration



Chondral microfractures



Chondroblastic activation



Subchondral reactive neovascularisation



Bony trabeculae demineralisation

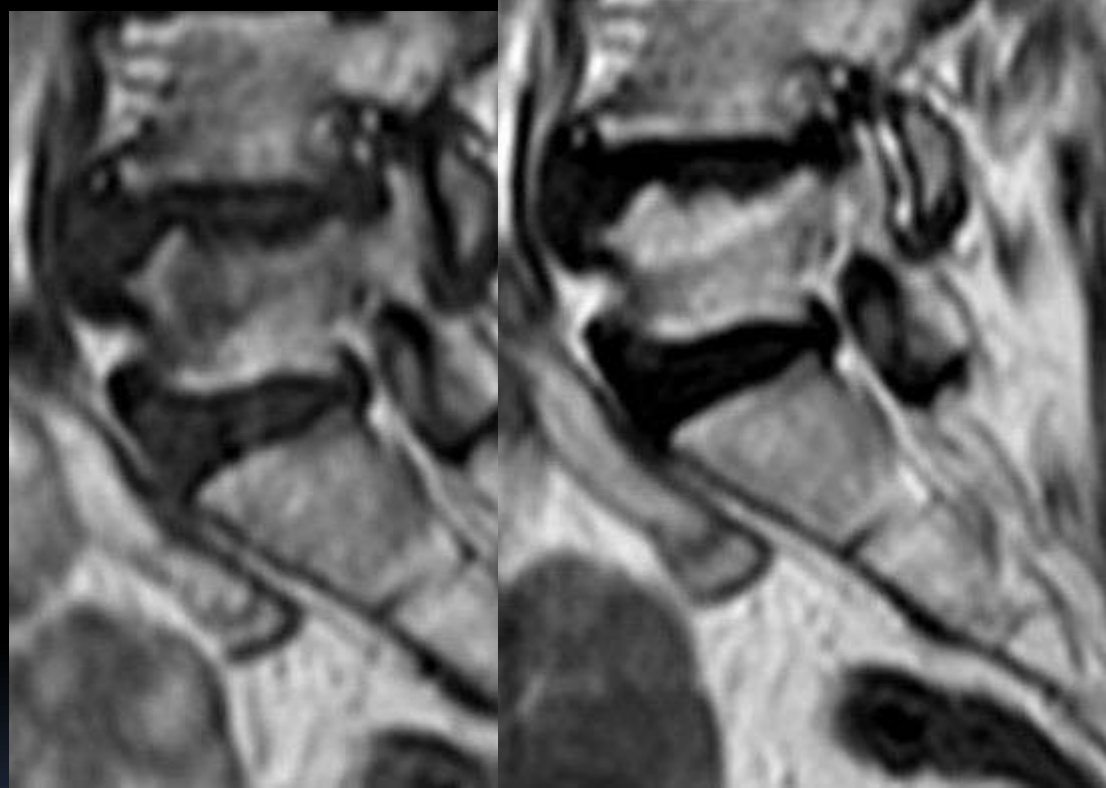


Osteosclerosis

Modic classification	T1 signal characteristics	T2 signal characteristics	Gadolinium contrast enhancement	Pathobiology
Type I	Low	High	(+) Present	Marrow oedema (or inflammation)
Type II	High	High	(-) Absent	Fatty marrow conversion
Type III	Low	Low	(-) Absent	Subchondral bone sclerosis

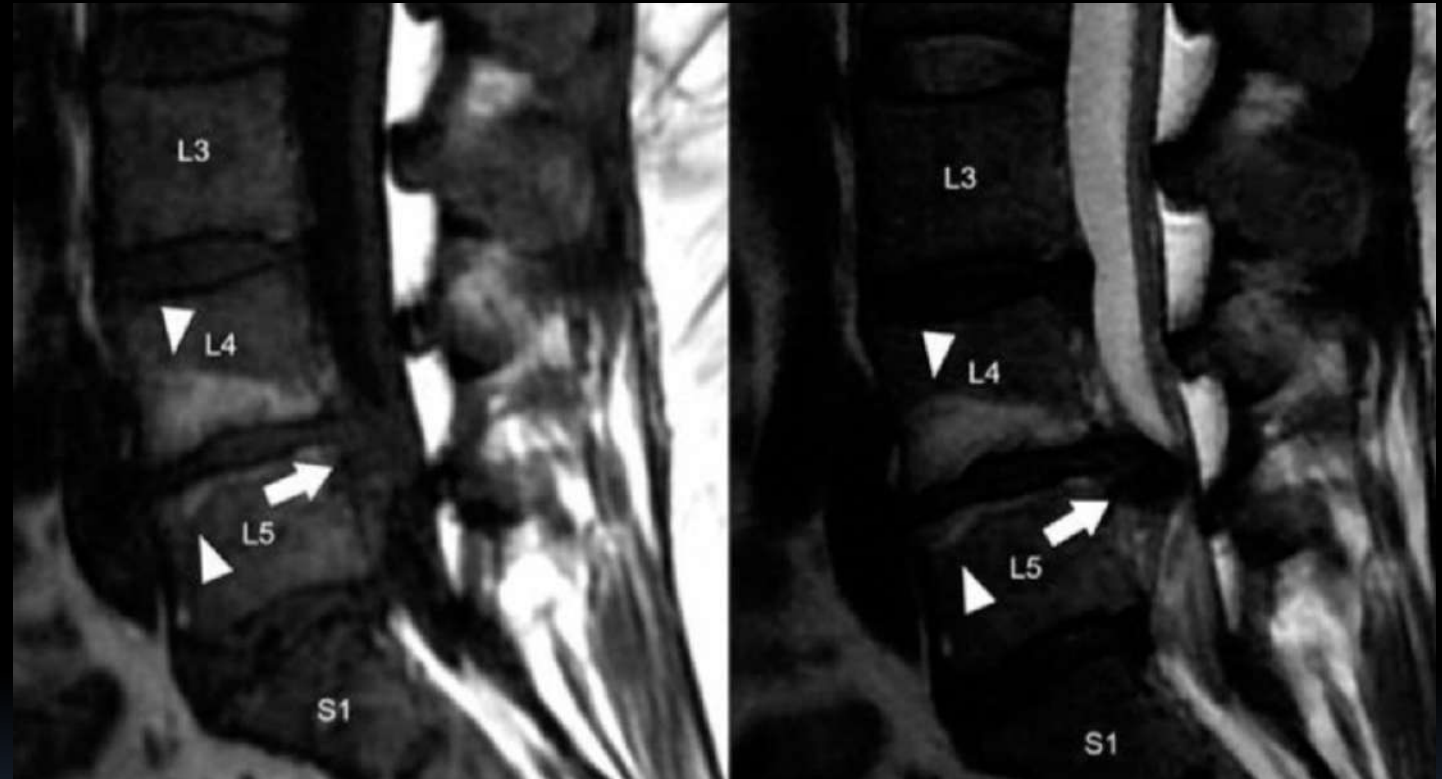
MODIC CHANGES

- TYPE 1
- Discovertebritis
- Aseptic spondylitis



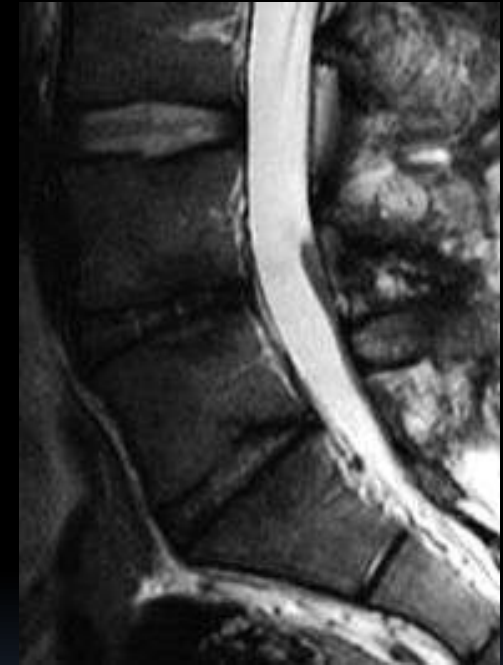
Type 2

- Fatty pattern



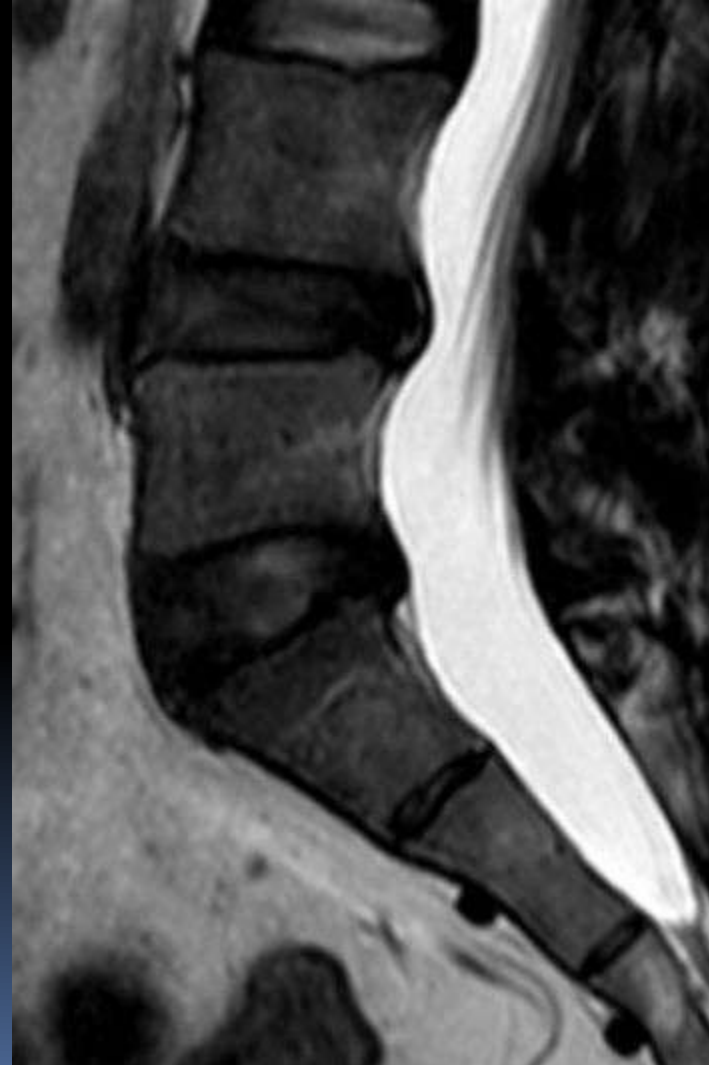
Type 3

- Sclerotic pattern
- Endplate sclerosis
- Traction osteophytes
- T1&T2 dark



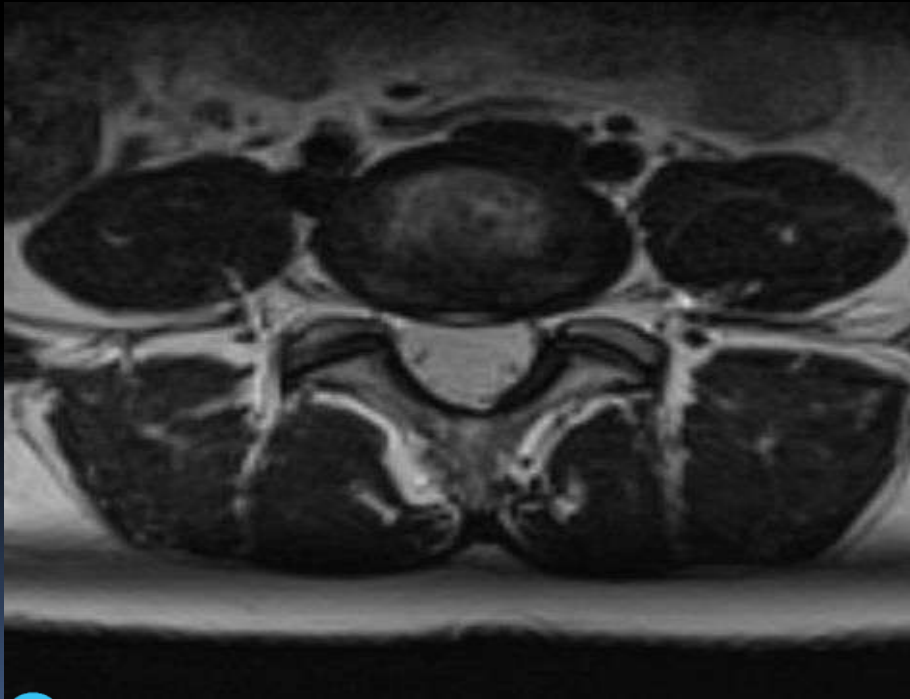
DEGENERATIVE DISC DISEASE

- Loss of water and proteoglycans of nucleus pulposus
- Characterised by
 - Dehydration
 - Fissures
 - Bulging
 - Herniation



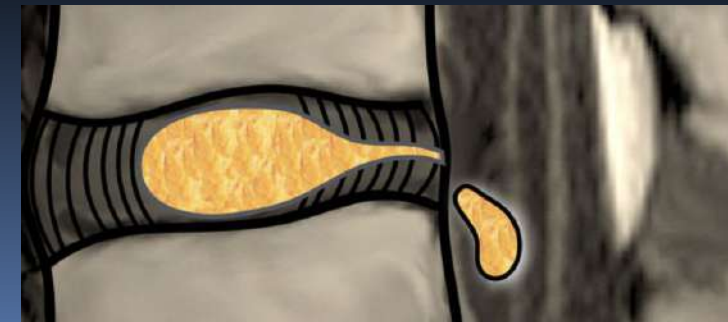
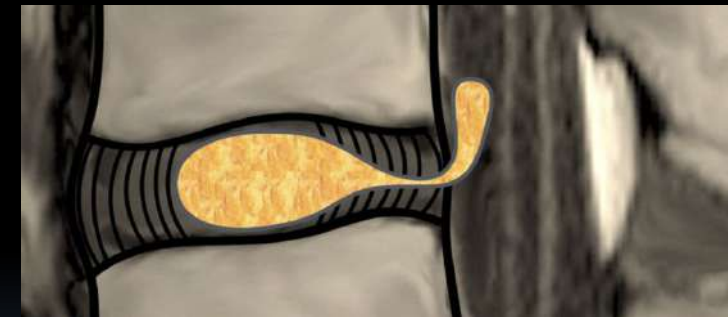
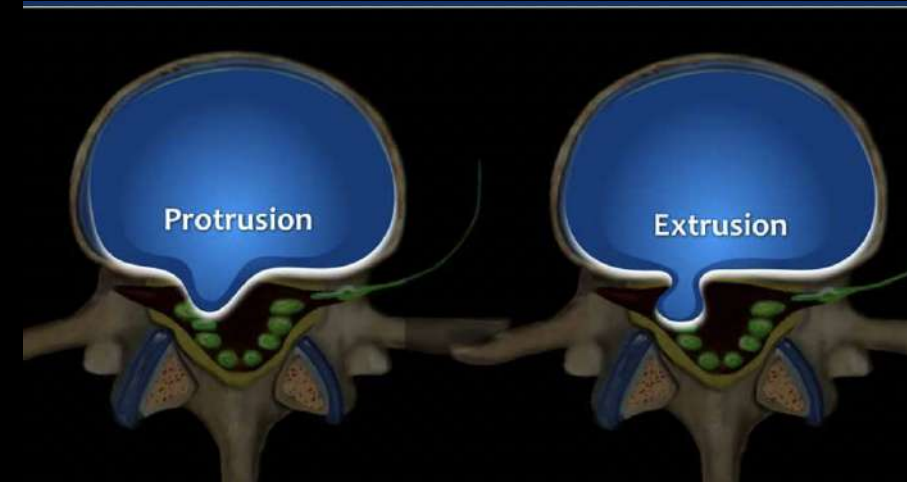
DISC FISSURES

- Intranuclear cleft
- Annular tears



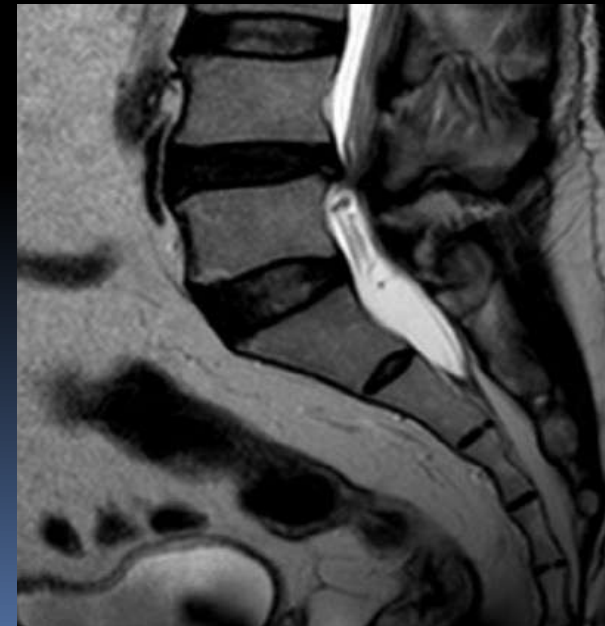
Revised terminologies

- Disc Bulge: >90 degrees
- Disc Herniation: <90 degrees
 - a) Protrusion: Width of the base is larger than any other part of the herniation
 - b) Extrusion : Width of the base is narrower than the remaining herniation in any plane
 - c) Migration: Attachment with disc maintained
 - d) Sequestration: Attachment lost



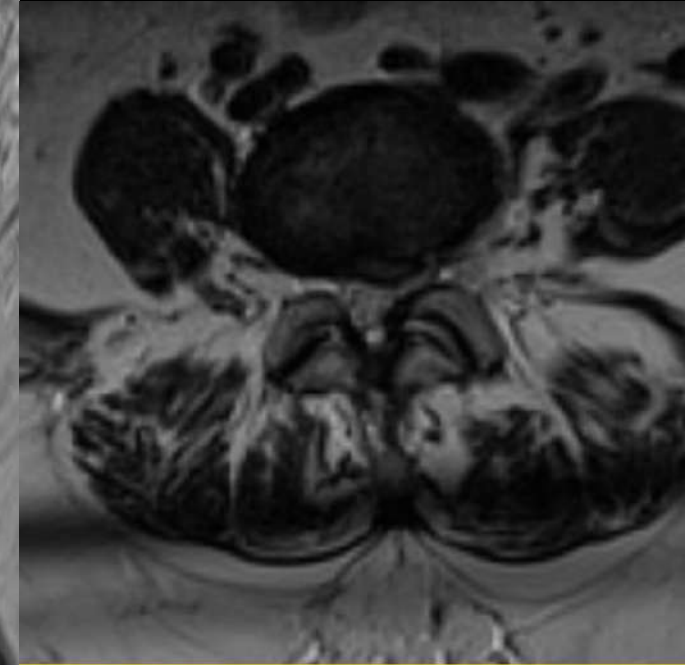
DISC HERNIATIONS-Diffuse disc bulge:

- Circumferential symmetrical diffuse extension of annulus beyond the adjacent vertebral end plate by 3 mm due to laxity of annulus.



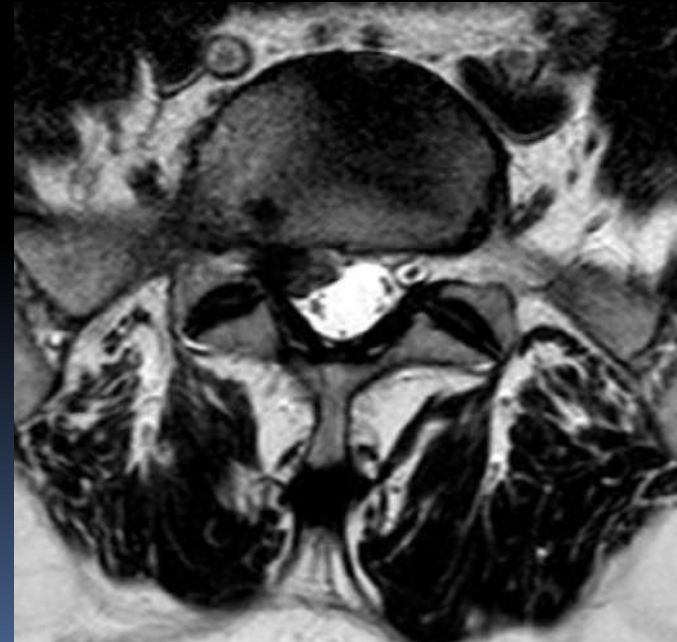
LOCALISED DISPLACEMENTS

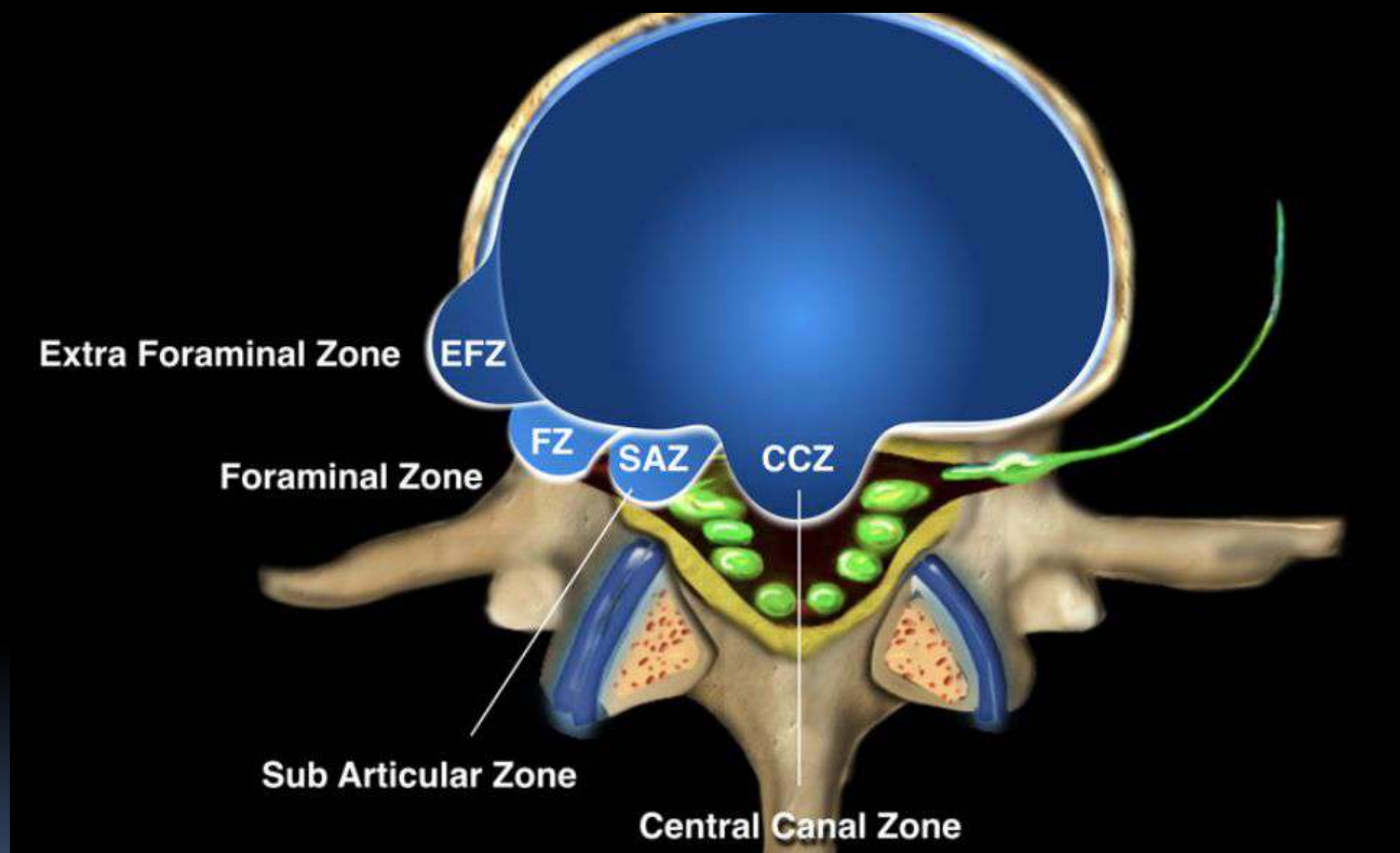
Protrusion:
Broader base than
extension of disc
material beyond disc
space



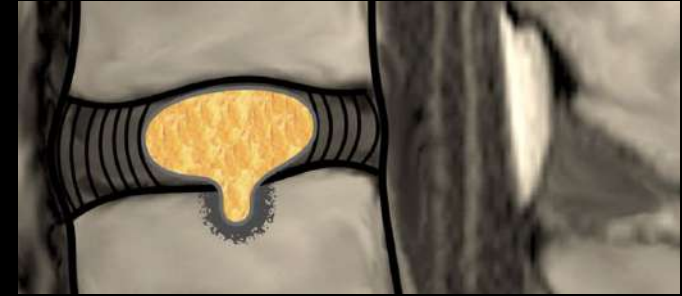
Extrusion & sequestration

- Base narrower than the extension of disc material beyond disc space
- Disc material lost communication with disc-sequestration

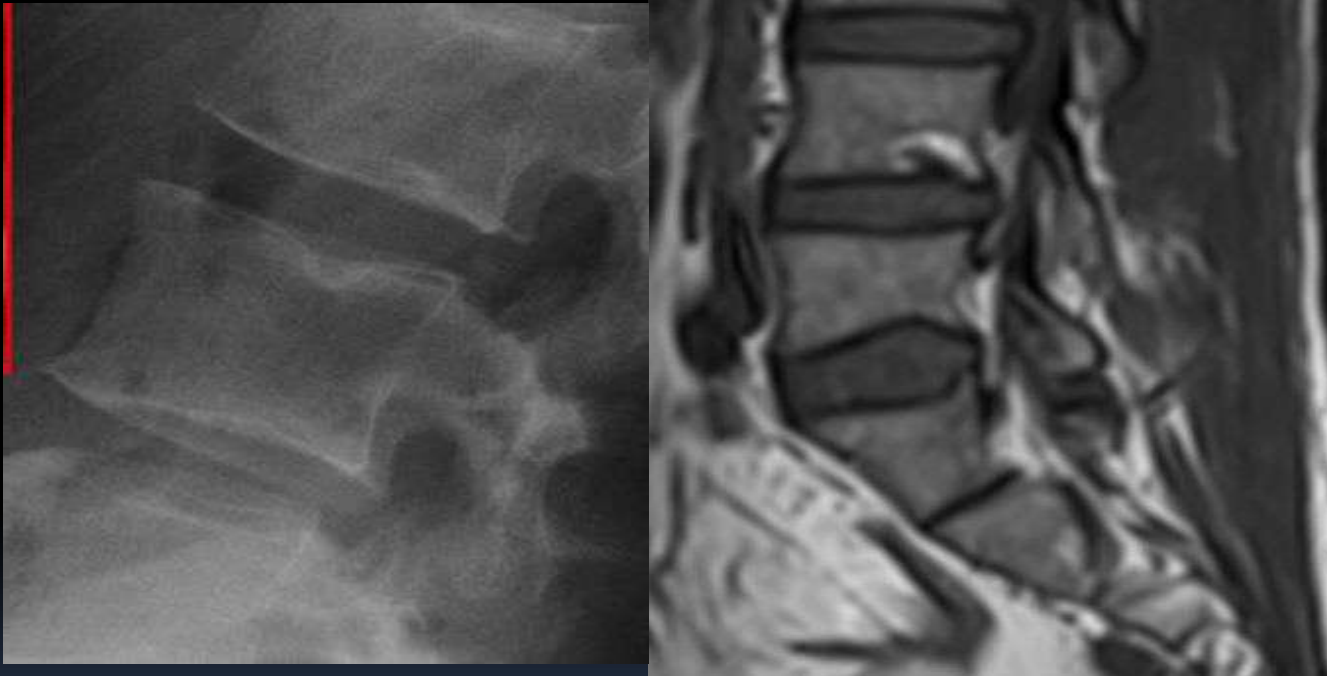


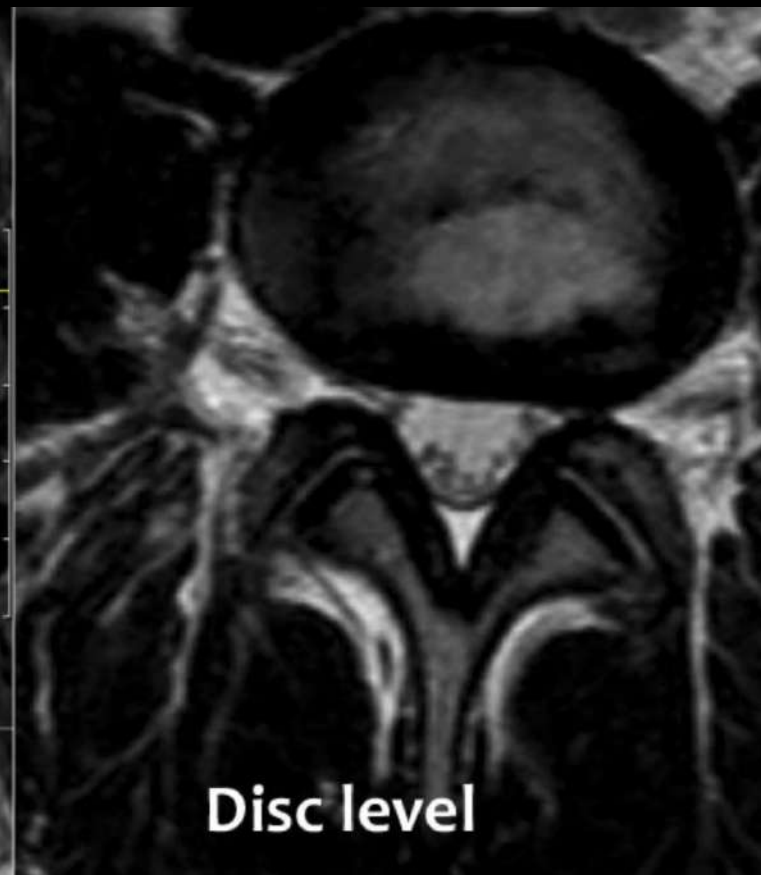
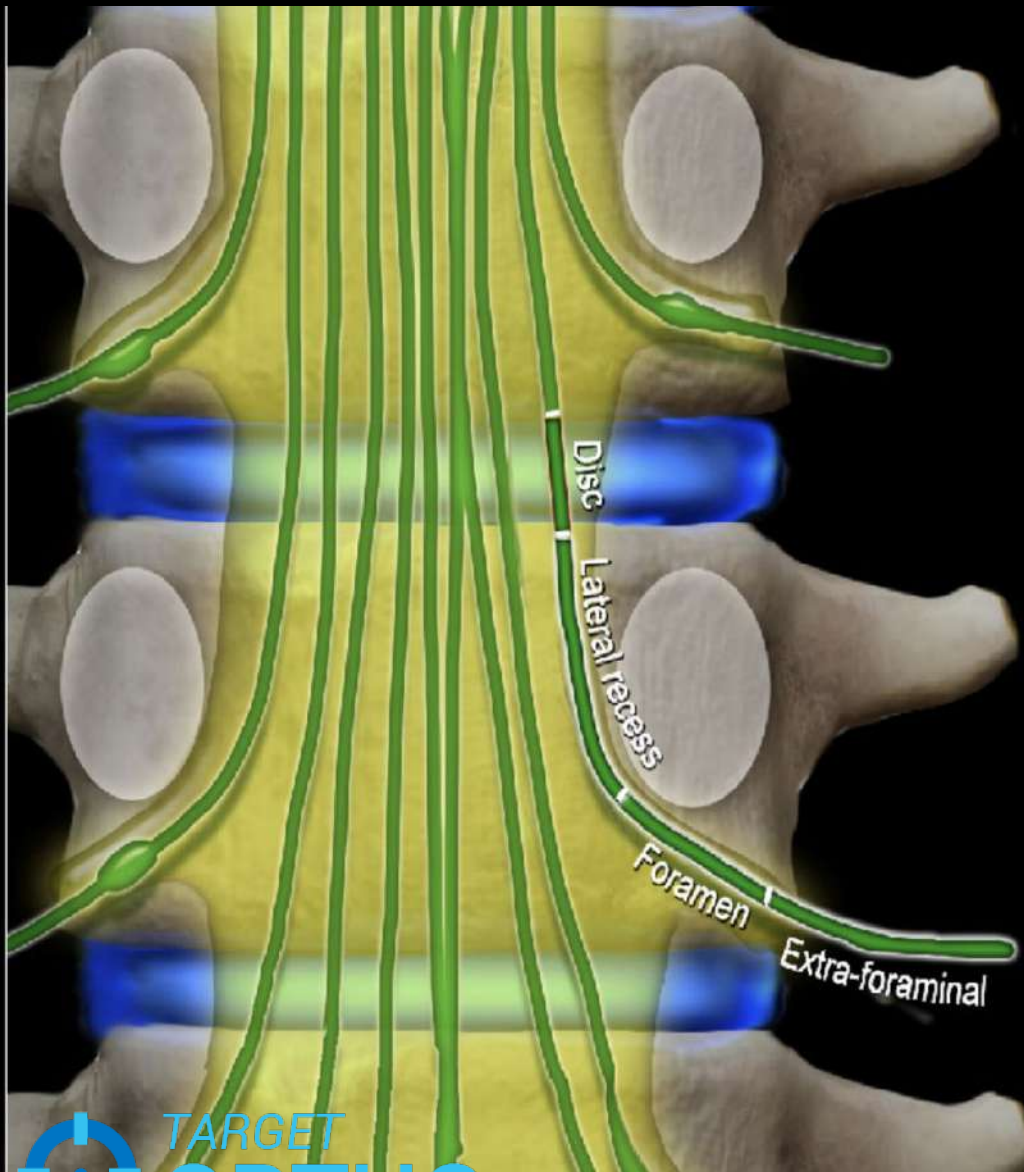


Schmorl's nodules



- Herniation of disc through endplates
- Central defect in upper endplate of vertebral body
- Sclerotic rim
- MRI-relation b/w disc and herniation



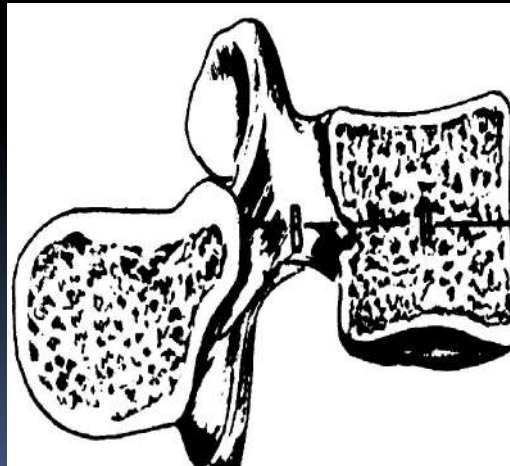
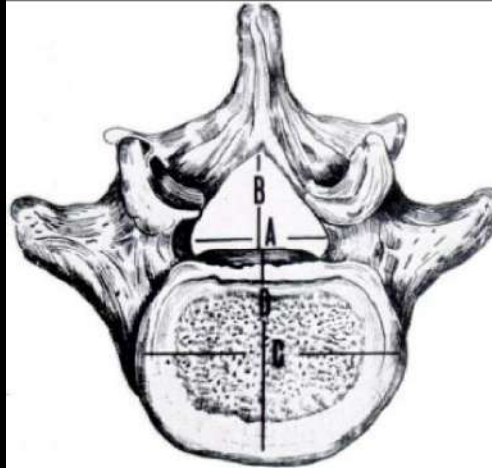


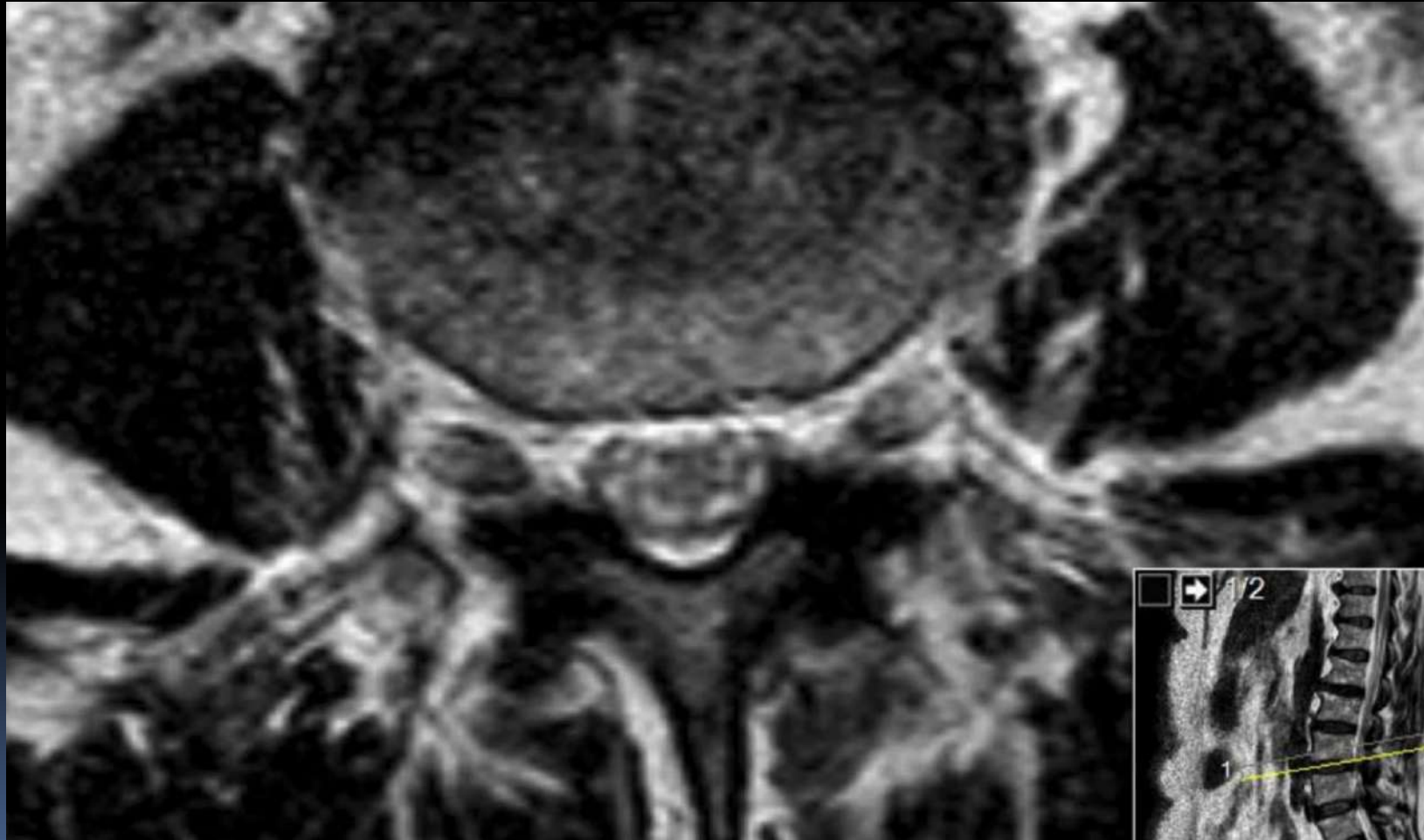
SPINAL STENOSIS

- Central canal
- Lateral recess
- Foraminal

Central canal

Sagittal diameter
10-14-moderate
<10mm- severe





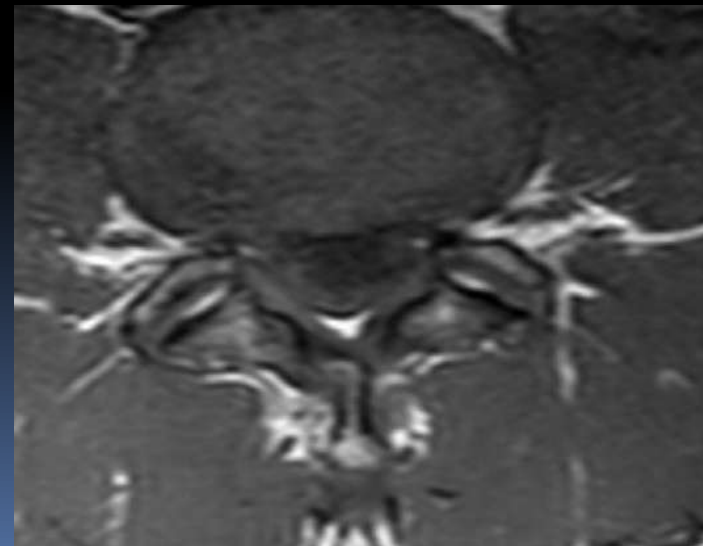
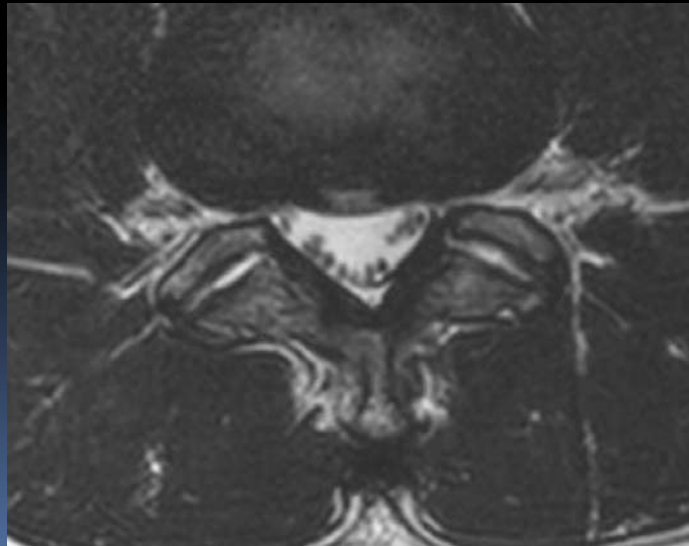
FORAMINAL STENOSIS

- Disc/marginal osteophytes protrusion
- Narrowing of disc space → anterosuperior slippage of superior facet



LATERAL RECESS STENOSIS

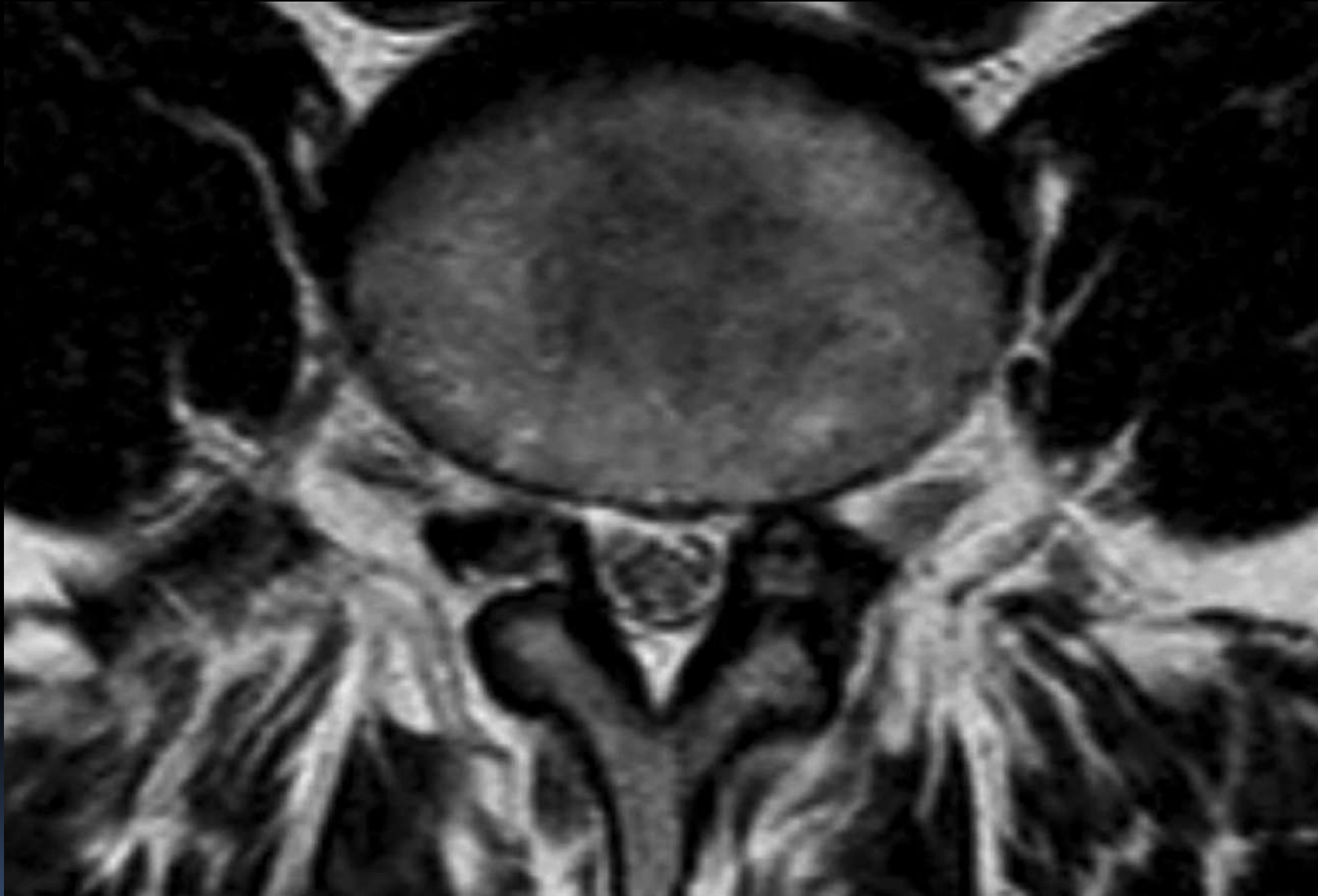
- Hypertrophy and osteophytosis of superior articular facet
- Vertebral body osteophytosis
- When sagittal diameter of lateral recess < 4mm



PARS INTERARTICULARIS DEFECT

- Mass of bone between superior and inferior articular facets
- Types
Dysplastic, traumatic, degenerative
- Unilateral/bilateral
- Pain with extension /rotation movement of spine
- Usually non progressive





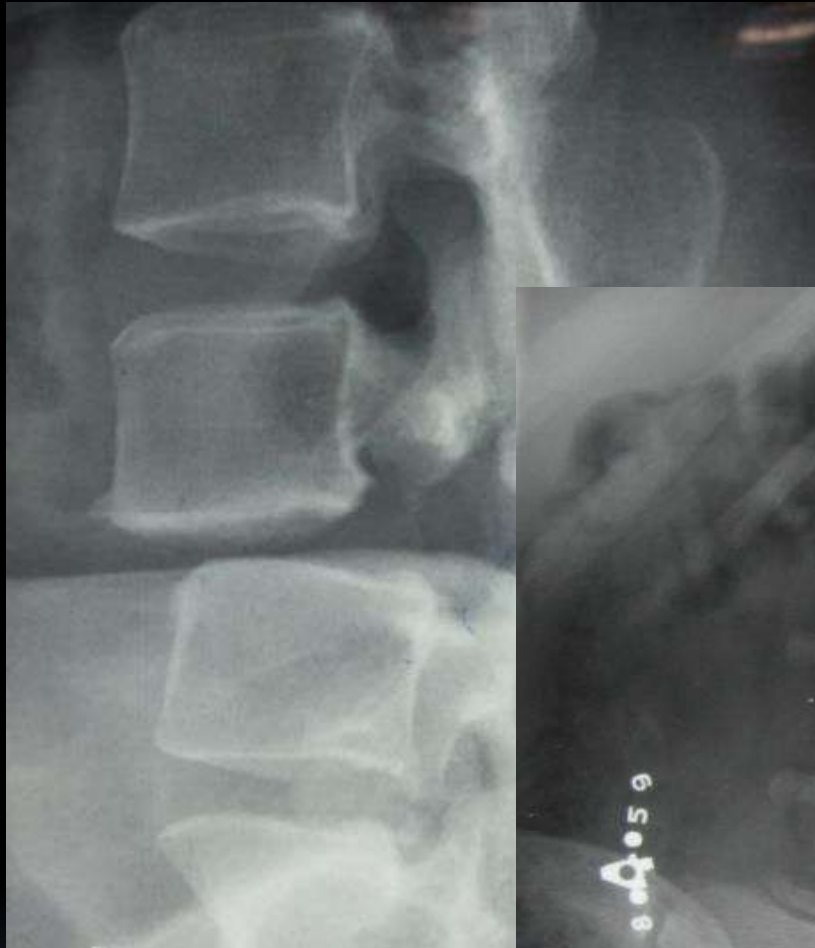
SPONDYLOLYSIS

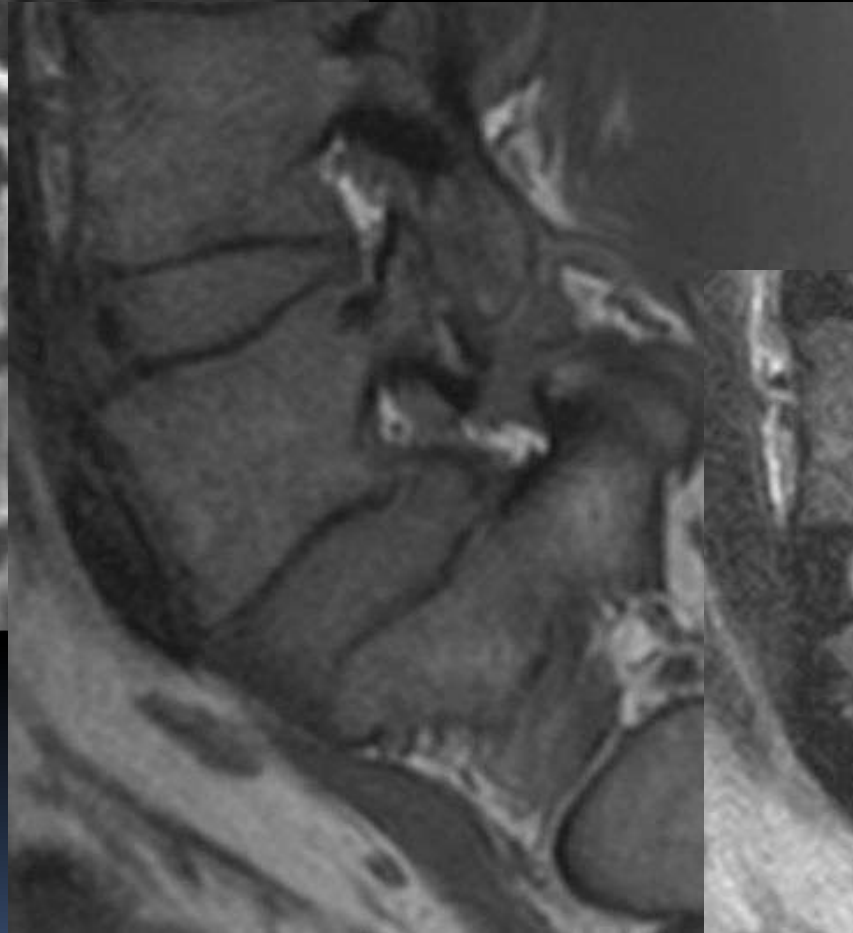


SPONDYLOLISTHESIS

- Most frequent at L5-S1
- Narrowing of intervertebral foramina
- CT more sensitive than radiographs; for staging of healing of fracture
- Scintigraphy and SPECT-for subtle stress fractures
- MRI-for early detection; assessing narrowing of foramen; nerve root compression
- 3mm thick sagittal sections more useful

ANDYLOLISTHESIS





SPONDYLOSIS DEFORMANS

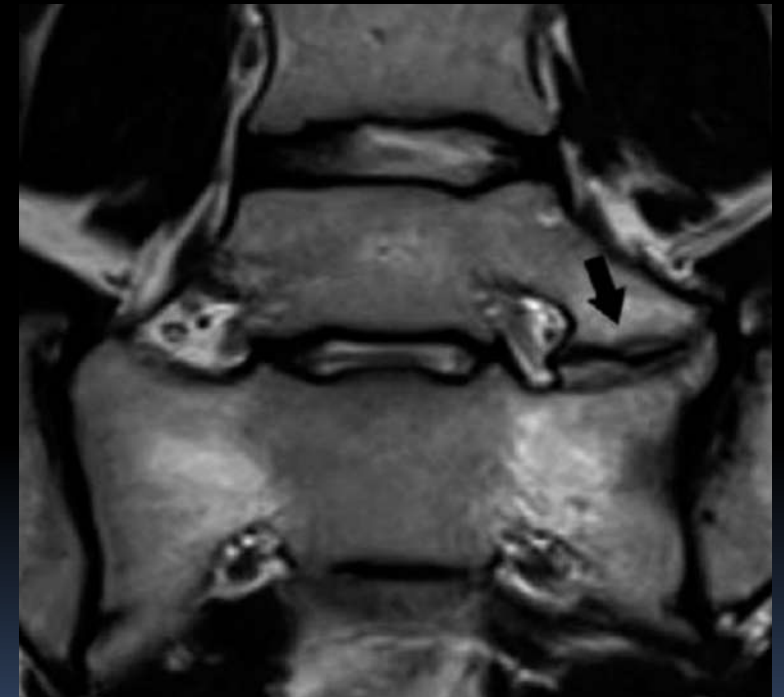
- Classic sign
–osteophytosis
- Weakening and radial degeneration of annulus
- Bridge osteophytes



Bertolotti syndrome = LSTV

Castellvi classification

Type	Description	Illustration
I	Dysplastic transverse process (unilateral: Ia; bilateral: Ib), measuring at least 19 mm in width (craniocaudad dimension)	 
II	Incomplete lumbarization/sacralization showing enlarged transverse processes with unilateral (IIa) or bilateral (IIb) pseudarthrosis with the adjacent sacral ala	 
III	Complete lumbarization/sacralization showing enlarged transverse processes, with unilateral (IIIa) or bilateral (IIIb) fusion with the adjacent ala	 
IV	Mixed (eg, type IIa on one side and type IIIa the other)	



FAILED BACK SURGERY SYNDROME

- Persistent lumbar back pain after surgical procedure

- Causes

Recurrent/residual lumbar disc disease

Scar

Post operative instability

instrument related

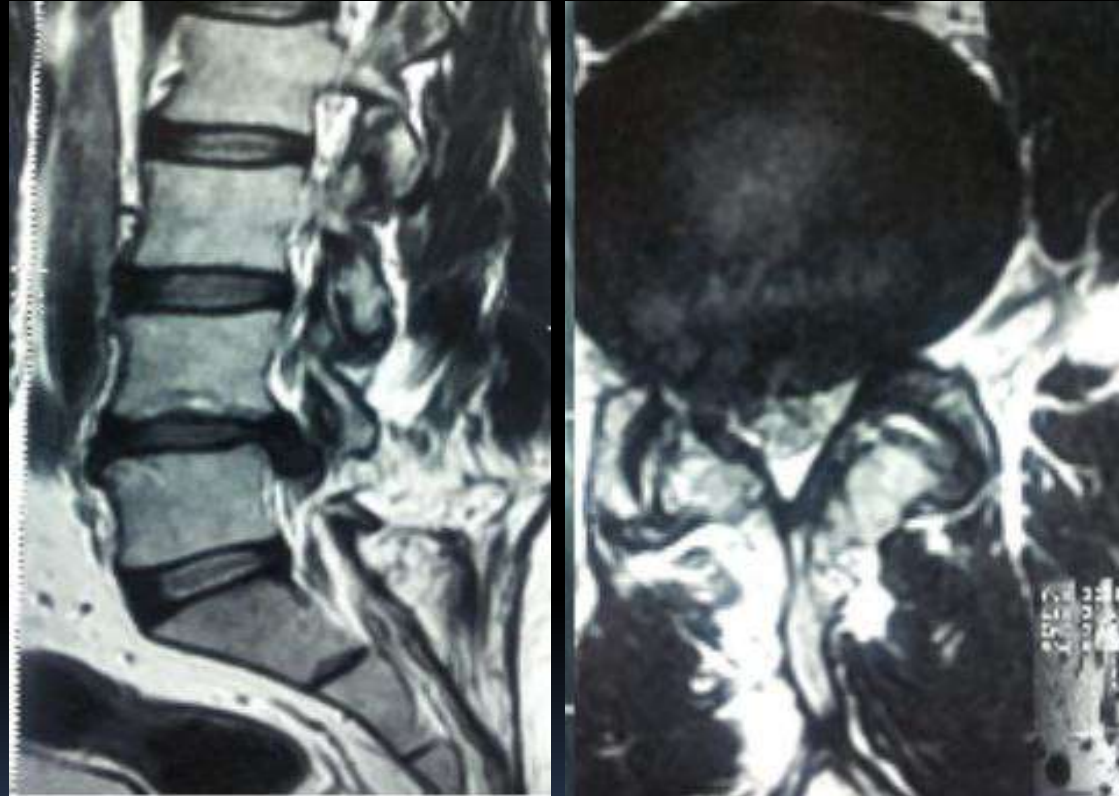
wrong level surgery

lateral recess/lumbar canal stenosis

epidural abcess/hematoma

Arachnoiditis

RECURRENT DISC DISEASE



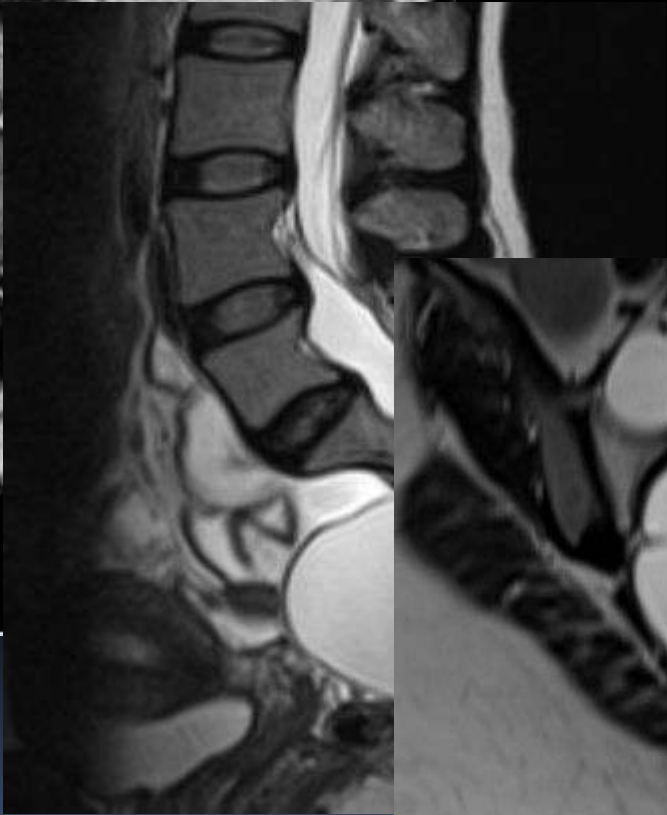
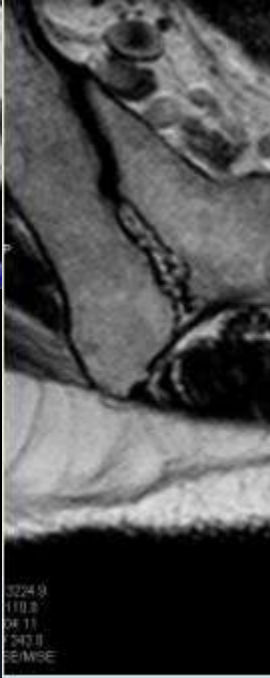
EPIDURAL HEMATOMA





TARLOV CYSTS

- CSF filled dilatation of sacral nerve root sheath
- Type 2 spinal meningeal cyst
- Can cause bony erosion
- Caused by ball valve mechanism
- Can cause mass effect on nerve roots





SCHEUERMANN'S DISEASE

- Aseptic necrosis of ring vertebral apophyses
- Vertebral wedging
- Endplate irregularity
- Narrowing of disc space
- Herniation

Sorenson's criteria

- Thoracic spine kyphosis $>40^\circ$ or
- Thoracolumbar kyphosis $>30^\circ$ and
- At least 3 vertebral body wedging $> 5^\circ$





CONCLUSION

- Imaging should be used judiciously in low back pain
- Degenerative disease of LS spine constitute majority of etiology
- Correlation between symptoms and imaging may not be seen in all cases
- Imaging plays central role in guiding the management
- MRI is the preferred modality in most of the low back ache cases