



تشريح الشعاعي و الكورس الأول

RADIOLOGICAL FEATURES OF INTERVERTEBRAL DISCS

Sawa University

College of health and medical techniques

Department of Radiology Tech.

Third Stage

جامعة ساوة الاهلية

كلية التقنيات الصحية والطبية

قسم تقنيات الاشعة والسونار

المرحلة الثالثة

محاضرة رقم 5

Lecture No. ...5.

الجانب النظري

Theoretical

تدريسي المادة : م.م. ابراهيم فاضل

Radiological Features of Intervertebral Discs

A comprehensive visual exploration of intervertebral disc anatomy and pathology through advanced medical imaging techniques.



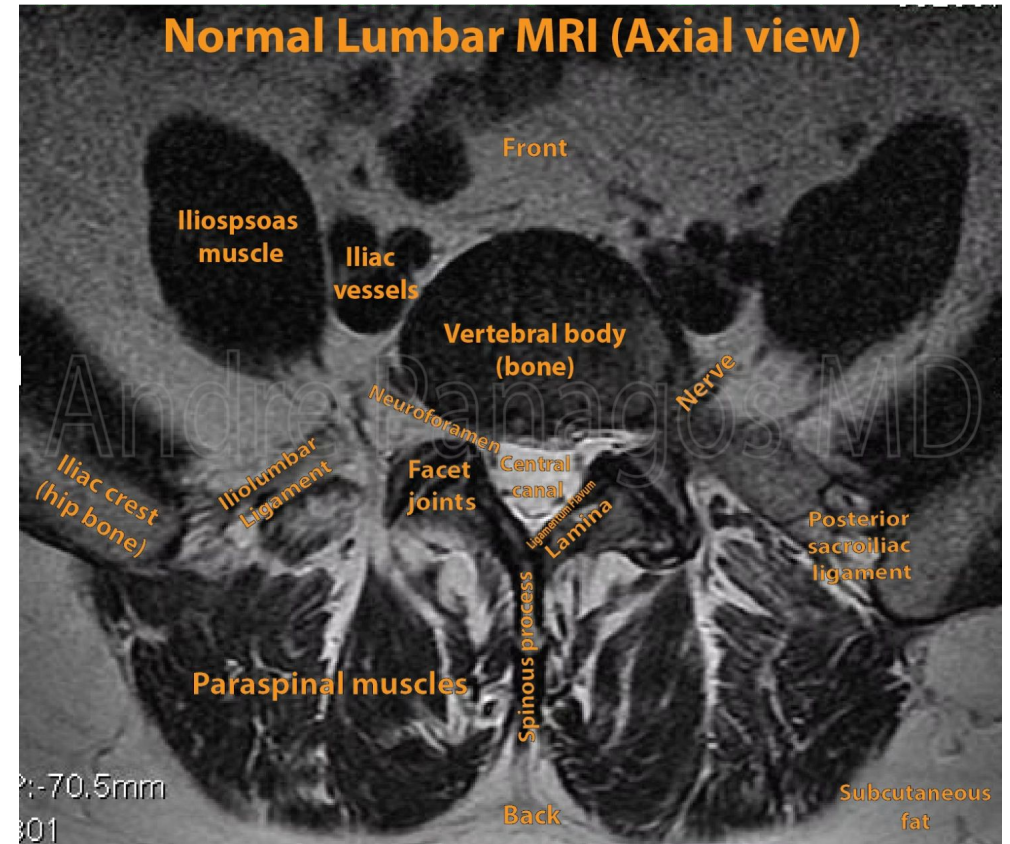
Normal Disc Anatomy on

MRI Key Structural Components

The intervertebral disc consists of two primary regions clearly visible on T2-weighted MRI sequences:

- **Nucleus Pulposus:** Central gelatinous core appearing hyperintense (bright) due to high water content
- **Annulus Fibrosus:** Outer fibrocartilaginous ring appearing hypointense (darker) with concentric lamellae
- **Endplates:** Thin cartilaginous layers separating disc from vertebral bodies

This contrast differentiation is essential for detecting pathological changes.

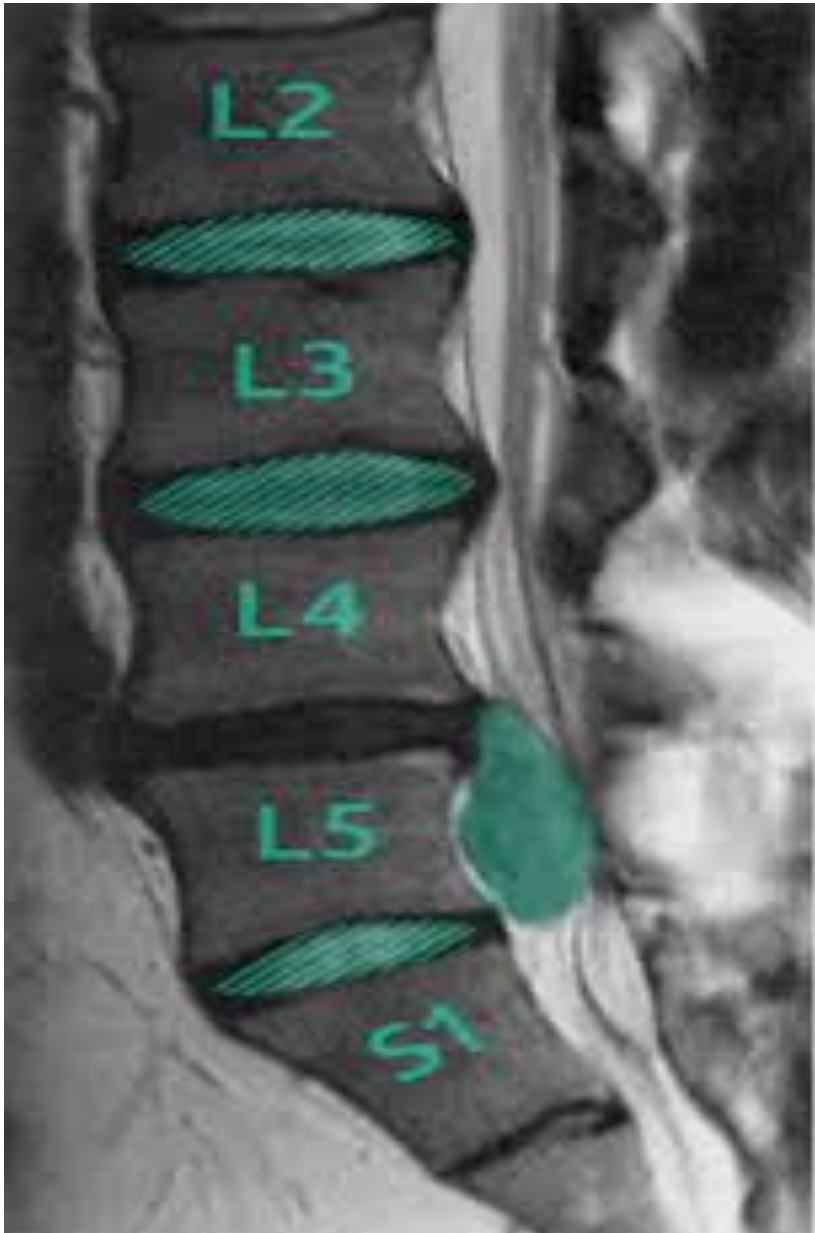




Conventional Radiography

Assessment

Standard lateral radiographs provide crucial baseline information about disc health and spinal alignment. Key radiographic features include uniform disc space heights, smooth vertebral body contours, and proper lordotic curvature. While X-rays cannot visualize soft tissue disc components directly, they reveal secondary signs of disc pathology through space narrowing and bony changes.



Degenerative Disc Disease: Early Changes

Disc Desiccation

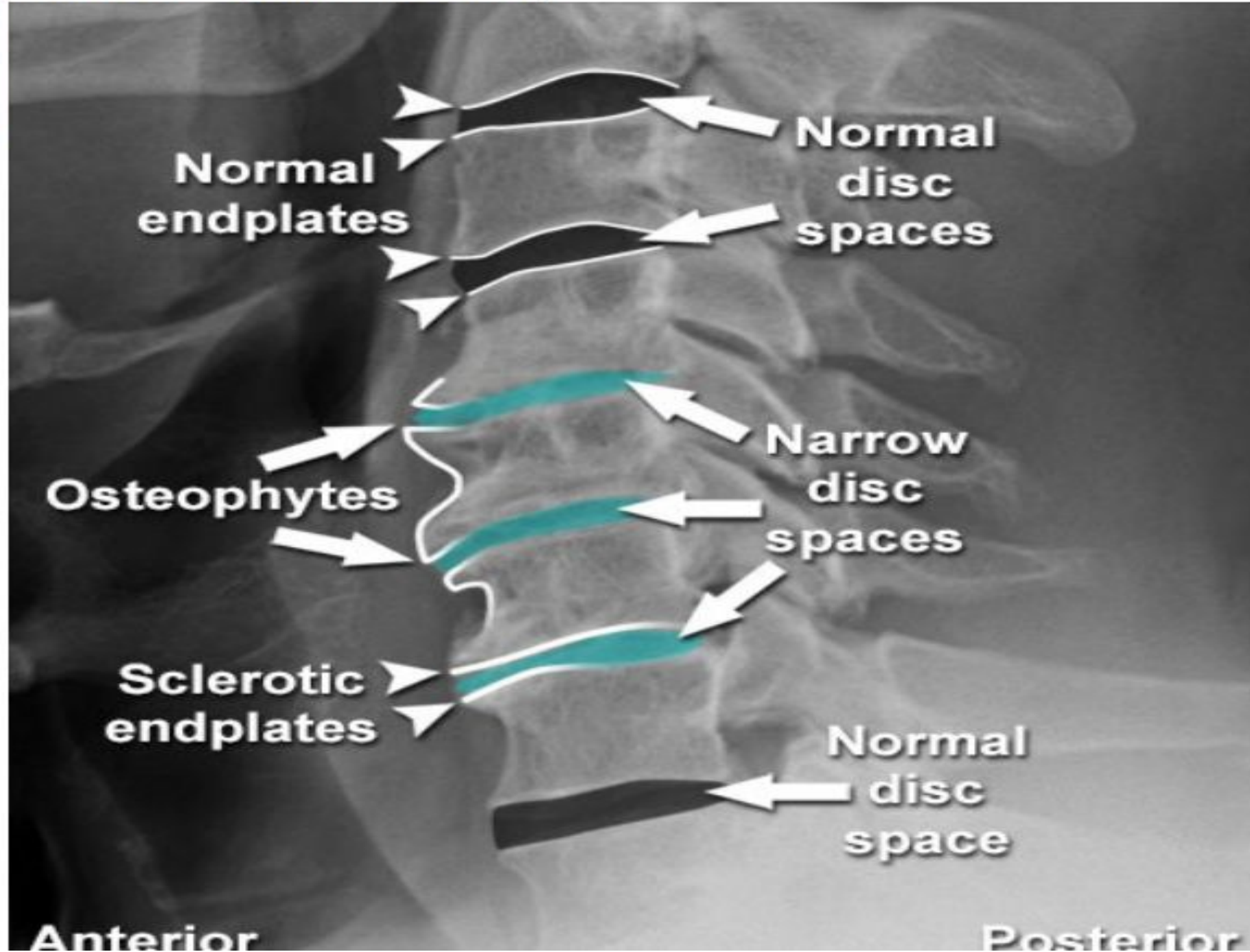
Progressive loss of nucleus pulposus water content manifests as decreased T2 signal intensity on MRI, transitioning from bright to dark appearance.

Signal Changes

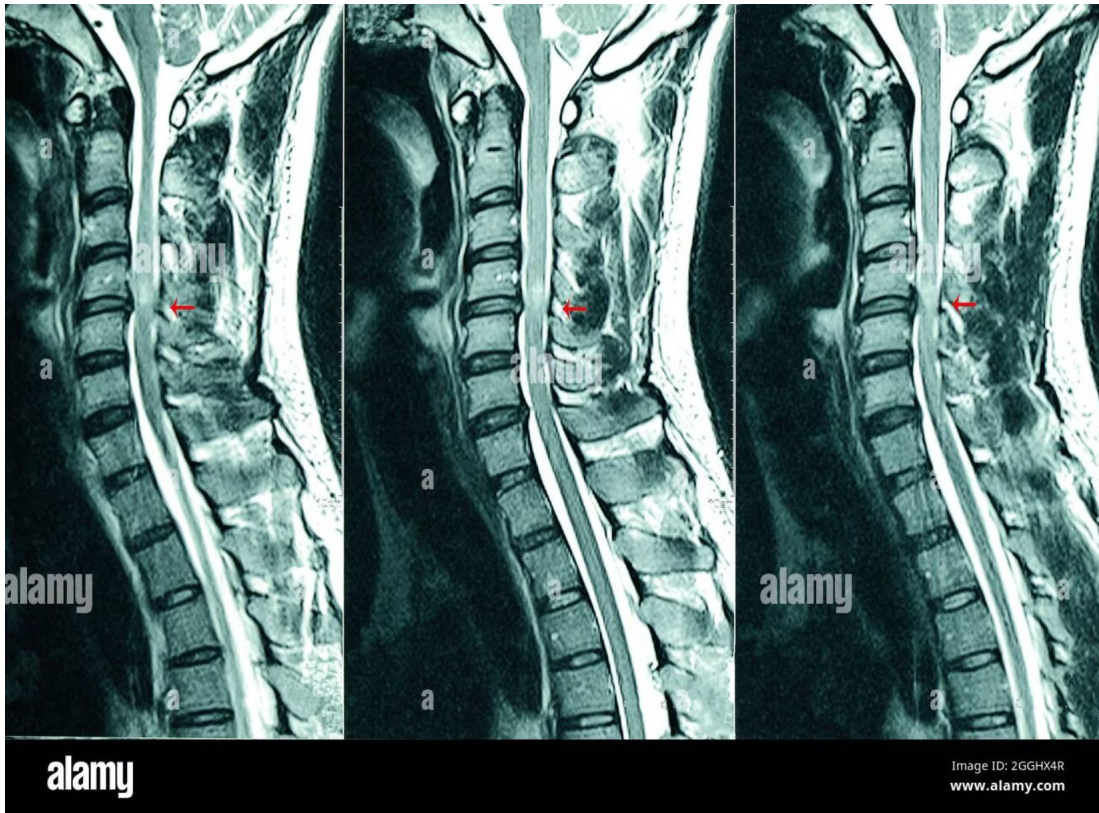
The normal hyperintense nucleus becomes progressively hypointense, reflecting biochemical degradation and loss of proteoglycan content.

Disc Height Loss

Accompanying dehydration leads to gradual reduction in vertical disc space, visible on both MRI and conventional radiographs.



Contained Disc Herniation

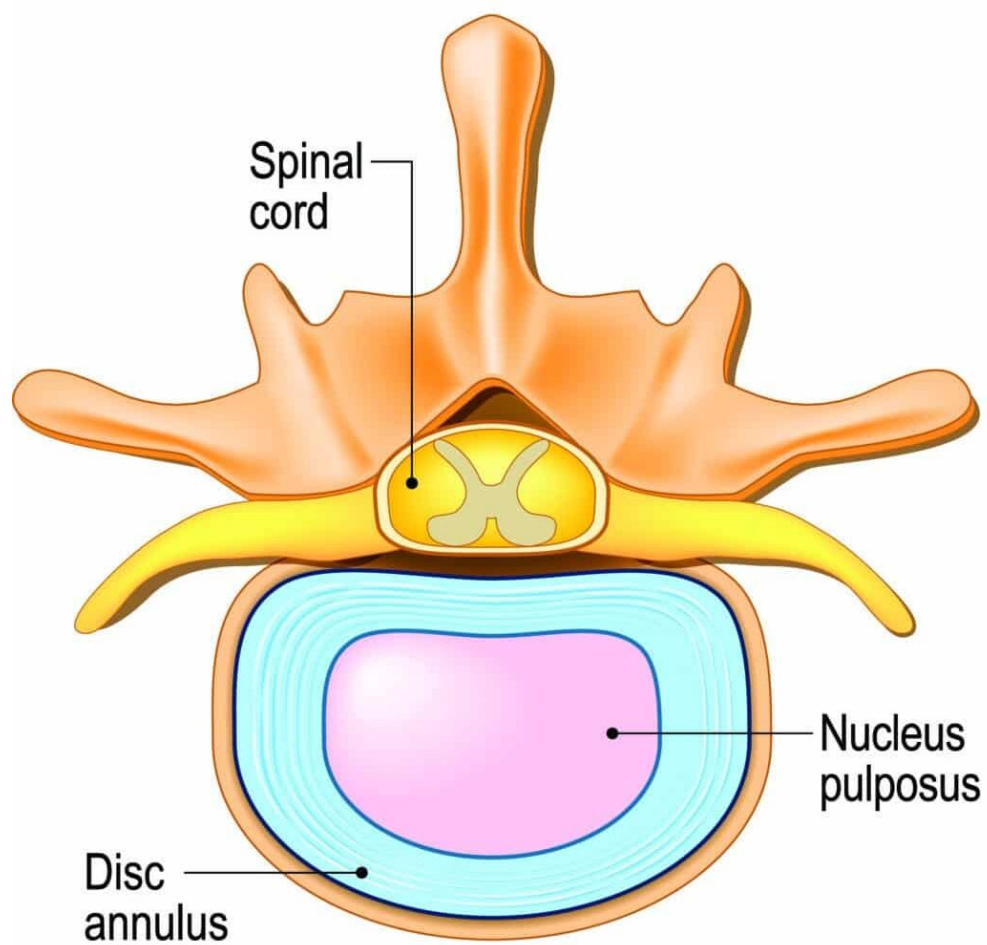


Protrusion Characteristics

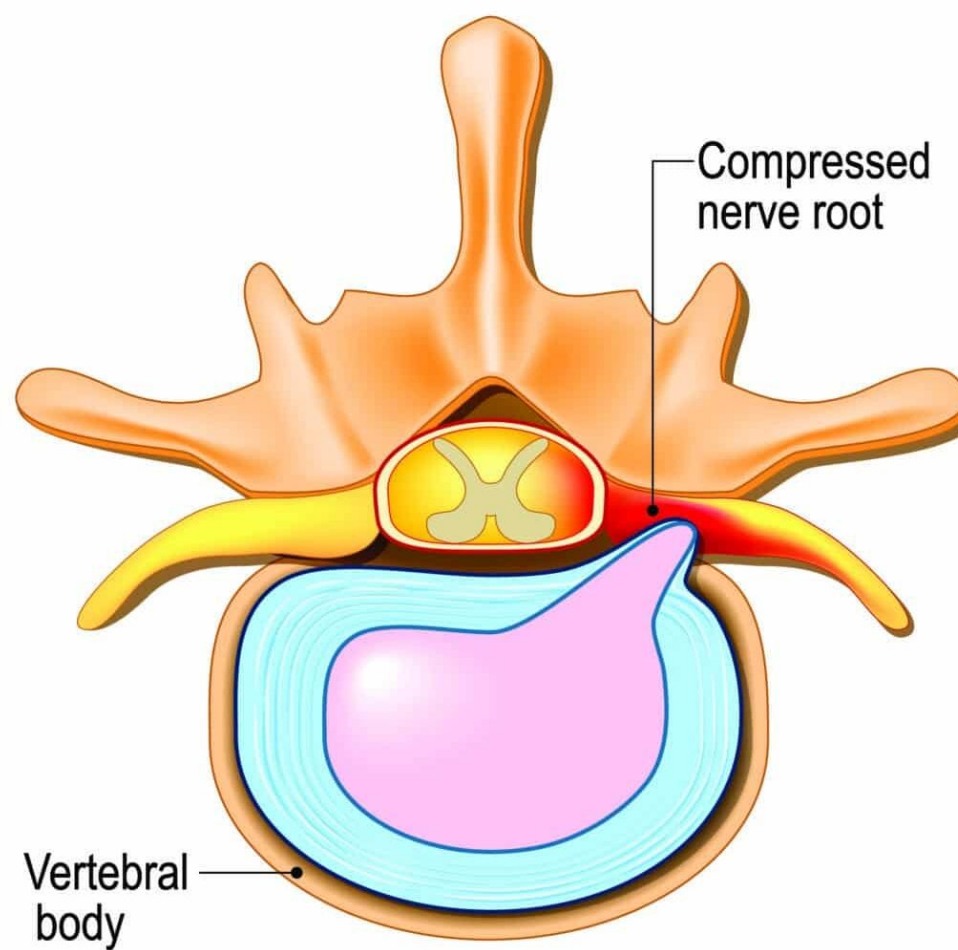
In contained herniations, the nucleus pulposus displaces posteriorly but remains confined within the outer annular fibers. The disc margin maintains a smooth, focal convexity extending beyond the vertebral body margin.

Radiological Criteria:

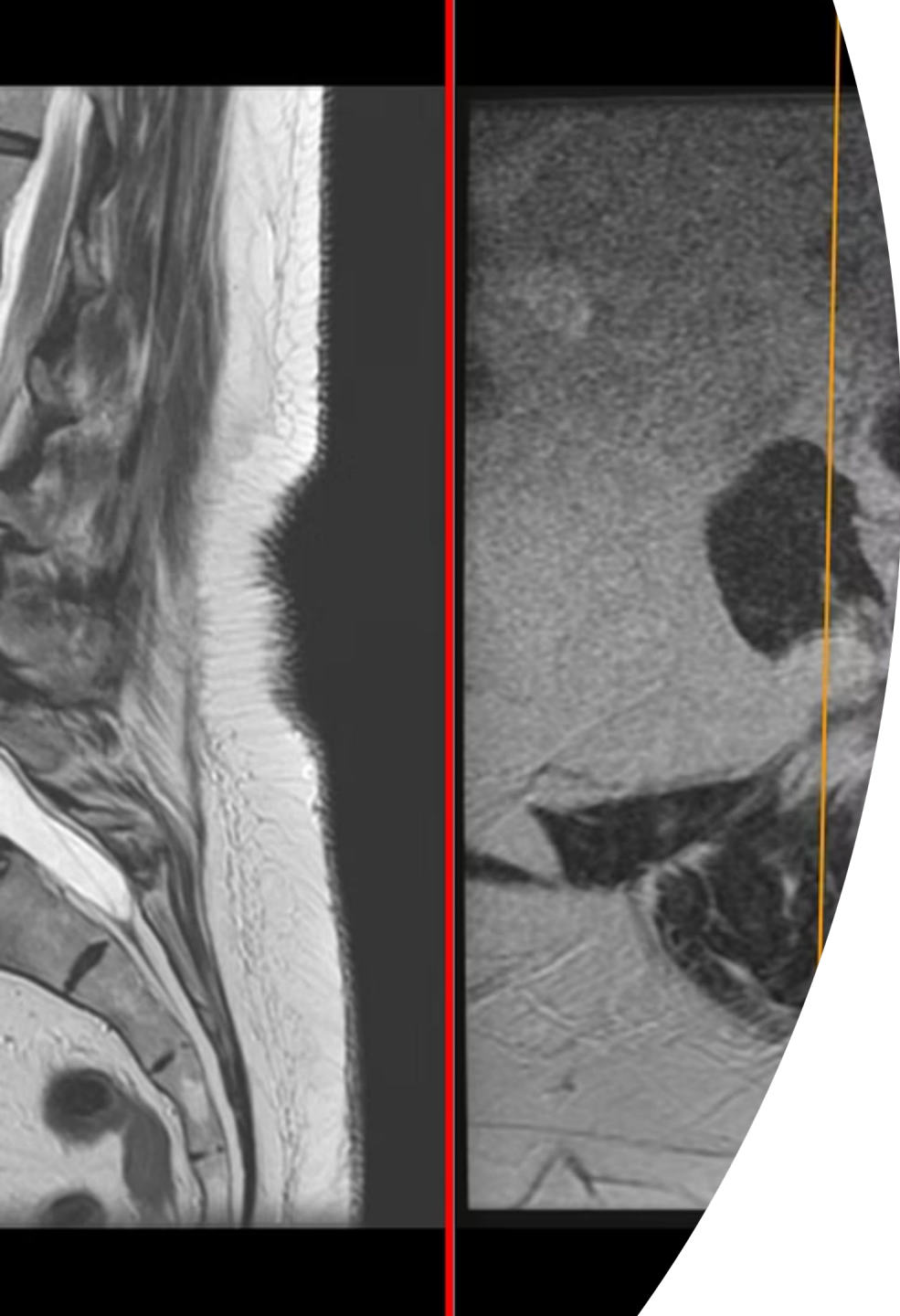
- Intact outer annulus fibrosus
- Smooth herniation contour
- Base wider than apex
- No free fragment migration



NORMAL DISC



HERNIATED DISC



Extruded Disc Herniation

1

Annular Rupture

Complete disruption of annulus fibrosus allows nucleus to escape disc confines

2

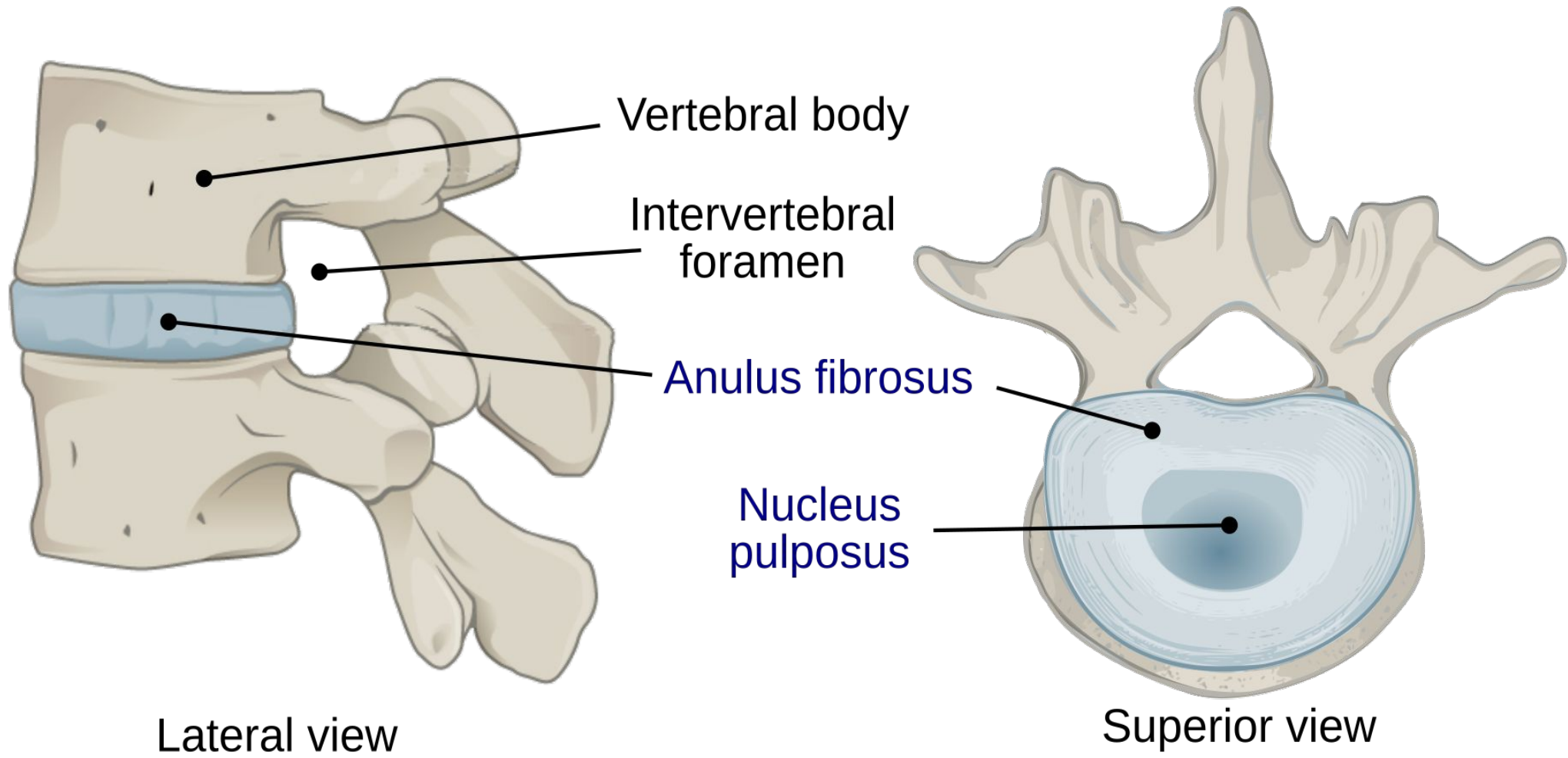
Fragment Extrusion

Herniated material extends into spinal canal with base narrower than displaced portion

3

Neural Compression

Extruded disc contacts and compresses nerve roots or thecal sac structures

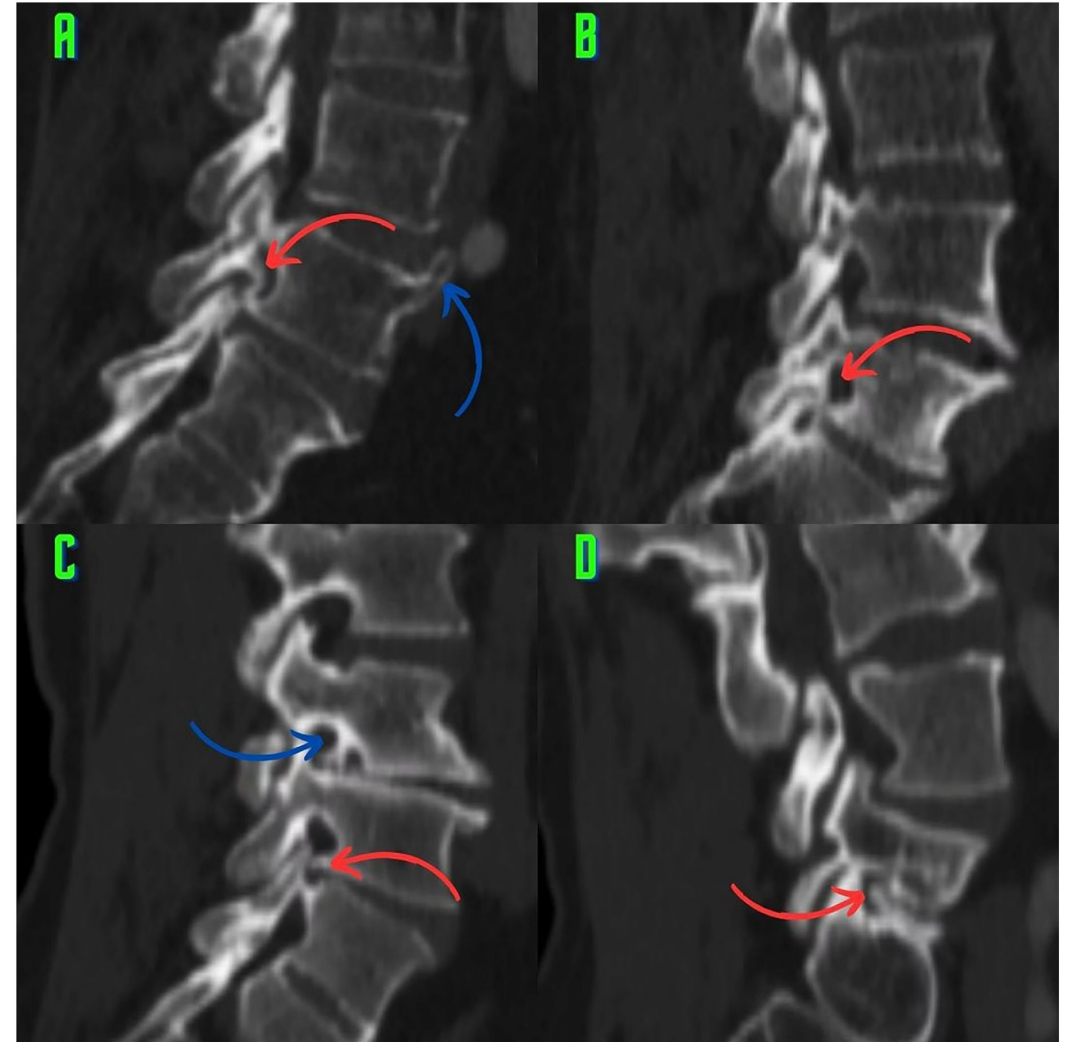


Advanced Degenerative Changes

Radiographic Findings

Chronic degenerative disc disease produces characteristic bony remodeling visible on plain radiographs:

- **Osteophytes:** Marginal bone spurs forming at vertebral body edges
- **Endplate Sclerosis:** Increased bone density adjacent to degenerated discs
- **Space Narrowing:** Marked reduction in intervertebral disc height
- **Vacuum Phenomenon:** Gas within disc space indicating severe degeneration



Modic Endplate Changes

Type 1 Changes

Bone marrow edema and inflammation

- Hypointense on T1
- Hyperintense on T2
- Active, painful phase
- Associated with disc disruption

Type 2 Changes

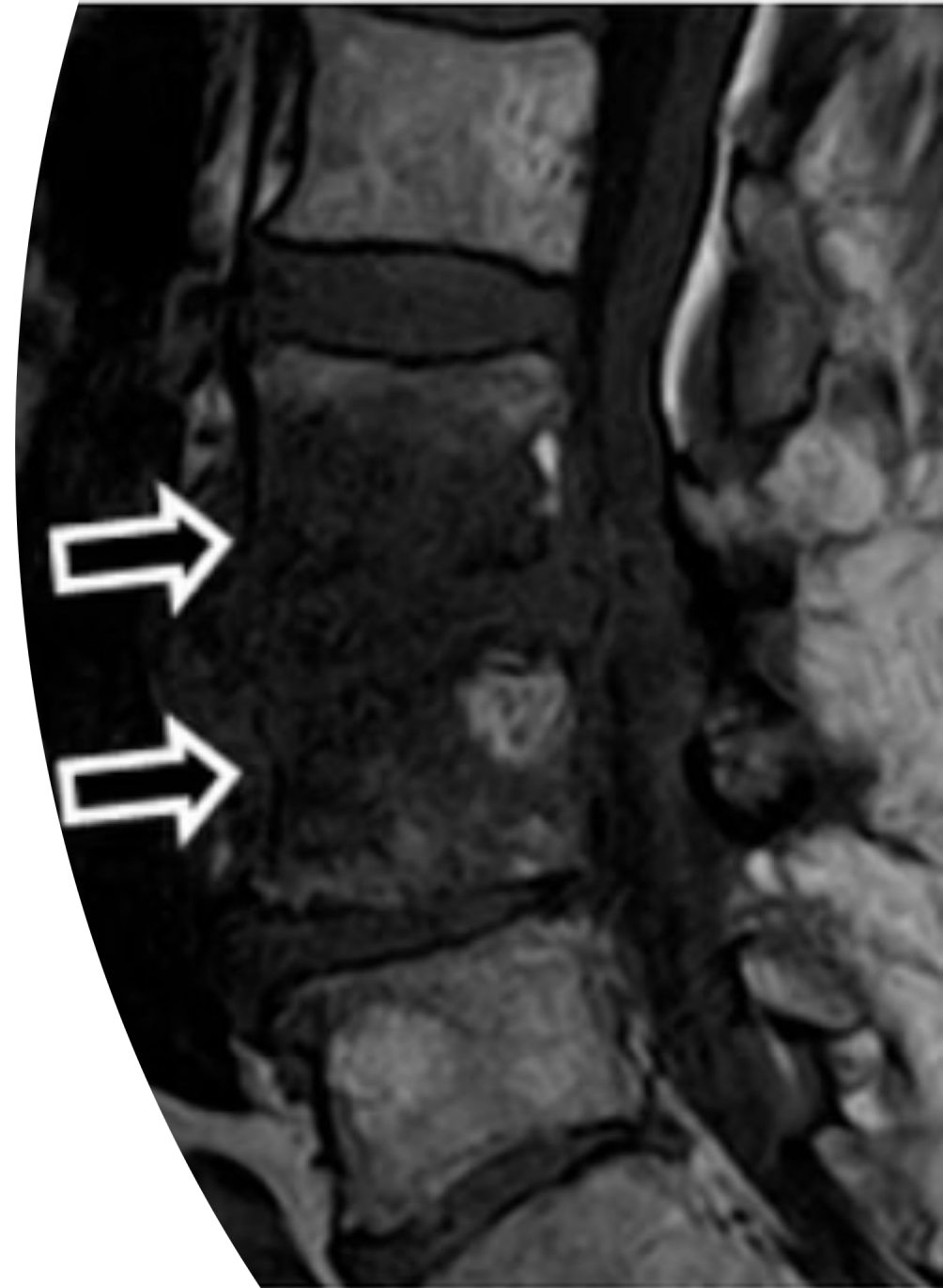
Fatty marrow replacement

- Hyperintense on T1
- Isointense/hyperintense on T2
- Chronic, stable phase
- Less clinically significant

Type 3 Changes

Subchondral bone sclerosis

- Hypointense on both sequences
- End-stage degeneration
- Dense bone formation
- Irreversible changes



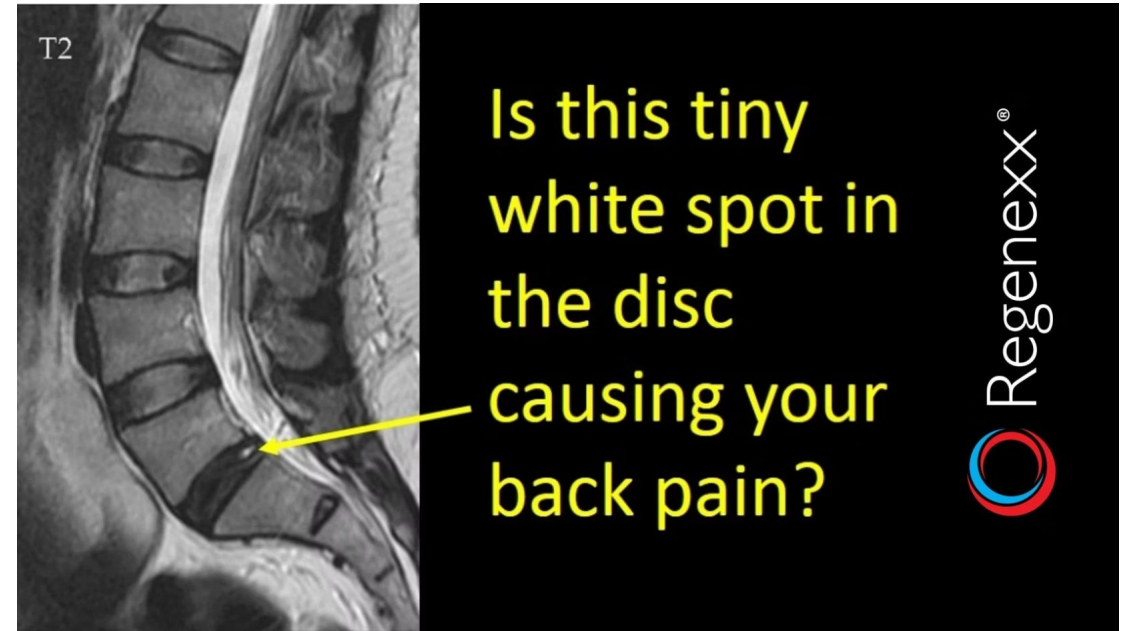
Annular Fissures and Tears

High-Intensity Zone

(HIZ) A high-intensity zone represents a focal area of hyperintense signal within the posterior annulus fibrosus on T2-weighted images, indicating an annular fissure or tear.

Clinical Significance:

- Marker of internal disc disruption
- Correlates with discogenic pain
- Represents vascularized granulation tissue
- Guides treatment planning decisions



Herniation Classification Spectrum

01

Normal Disc

Intact annulus, central nucleus, normal hydration and height

02

Bulging Disc

Circumferential extension beyond vertebral margins, diffuse

03

Disc Protrusion

Focal herniation, base wider than apex, annulus intact

04

Disc Extrusion

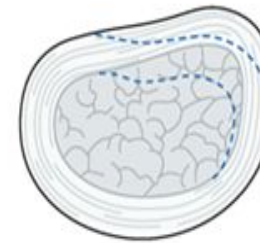
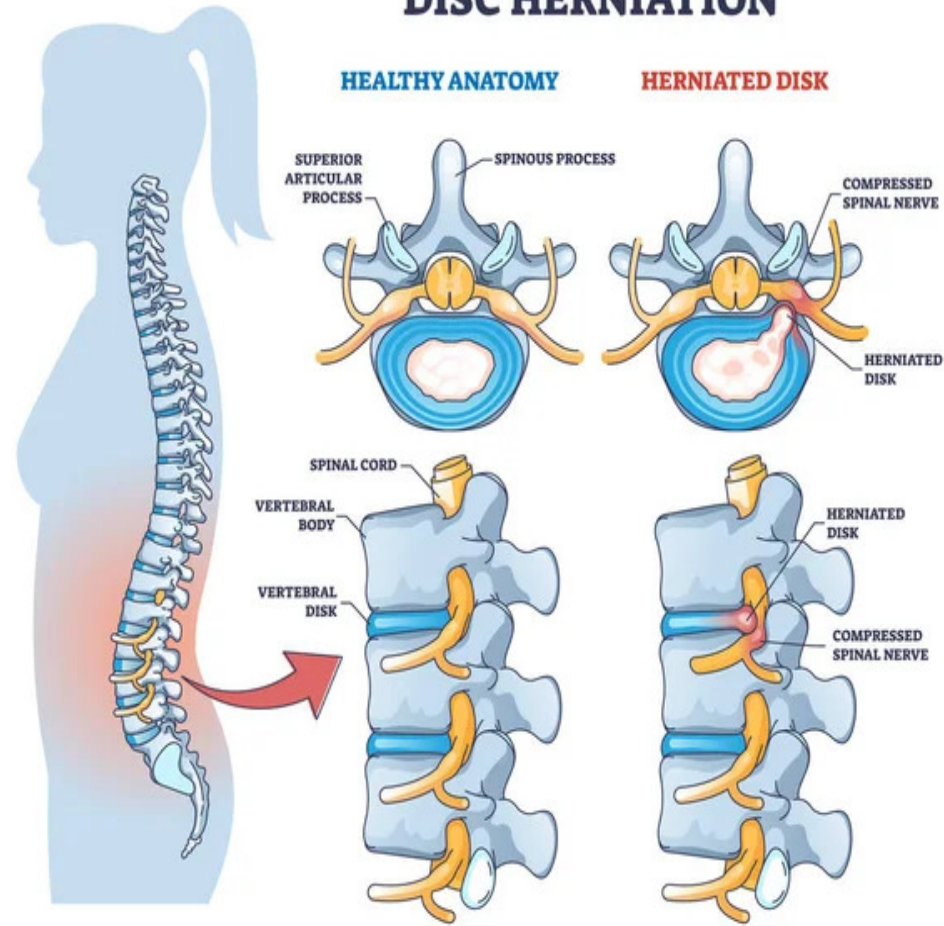
Herniation through annulus, base narrower than displaced material

05

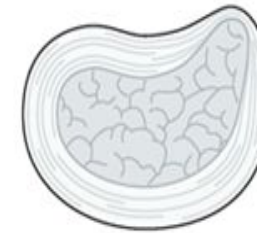
Sequestration

Free fragment completely separated from parent disc, migrated

DISC HERNIATION



Bulge



Protrusion



Contained extrusion



Uncontained extrusion

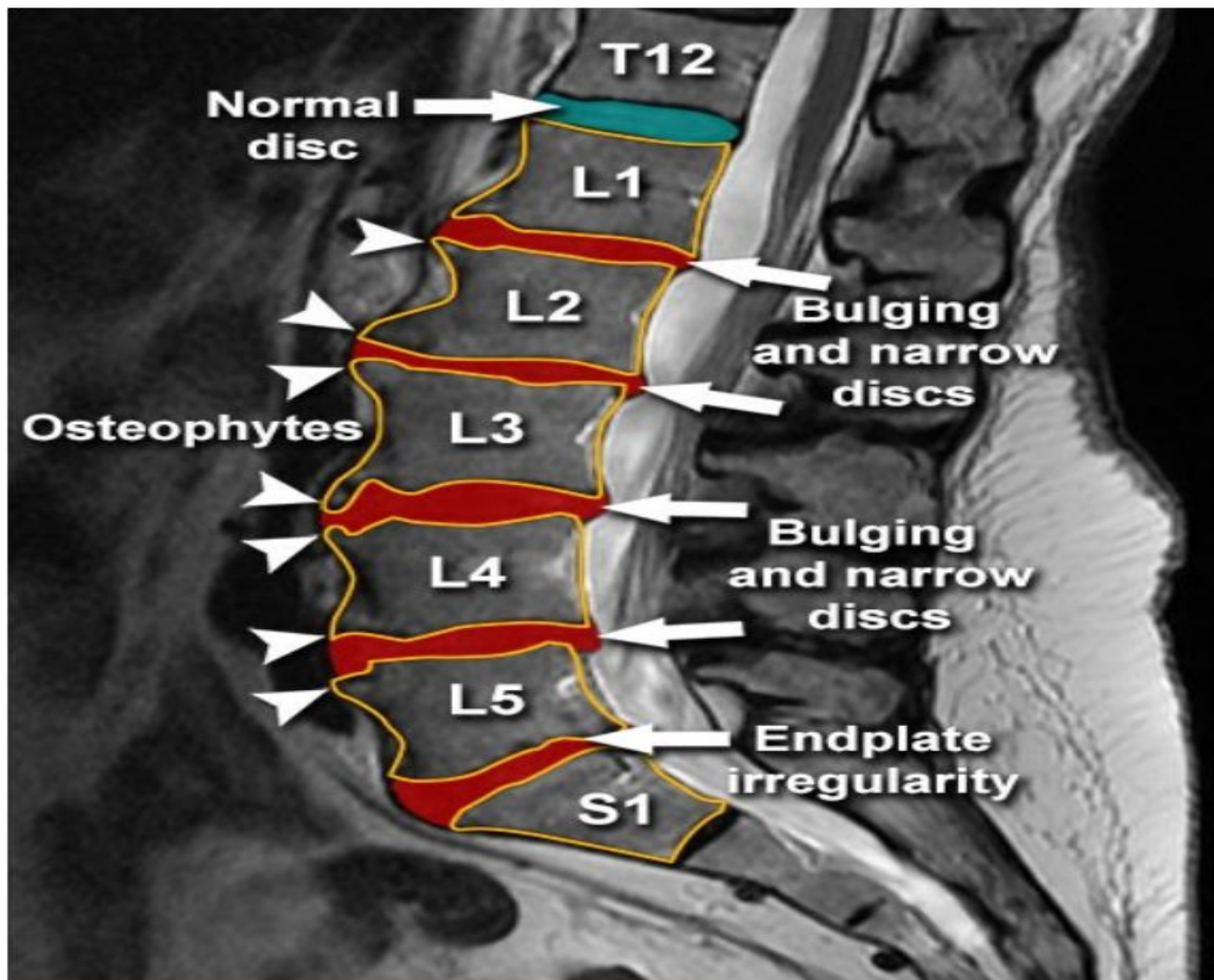


Sequestration



Pseudohermiation

AO



QUIZ



Any questions?

*Thank
You*