



Special Radiological Procedures Of The Head ,Breast And Respiratory System

Method Of Imaging The Spine

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جامعة ساوة الاهلية

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كلية التقنيات الصحية والطبية

Department of Radiology Tech.

قسم تقنيات الاشعة والسونار

. 3 Stage

المرحلة 3

محاضرة رقم 5

الجانب النظري

Lecture No 5.

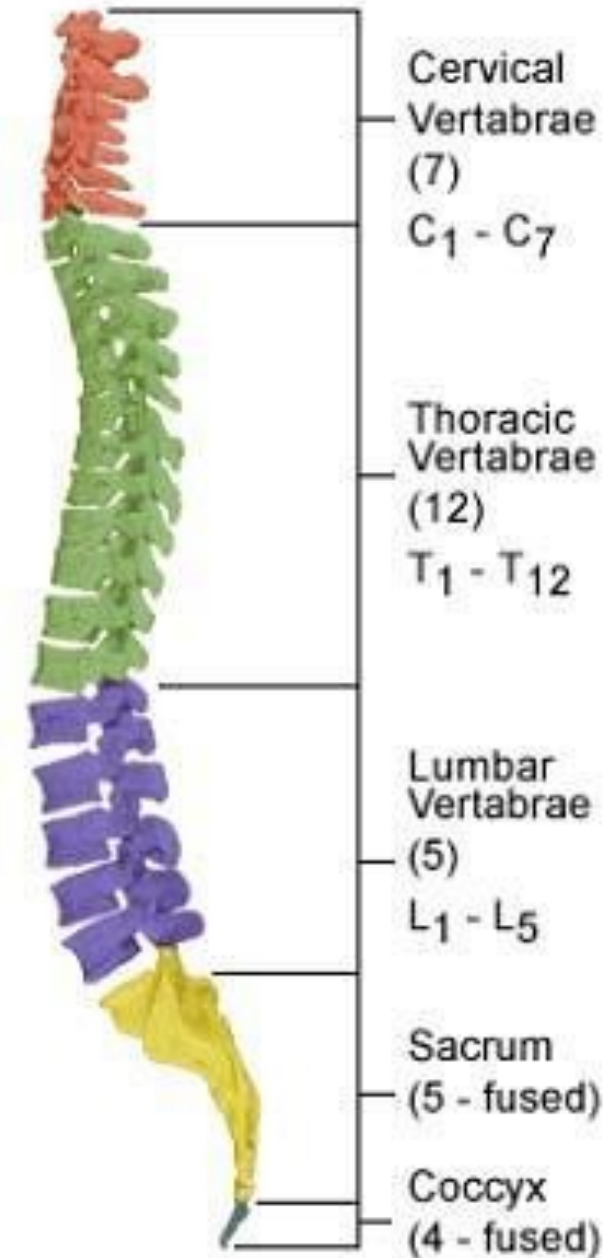
Theoretical

تدريسي المادة : م.م خيرات رحيم لهمود

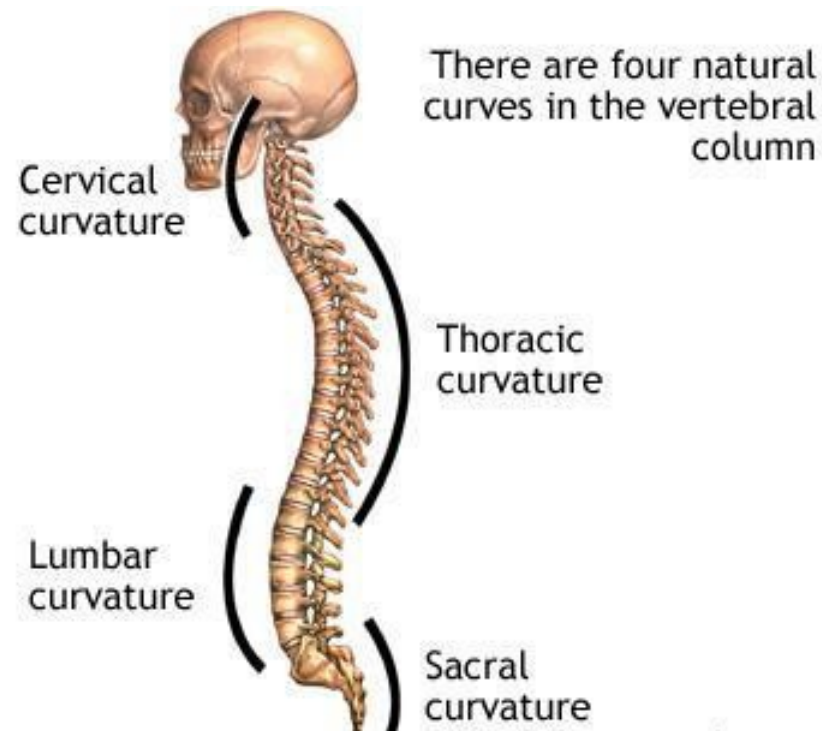
Anatomy of the

- The spine is made up of 33 vertebrae that are separated by spongy disks and classified into areas:
- The cervical area consists of 7 vertebrae in the neck.
- The thoracic area consists of 12 vertebrae in the chest.
- The lumbar area consists of 5 vertebrae in the lower back.
- The sacrum has 5 small, fused vertebrae.
- The 4 coccygeal vertebrae fuse to form 1 bone.

Spinal Column with Vertebrae



- The **vertebrae** are **separated** by pads of flexible fibrocartilage called the **intervertebral disc**.
- **The intervertebral disc** cushion the vertebrae and absorbs shocks .
- **The spinal curvature (Lordosis , kyphosis) and discs** make the body flexible and prevent shock to head while walking or running.



- **The vertebrae in each region have unique features that help them perform their main function :**

1. **Cervical vertebrae C1-C7:** The main function of cervical spines is to support the weight of the head
2. **Thoracic vertebra T1-T12:** The main function of thoracic spines is to hold the rib cage and protect the heart and lungs
3. **Lumber vertebrae L1-L5 :**to bear the weight of body
4. **Sacral bone:** The function of bone is to connect the spines with hip bones five fused vertebrae.
5. **Coccygeal region** four fused bones of coccygeal or tailbone provide attachment for ligaments and muscle of pelvic floor

- **Typical vertebra**

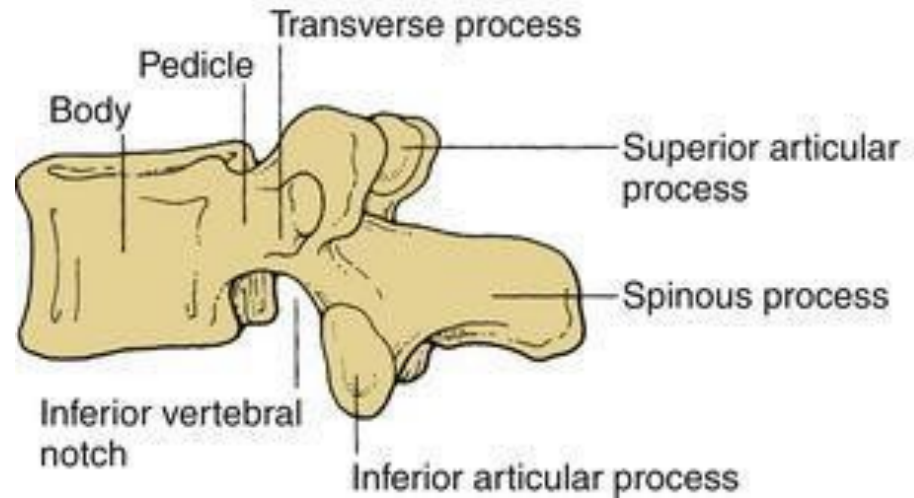
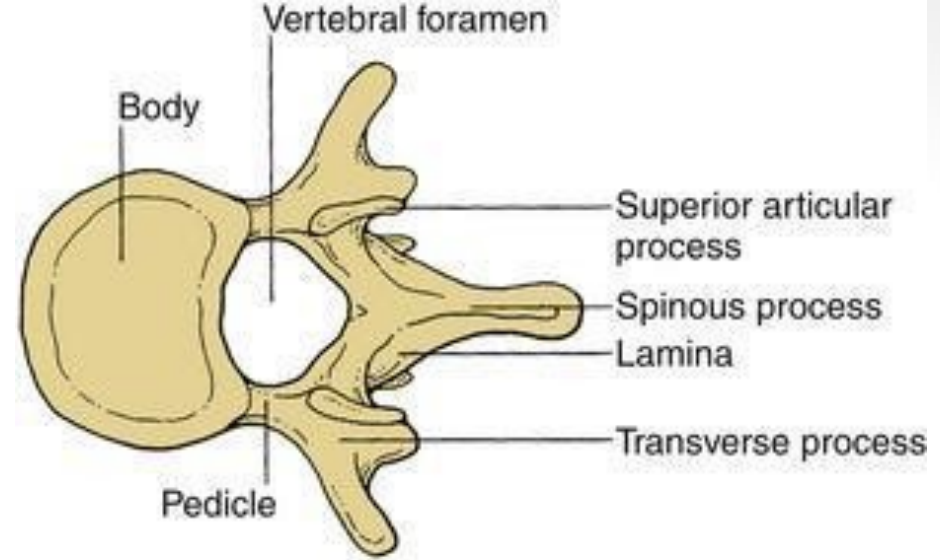
- Any vertebra is made up of:

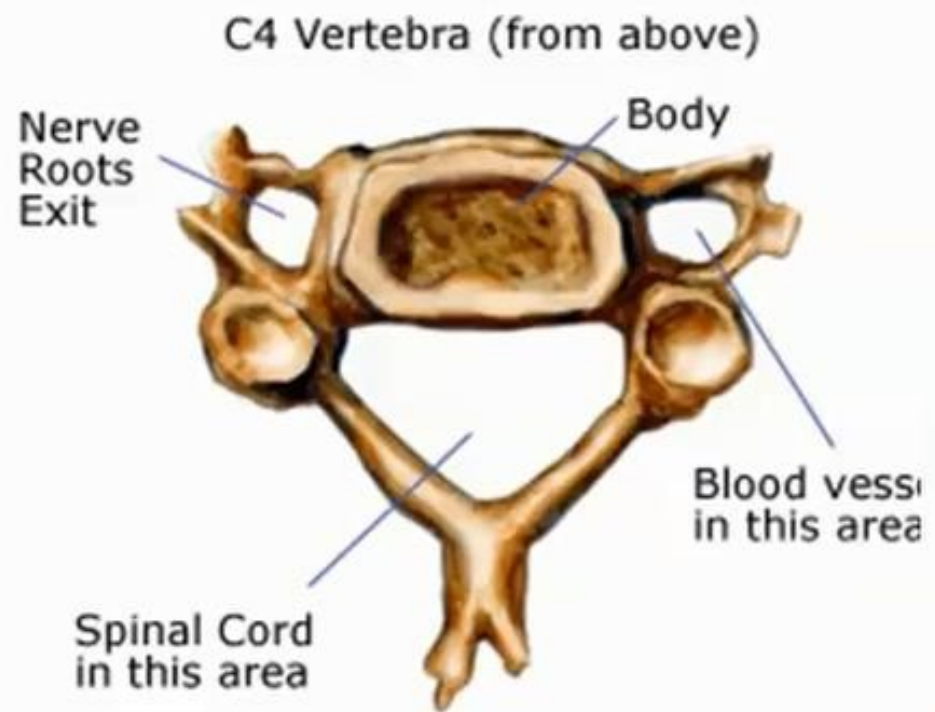
- 1. Body or Centrum :

- 2. Vertebral Arch :

- • Vertebral foramen lies between the body and the arch

- • The spinal cord passes through the vertebral foramen.





Methods of imaging the spine

- There are a variety of ways to image the spine, many of which are expensive. The role imaging are selected **diagnostic accuracy, clinical relation and effectiveness.** Each diagnostic imaging procedure has a different degree of sensitivity when applied to a particular diagnostic problem. A combination of imaging techniques can be used in a complementary way to enhance diagnostic accuracy.

1 Conventional Radiography

2 Fluoroscopy

3 Computed Tomography (CT)

4 Magnetic Resonance Imaging (MRI)

5 Myelography

X-Ray of the Spine

- A spinal x-ray is an imaging technique that uses radiation to provide a general overview of the spine. Spinal x-rays are used for the evaluation of **the bony structures, such as the vertebrae and joints**, in diagnosing and guiding medical treatment for conditions that cause neck or back pain.
- Also called a plain or conventional radiograph, the x-ray is one of the first tests ordered when a back or neck problem is suspected.





Cervical spine

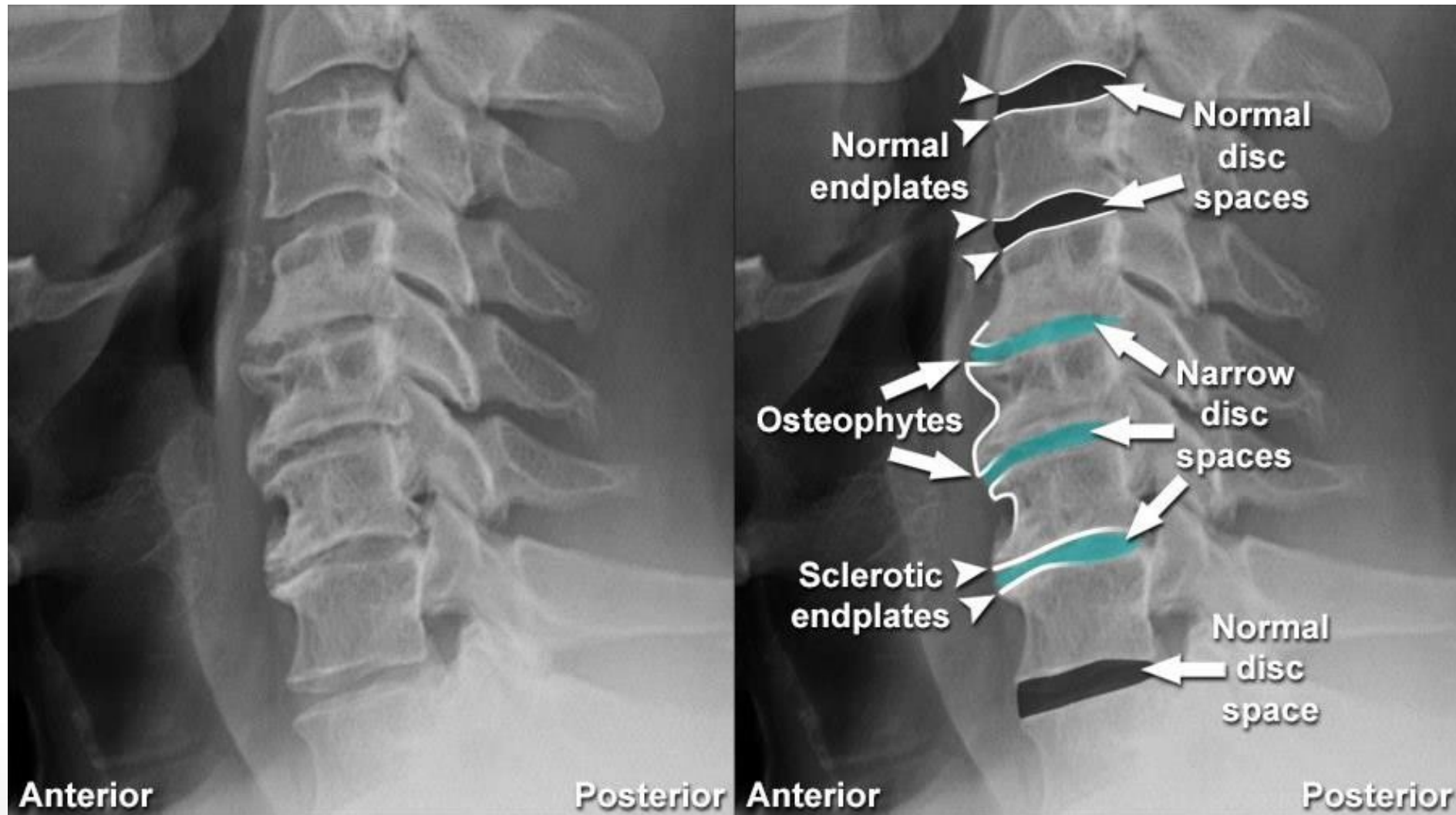


Spinal Conditions that may be identified on an X-ray

The conventional x-ray typically has five views of the spine: one anteroposterior (or front-to-back) view, two lateral (or side) views, two (left and right) oblique views, and one odontoid view (taken from the front, to view the neck, with the mouth open). One or more of these views may be used in aiding the diagnosis of:

- [Compression fractures](#) (osteoporosis or bone cancer)
- Stress fracture or [spondylolysis](#)
- [spinal muscle Spasm](#)
- [Spinal arthritis](#) and bone spurs
- [Spinal tumors](#)
- Spinal alignment disorders (abnormal curves of the spine), such as [scoliosis](#), [kyphosis](#) and [lordosis](#)
- [Neuroforaminal stenosis](#) (narrowing of the bony openings in the spine through which the spinal nerves pass)
- Spinal [osteopenia](#) (thin of the spinal bones)
- Birth defect (such as a [lumbar sacralization](#) or fusion of the L5 vertebra with the pelvic bone, [spina bifida occulta](#), normal variant and other abnormal [fusions in the spine](#))

Cervical spine X-Ray





Stress fracture



Compression fractures



spinal muscle Spasm



Spinal arthritis



[scoliosis](#)



[kyphosis](#)



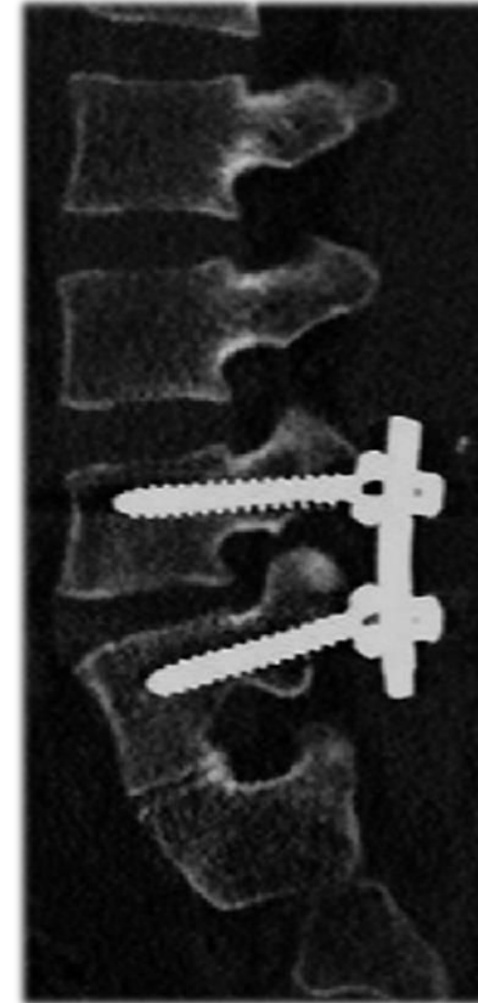
[fusions in the spine](#)

Computerized Tomography (CT) Scan



Computerized Tomography (CT) Scan

- A computed tomography scan, commonly referred to as a CT scan, is a radiological imaging technique that creates two-dimensional images of the body in horizontal , cross-sectional (sliced) planes and three-dimensional images .
- CT scan is a rapid, 5-20 minute painless exam that combines the power of X-rays with computers to produce 360 degrees, cross-sectional views of your body. CT images of internal organs, bones, soft tissue and blood vessels provide greater detail than traditional x-rays, particularly of soft tissues and blood vessels.



Abnormal Lumbar spine imaging



Normal Lumbar spine imaging (radiopedia)



Items for evaluation

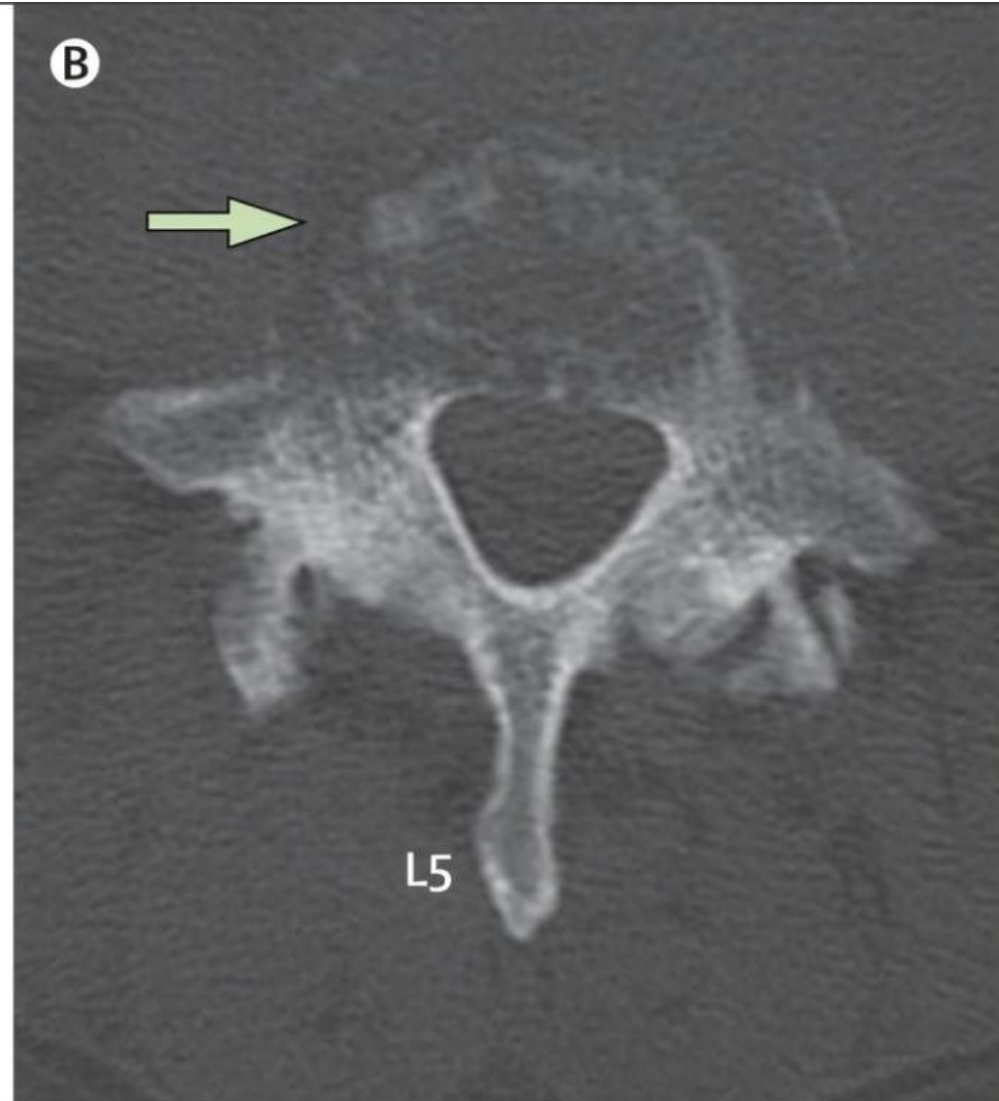
- Spinal canal diameter[lumbar]
- Disc lesions
- Others
 - Joints [facet, neuro central, sacroiliac]
 - Para vertebral soft tissues



Spinal Conditions that may be identified on a CT Scan

- A spinal CT scan can show details of bones, muscles, and organs,
and aid in the diagnosis of neck or back pain from:
 - [Vertebral fractures](#)
 - [Spinal degenerative changes](#)
 - [Spinal osteomyelitis](#) (bacterial infection)
 - [Spinal tumors and masses](#)
- A CT procedure can allow the entire cervical (neck) spine or the whole spine to be adequately visualized, and this type of view is typically preferred in **the emergency department to examine traumatic injuries in detail**. CT is the imaging technique of choice for gunshot wounds, providing clear details of the injury, which cannot be seen in other specialized scans, such as a magnetic resonance imaging (MRI) scan, due to the metallic nature of the bullet.

- Spinal osteomyelitis (bacterial infection)



MRI Scan of the Spine

MRI Scan of the Spine

• Magnetic resonance imaging (MRI) is a highly sensitive and specific imaging technique that yields comprehensive images of **the structure, function, and composition of tissues in the body**. The technique uses a strong magnet, radio waves, and a computer to generate detailed images of the body. In the spine, an MRI scan can reveal thorough details **of the joints, muscles, tendons, ligaments, spinal discs, spinal nerve roots, and the spinal cord.**

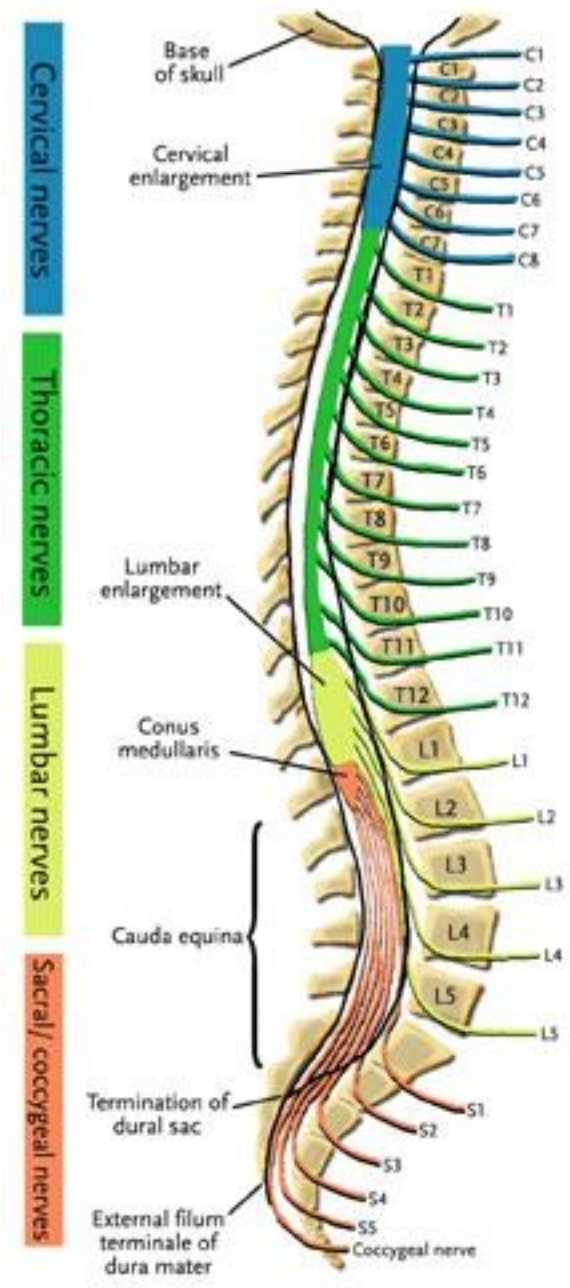


- MRI produces detailed images without the use of ionizing radiation, making it a safer option compared to standard imaging techniques, like x-rays or computed tomography (CT) scans.

Spinal coil of the MRI

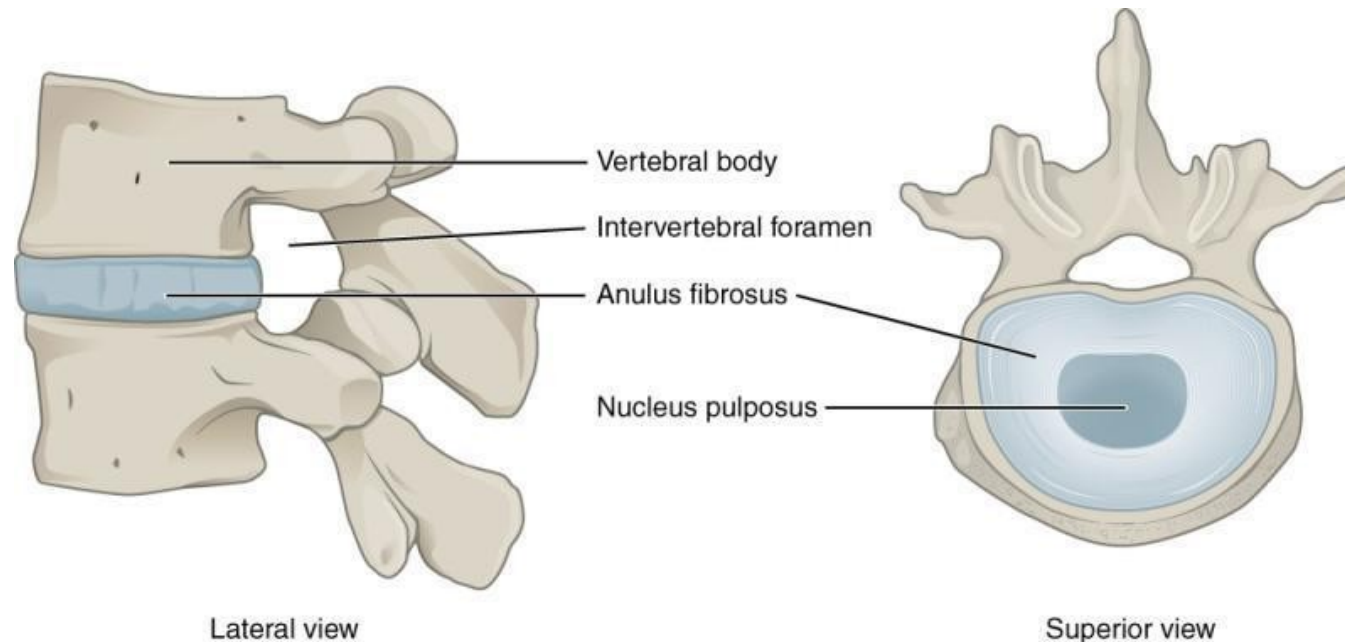


- **MRI may be recommended when the following conditions are suspected:**
- Spinal cord compression in the neck due to conditions such as [cervical stenosis with myelopathy](#)
- Spinal cord compression in the lower back, leading to conditions such as [cauda equina syndrome](#)
- Primary or secondary [spinal tumors](#)
- [Herniated disc](#)
- In these conditions, MRI is considered the gold standard for imaging and investigating the underlying cause of the specific condition and formulating the treatment plan.

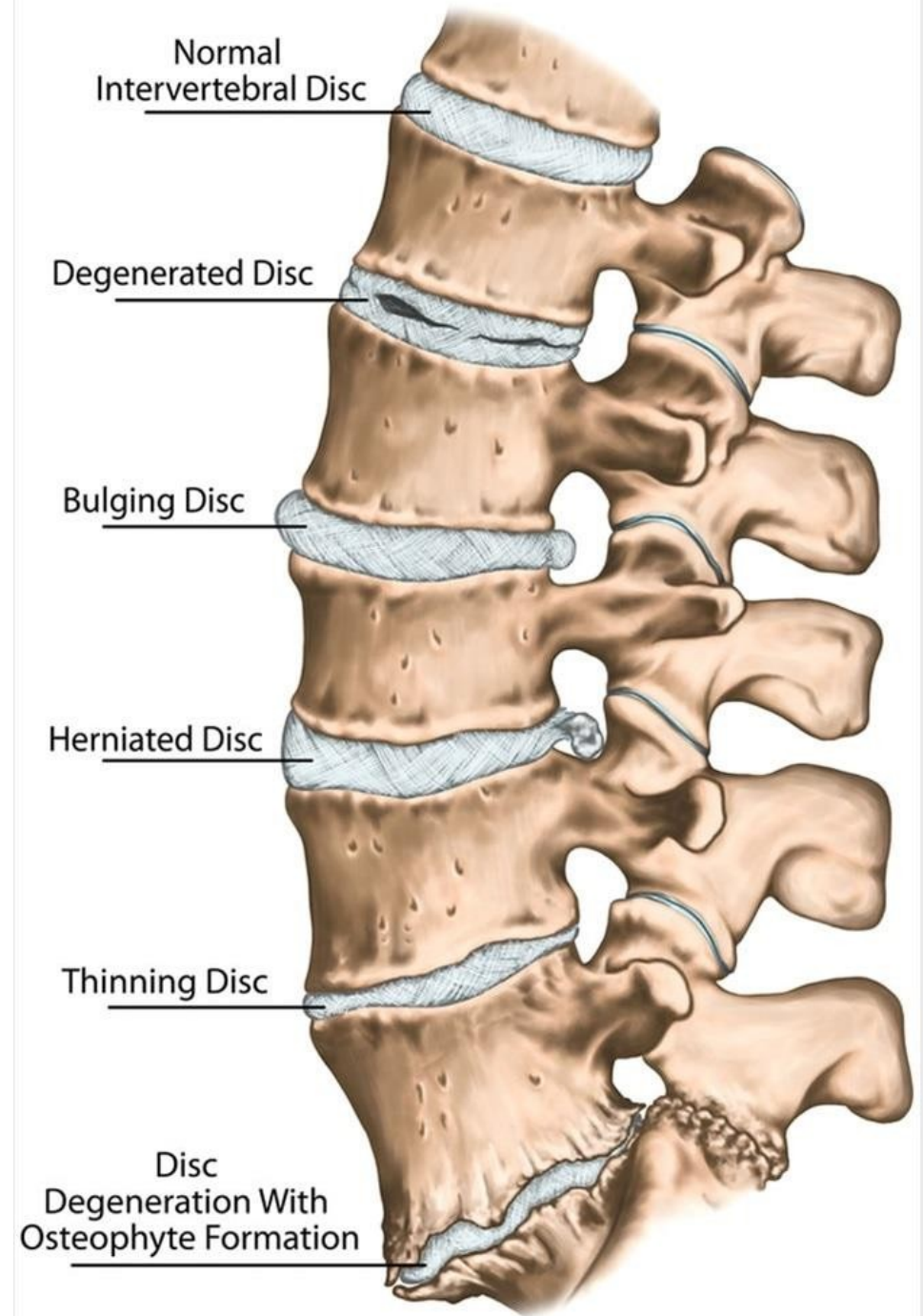


Intervertebral disc

- Each vertebrae is separated and cushion by intervertebral disc, keeping the bones from rubbing together .
- Disc are designed like a radical car tire .
- The outer ring called the **annulus**, has criss-crossing fibrous bands, these bands attached between the body of each vertebrae. Inside the disc is a gel filled center called **nucleus**.

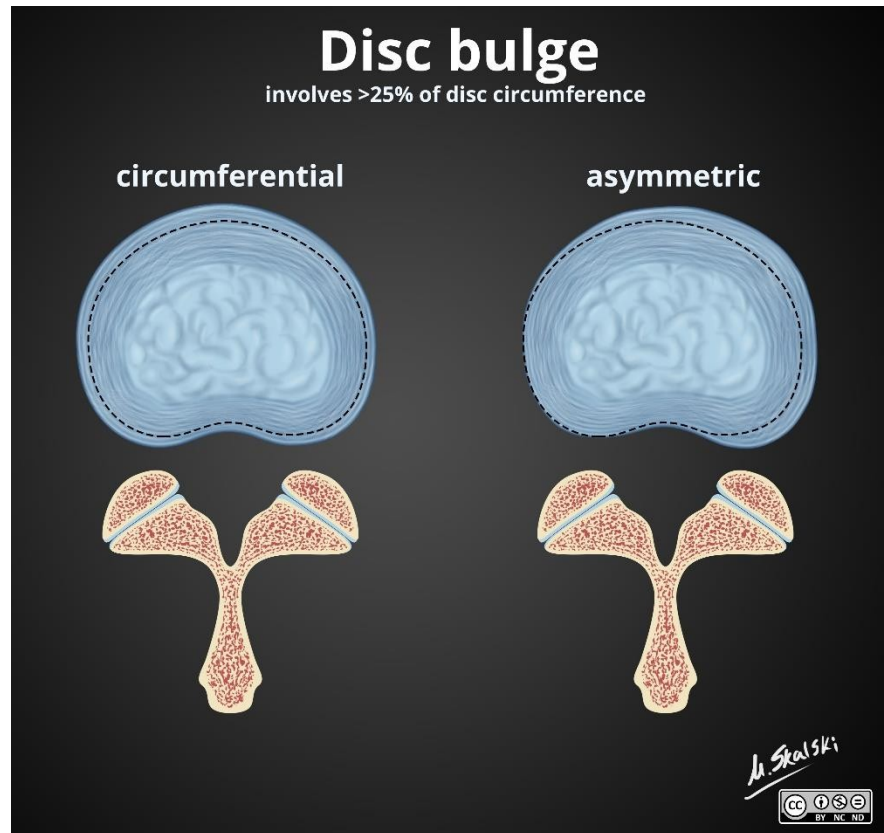


**Spine
problems
can be
more
complex**

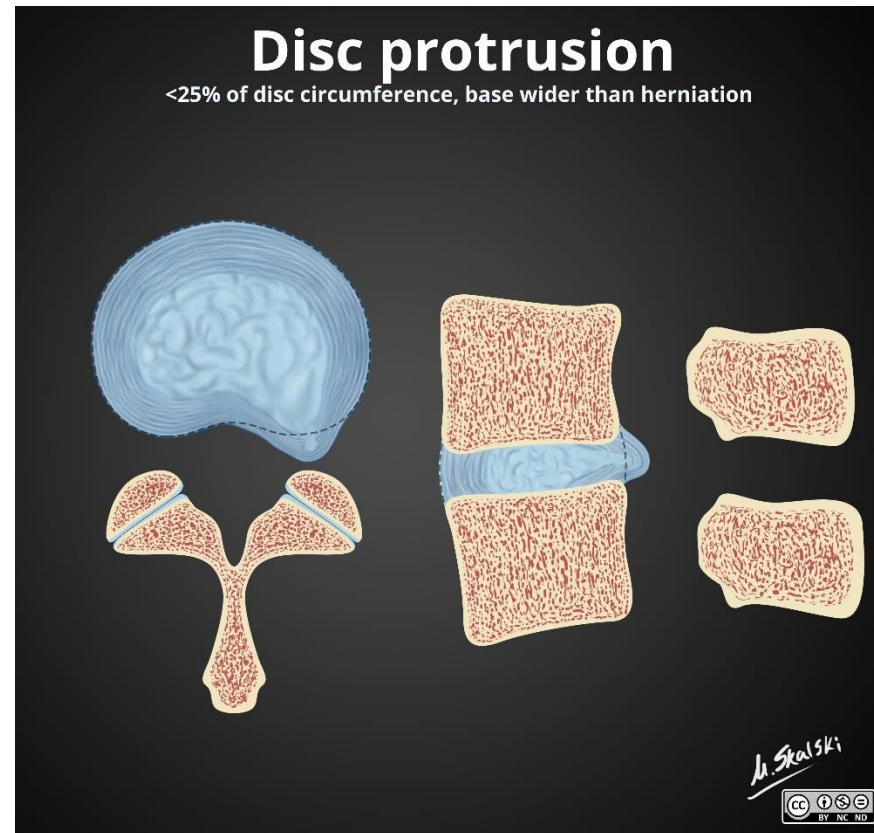


Disc prolapse levels

First level



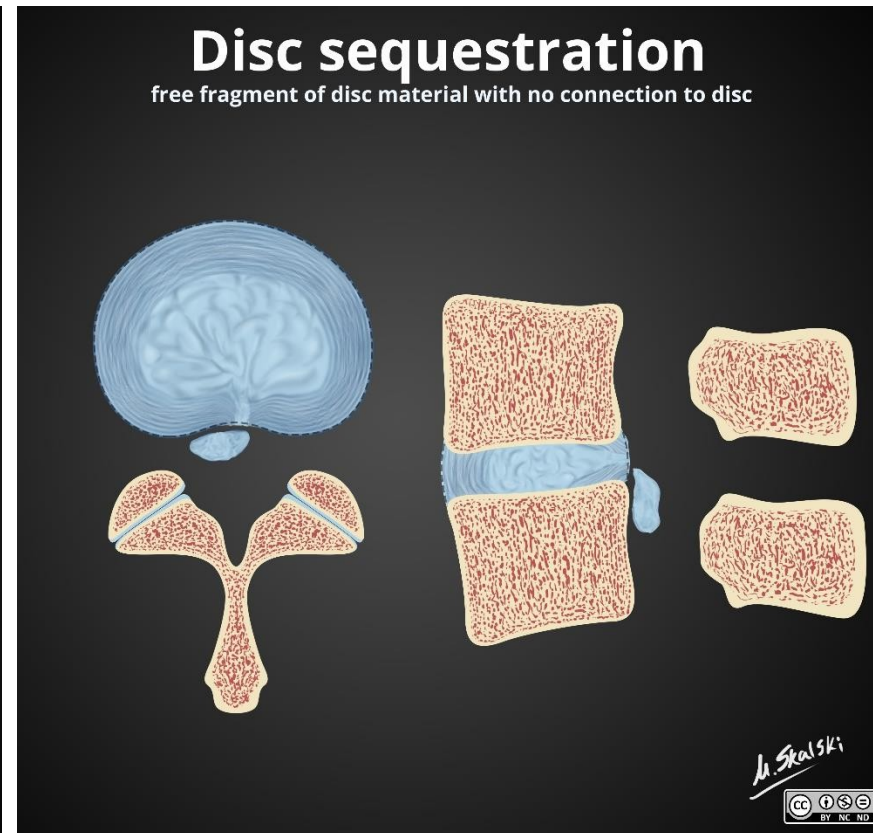
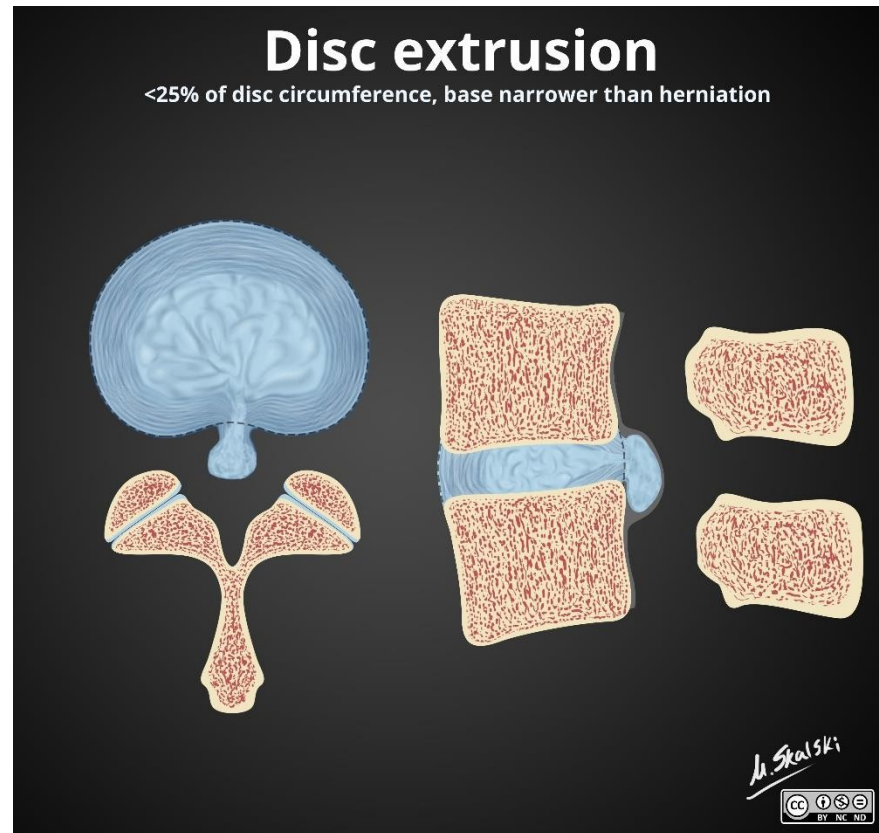
Second level



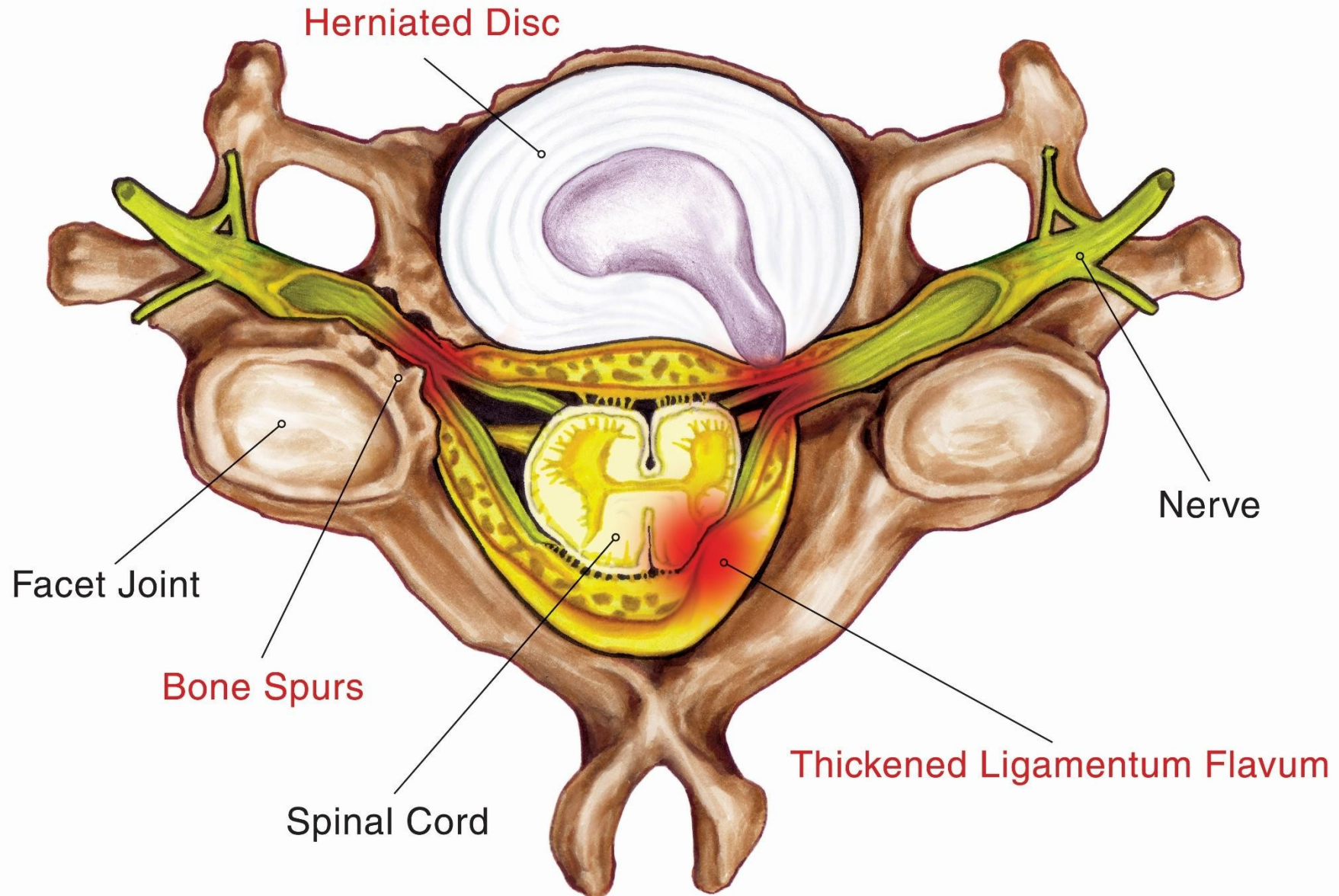
MRI DISC PROLAPSE LEVELS

Third level: Herniation,

Fourth level ; sequestration



Example of Spinal Nerve Compression (viewed from above)



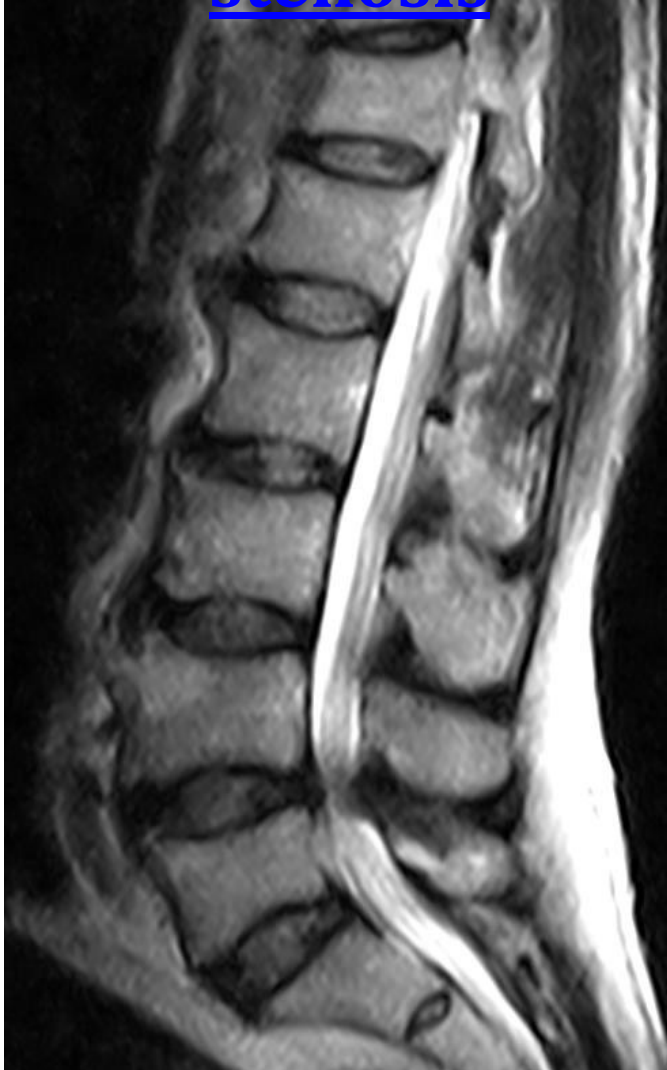
Normal MRI
cervical spine



Normal
MRI lumbar



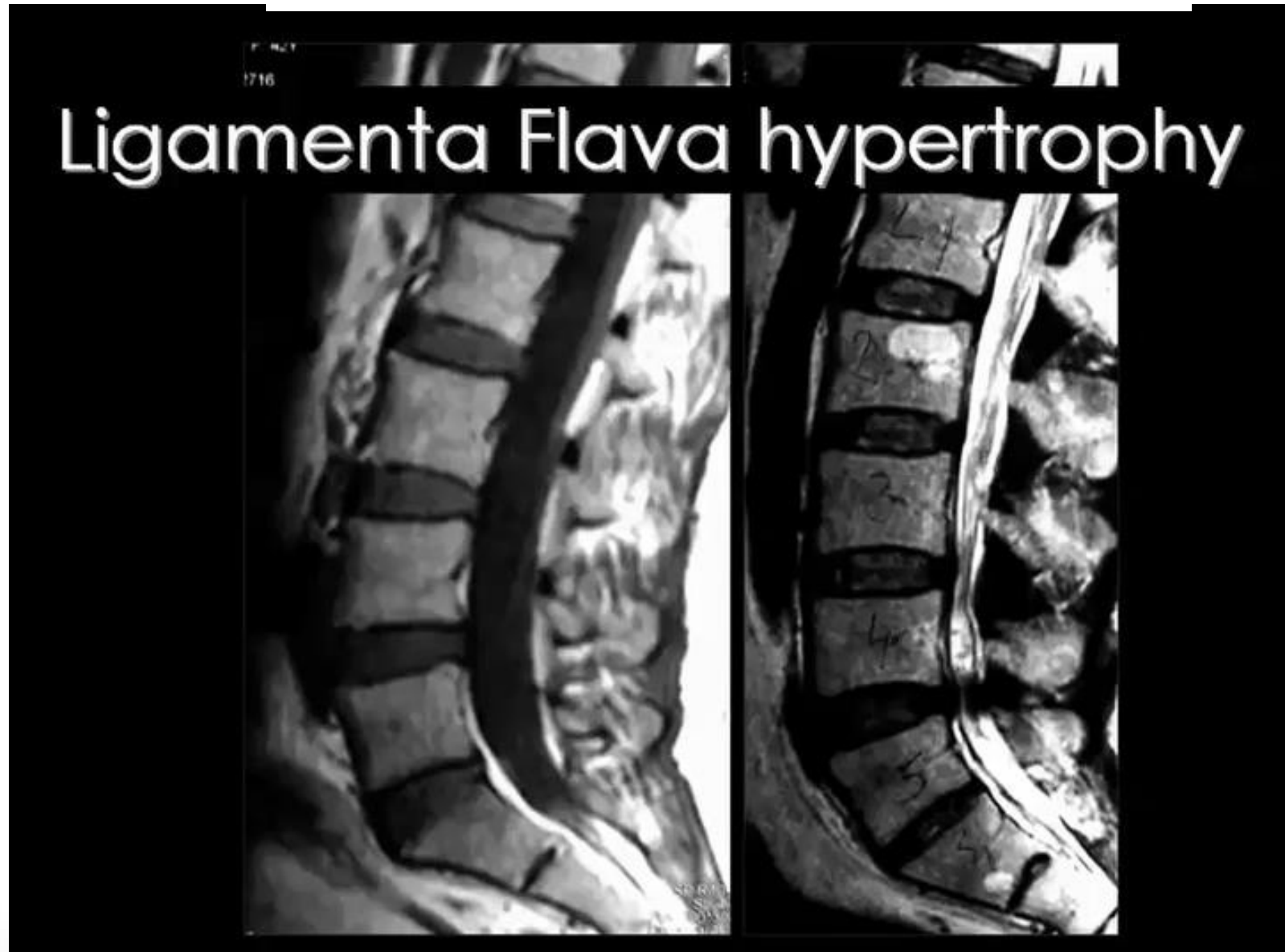
Spinal
canal
stenosis



Disc
herniation (
extrusion)

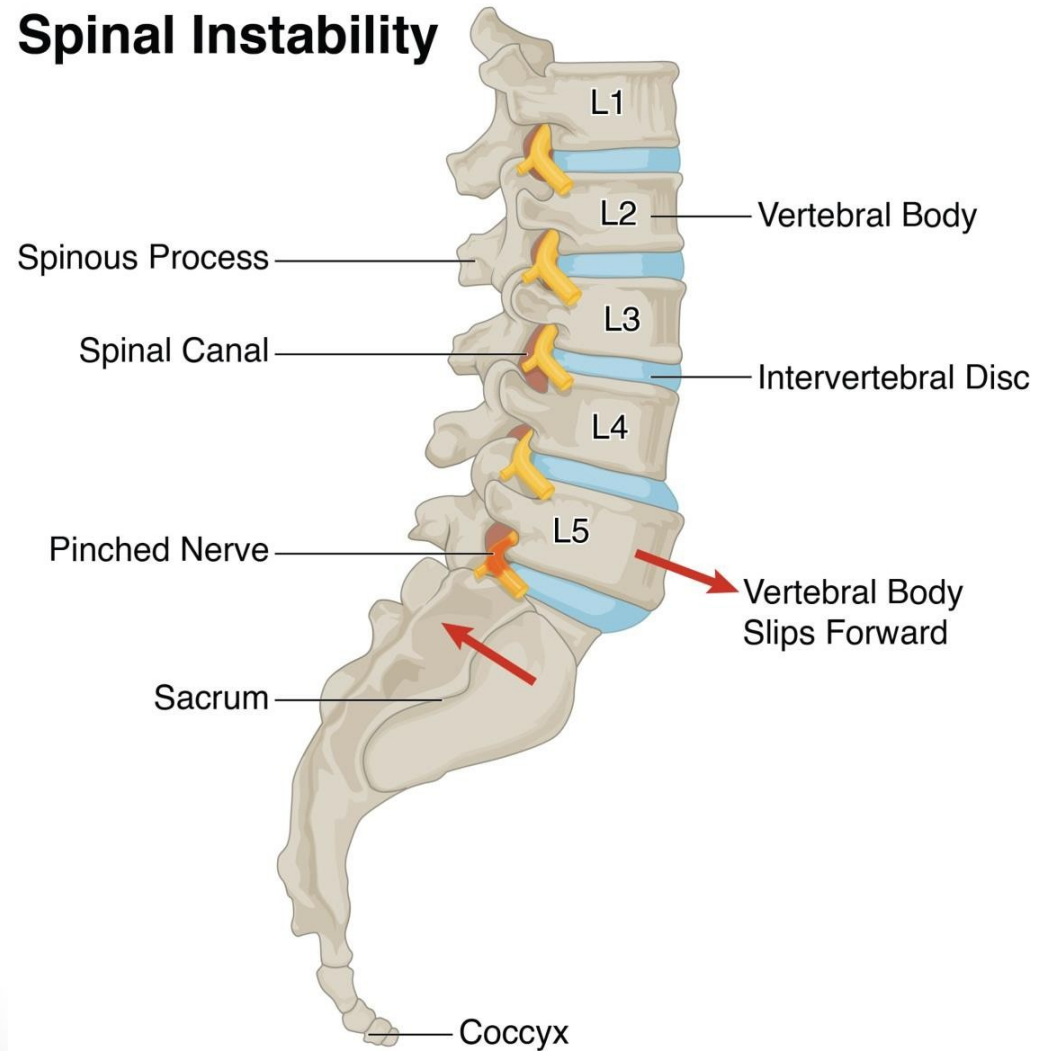


Ligamenta Flava hypertrophy



vertebral problem : spondylolisthesis

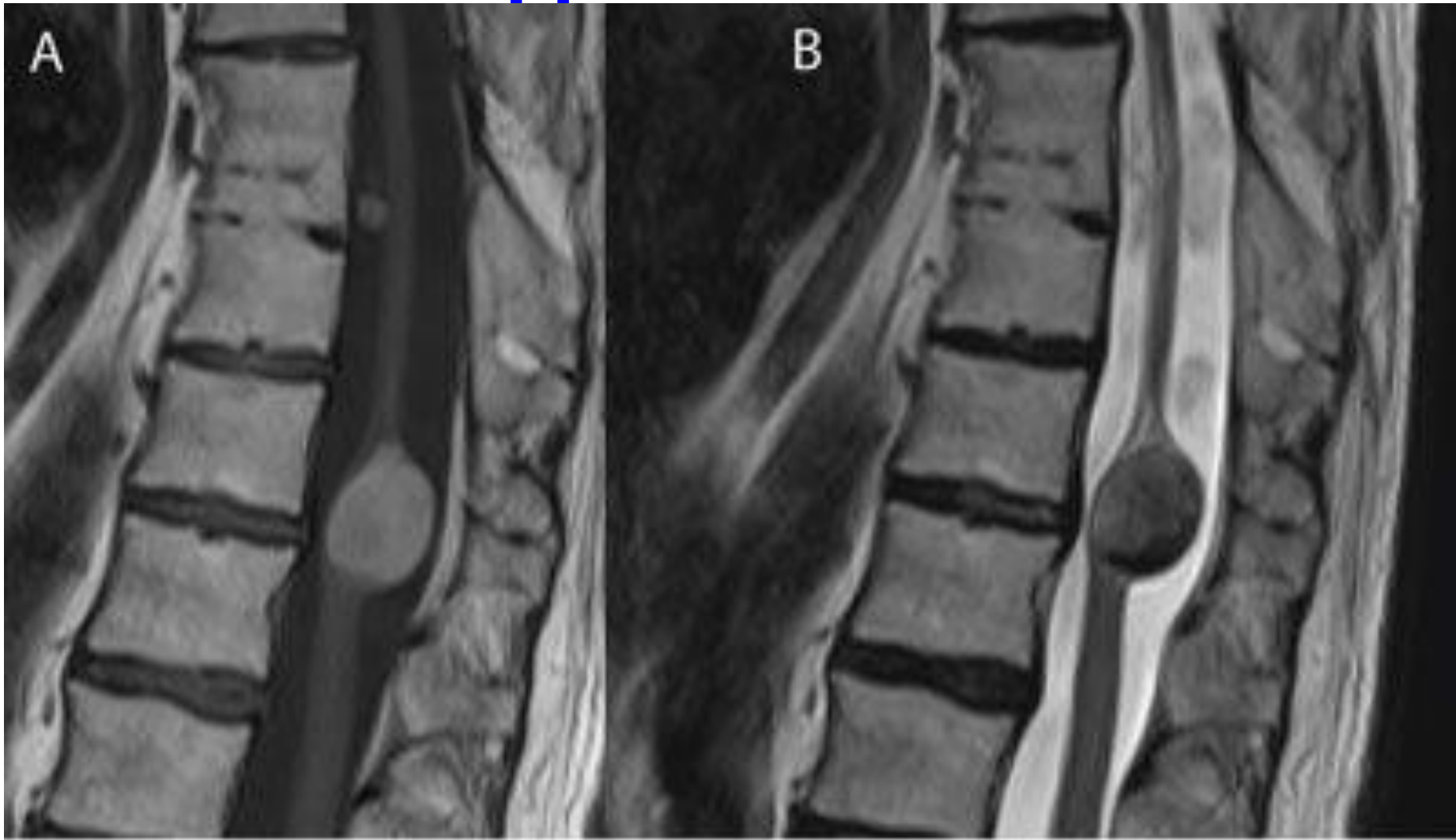
Spinal Instability





Bone marrow changes

Spinal cord problem



A- T1 with contrast

B- T2 without contrast

MRI with Contrast

- For certain conditions, an additional MRI sequence using contrast can help more accurately determine the **anatomy and pathology** of the area of the spine being studied. These contrast agents make the **abnormality in the tissues brighter and clearer on T1. Then the contrast should be administrated on the T1 sequences**

Contrast administration

Yes

*Post-operative lumbar spine
Inflammatory and neoplastic lesion*

No

*Any other pathology [disc lesions,
spinal trauma, congenital anomalies]*



recapitulate Spinal MRI imaging

Degenerative diseases

- 1 spinal canal stenosis
- 2 Disk lesions
- 3 Bone marrow change
- 4 Spinal instability → spondylolisthesis (antrolisthesis , Retrolisthesis)
- 5 cord pathology



Any questions?

*Thank
You*