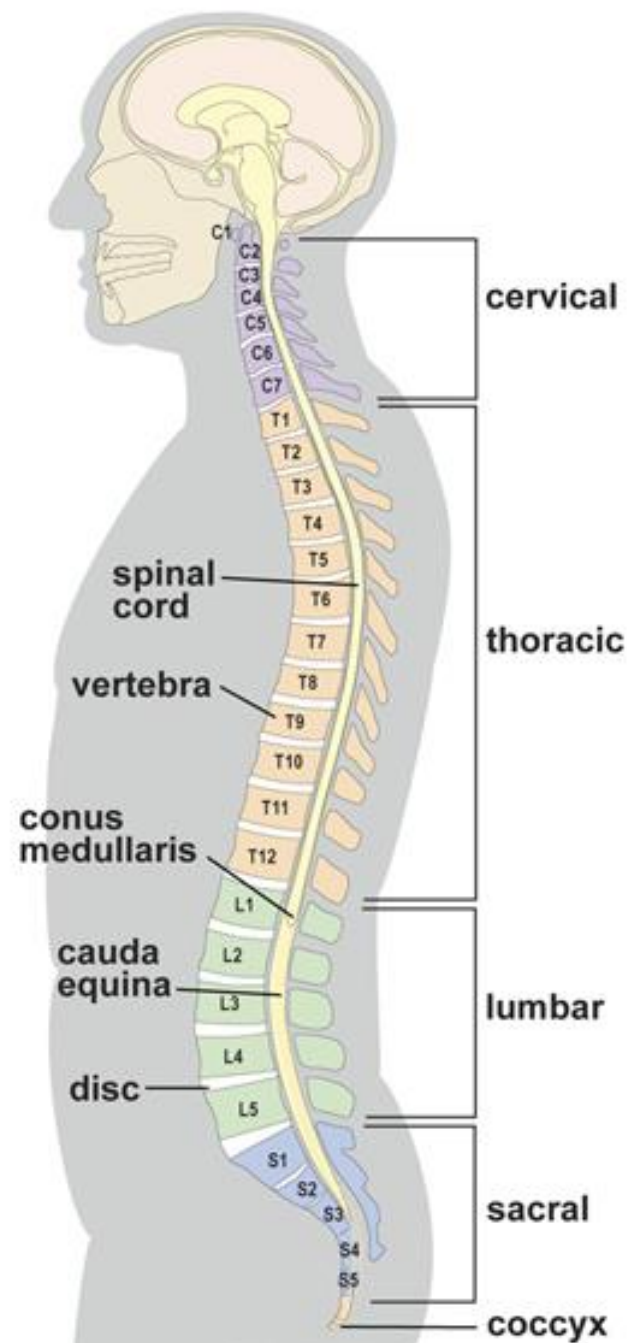


SPINE IMAGING



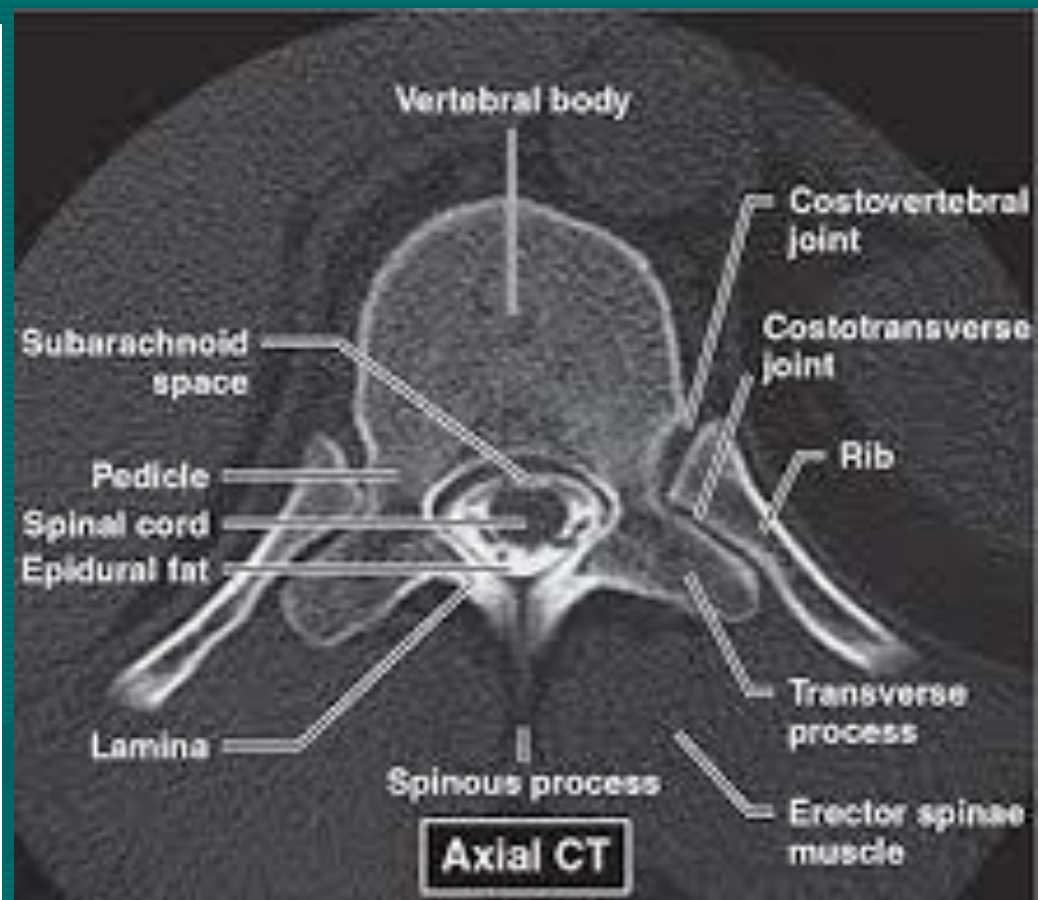
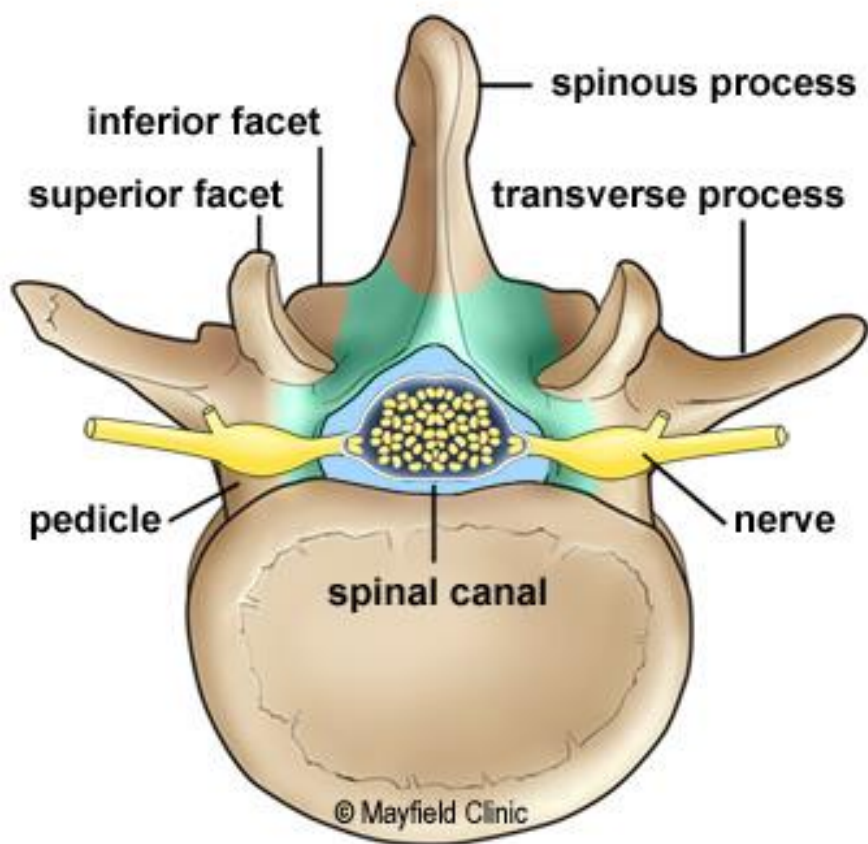
Spine anatomy

- ❖ The vertebral column forms the central bony axis of the spine, and is composed of 33 vertebrae.
- 7 Cervical vertebrae
- 12 Thoracic vertebrae
- 5 Lumbar vertebrae
- 5 Fused sacral segments
- 4 Fused coccygeal segments

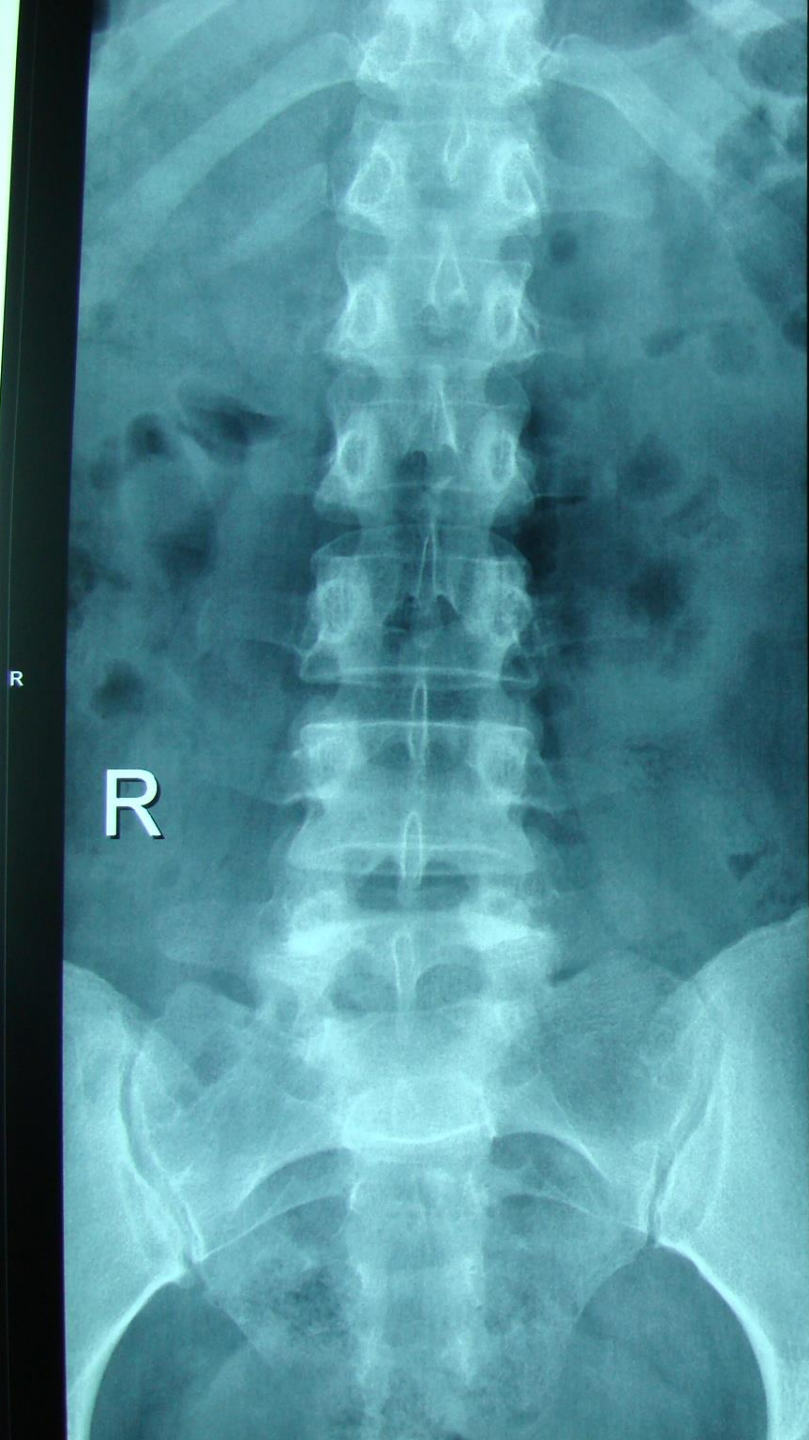


Spine anatomy / 2

- A typical vertebra consist of two parts:
 - Anterior (the body)
 - Posterior (neural arch)
- The two parts of the vertebrae enclose the vertebral canal which contains:
 - The spinal cord.
 - The meninges.
 - The associated vessels.

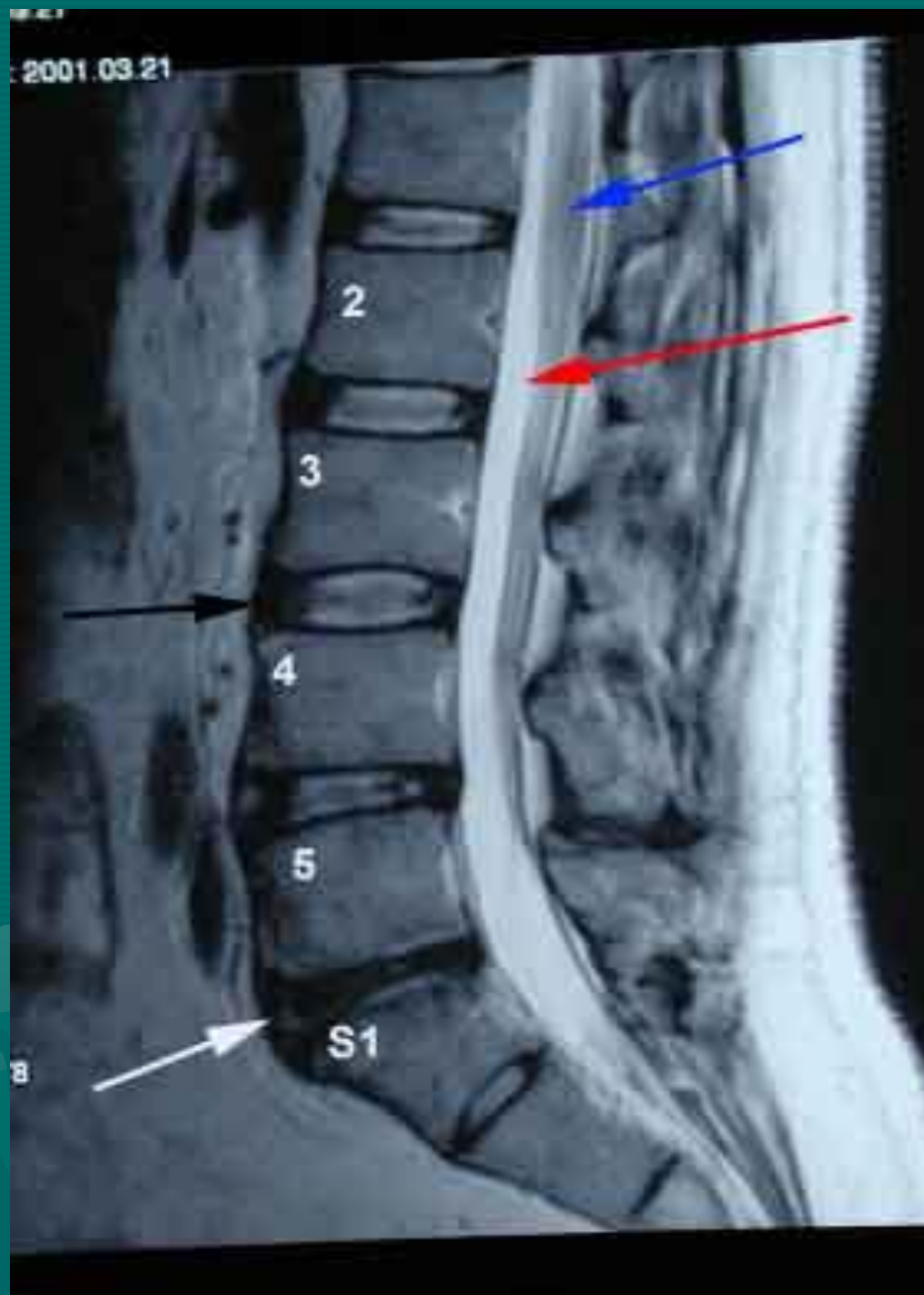


Source: Lynn N. McKinnis: *Fundamentals of Musculoskeletal Imaging*, 4th Edition:
www.FADavisPTCollection.com
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Spinal cord

- The spinal cord is approximately 45cm long and descends from the medulla oblongata at the level of the foramen magnum and terminates at the conus medullaris between L1-L2.
- The cauda equina is formed by the spinal nerves extending from the lowest portion of the spinal cord (conus medullaris).
- The spinal nerves lie free in the subarachnoid space.



DEVELOPMENTAL ANOMALIES OF THE LUMBAR SPINE

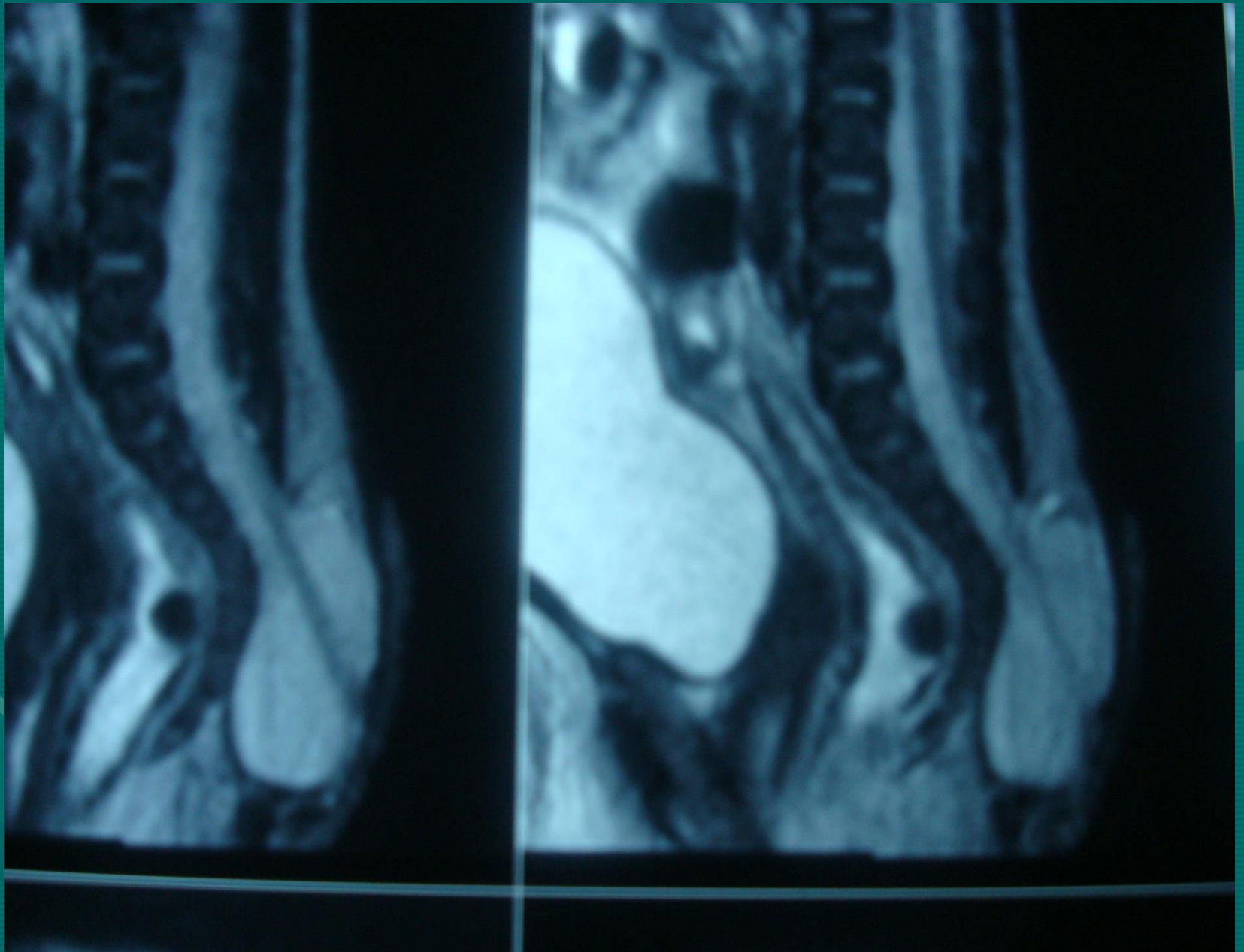
- Sacralization or Lumbarization.
- Spina bifida.
- Synostosis (Block vertebra).
- Hemivertebra.
- Butterfly vertebra.
- Myelomeningocele.
- Tethered cord.
- Diastematomyelia.



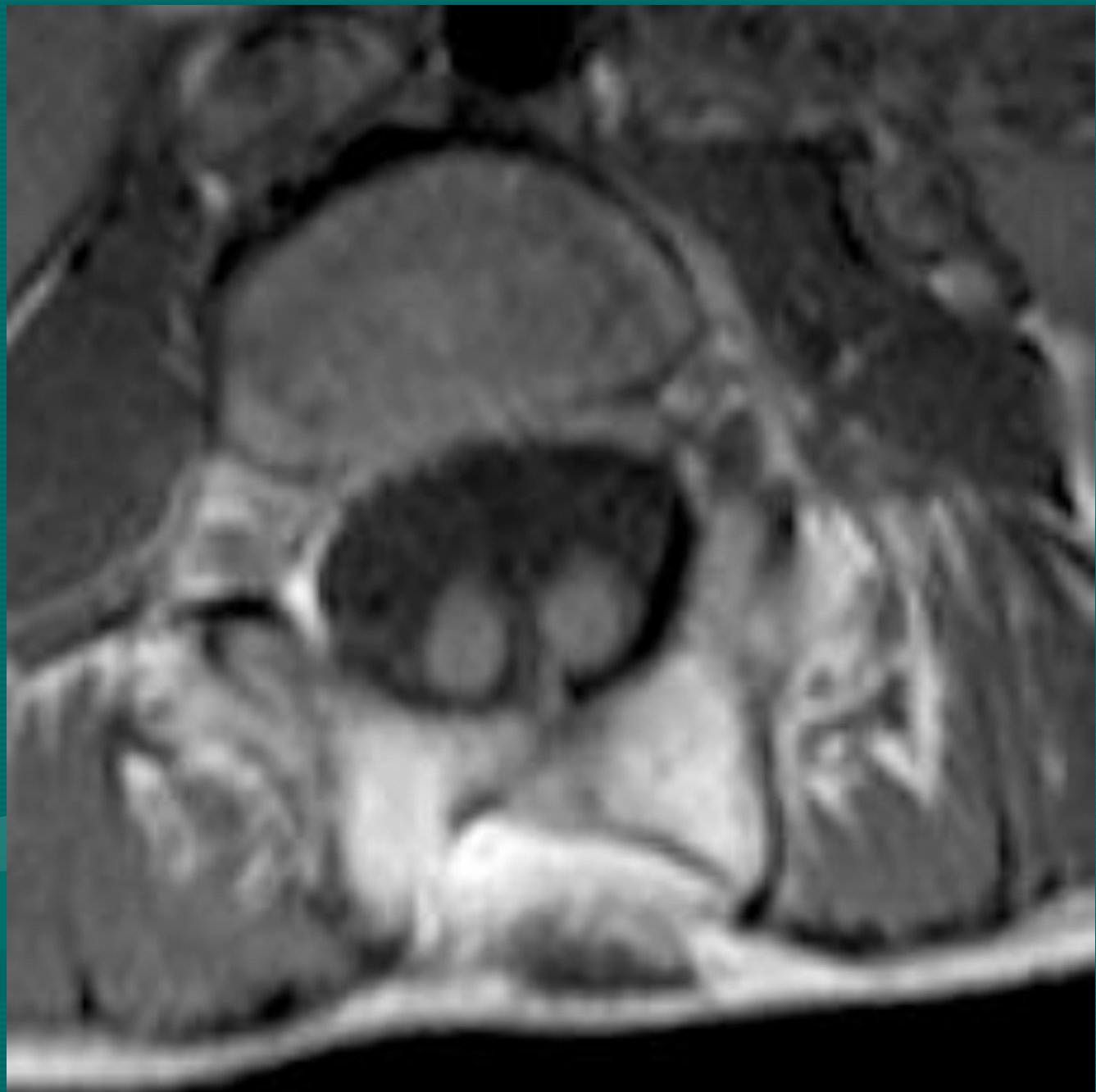












SPONDYLOLISIS AND SPONDYLOLISTHESIS

What is spondylolysis ?

- Is a defect in the region of the pars interarticularis of a vertebra, most commonly at the fourth and fifth lumbar level.
- This defect which was considered to be a congenital abnormality, is now thought to be almost always the result of unhealed stress fracture.

WHAT IS SPONDYLOLISTHESIS ?

Is anterior slipping or subluxation of a vertebra (or the spine above) in relation to the vertebrae below.

The main causes of spondylolisthesis are:

- Spondylolysis, is the most common cause
- Degenerative disc disease and osteoarthritis of the facet joints.
- Fracture of the posterior elements of the vertebra

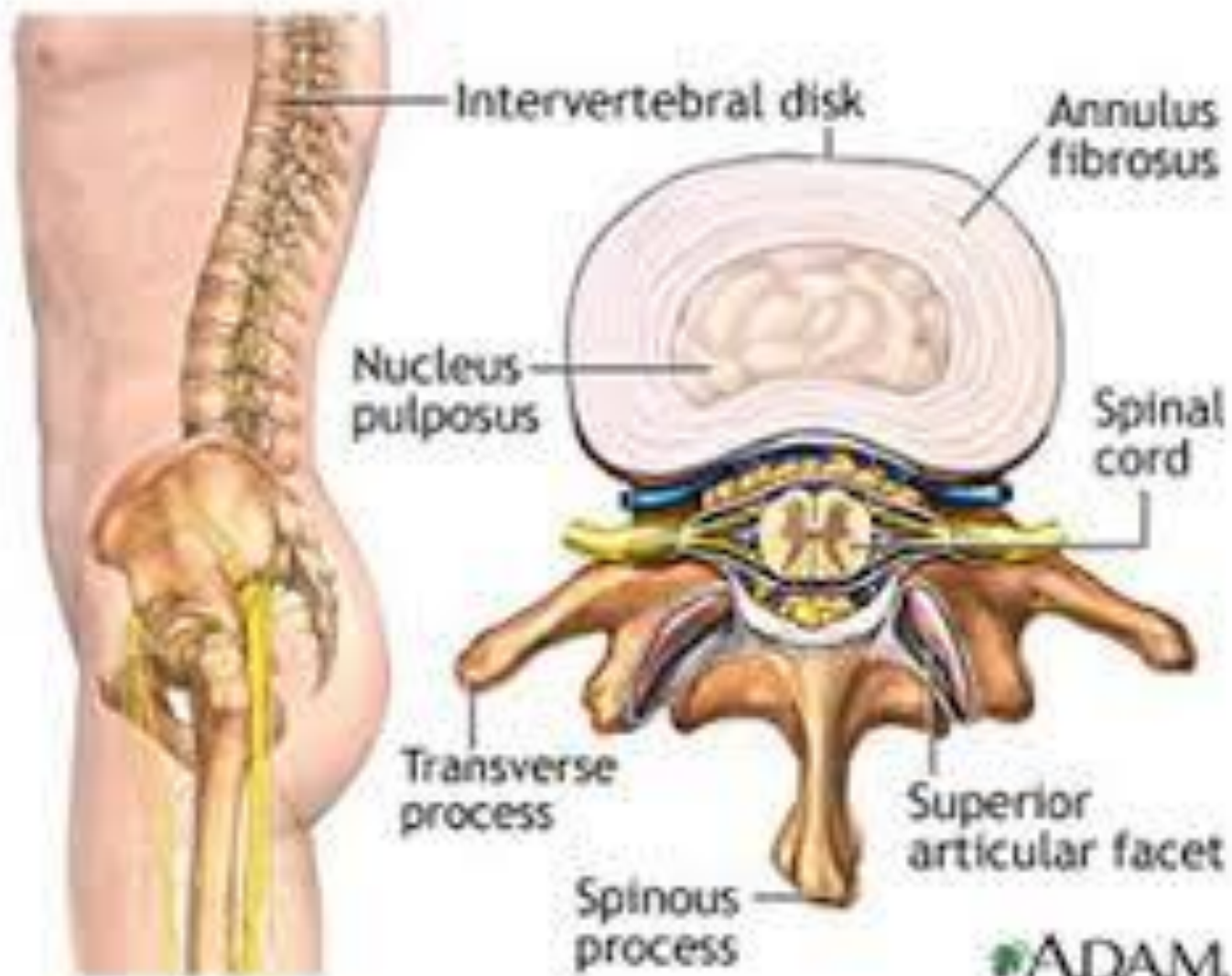






INTERVERTEBRAL DISC PATHOLOGY

- The intervertebral disc which lies between each two vertebral bodies is composed of a central gelatinous core known as the nucleus pulposus and surrounded by fibro cartilage called annulus fibrosus.
- Most common articular disorders :
 - ❖ Degenerative disc disease.
 - ❖ Disc bulging and herniation.
 - ❖ Infection.



DEGENERATIVE DISC DISEASE

- ❖ Is not really a disease but a term used to describe the natural degenerative changes in the intervertebral discs .
- ❖ Disc degeneration is part of the natural process of aging, and is one of the most common causes of low back pain.
- ❑ The DDD is characterized by:
 - Disc space narrowing.
 - Osteophytes formation at the vertebral body margins.
 - Subchondral bone sclerosis (mainly at the end plates).
 - In some cases, collection of gas is seen in the intervertebral disc (vacuum disc phenomenon).

DISC HERNIATION

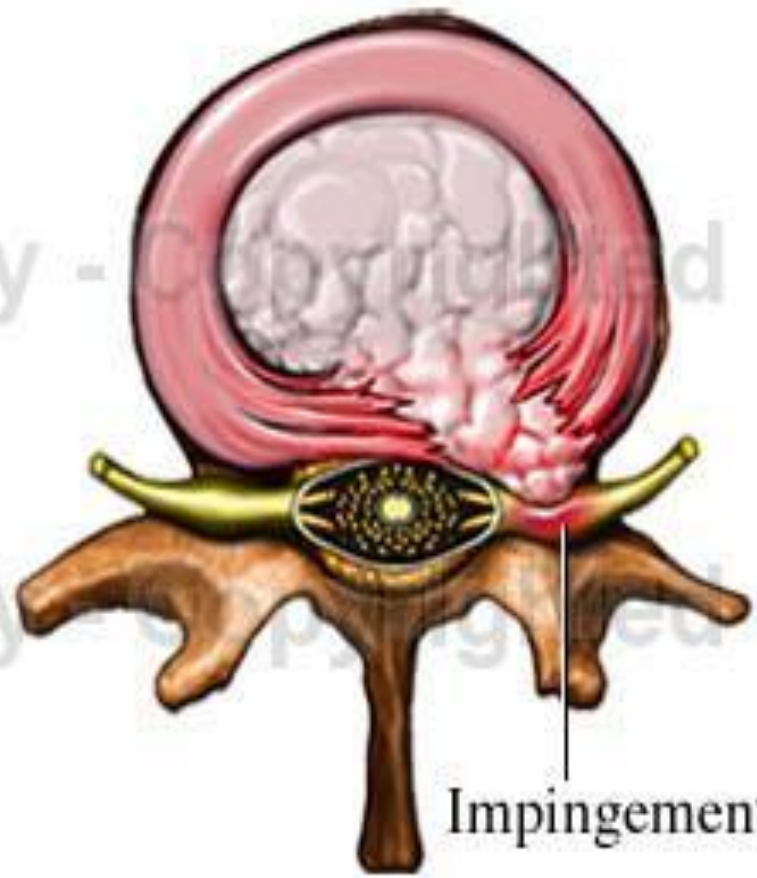
- The herniated disc is a portion of the nucleus pulposus extends through a tear in the annulus fibrosus, resulting in a focal protrusion at the margin of the disc.
- About 90% of disc herniation occurs at L4-L5 and L5-S1, with most of the remainder at L3-L4.
- **Types of disc herniation:**
 - ✓ Prolapse.
 - ✓ Extrusion.
 - ✓ Sequestration.

Normal disc

Herniated disc



Nerve root



Impingement

DISC PROLAPSE

The herniated nucleus pulposus extends through a tear in some of the annular fibers, but still confined by the intact outer most annular fibers

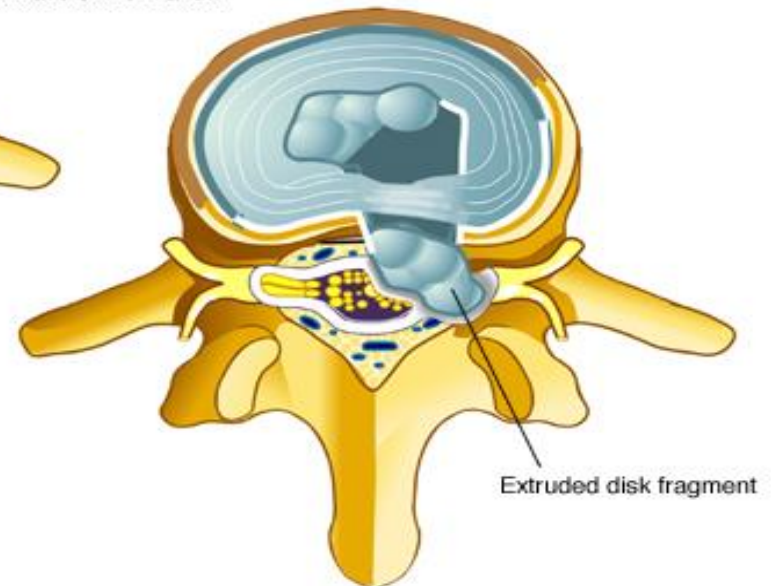
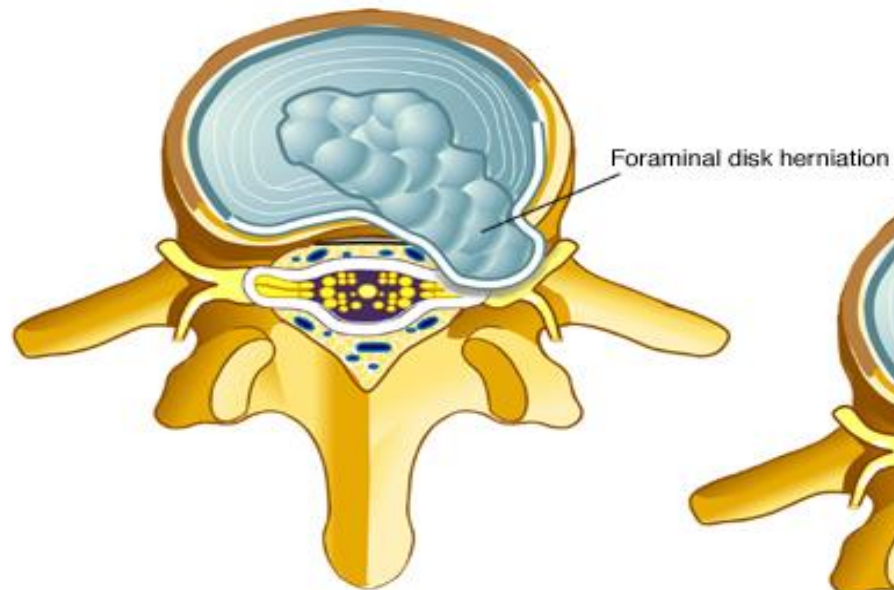
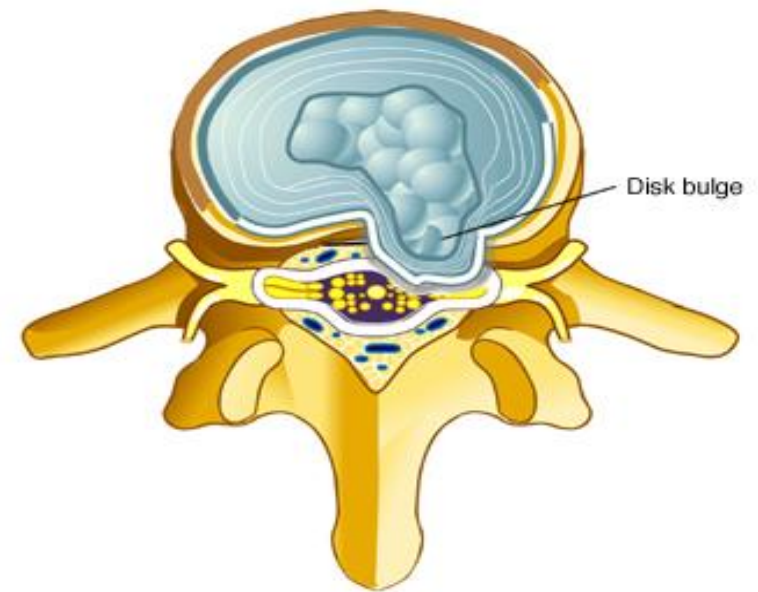
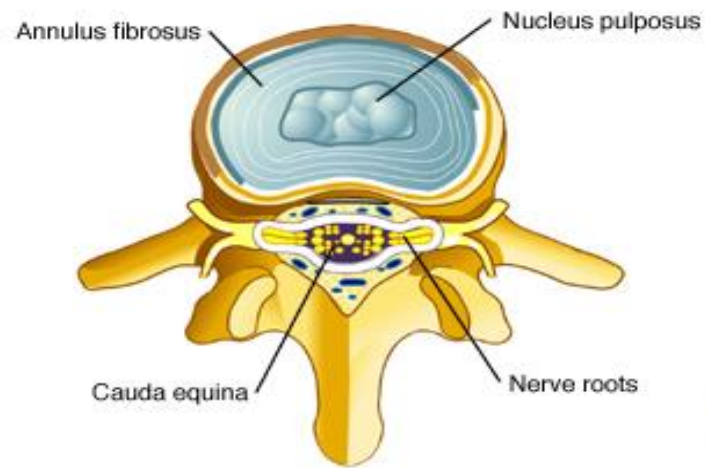
DISC EXTRUSION

- The herniated nucleus pulposus penetrates through a complete tear of the annulus fibrosus.
- The extruded disc material may extend superiorly or inferiorly, but remain attached to the parent disc.

DISC SEQUESTRATION

(Free fragment)

- The disc herniates through a complete tear and penetrate the posterior longitudinal ligament and lies within the epidural space.
- The herniated disc breaks free of the parent disc and can migrates superiorly or inferiorly within the epidural space or into the neural foramen as a separate fragment.



central

para-
median

foraminal

extraforaminal



R 2004V *10-Oct-71, M, 35Y

HFS
+LPH

STUDY 1
10-Oct-06
14:08:22
2 IMA 8 / 1



A

10cm

MF 1.09

E

P R4.0
SL 4.0
00*300
2*320s
ra(1.1)
v 398
c 199
A3/SAT1
C:SP2-5
*tse2d1_25 / 150

TR 4000.0
TE 113.0
TA 03:13
BW 190.0
M/ND

Avanto 330968
MR 2004V *10-Oct-71,

HFS
+LPH

STUDY 1
10-Oct-06
14:08:20
2 IMA 9 / 1



A

10cm

MF 1.09

E

SP L0.4
SL 4.0
FoV 300*300
272*320s
Sag>Tra(1.1)
w 398
c 199
A3/SAT1
C:SP2-5
*tse2d1_25 / 150

TR 4000.0
TE 113.0
TA 03:13
BW 190.0
M/ND

Disc herniation / plain film

Can plain film be used to diagnose disc herniation ?

NO

Then why are plain films routinely ordered for patients with low back pain ?

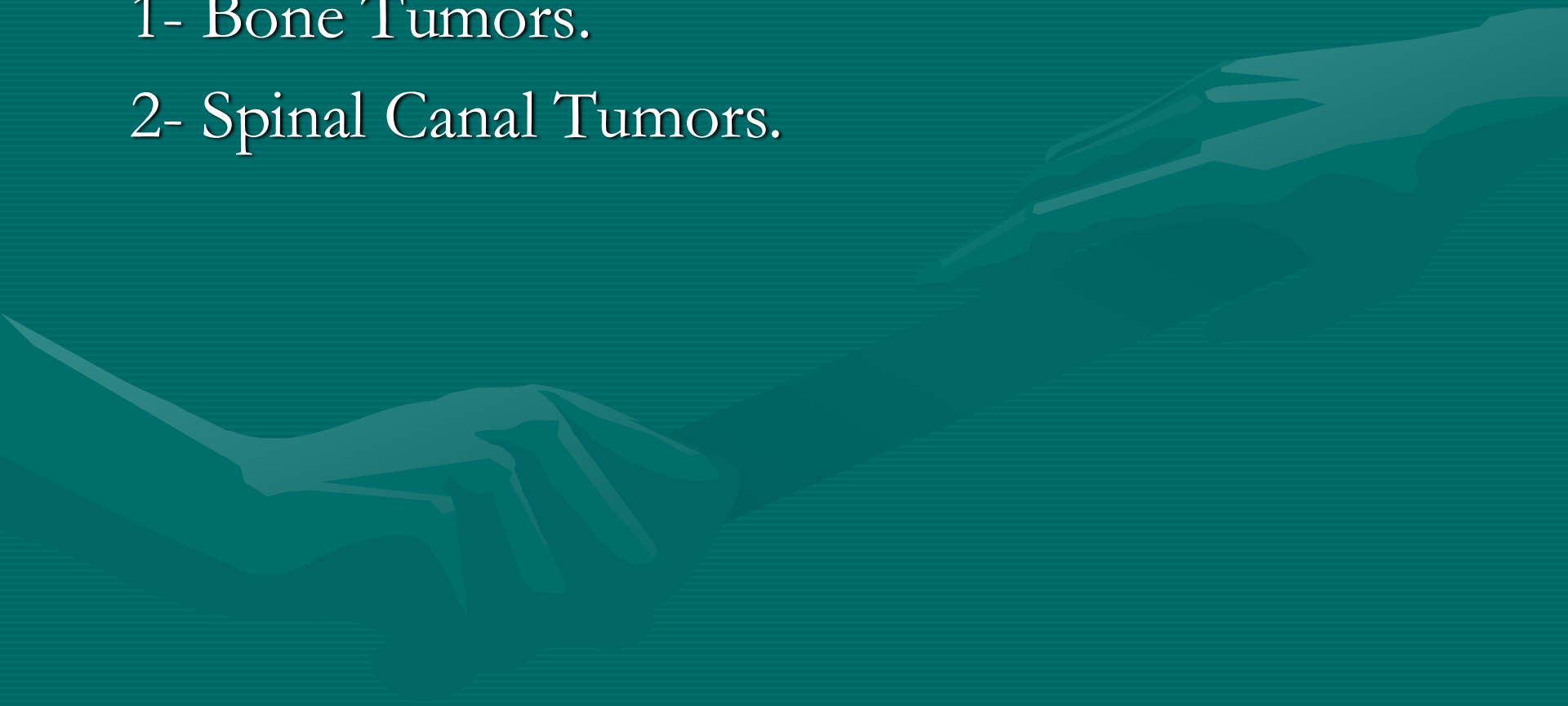
Plain film is essential and may reveal the presence of one of the common causes of back pain such as:

- Degenerative disc disease.
- Sacralization
- Facet joint osteoarthritis.
- Spondylolisthesis.
- Neoplastic disease.

LUMBAR SPINE TUMORS

Can be classified into two groups:

- 1- Bone Tumors.
- 2- Spinal Canal Tumors.



TUMORS OF THE SPINE

1- Tumors of bone

- Hemangioma of Vertebral body.
- Osteoid osteoma
- Osteoblastoma
- Aneurysmal bone cyst
- Histiocytosis x (Eosinophilic granuloma)
- Multiple myeloma
- Metastasis

Tumors of the spinal canal

- Intramedullary: occur inside the cord

- ❖ Ependymoma

- ❖ Astrocytoma

- ❖ Lipoma

- Extramedullary-intradural:

Occur within the meninges covering the spinal cord:

- neurofibroma and schwannoma

- Meningiomas

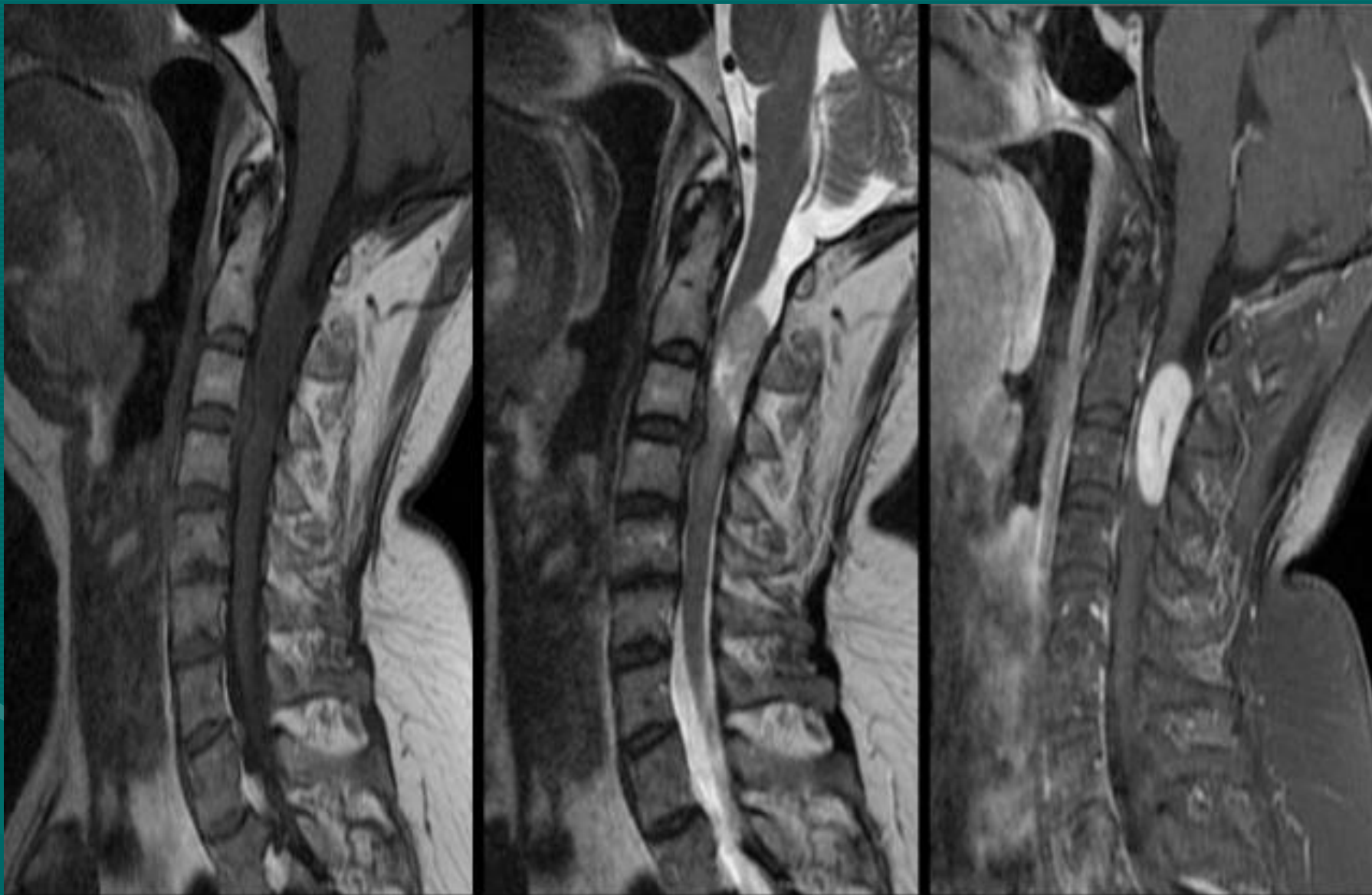
- Dermoid and epidermoid

Tumors of the spinal canal /2

- Extradural:

Appear between the meninges and the bones of the spine:

- Metastasis:
- Meningiomas



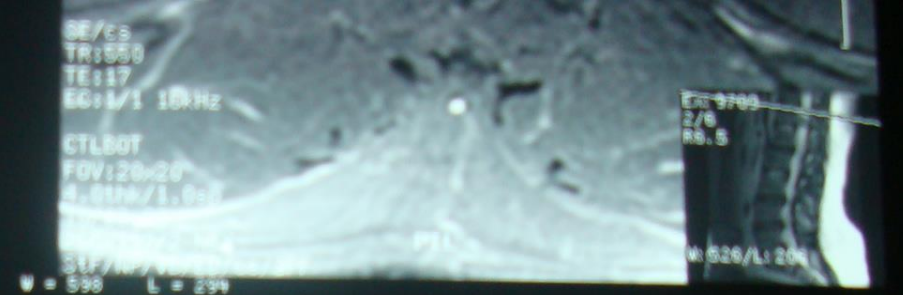
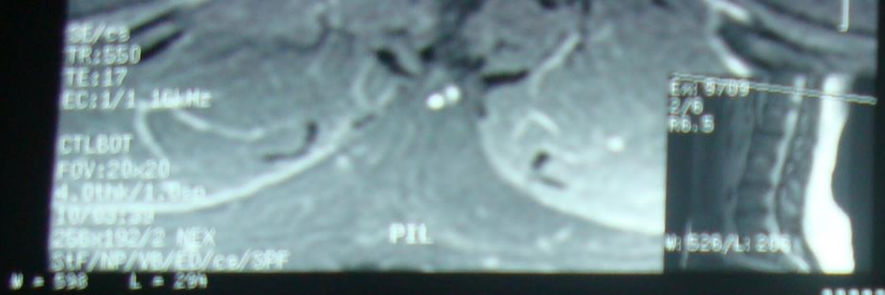
Cervical Spinal schwannoma.



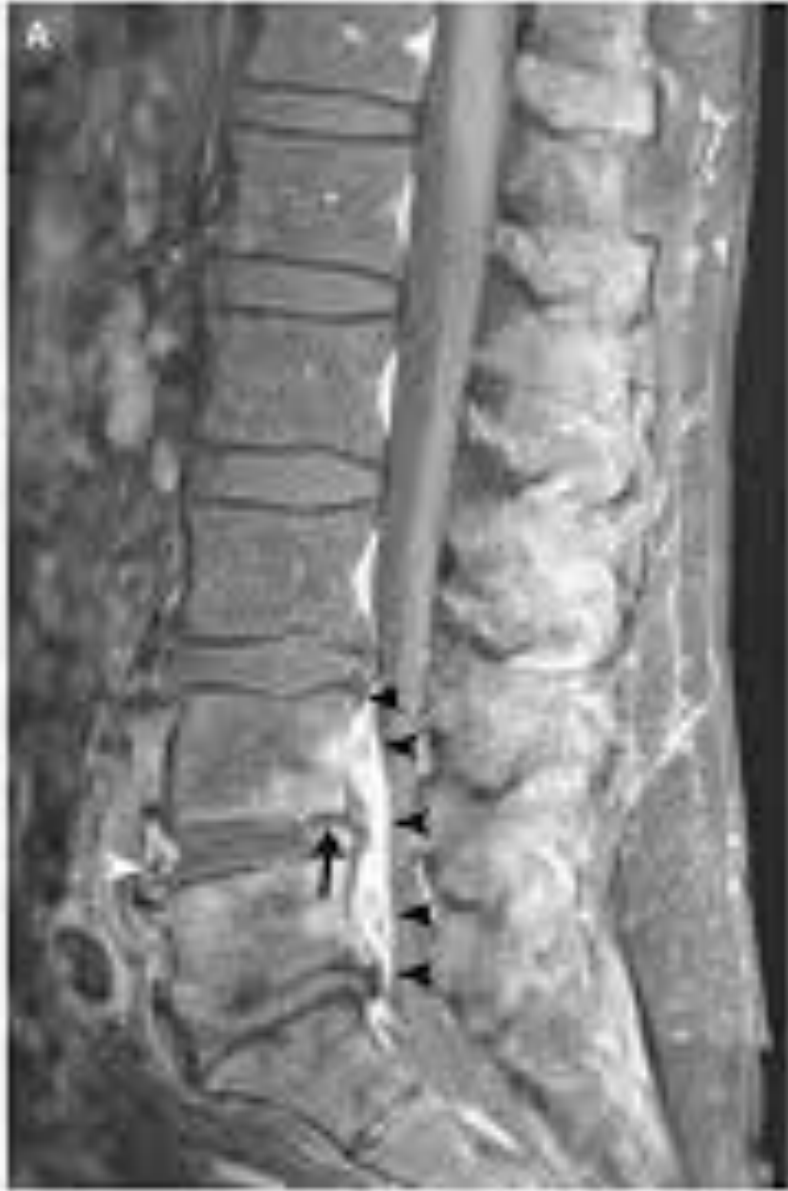
(a)



(b)







A scenic landscape photograph featuring a large body of water, likely a lake or bay, in the middle ground. The water is a deep blue with whitecaps reflecting the light. In the background, a dense forest of evergreen trees covers a hillside that rises from the water's edge. The foreground is framed by dark, out-of-focus evergreen branches on the left and right sides. The sky is a pale, hazy blue. Overlaid on the center of the image is the text "Thank You" in a large, red, sans-serif font with a white outline.

Thank
You