Common spine disorders

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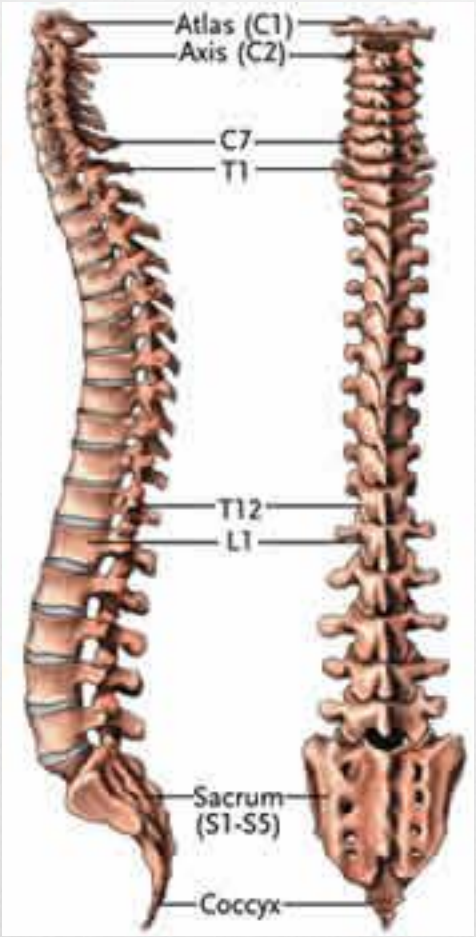
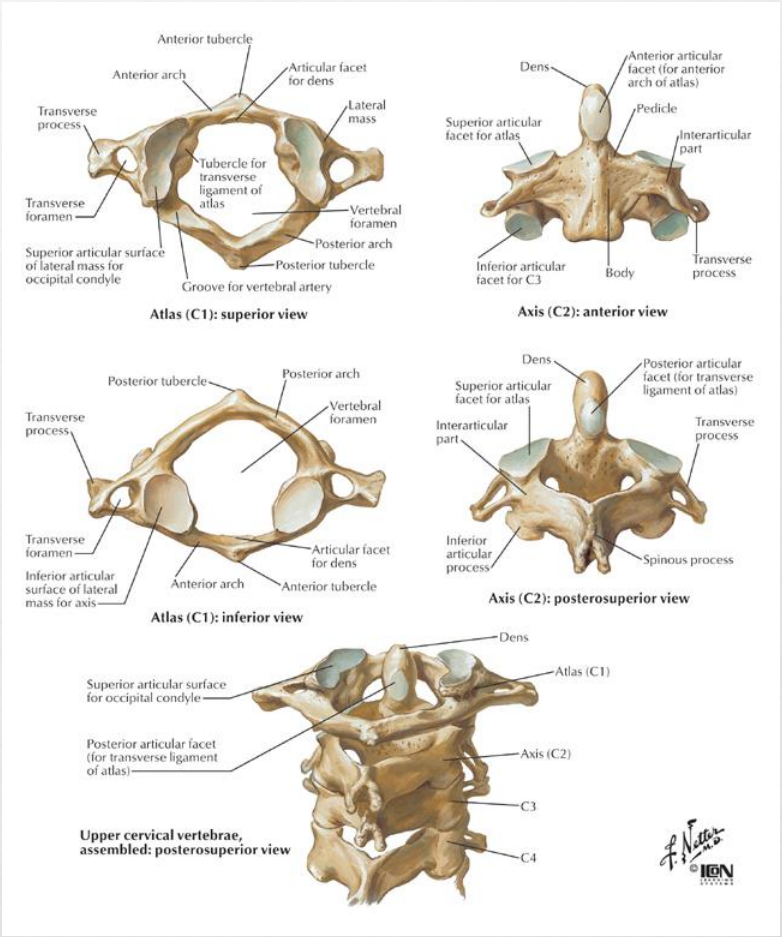
Objectives

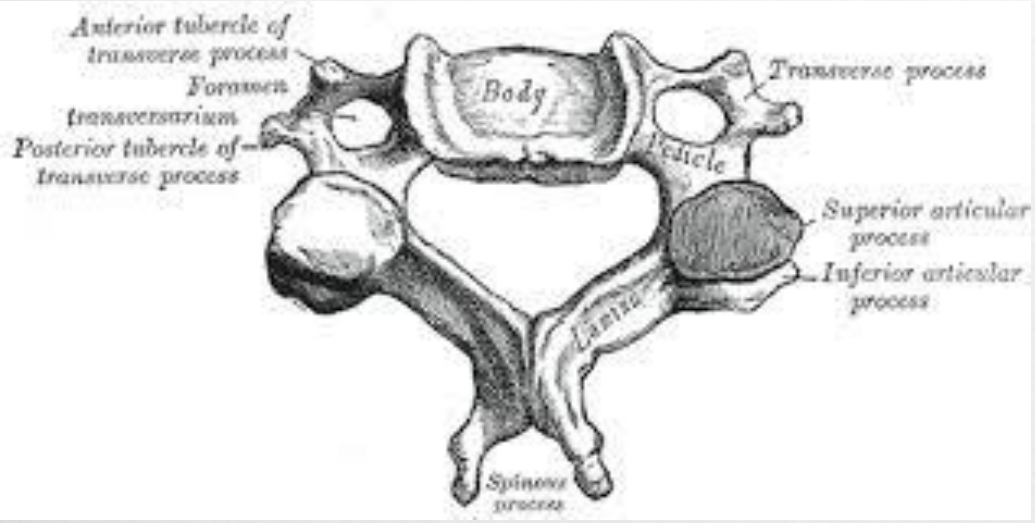
- Comprehension of the common spine disorder
  - Disc degeneration/hernia
  - Spinal stenosis
  - Common spinal deformity (Spondylolisthesis, Scoliosis)
  - Osteoporotic fracture
  - Destructive spinal lesions

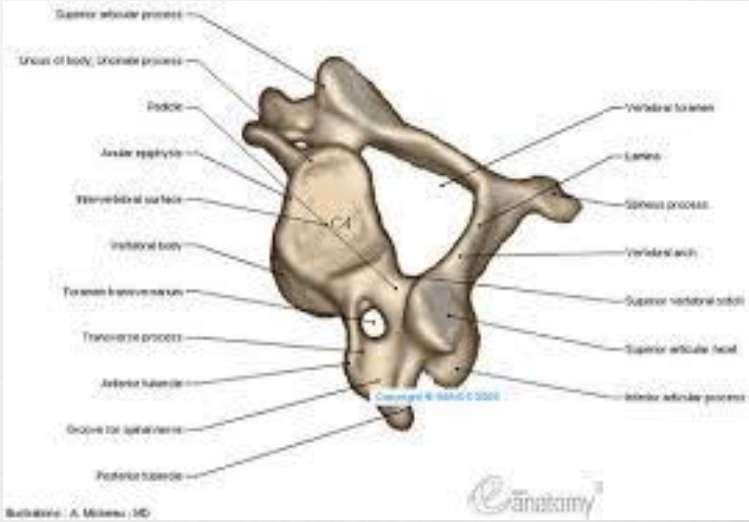
Anatomy


Atlas (C1)
Axis (C2)
C7
T1
T12
L1
Sacrum
(S1-S5)
Coccyx

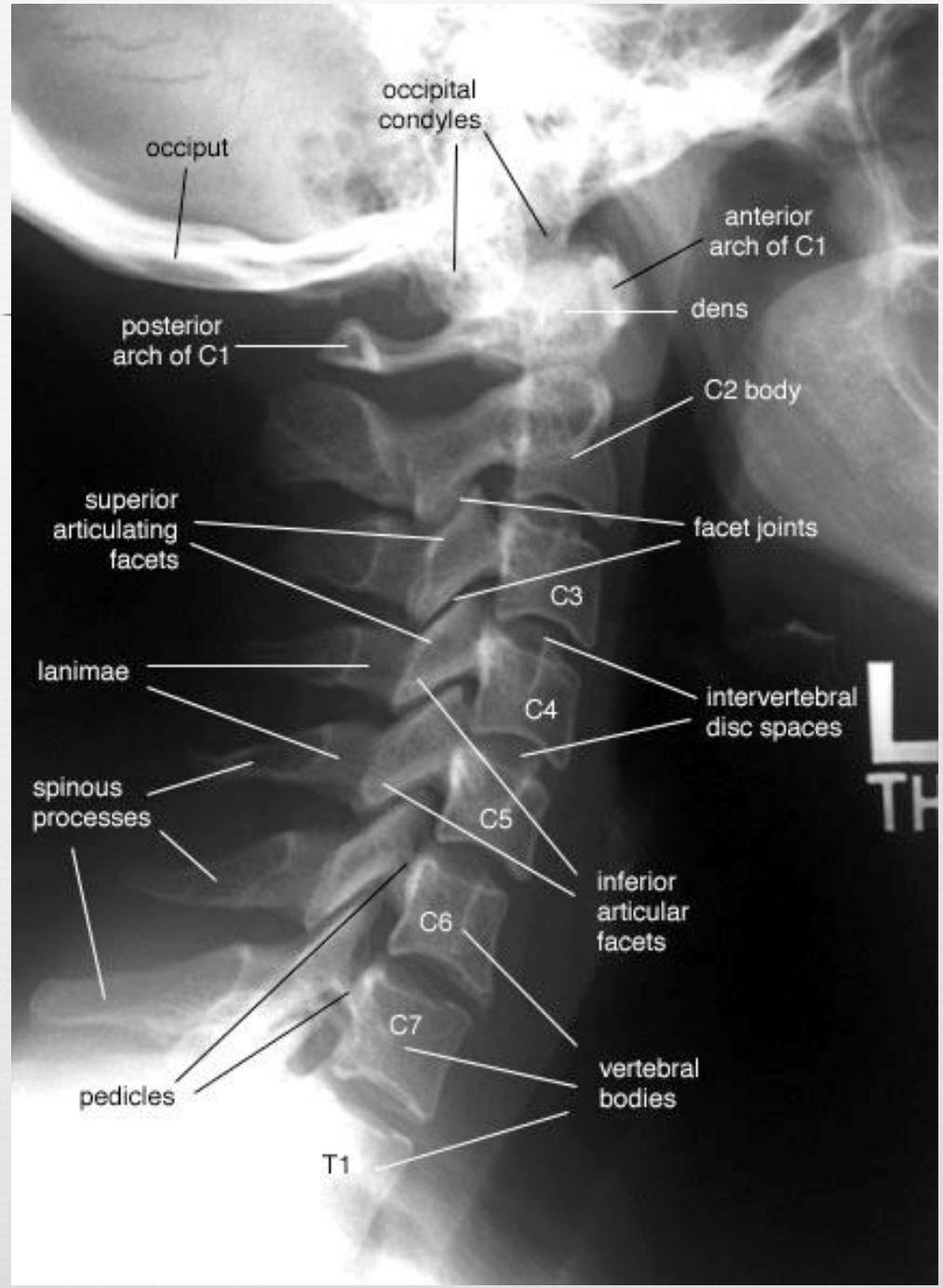

Anterior tubercle
Anterior arch
Articular facet for dens
Transverse process
Lateral mass
Tubercle for transverse ligament of atlas
Transverse foramen
Vertebral foramen
Posterior arch
Superior articular surface of lateral mass for occipital condyle
Posterior tubercle
Groove for vertebral artery
Atlas (C1): superior view
Dens
Anterior articular facet (for anterior arch of atlas)
Pedicle
Superior articular facet for atlas
Interarticular part
Inferior articular facet for C3
Body
Transverse process
Axis (C2): anterior view
Posterior tubercle
Posterior arch
Vertebral foramen
Transverse process
Transverse foramen
Articular facet for dens
Inferior articular surface of lateral mass for axis
Anterior arch
Anterior tubercle
Atlas (C1): inferior view
Dens
Posterior articular facet (for transverse ligament of atlas)
Superior articular facet for atlas
Interarticular part
Transverse process
Inferior articular process
Spinous process
Axis (C2): posterosuperior view
Dens
Atlas (C1)
Superior articular surface for occipital condyle
Posterior articular facet (for transverse ligament of atlas)
Axis (C2)
C3
C4
Upper cervical vertebrae, assembled: posterosuperior view

Anatomy

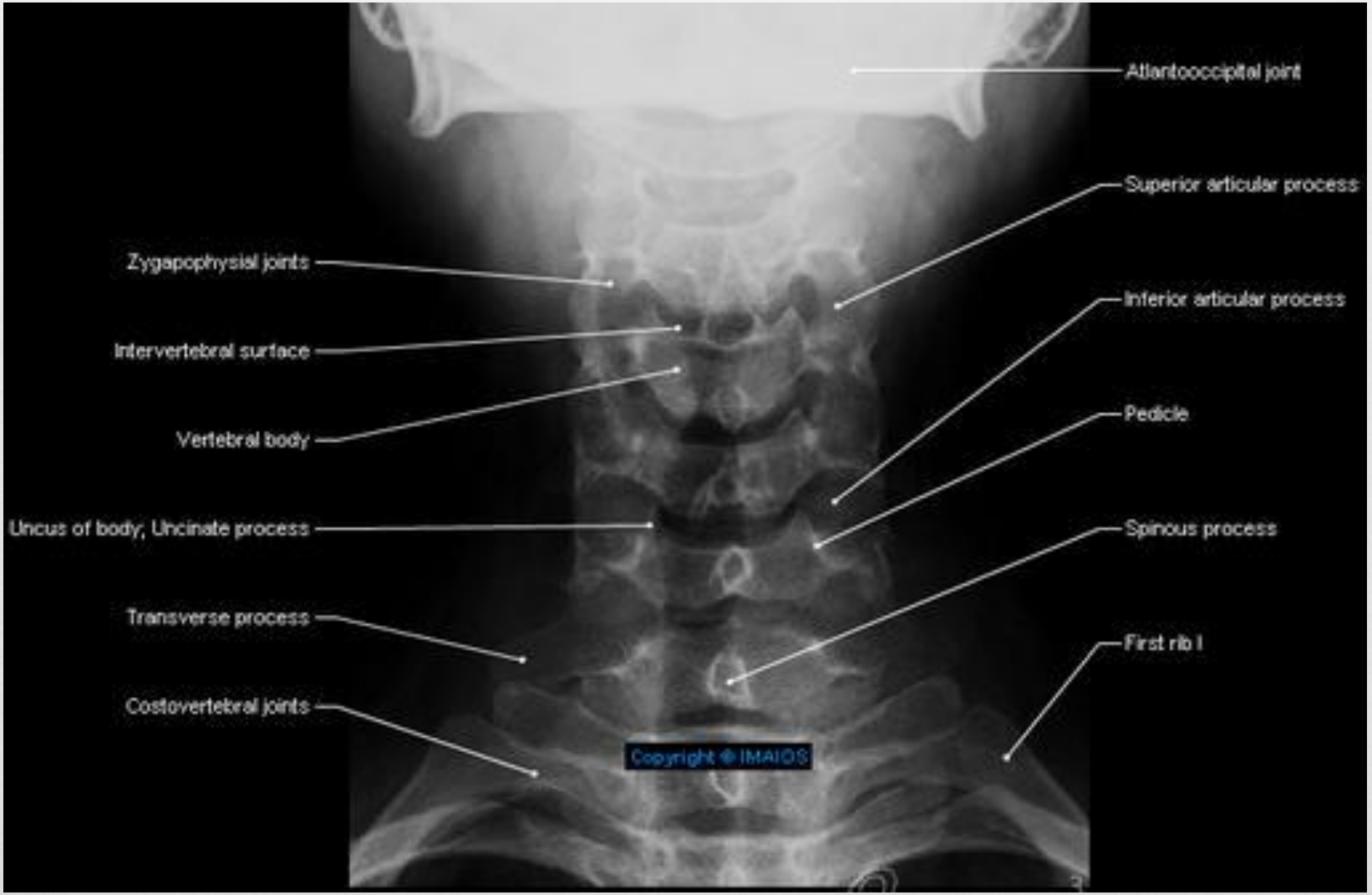

Anterior tubercle of transverse process
Foramen transversarium
Posterior tubercle of transverse process
Body
Pedicle
Transverse process
Superior articular process
Inferior articular process
Lamina
Spinous process


Superior articular process
Pedicle
Vertebral foramen
Lamina
Spinous process
Vertebral arch
Superior articular facet
Inferior articular process
C4

Anatomy


occipital condyles
occiput
anterior arch of C1
dens
posterior arch of C1
C2 body
superior articulating facets
facet joints
C3
lanimae
C4
intervertebral disc spaces
spinous processes
C5
inferior articular facets
C6
C7
vertebral bodies
pedicles
T1

Anatomy


Atlantooccipital joint
Superior articular process
Zygapophysial joints
Inferior articular process
Intervertebral surface
Pedicle
Vertebral body
Uncus of body; Uncinate process
Spinous process
Transverse process
First rib
Costovertebral joints
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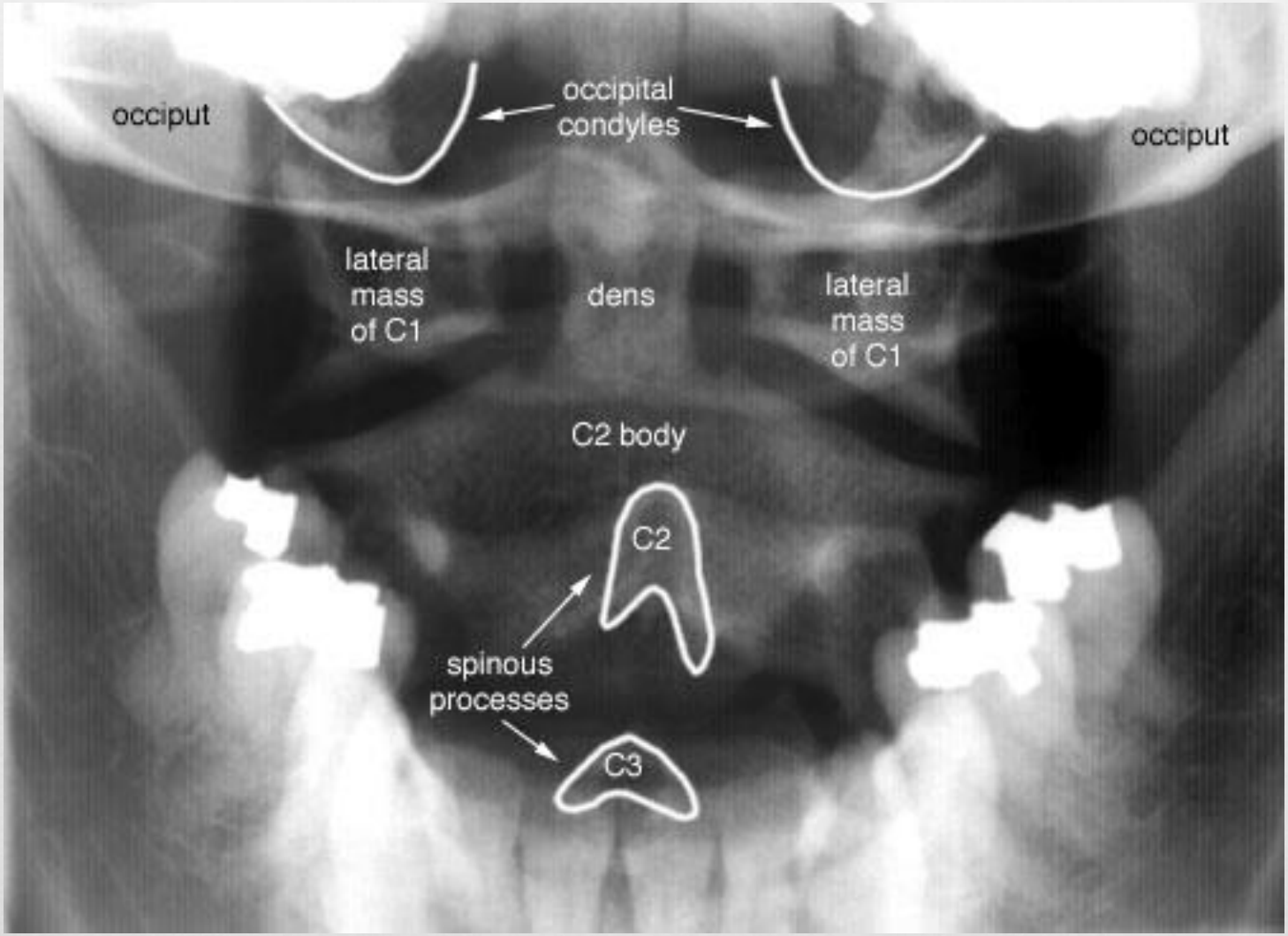
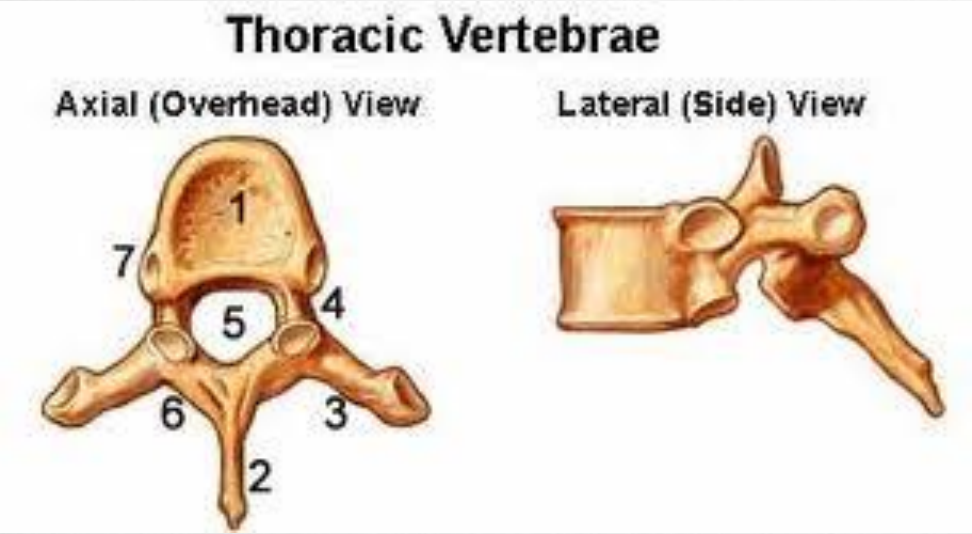
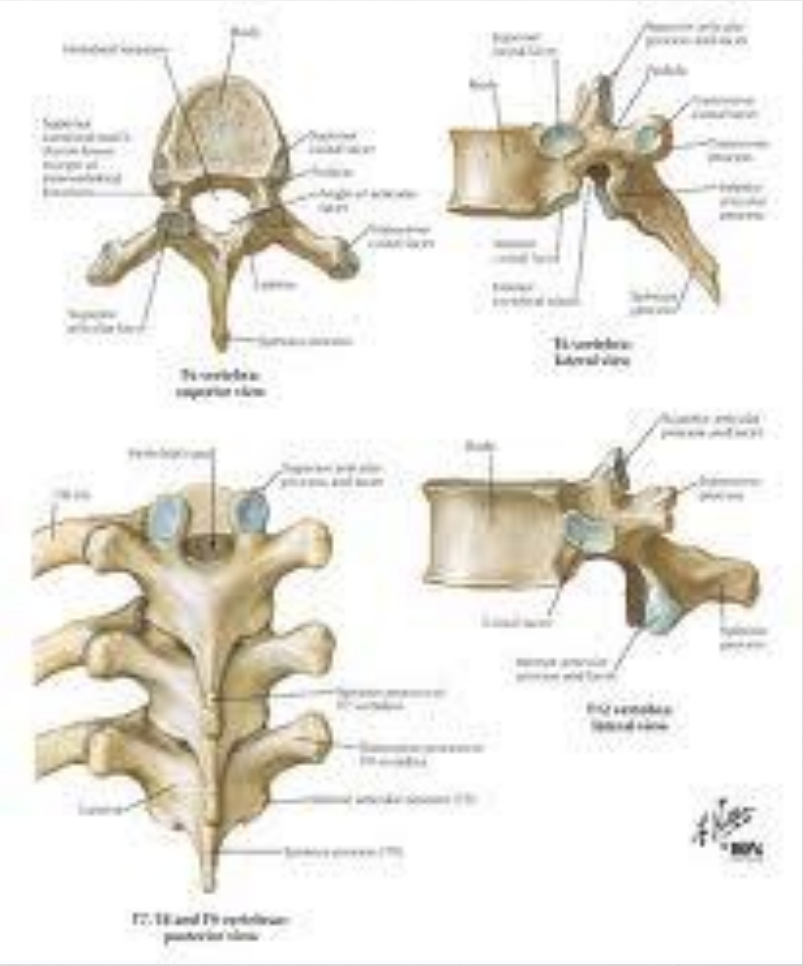
Anatomy


occiput
occipital condyles
occiput
lateral mass of C1
dens
lateral mass of C1
C2 body
C2
spinous processes
C3

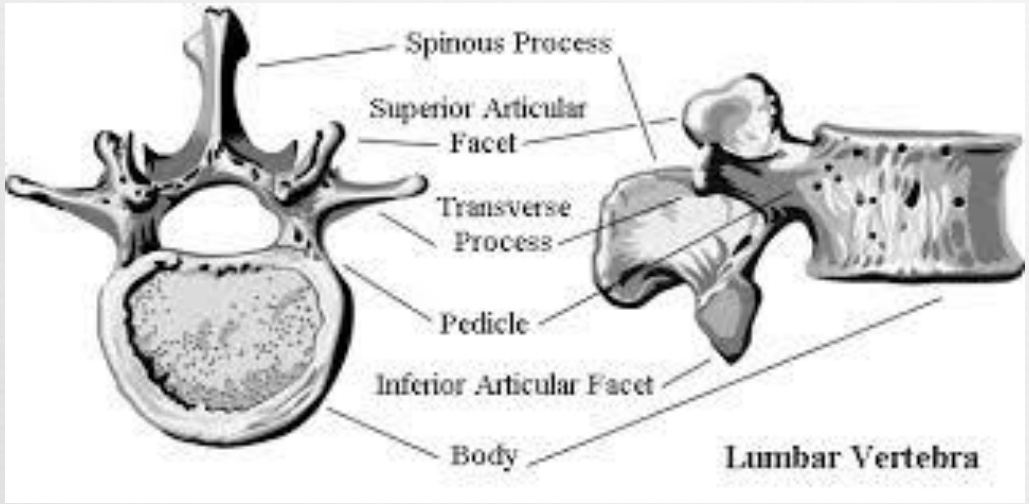
Anatomy

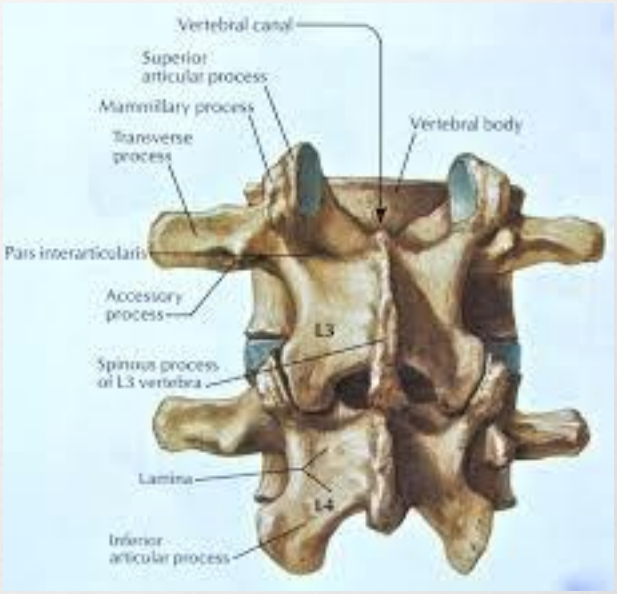

Thoracic Vertebrae
Axial (Overhead) View
Lateral (Side) View
1
7
4
5
6
3
2



Anatomy

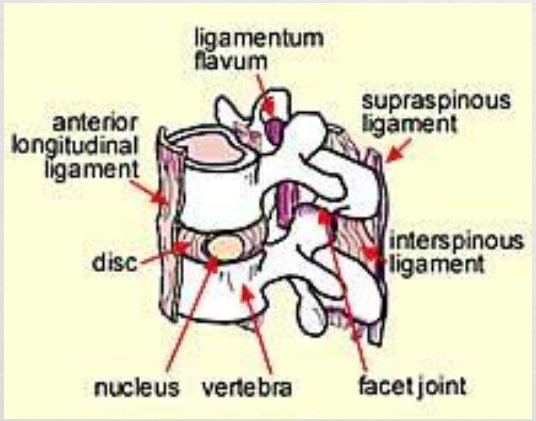
Anatomy

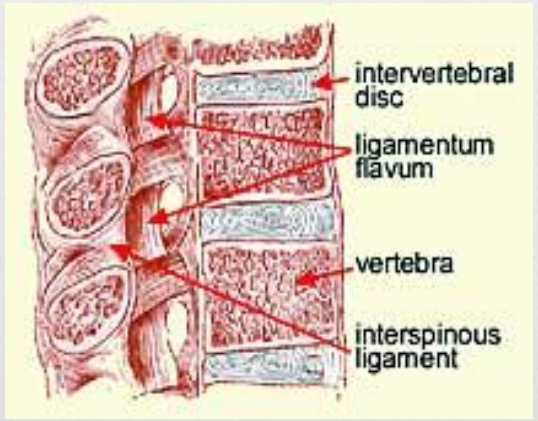

Spinous Process
Superior Articular Facet
Transverse Process
Pedicle
Inferior Articular Facet
Body
Lumbar Vertebra

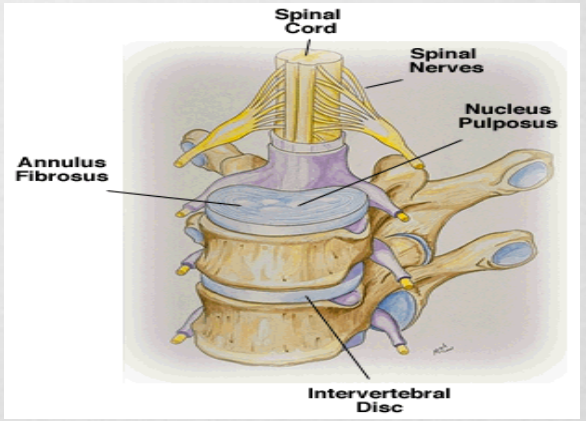

Vertebral canal
Superior articular process
Mammillary process
Transverse process
Vertebral body
Pars interarticularis
Accessory process
L3
Spinous process of L3 vertebra
Lamina
L4
Inferior articular process

Anatomy

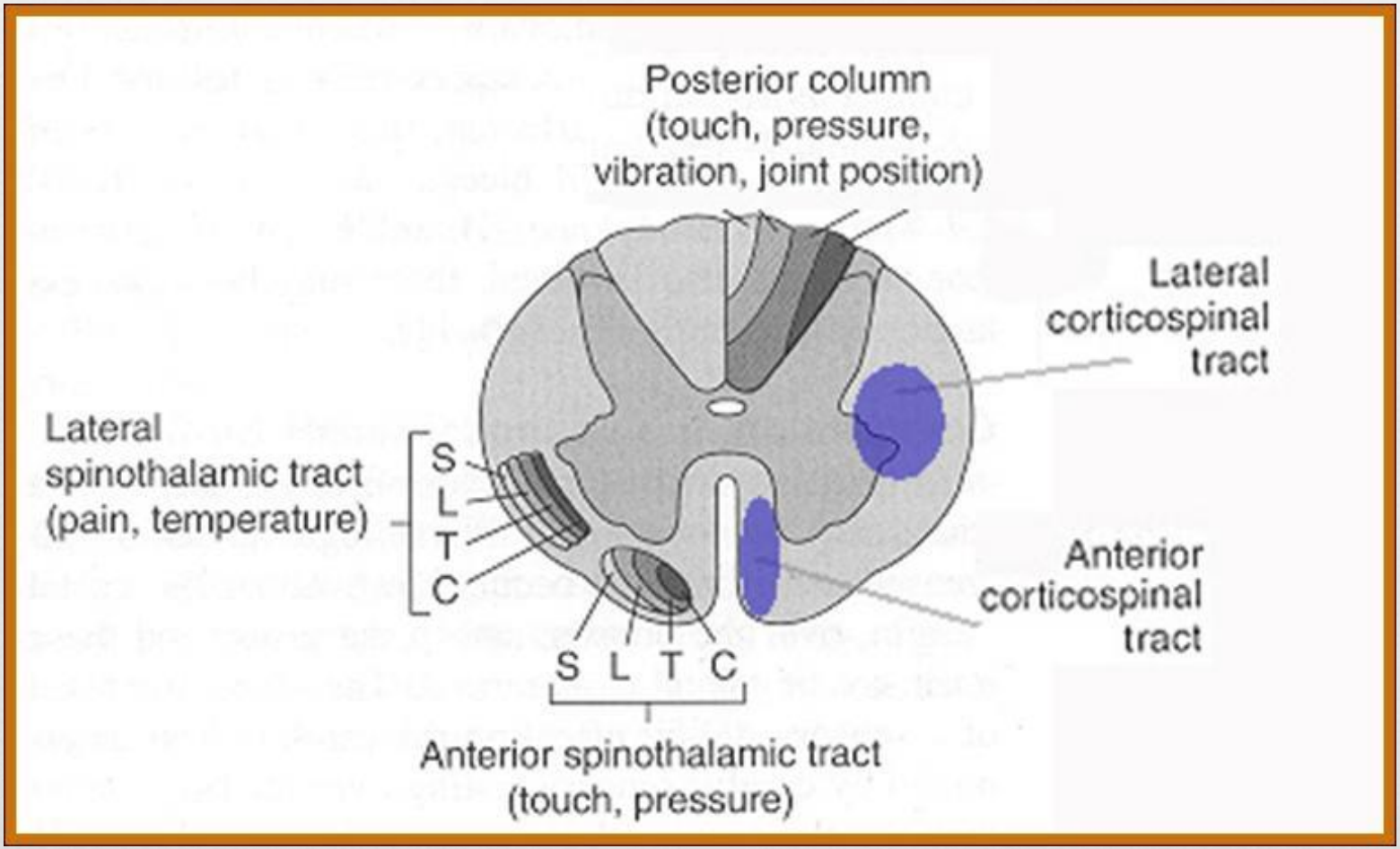
Anatomy


ligamentum flavum
supraspinous ligament
anterior longitudinal ligament
interspinous ligament
disc
nucleus
vertebra
facet joint

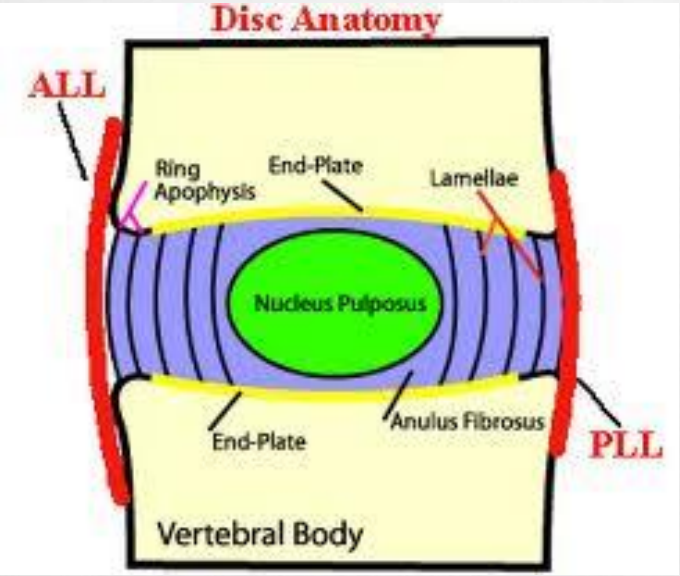

intervertebral disc
ligamentum flavum
vertebra
interspinous ligament

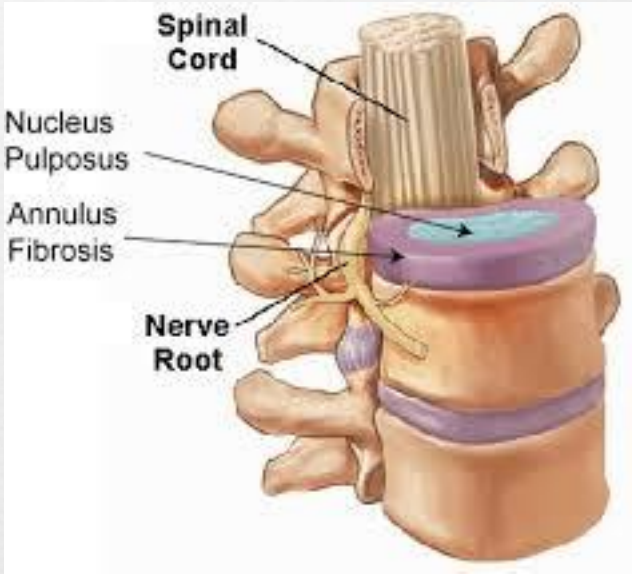

Spinal Cord
Spinal Nerves
Nucleus Pulposus
Annulus Fibrosus
Intervertebral Disc

Anatomy


Posterior column
(touch, pressure,
vibration, joint position)
Lateral
corticospinal
tract
Lateral
spinothalamic tract
(pain, temperature)
S
L
T
C
Anterior
corticospinal
tract
S L T C
Anterior spinothalamic tract
(touch, pressure)

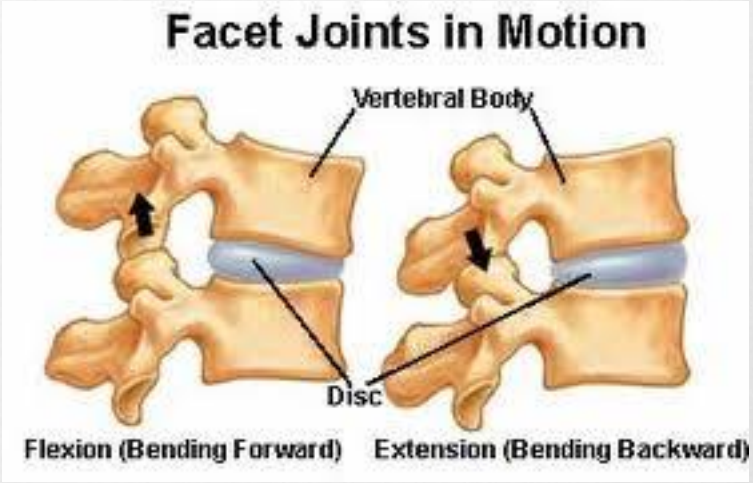
Anatomy


Disc Anatomy
ALL
Ring Apophysis
End-Plate
Lamellae
Nucleus Pulposus
End-Plate
Anulus Fibrosus
PLL
Vertebral Body


Spinal Cord
Nucleus Pulposus
Annulus Fibrosis
Nerve Root

Pathophysiology IVD

- Spinal motion segment.
  - Two adjacent vertebrae.
  - Three joint complex.
  - Ligaments.
- Degeneration of IVD.



Pathophysiology IVD

- Degeneration of IVD.
  - Loss of cellular material and hydration.
  - Loss of disc height.
  - Abnormal loading to the facet.
  - Facet joints degeneration (Loss of height + facet OA).
  - Spinal stenosis +/- instability.

Pathophysiology IVD

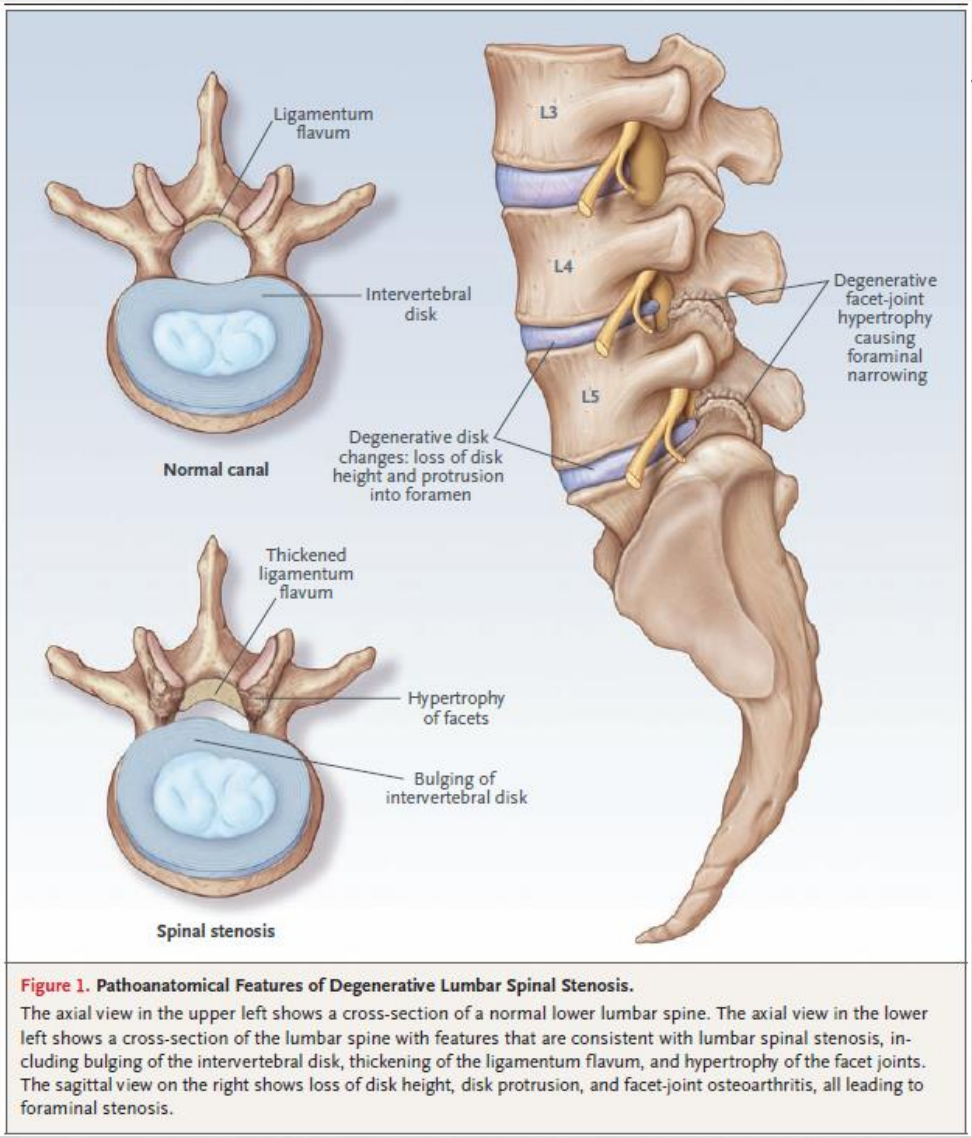
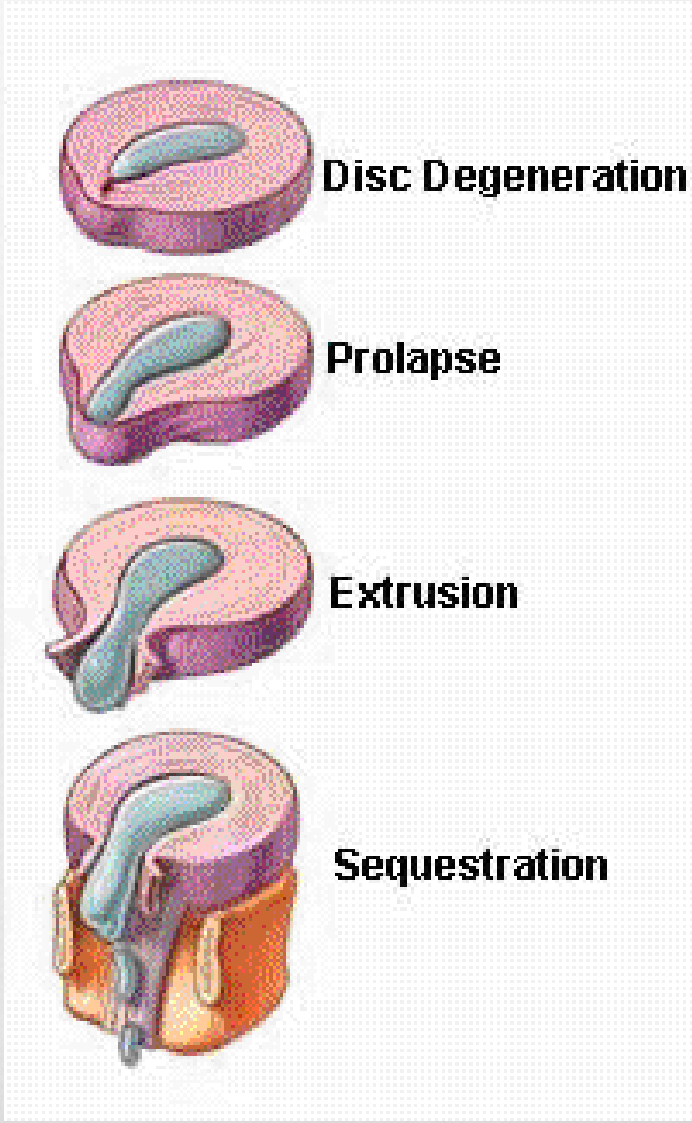


Figure 1. Pathoanatomical Features of Degenerative Lumbar Spinal Stenosis.
The axial view in the upper left shows a cross-section of a normal lower lumbar spine. The axial view in the lower left shows a cross-section of the lumbar spine with features that are consistent with lumbar spinal stenosis, including bulging of the intervertebral disk, thickening of the ligamentum flavum, and hypertrophy of the facet joints. The sagittal view on the right shows loss of disk height, disk protrusion, and facet-joint osteoarthritis, all leading to foraminal stenosis.



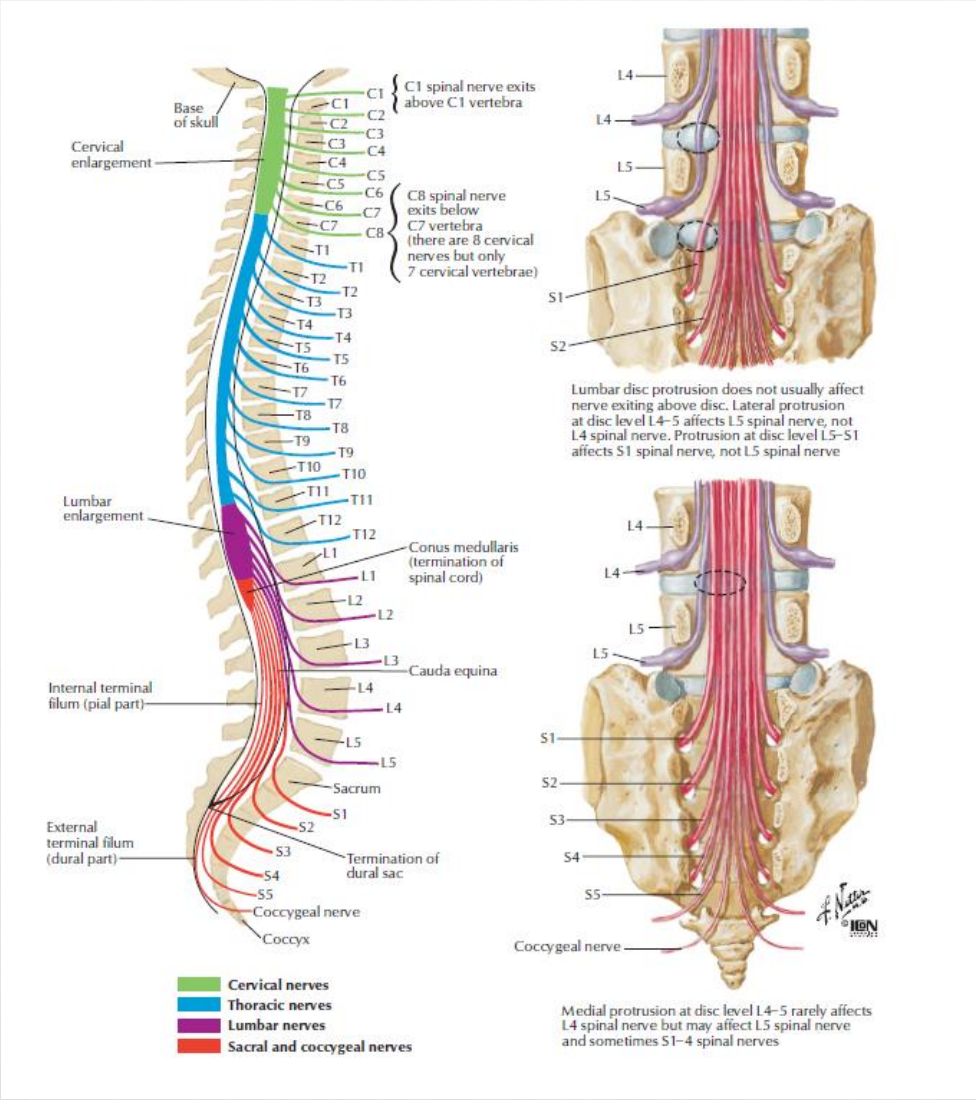
Clinical presentation

- Mechanical pain
  - Degeneration +/- Instability
  - Axial pain
  - Activity related
- Neurological symptom
  - Spinal cord: Cervical and Thoracic
  - Nerve roots
  - Cauda equina
  - Spinal stenosis

Clinical presentation

- Neurological symptom
  - Spinal cord:
    - Cervical: Myelopathy (CSM)
    - Spinal cord injuries: complete vs incomplete
  - Nerve roots: Sciatica
  - Cauda equina: Prevalence 0.0004/LBP But Serious
  - Spinal stenosis: Neurogenic claudication

Clinical presentation



Clinical presentation

Table III.[22,32] Differences between neurogenic and vascular claudication

Symptom/sign	Neurogenic Claudication	Vascular Claudication
Pain	Proximal to distal	Distal to proximal
Relief of symptoms	Relieved by sitting/forward bending	Relieved by standing
Walking up hill	Better	Worse
Walking down hill	Worse	Better
Cycling	No symptoms	Symptoms present
Walking distance	Variable	Fixed
Neurological symptoms	Commonly present	Not present
Neurological signs	May be positive especially after walking	Negative
Pulse	Present	Absent
Skin	No changes	Atrophic changes

Management

- Cervical spine (CSM)
- Lumbar spine

- Conservative always first
- Surgical indication
- Surgical procedures

Management

- Cervical spine: axial neck pain and radiculopathy, without neurological deficits
  - Conservative:
    - rest and short period of immobilization
    - Physiotherapy: ROM and strengthening
    - Pain management
    - Neuropathic medication for radiculopathy

Management

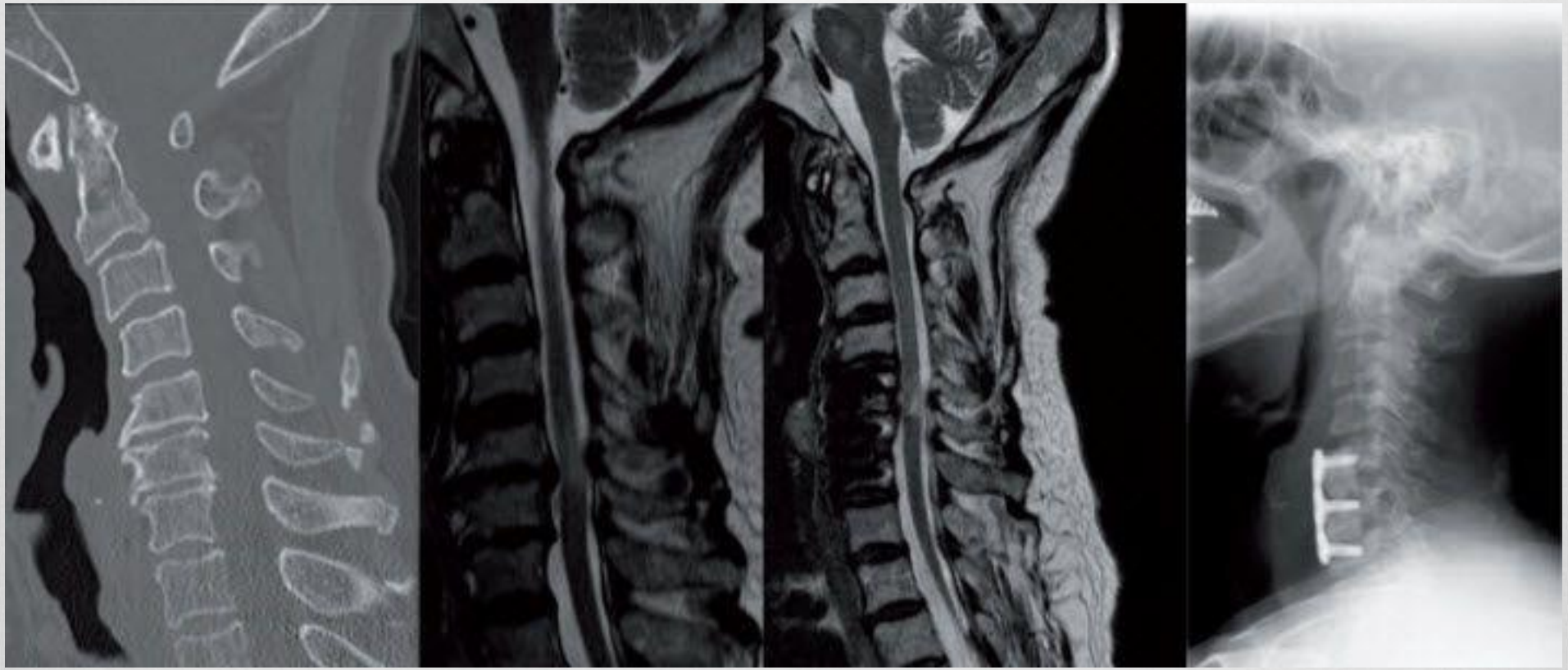
- Cervical spine:
  - Surgical indication:
    - Cervical stenosis causing cervical myelopathy
    - Disc hernia causing radiculopathy associated with weakness
    - Failure of conservative managements

Management

- Cervical spine:
  - Surgical procedures:
    - Anterior cervical discectomy and fusion
    - Posterior laminectomy +/- fusion
    - Laminoplasty
    - Cervical disc arthroplasty

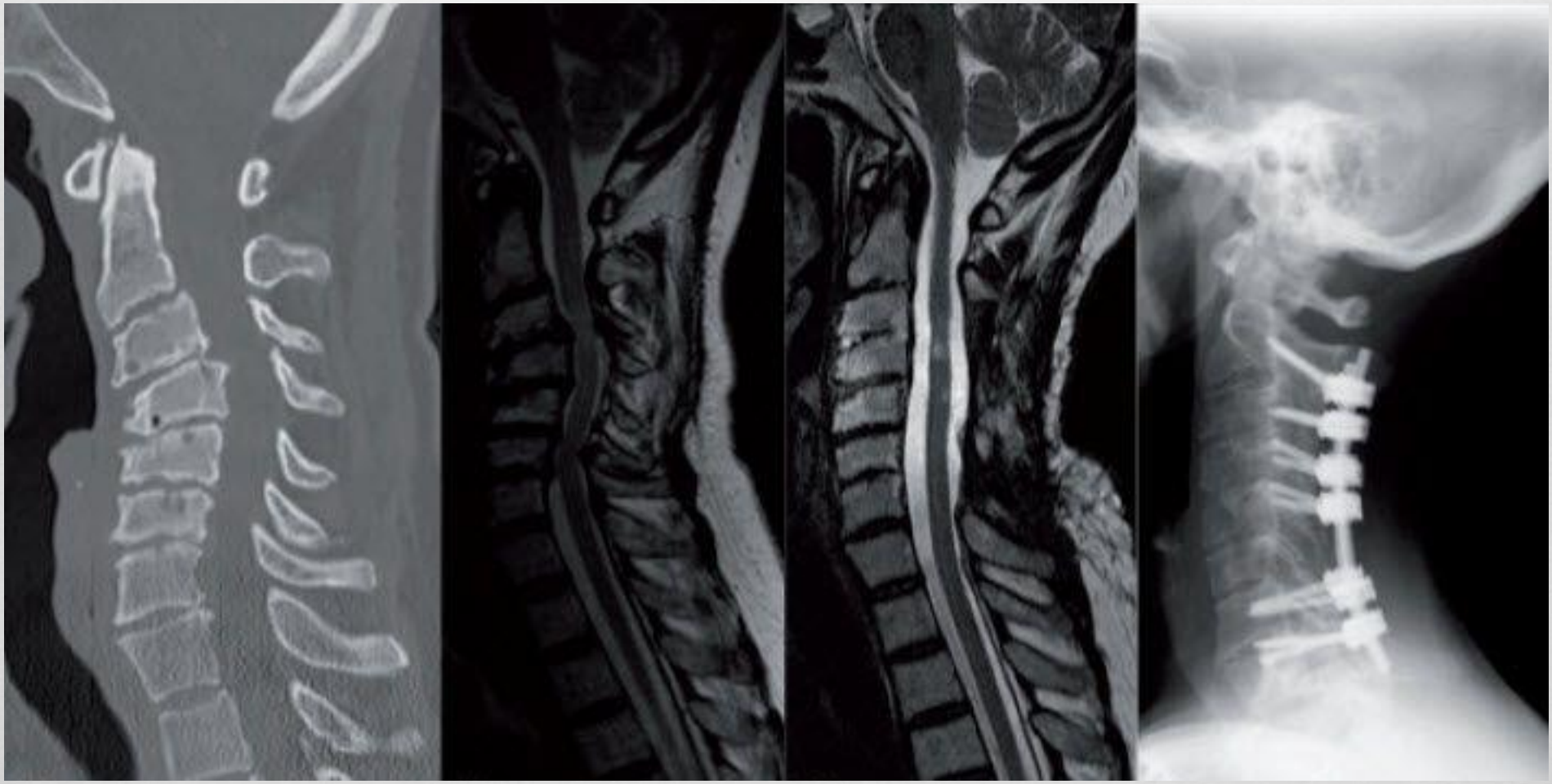
Surgical procedure

Anterior discectomy and fusion



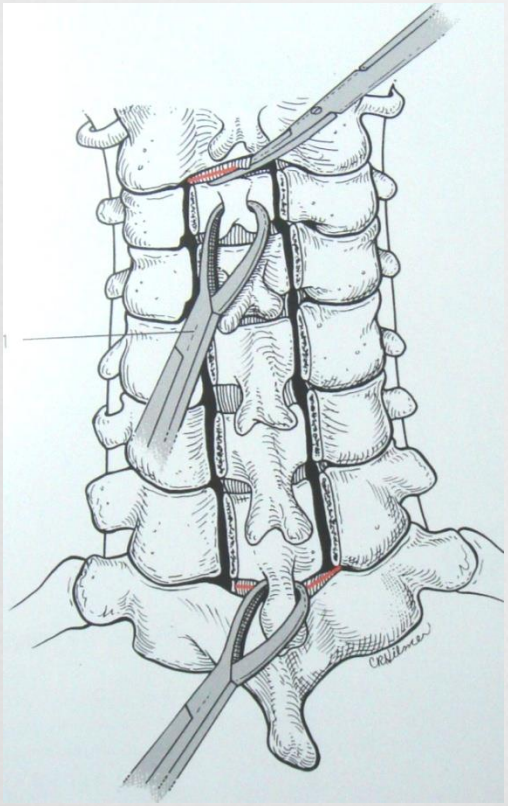
Surgical procedure

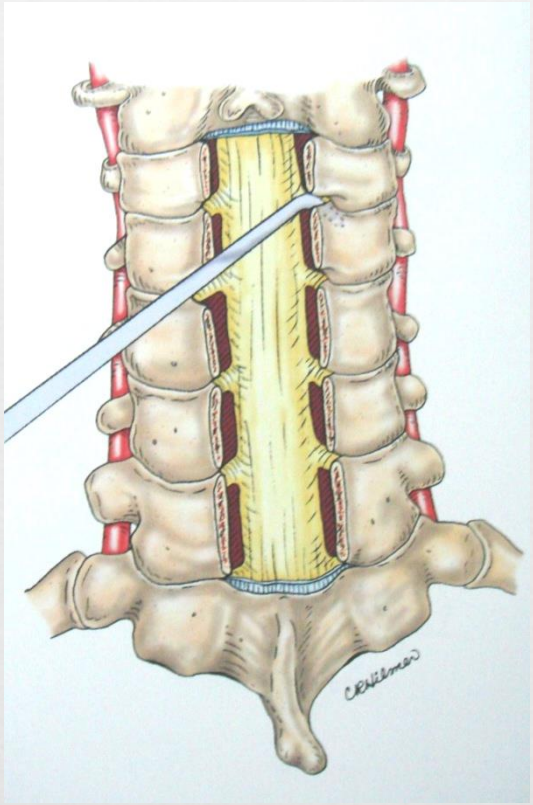
Laminectomy and fusion



Surgical procedure

Laminectomy





Management

- Lumbar spine:
  - Disc hernia
  - Axial LBP
  - Spinal stenosis

Management

- Lumbar spine (acute disc hernia): 90% resolved within 12 weeks
  - Conservative: short period of rest, PT, Pain management (non-invasive and invasive)
  - Surgical indication: Cauda equina, motor deficit and failure of 3 months conservative treatment
  - Surgical procedure: Discectomy

Management

Management

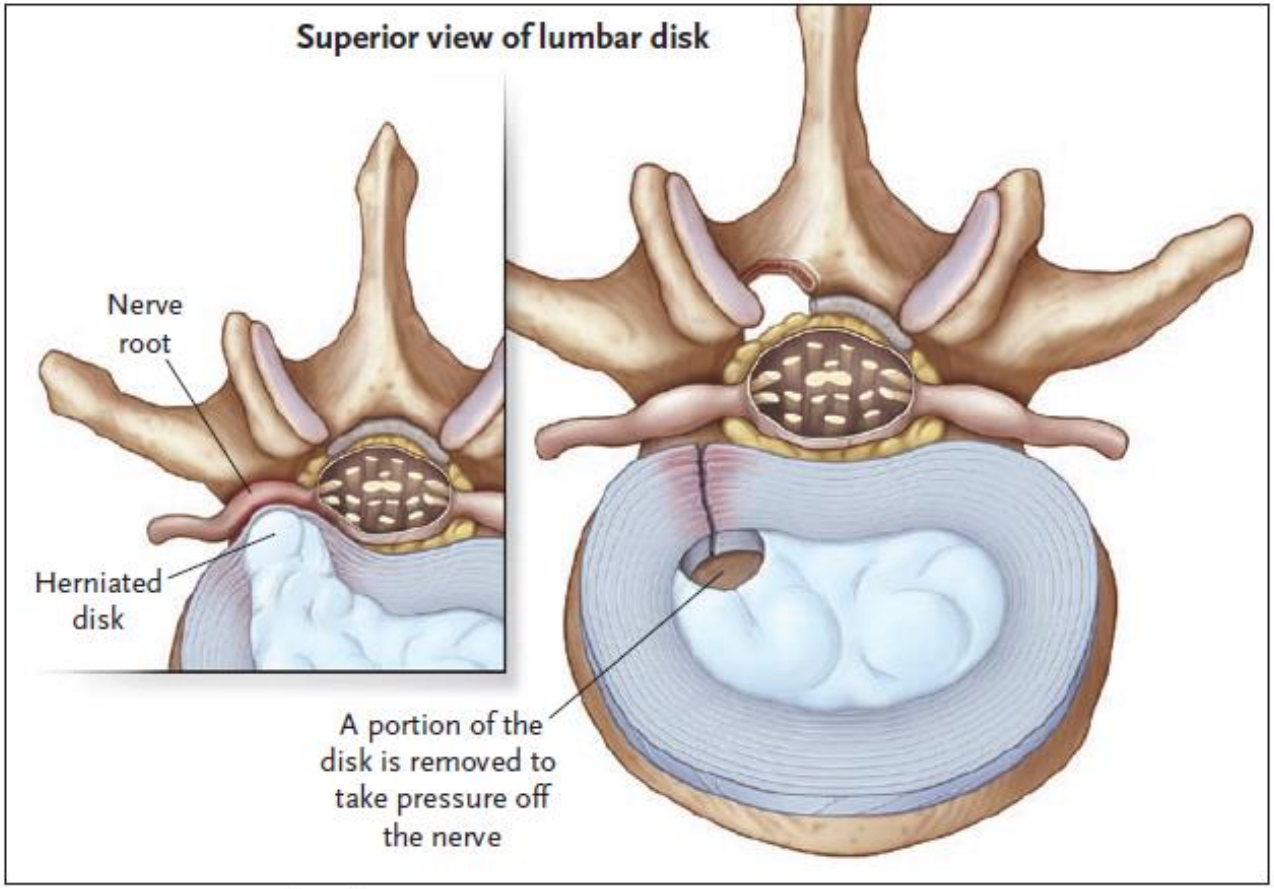


Figure 2. Conventional Diskectomy.

The protruding segment of the disk that is causing nerve-root compression is excised. The remainder of the disk is usually left undisturbed.

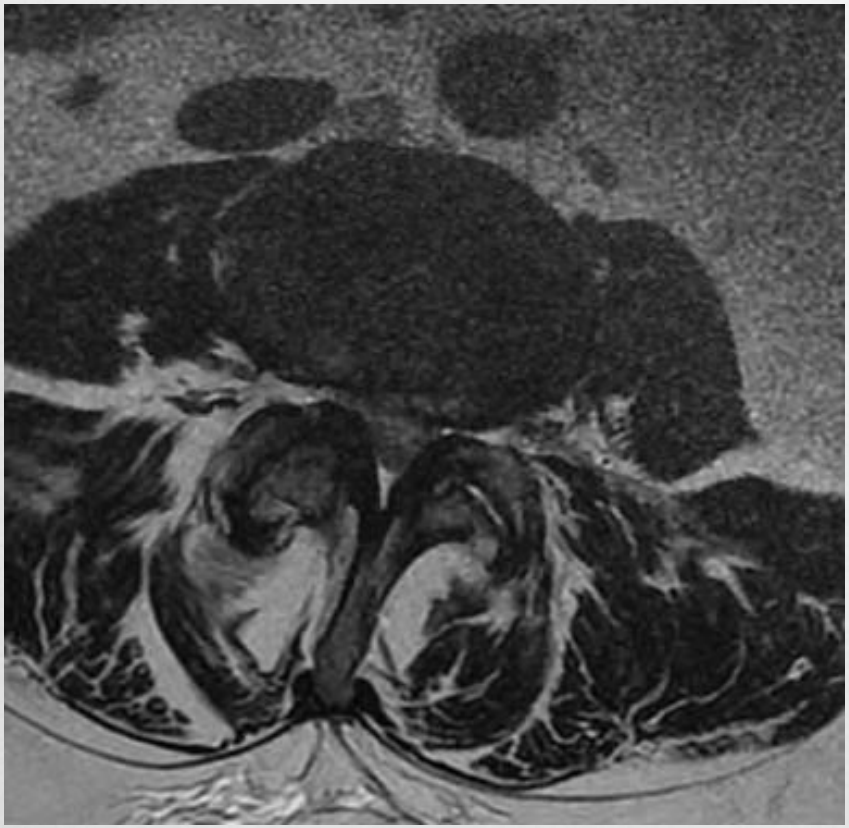
Management

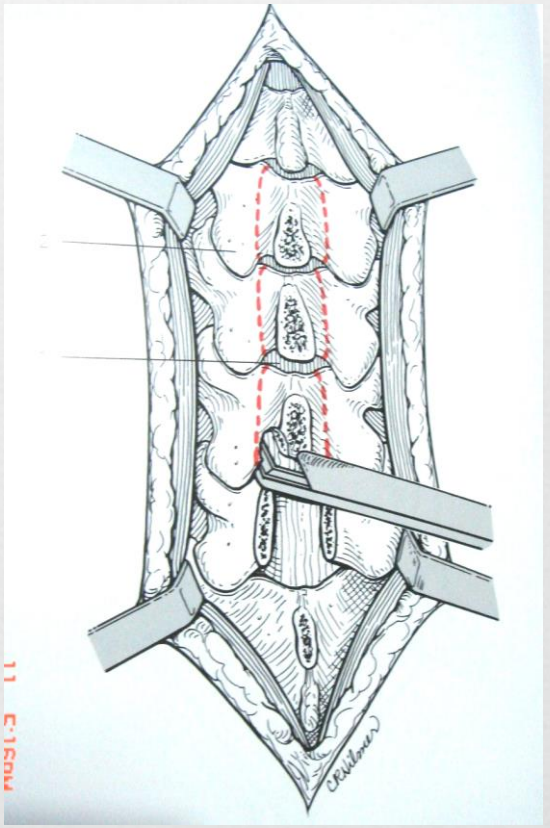
- Lumbar spine (Axial LBP): Conservative is the mainstay
  - Conservative: PT, Pain management (non-invasive and invasive)
  - Surgical indication: deformity , instability and failure of conservative treatment

Management

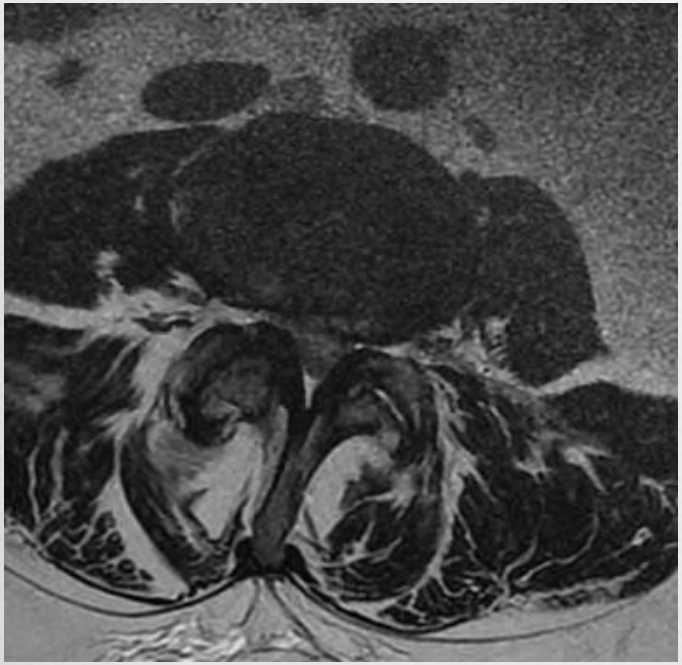
- Lumbar spine (Spinal stenosis):
  - Conservative: PT, Pain management (non-invasive and invasive)
  - Surgical indication: Motor deficit, severe neurogenic claudication and failure of 6+ months of conservative treatment
  - Surgical procedure: Laminectomy is the commonest

Management





Management



Spinal deformities

- Common spinal deformities:
  - Scoliosis (less common Kyphosis or combined)
  - Spondylolisthesis

Spinal deformities

- Causes of scoliosis:
  - Congenital
  - Syndromic
  - Neuromuscular
  - Idiopathic: most common type

Spinal deformities

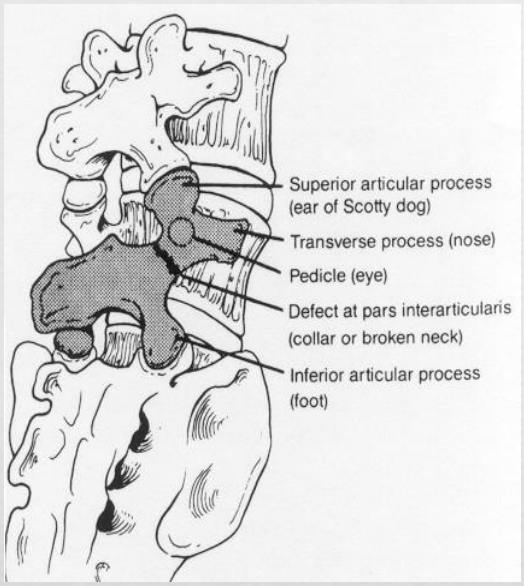
- Adolescent idiopathic scoliosis:
  - Between 10 and 14 years
  - Vertebral rotation
  - Deformity without significant pain
  - Normal neurological examination
  - Surgical indication: 45 degrees or more
  - Surgical procedure: instrumented PSF

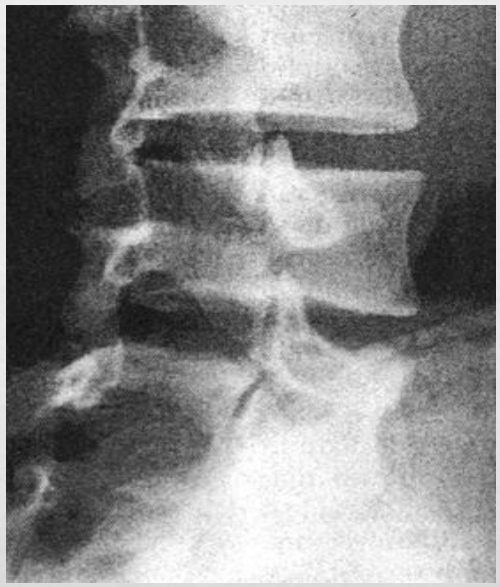
Spinal deformities

- Adolescent idiopathic scoliosis:

Spinal deformities

- Spondylolysis
- Is a defect in the pars interarticularis
- Plan lateral radiograph 80%, oblique another 15%
- Single photon emission computed tomography



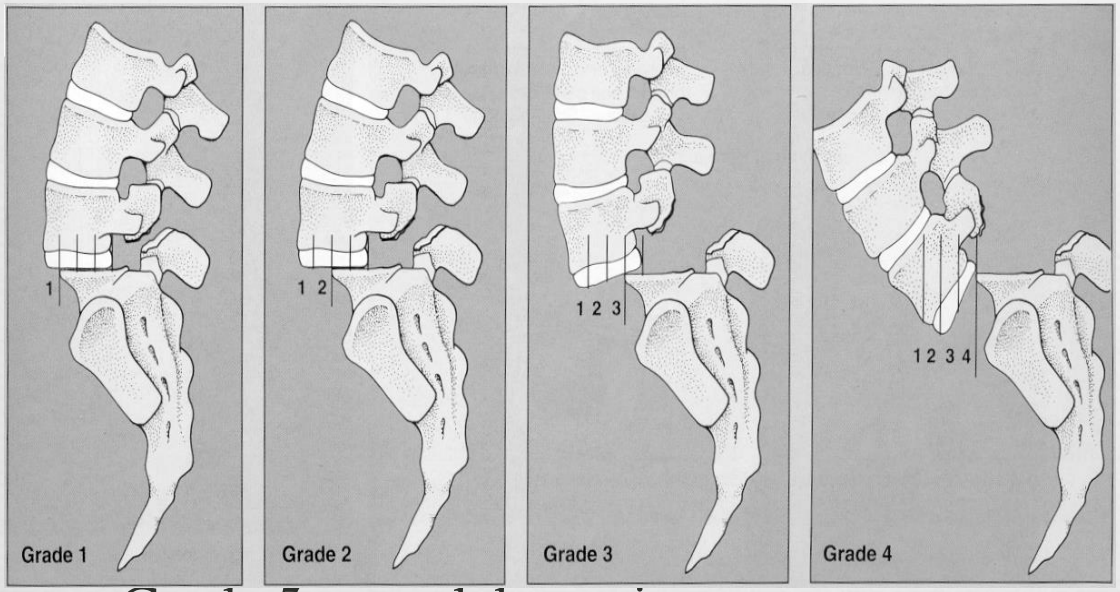


Spinal deformities

- Spondylolisthesis: Displacement of a vertebra in relation to a vertebra below
- Most people are asymptomatic
- Commonest causes are:
  - Degenerative
  - Isthmic
- Severity according to the degree of displacement
- Surgical indication: grade 3 or more, failed conservative
- Surgical procedure: according to severity. Instrumented PSF +/- interbody fusion is the commonest

Spinal deformities

- Spondylolisthesis



- Grade 5: spondyloptosis.

Spinal deformities

- Spondylolisthesis

Pathologic fractures

- Low-energy fractures
- Osteoporotic is common
- Usually due to infection or tumour
- X-rays: “winking owl” sign

Spine Pathology Red Flag Conditions

- Beware of:

1) Cauda Equina/severe neurologic injury (perianal numbness, decreased rectal tone, loss of movement in the extremeties)

2) Tumour weakening the vertebrae (causing cord compression or vertebral fracture)

3) Infection weakening bone (causing disc/vertebral destruction or cord compression)

4) Traumatic Spine Fracture (causing vertebral angulation, pain, or neuro compromise).

Remember that spine fracture can occur without trauma

Destructive Spinal Lesions

- Present with pain at rest or at night
- Associated with constitutional symptoms
- Most common causes
  - Infection
  - Tumors
- Vertebral body and pedicle are the commonest sites of pathology

Spinal Tumors

- Primary Spinal tumors:
  - Rare
  - Benign (e.g. osteoid osteoma) or malignant (e.g. chordoma)
  - Management depends on pathology
- Spinal metastasis
  - Very common
  - Biopsy required if primary unknown

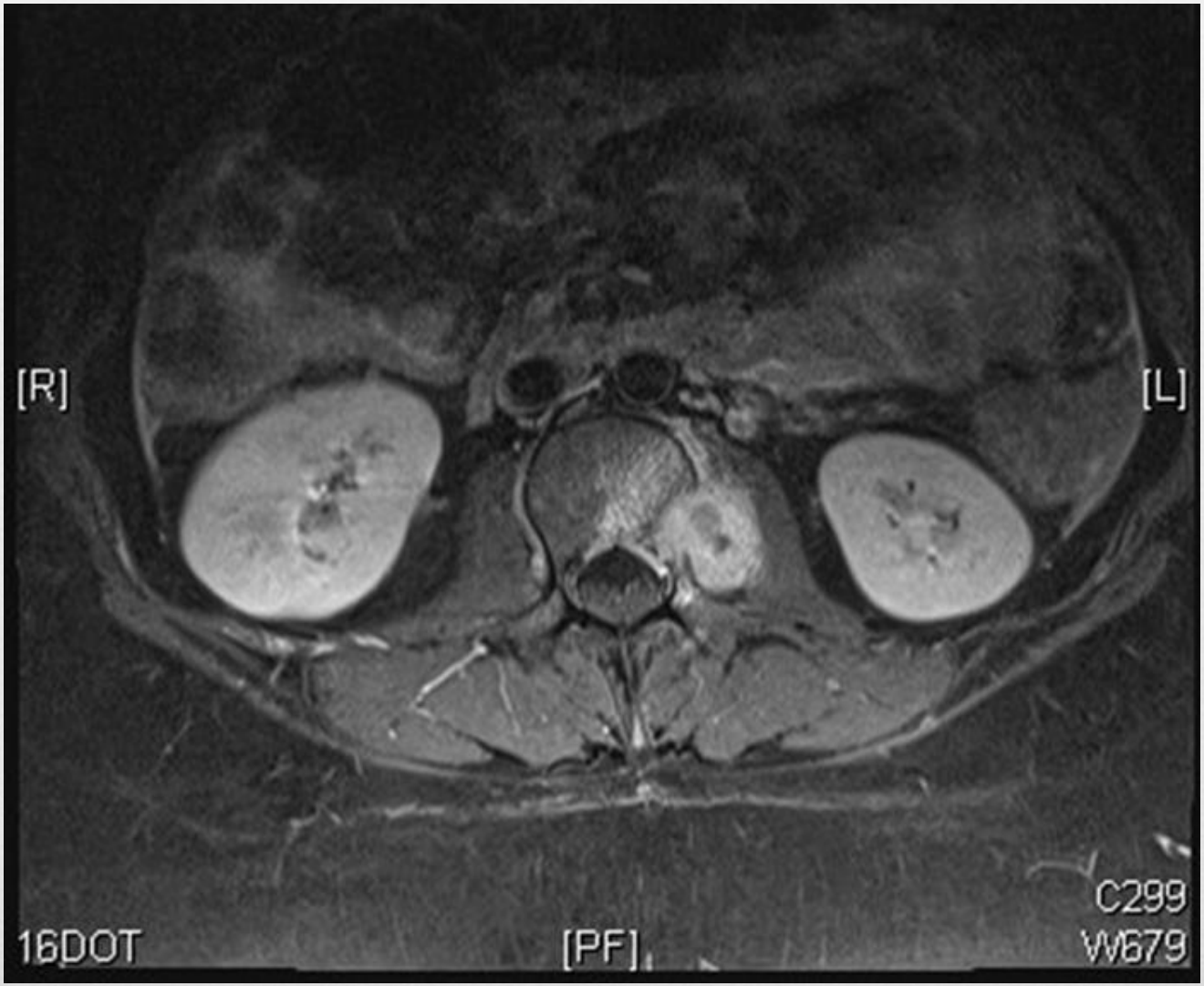
Spinal infections

- Most common is TB and Brucellosis
- History of contact with TB patient, raw milk ingestion
- Potentially treatable diseases once diagnosis is established and antimicrobials administered

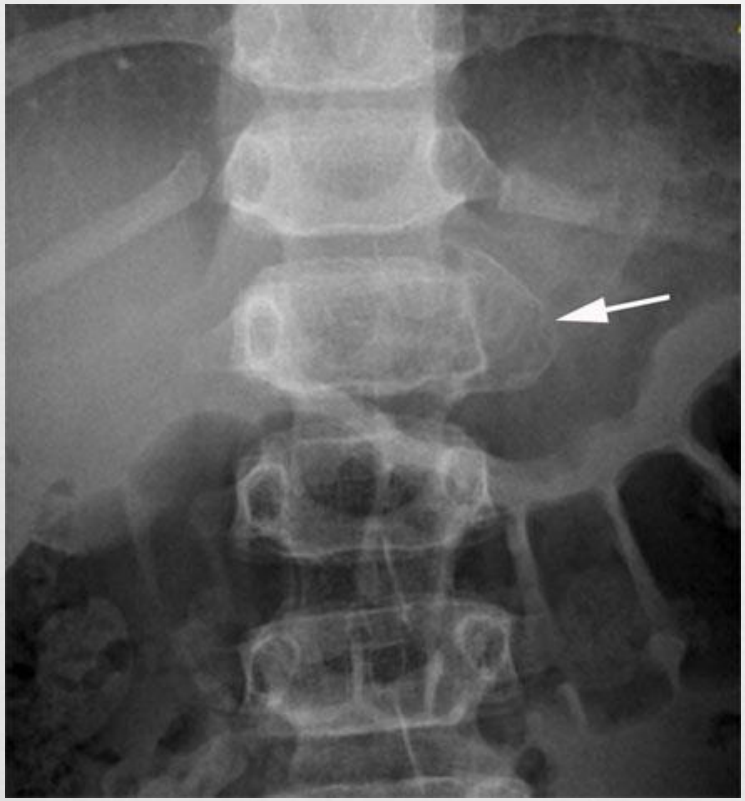
Osteoporotic fracture

- Pathological fractures
- Common injury post menopausal, if repetitive will result in loss of height and kyphotic deformity.
- Often missed
- Treatment:
  - Underlying disease

Spinal Tuberculosis (with psoas abscess)



Pathologic feature



Questions