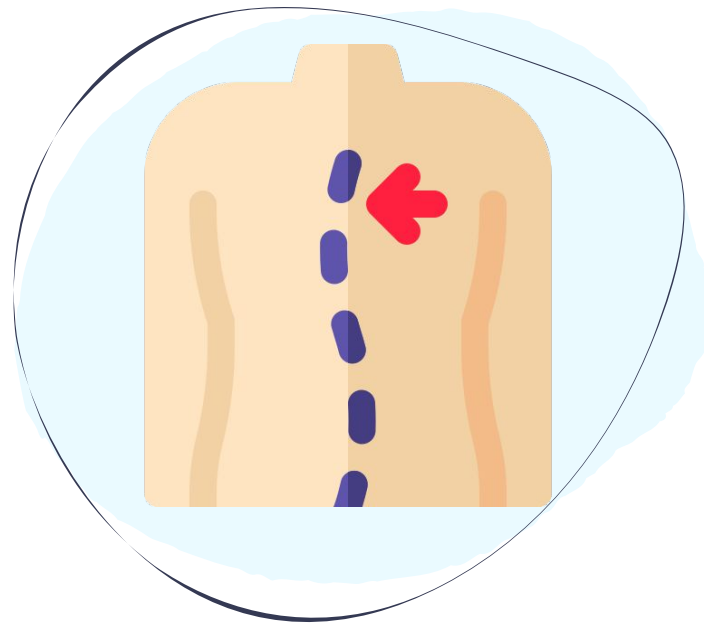





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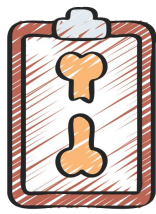


Common Spine Disorders

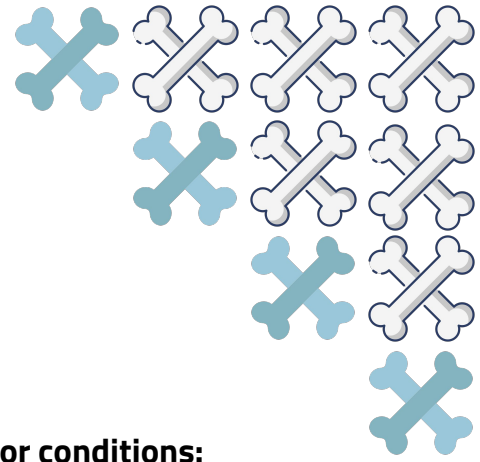
Dr. Abdulmajeed Alzakri

Color Index:






-  Main Text
-  Important
-  441 Notes
-  Old Notes
-  Extra
-  



Objectives



The ability to demonstrate knowledge of the characteristics of the major conditions:

-  Degenerative neck or back pain.
-  Spinal cord or root entrapment (for example, herniated lumbar disc).
-  Osteoporotic vertebral fracture.
-  Spinal deformity (scoliosis, spondylolisthesis).
-  Destructive (infectious and tumor related) back pain (for example, tuberculosis, metastasis, certain cancers).



Resources

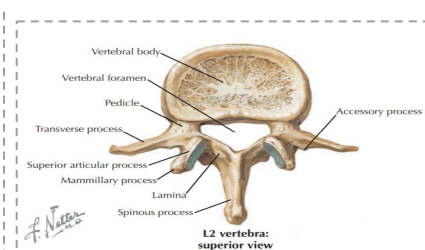
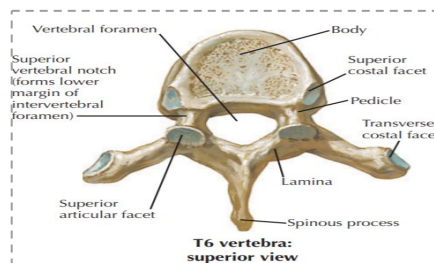
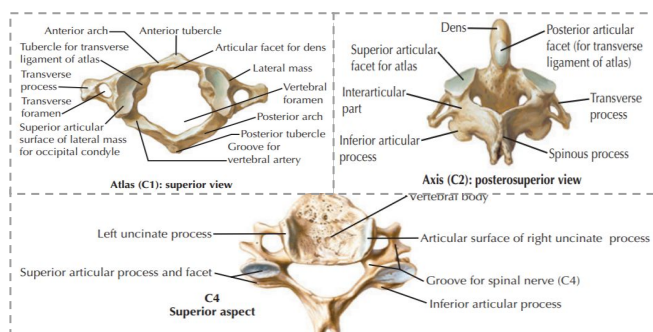


Anatomy of the Vertebrae

Vertebral Structure

- **Body or Centrum:** Weight-bearing part of the vertebra that lies anteriorly.
- **Vertebral arch:** formed from fusion of: 2 Pedicles and 2 Laminae.
- **The vertebral arch carries 7 process:**
 - 2 Transverse
 - One spinous
 - 2 Superior and 2 inferior articular
- **Vertebral foramen:** between the body and arch, through which the spinal cord passes.
- **Intervertebral disc:** Pads of flexible fibrocartilage that separate the vertebrae.

Vertebrae	Description
Cervical Vertebrae	<ul style="list-style-type: none"> ● Atlanto-occipital joint → allow you to nod "Yes". ● Atlantoaxial joint → allow you to nod "No". ● The vertebral vessels passes through the transverse foramen and the vertebral arteries take part in the formation of the circle of Willis in the brain. ● Only the vertebral vein passes through C7. ● Nerve roots exit above the vertebra (C4 nerve exits between C3 and C4).
Thoracic Vertebrae	<ul style="list-style-type: none"> ● Most thoracic vertebrae are typical, have bodies, vertebral arches and seven processes for muscular and articular connection. ● It articulates with the ribs which acts as a splint to stabilize the thoracic spine. ● Rarely injured only in high energy trauma or osteoporotic fractures. ● ROM: Mainly rotation, very limited extension and flexion. Why? due to the way the thoracic articular facets are oriented (most rigid part of the spine).
Lumbar Vertebrae	<ul style="list-style-type: none"> ● The most common region for fractures and disc herniation. ● Most of the lumbar disc herniation happen posterolateral. ● ROM: Flexion and Extension. (again, due to facet orientation that goes in the sagittal plane). ● Defect in the pars interarticularis (connection between pedicle & lamina) → Spondylolysis. ● Nerve roots exit below the vertebra (L4 nerve exits between L4 and L5).





Lower Back Pain Red Flags

- **Age more than 50** (of new onset lower back pain)
- **History of malignancy** tumour weakening the vertebrae → cord compression or fracture
- **History of trauma** traumatic Spine Fracture → vertebral angulation, pain, or neural sx
- **History of infection** weakening bone → disc/vertebral destruction or cord compression
- **Urinary retention/fecal incontinence** "Cauda equina" (perianal numbness, decreased rectal tone)
- **Acute motor deficit**: Any acute loss of motor power = emergency surgery rush to the OR as soon as possible 6-12 hours to save it. = patient present with developed disc herniation and **foot drop**.
- **Constitutional symptoms**: Loss of appetite, loss of weight, fever, night sweat, pain at night.
- IV drug abuse.

Remember that spine fracture can occur without trauma patient can have severe osteoporosis coughs or sneezes (or any minor load) → fracture!

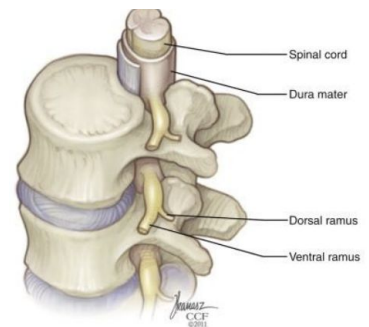
Degenerative Spinal Disorders

- **Degeneration**: deterioration of a tissue or an organ in which its function is diminished or its structure is impaired.
- **Other terms: Spondylosis¹**, degenerative disc disease, facet osteoarthritis.

Etiology

Multifactorial in origin

- Genetic predisposition
- Age related
- Environmental factors: **smoking**, obesity, **previous injury**, **fracture** or subluxation, deformity, operating heavy machinery such as a tractor.



Anatomy

Anterior elements:

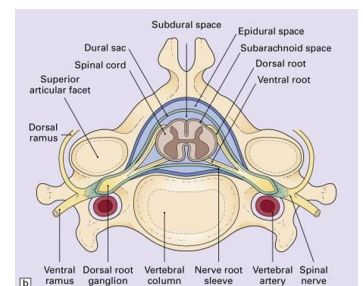
- Vertebral body
- **Inter-vertebral disc**
 - (Degeneration occurs at the disc)

Posterior elements:

- Pedicles, Laminae, Spinous process, Transverse process, **Facet joints** (2 in each level).
 - Osteoarthritis occurs at the facet joints

Neurologic elements:

- Spinal cord.
- Nerve roots.
- Cauda equina.

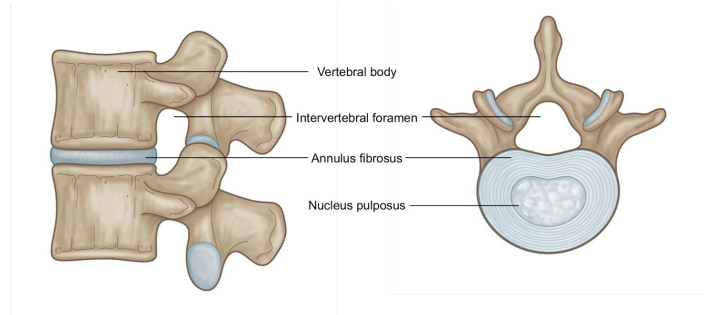
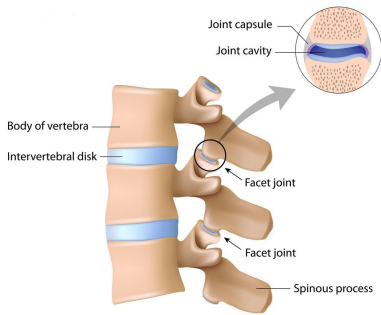


1- **Spondylosis**: an umbrella term used to describe pain from degenerative conditions of the spine.

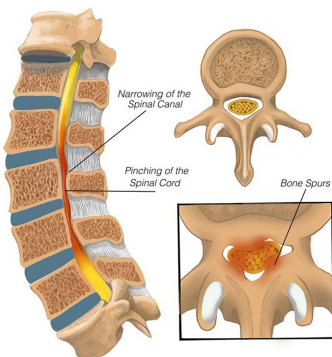


Pathology

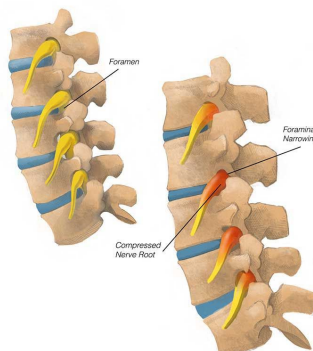
Anteriorly Intervertebral Disc (C2-S1)	Posteriorly Facet Joints (Zygapophysial Joints)
<p>The first component of the 3 joints complex:</p> <ul style="list-style-type: none"> ● Motion segment. ● It is primarily loaded in Flexion. ● Composed of "annulus fibrosus" and "nucleus pulposus". ● Degeneration of the nucleus: <ul style="list-style-type: none"> - Loss of both: cellular material and hydration → Pain ● Can be asymptomatic, Water content drops disc became hard and black on the X-ray. <p>Disc degeneration will also cause:</p> <ul style="list-style-type: none"> ● Bulging of the disc → "Spinal" stenosis. ● Loss of disc height → "Foraminal" stenosis. ● Herniation of the nucleus → "Radiculopathy" (e.g. sciatica in the lumbar spine). 	<ul style="list-style-type: none"> ● They are synovial joints and we have 2 in each motion segment. ● Are primarily loaded in extension. ● Pattern of degeneration similar to other synovial joints: <ul style="list-style-type: none"> → Loss of hyaline cartilage. → Formation of osteophytes. → Laxity in the joint capsule¹. <p>Facet joints degeneration will cause:</p> <ol style="list-style-type: none"> 1. Hypertrophy, osteophyte formation <ul style="list-style-type: none"> → Leading to spinal stenosis or foraminal stenosis. 2. Laxity in the joint capsule: <ul style="list-style-type: none"> → Leading to instability (degenerative spondylolisthesis²)



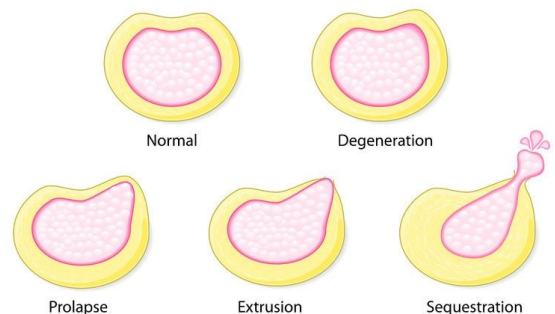
SPINAL STENOSIS



FORAMINAL STENOSIS



DISC HERNIATION



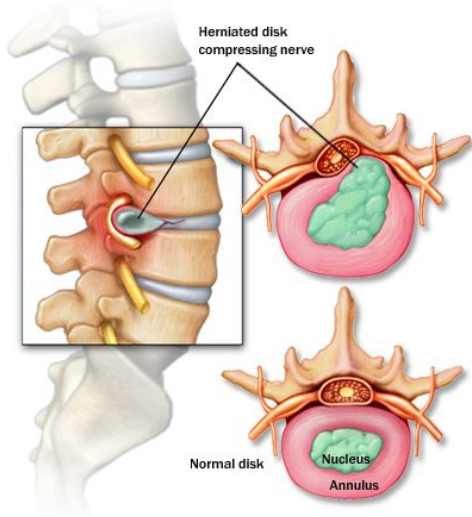
1- It's like any synovial joints in the body the degeneration process leads to loss of joint height, osteophytes formation, redundancy in capsule, inflammatory changes, excessive fluid and eventually instability which cause spondylolisthesis usually anterior posterior slippage "the vertebral above slips anteriorly"
 2- Especially at the lumbar vertebrae. Another term is slippage of one vertebra or spondylolisthesis usually in sagittal plane front to back



Clinical Presentation

Clinical Presentation of Spinal Disorders Falls Into Two Main Categories

Mechanical Pain	Neurological Symptoms
<p>Due to joint degeneration or instability.</p> <ul style="list-style-type: none"> ● “Axial pain” in the neck or back (dull, deep, aching pain). ● Activity related not present at rest. ● Associated with movement: <ol style="list-style-type: none"> 1. Sitting, bending forward (flexion): <ul style="list-style-type: none"> - From the disc “Discogenic pain”. - Pain when praying. 2. Standing, bending backward (extension): <ul style="list-style-type: none"> - From the facet joints “Facet syndrome”. - Patient presents with the inability to stand or walk for a long time. <p>❖ Both can occur simultaneously.</p>	<p>Due to neurologic impingement of the spinal cord, cauda equina or nerve roots.</p> <p><u>Spinal Cord:</u></p> <ol style="list-style-type: none"> 1) Myelopathy: (compression) <ul style="list-style-type: none"> ● Loss of motor power and balance. ● Loss of dexterity¹. <ul style="list-style-type: none"> - Objects slipping from hands. ● UMN deficit: <ul style="list-style-type: none"> - Rigidity, hyperreflexia, positive Babinski. ● Slowly progressive (stepwise) deterioration². 2) Spinal Cord Injury: <ul style="list-style-type: none"> ● Spinal stenosis associated with a higher risk of spinal cord injury. <p><u>Cauda Equina and Nerve Roots:</u></p> <ol style="list-style-type: none"> 1) Radiculopathy (e.g sciatica) <ul style="list-style-type: none"> ● LMN deficit³. ● Commonest is sciatica⁴ (lumbar). <ul style="list-style-type: none"> - Cervical root impingement causes similar complaints in the upper limb. 2) Neurogenic Claudication: <ul style="list-style-type: none"> ● Pain in both legs caused by walking. ● Pain relieved by sitting. ● Differentiate from vascular claudication.



Factors	Neurogenic	Vascular
Evaluation after walking	Increased weakness	Unchanged
Palliative factors	Bending over, sitting	Stopping
Provocative factors	Walking downhill Increased lordosis	Walking uphill Increased metabolic demand
Pulses	Present	Absent
“Shopping cart” sign	Present	Absent
van Gelderen bicycle test	No leg pain	Leg pain

IMPORTANT

Going downhill is more difficult since you'll need to extend your back for balance, thus worsening the pain, Bending over relaxes the ligaments and relieves the spinal stenosis. While extending the spine does the opposite.



1- Loss of balance, fine movement such as writing, inability to button his shirt, coffee cup will slip from his hands.
 2- Unlike spinal cord injury, myelopathies happen over months causing stepwise pain, numbness and paresthesia.
 3- Hyporeflexia, hypotonia, dermatomal pain, motor defect, hypoesthesia, ..., etc.
 4- Sciatica refers to the symptoms of pain, numbness, tingling, burning sensation or weakness that originate in the lower back, and radiate through the buttock, and continue down the back of the thigh, leg and foot. Sciatica occurs when there is compression, inflammation or injury to the sciatic nerve or to its (spinal nerve) roots L4-S2.

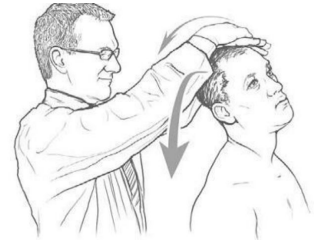


Cervical Spine

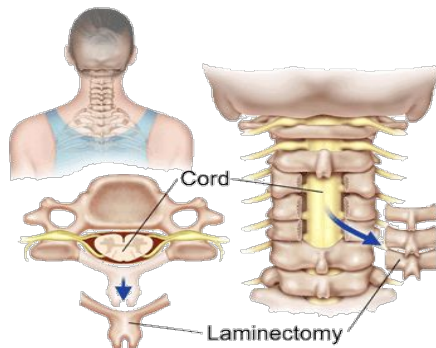
- Degenerative changes typically occur in **C3-C7**.

Degenerative Cervical Spine

History		<ul style="list-style-type: none"> • Presents with axial pain, myelopathy and radiculopathy
Physical Exam		<ul style="list-style-type: none"> • Stiffness → Loss of ROM <p>Neurological exam:</p> <ul style="list-style-type: none"> • Weakness. • Loss of sensation. • Hyper-reflexia/tonia (UMN) • Special tests: Spurling's sign¹
Management	Conservative	<ul style="list-style-type: none"> • First line of treatment for axial neck pain and mild neurologic symptoms (e.g. mild radiculopathy without any motor deficit) • Physiotherapy: <ul style="list-style-type: none"> ○ Focus on ROM and muscle strengthening • Non-steroidal anti-inflammatory medications (NSAID)² <ul style="list-style-type: none"> ○ E.g. Diclofenac, ibuprofen, or naproxen • Neuropathic medication: for radiculopathy pain <ul style="list-style-type: none"> ○ E.g. Gabapentin or pregabalin. We don't commonly use it due to its side effects.
	Surgical	<p>Indications:</p> <ul style="list-style-type: none"> • Spinal stenosis causing myelopathy (urgent surgery) • Disc herniation causing severe radiculopathy and weakness³ • Failure of conservative treatment of axial neck pain or mild radiculopathy <p>Procedures:</p> <ul style="list-style-type: none"> • Anterior discectomy and fusion • Posterior laminectomy



Cervical compression



Laminectomy



Anterior discectomy and fusion

1- The examiner turns the patient's head to the affected side while extending and applying downward pressure to the top of the patient's head. A positive sign is when the pain arising in the neck radiates in the direction of the corresponding dermatome ipsi-laterally.

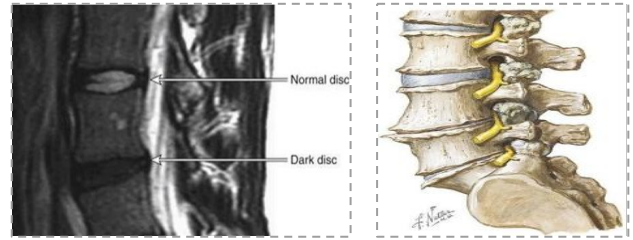
2- Pay attention while prescribing such medications to patients with peptic ulcer, nephropathy, HTN.

3- It will present as **acute** limb weakness.



Lumbar Spine

- Degenerative changes typically occur in **L3-S1**



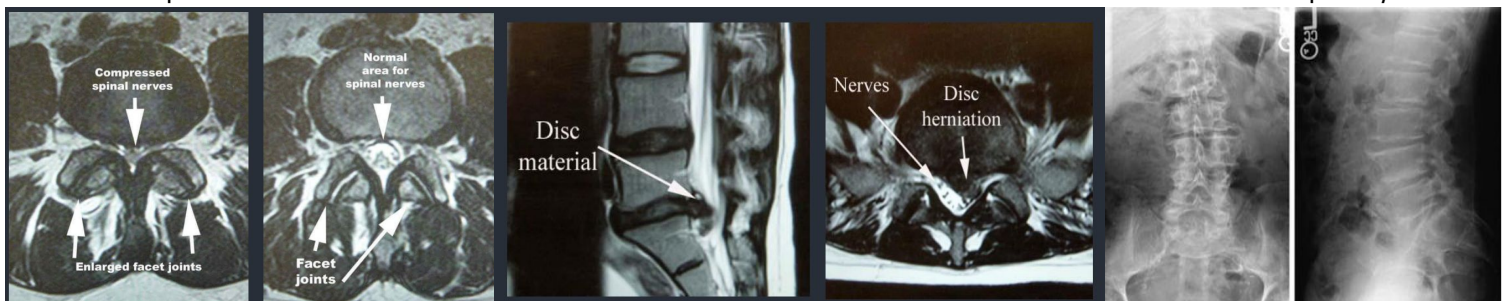
Degenerative Lumbar Spine

History	<ul style="list-style-type: none"> • Presents with axial pain, sciatica and neurogenic claudication. 	
Physical Exam	<ul style="list-style-type: none"> • Stiffness → Loss of ROM <p>Neurological exam:</p> <ul style="list-style-type: none"> • Weakness. • Loss of sensation. • Hypo-reflexia/tonia (LMN). • Special tests: Straight Leg Raise Test (SLRT). 	
Management	<p>Axial Lower Back Pain (Spondylosis)</p>	<p>Conservative: (first-line)</p> <ul style="list-style-type: none"> • Physiotherapy: <ul style="list-style-type: none"> ◦ Core muscle strengthening, posture training. • NSAIDs. <p>Surgical: indicated for:</p> <ul style="list-style-type: none"> • Instability/deformity e.g. high-grade spondylolisthesis. • Failure of conservative treatment.
	<p>Spinal Stenosis</p>	<p>Conservative: (first-line) (Especially in elderly or people who can't undergo surgery)</p> <ul style="list-style-type: none"> • Activity modification. • Analgesics, epidural corticosteroid injection. <p>Surgical: indicated for:</p> <ul style="list-style-type: none"> • Acute motor weakness e.g. Foot drop. • Failure of conservative treatment (minimum 6 months). • Procedure: Spinal decompression (laminectomy) commonest
	<p>Disc Herniation</p>	<p>Conservative: (first-line) for mild sciatica with no motor loss</p> <ul style="list-style-type: none"> • Short (2-3 days) rest • NSAIDs, epidural corticosteroid injection. • Physiotherapy (95% resolves with no surgery in 3 months). <p>Surgical: indicated for:</p> <ul style="list-style-type: none"> • Cauda Equina or motor deficit. • Failure of conservative treatment (minimum 2 months). <p>Procedure: Discectomy (only the herniated part).</p>

Spinal Stenosis

Disc Herniation

Lumbar Spondylosis



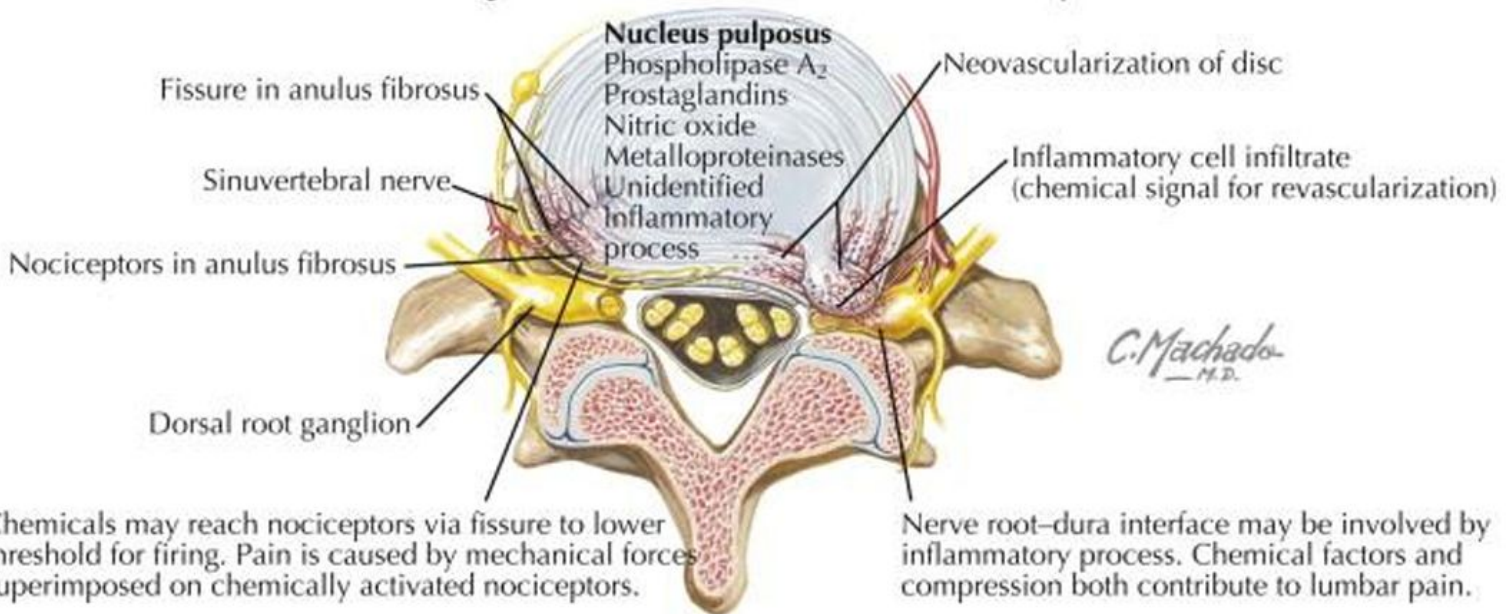


Discectomy

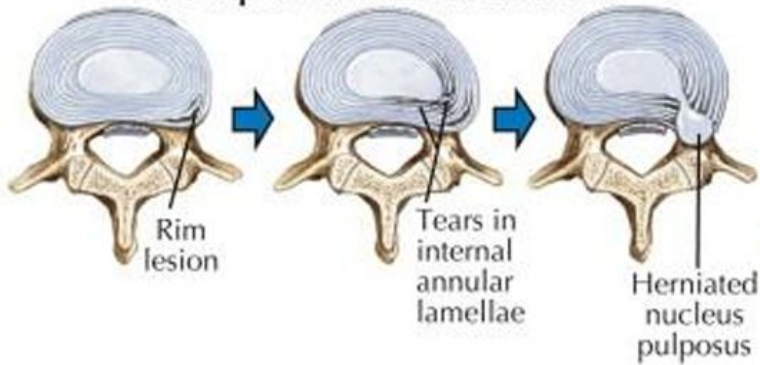
LUMBAR DISC HERNIATION

Discogenic Pain

Herniated Nucleus Pulposus

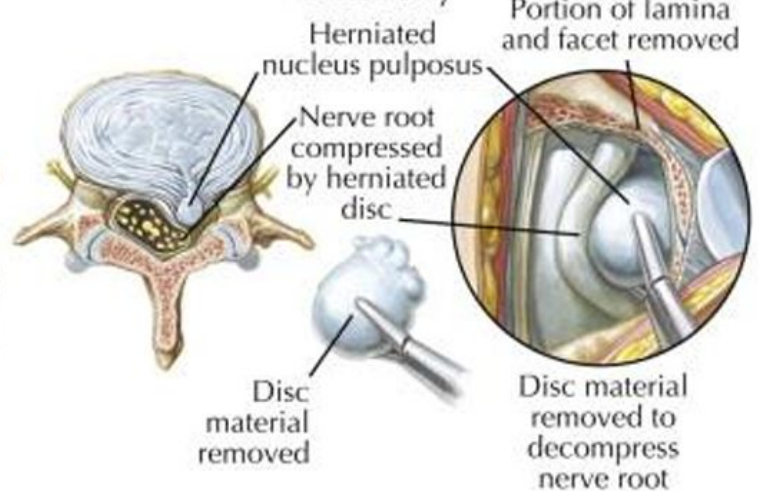


Disc Rupture and Nuclear Herniation



Peripheral tear of anulus fibrosus and cartilage end plate (rim lesion) initiates sequence of events that weaken and tear internal annular lamellae, allowing extrusion and herniation of nucleus pulposus.

Discectomy

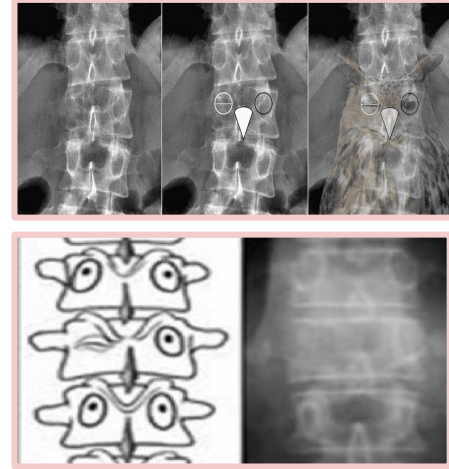




Osteoporotic Vertebral Fractures

Description

- Pathologic fractures (low-energy fractures)
- Anterior column (±middle column) only compromised (Wedge/Burst Fracture)
- Often missed (common injury in postmenopausal women)
- Repetitive fractures result in kyphotic deformity (hunchback)
- **Treat the underlying cause.**



-(e.g. osteoporosis). It increases the mortality rate by increasing the rate of DVT and pneumonia

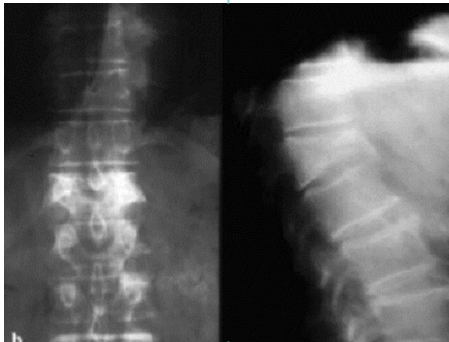
-Pathological fractures spinal X-ray shows "winking owl sign" (absent pedicles)

Spinal Deformities

Spinal Deformities

Kyphosis

Sagittal plane



Give the patient anti-osteoporotic medications

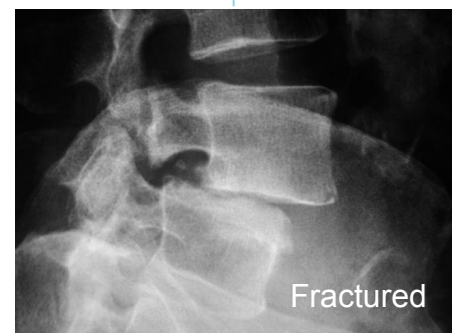
Scoliosis

Coronal plane



Spondylolisthesis¹


Translation



1- Only high grade spondylolisthesis causes visible deformity.

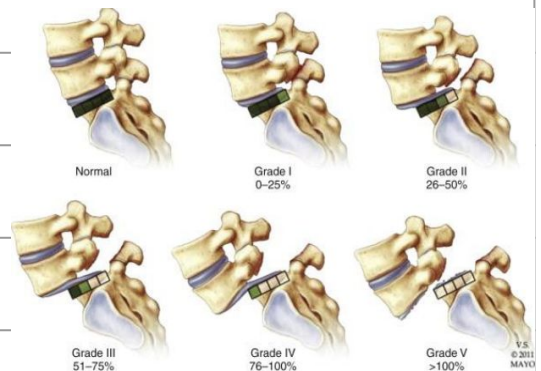


Scoliosis

Types		<ul style="list-style-type: none"> ● Congenital: Associated with vertebral anomalies. <ul style="list-style-type: none"> - E.g. hemivertebra (they have half vertebra). ● Acquired: Secondary to other pathology. <ul style="list-style-type: none"> - E.g. tumors, infection. ● Idiopathic: Most common is adolescent type. ● Syndromic: Secondary to other syndromes. <ul style="list-style-type: none"> - E.g. Ehler danlos, marfan, muscular dystrophy.
Adolescent Idiopathic Scoliosis	Description	<ul style="list-style-type: none"> ● Three dimensional deformity of the spine <ul style="list-style-type: none"> ★ Vertebral rotation is the hallmark ● Painless deformity (usually noticed by parents/others)
	Examination	<ul style="list-style-type: none"> ● Neurologically normal. ● Positive Adams test¹. 
	Management	<ul style="list-style-type: none"> ● Depends on age & degree of deformity². Young girl presents with severe idiopathic scoliosis with back pain, next step? MRI

Spondylolisthesis

Description		<ul style="list-style-type: none"> ● Translation (displacement/subluxation) of one vertebra over the another (defect in the pars interarticularis) <ul style="list-style-type: none"> ○ Most people are asymptomatic
Types		<ul style="list-style-type: none"> ● Degenerative spondylolisthesis (most common) ● Isthmic spondylolisthesis <ul style="list-style-type: none"> ○ Caused by interarticularis defect (spondylolysis)
Grades	Grade I	<ul style="list-style-type: none"> ● 25% displacement
	Grade II	<ul style="list-style-type: none"> ● 50% displacement
	Grade III	<ul style="list-style-type: none"> ● 75% displacement
	Grade IV	<ul style="list-style-type: none"> ● Full displacement
	Grade V	<ul style="list-style-type: none"> ● No contact (Spondyloptosis)
Management		<ul style="list-style-type: none"> ● Conservative treatment first. ● Surgery is indicated for grade ≥ 3 or failed treatment.



1-In "Adam forward bend" test, The patient bends forward, as if they are diving. If the patient has scoliosis, their back often has a prominent line where the spine is, and one side is higher than the other. Patient's back is completely straight if they do not have scoliosis.

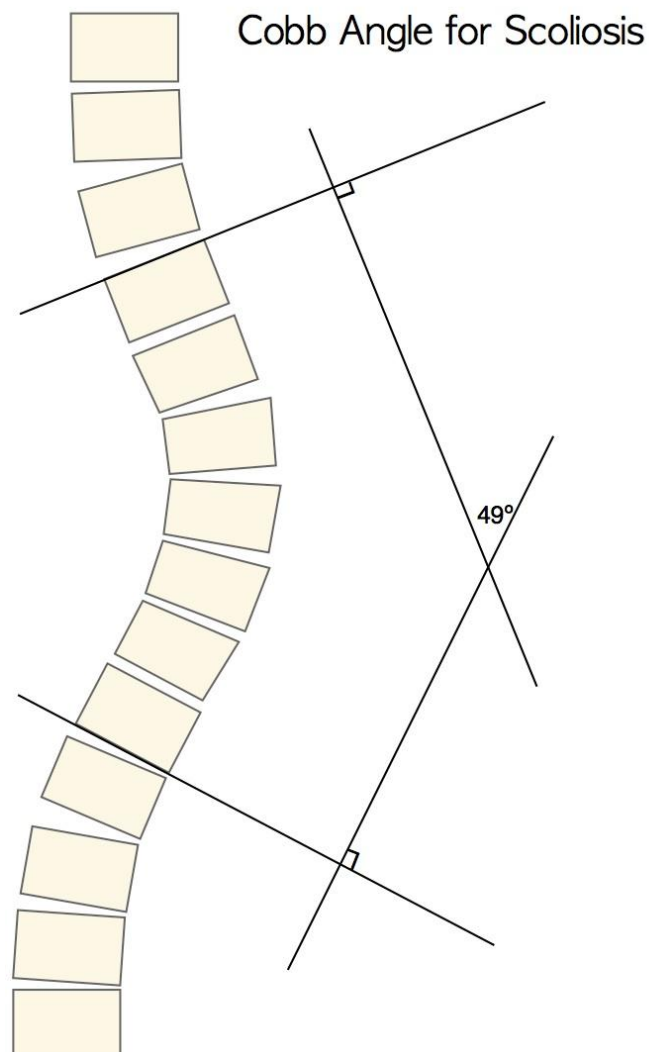
2- Next slide.



Scoliosis Management

IMPORTANT

Cobb's Angle	Treatment
< 10	Normal
10-20	Physical therapy
20-45	Brace
> 45	Surgery





Destructive Spinal Lesions

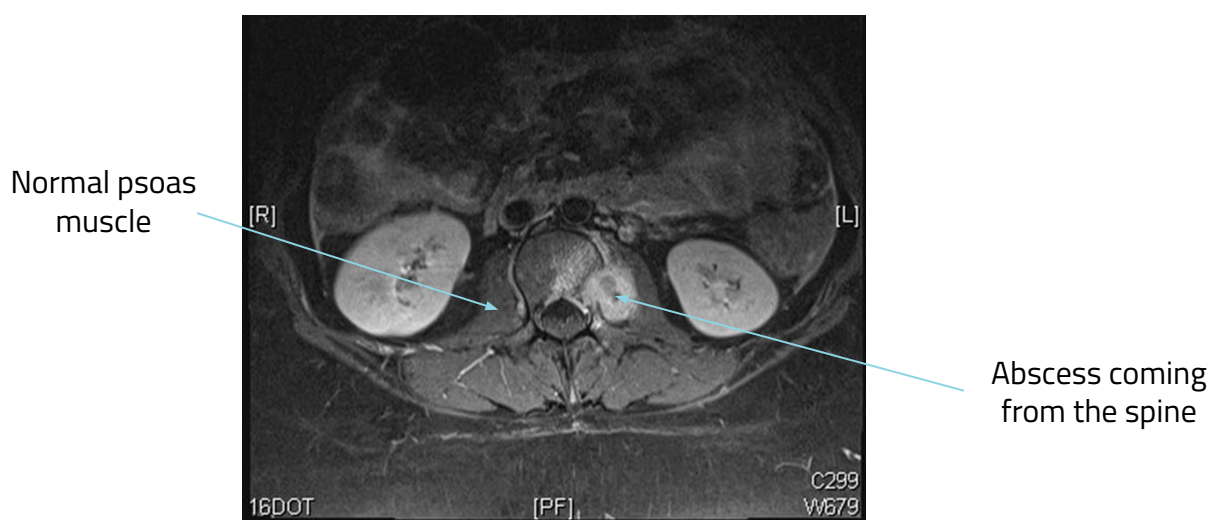
- Present with **pain at rest** or **pain at night**.
 - The lesion then weakens the bone causing more pain (axial pain with movement) which might lead to fractures with minor trauma and loss of function
- Associated with **constitutional symptoms**.
- Vertebral body and pedicle are the most common sites of pathology
 - Because it's highly vascular.
- Most common causes are: Tumors and infections.
- If the patient presents without back pain or red flags, we order X-ray to check for stability.

Tumors

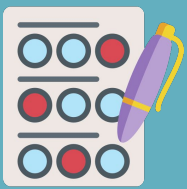
- **Primary Spinal tumors (rare)**
 - Benign (e.g. osteoid osteoma).
 - **Malignant** (e.g. chordoma).
- Management depends on pathology.
- **Spinal metastasis (very common)** because the spine is very close to major organs affected by tumors.
 - Biopsy required if primary unknown (if you suspect lesion → biopsy).
 - Spinal cord presentation is according to the site of compression.

Infections

- Most common are **TB** and **Brucellosis**.
- History of contact with **TB** patient or raw milk ingestion is indicative.
- Potentially treatable diseases once diagnosis is established and antimicrobials administered.
- **Most indicative feature is fever.**



Spinal Tuberculosis with psoas abscess: abscess acts just like a tumor and can present like femoral hernia
◆ Compresses adjacent structures and spine



Quiz

Q1: A 35 year old patient's X-ray showed some degeneration at the level of C5 with no red flags which of the following is an indication for surgery?

A

Mild radiculopathy

B

Failure of conservative treatment

C

Myelopathy

D

All of the above

Q2: Nawaf a 40 year old patient came with repetitive pain after walking a certain distance which of the following is more indicative of neurogenic claudication?

A

Pain is alleviated by rest

B

Pain gets worse by going down stairs

C

Pulses are weak in the lower limbs

D

Nawaf starts with an N and Neurogenic also starts with an N

Q3: In spondylolisthesis above which grade is it an indication for surgery?

A

Grade II

B

Grade III

C

Grade IV

D

Grade V

Q4: A 14 years old female brought by her parents. They are concerned about the abnormality seen in her back. On examination, the only positive thing was a unilateral hump on the right side of her back when she bends forward. What is the most likely diagnosis?

A

Degenerative disc disease

B

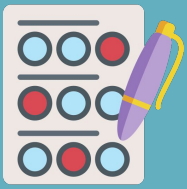
Spinal TB

C

Spondylolisthesis

D

Scoliosis



Quiz

SAQs

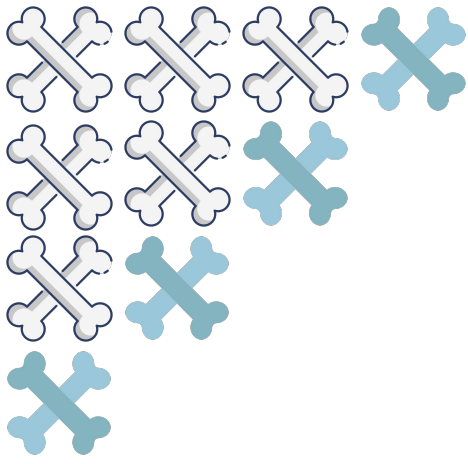
441 & 439:

1. Mention the posterior elements of the vertebra?
 - Pedicles.
 - Laminae.
 - Spinous process.
 - Transverse process.
 - Facet joints (2 in each level).
2. Mention three features of the neurological claudication?
 - 1- The pain increases after sitting.
 - 2- The pulse is present.
 - 2- Shopping cart sign.
3. What lumbar spondylolisthesis means?
 - Translation of one lumbar vertebra over the other.

438:

A 30 year old female patient presents to your clinic complaining of unilateral pain, burning and numbness in her left buttocks, radiating down the back of her thigh and leg. Which was proven to be sciatica, she does not have any red flags.

1. Name 4 red flags for lower back pain:
 - 1- History of infection.
 - 2- History of trauma.
 - 3- Age more than 50 years
 - 4- Urinary retention/Fecal incontinence
2. How will you manage this patient?
 - 1- Physiotherapy.
 - 2- NSAIDs.
 - 3- Surgery if necessary.
3. What are the indications for discectomy?
 - 1- Cauda equina.
 - 2- Motor deficits.
 - 3- Failure of conservative management.



Team Leader

Abdulrahman Alroqi

Done by

Hussam AlGhamdi

Organized by

Abdulrahman Alroqi
Abdullah Alomran

وَفَقَّكُمْ اللَّهُ



This work was originally done by team 438 & 439

