433 Teams

ORTHOPEDICS

Lecture 11

Spinal disorders

Ortho433@gmail.com

جامعة الملك سعود
King Saud University

Objectives :

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

1- Degenerative neck or back pain.

2- Spinal cord or root entrapment (for example, herniated lumbar disc).

3- Osteoporotic vertebral fracture.

4- Spinal deformity (scoliosis, spondylolisthesis).

5- Destructive (infectious and tumor related) back pain (for example, tuberculosis, metastasis, certain cancers).

1-Degenerative Spinal Disorders:

- ✓ Degeneration: "deterioration of a tissue or an organ in which its function is diminished or its structure is impaired".
- ✓ Other terms: Spondylosis: (Spondy: vertebra) (losis: abnormal or diseased condition)
  - ❖ Degenerative disc disease.
  - ❖ Facet osteoarthrosis. Facet joints like any other synovial joint in the body can get osteoarthritic changes and all of xray signs of osteoarthritis like(loss of joint space, osteophytes,…)

Etiology:

> Intervertebral disc degeneration is an age-related phenomenon that occurs in over 80 per cent of people who live for more than 50 years and in most cases it is asymptomatic. *Apley's*

1- **Non-Modifiable**
   - Genetic predisposition.
   - Age-related.

2- **Modifiable:**
   - Some environmental factors:
   - Smoking.
   - Obesity.
   - Previous injury, fracture or subluxation. For e.g 30y patient with intraarticular fracture of the spine can develop osteoarthritis later on.
   - Deformity.
   - Operating heavy machinery, such as a tractor.

Anatomy:

1- Anterior elements:

A. Vertebral body.

B. Inter-vertebral disc: **Degeneration occurs at the disc.**

2- Posterior elements:

Pedicles, laminae, spinous process, transverse process, facet joints (2 in each level).
Osteoarthrosis occurs at the facet joints.

3- Neurologic elements:

A. Spinal cord. Part of CNS, any pathology to it cause UML manifestations

B. Nerve root. Part of PNS, any pathology to it cause LML manifestations

C. Cauda equina. (it's composed of nerve roots that start at the spinal cord ending (L1-L2) that move inside the spinal cord canal giving off 2 nerves at every exit point).431team

Pathology:

1. Inter- vertebral disc:

- The first component of the 3 joint complex. "Motion segment" (Disc anteriorly, canal centrally and 2 facet joints posteriorly)
- It is primarily **loaded in FLEXION**

(That's why when you have disk pathology you don't like to bend forward, reach for things, set down because it hearts your back. Patient likes to walk and stand rather than set down. Patient can't set because setting induce a lot of flexion)431team.

- Composed of "annulus fibrosus" and "nucleus pulposus"
- Degeneration of the nucleus causes loss of cellular material and loss of hydration ◊ which produces pain.
- **Disc degeneration will also cause:**

A. Bulging of the disc →"Spinal" stenosis.
B. Loss of disc height →"Foraminal" stenosis
   - Abnormal loading of facet joints.
   - Stenosis in the intervertebral foramen.
C. Herniation of the nucleus →"Radiculopathy" (e.g. sciatica in the lumbar spine).

(Radiculo- means root). Radiculopathy means pain in dermatomal distribution. So pain along the median nerve is not a radiculopathy. Pain along L4 is radiculopathy.431team

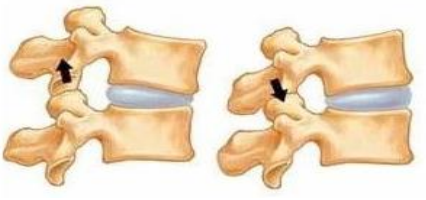
2. The facet joints:

- Scientific name: "zygapophysial joints".
- Synovial joints. (2 in each motion segment.)
- Are primarily **loaded in EXTENSION**

(Patient can't walk and can't stand. when they stand they bend forward because that way they relieve the pressure on the facet joint).431team

- Pattern of degeneration similar to other synovial joints.
  - Loss of hyaline cartilage, Formation of osteophytes, Laxity in the joint capsule.
- **Facet degeneration will cause:**
  - Hypertrophy, osteophyte formation: Contributing to spinal stenosis or foraminal stenosis.
  - Laxity in the joint capsule: Leading to instability (degenerative spondylolisthesis).

Presentation: (dr said presentation is the most important thing to know)



• Falls into 2 categories:

1- Mechanical pain: due to joint degeneration or instability.

A. "Axial pain" in the neck or back.

B. Activity related-not present at rest:

- (weight bearing pain such as standing. Inflammation, infection, and tumors back pain present at rest

C. Associated with movement:

- Sitting, bending forward (flexion): Originating from the disc »"discogenic pain".
- Standing, bending backward (extension): Originating from the facet joints »"Facet syndrome"

2- Neurologic symptoms: due to neurologic impingement:

A. Spinal cord (Presents as myelopathy, spinal cord injury)

- **Myelopathy:** chronic. (myelo- is a prefix that mean spinal cord or bone marrow)
  - ♣ Loss of motor power and balance.
  - ♣ Loss of dexterity »Objects slipping from hands. Difficulty of dressing or feeding.
  - ♣ UMN deficit (rigidity, hyper-reflexia, positive Babinski..) (long tract signs) .
  - ♣ Slowly progressive "step-wise" deterioration.

- **Spinal cord injury:** acute
  - ♣ Spinal stenosis associated with a higher risk of spinal cord injury.

B. Cauda equina & Nerve roots (Presents as radiculopathy (e.g. sciatica) or neurogenic claudication.

- **Radiculopathy:** acute
  - ♣ LMN deficit.
  - ♣ Commonest is sciatica, but cervical root impingement causes similar complaints in the upper limb. (sciatica pain along the course of a sciatic nerve especially in the back of the thigh caused by compression, inflammation).

- **Neurogenic claudication:** chronic, ischemia at the level of spinal canal because the canal gets tight.
  - ♣ Pain in both legs caused by walking.
    (Patient walk for 50m the he can't proceed his legs are in pain and he stand forward to relieve the pain).
  - ♣ Must be differentiated from vascular claudication.
    (in vascular claudication patient has to set down to relieve the pain)

Neurogenic claudication is position dependent; vascular claudication is exercise dependent. *Toronto notes 2015*

2- Degenerative neck or back pain:

A- The cervical spine: cervical spondylosis or neck degenerative disease

Introduction:

- Degenerative changes typically occur in C3-C7.
- Presents with axial pain, myelopathy, or radiculopathy.

Physical examination:

1. Stiffness (loss of ROM).
2. Neurologic exam:
   - Weakness.
   - Loss of sensation.
   - Hyper-reflexia, hypertonia.(myelopathy, UML)
   - Special tests: Spurling's sign. (for radiculopathy) https://www.youtube.com/watch?v=h8GxF73P6GQ

Management:

A. Conservative treatment:

First line of treatment for axial neck pain and mild neurologic symptoms (e.g. mild radiculopathy without any motor deficit).

- Physiotherapy: Focus on ROM and muscle strengthening.
- Non-steroidal anti-inflammatory medications (NSAID) –E.g. Diclofenac, ibuprofen, naproxen.
- Neuropathic medication: for radiculopathy pain –E.g. Gabapentin or pregabalin.

B. Surgical management: **(Any motor deficit is an indication for surgery)**

- **Indicated for:**
  1. Spinal stenosis causing myelopathy. Relatively urgent, the aim is stop the progression.
  2. Disc herniation causing severe radiculopathy (emergency situation) and acute weakness.
  3. Failure of conservative treatment of axial neck pain or mild radiculopathy.
- **Procedures:**
  1. **Anterior discectomy and fusion.**
  2. **Posterior laminectomy.**

Case: 30y, male, woke up last morning and twisted his neck and developed sever right arm pain and can't lift his wrist, what's the most likely Dx?
Ans:
C7 radiculopathy due to herniated disc. Next step is MRI.

B- The lumbar spine: lumbar spondylosis or back degenerative disease

▪ Introduction:

- Degenerative changes typically occur in L3-S1.
- Presents with axial pain, sciatica, neurogenic claudication.

▪ Physical examination:

1. Stiffness (loss of ROM).
2. Neurologic exam:

- Weakness.
- Loss of sensation.
- Hypo-reflexia, hypo-tonia. LML
- Special tests: **SLRT.** (https://www.youtube.com/watch?v=nWsQWSqfgh4)
  Present as lower motor neuron picture (has to be in dermatomal distribution).

▪ Management:

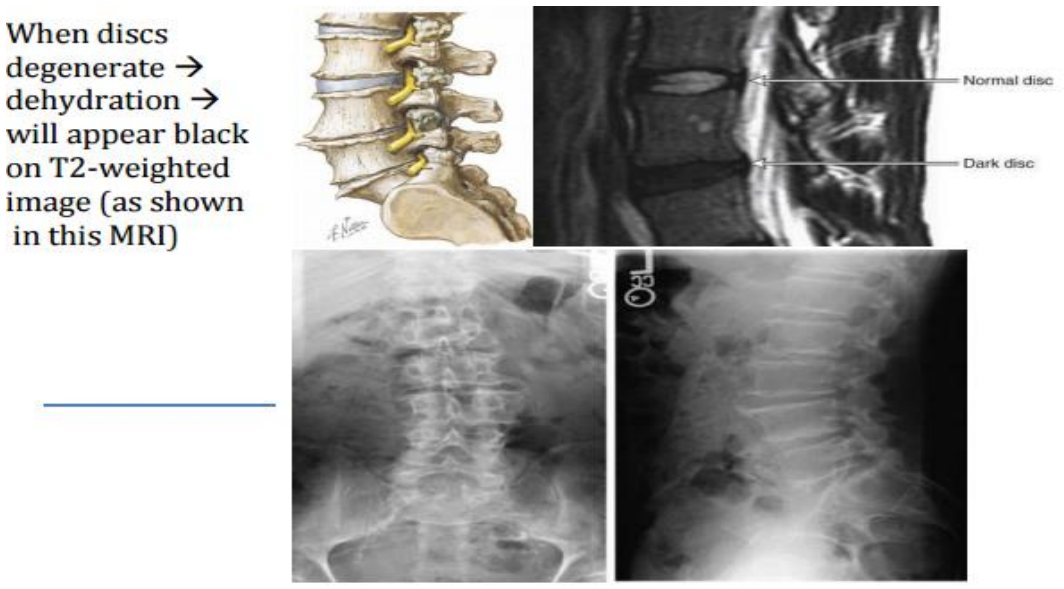
A. Conservative treatment is first-line and mainstay of treatment.

- Physiotherapy: core muscle strengthening, posture training.
- NSAIDs.

B. Surgical treatment:

indicated for:

1. Instability or deformity e.g. high-grade spondylolisthesis or scoliosis.
2. Failure of conservative treatment.



Lumbar spondylosis

3- Spinal cord or root entrapment:

A. Spinal stenosis: Narrowing of spinal canal<10mm

A. Conservative treatment is first line of treatment.

Activity modification, analgesics, epidural cortico-steroid injections.

B. Surgical treatment:

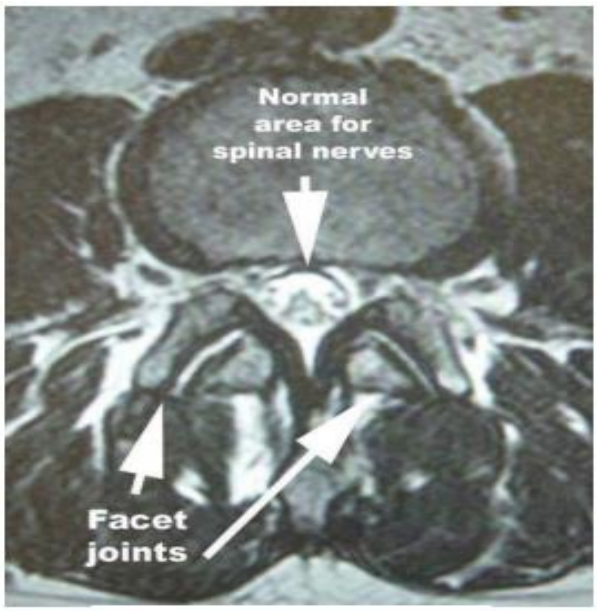
Indicated for:

1. Acute Motor weaknesses e.g. drop foot.
2. Failure of –minimum-6 months of conservative treatment.

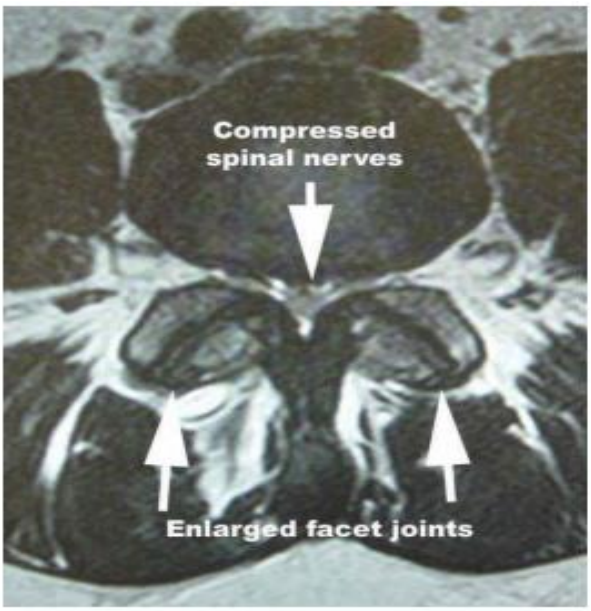
Procedures:

- **Spinal decompression (laminectomy) is the commonest.**

The causes of spinal stenosis are:
(1) Congenital vertebral dysplasia (e.g. in achondroplasia or hypochondroplasia).
(2) Chronic disc protrusion and peri-discal fibrosis or ossification.
(3) Displacement and hypertrophy, or osteoarthritis, of the apophyseal (facet) joints.
(4) Hypertrophy, folding, or ossification of the ligamentum flavum.
(5) Bone thickening due to Paget's disease.
(6) Spondylolisthesis. Apley's



Normal



Abnormal

B. Disc herniation: Tear in annulus fibrosus allows protrusion of nucleus pulposus causing either a central, posterolateral, or lateral disc herniation, most commonly at L5-S1 > L4-5 > L3-4. Toronto notes 2015 a.

A. Conservative treatment is first line of treatment for mild sciatica without motor deficit.

- Short (2-3 day) period of rest, NSAID, physiotherapy, epidural cortico-steroid injection.
- 95% of sciatica resolves within the first 3 months without surgery.

B. Surgical treatment:

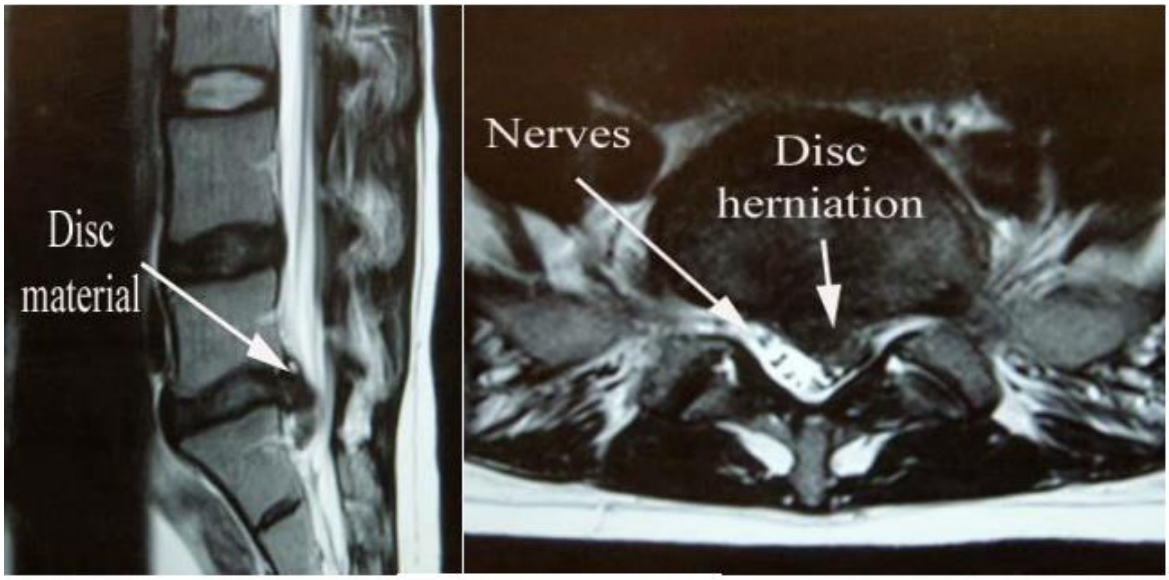
Indicated for:

1. Cauda-equina syndrome.
2. Motor deficit also complete loss of sensation usually considers an indication.
3. Failure of 2 months of conservative treatment.

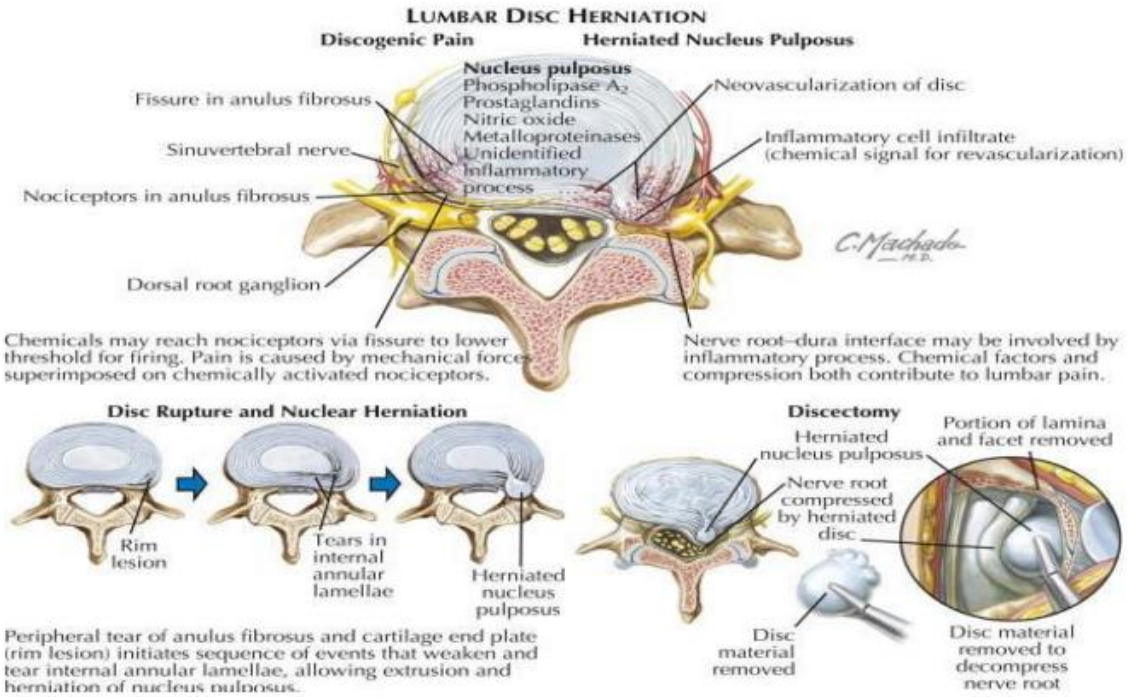
> 90% resolve in 3 mo; surgical discectomy reserved for progressive neurological deficit, failure of symptoms to resolve within 3 mo, or cauda equina syndrome due to central disc herniation. *Toronto notes 2015*

Procedure:

- **Discectomy (only the herniated part).**



Disc herniation



Spinal fusion

C- Osteoporotic Vertebral Fractures:

- The commonest type of pathological fractures of spine
- Anterior column (±middle column) only compromised (Wedge/Burst Fracture).
- Often missed.
- Repetitive fractures result in kyphotic deformity (hunchback).
- Treat the underlying cause. (Number one priority because osteoporotic fracture have high mortality rate).431team
- Osteoporosis and osteoarthritis (they happen in old people) but they are not the same. Osteoporosis is metabolic bone disease, and osteoarthritis is a degenerative disease. Also the age group is different osteoporosis mostly affect 60-70, while osteoarthritis affect 40-50. And the treatment is different as will.431team

D- Spinal Deformities:

- Scoliosis: Deformity of the spine in the Coronal plane
- Kyphosis: Deformity of the spine in the Sagittal plane.
- Spondylolisthesis: Translation of one vertebra over another.

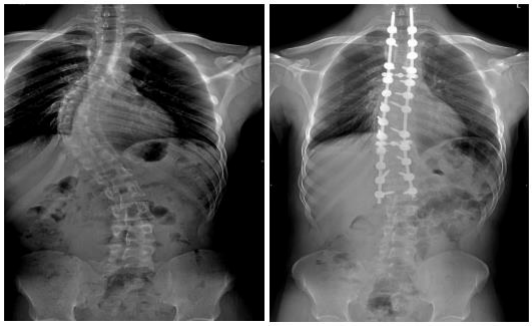
Types of scoliosis:

1. **Congenital:** rare
   Associated with anomalies of the bony vertebral column, e.g hemivertebra.

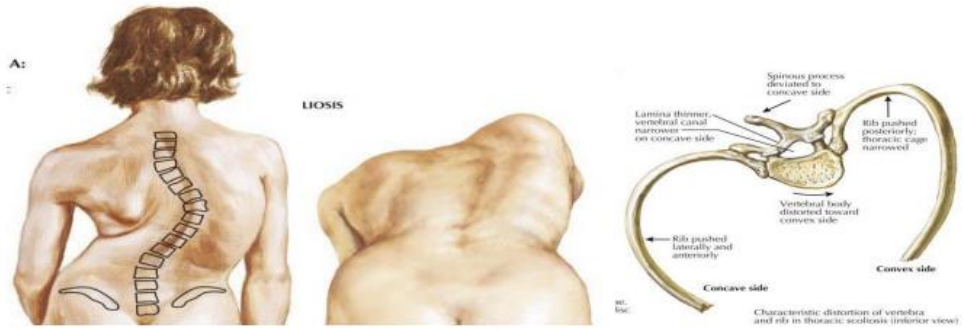
2. **Acquired (=secondary):** uncommon
   Secondary to other pathology, e.g. tumor or infection.

3. **Idiopathic:** the most common
   Most common is adolescent type.

Adolescent idiopathic scoliosis:



- **Female more than male.**
- **Three dimensional deformity of the spine:**
- **Vertebral Rotations the hallmark.**
- **Painless deformity**
- **Examination:**
  - Neurologically normal.
  - **Positive Adams test.**
- **Management:**
  - Depends on age & degree of deformity.



Scoliosis

4- Spondylolisthesis:

Defect in pars interarticularis causing a forward slip of one vertebra on another usually at L5-S1, less commonly at L4-5. Toronto notes 2015

- **Types:**

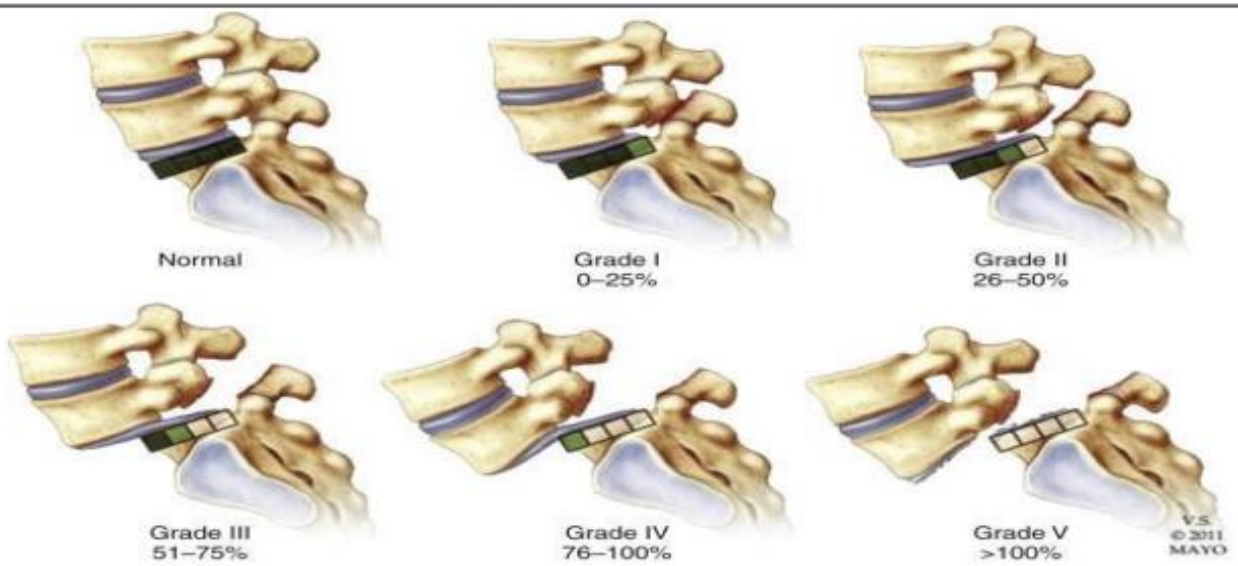
1. "Degenerative" Spondylolisthesis.: Causes spinal stenosis.431team
2. "Isthmic" spondylolisthesis: Caused by inter-articularisdefect (spondylolysis).

- Clinical features: lower back pain radiating to buttocks. Toronto notes 2015

A. **Conservative treatment first.**
B. **Surgery if Grade 3 or more or Failed conservative management.**

Table 18. Classification and Treatment of Spondylolisthesis

Class	Percentage of Slip	Treatment
1	0-25%	Symptomatic operative fusion only for intractable pain
2	25-50	Same as above
3	50-75	Decompression for spondylolisthesis and spinal fusion
4	75-100	Same as above
5	>100	Same as above



5- Destructive Spinal Lesions:

- Present with pain at rest or pain at night.
- Associated with constitutional symptoms.
- Most common causes: –Infection –Tumors
- Vertebral body and pedicle are the commonest sites of pathology. (rich of blood supply)

A. Spinal tumors:

- Primary Spinal tumors:
  - Rare.
  - Benign (e.g. osteoid osteoma) or malignant (e.g. chordoma).
  - Management depends on pathology.

- Spinal metastasis:
  - Very common.
  - Aging over 50 is red flag
  - Biopsy required if primary unknown.

B. Spinal infections:

1. Most common is TB and Brucellosis.
2. History of contact with TB patient, raw milk ingestion.
3. Potentially treatable diseases once diagnosis is established and antimicrobials administered.
4. Disability, Deformity or nerve compression are indications of surgery.

Spinal Tuberculosis (with psoas abscess)

Summary:

Table – Differentiating neurogenic and 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 **or weak**
"Shopping cart" sign	Present	Absent
van Gelderen bicycle test	No leg pain **Flexion relives the pain**	Leg pain

Uphill walking causes the vertebrae to be in flexed position "increase space in spinal canal → relieve neurogenic pain.
Downhill walking causes back extension "less space in spinal canal"→ neurologic claudication.

1. Pain with flexion--> disc degeneration. Pnt doesn't like to bend forward.
2. Pain with extension→ facet syndrome. Pnt doesn't like to be extended.
3. **Cauda equine**: LMN deficit, sciatica pain along the course of a sciatic nerve especially in the back of the thigh caused by compression, inflammation.
4. **Cervical spine:** Degenerative changes typically occur in C3-C7.
   Presents with axial pain, myelopathy, or radiculopathy.
5. Lumbar spine: lumbar spondylosis or back degenerative disease typically occur in L3-S1.
6. **Spinal stenosis:** Narrowing of spinal canal <10 mm.
7. **Disc herniation**: Tear in annulus fibrosus allows protrusion of nucleus pulposus causing either a central, posterolateral, or lateral disc herniation, most commonly at L5-S1 > L4-5 > L3-4.
8. **Osteoporotic Vertebral Fractures:** The commonest type of pathological fractures of spine
9. **Spinal Deformities:**

   - Scoliosis: Deformity of the spine in the Coronal plane
   - Kyphosis: Deformity of the spine in the Sagittal plane.
   - Spondylolisthesis: Translation of one vertebra over another.

1. **Destructive Spinal Lesions:**

   - Present with pain at rest or pain at night.
   - Associated with constitutional symptoms.
   - Most common causes: –Infection –Tumors

Done By:

Turki Alotaibi

Ziyad Alajlan

Revised By:

Mojahed Otayf