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Introduction to Orthopedics

Objectives:

- To explain what Orthopedic is and what conditions will be discussed during this course.
- Explain what we mean by Red Flags.
- List the different causes of orthopedic disease.
- Describe some of clinical examination tests.
- Introduce titles of Clinical Skills which will be taught during this course.

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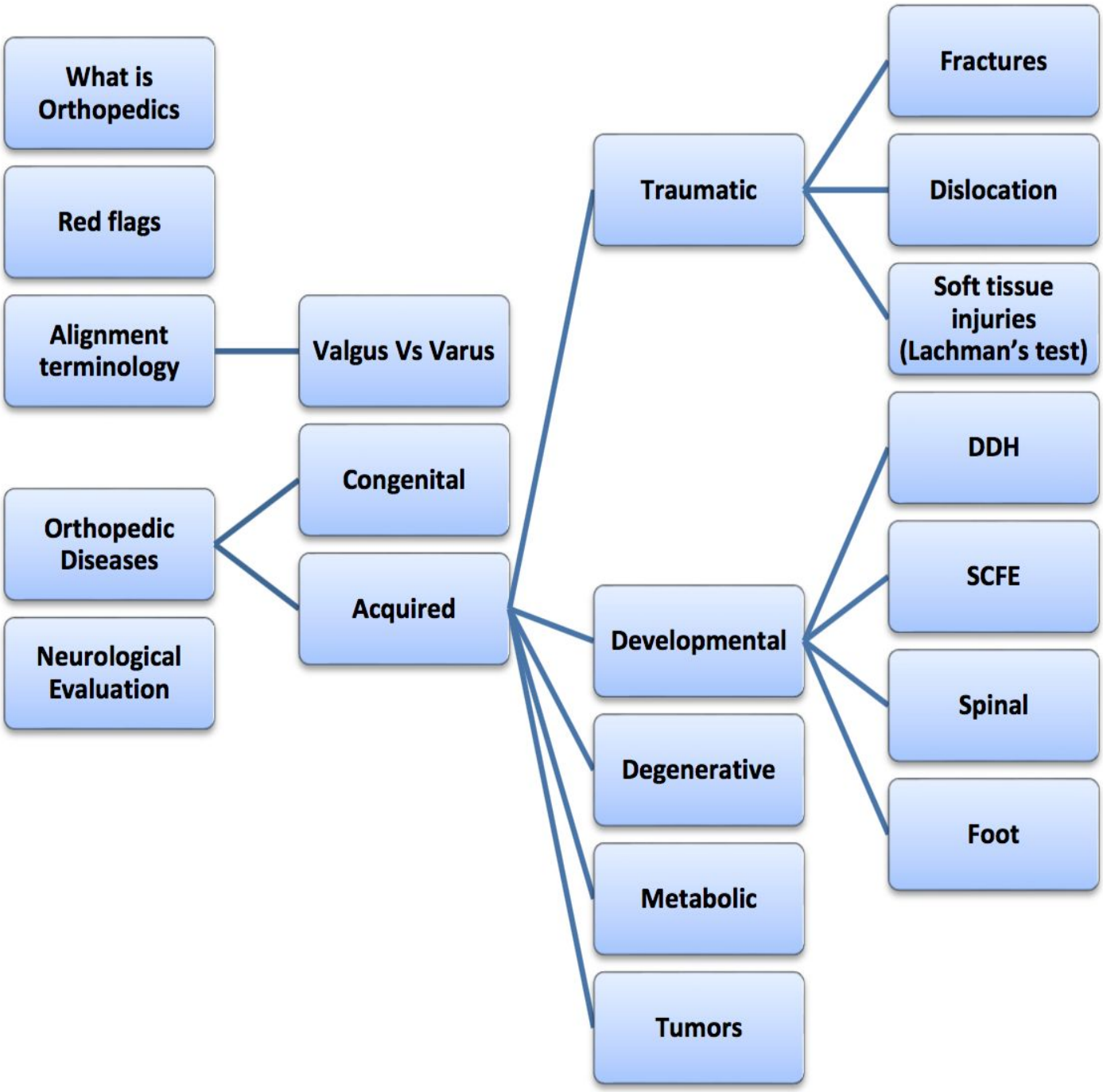
Sources: Slides+Notes+433Team.

Mind map


What is Orthopedics
Red flags
Alignment terminology
Valgus Vs Varus
Orthopedic Diseases
Congenital
Acquired
Neurological Evaluation
Traumatic
Fractures
Dislocation
Soft tissue injuries (Lachman's test)
Developmental
DDH
SCFE
Spinal
Foot
Degenerative
Metabolic
Tumors

Orthopedics

- ORTHO = Straight, Upright, Correct. Paios = Child.
- First used by Nicolas Andry; a French doctor (1841) in a book titled “Orthopedia: the art to correct and prevent deformities in children”.
- Orthopedic specialty is the branch of medicine which manage trauma and disease of musculoskeletal system. It is also known as: Trauma and Orthopedic Surgery.
- It includes: bones, muscles, tendons, ligaments, joints, peripheral nerves, vertebral column and spinal cord and its nerves.

❖ **Sub-Specialties:**

- Pediatric Orthopedic
  It differs from adult orthopedic that bones in pediatrics have growth plate, and injury to that may cause deformity.
- Sport and Reconstructive Orthopedic
  Each sport has a specific type of injury that occurs the most. For example: knee injury is the most common in football, ankle injury is the most common in ballet dance and elbow injury is the most common in tennis.
- Orthopedic Trauma
  The most common in Saudi Arabia due to car accident.
- Arthroplasty
  For example: knee joint replacement.
- Spinal Surgery
  This is overlapping between specialties, it could be under rheumatology, neurology or orthopedics. So, when someone presents with back pain, he/she should go to family medicine first.
- Foot and Ankle surgery
- Orthopedic Oncology

Red flags

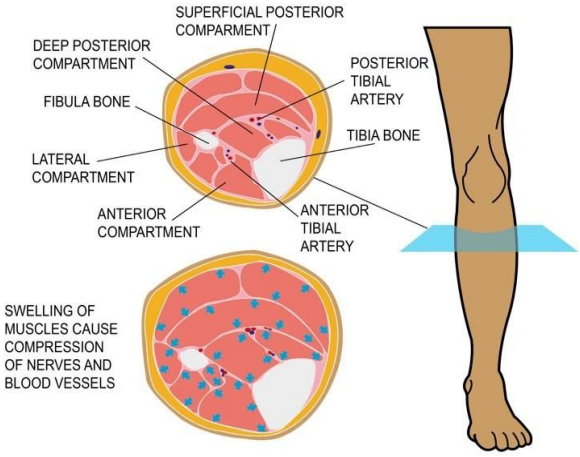
- Red Flag = Warning Symptom or Sign.
- Red flags should always be looked for and remembered.
- Presence of a red flag means the necessity for urgent or different action/intervention.

Examples :

- **Open fracture**: more serious and very high possibility of infection and complications.
  Close fracture: when the overlying skin is intact.
  Open fracture: the bone doesn't have to be exposed to call it "open fracture", even a small puncture in overlying skin is enough to call it so.

- **Complicated Fractures**: fracture with injury to major blood vessel, nerve or nearby structure. E.g. leg fracture with foot drop

- **Compartment Syndrome**: increase in intra-compartment pressure which endangers the blood circulation of the limb and may affect nerve supply.



- **Acute joint Dislocations**: requires urgent reduction or may cause serious complications due to Neurovascular Compromise.

- **Multiple Trauma or Pelvic Injury**: more than one fracture or injury sustained at the same time; consider massive blood loss (1.5L-2L) and associated injuries. It may result in hypovolemic shock.

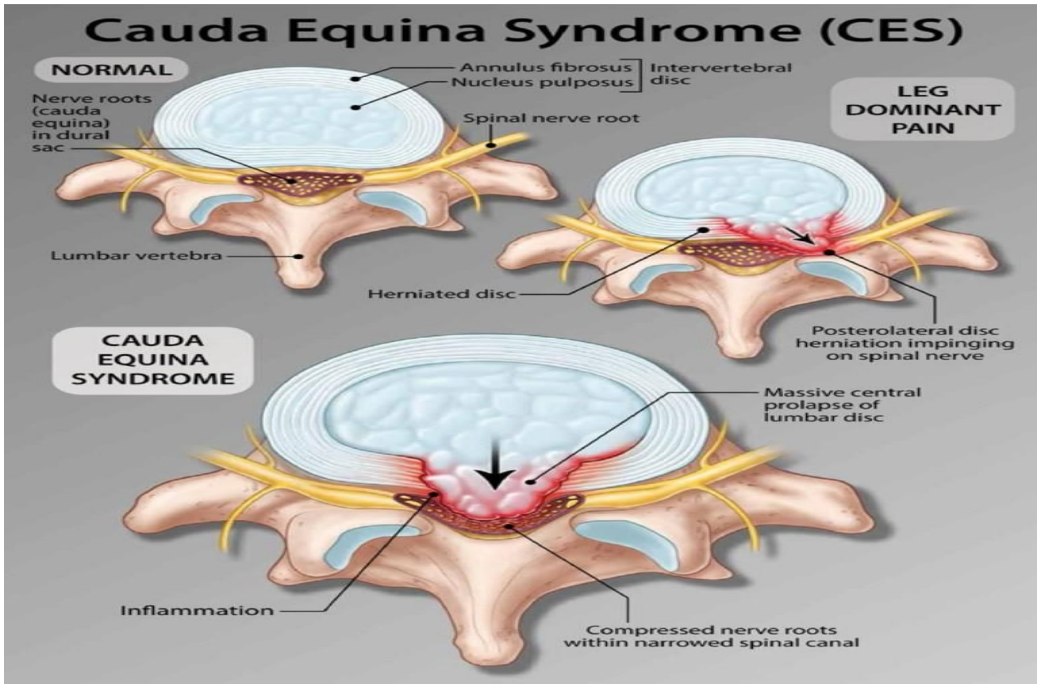
- **Infection of Bone, Joint and Soft Tissue**:
  o *Osteomyelitis:* Infection of the bone.
  o *Septic Arthritis:* Infection of the joint.
  o *Cellulitis:* spreading Infection of the soft tissue, may cause septicemia or irreversible damage

- **Cauda Equina Syndrome**: compression of the nerve roots of the Cauda Equina at the spinal canal (below level of L1) which affect motor and nerve supply to lower limbs and bladder (also saddle or peri-anal area).

  - Symptoms include:

    - Weakness, tingling or numbness in the lower extremity.
    - Altered sensation of the saddle region.
    - Bladder retention (overflow Incontinence)/bowel incontinence.

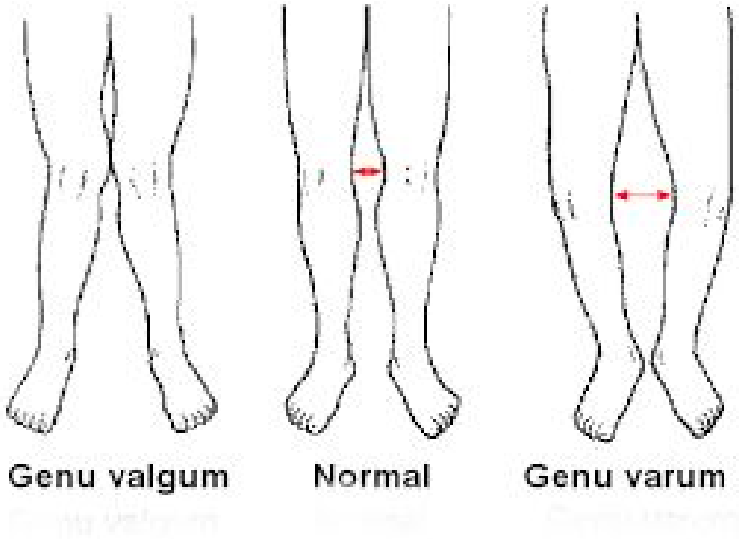
*Why is CES serious? Because the later the decompression the lesser chance of recovery.



Alignment terminology

- Why should we treat alignment problems? Because the effect of weight on the knees may cause premature Osteoarthritis.

Genu Valgum	Genu Varus
When the limb is directed laterally and the knee joint directed(Apex pointed) medially.	When the limb is directed medially and the knee joint directed(Apex pointed) laterally.
	

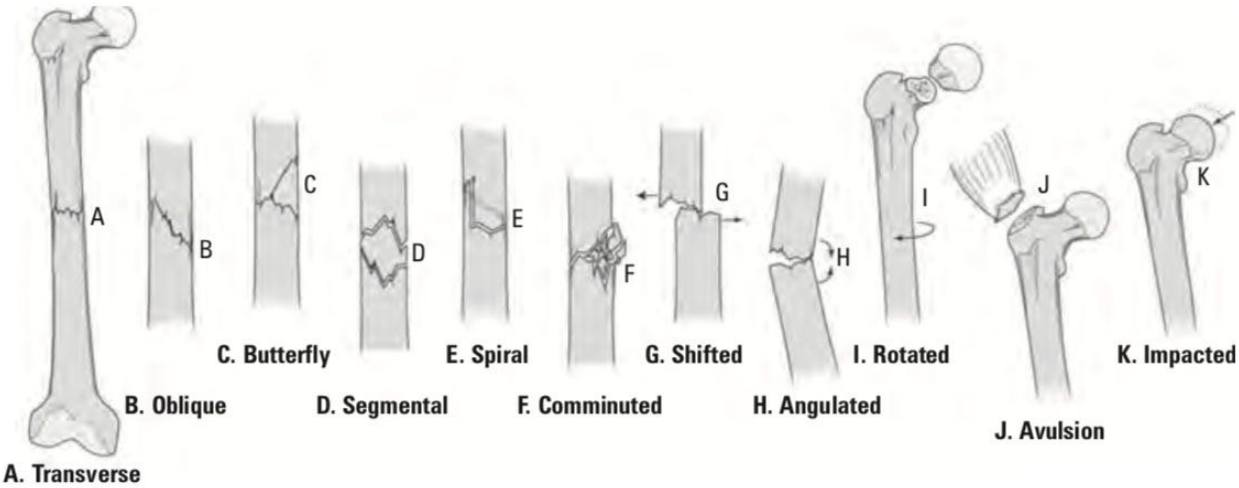


Orthopedic diseases

Congenital	Acquired
➔ Talipes equinoVarus: present since birth, though may not be evident until sometime later. 	➔ Develop or begin after birth: ● Trauma ● Developmental ● Inflammation ● Infection ● Neuromuscular ● Degenerative ● Metabolic ● Tumor

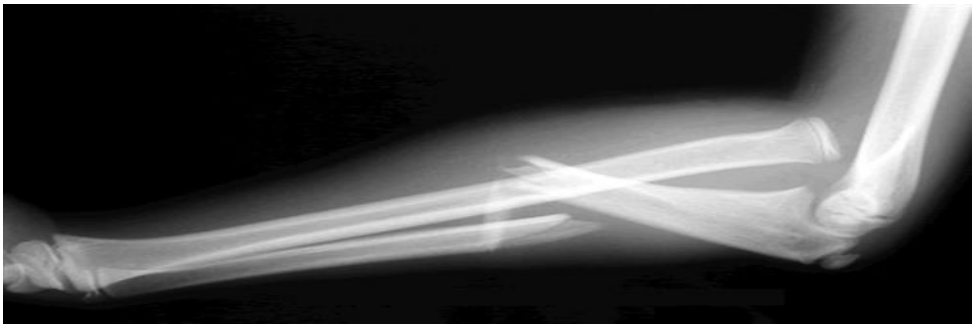
Traumatic

➢ **Fractures:** Break in the continuity of bone



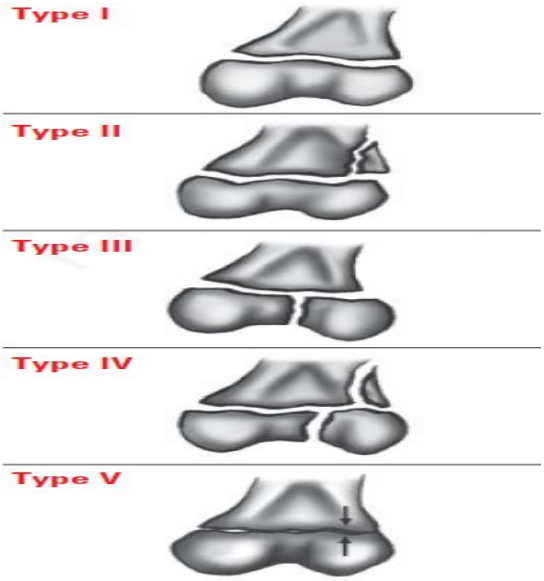
➢ **Dislocation: Complete separation of the articular surface and it is described by distal in relation to proximal fragment (anterior, posterior, superior, inferior).**

➢ **Fracture dislocation:** dislocation with fracture of the bone. **Always x-ray joint above & below.**



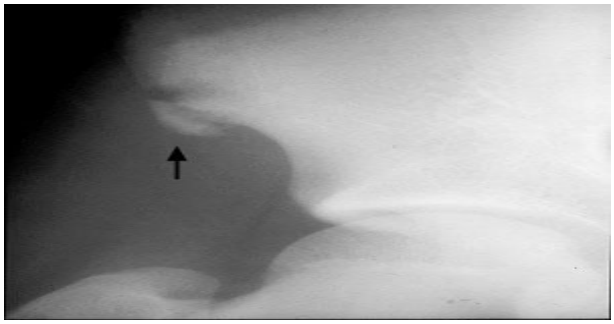
➢ **Intra-articular fracture:** If displaced; should always be treated by ORIF=Open Reduction and Internal Fixation. Failure to reduce and fix such fracture results in loss of function, deformity and early degenerative changes.

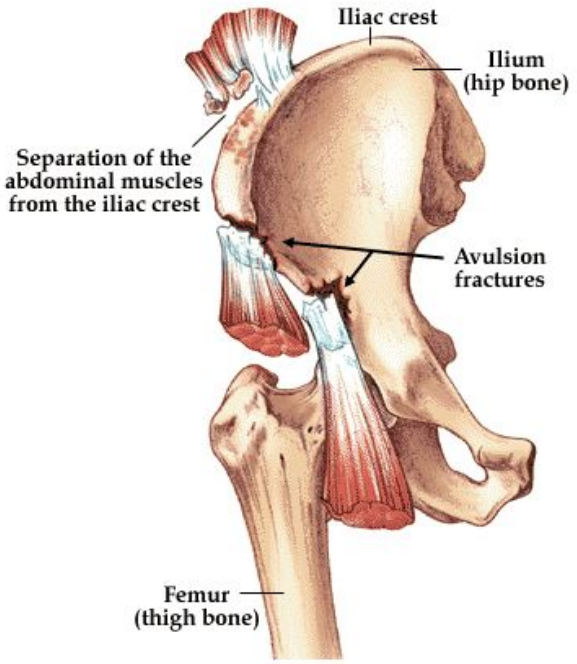
➢ **Epiphyseal injury:**



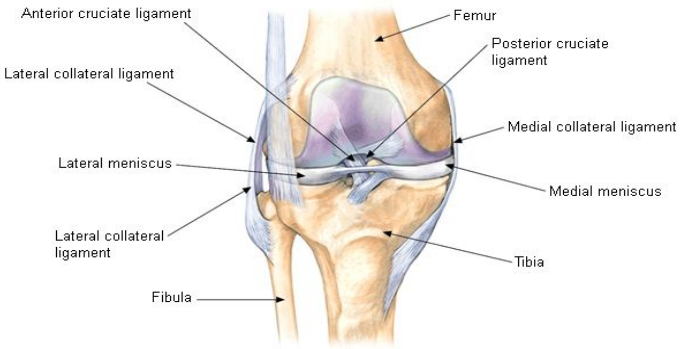
➢ **Avulsion fracture:** force due to resisted muscle action. Mostly occur at locations of tendinous/muscular attachment to bone and it's mostly transverse. Examples:

- fracture of anterior superior iliac spine due to resisted action of sartorius muscle.
- fracture of anterior inferior iliac spine due to resisted action of rectus femoris muscle.





➢ Soft tissue injury



(anterior cruciate ligament rupture)

What test is used to diagnose ACL injury?

Lachman's test.(most sensitive) CLICK HERE

Medial Collateral Ligament (MCL):

Extra articular. We do stress test to the knee to determine if there is an injury to the collateral ligament or not. It appears normal in x-ray.

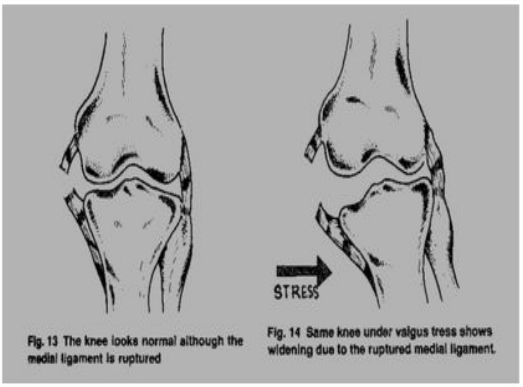
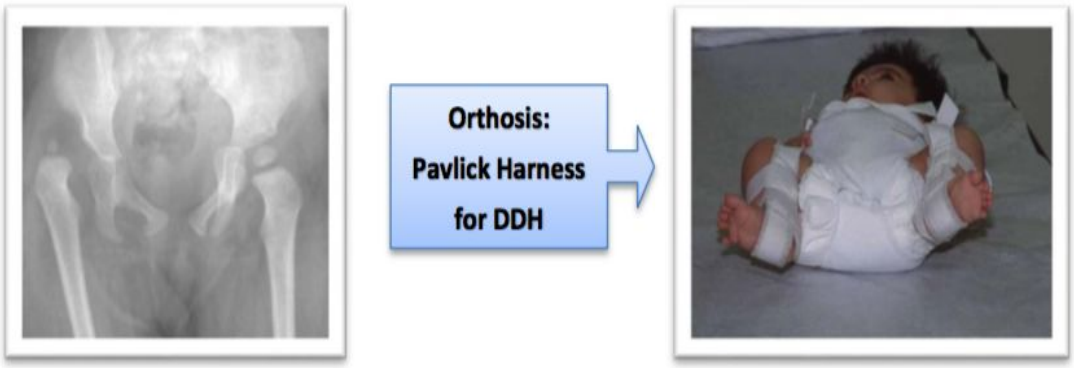


Fig. 13 The knee looks normal although the medial ligament is ruptured

Fig. 14 Same knee under valgus tress shows widening due to the ruptured medial ligament.

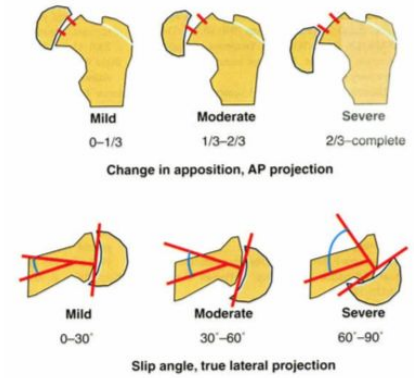
Developmental

- **Developmental Dysplasia of Hip (DDH):** The hip joint has not formed normally. The ball is loose in the socket and may be easy to dislocate. The mother complains of difficulty in changing the baby's diaper. At the beginning we do US because the newborn bone's doesn't calcify till (4-6 Months). When the baby become few months old, we do x-ray.

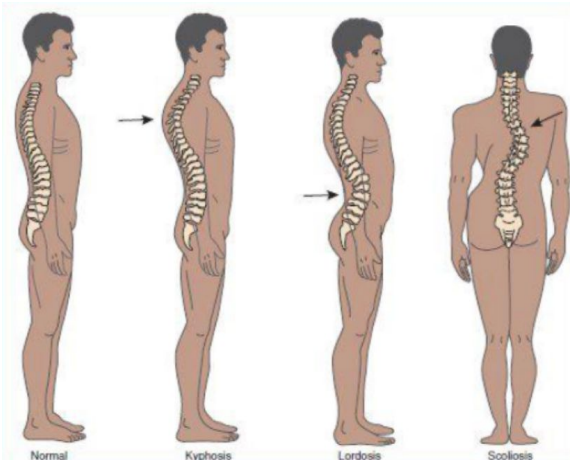


VERY IMPORTANT VIDEO (only 1 minute) >> how to recognize a dislocated hip on x-ray

- **Slipped Capital Femoral Epiphysis (SCFE):** For reasons that are not well understood, the ball at the upper end of the femur (thigh bone) slips off in a backward direction. This is due to weakness of the growth plate. Most often, it develops during periods of accelerated growth, shortly after the onset of puberty.
  - The slip occurs through the hypertrophic zone of the cartilaginous growth plate.
  - the femoral shaft rolls into external rotation and the femoral neck is displaced forwards while the epiphysis remains seated in the acetabulum.(Appley's)



- **Spinal Deformities:**
  - Hyperlordosis is an excessive inward curvature of the lumbar (lower) spine. It's very common among females in our society.
  - Kyphosis is an exaggerated curvature of the upper (thoracic) spine that creates a hunchback appearance.
  - Scoliosis it is the lateral deviation of the spine from the midline.
    o Most of the time it's painless
    o Developmental (but it could be congenital).



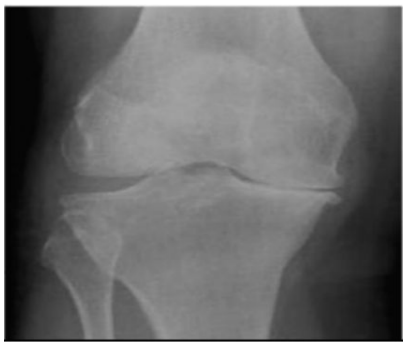
o Mostly affect female more than male.

➢ **Hallux valgus:**

- When there's medial deviation of first metatarsal bone and lateral deviation of the big toe.
- Usually affect women who wears high-heeled shoes or people who wear shoes with pointed/narrowed front.
- Management include: If early in the course of disease > conservatively e.g. changing shoes. But if late > needs surgical correction.

Degenerative

- Occur at any joint.
- Can be primary or secondary.
- Increased wear and tear.
- Can lead to pain, deformity, loss of function.
- Increase with advancing age.
- Management depends on type and age

Degenerative Joint	Knee	Hip
Changes	- Osteophytes formation. - Sclerosis. - decrease medial joint space.	- Osteophyte. - Sclerosis. - Decrease in joint space because cartilage becomes thinner. - Cystic formation.
		

Metabolic

- **Rickets** (Bow Legs):

  - Unique to children
  - It's due to vitamin D, calcium deficiency or insufficient exposure to the Sunlight (nutritional & sun exposure).
  - Sometimes the cause is the kidney disease & it's called renal rickets.

- **Osteoporosis:**
  - **Fracture of the Neck of the Femur (NOF)**: The most dangerous complication especially in old people.
  - **Colles fracture:** a complete fracture of the radius bone of the forearm close to the wrist resulting in an upward (posterior) displacement of the radius and obvious deformity.
  - **Spinal Osteoporosis:**
    - Mainly affect female more than male due to the decrease of the level of estrogen after the menopause.
    - It's painless & can cause the fractures.
  - **Osteoporotic fractures** are painful & can affect the patient's life & he may die from it (especially hip fracture).

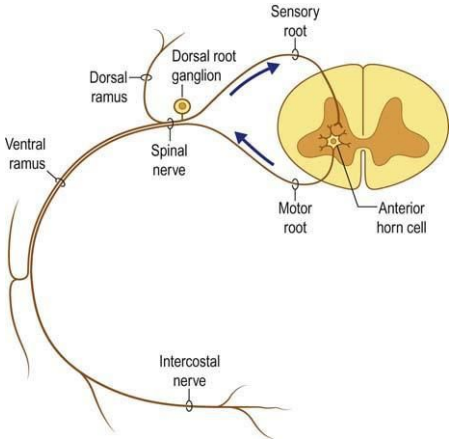
Bone Tumors

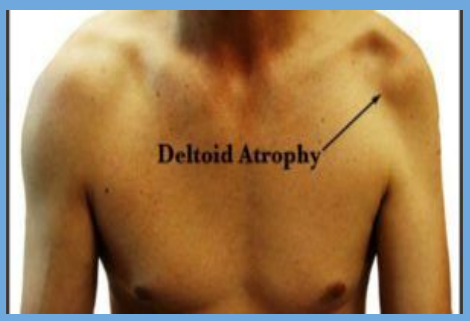
Tumors & Tumor-like Lesions			
Malignant			Benign
Primary	Secondary (Malignant transformation or benign process)	Metastatic	

- In X-ray there are:
  - Bone destruction
  - Pathological fracture
  - Ill-defined lesion
  - Most likely it's malignant tumor

Neuromuscular disorders

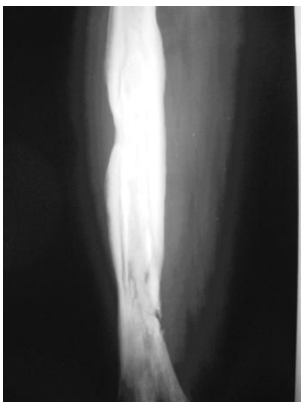
- An example for this: Polio
- Polio is a pure motor disorder: presents as flaccid limbs but sensation is intact, why? Because it affects the anterior horn cells. Anterior horn cells give motor fibres as it's shown on the image below.



Nerve injury	Spinal cord injury:
• There is a difference between the R and the L shoulder. The contour of the R shoulder is normal while the L one is slipped due to nerve injury that caused **muscle atrophy.** 	• Often results from fracture dislocation of spine • When injury is at cervical spine it may result in Tetraplegia • Injury at dorsal spine may result in Paraplegia

- **Chronic osteomyelitis**

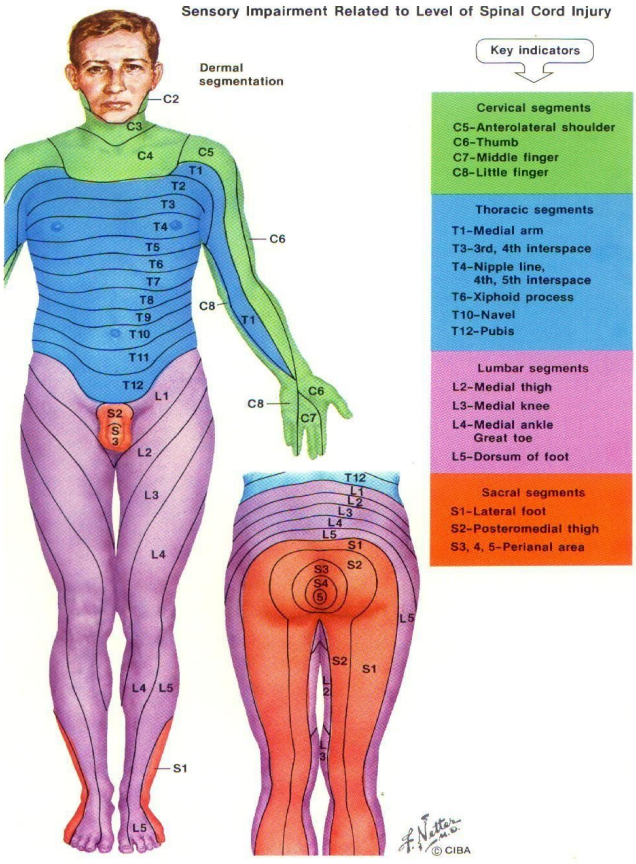
Discharging osteomyelitis



sequestrum (dead bone)

Neurological Evaluation

Nerve Root Level	Motor Testing
C1-C2	Neck flexion
C3	Lateral flexion
C4	Shoulder shrug
C5	Shoulder abduction
C6	Elbow flexion and wrist extension
C7	Elbow extension and wrist flexion
C8	Finger flexion and thumb extension
T1	Finger abduction



Physiotherapy for Orthopedic Patients

- Physiotherapy is an important part of recovery
- It is used for: pain relief, prevention of stiffness, muscle strengthening, mobilization of stiff joint or spine, training non-weight bearing or partial weight bearing
- Physiotherapy modalities include: heat, cold, exercise, ultrasound, traction, electrical stimulation