



# Introduction to Orthopedics

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## 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.

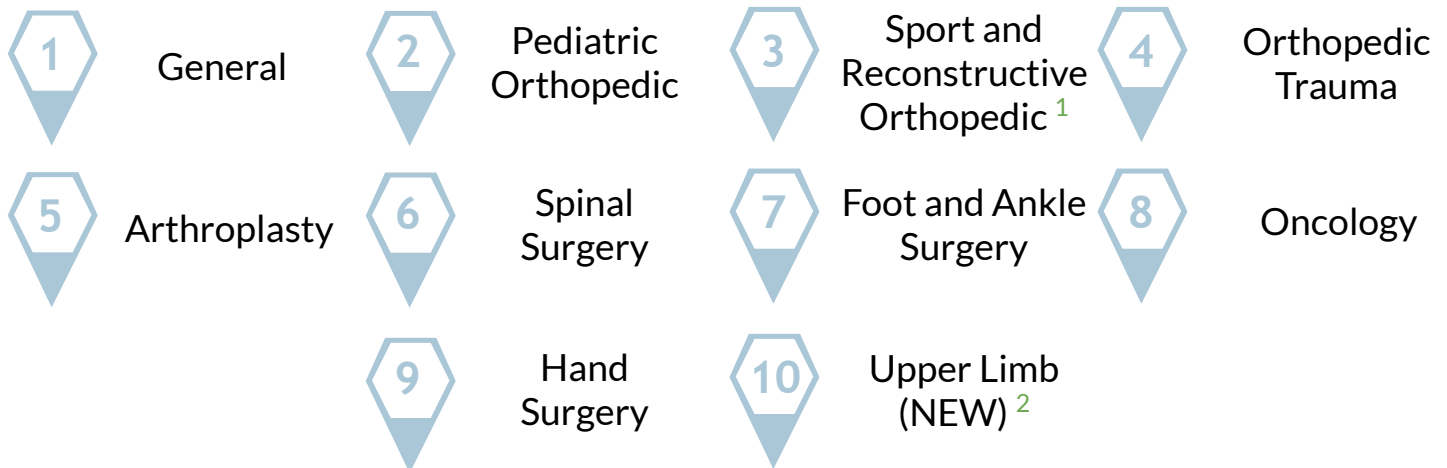
## Color Index:

Original text | **Doctor's notes** | Text book  
**Important** | **Golden notes** | Extra

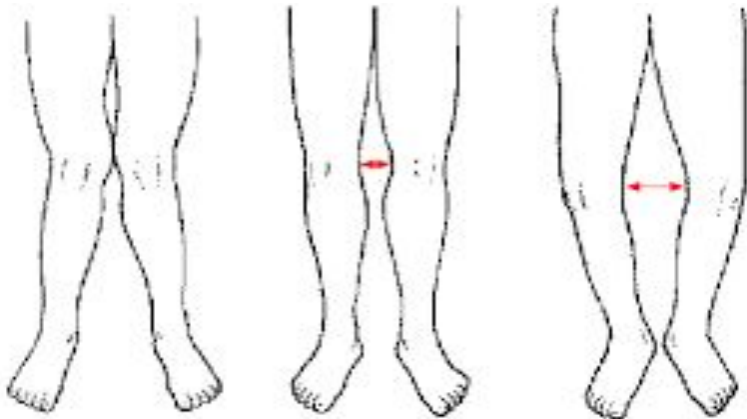
# Orthopedic Surgery

- Orthopedic surgery is a branch of medicine concerned with conditions involving the musculoskeletal system.
- This field **is not limited to bone surgeries**. It is concerned with: bones, muscles, tendons, ligaments, joints, peripheral nerves, vertebral column, and the spinal cord.

## ❖ Subspecialties:



## Alignment Terminology<sup>3</sup>



**Genu valgum**

Knees are stuck to each other

Val GUM, imagine a gum sticking the two knees together

**Normal**

Legs are straight

**Genu varum**

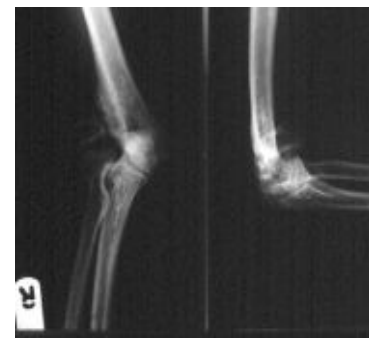
Knees are pushed away from each other (bow-legged)

Val RUM, imagine a bottle of rum pushing the two knees away



**Cubitus Varus**

Distal piece of humerus is going towards the ulna, medially (you can kind of see the olecranon)



**Cubitus Valgus**

Distal piece of humerus is going away from the ulna (away from olecranon)

1. One common procedure done in this subspecialty is ACL (Anterior Cruciate Ligament) repair.
2. This subspecialty is concerned mainly with the elbow and shoulder.
3. Checking the alignments of the limbs at different joints is very crucial in examining and diagnosing patients. Certain alignments can hint for certain diseases.

# Orthopedic Red Flags

All of these topics will be explained in details in different lectures

- Red flags are warning symptoms or signs and should be always looked for and remembered when practicing this field.
- Presence of a red flag **necessitates urgent interventions or action.**

## 1 Open Fractures <sup>1</sup>

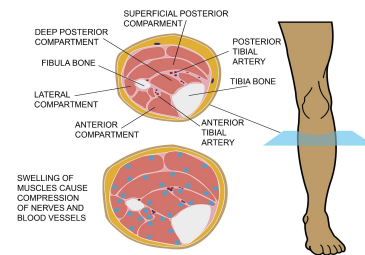
- Fractures that communicate with the external environment.
- More serious and very **high possibility of infection** and complications.

## 2 Complicated Fractures

- Fractures with injury to major vessels, nerves or nearby structures.
- Fractures that results in foot drop, DVT, bleeding...etc.

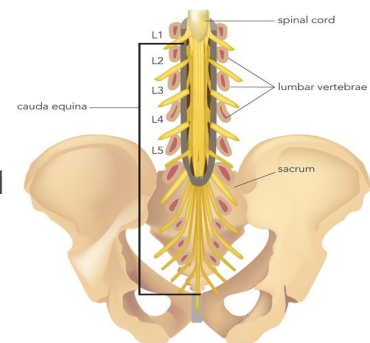
## 3 Compartment Syndrome

- Increase in intra-compartment pressure which endangers (compromise) the blood circulation of the limb and may affect nerve supply.



## 4 Cauda Equina Syndrome

- Compression of the cauda equina at the spinal canal affecting motor and nerve supply to lower limbs and bladder resulting in incontinence and saddle (perianal) sensory loss.



## 5 Infection of Bone, Joint and Soft Tissue

- Osteomyelitis: infection of the bone.
- Septic arthritis: infection of the joint.
- Cellulitis: spreading Infection of the soft tissue

Can cause septicemia and irreversible damage

## 6 Multiple Trauma or Pelvic Injury

- More than one fracture or injury sustained at the same time.
- We need to consider massive blood loss and associated injuries

## 7 Acute Joint Dislocation <sup>2</sup>

- Requires urgent reduction or may cause serious complications. <sup>3,4</sup>

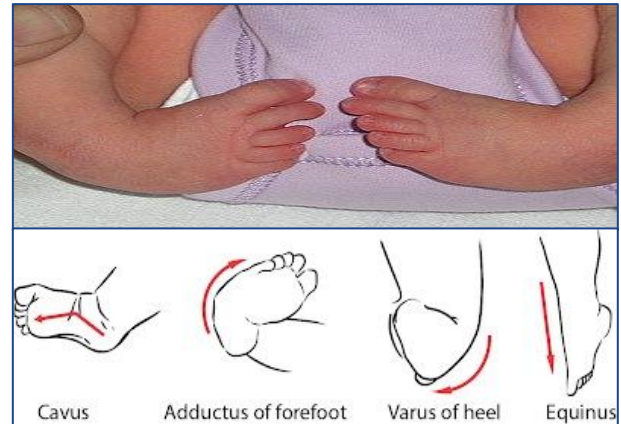
1. Open fractures are usually caused by high energy trauma. Such injuries necessitates full examination (you might miss)  
 2. Dislocation is complete disruption of the joint, while subluxation is a partial dislocation.  
 3. Must be treated as soon as possible (within 24 hrs) because the blood supply is compromised.  
 4. Both acute and chronic dislocations are serious (acute → neurovascular damage; chronic → joint arthritis)

# Orthopedic Conditions

- We can divide deformities in Orthopedics into: congenital and acquired deformities.

## ❖ Congenital Deformities:

- One very common congenital deformity is **Talipes Equinovarus** (TEV) also known as clubfoot.<sup>1</sup>
- Clubfoot presents with the following:
  - Midfoot cavus (exaggerated medial longitudinal arch)
  - Forefoot adductus (adduction)
  - Hindfoot varus (rotated medially)
  - Hindfoot equinus (fixed at plantar flexion)



## ❖ Acquired Conditions:

- Trauma (most common)**
  - It includes: fractures, dislocations, soft tissues injuries (ligaments and tendons), nerve injuries and epiphyseal injuries (in kids).
- Developmental**
  - It includes: developmental dislocation of the hip (DDH), developmental foot deformities, femoral epiphysis, and spinal deformities
- Inflammation**
  - It includes: rheumatological disease (such as: rheumatoid arthritis)
- Infection**
  - It includes: osteomyelitis, septic arthritis and cellulitis
- Neuromuscular**
  - It includes: poliomyelitis, duchenne muscular dystrophy (DMD) and cerebral palsy
- Degenerative**
  - It includes: primary and secondary osteoarthritis
- Metabolic (Endocrine)**
  - It includes: rickets/osteomalacia and osteoporosis
- Tumor**
  - It includes: osteosarcoma, myosarcoma and chondrosarcoma

1- Very common here in the kingdom. It's pathophysiology is hypothesized to be linked to a dominant posterior musculature, especially tibialis posterior, along with weak peroneus muscles and shortened achilles tendon.

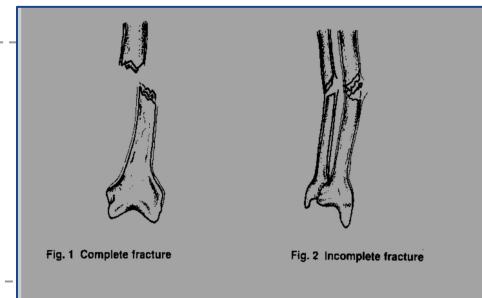


# Acquired Deformities:

## 1- Traumatic Injuries:

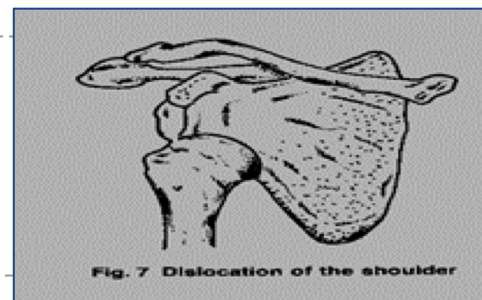
### Fractures

- Fractures are a break in the continuity of the bone.
- They can be classified: complete and incomplete.
  - **Complete:** complete separation
  - **Incomplete:** incomplete separation



### Dislocations

- Dislocations are complete separation of the articular surface.
- Distal to proximal fragment: Anterior, Posterior, Inferior, Superior.



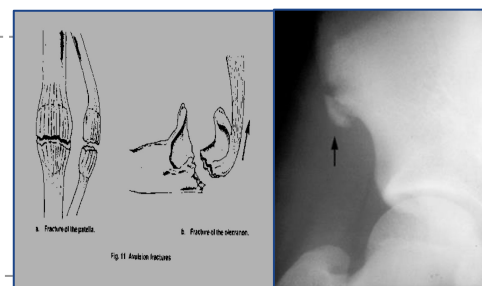
### Fracture Dislocations

- Whenever you have dislocation always think of fractures
- **Always ask for an xray of the joint above and below.**
- **Always ask for 2 views**



### Avulsion Fractures

- Fractures that results due to resisted muscle action.
- **Examples:** fracture of anterior superior iliac spine due to resisted action of sartorius muscle.
- It is when a tendon/ligament pulls a piece of the bone away



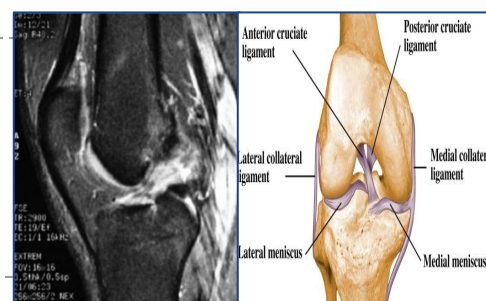
### Intra-articular Fractures

- If displaced; should always be treated by open reduction and internal fixation (ORIF).
- Failure to reduce and fix such fracture results in loss of function, deformity and early degenerative changes.



### Soft Tissue Injury

- Most common site of soft tissue injury is the **knee joint**.
- Most common knee joint injury is Anterior Cruciate Ligament (ACL) → “Common in sport injuries”



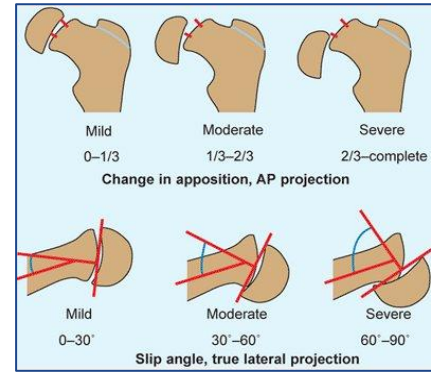
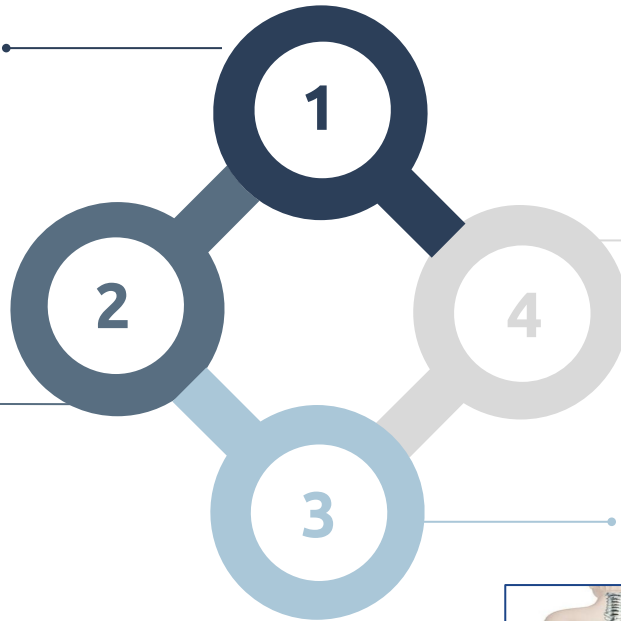
# Acquired Deformities:

## 2- Developmental Deformities:

### Developmental Dysplasia of the Hip (DDH)



### Developmental Foot Deformity (Hallux Valgus)<sup>1</sup>



### Slipped Capital Femoral Epiphysis (SCFE)

### Spinal Deformities

Can be either congenital or acquired, and they include:

- Hyperlordosis
- Kyphosis
- Scoliosis



## 3- Degenerative Deformities:

- Can occur at any joint.
- Can be classified into either primary or secondary (more common)
- Patient might complain of pain and functional limitations.

### Osteoarthritis of the hip



### X Ray Signs in OA

- Osteophytes
- Sclerosis
- Decreased joint space
- Subchondral cysts

### Osteoarthritis of the knee

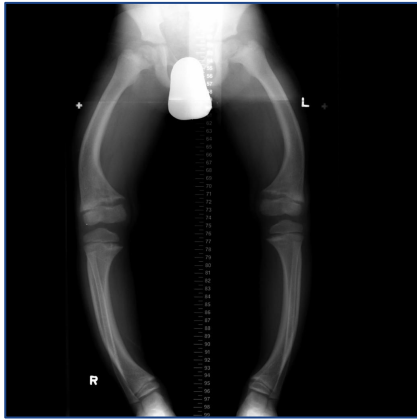


<sup>1</sup> Remember to always mention it in the physical examination part of your OSCE.

# Acquired Deformities:

## 3- Metabolic Deformities

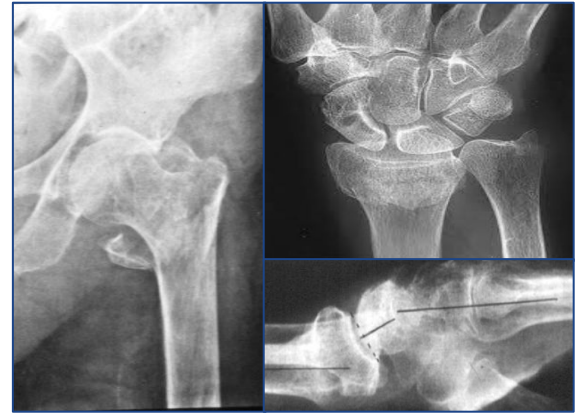
### Rickets



Bowed Legs

1

### Osteoporosis



Pathological fracture

Colles fracture

2

## 4- Bone Tumors

- Usually it can be obvious by simple imaging.
- Advanced imaging is sometimes required to differentiate between benign and malignant lesions



## 5- Infections

- Infections can produce a clear clinical picture such as the image below showing a discharging sinus caused by chronic osteomyelitis; however, sometimes you have to use other diagnostic techniques such as xrays to diagnose them.
- The other image for example is showing a sequestrum, which is a necrotic bone fragment that has become detached from the original bone



Chronic Osteomyelitis  
↓  
Discharging sinus



Sequestrum

# Acquired Deformities:

## 7- Neuromuscular Deformities

### Poliomyelitis:

- Poliomyelitis is caused by an RNA virus that attacks lower motor neurons.
- The main clinical manifestations of poliomyelitis are weakness, decreased muscle tone, and hyporeflexia.
- Poliomyelitis has been eradicated in most of the world thanks to vaccination initiatives.



### Spinal Cord Injuries:

- 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.

### Peripheral Nerve Injuries:

- The image on the right shows an axillary nerve injury which lead to the wasting of the deltoid muscle



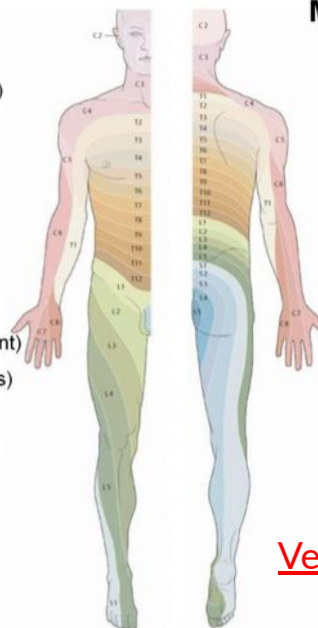
### Neurological Evaluation

We need to differentiate between two nervous systems:

- Central nerve examination: examine the myotomes and dermatomes  
[in spinal conditions]
- Peripheral nerve examination: examine the ulnar, radial, median and so on  
[in fractures conditions]

#### Dermatomes

- C4 (collar)
- C5 (lateral shoulder)
- C6 (thumb)
- C7 (no Heaven)
- C8 (pinky)
- T4 (teet-pore)
- T7 (xiphoid)
- T10 (belly-butTen)
- L1 (Inguinal Ligament)
- L4 (medial malleolus)
- L5 (top of foot)
- S1 (Heel)



#### Myotomes

- C5 – Shoulder abduction (deltoid)
- C6 – Elbow flexion (biceps;brachiorad)
- C7 – Elbow extension (triceps)
- C8 – Wrist flexion (FDS)
- T1 – Finger abduction (DABs)
- L2 – Hip flexion (iliopsoas)
- L4 – Knee extension (quad fem)
- L5 – Dorsiflexion (tibialis anterior)
- S1 – Plantar flexion (gastrocnemius)

Very important to know



# Physiotherapy:

- Physiotherapy is an important part of orthopedic and trauma management.
- Physiotherapy modalities include: heat, cold, exercise, ultrasound, traction, electrical stimulation.
- Surgery is not always the answer, sometimes you can treat the patient with physiotherapy and good rehab.

## Uses and Benefits of Physiotherapy

It is used for pain relief

It is used to strengthen muscles

It is used prevent joint stiffness and to initiate mobilization

It is used to train non-weight bearing or partial weight bearing

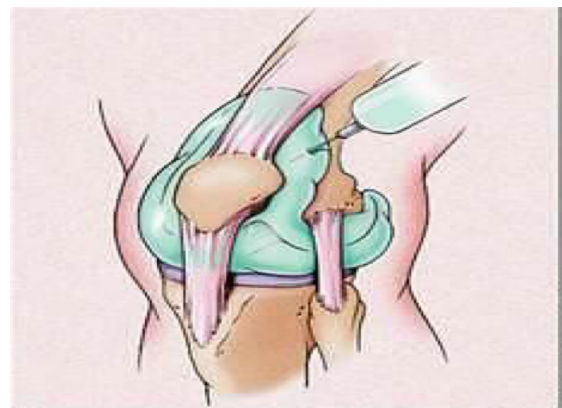
# Clinical Skills:

## Cast Application



- Not everything in orthopedics requires surgery
- Sometimes we can treat the patient with reduction of the fracture and stabilization, especially in the pediatric population.

## Knee Aspiration



- It's an important skill to confirm one of the red flags which is septic arthritis
- Also it is important in administering some medications such as steroids to relief pain.

# THANK YOU

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