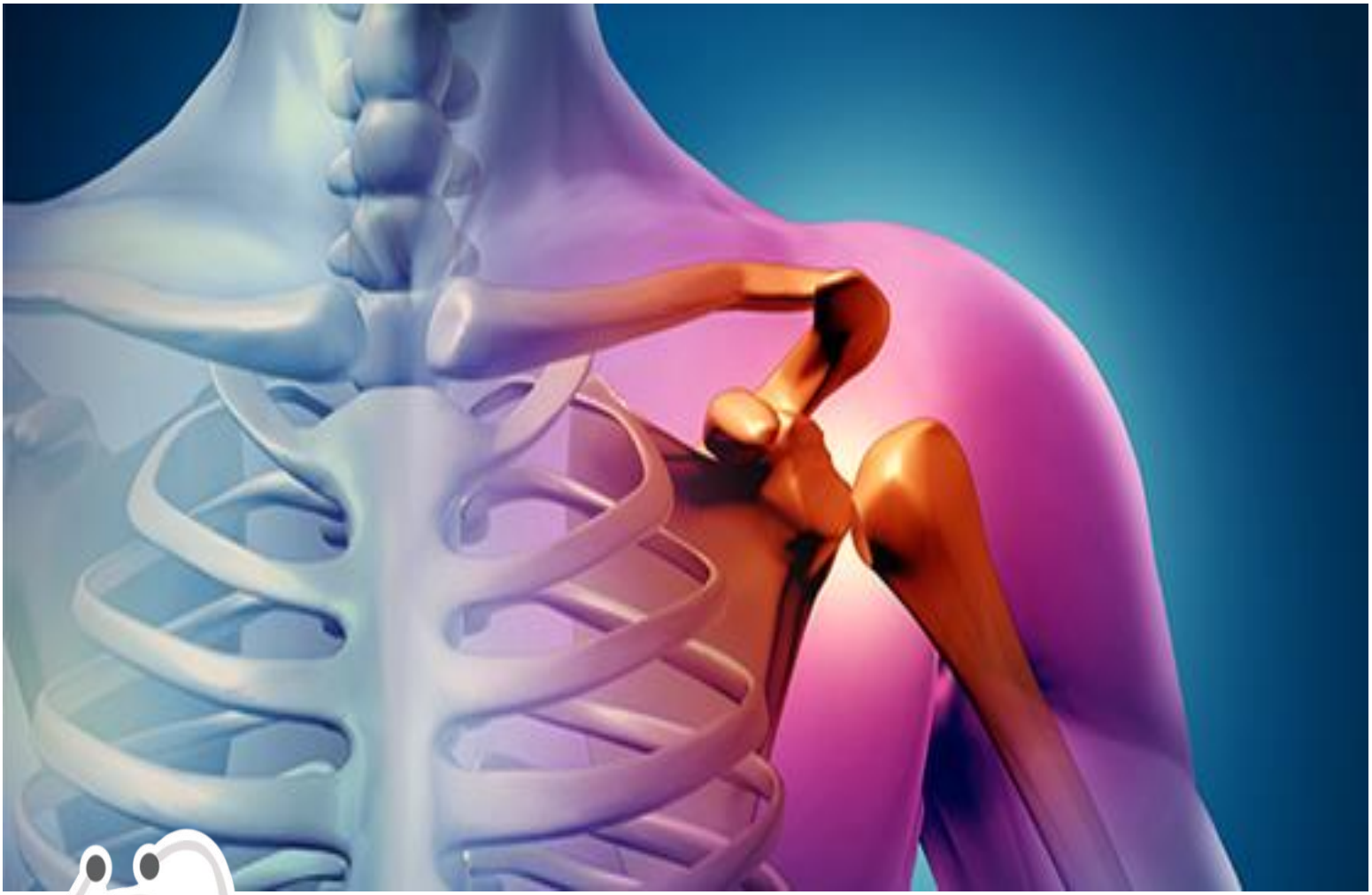
Orthopedics

432 Team

12 Common Adult's Fractures



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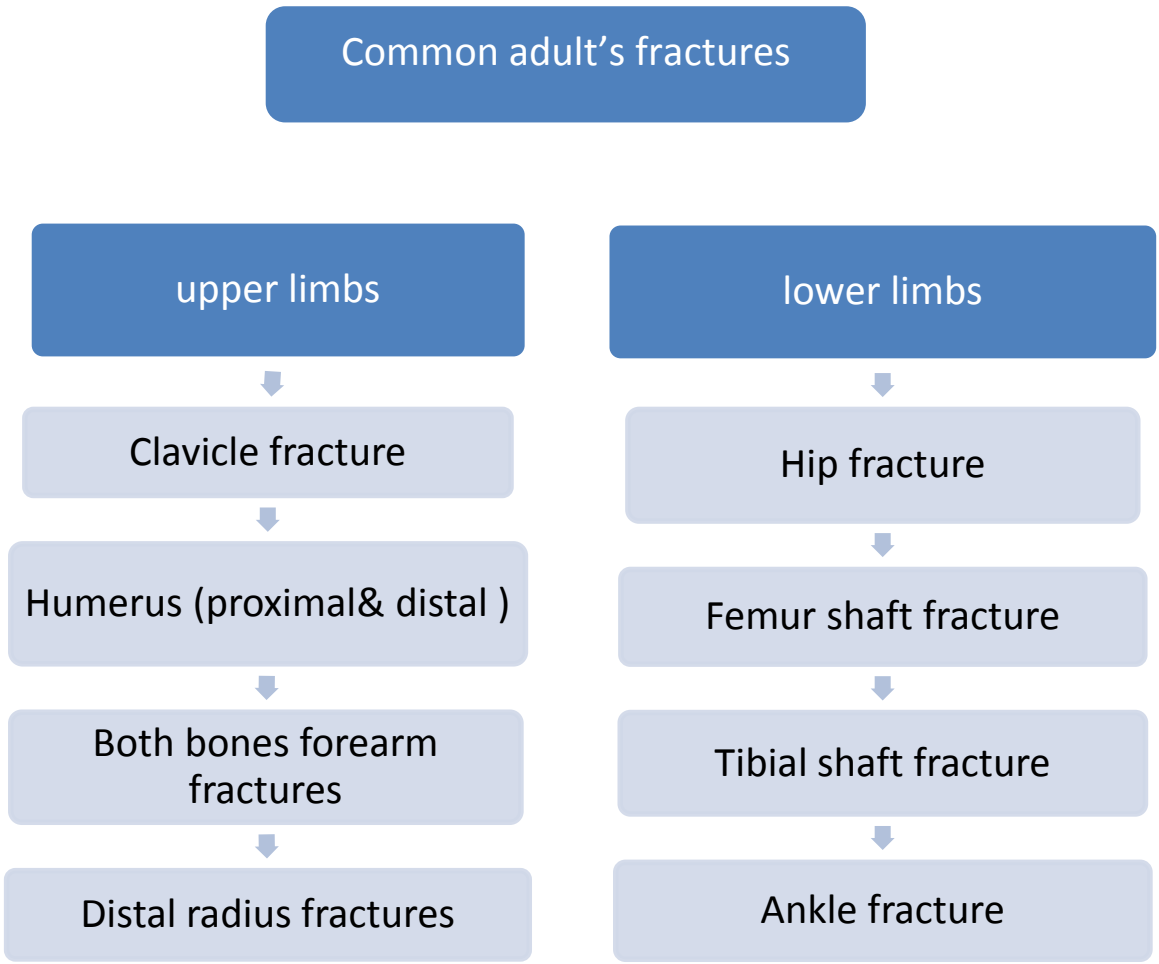
Color Code:

Slides	Doctor's Notes	Team Notes	Important
431 team work	Arabic Words	Books' notes	Other Sources

Objectives

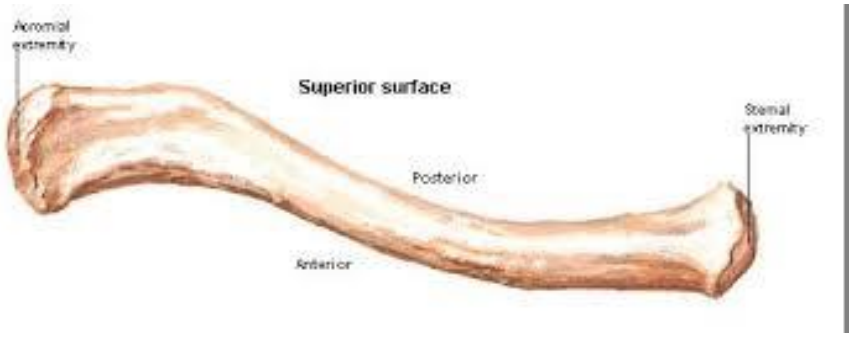
- Clavical fracture.
- Humerus (Proximal & Shaft).
- Both bone forearm fractures.
- Distal radius fracture.
- Hip fracture.
- Femur shaft fracture.
- Tibial shaft fracture.
- Ankle fracture.

Mind Map

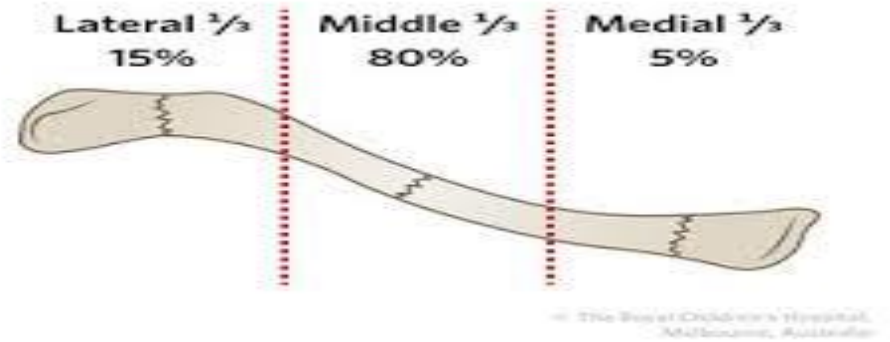


1. CLAVICLE FRACTURE: (can affect all age groups)

- Clavicle is S shaped bone. (it is a subcutaneous structure)
- It is anchored to scapula via ACJ (acromioclavicular joint).
- It is anchored to trunk via SCJ (sternoclavicular joint).
- Most of fracture occurs as result from **fall onto shoulder**.



- Fractures are classified into: proximal, middle and lateral third fractures.
- Most of fractures are of **middle third**.
- Majority of brachial plexus injuries are associated with proximal third fracture



- **Clinical finding:**

- Check the skin.
- Injury to brachial plexus and subclavian artery/vein may be present.
- Rarely, pneumothorax can occurs.
- Can manifest as a tender swelling or a bony spike which may puncture the skin leading to open fracture.

- **X-ray:**
  - AP view.
  - Clavicle special view

Fracture in middle third of Clavicle which shows butterfly fragment →

- **Treatment:(usually conservative)**
  - Most of clavicle fractures are treated with a **sling** or by something called; figure of eight splint (**Non-surgical**) **"if it is not displaced"**.
  - In clavicle fracture, we do not reduce it, because can't immobilize it.

Figure of 8 splint

Simple splint

- Few fractures should be treated surgically with open reduction and internal fixation, as if:
  - Skin tenting
  - Severe displacement (100% displaced or >2cm overlap or shortening).
  - Flail joint. (Minimum you have to fix one side).
  - Profession of the patient. (**e.g.; baseball player**)

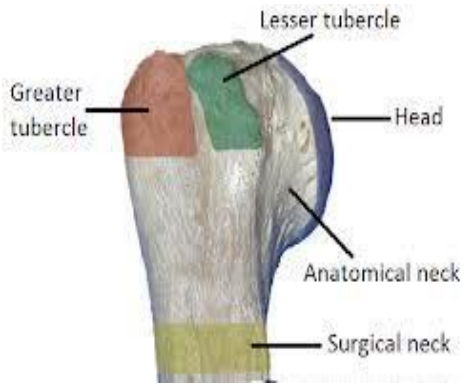
open reduction internal fixation (**ORIF**)

Complications: it might heal with a mild degree of mal-union but it will remodel with time.

2. HUMERUS FRACTURES:

A- **PROXIMAL HUMERUS FRACTURE:** It has four anatomic parts:

- Head
- Greater tuberosity
- Lesser tuberosity
- Shaft.
- Fractures occur in Surgical neck more than in anatomical neck.



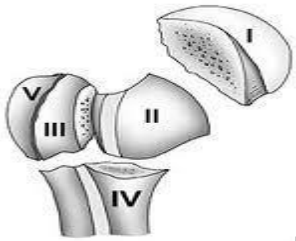
- In younger patients: violent trauma (high energy "car accident").
- In older patients: minor trauma.
- Most fractures are minimally displased.

- **Physical exam:**

- Expose the shoulder very well.
- Look for fracture signs (skin bruising, swelling …).
- Check the skin.
- Peripheral N/V examination.
- Axillary nerve: lateral skin patch (deltoid atrophy).

Lateral skin patch

- Fracture is defined by fragment displaced.
- Displacement: more than 1 cm.



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We could have a one part fracture, and we could find a two parts fractures and so on.

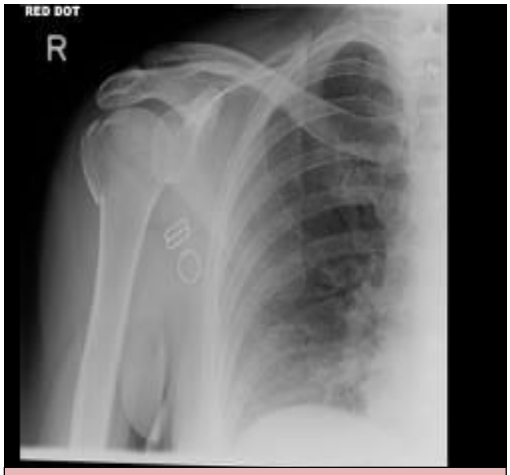
- **Investigations:**

- X-ray: AP, lateral and a **special view (axillary view).**
- CT scan for displaced fractures.

Axillary view, to see if there is any dislocation

If I ask you in exam and I give you AP view what's the next step? Do other views.

Normal



Not displaced (less than 1cm) fracture of greater tuberosity of humerus

Displaced fracture

The findings are:
The surgical neck is broken; the greater tuberosity is broken, The head and greater tuberosity are also displaced.
Thus, it is a displaced proximal humerus fracture.

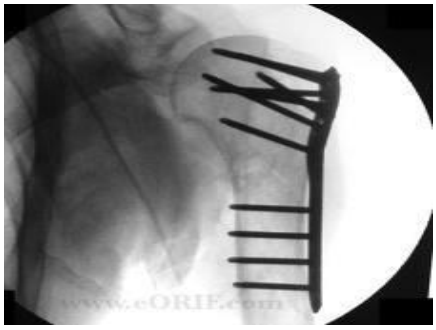
If fracture is not displaced:
– Treatment with sling and Non-weight bearing "NWB" of UE for 6-8 weeks.

– Early ROM exercises after 2-4 weeks. (If you miss ROM >> stiffness)

– Normal function can be resumed after 3-4 months.

If the fracture is displaced:
– Surgery is indicated.

– ORIF is indicated (plate and screws).
– Shoulder hemi-arthroplasty is indicated in some cases.



B- HUMERUS SHAFT FRACTURE:

- It can be classified based on location of fracture. (Proximal, middle and distal).
- Fracture symptoms.
- On exam:
  - ✓ Skin.
  - ✓ N/V.
  - ✓ Compartment.
  - ✓ Watch for radial nerve palsy.(wrist drop)

Spiral fracture in middle third of the humerus.

- **Treatment:**

➢ **Almost all humerus shaft fracture can be treated non-surgically.**

– Close reduction

– Functional brace x 4-6 weeks + NWB

– Early ROM of elbow and shoulder.

*if there is a nerve injury, we see;
-if it is an open fracture, we repair the nerve in the surgery.
-if it is a closed fracture, we wait and follow the patient up with the nerve conduction study looking for the nerve spontaneous healing.

➢ **Surgery is indicated for specific conditions like:**

– Segmental fracture

– Open fracture

– Obese patient

– Bilateral fracture (both humerus)

– Floating elbow (forearm and humerus)

• Surgery: ORIF with plate and screws.

NWB: non-weight bearing
UE: upper extremity.
ROM: range of motion.

For your own knowledge:

Neer Classification

Based on 4 parts of humerus

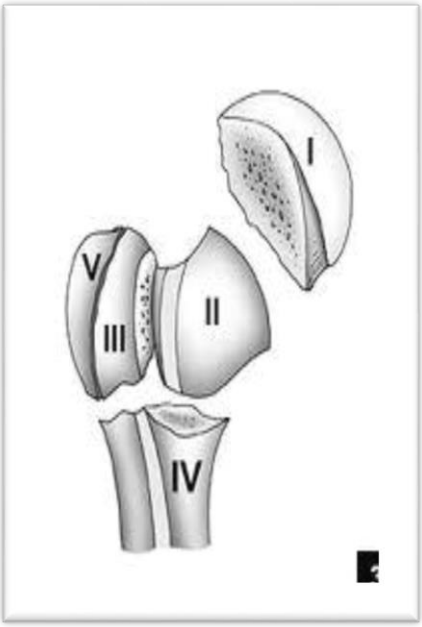
• Greater Tuberosity • Lesser Tuberosity • Humeral Head • Shaft

One-part fracture: any of the 4 parts with none displaced

Two-part fracture: any of the 4 parts with 1 displaced

Three-part fracture: displaced fracture of surgical neck + displaced greater tuberosity or lesser tuberosity

Four-part fracture: displaced fracture of surgical neck + both tuberosities



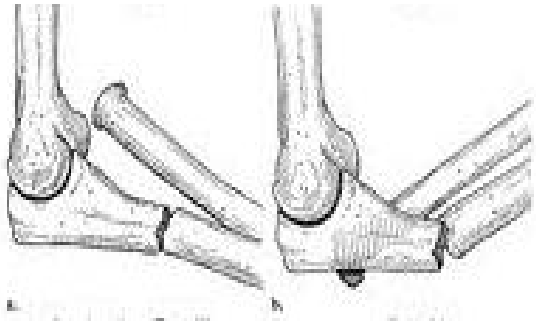
3. BOTH BONES FOREARM FRACTURES:

Forearm is complex with two mobile parallel bones.

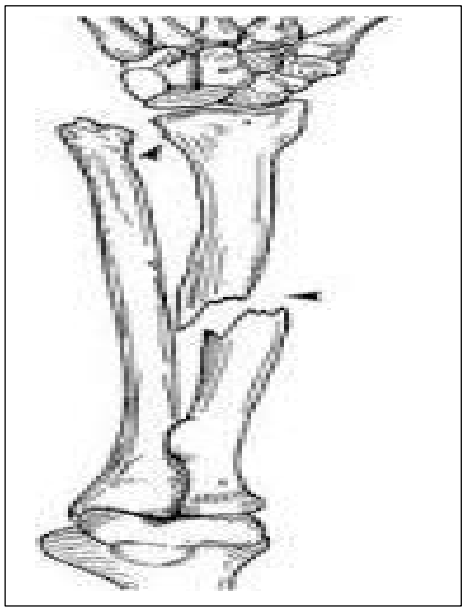
- Radius and ulna articulate proximally and distally.
- Fractures are often from fall or direct blow.

• It very unlikely to fracture only one bone without disruption of their articulation:

- **Both bone fracture:** Means radius and ulna are broken.
- **Monteggia fracture:** Means proximal or middle third ulna shaft fracture with dislocation of radius proximally (at elbow). "if the fractured third of ulna is angulated anteriorly, the radius will dislocate anteriorly and so on".



- **Galeazzi fracture:** Means distal third shaft radius fracture with disruption of DRUJ (distal radio-ulnar joint).



- **Clinical:**
  - Symptoms and signs of fracture
  - Check the skin
  - Check the compartments of forearm
  - Check Ulnar, median and radial nerve (PIN,AIN)
  - Check vascularity: color, temperature, capillary refill and pulse.
- **Investigations:**
  - 2 orthogonal views
  - CT scan if fracture extends into joint. (If the fracture extends to the joint > there's a risk of osteoarthritis).

- **Treatment:**
  - Both bone fracture:
    - Reduce and splint at ER/clinic (temporary to relief pain).
    - Are treated almost always with ORIF: (plate and screws).
  - Monteggia fracture: ORIF ulna and close reduction of radial head.
  - Galeazzi fracture: ORIF radius and close reduction of DRUJ.

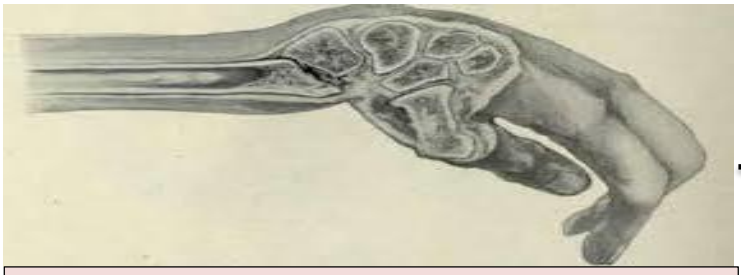
4. DISTAL RADIUS FRACTURES:

- Most common fracture of upper extremity.
- Most frequently are seen in older women. (osteoporosis)
- Young adults are most commonly secondary to high energy trauma.

MOI: outstretching the wrist.

A. Extra-articular fractures:

- Colle's Fracture: Dorsal angulation and displacement, shortening and radial deviation.



Dorsal /posterior displacement

We always look to the **distal** fragment of the fracture to determine whether it is dorsal or volar angulation.

- Smith's Fracture: shortening and volar angulation.

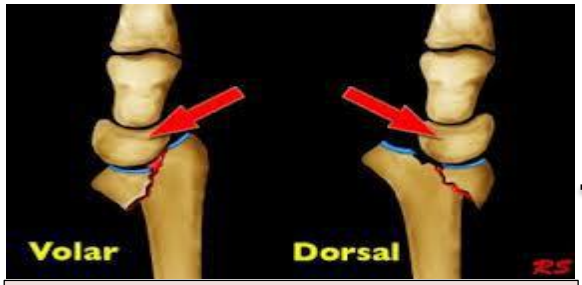
Volar / anterior displacement

Smith's "garden spade"

Colle's "dinner fork"

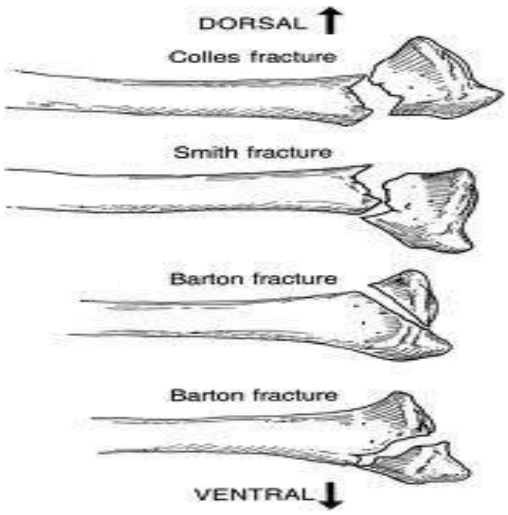
B. Intra-articular Fractures:

- Barton's fracture: volar or dorsal.
- Others.



Lateral view of Barton's fracture

If you don't treat it surgically it will always displace proximally.



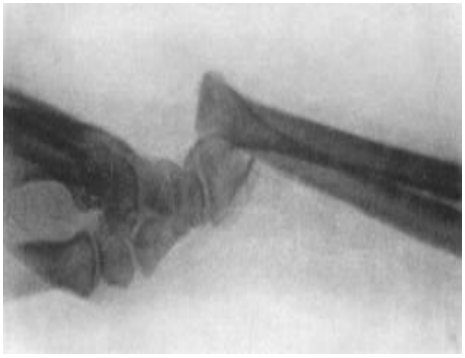
Mechanism of colles' fracture:
Is fall on out stretched hand.

Mechanism of smith fracture:
Is fall onto the back of the flexed hand.

- **Investigations:**

  - X-ray:

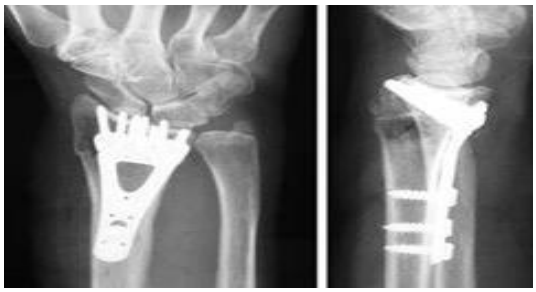
Use the thumb as a guide to know the volar aspect.



Colles' | Smith's

  - CT scan if fracture extends into joint.

- **Treatment:**
  - **Exrta-articular:**
    - Close reduction and cast application (below elbow cast).
    - Immobilization for 6-8 weeks.
    - ROM exercises after cast removal.
    - Surgery: if reduction is not accepted (smith's almost always treated surgically).
  - **Intra-articular fracture:**
    - A step more than 2 mm is an indication for surgery.
    - ORIF with plate and screws.



ORIF with plate and screws

Below elbow cast

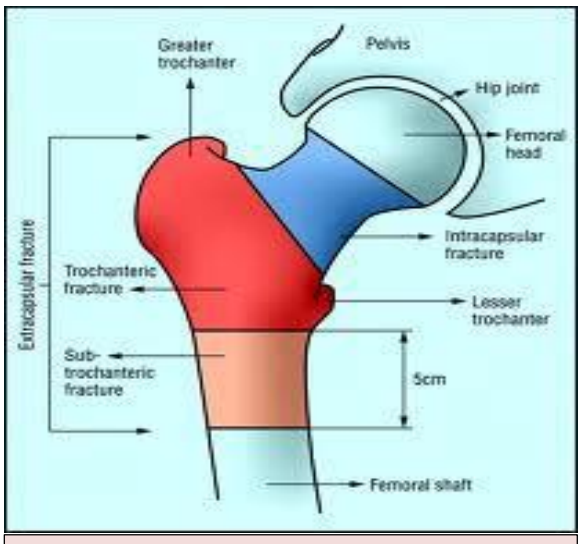
*if child above elbow

LOWER EXTREMITY:

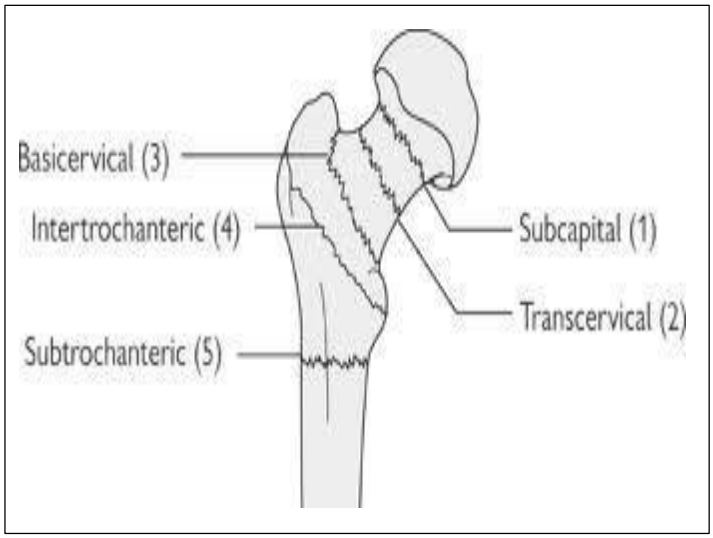
1. HIP FRACTURE (old patients > 60):(can cause death)

- It is the **most common** fracture in lower limb.
- It is associated with osteoporosis.
- Most common mechanism is a fall from standing height (mechanical).
- Other causes of fall (stroke, MI, hypoglycemic attack) should be rolled out during clinical evaluation.
- It is a life changing event.
- Fracture can be classified into:
  - Intra-capsular: Subcapital, Trans-cervical.
  - Extra-capsular: Basicervical, Introchanteric
  - Displaced / Not displaced.

- AVN (avascular necrosis) risk is higher with intra-capsular fracture because blood supply comes through the neck



Intra-capsular fracture up to the blue area.



- Full detailed history of mechanism of injury.
- R/O syncope, chest pain, weakness etc.
- A detailed systemic review.
- Deformity: Abduction, External rotation and shortening.
- Assess distal N/V status.
- Avoid ROM if fracture is expected.

- **Common associated injuries (fragility fractures):**

1. Distal radius fracture.
2. Proximal humerus fracture.
3. Subdural hematoma.

Rule out:

- Acute coronary syndrome
- stroke

- **Investigations:**

- **X-ray:**

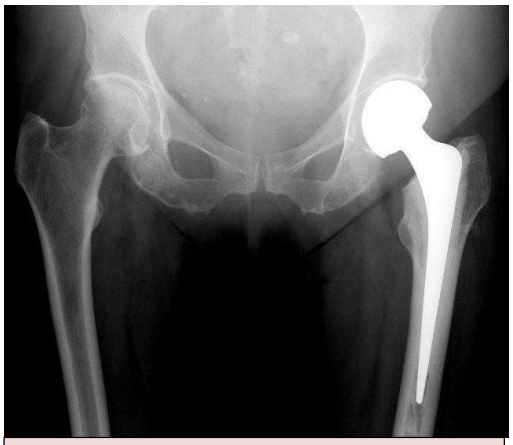
- **3 views** are needed:
  - AP pelvis (shows both hips) – "to compare"
  - AP hip.
  - Lateral hip.

Basicervical

Trans-cervical

- MRI is sensitive for occult fracture (rarely done). (if you can't decide whether a fracture is present or not)

- **Treatment:**
  - No close reduction is needed.
  - No traction is needed.
  - Patient needs **surgery** ideally within 48 hrs.
  - The goal is to ambulate patient as soon as possible.
  - Be sure that **DVT prophylaxis is started**.
  - Be sure that patient will be evaluated for osteoporosis after discharge.
- **If fracture is Intra-capsular:**
  - Displaced:
    - Old patient: we do hip replacement (hemiarthroplasty).
    - Young patient: internal fixation/intra-medullary nailing (within 6hrs).
  - Non-displaced:
    - We do percutaneous in situ fixation (for all patients).



Hemiarthroplasty

Percutaneous in situ Screws fixation.

Intra-capsular fracture in young patients whether it is displaced or not it is an emergency, we must take the patient to OR with in 6hrs.

- **If fracture is extra-capsular:**
  - Stable: Close reduction and DHS (direct hip screw).
  - Unstable: Intra-medullary devise (IM).

DHS

IM

DHS and IM nail are used for fixation (internal/external rotation)

Intertrochanteric fracture which is extra capsular:

Stable: intact posteromedial cortex
Unstable: non-intact posteromedial cortex

- **Fracture fragility signs:**
    1) Large LT fragment.
    2) Extension to subtrochantric region.
    3) 4 parts fracture.

- **Complications:**
    - Nonunion
        - 2% (IT fractures)
        - 5% (non displaced neck fracture)
        - 30% (displaced neck fracture)
    - AVN (femoral neck fracture)
        - 10% (non displaced)
        - 30% (displaced)
    - Death: early 4% . At 1 year: 20%40'%
    - VTE

2. Femoral Neck FRACTURE (Young Patients):

- It is a completely different entity from similar fractures in elders (>60 years).
- High energy mechanism.
- **ATLS protocol.**
- 2.5%: associated femoral shaft fracture. (long femur X-ray)
- **Patient should be taken to operative room for ORIF within 6 hours.**
- Nonunion: 30% (most common complication)
- High energy > highly displaced > difficult to reduce (Needs open reduction)
- AVN: 25%-30%

3. FEMUR SHAFT FRACTURE:

- Most common:
    - high energy mechanisms
    - Young patients (male<30 years).
    - ATLS protocol.
- Less common:
    - low energy mechanism (torsional forces)
    - Old patients.
    - Spiral type fracture.
- R/O pathological fracture in Young + low energy mechanisms.

- Associated musculoskeletal injuries:
  - Ipsilateral femoral neck fracture (10%. Missed in 30%-50%)
  - Knee ligaments injuries: 50%
  - Meniscal tear 30%
  - Floating knee injury: less common "fracture of shaft of femur+ tibial fracture".
  - Vascular/nerve injuries: rare
  - Contralateral femur shaft fracture. (worse prognosis among above)

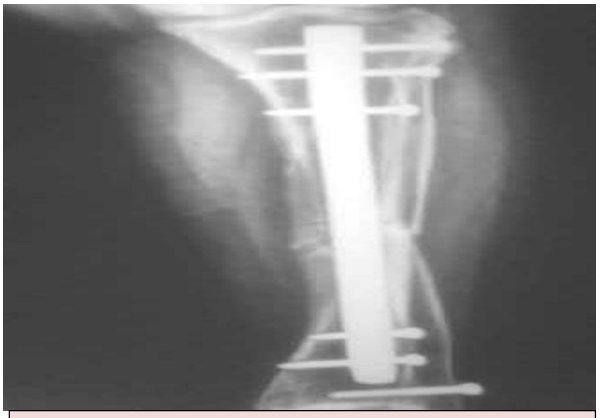
- Associated non-MS injuries:
  - Fat embolism. (sudden dyspnea + sudden drop in BP)
  - **ARDS.**
  - Head injuries.
  - Abdominal injuries.

- **Clinical:**
  - ATLS
  - Fracture symptoms and signs
  - Skin integrity
  - N/V exam.
  - Compartment assessment
  - Knee swelling or ecchymosis

- **Investigations:**
  - AP and lateral views femur
  - 15° internal rotation AP view ipsilateral hip.
  - Lateral view ipsilateral view
  - **If femoral neck fracture is suspected CT scan hip.**
  - Knee AP and lateral views

- **Management:**
  - ATLS: ABC resuscitation.
  - Skeletal traction (proximal tibial pin) or skin traction
  - **Early surgical fixation:**
    - Proven to reduce pulmonary complications.
    - Must be within 24 hrs (ideally < 6 hrs).
    - If patient is unstable: External fixation. Takes 15 mines (because he can't tolerate surgery).
    - If Patient is stable: IM nailing. Take 2 hours.

External fixation



IM nail

- **Complications:**

  - Mal-union:
    - Most common.
    - **More common with proximal fracture (sub-trochantric fracture)**
    - Rotational, angulation and shortening
  - Nonunion: rare
  - Infection.
  - VTE.

4. TIBIA SHAFT FRACTURE:

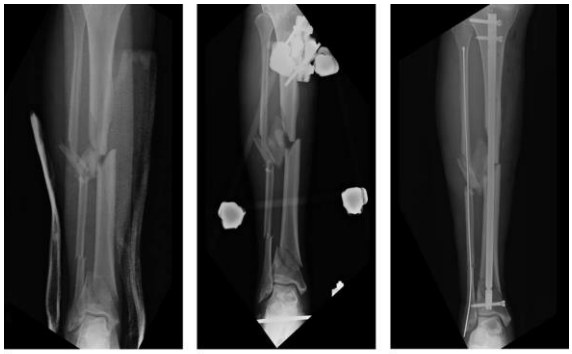
- It is a subcutaneous bone (high suspicion for Skin injury).
- Most common large long bone fracture.
- It can be secondary to low or high energy mechanism.
- **It carries the highest risk of compartment syndrome. (MCQ)**
- 20 % of tibial fracture can be associated with **ankle intra-articular fracture**.
- It can be classified based on location and morphology:
  - Proximal third
  - Middle third
  - Distal third
- Displaced vs. Non-displaced.

- **Clinical:**

  – Skin integrity.
  – **Assess compartments** of leg: needs serial exam.
  – Serial N/V exam.

- **Investigations:**
  - X-rays: "join above and below"
    - AP and lateral tib/fib.
    - AP/lateral knee
    - AP/Lateral ankle
  - CT scan if fracture extends to joint above or below.

Not displaced



Displaced

- **Management:**
  - Indications for non-surgical treatment:
    - NO displacement: < 10° angulation on AP/lateral x-rays.
    - < 1 cm shortening.
    - Not comminuted.

  - <u>C/I:</u>
    - Displacement.
    - Open fracture.
    - Compartment syndrome.
    - Floating knee.

In E.R do close reduction and immobilization then think of a definitive treatment.

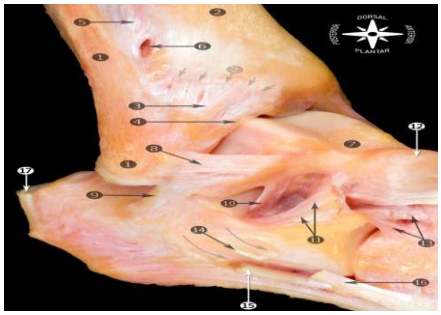
  - Close reduction and cast immobilization:
    - Above knee **back slab** and U slab if **surgical** treatment is chosen.
    - Above knee **full cast** if **non-surgical** treatment is chosen: it must be bivalved to minimize compartment syndrome.
    - Always provide patient with Compartment Syndrome checklist if patient is discharged home with cast.
    - Non weight bearing "NWB" for 8 weeks with cast immobilization.

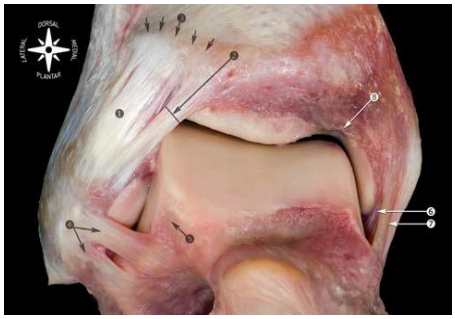
  - Surgical treatment:
    - Most common modality of treatment.
    - Most commonly IM nail fixation.

- **Complications:**
  - **Non-union: most common complication**. "MCQ" mainly at lower tibia.
  - Delayed union.
  - Infection: open fracture.
  - DVT/PE.

5. ANKLE FRACTURE:

• Ankle anatomy:
  - Medial and lateral malleoli, distal Tibia and talus.
  - Highly congruent joint
  - Fibula is held to distal tibia by syndosmotic ligament.
  - Medial malleolus is held to talus by deltoid ligament.
  - Lateral malleolus is held to talus by lateral collateral ligament "LCL".





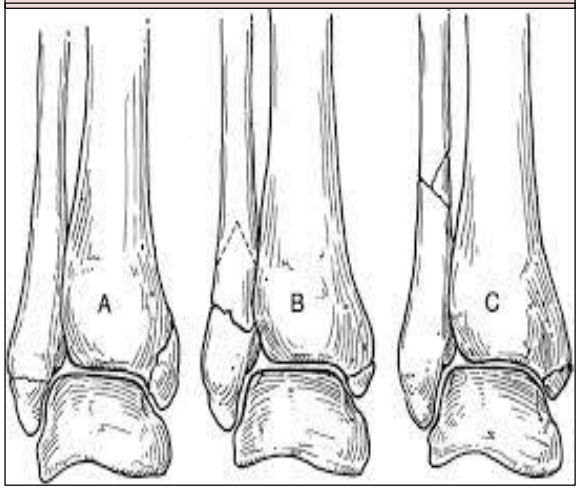
- Low energy (torsional): malleoli fracture.
- **Classification:**
  - Stable v.s Unstable fracture (lateral displacement of talus).
  - Medial, lateral or bi-malleolar fracture.
  - Lateral malleolus: Weber A, B, C.

Weber type A:
- below level of the ankle joint.
- Tibiofibular syndesmosis intact. (deltoid ligament intact)
- Medial malleolus often fractured.

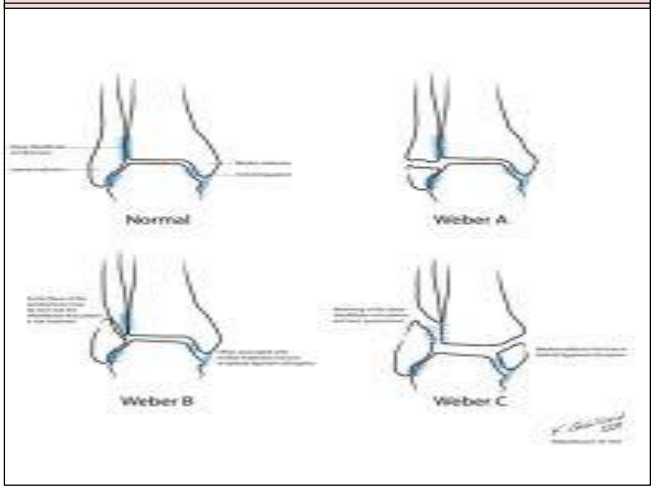
weber type B:
- at the level of the ankle joint, extending superiorly and laterally up the fibula.
- tibiofibular syndesmosis intact or only partially torn, but no widening of the distal tibiofibular articulation.
- medial malleolus may be fractured or deltoid ligament may be torn.

Weber type C:
- Above the level of the ankle joint.
- Tibiofibular syndesmosis disrupted with widening of the distal tibiofibular articulation.
- Medial malleolus fracture or deltoid ligament injury present.

Weber fractures



Weber fractures



- **Clinical:**
  - Look for Fracture symptoms and signs.
  - Assess medial joint ecchymosis or tenderness To assess medial malleolus and deltoid ligament integrity.
  - Assess N/V status (before and after reduction).

- **Investigations:**
  - X-rays:
    - AP/Lateral
    - Mortise view. is done with the leg internally rotated 15-20o
    - **Long leg x-rays if only medial malleolus is broken.**
  - CT scan if fracture extends to articular distal Tibia articulation.

- **Management:**
  - Intact medial malleolus:

    Weber A:

    – Splint + NWB X 6 weeks.

    – Early ROM.

    Weber B/C:

    - If medial joint line widen (unstable): ORIF.

    - If not: Call Orthopedic for stress film x-rays.
  - If both malleoli are broken:

    ORIF.

Summary:
Weber A: no need to operate.
Weber B: most of the time needs surgery.
Weber C: always surgery.

Questions

1-A 50 year old housewife lady presented to the emergency room after a slip accident in the kitchen 2 hours earlier complaining of pain. She reported that she is unable to move her hand.

- What is your next step?

A-MRI.
B-CT.
C-ORIF.
D-closed reduction.

Answer: B "because it is an intra-articular fracture".

2- Which of the following carries the highest risk of compartment syndrome?

A-Ankle fracture.
B-Humerus fracture.
C- Tibia shaft fracture.
D-Both bones forearm fracture.

Answer: C.