433 Teams

ORTHOPEDICS

Lecture 10

Common Adult Fractures

Apley : pink color

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Objectives

- CLAVICLE FRACTURE
- HUMERUS (PROXIMAL& SHAFT)
- BOTH'BONE'FOREARM'FRACTURS'
- DISTAL'RADIUS'FRACTURE
- HIP FRACTURE
- FEMUR'SHAFT'FRACTURE'
- TIBIAL'SHAFT'FRACTURE'
- ANKLE'FRACTURE

Before you study this lecture we suggest to read how to manage open fracture from previous lecture which given by

Dr.Sultan Al dossary

How to do physical examination for any fracture?

1st step: Expose the area and check for any deformity or skin changes

2nd step: N/V examination: ask the patient to move distal parts from fracture and check sensation then check temperature, color, pulses and capillary refill distally to fracture

3rd step: Examine the joint above and joint below

4th step: Check for other complications

In fractures, we don't examine range of motions passively because of pain

CLAVICLE FRACTURE:

Normal Anatomy and Facts:

- Clavicle is S shaped bone.
- 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** **(the outer fragment is pulled down by the weight of the arm and the inner half is held up by the sternomastoid muscle)**
- Majority of brachial plexus injuries are associated with proximal third fracture

Physical examination:

- **1st Step:** Expose the area and check the skin.
- **2nd Step:** Check **brachial plexus** and **subclavian artery/vein**
- Rarely, pneumothorax can occurs.
- Closed clavicle fractures has the tendency to become open fracture because it is subcutaneous structure and may tenting the skin by its sharp bony spike and penetrate it

Investigation:

X-ray: AP view and Clavicle special view

Fracture in middle third of Clavicle

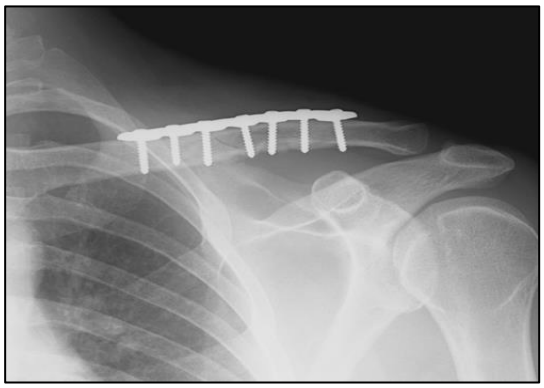
Treatment:

- **Usually conservatively** with a **sling** or by **figure of eight splint**.

Figure of 8 splint

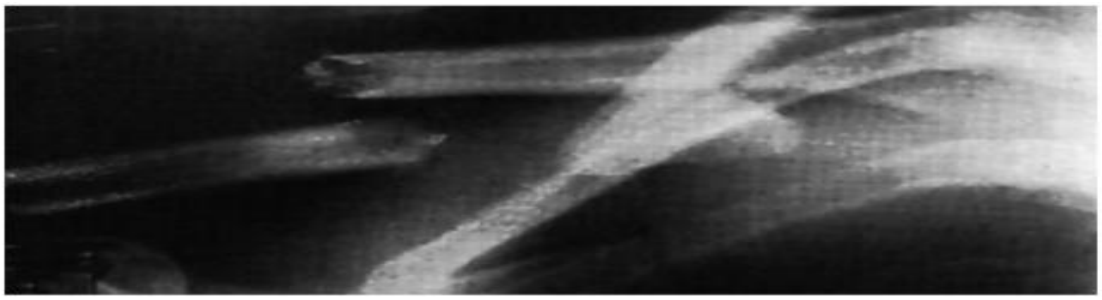
Simple splint

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



- **Why don't we do closed reduction instead of open reduction?**

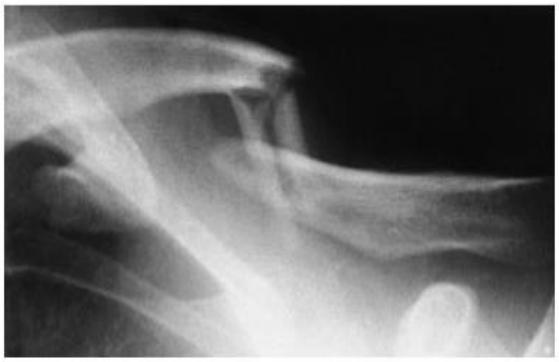
because can't immobilize it.



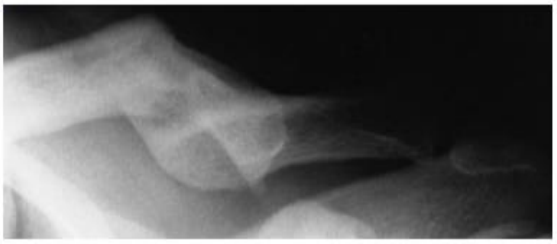
(a)

(b)

24.1 Fracture of the clavicle (a) Displaced fracture of the middle third of the clavicle – the most common injury. (b) The fracture usually unites in this position, leaving a barely noticable 'bump'.



(a)



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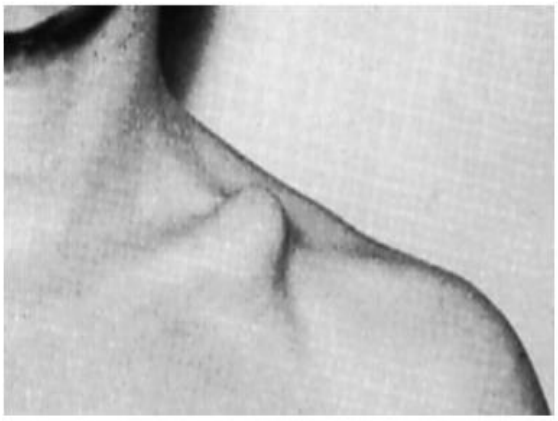


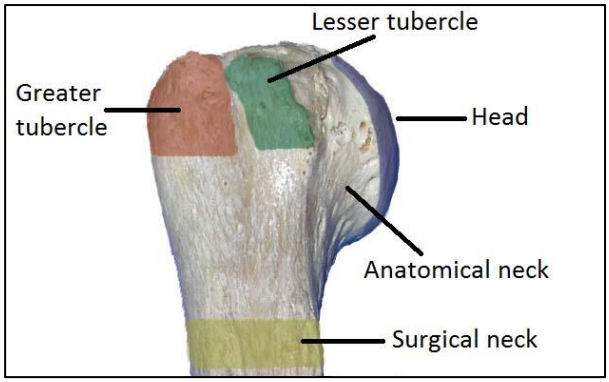
(c)

(d)

24.2 Severely displaced fracture (a) A comminuted fracture which united in this position (b) leaving an unsightly deformity (c). This fracture would have been better managed by (d) open reduction and internal fixation.

HUMERUS FRACTURES:

A- PROXIMAL HUMERUS FRACTURE:



Normal Anatomy and Facts:

It has four anatomic parts:

- Head
- Greater tuberosity
- Lesser tuberosity
- Shaft.
- Fractures occur in **Surgical neck** more than in **anatomical neck.**
- Anatomical neck fracture associated with **AVN** (avascular necrosis)
  - In younger patients: violent trauma (high energy "car accident").
  - In older patients: minor trauma.
  - Most fractures are minimally displased.
- Fractures of the proximal humerus usually occur after middle age and most of the patients are osteoporotic, postmenopausal women

Physical examination:

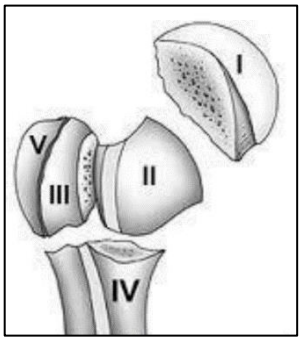
- 1st Step: Expose the shoulder very well and look for fracture signs (skin bruising, swelling …) and Check the skin.
- 2nd Step: Check for Axillary nerve (deltoid atrophy and upper lateral of arm).
- **3rd Step:** Ask the patient to move his **head and elbow**

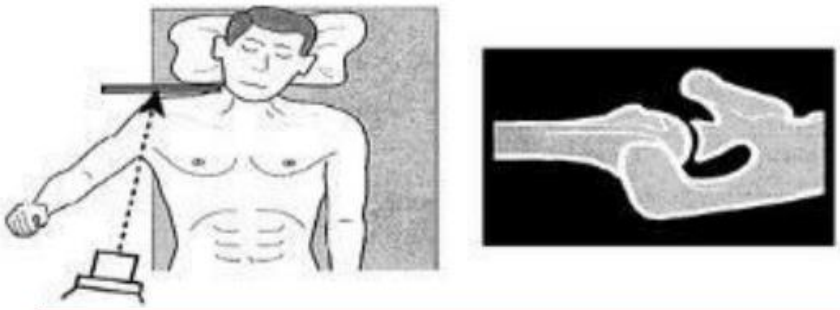
Investigations:

- X-ray: AP, lateral and a **special view (axillary view).**

- Fracture is defined by fragment displaced.
- Displacement: > 1 cm.
- Angulation: > 45 degrees

- CT scan: for displaced fractures if X-ray isn't clear.





Axillary view, to see if there is any dislocation

Treatment:

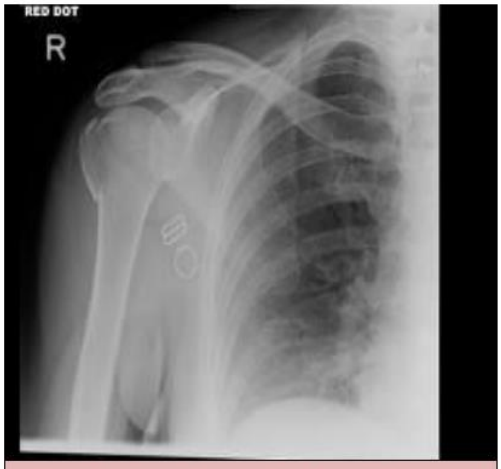
➢ **If fracture is not displaced, Treat it Conservatively:**

- Treatment with **sling** and **Non-weight bearing "NWB"** for 6-8 weeks.
- Early ROM exercises after 2-4 weeks. **(To avoid stiffness)**
- Normal function can be resumed after 3-4 months.

➢ **If the fracture is displaced, Treat it Surgically:**

- ORIF (plate and screws): **If the patients is young OR old patient without anatomical neck fracture**
- Shoulder hemi-arthroplasty: **If the patient is old with anatomical neck fracture complicated with AVN**

Normal



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

Displaced fracture

B- HUMERUS SHAFT FRACTURE:

Normal Anatomy and Facts:

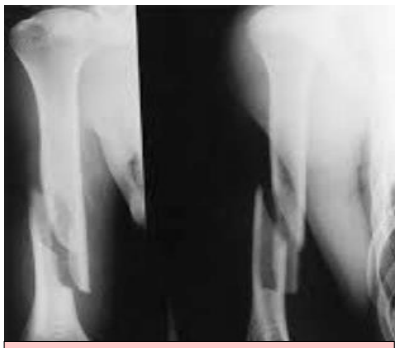
- It can be classified based on location of fracture: Proximal, middle and distal.
- Fracture of the shaft in an elderly patient may be due to a metastasis.

Physical Examination:

- **1st Step:** Expose the area very well and look for fracture signs Check the skin.
- **2nd Step:** Watch for radial nerve palsy.(wrist drop) and vascular examination
- **3rd Step:** Ask the patient to move his **shoulder and elbow**
- **4th Step:** Check for Compartment syndrome **(Patient will complain from continuous aggravating pain even without movement and woody skin)**

Investigations:

X-ray: AP and lateral views



Spiral fracture in middle third of the humerus.

Treatment:

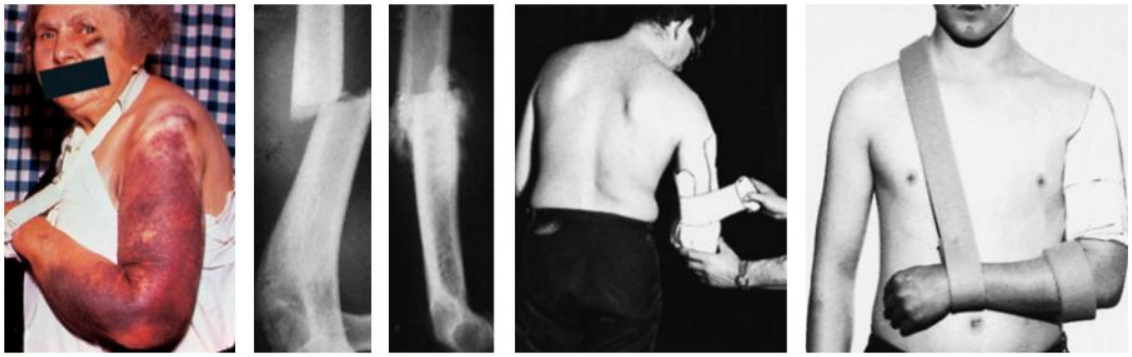
➢ **Usually conservatively in almost all humerus shaft fracture:**

- Close reduction by **Functional Brace** for 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.

Surgically by ORIF (plate and screws) if:

Segmental fracture - Open fracture - Obese patient - Bilateral fracture (both humerus) - Floating elbow (forearm and humerus)



(a) (b) (c) (d) (e)

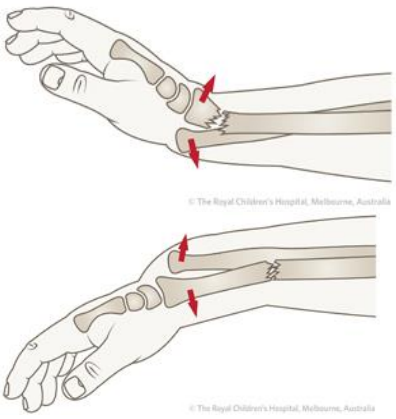
24.20 Fractured shaft of humerus (a) Bruising is always extensive. (b,c) Closed transverse fracture with moderate displacement. (d) Applying a U-slab of plaster (after a few days in a shoulder-to-wrist hanging cast) is usually adequate. (e) Ready-made braces are simpler and more comfortable, though not suitable for all cases. These conservative methods demand careful supervision if excessive angulation and malunion are to be prevented.

BOTH BONES FOREARM FRACTURES:

Normal Anatomy and Facts:

- 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).

Monteggia Fracture



Galeazzi Fracture

Physical Examination:

- **1st Step:** Expose the area, look for fracture signs and check the skin
- **2nd Step:** examine median, ulnar and radial nerve and vascular examination
- **3rd Step:** Ask the patient to move his **wrist and elbow**
- **4th Step:** Check for Compartment syndrome

Investigations:

- **X-ray:** 2 orthogonal views (AP and lateral views)
- **CT scan:** if fracture extends into joint. (If the fracture extends to the joint, there is a risk of osteoarthritis).

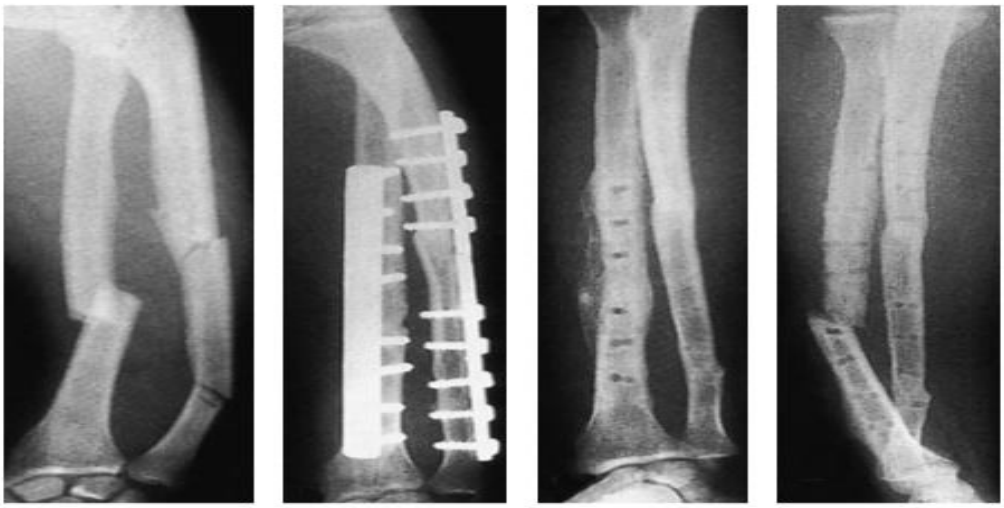
Treatment:

- 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.

Monteggia		Galeazzi
Anterior dislocation of the radial head with a fracture of the ulna, usually angulated dorsally	Description	Fracture of the radius with shortening and dislocation of the distal ulna
Dislocation at the head	Radius	Isolated fracture at the junction of the distal and middle third
Fracture of the proximal third	Ulna	Subluxation or dislocation of the distal radio-ulnar joint
Fall on an outstretched hand with the forearm in excessive pronation Direct blow on back of upper forearm in self-defense (night-stick injury)	Mechanism	Fall on an outstretched arm with elbow flexed



(a) (b) (c) (d)

25.2 Fractured radius and ulna in adults (a, b) These fractures are usually treated by internal fixation with sturdy plates and screws. However, removal of the implants is not without risk. **(c,d)** In this case, the radius fractured through one of the screw holes.

(a)

(b)

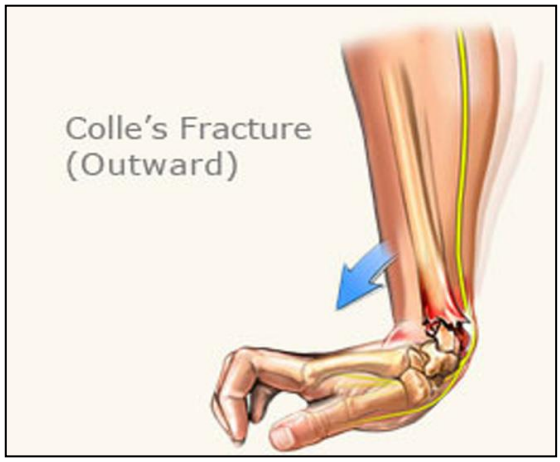
25.4 Compartment syndrome Incisions to relieve a compartment syndrome in the forearm.

DISTAL RADIUS FRACTURES:

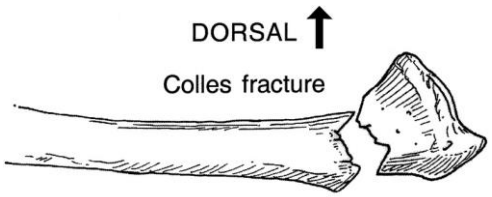
- **Most common fracture of upper extremity.**
- Most frequently are seen in older women. (osteoporosis)
  - Young adults are most commonly secondary to high energy trauma.

A. Extra-articular fractures:

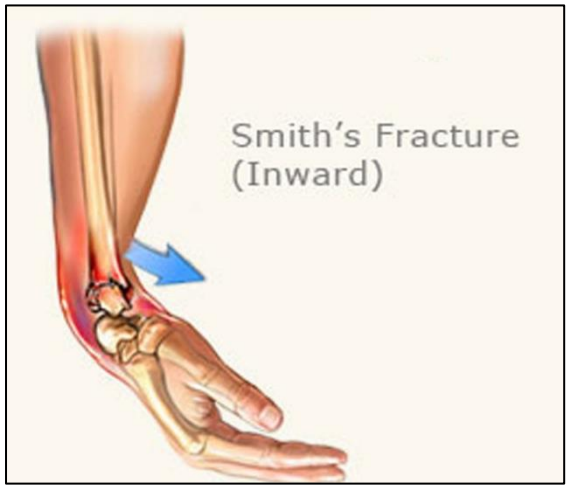
Colle's Fracture: Dorsal angulation and displacement, shortening and radial deviation.



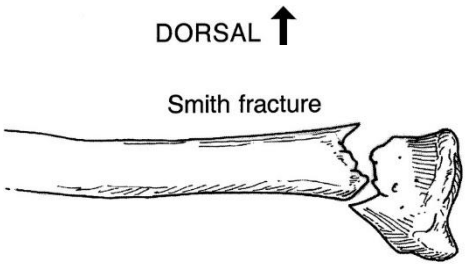
Colle's "dinner fork"



Smith's Fracture: shortening and volar angulation.

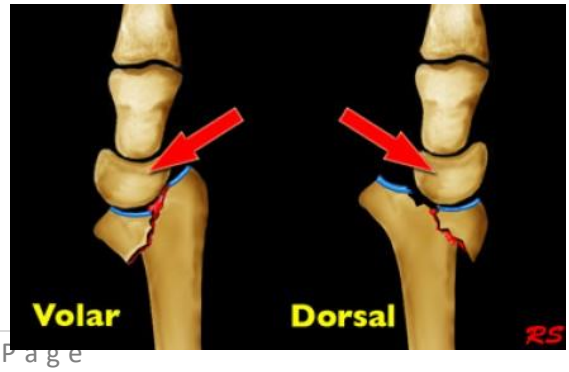


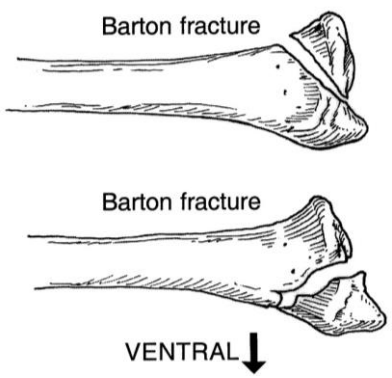
Smith's "garden spade"



B. Intra-articular Fractures:

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





Investigations:

- AP and lateral X-ray views
- CT scan because it extends to joint "Barton's"

Treatment:

- **For Colle's fracture and other intra-extra articular fractures:**
  - If stable, do close reduction under conscious sedation and cast application (below elbow cast). **If reduction is successful, send patient home. Then wait for 1 week if the swelling decreased and not painful. Continue Immobilization for 6-8 weeks. If not make split to decrease the pressure and wait for 15 minutes, if pain continues remove it completely.**
  - Why Below elbow cast? In adults below elbow cast used to prevent stiffness but we can use above elbow cast in children
  - ROM exercises after cast removal.
  - If not stable, treat it surgically
- **For Smith's fracture and Barton's fracture: almost always treated surgically** (ORIF with plate and screws)

LOWER EXTREMITY:

1. HIP FRACTURE:

Normal Anatomy and Facts:

- 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.

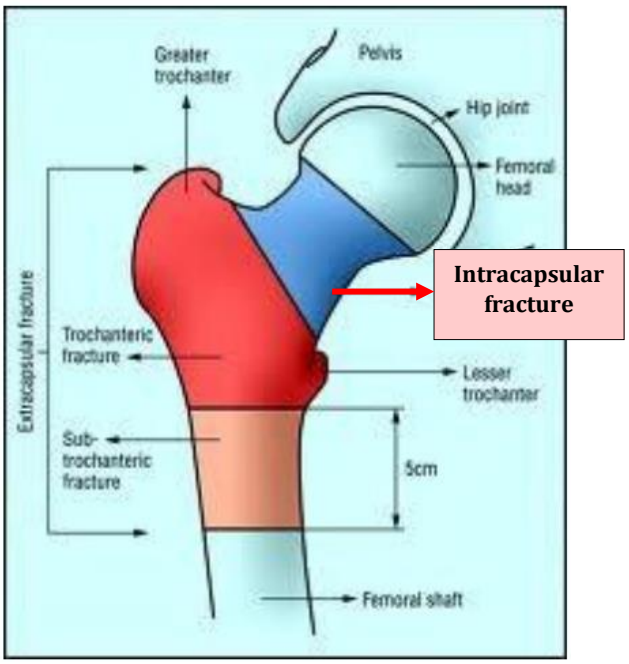
Common associated injuries (fragility fractures):

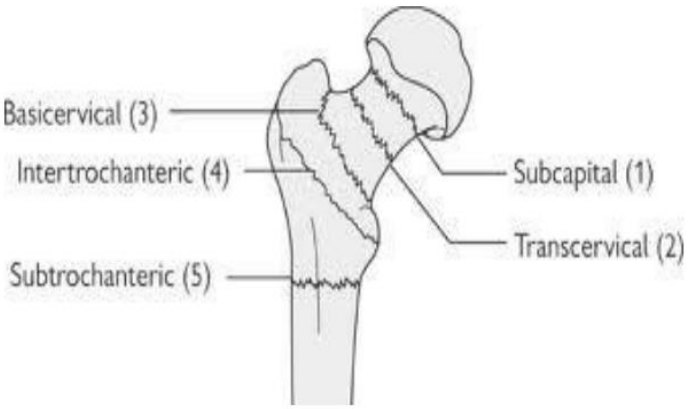
Distal radius fracture - Proximal humerus fracture - Subdural hematoma.

- **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





Physical Examination:

- 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.

Investigations:

- **X-ray:** AP and lateral Hip – AP Pelvis – AP Femur
- **MRI**: is sensitive for occult fracture (rarely done only if you can't decide whether a fracture is present or not)

Treatment: (IMPORTANT)

- 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 (Urgent within 6hrs).

❖ **Non-displaced:**

- We do **percutaneous in situ fixation** (Urgent for all patients old and young).

If fracture is extra-capsular:

- Stable: Close reduction and DHS (direct hip screw).
- Unstable: Intra-medullary devise (IM).

DHS

Intramedullary Nail

Hemiarthroplasty

Percutaneous in situ fixation

Complications:

- Nonunion: 30% (most common complication in young patient)

FEMORAL SHAFT FRACTURE:

Normal Anatomy and Facts:

- **Most common:** high energy mechanisms - Young patients (male<30 years).
- **Less common:** low energy mechanism (torsional forces) - Old patients.
- 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.

Physical Examination:

- **1st Step:** Expose the area, look for fracture signs and check the skin
- **2nd Step:** N/V exam.
- **3rd Step:** Knee swelling or ecchymosis
- **4th Step:** Check for Compartment syndrome

Investigations:

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

Treatment:

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.

TIBIA SHAFT FRACTURE:

Normal Anatomy and Facts:

- 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**.
- 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.

Physical examination:

1st Step: Expose the area, look for fracture signs and check the skin
2nd Step: N/V exam & Check for Compartment syndrome (need serial 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

Treatment:

- **Surgically**: most of the time and treatment by **IM nail fixation.**
- **Conservatively only if:** NO displacement: < 10° angulation on AP/lateral

(a) (b)

(c)

30.30 Compartment syndrome (a) With a fracture at this level the surgeon should be constantly on the alert for symptoms and signs of a compartment syndrome. This patient was treated in plaster. Pain became intense and when the plaster was split (which should have been done immediately after its application), the leg was swollen and blistered (b). Tibial compartment decompression (c) requires fasciotomies of all the compartments in the leg.

ANKLE FRACTURE:

Normal Anatomy and Facts:

• 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)
- No displacement

-No tenderness of the medial side

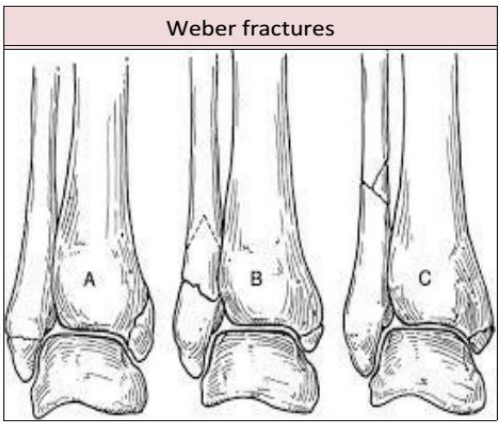
-No destruction of the joint line (no talas shift)

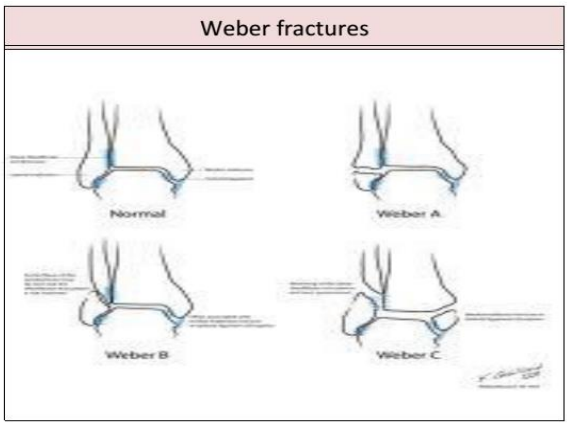
Weber type B:

- 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.



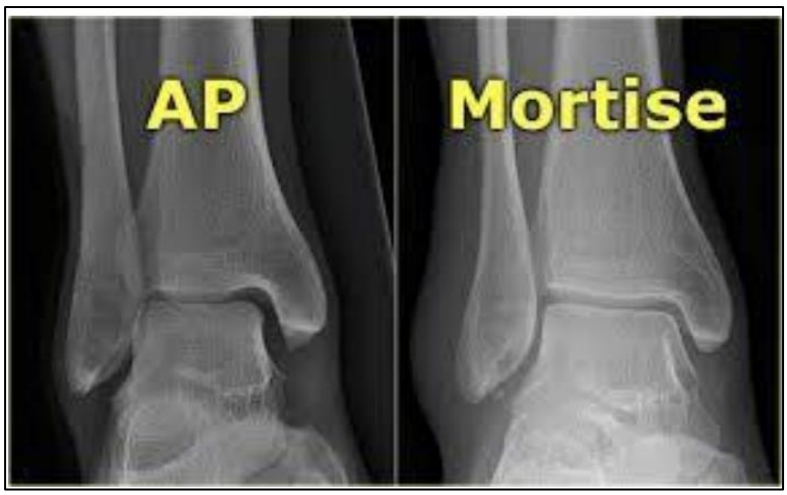


Physical examination:

– 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:

- IF the fracture in medial malleolus or both malleoli: **Always surgically**

- IF the fracture in lateral malleolus:

Weber A:

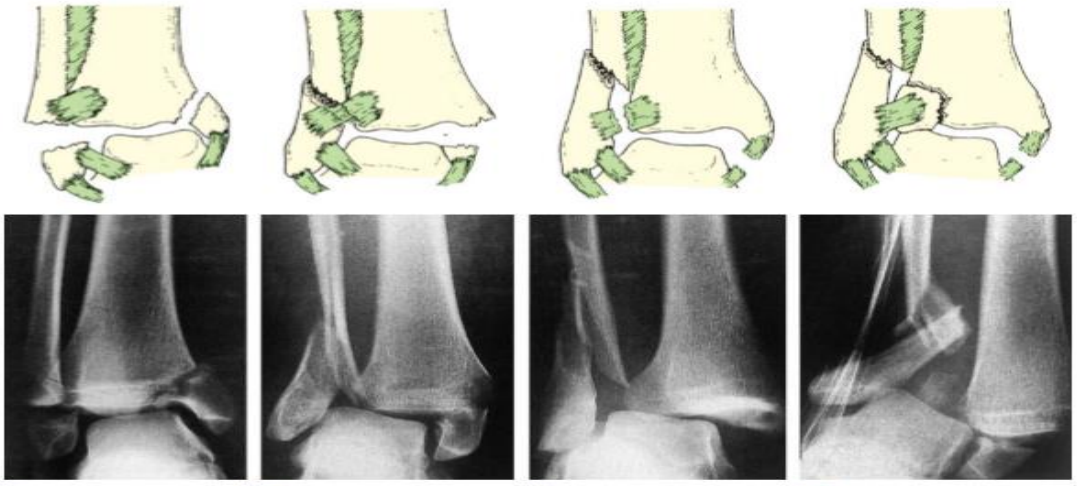
– Splint + NWB X 6 weeks.

– Early ROM.

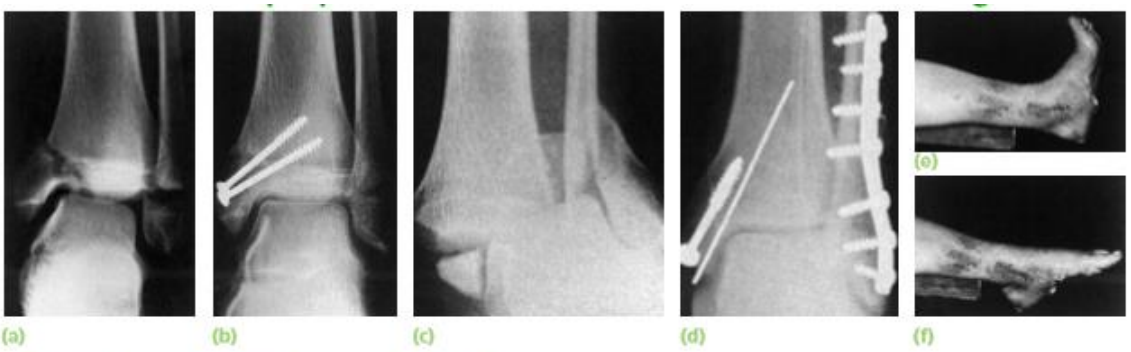
Weber B/C:

- If medial joint line widen (unstable): ORIF.
- If not: Call Orthopedic for stress film x-rays.

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



31.5 Ankle fractures – classification The Danis–Weber classification is based on the level of the fibular fracture. (a) Type A – a fibular fracture below the syndesmosis and an oblique fracture of the medial malleolus (caused by forced supination and adduction of the foot). (b) Type B – fracture at the syndesmosis, often associated with disruption of the anterior fibres of the tibiofibular ligament and fracture of the posterior and/or medial malleolus, or disruption of the medial ligament (caused by forced supination and external rotation). (c) Type C – a fibular fracture above the syndesmosis; the tibiofibular ligament must be torn, or else (d) the ligament avulses a small piece of the tibia. Here, again, there must also be disruption on the medial side of the joint – either a medial malleolar fracture or rupture of the deltoid ligament.



31.7 Ankle fractures – open treatment (1) (a,b) Danis–Weber type A fractures can often be treated conservatively, but if the medial malleolar fragment involves a large segment of the articular surface, it is best treated by accurate open reduction and internal fixation with one or two screws. (c,d) An unstable fracture–dislocation such as this almost always needs open reduction and internal fixation. The fibula should be restored to full length and fixed securely; in this case the medial malleolus also needed internal fixation; (e) and (f) show the range of ankle movement a few days after operation and before a 'walking plaster' was applied.

Summary

Upper extremities

Clavicle fracture	-Most of the fractures are middle third. -Usually treated conservatively (sling / figure of eight splint) -Surgical indications: skin tenting (open fracture), severe displacement , flail joint and profession of the patient.
Proximal humerus fracture	-Anatomic neck fracture associated with AVN. -Check for axillary nerve injury. -X-ray : special view axillary view. -If fracture is not displaced : treat it Conservatively. -If the fracture is displaced (>1cm): treat it Surgically.
Humeral shaft fracture	-Check for radial nerve injury and compartment syndrome. -Usually treated conservatively (Functional brace). -Surgical indications: Segmental fracture ,Open fracture ,Obese patient ,Bilateral fracture,Floating elbow.
Forearm fracture	-It could be both bone fracture , monteggia fracture or galeazzi fracture. -Check for median , ulnar and radial nerve injuries. -Always treated surgically.
Distal radius fracture	Classified into : Extra-articular fractures:Colles and smiths. Intra-articular fractures:Bartons.

Lower extremities

Hip fracture	Classified into : Intra-capsular fracture: risk of AVN. Extra-capsular fracture. -Treated surgically : **Intra-capsular** **non displaced**:fixation(For all pts old&young) **displaced**:fixation (young) , replacement (old) **Extra-capsular** **Stable**: DHS **Unstable**: IM nail
Femoral shaft fracture	-Associated with ipsilateral femoral neck fracture, fat embolism and ARDS. -Treated surgically : Stable > IM Nail fixation. Unstable> External fixation.
Tibial shaft fracture	-It carries the highest risk of compartment syndrome. -Treated Surgically by IM nail fixation.
Ankle fracture	X-ray: special view mortise view. Treatment: **Medial malleolus fracture** > always surgically **Lateral malleolus fracture** :Weber A > Observation Weber B > surgery OR non surgery Weber C >Surgery

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