

Upper Limb Fractures

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General Principles

- Upper limb fractures heal faster than lower limb fractures due to the richer vascularity of the upper limb.
- In the mature skeleton the healing time is around 6 weeks, while in the immature skeleton it is around 3 weeks.
Age is not a defining factor for the time of healing in skeletally mature patients
- Extra-articular fractures require only functional reduction and relatively stable fixation.
- Intra-articular fractures require anatomical reduction and an absolutely stable fixation to prevent complications as secondary osteoarthritis and joint stiffness.


①

②

General Principles

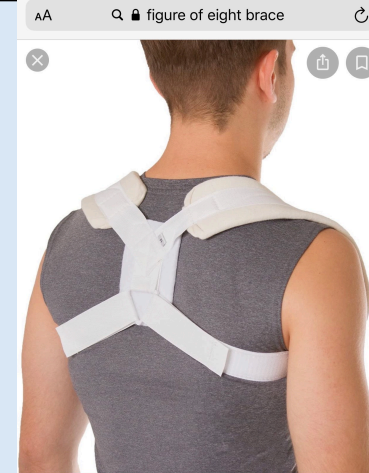
Simple fracture: one fracture line resulting in two pieces
Comminuted (multifragmentary) Fracture: more than one line with 3 or more pieces

* Simple fracture heal better than comminuted

- Most upper limb fractures result from falling down on an outstretched hand (FOOSH). 
- This will cause either a ^① bending force resulting in an oblique fracture, a ^② twisting force resulting in a spiral fracture, or a ^③ direct force (hitting an object) resulting in a transverse fracture.
- Transverse fractures result from the highest energy injuries causing more soft tissue damage, thus requiring a longer time to heal opposed to oblique or spiral fractures.
The least amount of energy is in spiral fractures, so less soft tissue damage
- When interpreting the displacement pattern of the fracture, think of muscle pull, the direction of the causative injury, and gravity.

Surface area for healing in spiral is very big and callus formation has a very good surface area

Clavicle Fractures



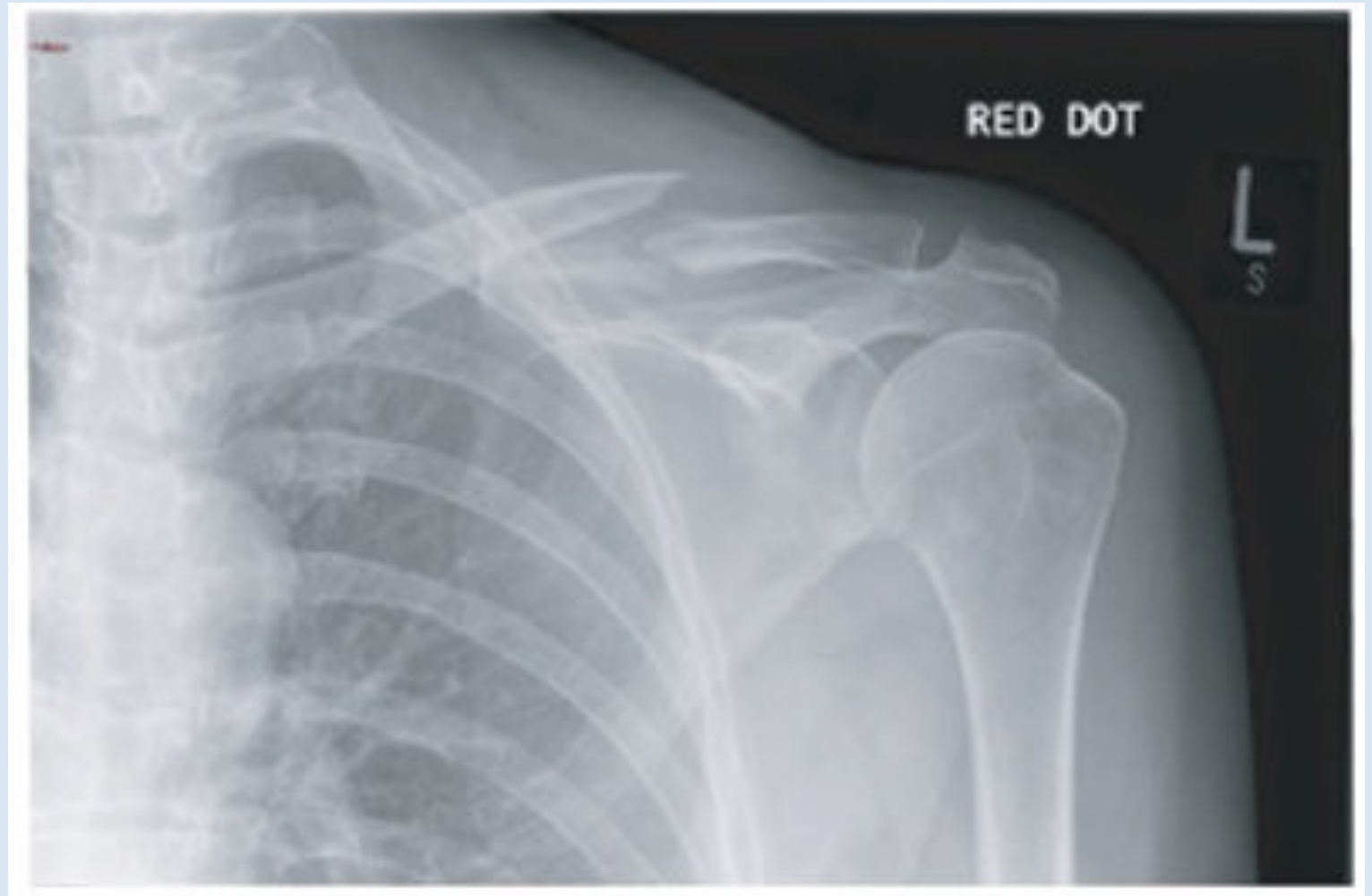
- Divided into 3 thirds.
- Most fractures occur in the middle third with the proximal piece pointed cranially due to the pull of the sternocleidomastoid muscle and the distal piece pulled caudally by the weight of the arm.
- Lateral third fractures are usually unstable as they involve ligamentous injuries.
- Management:
 - Conservative (sling or figure of eight brace) for middle third fractures.
 - Operative fixation for lateral third fractures.

Clavicle Fractures

- Middle third clavicle fracture.
- Note the pattern of displacement.

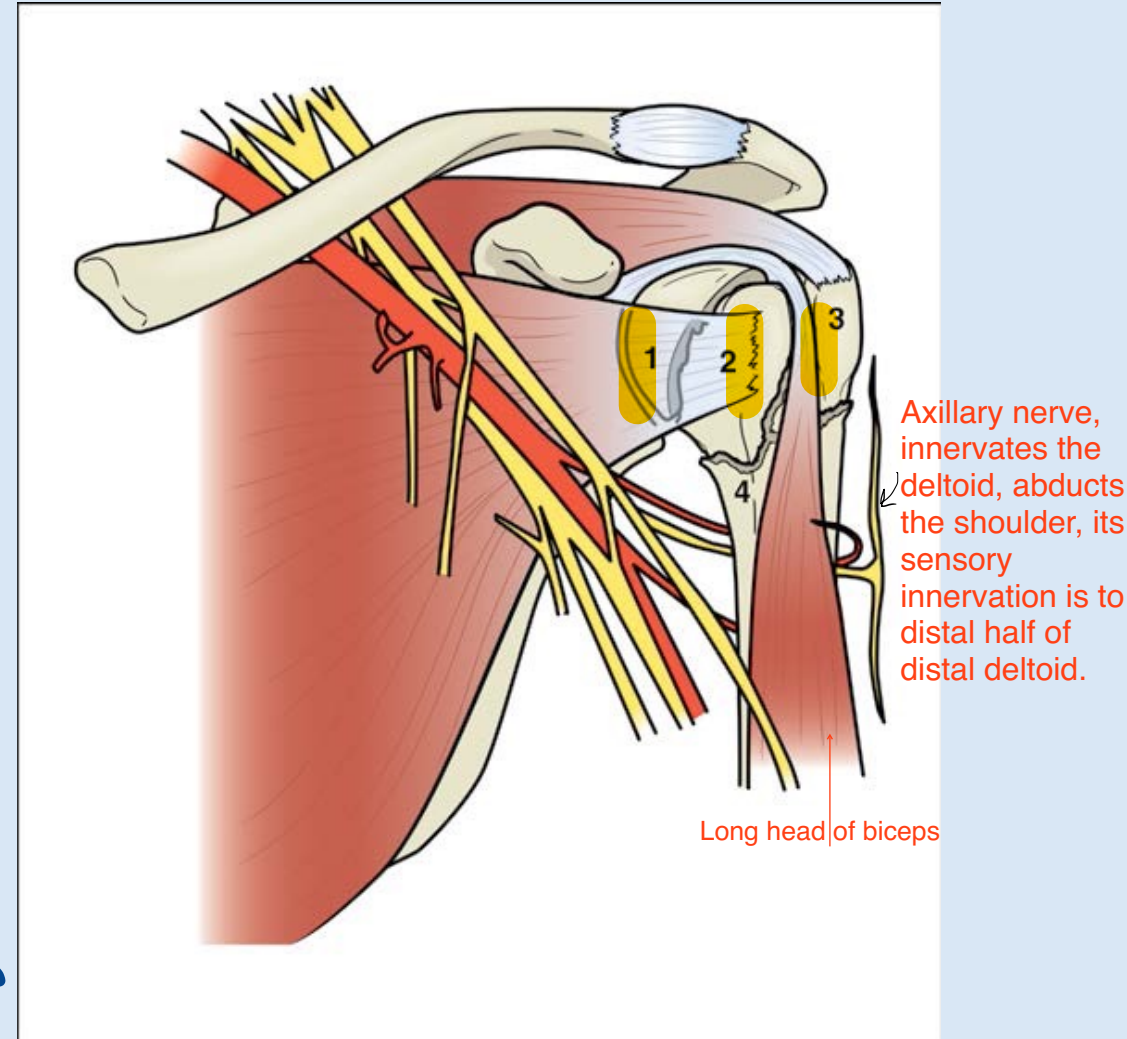
-Proximal segment is displaced proximally (cranially); due to sternocleidomastoid that is attached to the proximal part.

- Distal part is pulled downward by the effect of gravity



Proximal Humerus Fractures

1. Head of humerus.
2. Lesser tuberosity with subscapularis tendon.
3. Greater tuberosity with supra- and infraspinatus tendons. + *Teres Minor*
4. Shaft of the humerus.
5. The line between piece 1 and the rest is the anatomical neck.
6. The line between piece 4 and the rest is the surgical neck.



طريقة فحص axillary ← خط الابر واسفل المريض يدها بس تحس القبابات ثم

Proximal Humerus Fractures

- Anatomical neck fractures have a high risk of avascular necrosis of the head of humerus. + risk of nonunion → So we go for Surgical reduction.
- Greater tuberosity fractures are avulsion fractures (by pull of the supra- and infraspinatus) and can be associated with shoulder dislocations.
- Surgical neck fractures are the most frequent and are considered fragility fractures (along with hip fractures, vertebral compression fractures, and distal radius fractures). No risk of avascular necrosis or nonunion
- The axillary nerve is in close proximity and should be assessed during the physical examination.

Proximal Humerus Fractures

Treatment ranges from conservative (arm sling) to operative (fixation or replacement) depending on fracture comminution and bone quality.



Humeral Shaft Fractures

- The patient presents with arm pain after trauma (either direct or indirect).
- Physical exam shows one or more of ^①swelling, ^②bruising, ^③deformity, or wounds.
- The radial nerve should be assessed as it lies in close proximity to the distal half of the humeral shaft.
- If injured the patient would have wrist drop and decreased sensation in the dorsal aspect of the first web space.

Note * When you think of displacement:

① Angulation ② Translation ③ Lateral Rotation is more common on spiral fractures.

Humeral Shaft Fractures

How the trauma happen? ...
past Medical Hx.

bending force

Lateral view

Putting

Cast

1 month after visit

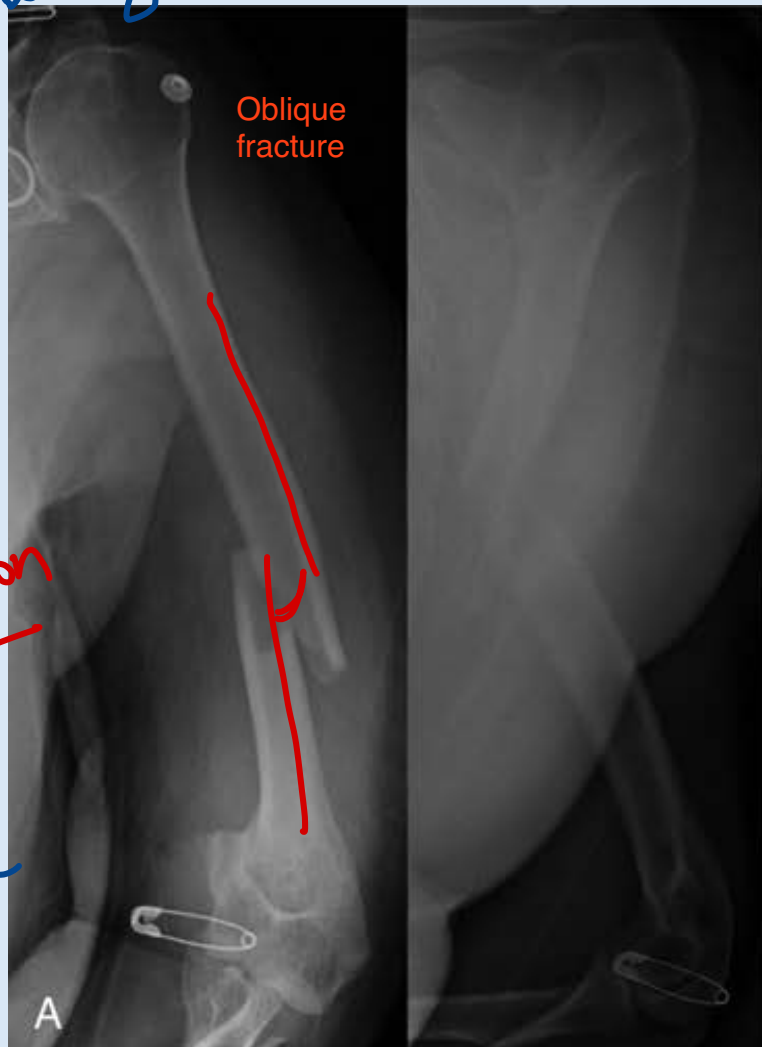
AP

Oblique fracture

Medial/Varus
Angulation

Functional
Repair

→ Secondary
healing
(Relative
Stability)



Humeral Shaft Fractures

- Notice in the previous slide the following:
- The first x-ray in the AP view there is medial translation of the distal piece with varus angulation (due to deltoid pull of the proximal piece). The lateral view shows posterior translation and posterior angulation of the fracture. Radial nerve here might be injured (it circulate the distal part of humerus), physical findings of radial nerve injury is wrist drop + sensory loss in the first soace
- The second x-ray (after 6 weeks) shows callus formation.
- The last x-ray (after 3 months) shows consolidation of the callus.
- This is an example of secondary (indirect) bone healing.

Here we did functional reduction, with secondary healing (callus is formed)

Humeral Shaft Fractures

Varus

Primary healing ← we don't see sign of healing.
↑ Absolute stability

- This is a similar fracture, it was treated by open reduction and internal fixation by a compression plate.
- This x-ray was taken 3 months after surgery.
- Notice the absence of callus, indicating that the fracture healed by primary (direct) healing.



Olecranon Fractures

- These are **intra-articular** fractures, so the treatment of choice is **anatomical reduction** (to avoid osteoarthritis) and **absolutely stable** fixation (to allow early movement thus preventing stiffness).
- The mechanism is usually an **avulsion injury** due to forceful pull of the triceps, that is why a **fracture gap is** usually seen.
- The next slide shows an olecranon fracture treated by **tension band wiring** which is a method of absolute stability.

Caused by avulsion injury (pull of muscle or tendon)



Olecranon Fractures

Lateral view of the elbow, intraarticular fracture. Triceps is pulling the triceps

Falling down

:

Avulsion injury



A



B

→ Absolute stability

→ Angulation

Forearm Fractures

- The radius and ulna act functionally as a joint as they pronate and supinate (the radius rotates around the ulna).
- As these fractures form one functional unit, a fracture in one bone usually is associated with an injury to the other bone (fracture or dislocation). However, isolated single bone injuries can occur.
- Considering the pronation/supination movement along these bones, they are treated by anatomical reduction and absolutely stable fixation (like intra-articular fractures).
- This does not apply to children as they have a high remodeling capacity.

Assist Supination, pronation
Forearm Fractures twisting RT<

it look extraarticular fracture
oblique fracture



it should be considered as
intraarticular fracture in
Adults.

Monteggia Fracture Dislocation

1. Fracture of the proximal half of the ulna.
2. Dislocation of the proximal radius.
3. Possible injury to the radial nerve as it turns around the radial neck.

If present this would result in finger drop at the MCP joints but not wrist drop as the nerve supply to the extensor carpi radialis longus already originated at a point proximal to the injury site.

Radial nerve supplies the muscle before reaching it

Any injury to the radial nerve from the elbow and distal will not result in wrist drop only finger drop



Galeazzi Fracture Dislocation

Dislocation of distal ulna

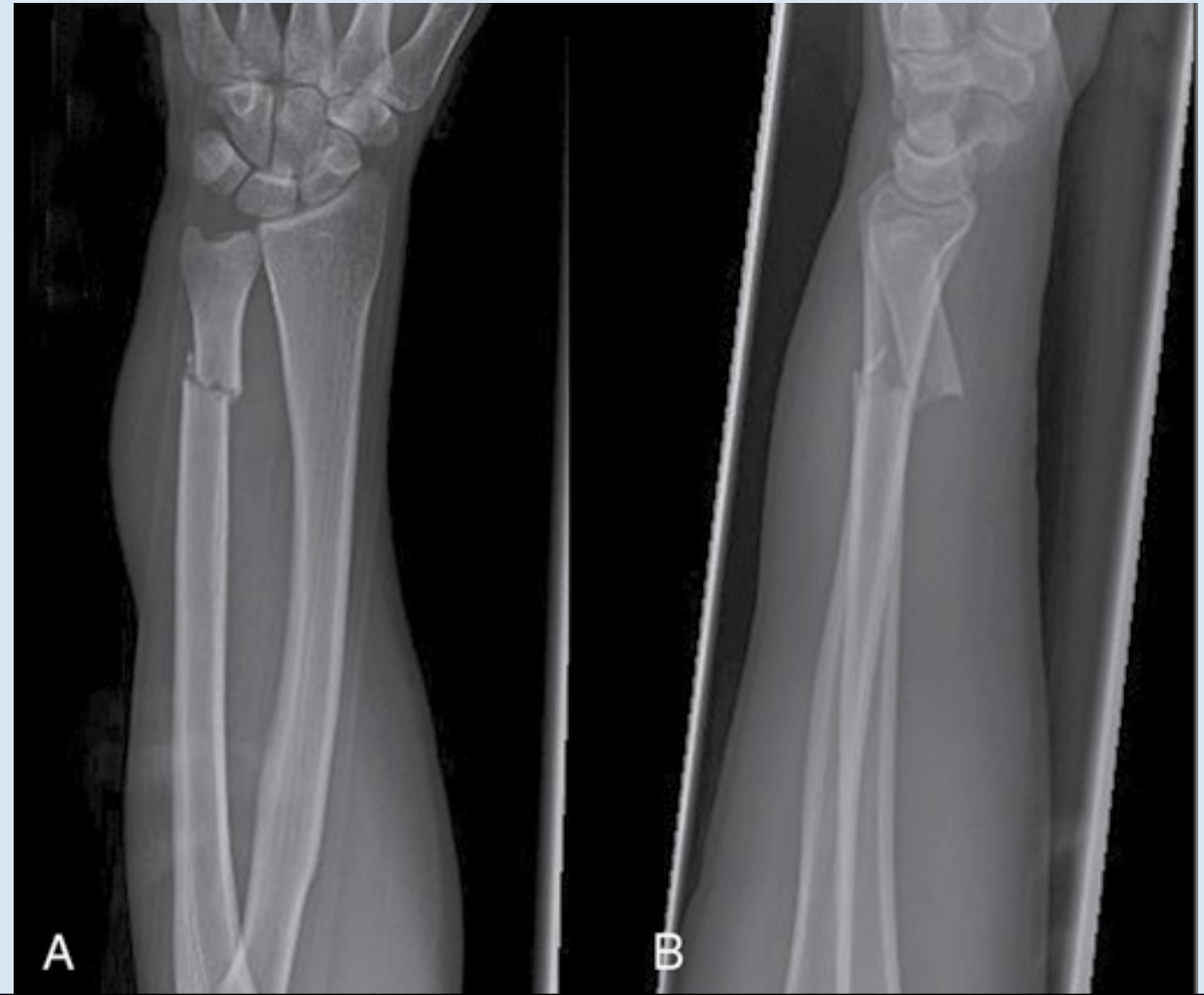
1. Fracture of the distal half of the radius.
 2. Dislocation of the distal ulna.
 3. Possible injury to the ulnar nerve.
- If present, this would result in weakness of finger abduction/adduction, and positive Froment's sign.

ما خط ورقة بين الأصابع، كانه
ما يقبل الخلفه تسحبها



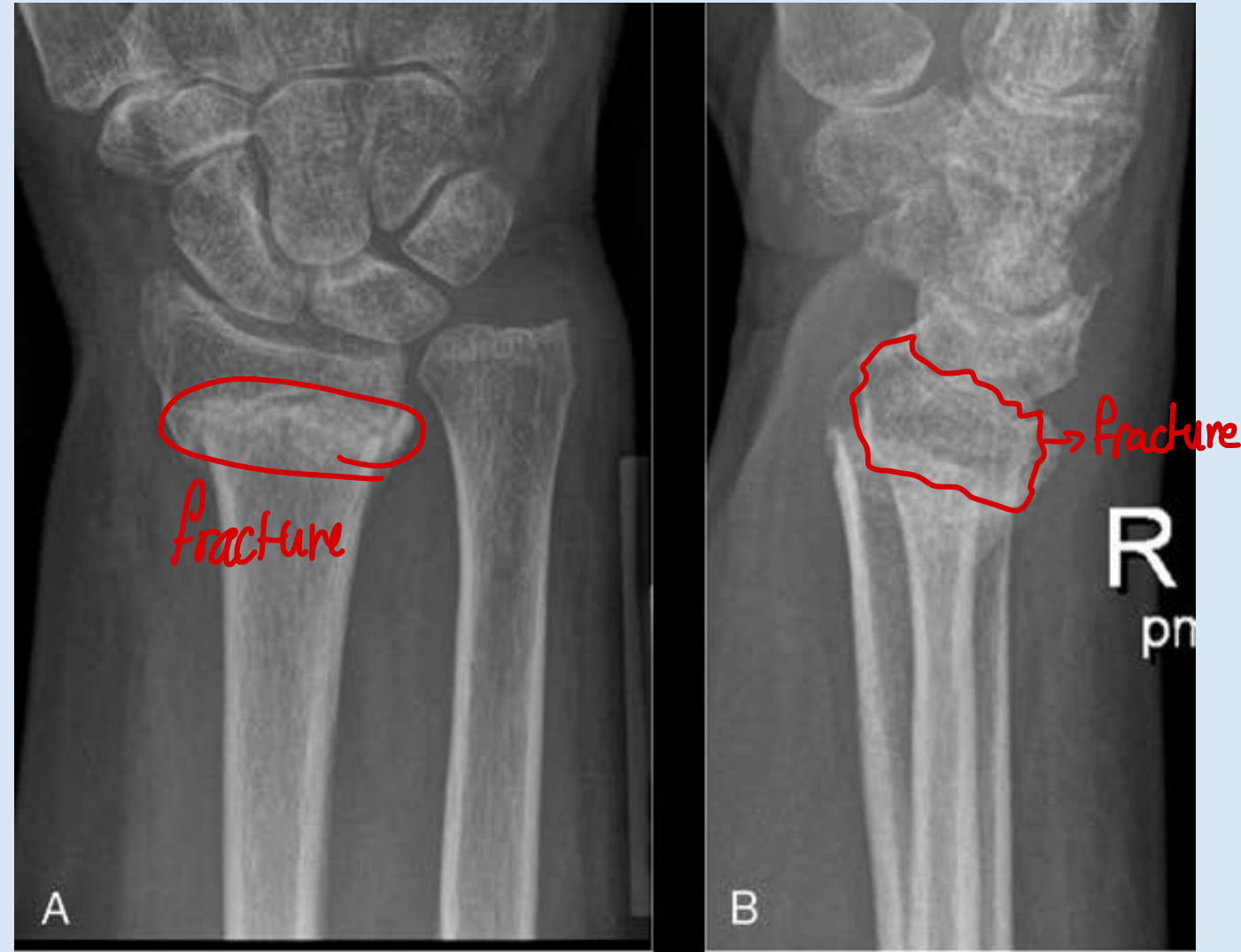
Isolated Ulna Fracture

- Also called nightstick injury.
- Results from a direct trauma to the ulna (you can see the transverse fracture pattern).
- The radius is intact.
- Has a risk of non-union, so surgical fixation is considered if conservative management fails.



Colles' Fracture

- A distal radius extra-articular fracture. *Due to hyperextension*
- Occurs in the elderly after a simple trauma (fragility fracture).
- Dorsally displaced (see the lateral view on the x-ray).
- Presents with wrist swelling called dinner fork deformity.
- Treatment usually closed reduction and casting for 6 weeks.



Smith's Fracture

- Also called **reverse Colles'** as it has the same features but with **volar** angulation.
- Caused by falling down with the wrist in flexion (in Colles' the wrist is in extension).
- Treatment is closed **reduction and casting** for **6 weeks.**

A P view same like Colles'



Barton's Fracture ← shearing force

- Intra-articular fracture.
- Best seen on the lateral view.
- Resembles a triangle (articular surface, fracture, cortex).
- Treatment is anatomical reduction and fixation.
- Can be volar or dorsal.



Radius shorter than Ulnar

Radius

Radial Styloid fracture

- Also called chauffeur fracture.
- Caused by sudden forceful radial deviation of the wrist.
- Intra-articular fracture.
- Treatment is anatomical reduction and fixation.

Forceful radial deviation

