

# Upper limb fractures

*: discontinuity of the cortex*

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# Topics

- Clavicle
- Scapula
- Humerus
- Elbow joint
- Forearm
- Wrist
- Hand

# Mechanism of Injuries

- Mostly Indirect
- Commonly described as " a fall on outstretched hand " foosh
- Type of injury depends on position<sup>①</sup> of the upper limb at the time of impact : Flexed, Extended, adducted, abducted, pronated or supinated
- Force of impact<sup>②</sup>

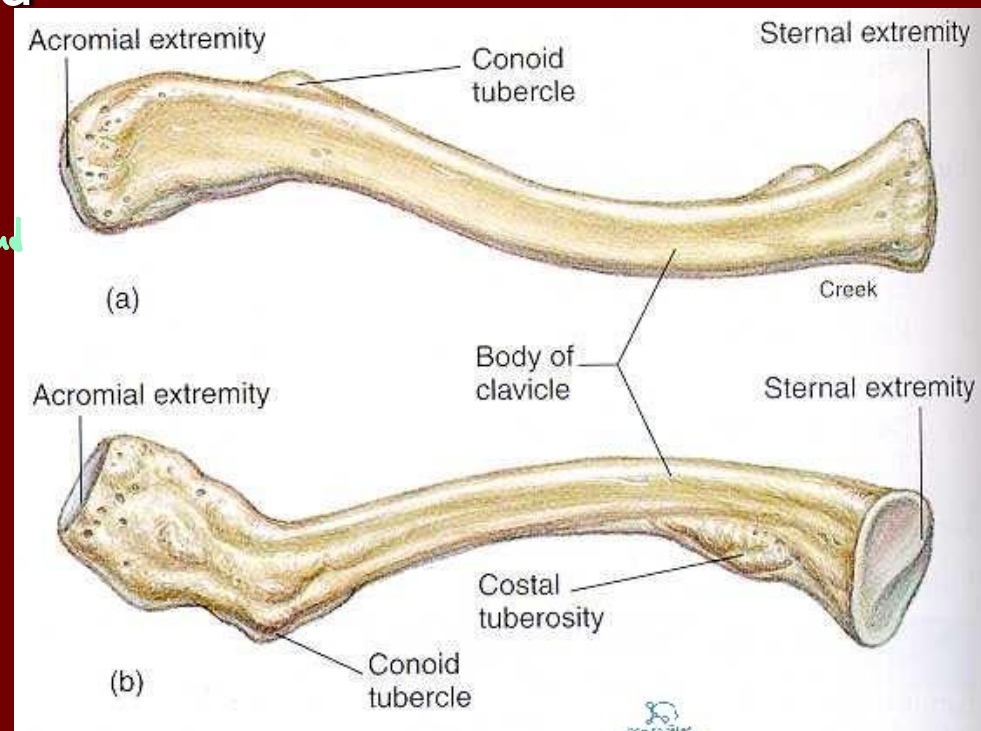
mechanism of trauma

# Clavicle Fractures

## ■ Mechanism

- Lateral compression (Commonest)
- Direct blow (comminuted)
- Fall on outstretched hand

The clavicle is the last ossification center to complete (sternal end) *medial end* at about 22-25yo.



## ■ Midshaft:

- Most common *?? bcz it's thin & no protection with M.S*

## ■ Distal:

- Lateral compression injuries
- Older patients, lower energy

## ■ Medial:

- Rare, usually high energy direct blow  
*usually with associated injury*

# Clavicle Fractures



# Clavicle Fractures

→ multiple or single  
trauma?  
Stable or Unstable?  
↓  
hX (mechanism  
of trauma)  
physical  
Vitals

## ■ Clinical Evaluation

- Skin integrity
- Inspect and palpate for deformity/abnormal motion
- Thorough distal neurovascular exam
- Auscultate the chest for the possibility of lung injury or pneumothorax (*chest examination*)

## ■ Radiographic Exam

- AP + cephalic view
- Upright AP clavicle ?? , Bilateral  
↓



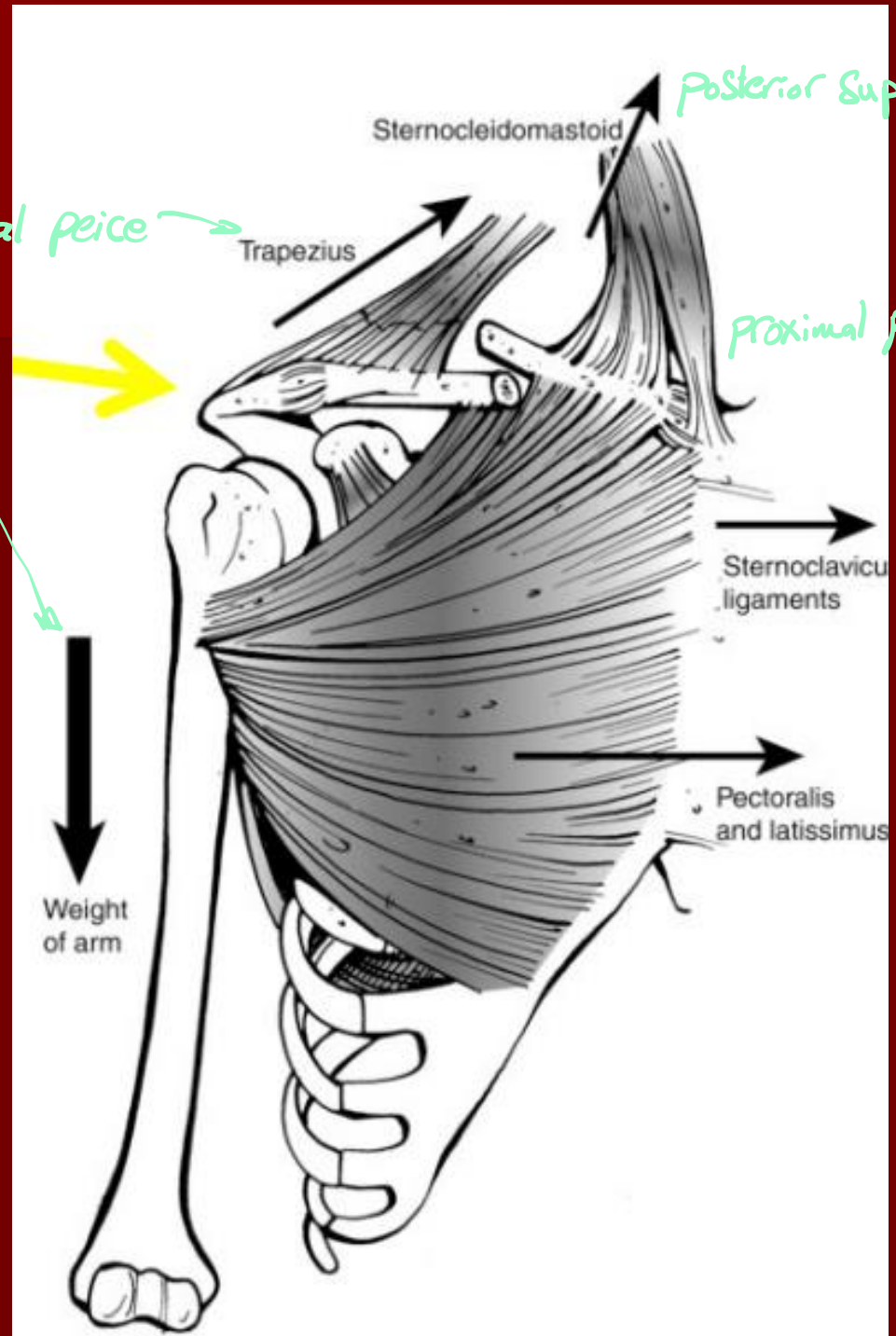


downward + anterior

lateral peice

Posterior Superior

Proximal peice



Weight of arm

Sternocleidomastoid

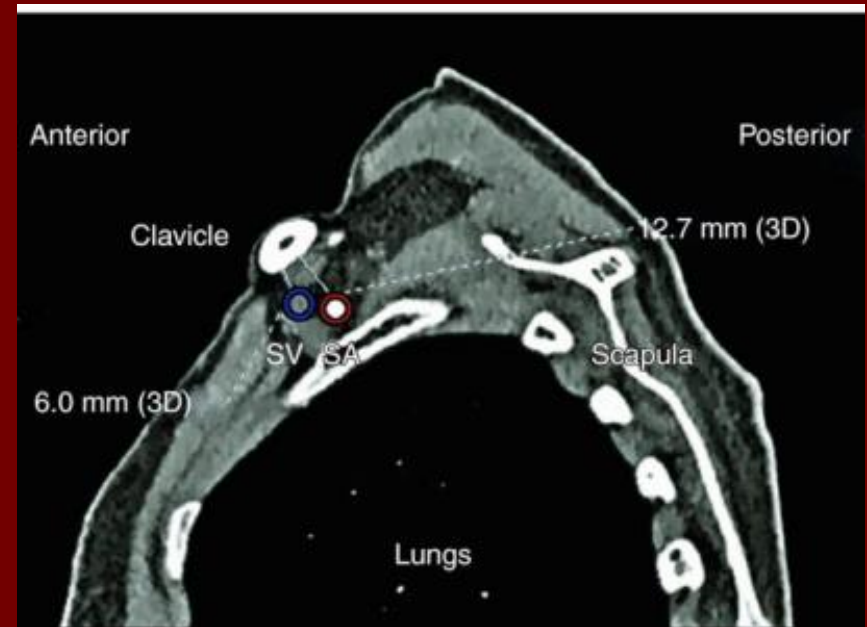
Trapezius

Sternoclavicular ligaments

Pectoralis and latissimus

# Associated injuries

rib fx  
hemothorax  
Pneumothorax  
vascular injury (major)  
brachial plexus injury  
lung injury



- reduction
- immobilization
- rehabilitation

# Clavicle Fracture

- Closed Treatment → for shortening  $< 2\text{cm}$ 
  - Sling immobilization for usually 4-6 weeks with early ROM
- Operative intervention → for shortening  $> 2\text{cm}$ 
  - Fractures with neurovascular injury
  - Fractures with severe associated chest injuries
  - Open fractures
  - Non-accepted alignment
  - Cosmetic reasons, uncontrolled deformity
  - Nonunion → especially with overlap

plates & screw

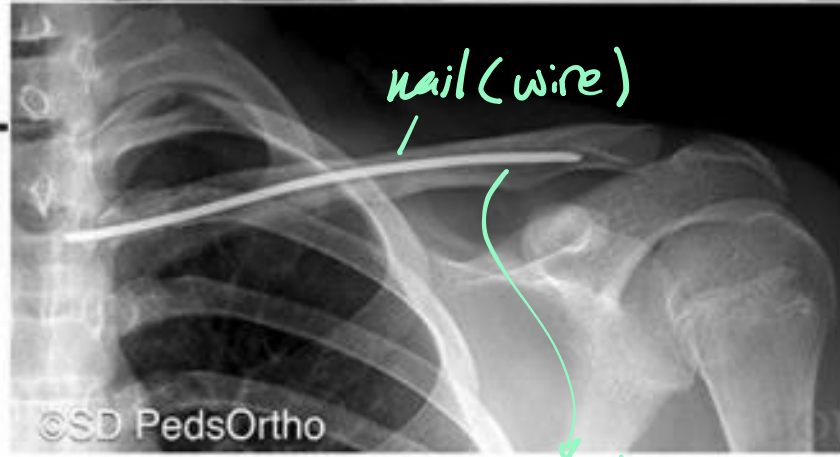


### Intramedullary fixation

Pre-op



Post-op



nail (wire)

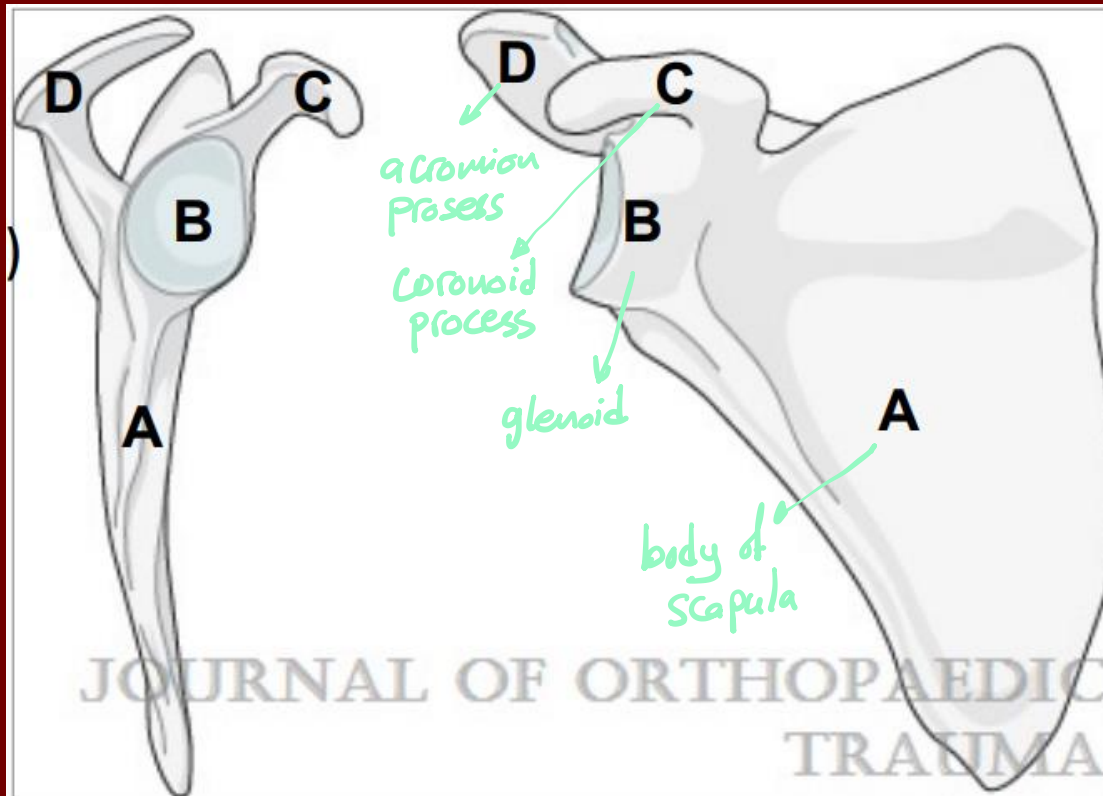
in medullary canal

# Scapula fractures

- Uncommon ~1% of all fractures
- 50% Scapular Body & Spine

bcz surrounded by M.S & protected by thoracic cage  
Pin it is high blood supply

bcz of that  
Usually Scapula  
fx treated  
conservatively

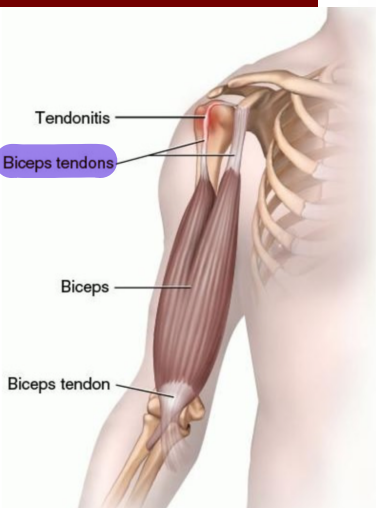
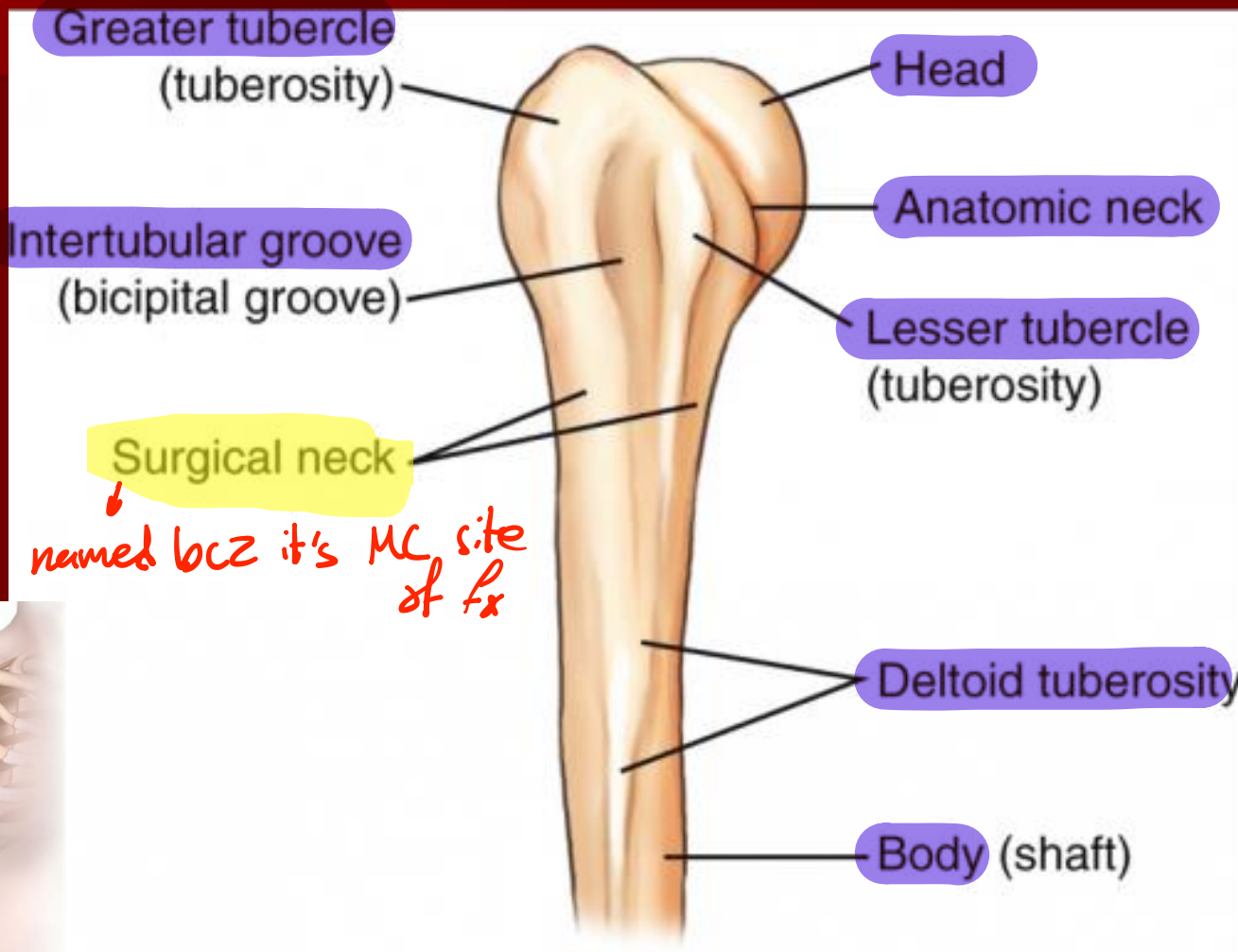




CT with 3D construction



# Proximal Humerus Fractures



# Proximal Humerus Fractures

*Surgical neck fx*





# Proximal Humerus Fractures

## ■ Epidemiology

- Most common fracture of the humerus
- Higher incidence in the elderly → *bcz of osteoporosis*
- Females > males
- Osteoporosis related fracture

## ■ Mechanism of Injury

- Most commonly a fall onto an outstretched arm from standing height
- Younger patient typically present after high energy trauma such as MVA

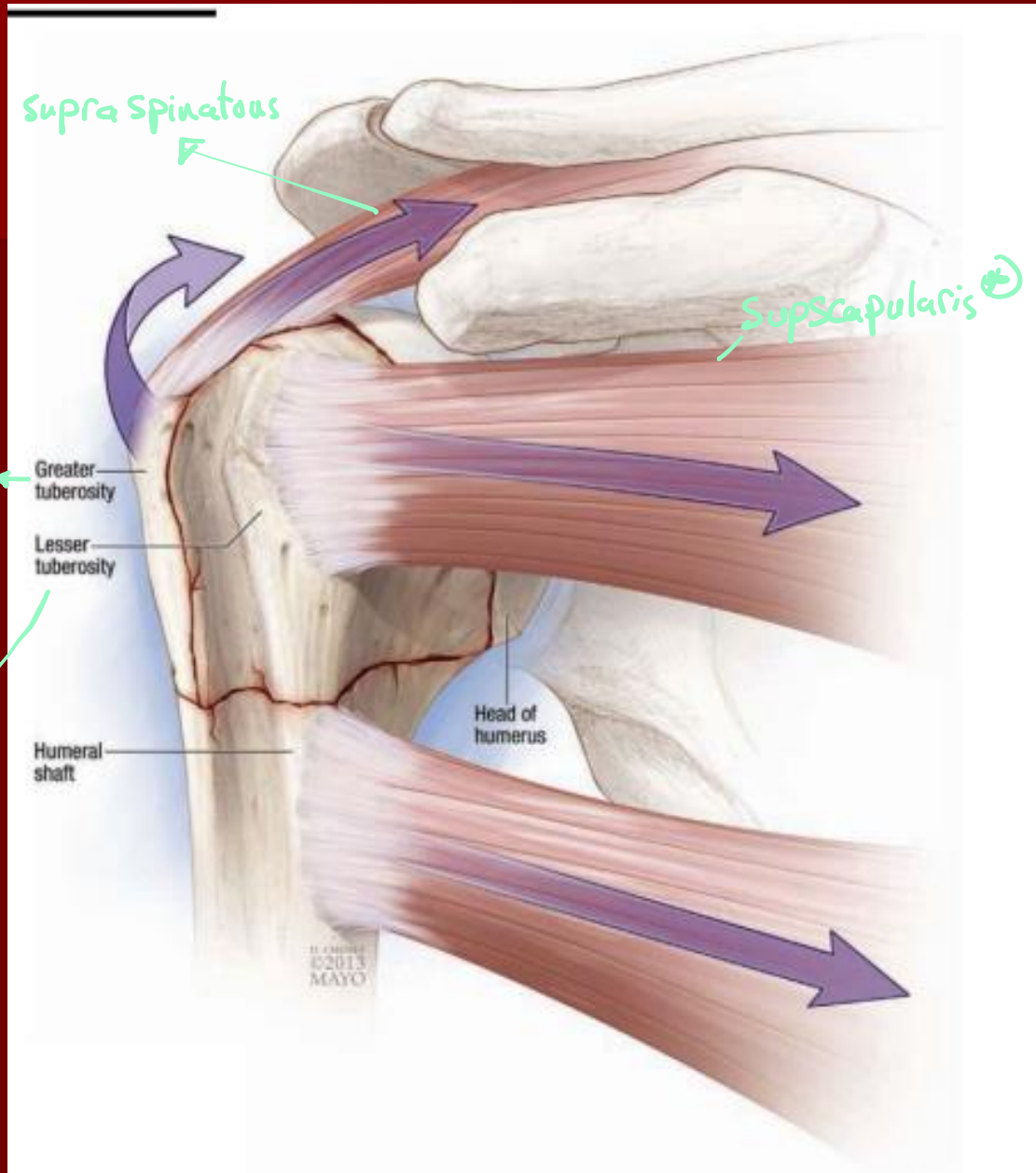
*old age*

*RTA*

# Proximal Humerus Fractures

- Clinical Evaluation *Sever Pain*
  - Patients typically present with arm held close to chest by contralateral hand.
  - Careful NV exam is essential, particularly with regards to the axillary nerve.
  - Majority are isolated low energy injuries

# ≠ deformity box of M.s



M.s inserted here:

- Supra spinatous
- infra spinatous
- teres minor

M. inserted is ⊕

ILLUSTRATION ©2013 MAYO



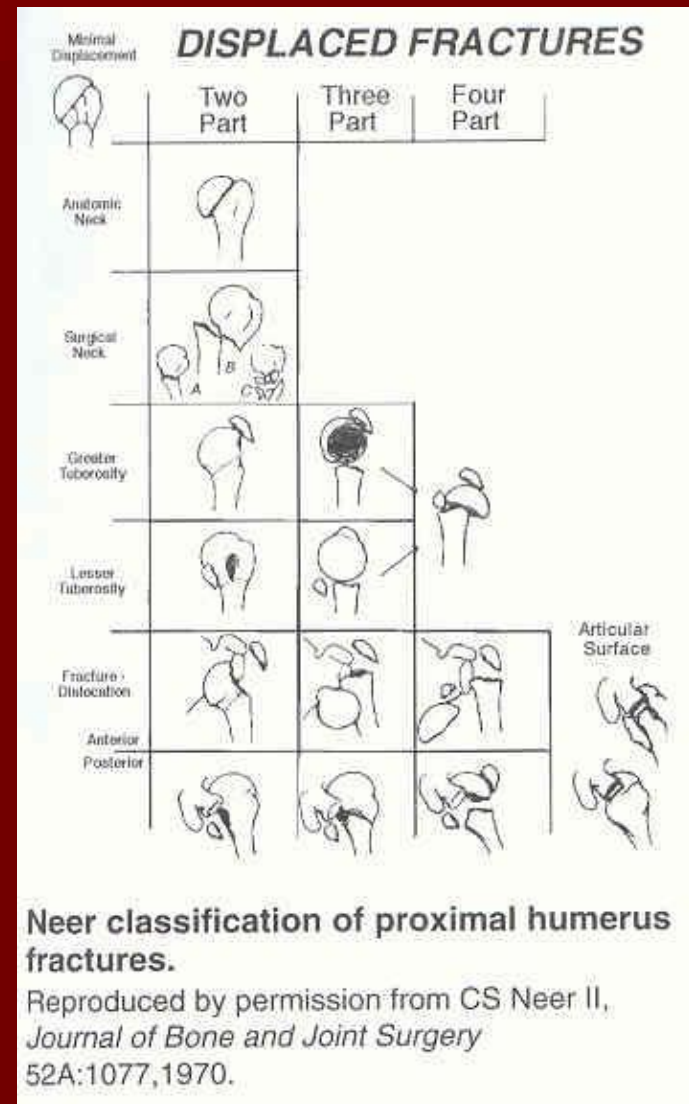
# Proximal Humerus Fractures

## ■ Neer Classification

– Four parts

- Greater
- Lesser tuberosities,
- Humeral shaft
- Humeral head

– A part is displaced if  
>1 cm displacement or  
>45 degrees of  
angulation is seen



# Proximal Humerus Fractures

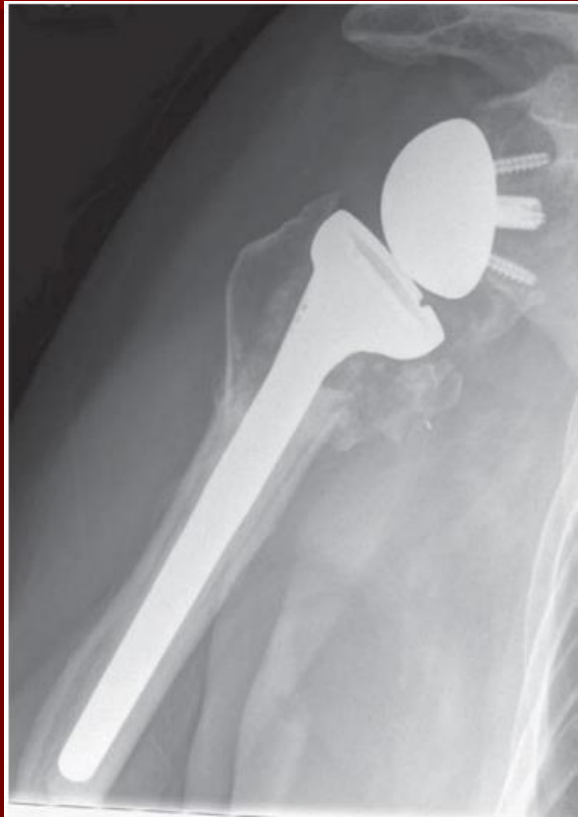
## ■ Treatment

- **Nonoperative** → in greater tuberosity + displacement < 0.5 cm

Just arm sling

- **Operative** → intraarticular fx

- Closed reduction and percutaneous pinning
- Open reduction internal fixation
- Arthroplasty → severe distraction ⇒ shoulder prosthesis



↓  
plate & screws

# Complications

Late Complications:

- **Malunion** → may affect function of M. attached to that point of bone
- Tuberosity malunion may cause rotator cuff dysfunction → 4 M.s:
  - Supscapularis
  - Supraspinatus
  - infraspinatus
  - teres minor
- **Nonunion**
- **AVN**

Early complications for surgery:

- infection ← bone surroundings
- bleeding

# Humeral Shaft Fractures

أكثر شيئا العنق الكلي

→ radial N.  
especially in  
distal shaft

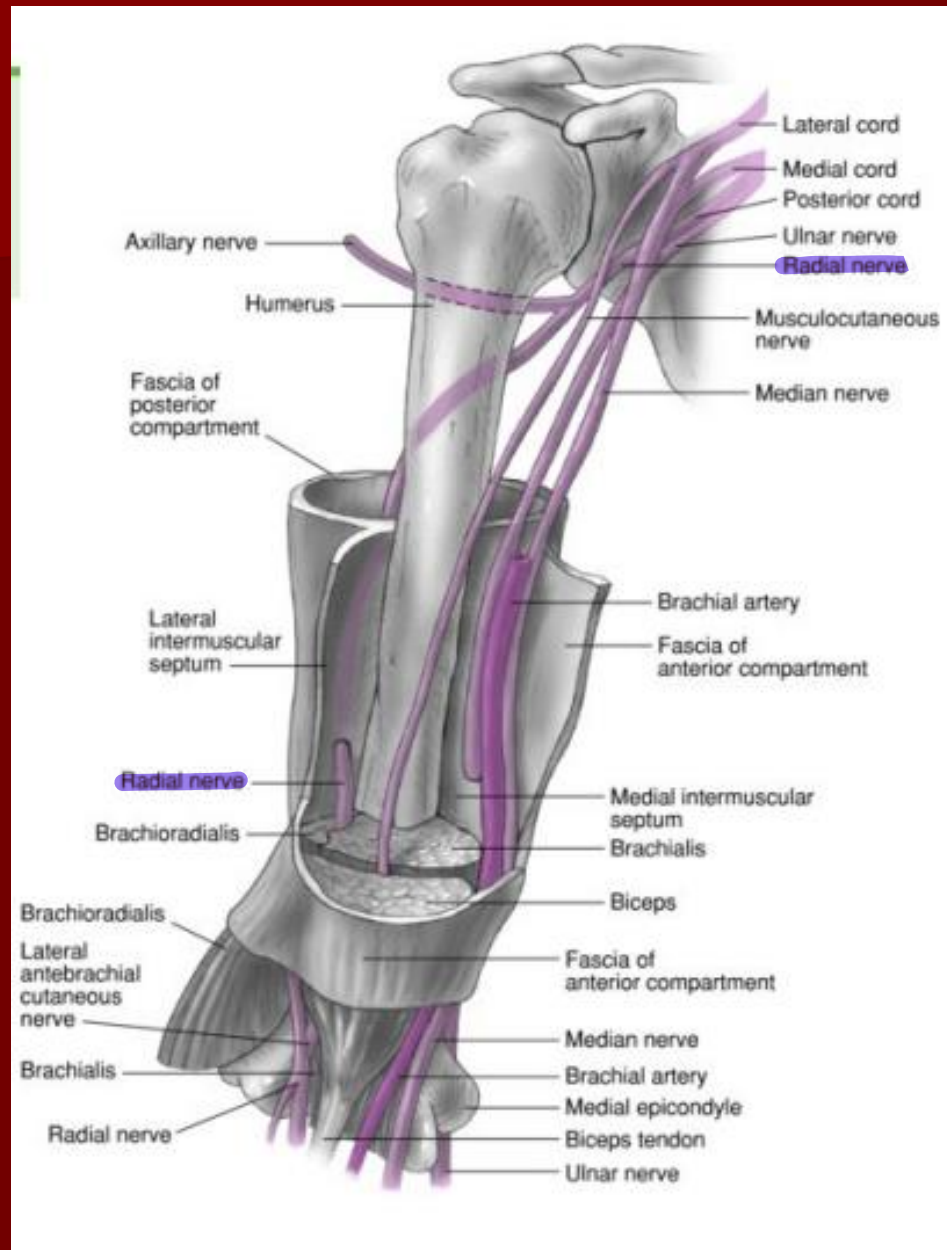
← أهم شي  
NV injury !!



\* radial N.  
injury causing  
wrist drop



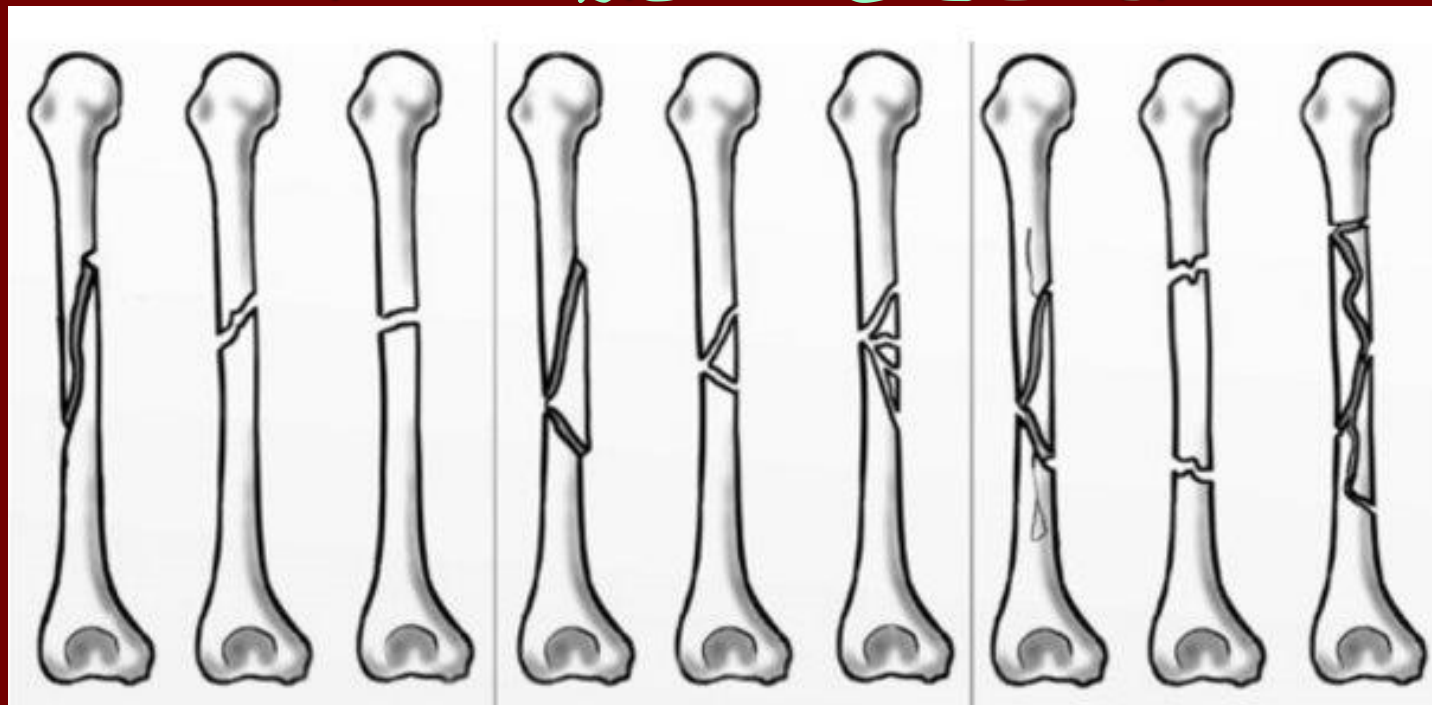
humeral shaft surrounded by M.s  $\Rightarrow$   $\uparrow$  healing



# Humeral Shaft Fractures

## ■ Mechanism of Injury

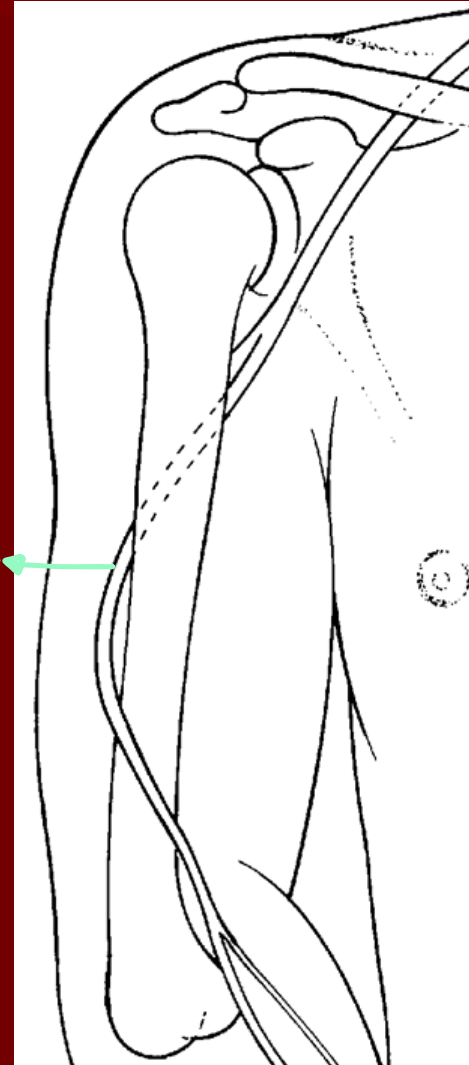
- Direct trauma is the most common especially MVA
- Indirect trauma such as fall on outstretched hand
- Fracture pattern depends on stress applied (*force; direction & amount*)

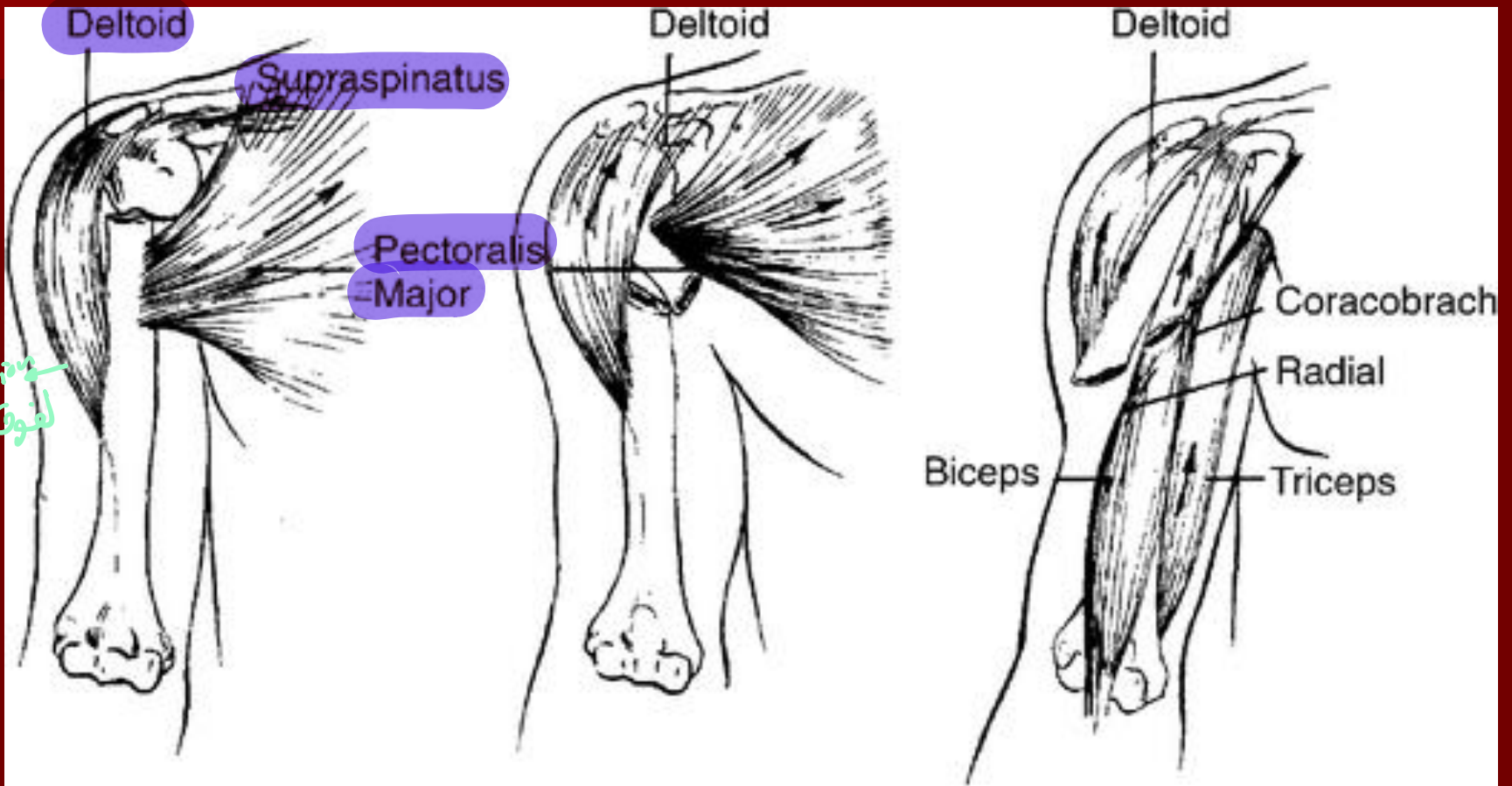


# Humeral Shaft Fractures

- Clinical evaluation
  - Thorough history and physical exam
  - Pain, swelling, and deformity of the upper arm
  - Careful NV exam

radial N.  
↓  
directly on shaft!!



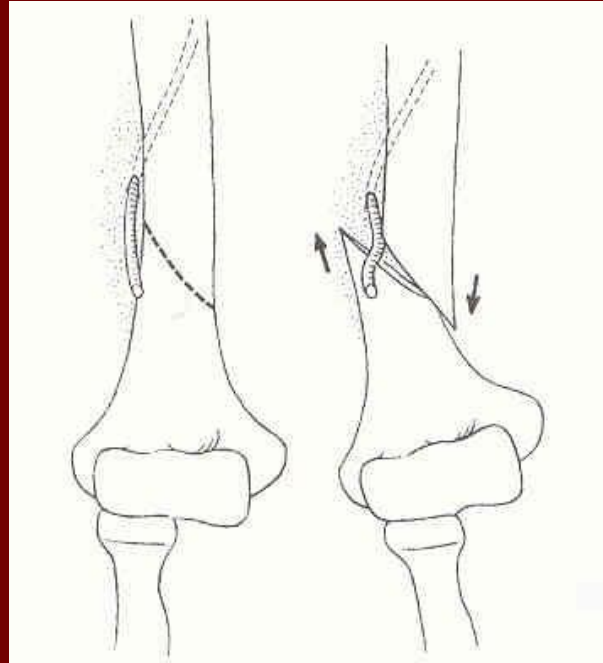
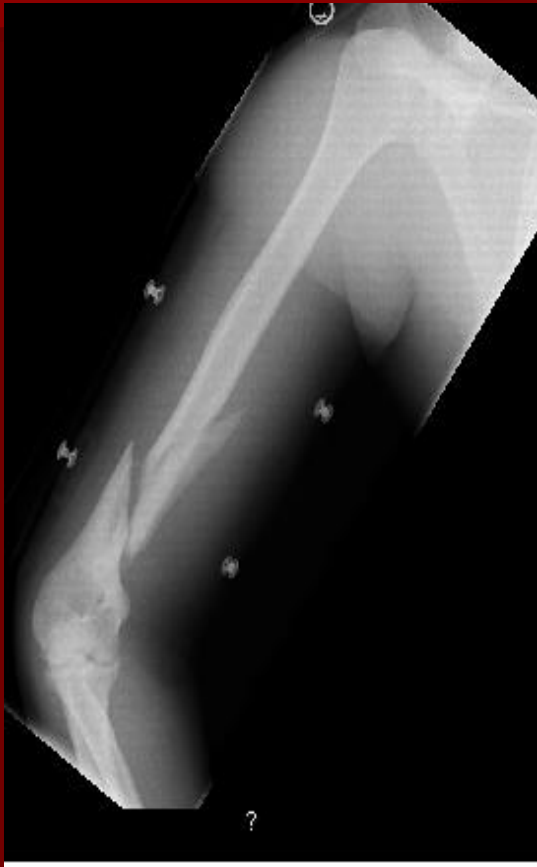




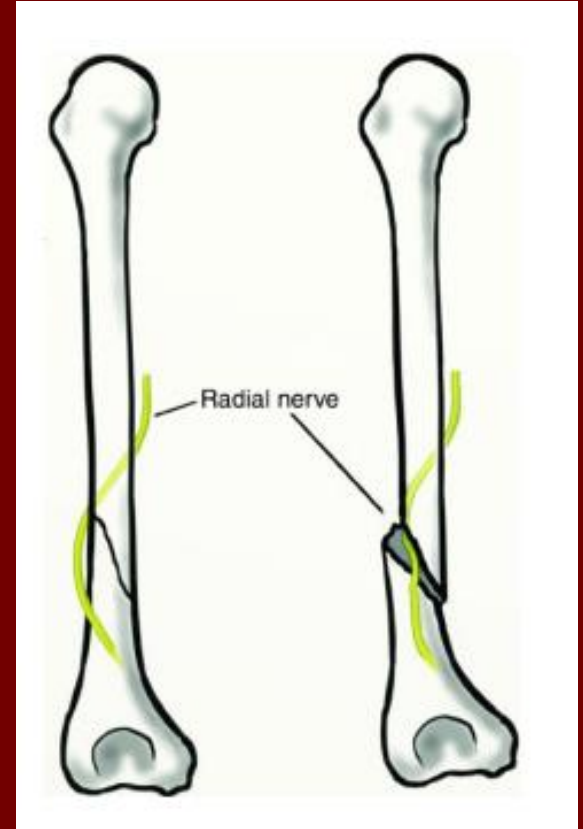
# Humeral Shaft Fractures + Radial N. injury

↳ indication for open reduction (surgery) →

ممکن یکن داخل داخل



**Holstein-Lewis fracture.**  
Reproduced by permission from A Holstein and GB Lewis, *Journal of Bone and Joint Surgery* 45A:1382, 1963.



# Humeral Shaft Fractures

## ■ Conservative Treatment

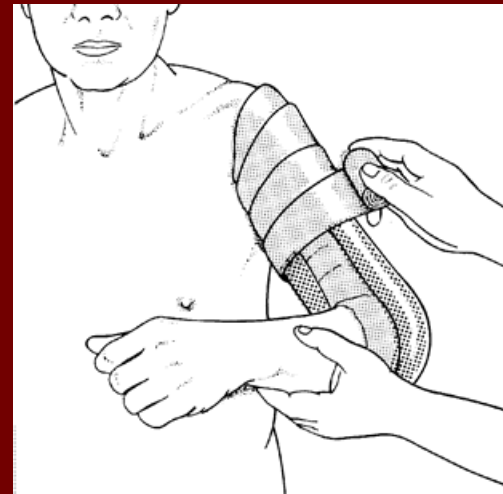
- Goal of treatment is to establish union with acceptable alignment



functional reduction:

- length
- alignment
- rotation

↳ How we know?  
image for 2 joints  
(above & below)

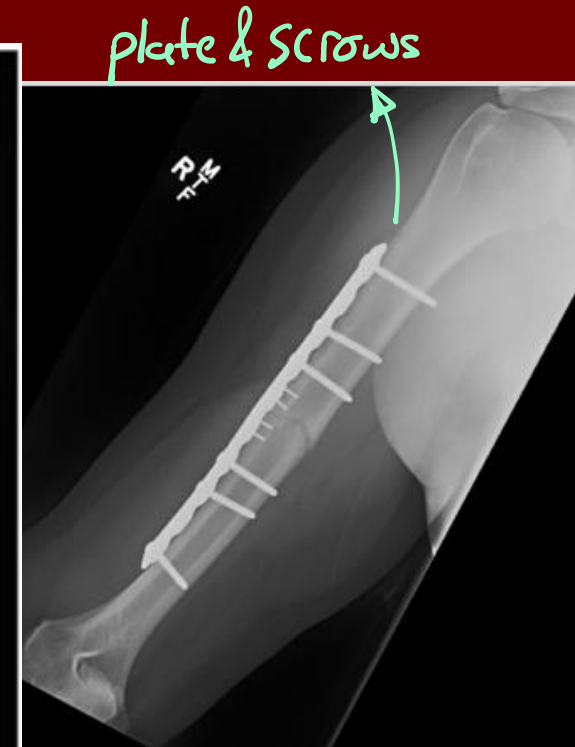


# Humeral Shaft Fractures

## ■ Treatment

### – Operative Treatment

- Indications for operative treatment include inadequate reduction, nonunion, associated N.V. injuries, open fractures, segmental fractures, associated vascular or nerve injuries



→ intramedullary nail

# Distal Humerus fractures

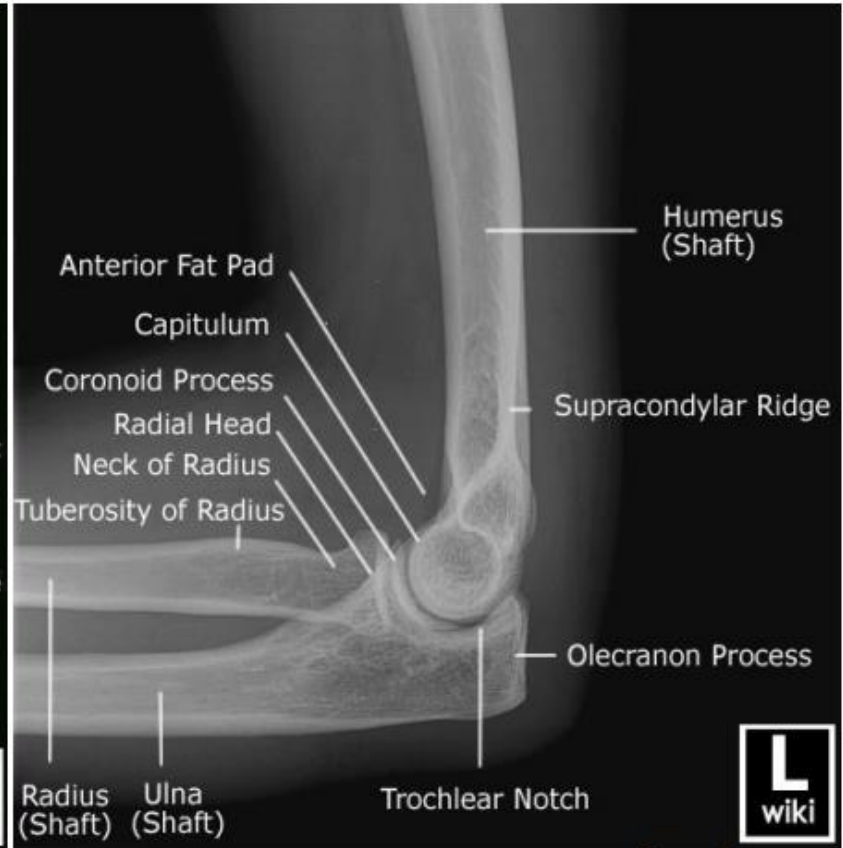
بوجود حالة

intraarticular extension  $\Rightarrow$  need anatomical (open) reduction

AP Xray



Lateral Xray





needs open reduction & internal fixation



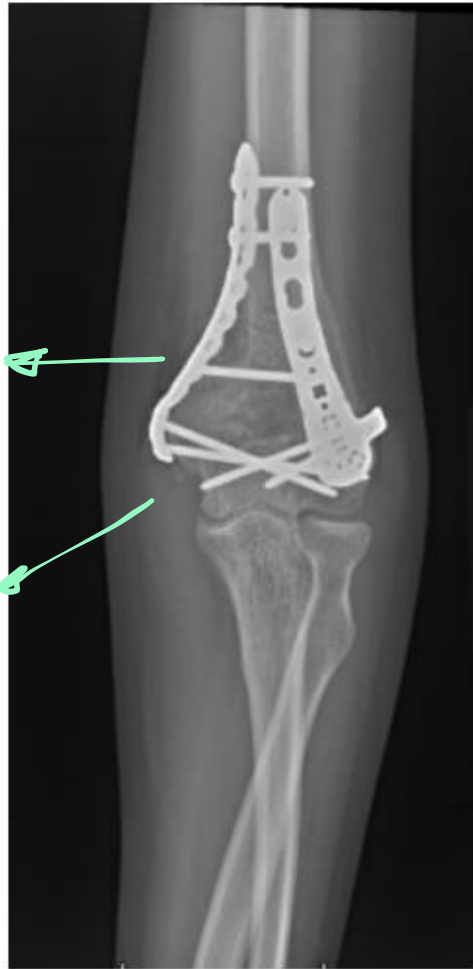
may be associated with elbow dislocation

Key points

- a. Anatomic reduction
- b. Stable fixation
- c. Early mobilization

2 plates for  
fixation

distal humerus  
intra articular fx



\* if Comminuted &  
we can't fixate  
we do prosthesis

elbow  
arthroplasty

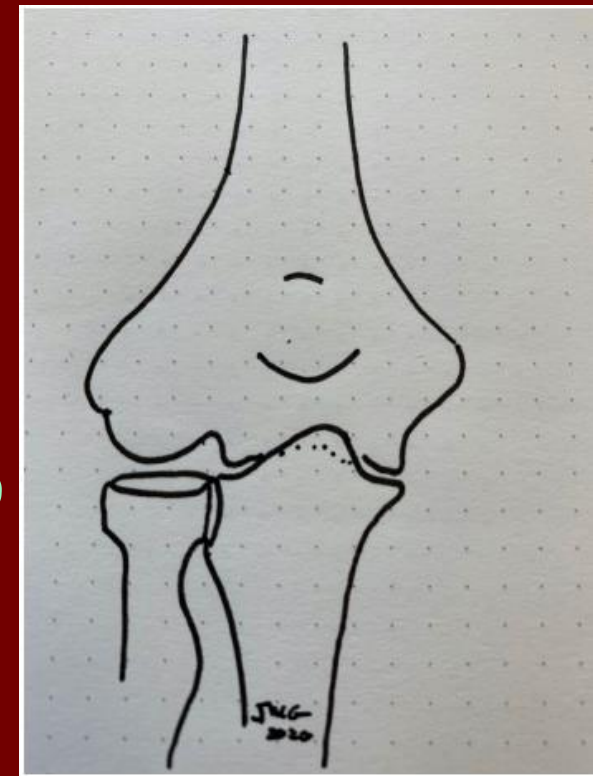


# Elbow dislocations

- Three distinct joints
  - Humeral(trochlea) – ulnar
  - Humeral(capitellum) – radial
  - Proximal radial-ulnar(PRUJ)

*Supination & pronation*

*\* Examined while elbow flexed*



# Elbow Dislocations

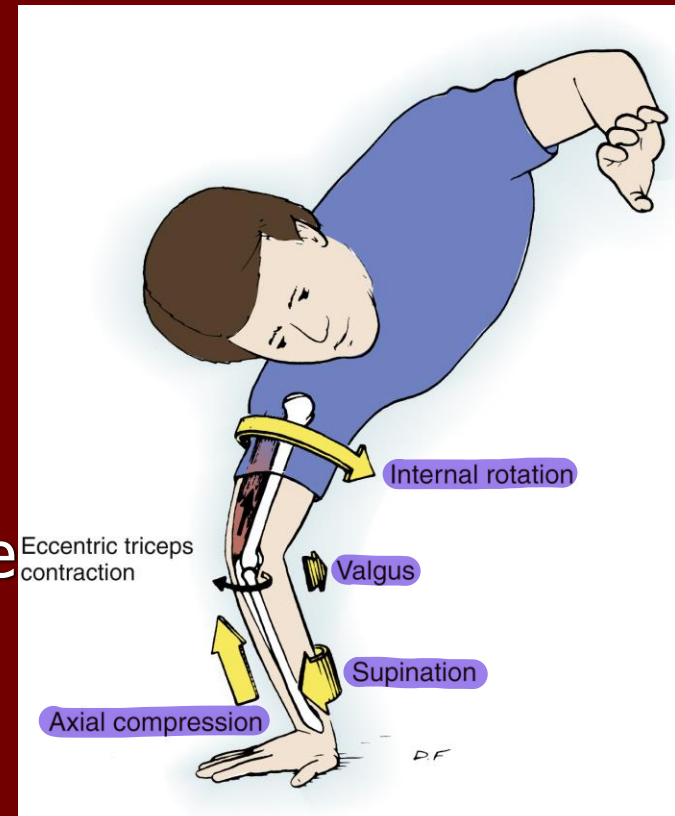
## ■ Epidemiology

- Posterolateral dislocations..... most common
  - Highest incidence in the young 10-20 years and usually sports injuries
- by distal*  
*peice location (olecranon)*

## ■ Mechanism of injury

- Usually a combination of
  - Axial loading
  - Supination/external rotation of the forearm
  - Valgus posterolateral force

*mechanism*



# Elbow Dislocations

## ■ Clinical Evaluation

- Patients typically present guarding the injured extremity *يكون حامل إيدته المكسورة*
- Usually has gross deformity and swelling
- Careful NV exam is important and should be done prior to radiographs or manipulation
- **Repeat after reduction** *مهم*

أول واهل  
المريض  
+  
بعد reduction

## ■ Radiographic Evaluation

- AP and lateral elbow films should be obtained both pre and post reduction للتأكد أنه عاد بشكل صحيح
- Careful examination for associated fractures

- ## ■ Treatment → *urgent reduction: initially closed reduction, and if failed we do open reduction*

# Simple dislocation

↳ without fx



posterolateral dislocation



# Complex dislocation

↳ with fx





# Elbow Dislocations

## ■ Associated injuries

– Terrible triad ??

- radial head fx
- elbow dislocation
- coronoid fx



# Olecranon fracture

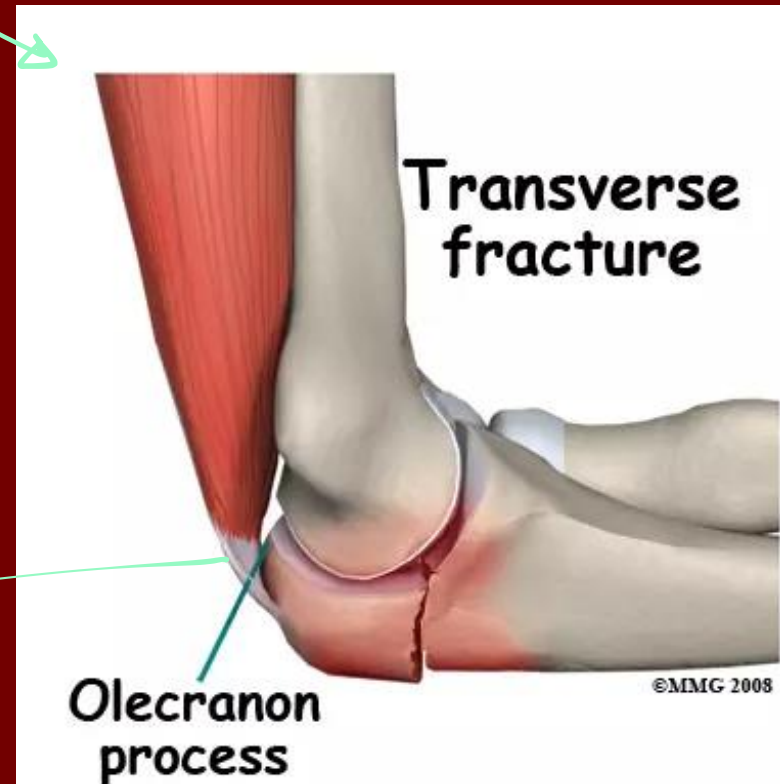
→ articular surface  
needs anatomical  
reduction

→ Simple

- **Avulsion fracture**: Tension applied by the triceps with flexion of the elbow

- **Direct Trauma** → Comminuted  
fx

triceps tendon ←



# Avulsion fx



AP View



Lateral View



Oblique View  
(sometimes helpful,  
good for Radial Head)

# Treatment

→ Surgery: anatomical reduction  
plates & screws  
tension bands (wires)

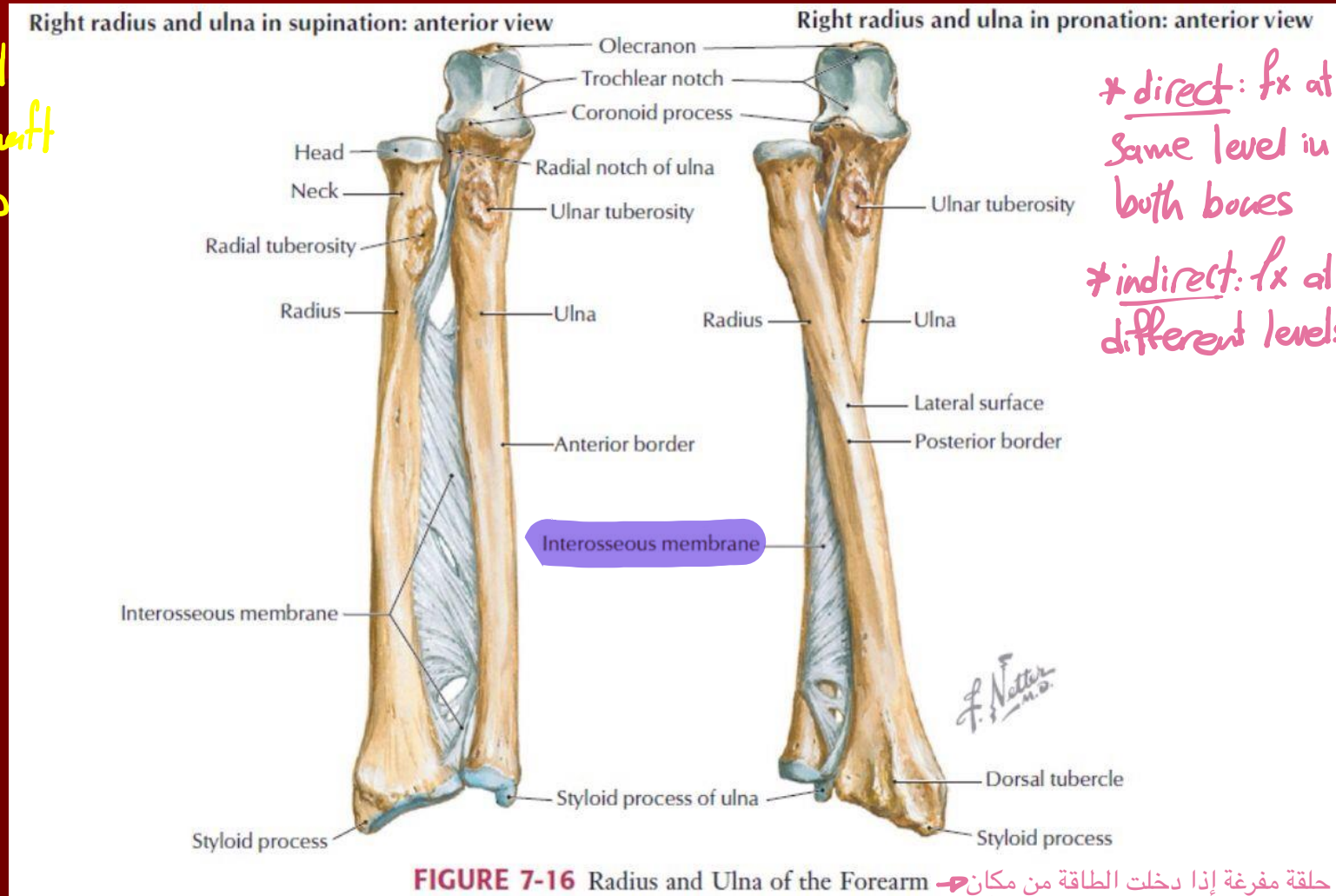


# Forearm Fractures

it's a joint - bcz has movement pronation & Supination

bcz of that  
fx in radial  
or Ulnar shaft  
we must do  
anatomical  
reduction

\* without  
anatomical  
reduction  
(shortening  
& affecting  
pronation,  
Supination)



\* direct: fx at  
same level in  
both bones  
\* indirect: fx at  
different levels

FIGURE 7-16 Radius and Ulna of the Forearm - حلقة مفرغة إذا دخلت الطاقة من مكان -> تخرج من الآخر

if there is an Ulnar fx only no :: there is dislocation in proximal or distal radioulnar joint

direct trauma



# Forearm Fractures

open both bone forearm fx - direct trauma



\*gastillo classification very imp to know:

- how much irrigation you need
- what is prognosis of this case and
- what is the type of antibiotic need

Type I → 1st generation cephalosporin

Type II → aminoglycoside + gentamicin (gram<sup>cover</sup> -ve)

\*open fx: connection btw bone & external environment

→ treated by: -in ER-

- Analgesia
- irrigation
- Antibiotic
- Anti-tetanus
- dressing



# Forearm Fractures

## ■ Clinical Evaluation

- Gross deformity of the forearm and pain, swelling, and loss of function
- Careful <sup>N.V.</sup> exam is essential, with specific assessment of radial, ulnar, and median nerves and radial and ulnar pulses

## ■ Radiographic Evaluation

- AP and lateral radiographs of the forearm
- Don't forget to examine and x-ray the elbow and wrist → *check rotation & dislocation*

# Treatment

*plate & screws*

- Most fractures are operative in adults

*both bones* →





# Monteggia Fracture

Proximal

- Ulna shaft fracture with radial head dislocation (PRUJ instability)





# Galeazzi Fracture

2 peaks → extremes of age (pedi. & elderly)

- Distal 1/3 radial shaft fracture with potential DRUJ instability.

↓  
distal

dislocation

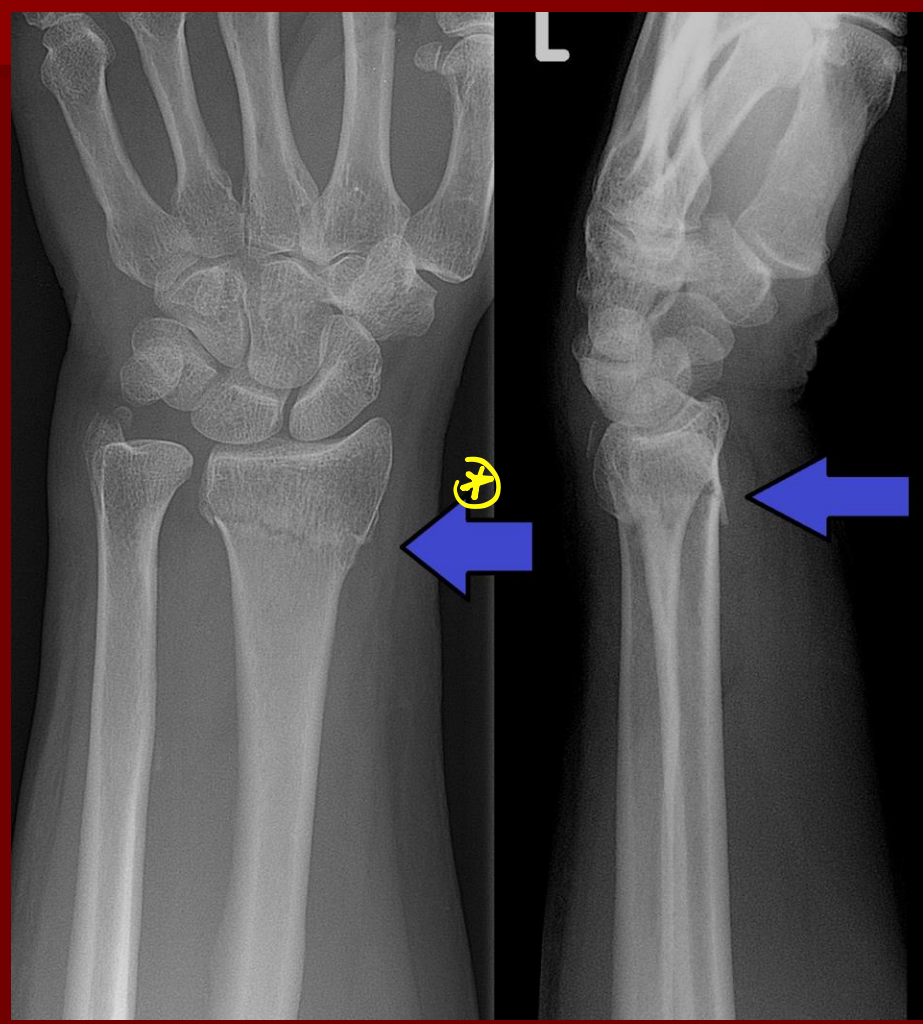


2 peaks → extremes of age (pedi. & elderly)  
↳ in time (summer ↔ pedi) (winter ↔ elderly)

# Distal Radius Fractures

↳ one of osteoporotic fx

intra articular  
extra " ⊕



# Eponyms

|                                           |                                                                           |
|-------------------------------------------|---------------------------------------------------------------------------|
| Die-Punch Fracture<br><i>articular fx</i> | Depressed fracture of lunate fossa of articular distal radius             |
| Barton's Fracture                         | Fracture dislocation of radial carpal joint involving volar or dorsal lip |
| Chauffer's Fracture                       | Radial Styloid Fracture                                                   |
| * Colles' Fracture                        | Low energy <u>dorsally displaced</u>                                      |
| * Smith's Fracture                        | Low energy <u>volarly displaced</u>                                       |

*distal radius*

*distal radius*

# Distal Radius Fractures

## ■ Epidemiology

- Most common fractures of the upper extremity *& in pedi.*
- Common in younger and older patients.
- Usually Fall on out stretched hand
- Increasing incidence due to aging population

♀ MC fx in pediatrics  
and needs for surgery:

Supracondylar  
humeral fx

# Distal Radius Fractures

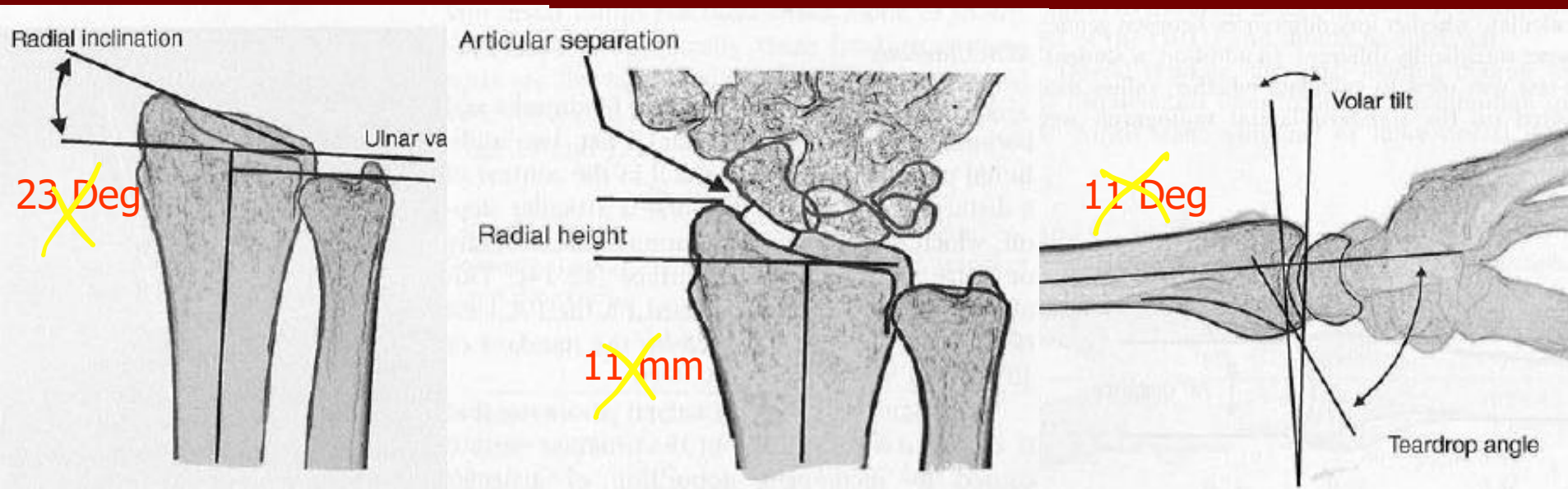
## ■ Clinical Evaluation

- Handedness & Job ⇒ Very imp in hx  
*دائماً* (always) *أعمال* (work) *fine motor function*
- Gross deformity of the wrist with variable displacement of the hand in relation to the wrist.
- Typically swollen with painful ROM
- NV exam including specifically median nerve for acute carpal tunnel compression syndrome  
*دع* (note) *indication for surgery*

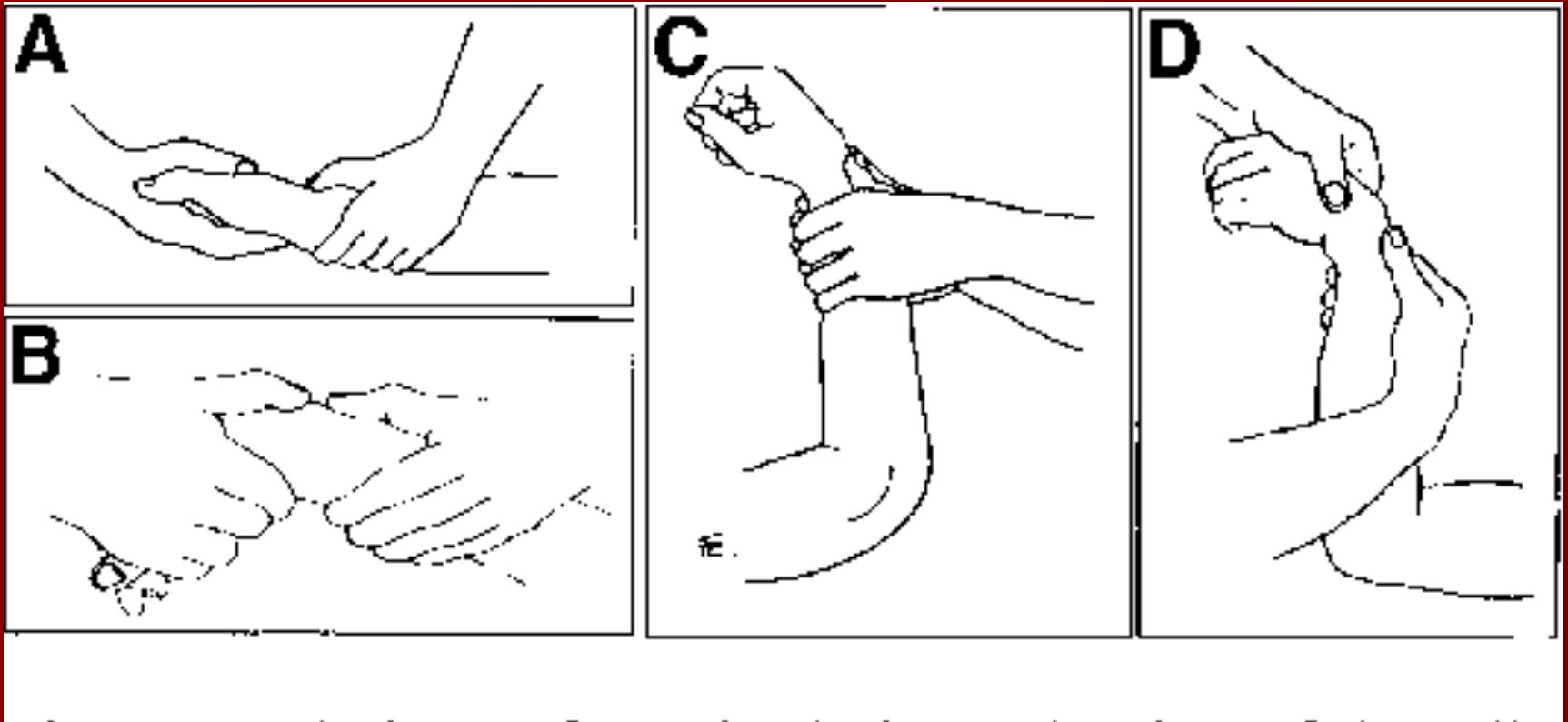


# Radiographic Evaluation

- 3-view of the wrist including AP, Lat, and Oblique
  - Normal Relationships



# Treatment



Closed reduction & Cast

# Treatment

## Percutaneous Pins



plate



D

8 year old woman with an intra-articular, unstable

# Carpal Fractures



*Names of bones are*

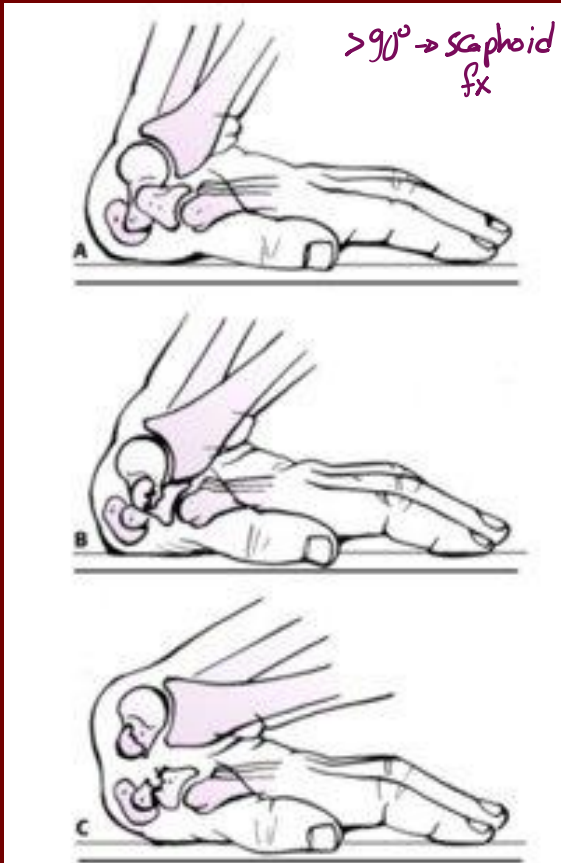
# Carpal Fractures

- Most common is fall on outstretched hand (axial compression)

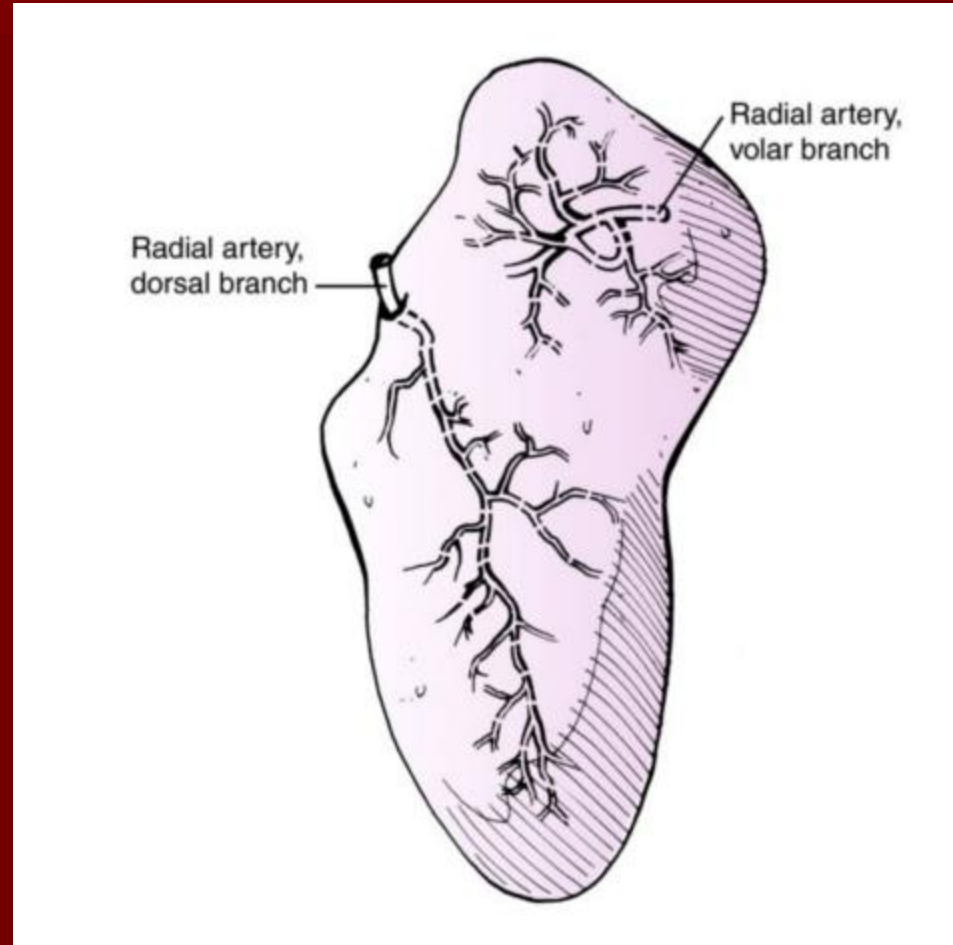
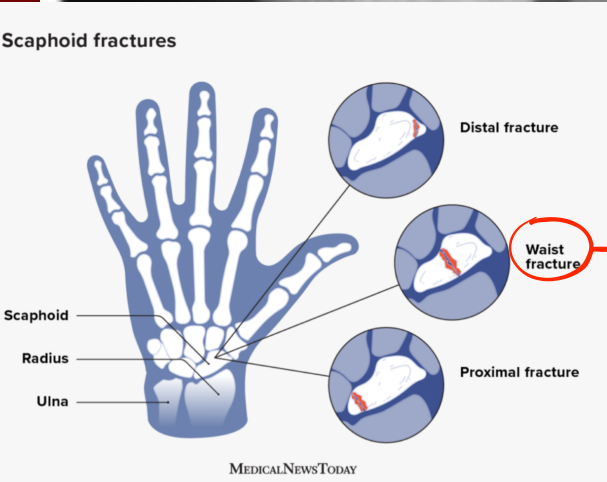
\*according to  $\pm$  of extention

$>90^\circ \rightarrow$  scaphoid (hyper extension)

$<90^\circ \rightarrow$  radius



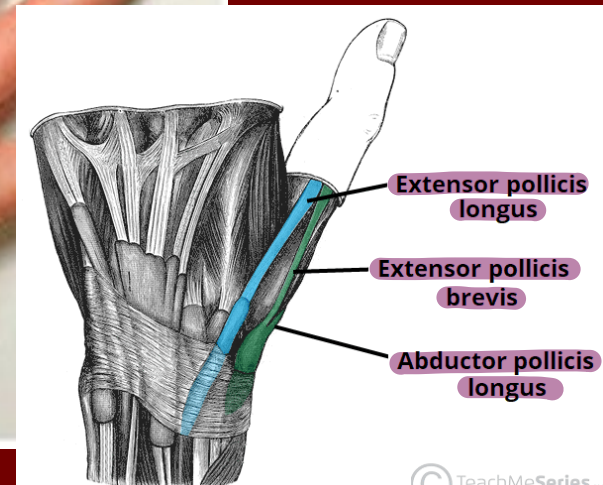
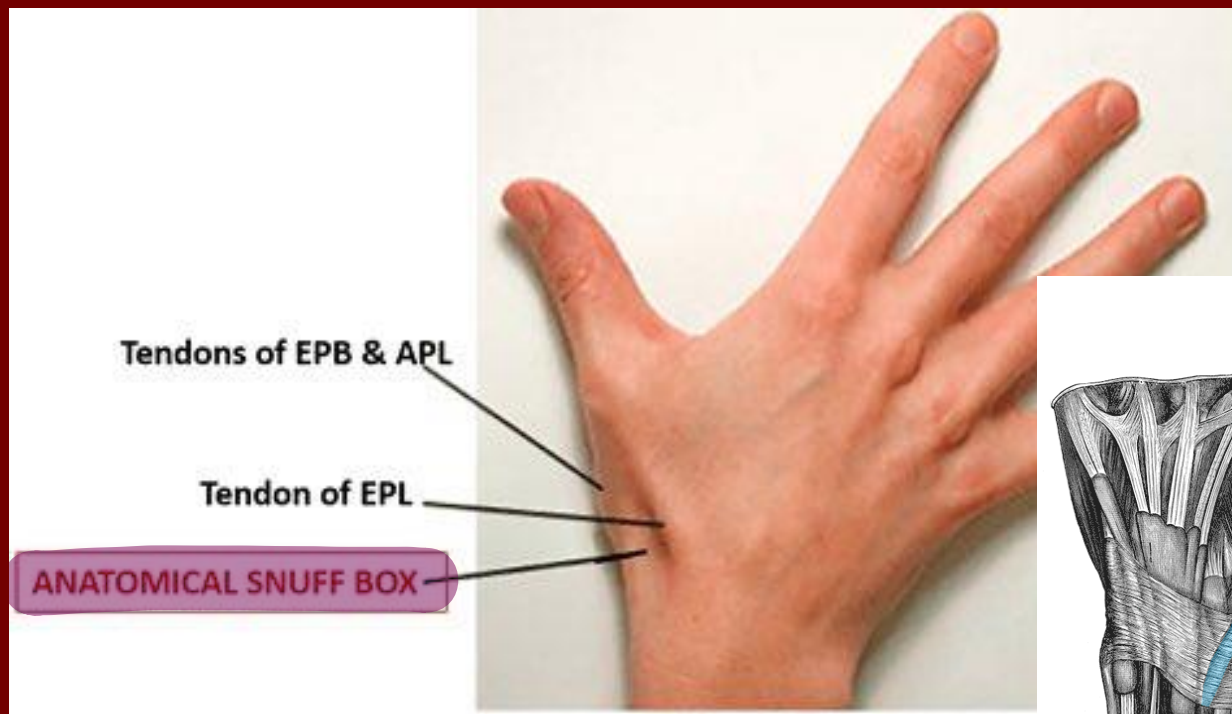
# Scaphoid fracture



↙ Retrograde blood supply  
distal to proximal <sup>bcz of that</sup> → healing in distal is better & lower risk for AVN

# Scaphoid fracture

- Physical Exam Findings
- Anatomic "Snuff box" tenderness<sup>12</sup>





# Scaphoid fracture

- "Occult" fracture

ما شفتها  
→ أول مرة

- Repeat x-ray in 2 weeks if suspicion remains high after initial negative x-ray

→ 2 occasions → may be AVN is happen

# Treatment of Acute Scaphoid Fractures

Mostly Conservative



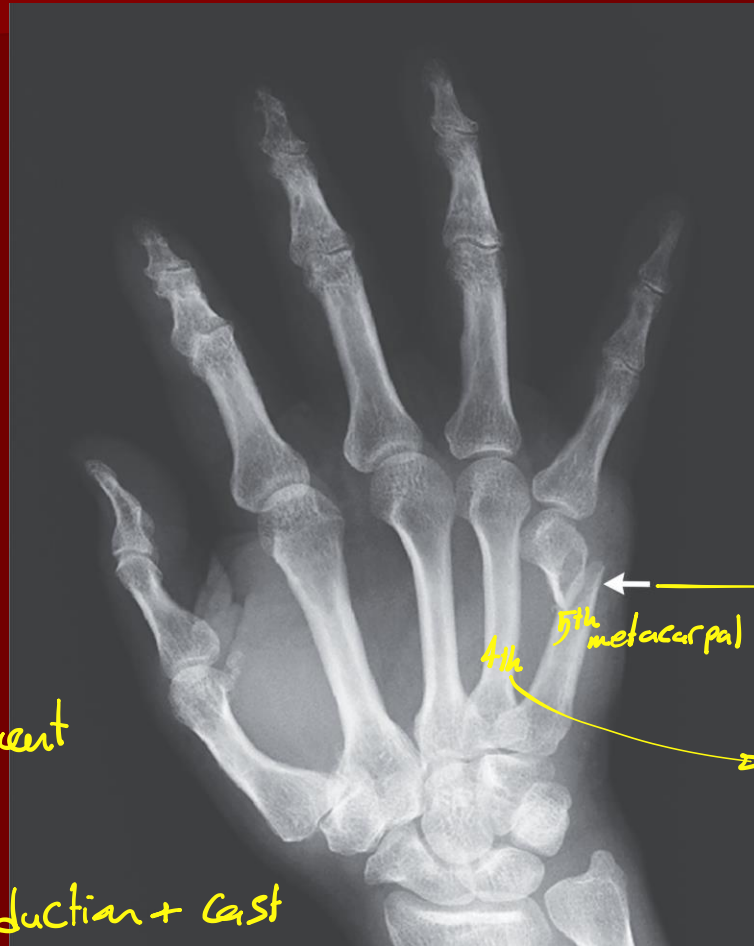
→ thumb spica

Surgery:

fixation by SCREW



# Hand



\* treated according alignment  
→ accepted : conservative

→ Non-accepted : close reduction + cast

failed → open reduction + wires

→ boxer fx (non professional)

→ fx in professional boxers

# Dislocation



5<sup>th</sup> metacarpophalangeal joint



1st metacarpo-  
phalangeal joint

largest one:  
patella

Sesamoid bone

↳ any bone inside tendon or lig.  
named by this name

Spiral fx

phalangeal fx

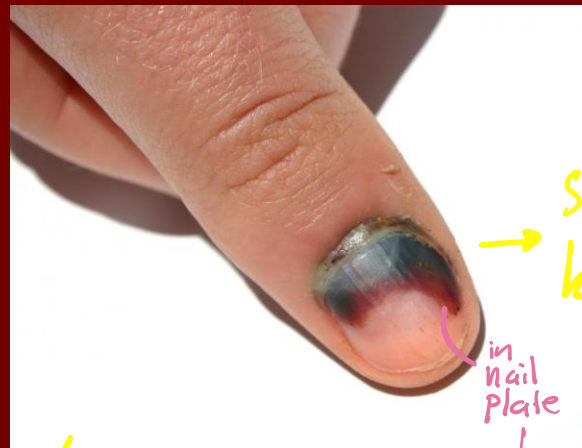
healing



fixation by screw



open fx



Subungual  
hematoma

in  
nail  
plate

needs  
antibiotic

if pt comes immediately  
after trauma (fresh):

I can do evacuation of  
hematoma bcz in ↑pain  
by ↑p. Under nail plate  
(compression)

# Summary

Questions ???