CHAPTER-2

Radiographic positioning of upper limb

By SAMUEL.B

Contents:

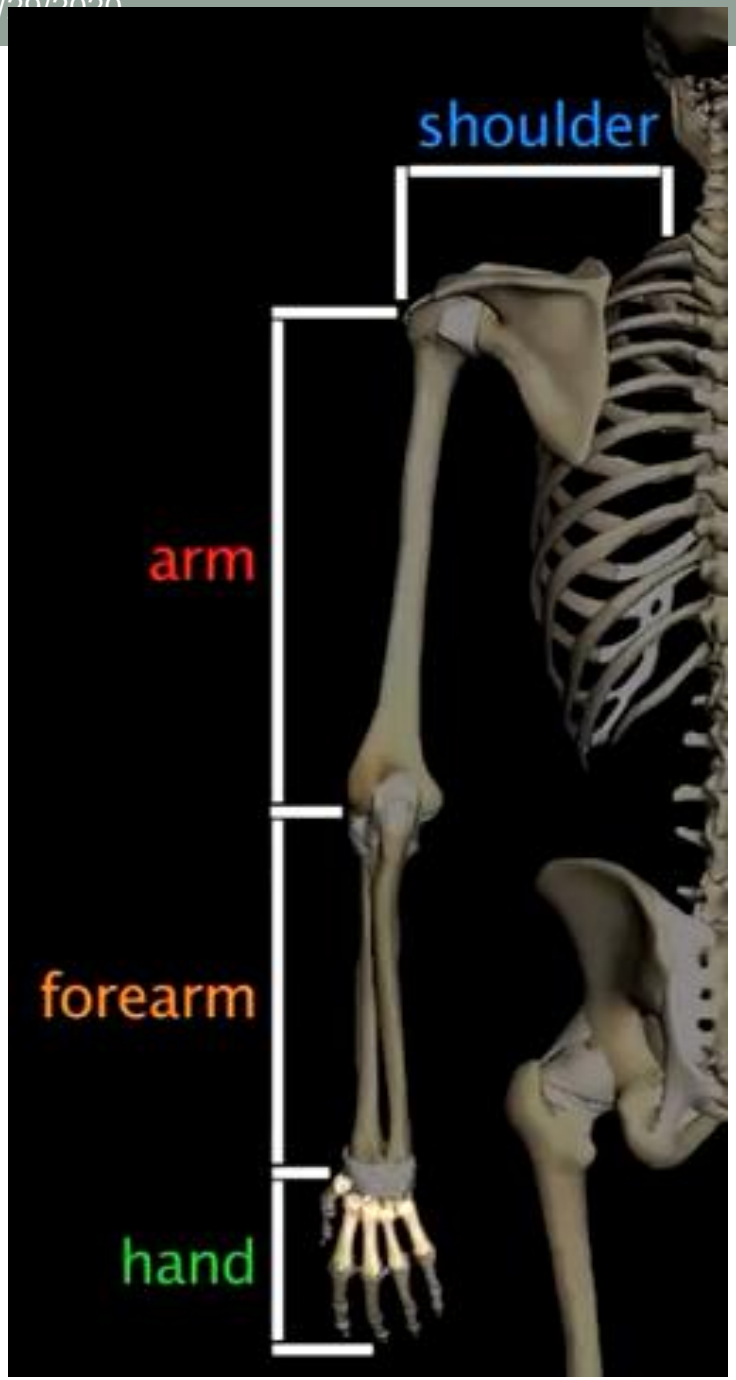
Objectives:

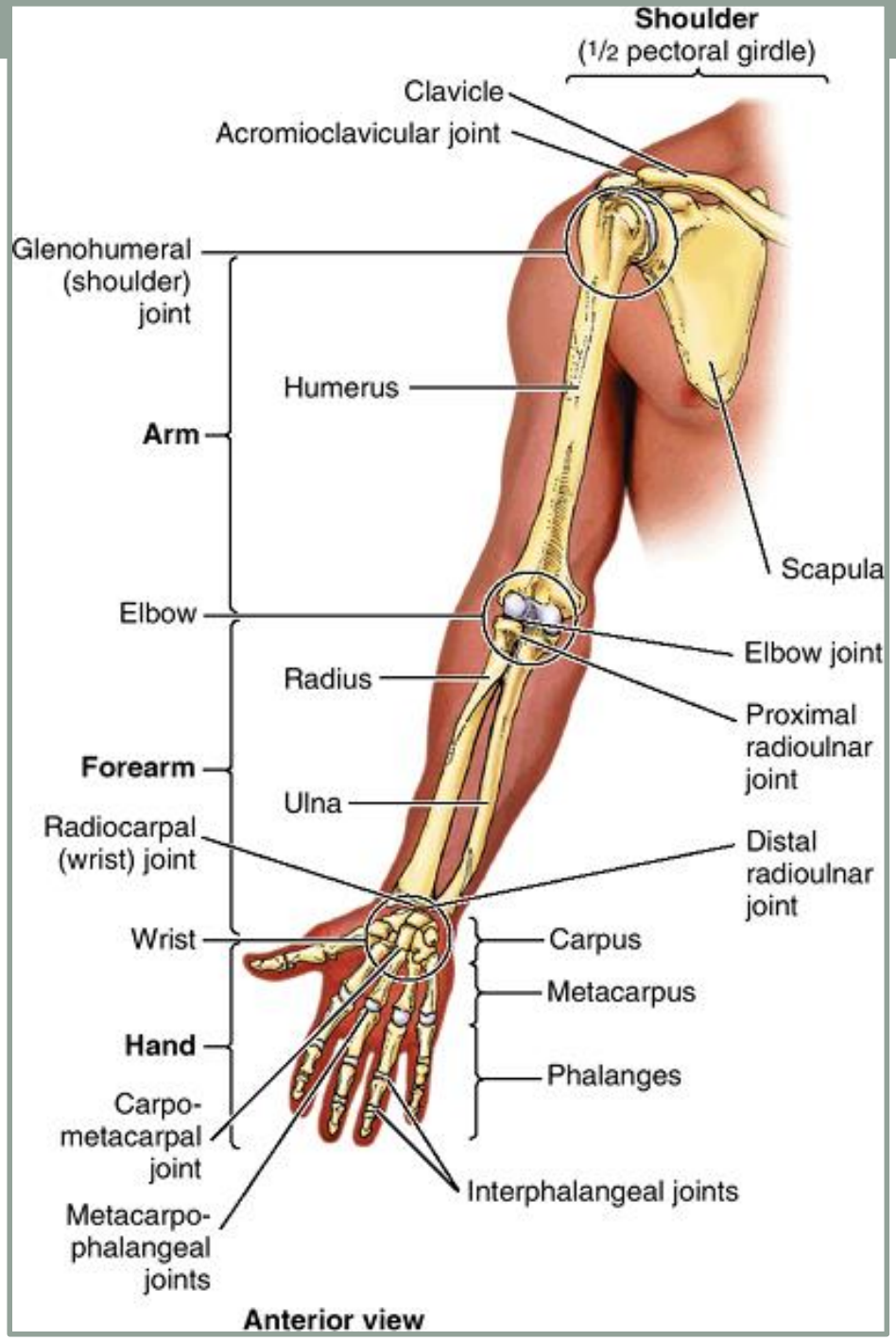
- Discuss ***gross anatomy*** of upper limb
- Explain ***radiographic procedures, and pathology***(clinical indication) related to upper limb
- State the ***criteria*** used to determine positioning accuracy on radiographs of the upper limb
- ***Evaluate*** radiographs in terms of positioning, centering, image quality, radiographic anatomy and pathology.

Bony anatomy of upper limb

- The bones of the upper limb can be divided into four main groups:

1. ***Hand & wrist,***
2. ***Forearm,***
3. ***Arm(humerus), &***
4. ***Shoulder girdle.***


shoulder
arm
forearm
hand


Shoulder
(1/2 pectoral girdle)
Clavicle
Acromioclavicular joint
Glenohumeral (shoulder) joint
Humerus
Arm
Scapula
Elbow
Elbow joint
Radius
Proximal radioulnar joint
Forearm
Ulna
Radiocarpal (wrist) joint
Distal radioulnar joint
Wrist
Carpus
Metacarpus
Hand
Phalanges
Carpo-metacarpal joint
Interphalangeal joints
Metacarpo-phalangeal joints
Anterior view

❖HAND & WRIST

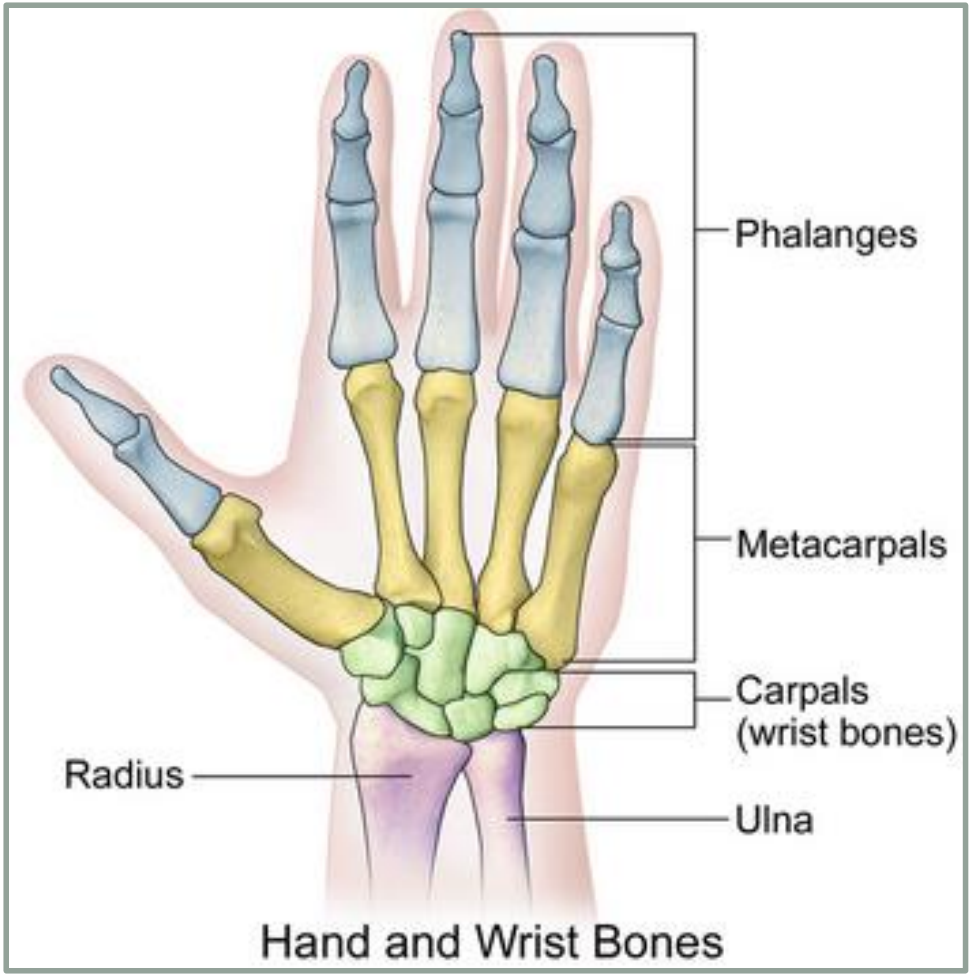
1. Bony Anatomy of hand

- Each hand consists of 27 bones;

a) ***Phalanges:-*** bones of the digits(14)

b) ***Metacarpals:-***bones of the palm(5)

c) ***Carpals:-*** bones of the wrist(8)



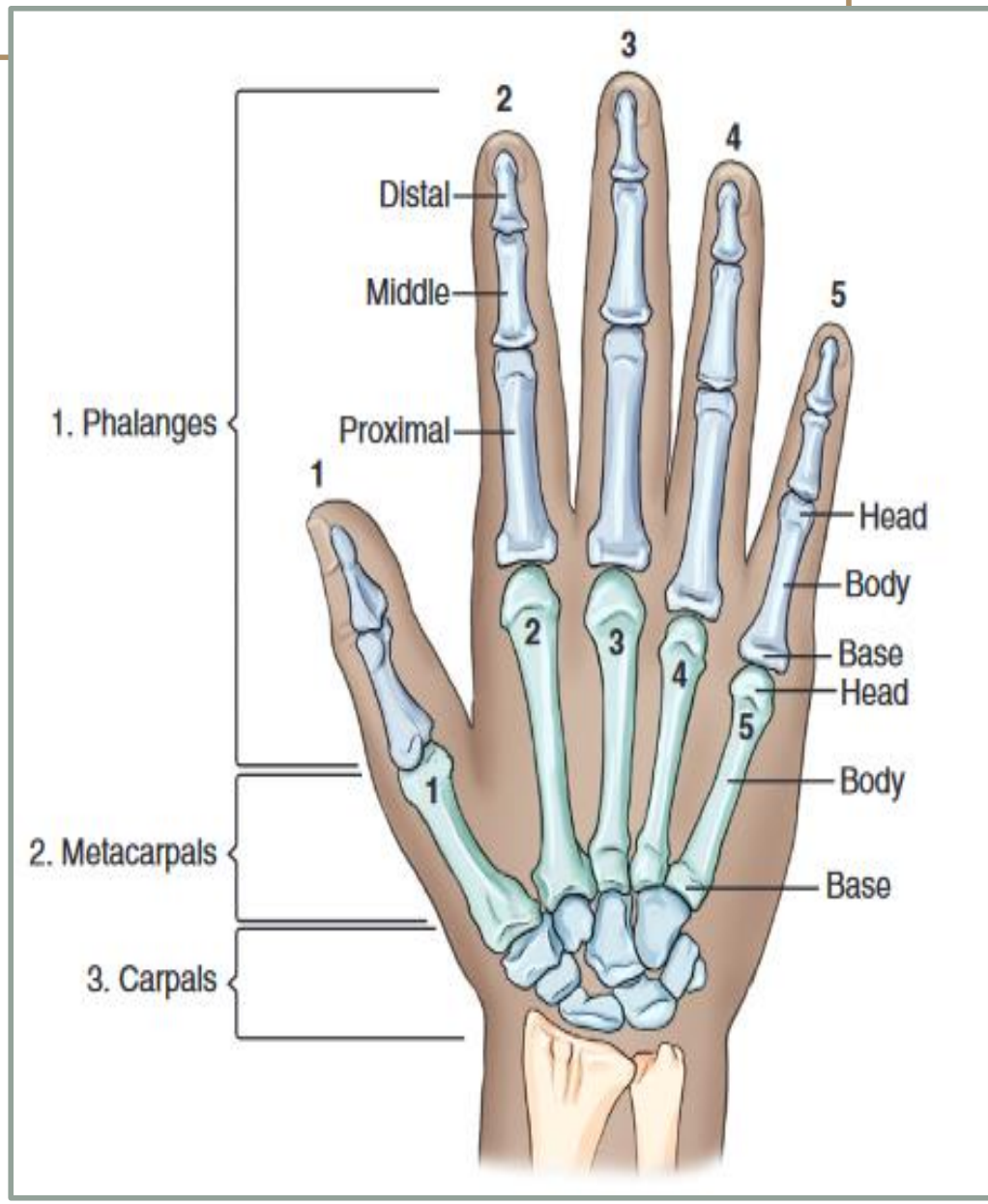
a) phalanges(digits):-

- Digits are described by numbers and names;

1. First digit (thumb)
2. Second digit (index finger)
3. Third digit (middle finger)
4. Fourth digit (ring finger)
5. Fifth digit (small/little finger)

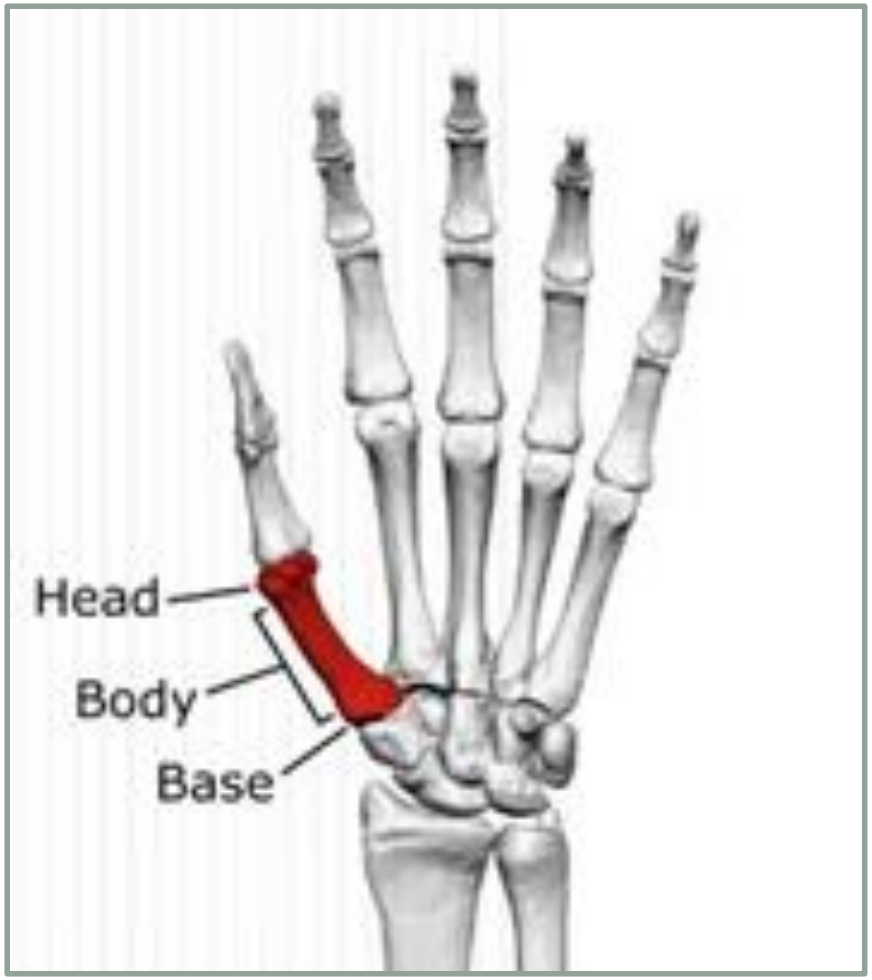
Cont'd…

- ✓The 1st digit(thumb):-
  1. Proximal, &
  2. Distal phalanges.
- ✓ The other digits(fingers):-
  1. Proximal,
  2. Middle, &
  3. Distal.
- ✓ Each phalanx consists of three parts:-
  1. **Head**: distal rounded
  2. **Body**: the shaft
  3. **Base**: proximal end



b) Metacarpals:-

- ***Our palm is made up 5 metacarpals:-***
  - Each consists of the ***head, body & base.***



- ***Fig, 1st metacarpal***

c) Carpals(Wrist):-

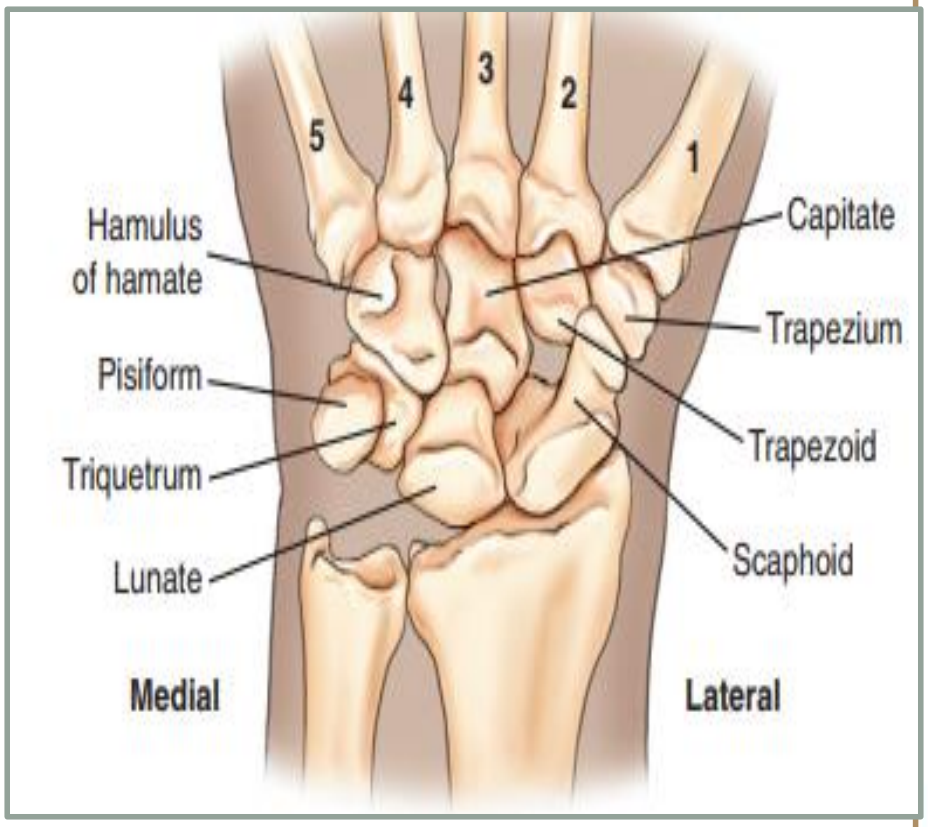
- There are ***8 carpal bones*** arranged in two horizontal rows.

Proximal rows	*Distal rows*
Scaphoid	***Trapezium***
Lunate	***Trapezoid***
Triquetrum	***Capitate***
Pisiform	***Hamate***

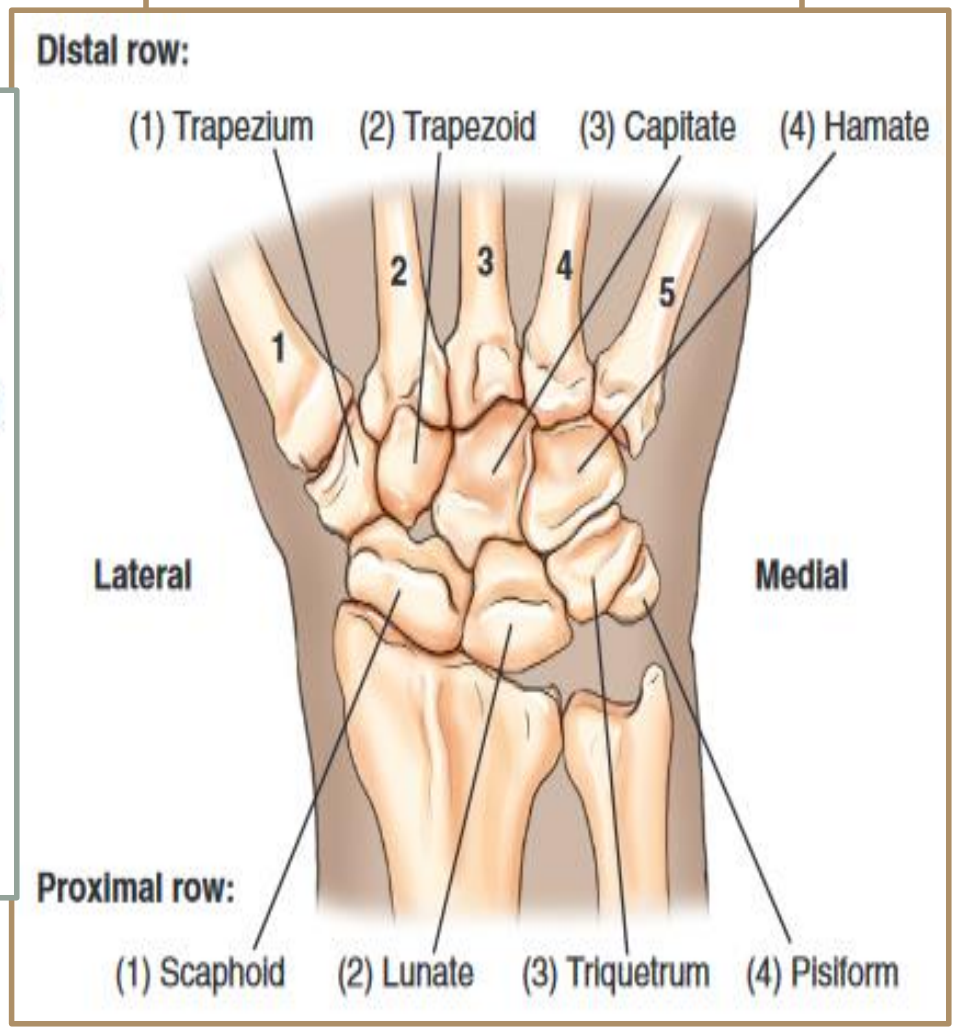
Table; Carpals, listed from lateral to medial

Fig, Carpals

- ***Anterior view***

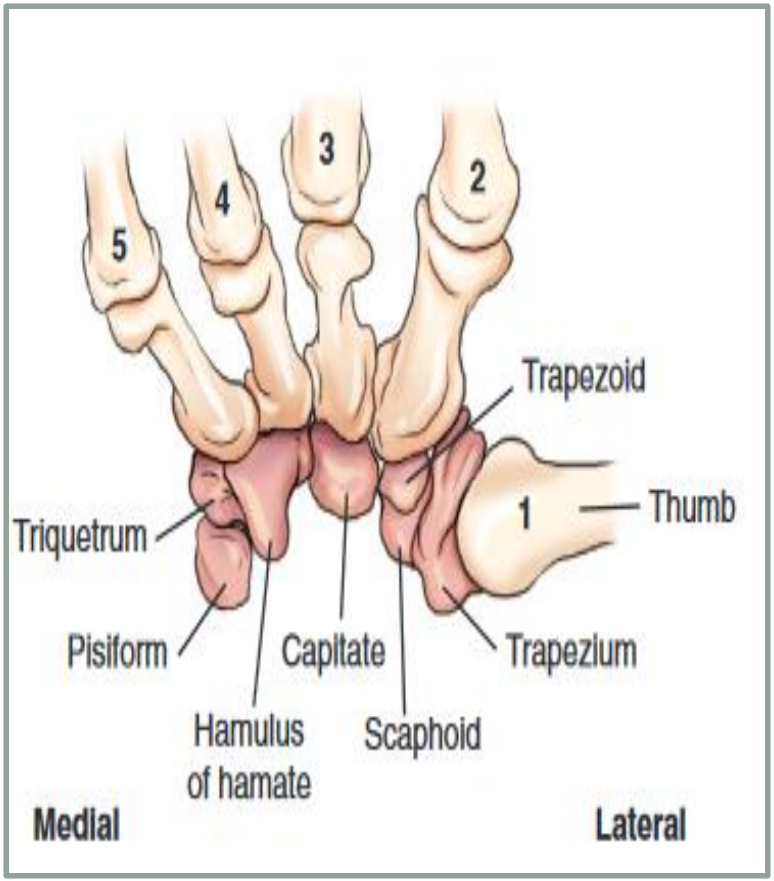


- ***Posterior view***



✓ *Carpal tunnel:-*

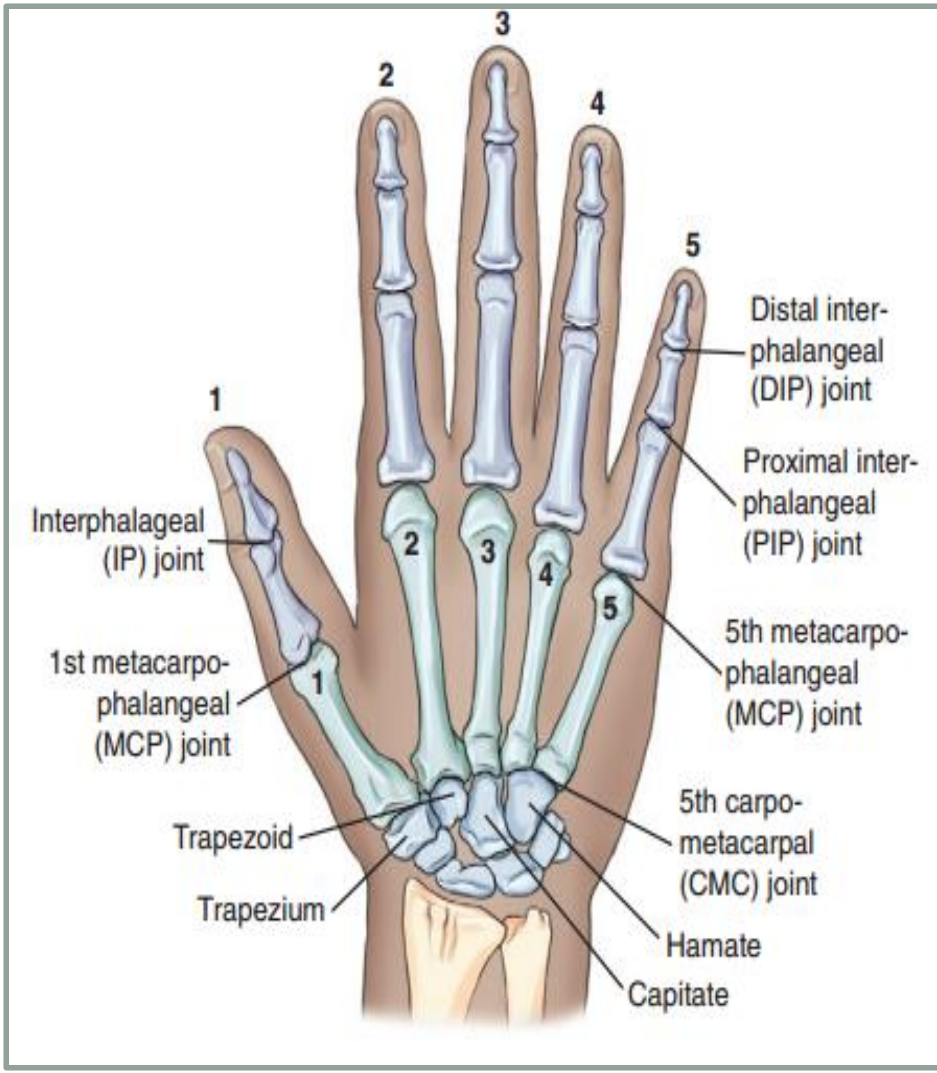
- ***is a groove formed by palmar aspect of the carpals,***
- through which the major nerves and tendons pass.



Carpal tunnel in tangential projection

Joints of the hand

1. ***Interphalangeal(IP);***
   a. Proximal**(PIP)** &
   b. Distal**(DIP)**
2. ***Metacarpophalangeal (MCP)***
3. ***Carpometacarpal(CMC).***
4. ***Intercarpal***
5. ***Radiocarpal***



2. Radiographic positioning

- when the upper limb is radiographed, we should;-
  - ✓Remove radiopaque objects
  - ✓Unless specified, direct the CR at right angle to mid-point of IR.
  - ✓Radiograph both side separately when performing bilateral examinations
  - ✓Shield gonads.
  - ✓Use close collimation
  - ✓Use side markers

FINGERS

- ***Clinical indications:-***

  1. Fractures & dislocation
  2. pathology, like osteoporosis and osteoarthritis**.**

- ***Technical consideration:-***

  - ✓ ***Image receptor:-*** 18 × 24 cm
  - ✓ ***FFD :-*** 100cm
  - ✓ ***Non grid***

Cont'd…

- ***Exposure factors:-***
  - kv-selection= 45-50 kvp
  - mA-selection=80mA
  - time=0.01sec
- ***collimation:-*** collimate area of interest

FINGERS(2^{nd} -5^{th} digits)

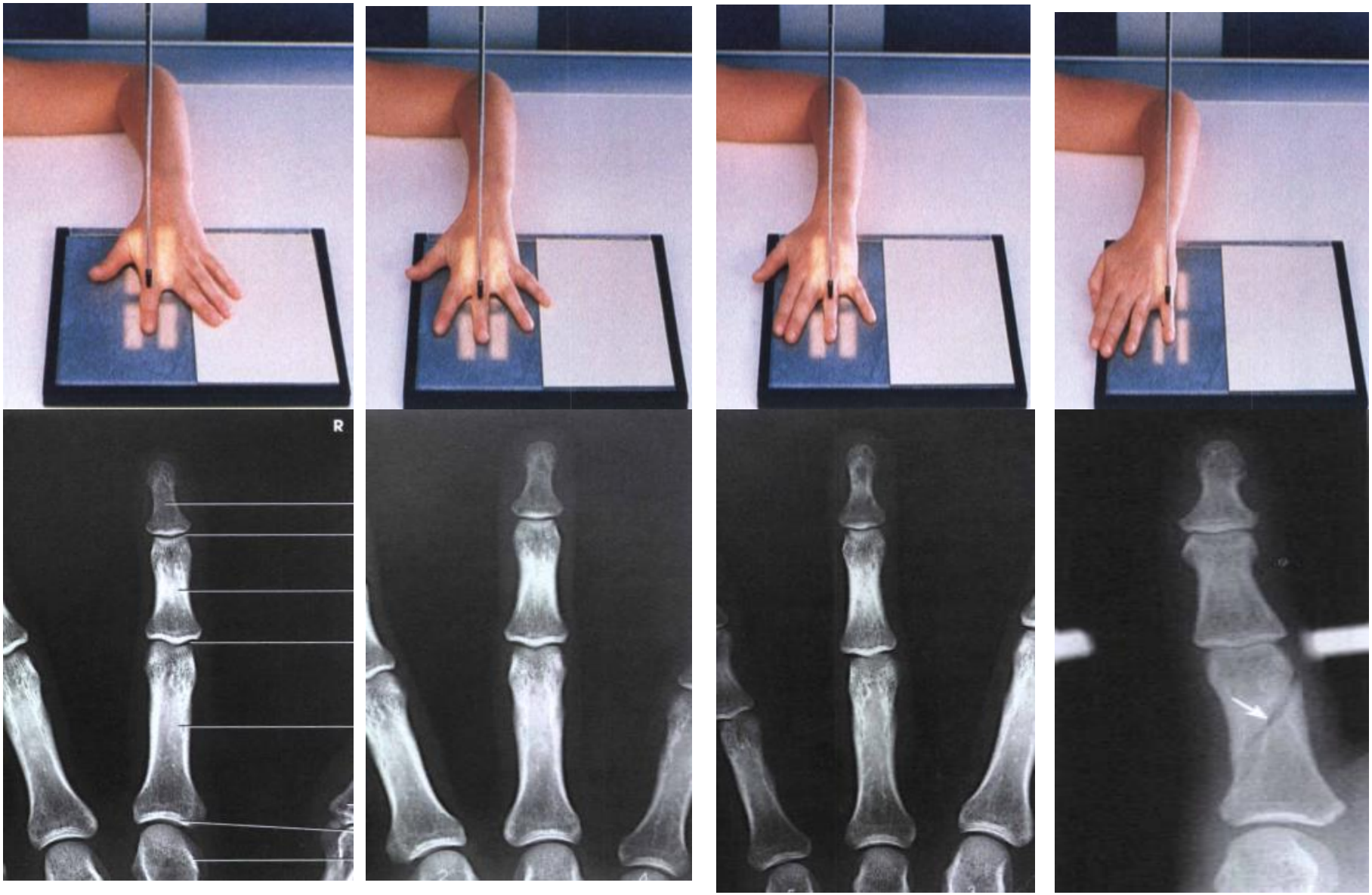
1. PA Fingers

- ***Patient position:-***
  - Seat the patient at the end of radiographic table.
- ***Part position:-***
  - place the ***extended digit with palmar surface down*** on the IR.
  - ***Separate the digits slightly***, and center the digits under examination to mid-line of the IR.

PA fingers cont'd…

- ***Central ray:-***
  - Perpendicular to the ***PIP joints*** of the affected digit.
- ***Image evaluation:-***
  - ✓ ***No rotation*** of the digits.
  - ✓ Entire digit from fingertip to distal portion of the adjoining metacarpal.
  - ✓ ***No soft tissue overlap*** from adjacent digits.
  - ✓ Open interphalangeal and MCP joint spaces.
  - ✓ soft tissue and bony trabeculation.

2nd 3rd 4th 5th



2. PA Oblique fingers

- ***Patient position:-***
  - Seat the patient at the end of radiographic table.
- ***part position:-***
  - Place the forearm on the table with the hand pronated and palm resting on the IR.
  - rotate the fingers externally to 45^0 angle using 45 degree foam wedge.
- ***CR:-***
  - perpendicular to the ***PIP joint*** of affected digit.

PA Oblique fingers cont'd…

- ***Image evaluation:-***
  - Entire digits rotated at a 45^0 angle.
  - No superimposition of the adjacent digits over the proximal MCP joint.
  - Open interphalangeal and MCP joint spaces.
  - Soft tissue and bony trabeculation.

2nd

3rd

5th

3. Lateral Fingers

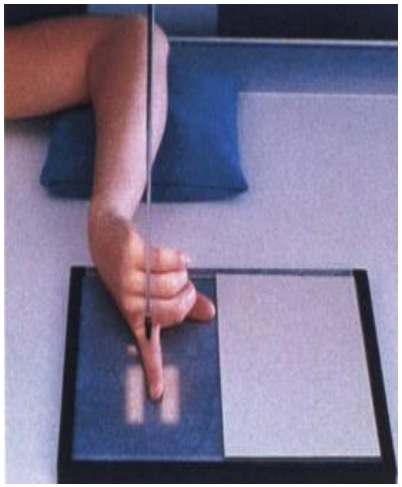
- ***Patient position:-***
  - Seat the patient at the end of radiographic table.
- ***Part position:-***
  - Rotate the hand to lateral position with the affected finger extended and the other finger flexed.
  - Ensure that the long axis of finger is ***parallel to IR.***
- ***CR:-***
  - perpendicular to the ***PIP joint*** of affected digit.

Lateral fingers cont'd…

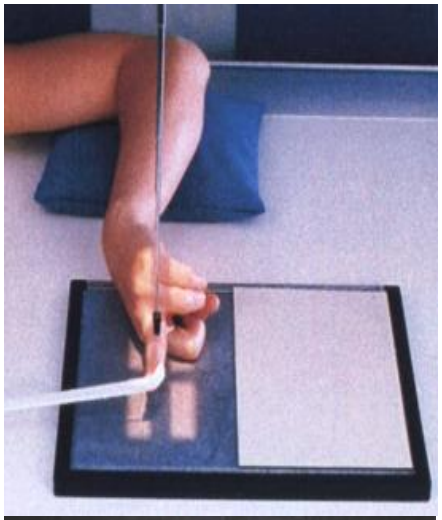
Image evaluation:-

- Entire digits in true lateral position with fingernail in profile.
- No obstruction of the proximal MCP joint by adjacent digits.
- Open interphalangeal and MCP joint spaces.
- Soft tissue and bony trabeculation.

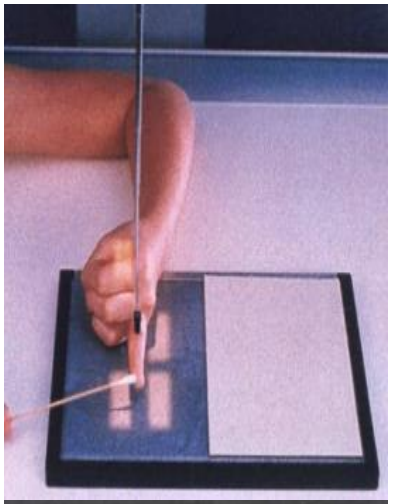
2nd



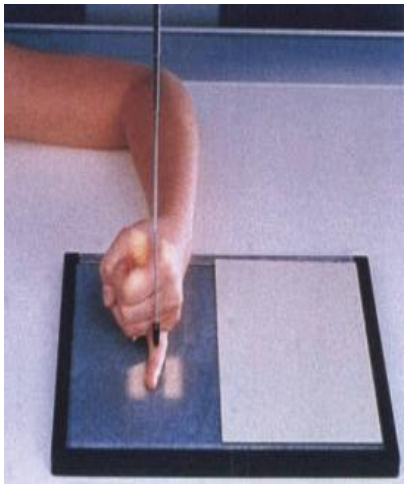
3rd



4th



5th



FIRST DIGIT (THUMB)

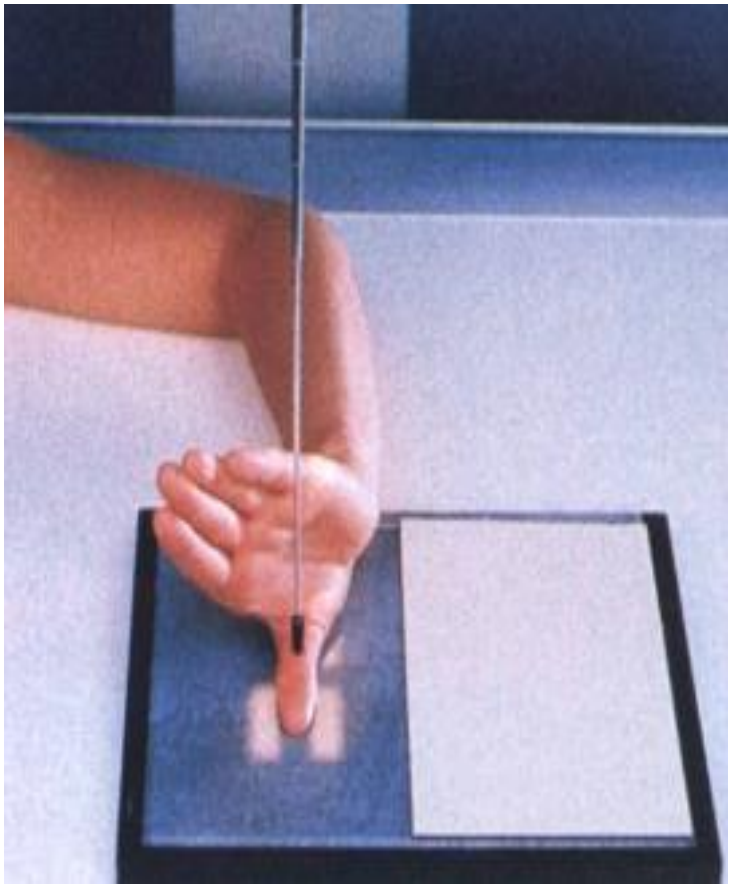
1. AP THUMB

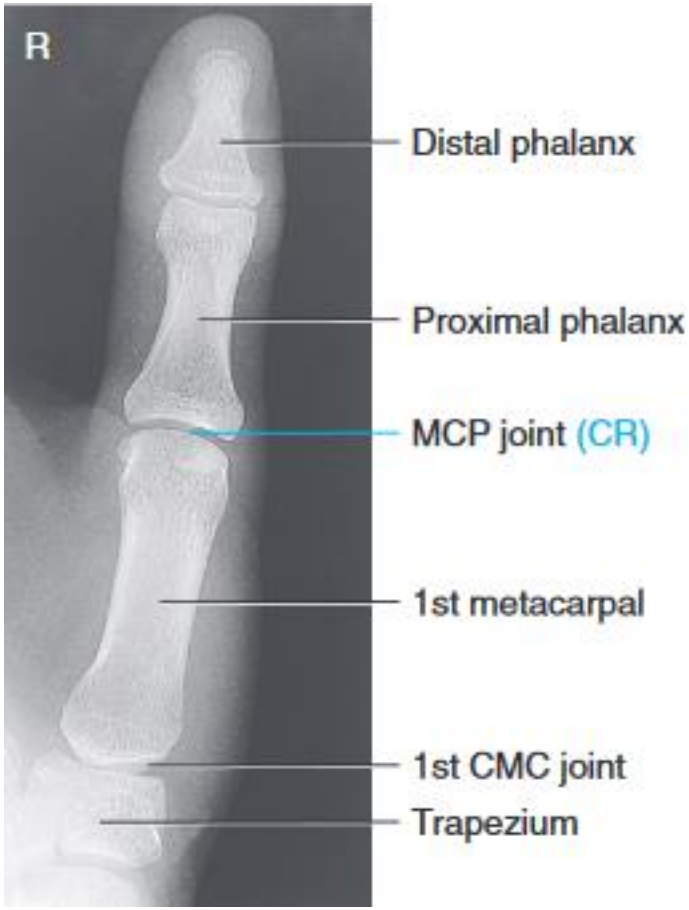
- ***Patient Position:-***
  - Seat patient facing table, arms extended in front.
- ***Part position:-***
  - ***Internally rotate hand with fingers extended*** until posterior surface of thumb is in contact with IR.
  - ***Align thumb*** with long axis of the IR.
  - Place the fifth metacarpal back far enough to avoid superimposition.
- ***CR:-***
  - Directly perpendicular to the ***1st MCP*** joint.

AP thumb cont'd…

- ***Image evaluation:-***
  - No rotation
  - From the distal tip of thumb to the trapezium should be included.
  - ***IP*** & ***MCP*** joints should be open and well demonstrated.
  - Soft tissue and bony trabeculation.

Fig, AP THUMB

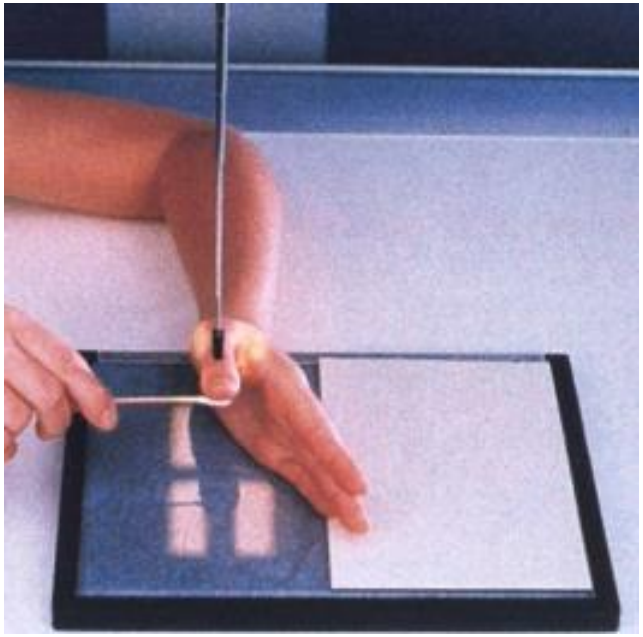



R
Distal phalanx
Proximal phalanx
MCP joint (CR)
1st metacarpal
1st CMC joint
Trapezium

Cont'd…

- ***PA thumb:-***
  - This is done only if the patient cannot position for AP.
  - Not advisable because it result in loss of definition caused by ***increased OID.***
- ***part position:-***
  - ✓Rest thumb on sponge support block that is high enough so that thumb is not rotated.

Fig, PA thumb



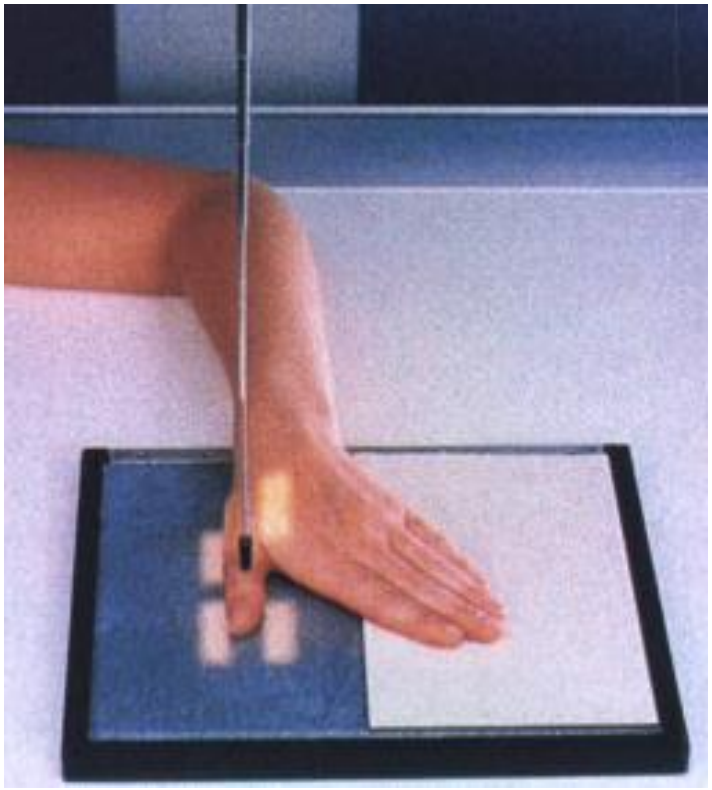
2. PA Oblique thumb

- ***Patient position:-***
  - Seat patient at end of table, ***with elbow flexed about 90°*** with hand resting on IR.
- ***Part position:-***
  - Abduct thumb slightly with palm rest on the IR.
  - Align long axis of thumb with long axis of IR.
- ***CR:-***
  - **P**erpendicular to the ***1st MCP*** joint.

PA obli. thumb cont'd…

- ***Image evaluation:-***
  - Proper rotation of phalanges & 1st metacarpal.
  - Area from distal tip of thumb to the trapezium.
  - Open **IP** and **MCP** joint spaces.
  - Soft tissue and bony trabecultion.

Fig, PA oblique thumb



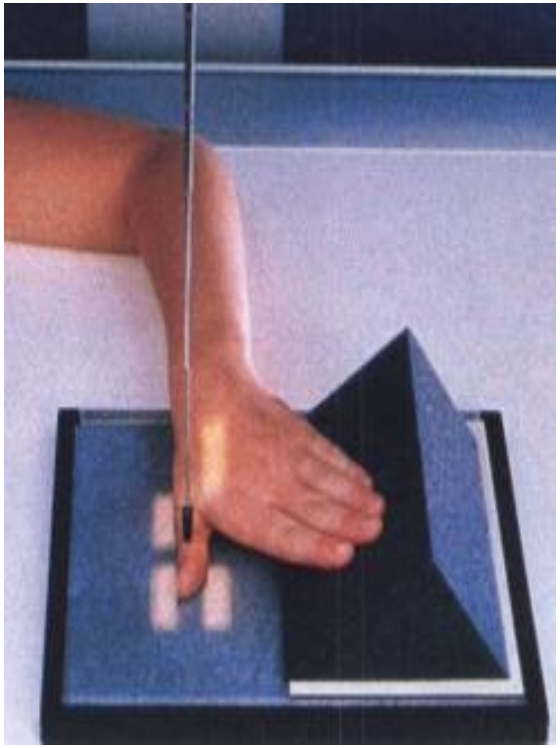
3. LATERAL THUMB

- ***Patient position:-***
  - Seat patient at end of table, with elbow flexed about 90° with hand resting on IR, palm down.
- ***Part position:-***
  - Hand pronated and thumb abducted, with fingers flexed or placed on sponge.
  - Lateral aspect of thumb should be in direct contact with IR.
- ***CR:-***
  - Perpendicular to the ***1st MCP*** joint.

3. Lateral thumb cont'd…

- ***Image evaluation:-***
  - First digit in true lateral position.
  - Area from distal tip of thumb to the trapezium.
  - Open **IP** and **MCP** joint spaces.
  - soft tissue and bony trabecultion.

Fig, LATERAL THUMB



Special Projections of Thumb

i) AP Axial (Modified Robert's Method)

- This special projection demonstrates ***fractures or dislocations of the first CMC joint.***
- And to demonstrate the base of first metacarpal for ruling out ***bennett's fracture.***

AP axial cont'd…

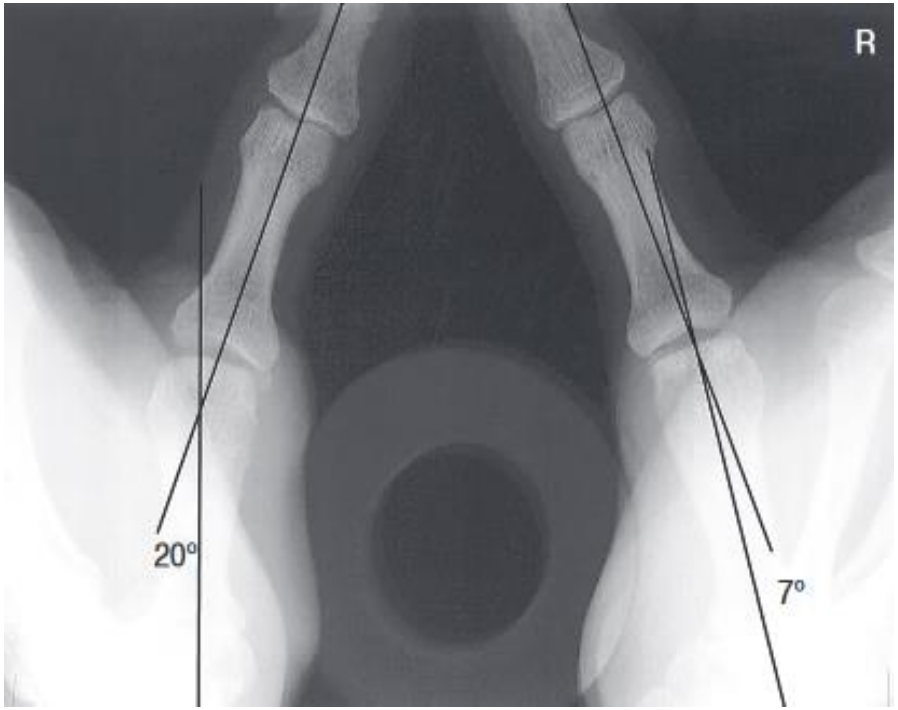
- ***Part position:-***
  - ***Rotate arm internally*** until posterior aspect of thumb rests on IR & centered.
  - ***Extend fingers so that soft tissue does not superimpose first CMC joint.***
- **CR:-**
  - Directed ***15° toward wrist***, entering at the ***1st CMC joint.***

Fig, AP axial thumb

i) PA stress(Folio method) thumb projection

- ***Indication:*** ***Sprain or tearing*** of ulnar collateral ligament of thumb at MCP joint.
- ***Part position:-***
  - ***Position both hands side by side*** to center of **IR**, rotated laterally into ***±45° oblique*** position.
  - ***Place round spacer,*** such as a ***roll of medical tape***, between proximal thumb regions.
  - ***Immediately*** before exposure, ask patient to pull thumbs apart firmly and hold
- ***CR:***
  - perpendicular to IR, directed to ***midway between MCP joints.***

Fig, PA stress *projection of bilateral thumb with tension applied.*



20º MCP angle indicates sprain ulnar collateral ligament.

HAND

- ***Clinical indication:***
  - ✓ Fracture, dislocations and foreign bodies.
  - ✓ Pathologic processes, like **Osteoporosis** and **Osteoarthritis**.
- ***Technical Factors:-***
  - ✓ ***Image receptor:-*** 24× 30 cm
  - ✓ ***FFD :-*** *100cm*
  - ✓ ***Non grid***

Hand cont'd…

- ***Exposure factors:-***
  - **KV - selection**= 50-55 kvp
  - **mA - selection**=80mA
  - **Time**=0.01sec
- ***Collimation:-***
  - include soft tissue and at least 1 inch of distal radius and ulna.

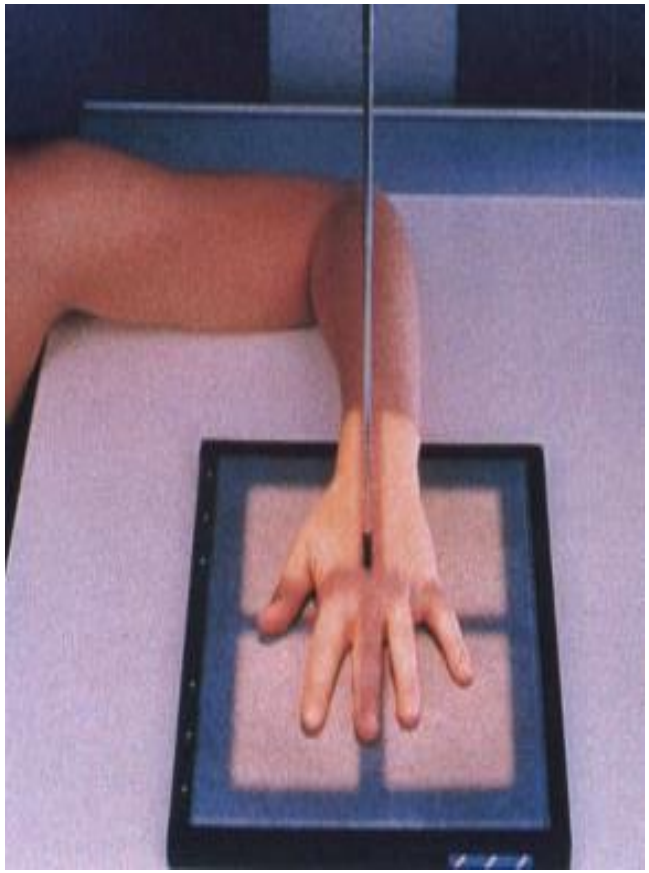
1. PA Hand

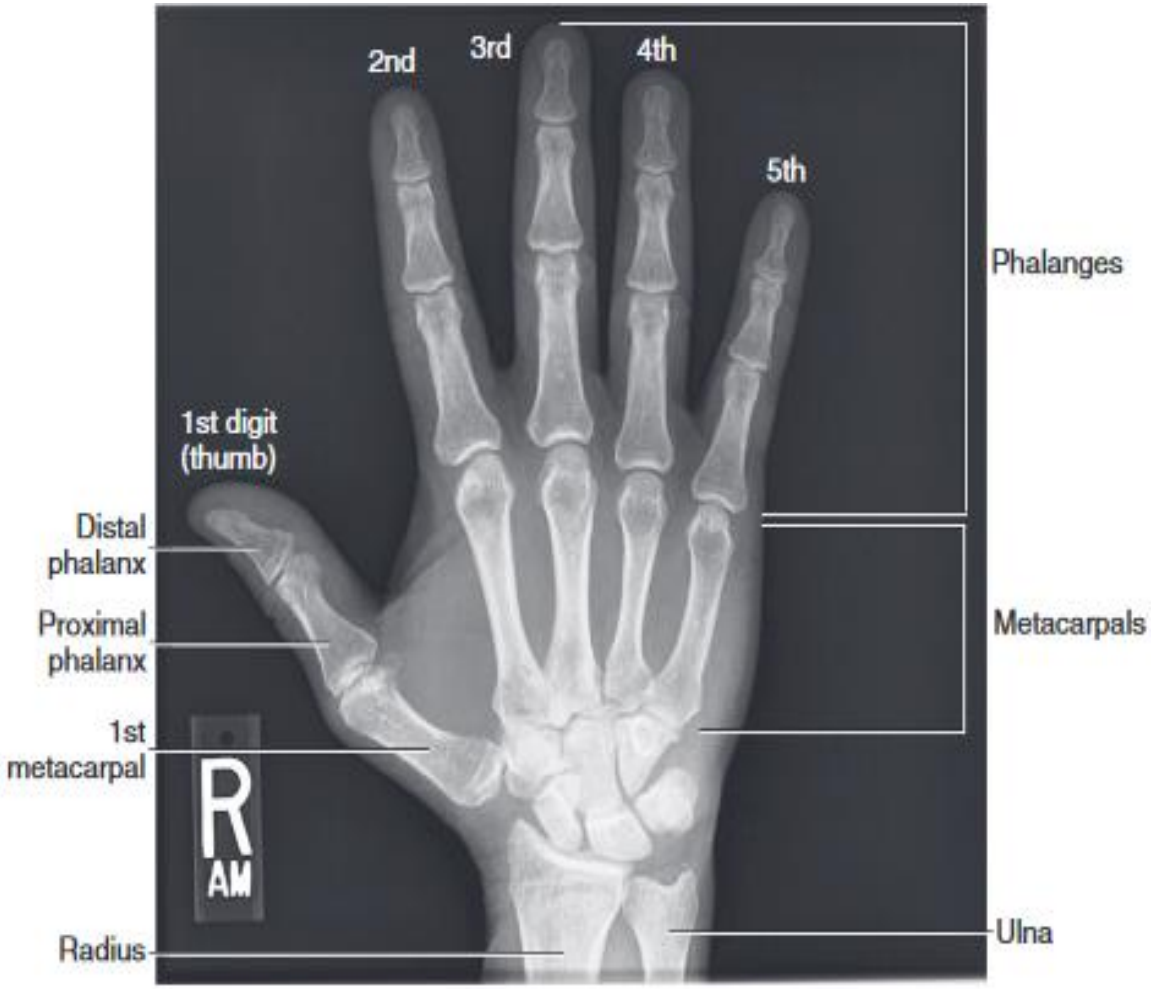
- ***Patient position:***
  - ***Seat patient*** at end of the table with ***elbow flexed*** about 90° and ***hand and forearm resting on table.***
- ***Part position:***
  - ***Pronate hand*** with palmar surface in contact with IR.
  - ***Spread fingers*** slightly, and the thumb slightly flexed.
- ***CR:***
  - Direct vertical beam to the ***head of the 3rd metacarpal.***

1. PA hand cont'd…

- ***Image evaluation:-***
  - ✓No rotation of the hand.
  - ✓Open ***MCP & IP*** joints..
  - ✓Area from fingertips to the distal end of the radius and ulna.
  - ✓Soft tissue and bony trabeculation.

Fig, PA hand




2nd
3rd
4th
5th
Phalanges
1st digit
(thumb)
Distal
phalanx
Proximal
phalanx
Metacarpals
1st
metacarpal
R
AM
Radius
Ulna

2. PA Oblique hand

- ***Patient position:-***
  - Seat patient at end of table with elbow flexed about 90° and hand and forearm resting on table.
- ***Part position:-***
  - ***Pronate hand*** on IR.
  - ***Rotate entire hand & wrist laterally 45°*** and support with radiolucent wedge.
  - The fingers are slightly flexed and separated to avoid overlapping.

PA Oblique hand cont'd…

- ***CR:-***
  - Head of the ***3rd metacarpal using a vertical beam***,
  - Or ***head of the 5th metacarpal first,*** then with ***tube tilting towards the radial side to the head of the 3rd metacarpal.***
- ***Image evaluation:-***
  - ✓ Minimal overlap of the 3rd on 4th and 4th on 5th metacarpal shafts.
  - ✓ Separation of 2nd and 3rd metacarpal.
  - ✓ Open ***MCP & IP*** joints.
  - ✓ Soft tissue and bony trabeculation.

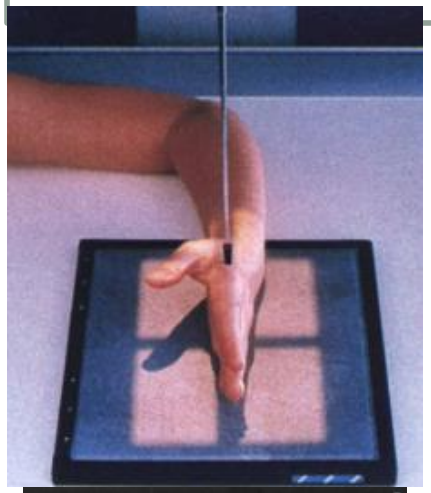
- ***Fig, PA Obli. hand***

3. Lateral hand

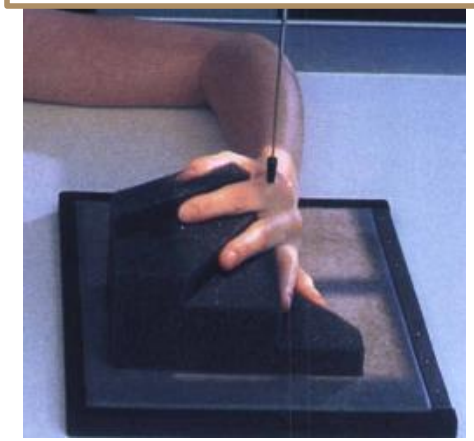
❖***used to locate foreign bodies.***

- ***Patient position:-***
  - Seat patient at end of table with elbow flexed about 90° and hand and forearm resting on table.
- ***Part position:-***
  - The palm is placed vertical with fingers overlapping each others.
  - The thumb is separated from the palm and rested on a soft pad for immobilization.
- ***CR:-***
  - ***head of the 2nd metacarpal using a vertical beam.***

- ✓ *Lateral*



- ✓ *"Fan" Lateral*



- *Lateral Extension, or*

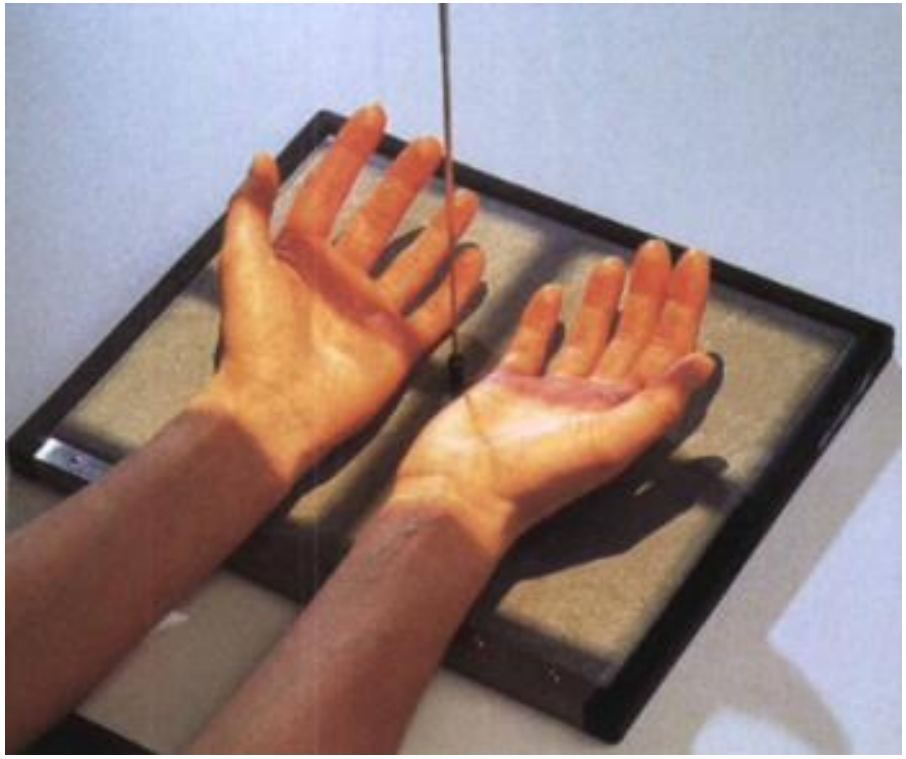
- *Lateral flexion*

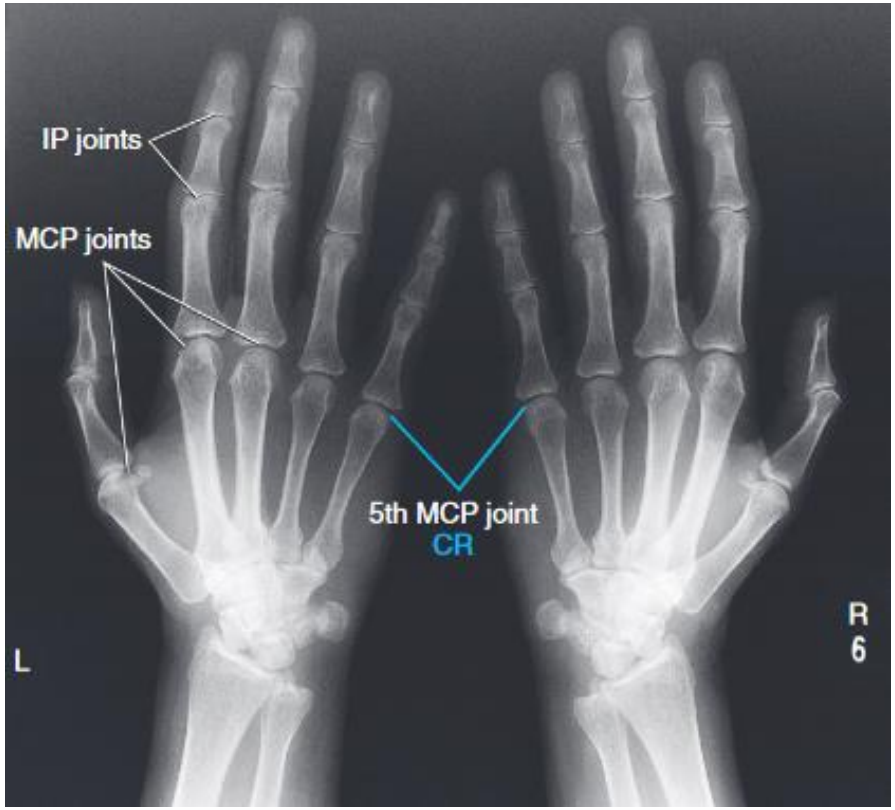
Spatial projection of hand

AP oblique bilateral (Norgaard method)

- ***Part position:-***
  - ***Supinate hands*** and place medial aspect of both hands together at center of IR.
  - ***From this position, internally rotate hands 45^{o}.***
  - The fingers and thumbs are slightly separated to avoid overlapping.
- ***CR:-*** directed to ***midpoint between both hands at level of 5th - MCP joints***.

Fig, AP OBLIQUE (BALL CATCHING)





- ***A special projection Performed commonly for early evidence of rheumatoid arthritis.***

WRIST

- ***Technical factors:-***
  - ✓ ***Image receptor:- 18× 24 cm***
  - ✓ ***FFD :- 100cm***
  - ✓ ***Non grid***
  - ✓ ***Exposure factors:***
    - **kv-selection**= 50-55 kvp
    - **mA-selection**=80mA
    - **time**=0.01sec

1. PA WRIST

- ***Patient position:***
  - ***Seat patient at end of table with elbow flexed*** about 90° and palm down.
  - ***Drop shoulder*** so that shoulder, elbow, and wrist are on same horizontal plane.
- ***Part position:-***
  - ***With hand pronated, arch hand slightly*** to place wrist and carpal area in close contact with **IR.**
- ***CR:-***
  - ***midway between the radial and ulnar styloid processes.***

PA wrist cont'd…

- ***Image evaluation:-***
  - Distal radius and unla, carpals and proximal half of metacarpals.
  - No rotation.
  - No excessive flexion to overlap metacarpals.

- ***Fig, PA WRIST***


Trapezium
Trapezoid
Capitate
Scaphoid
Fracture of radius
Hamulus of hamate
Hamate
Triquetrum
Pisiform
Lunate
Ulna

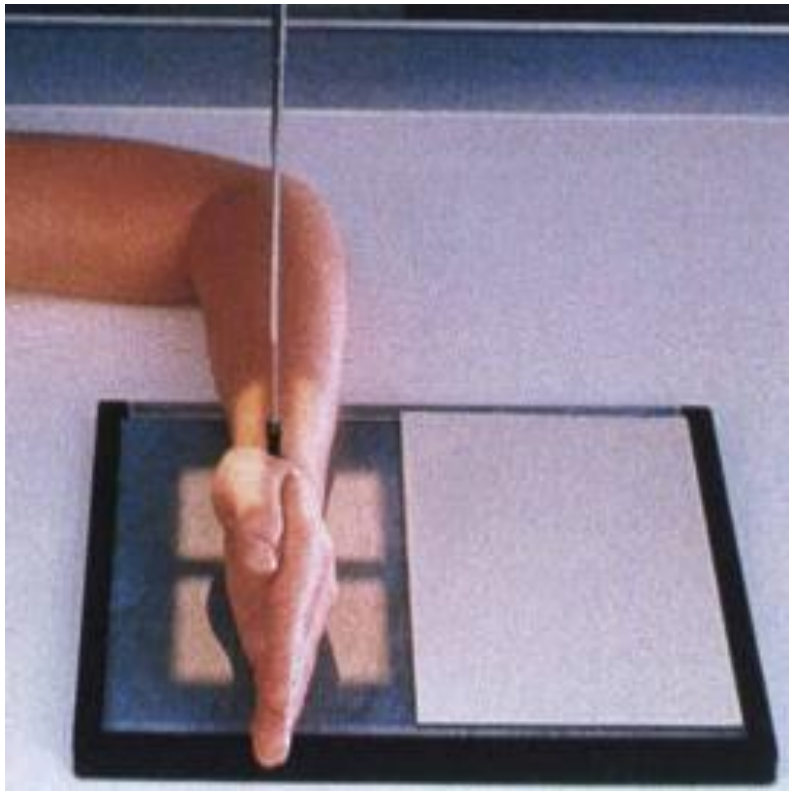
2. Lateral Wrist

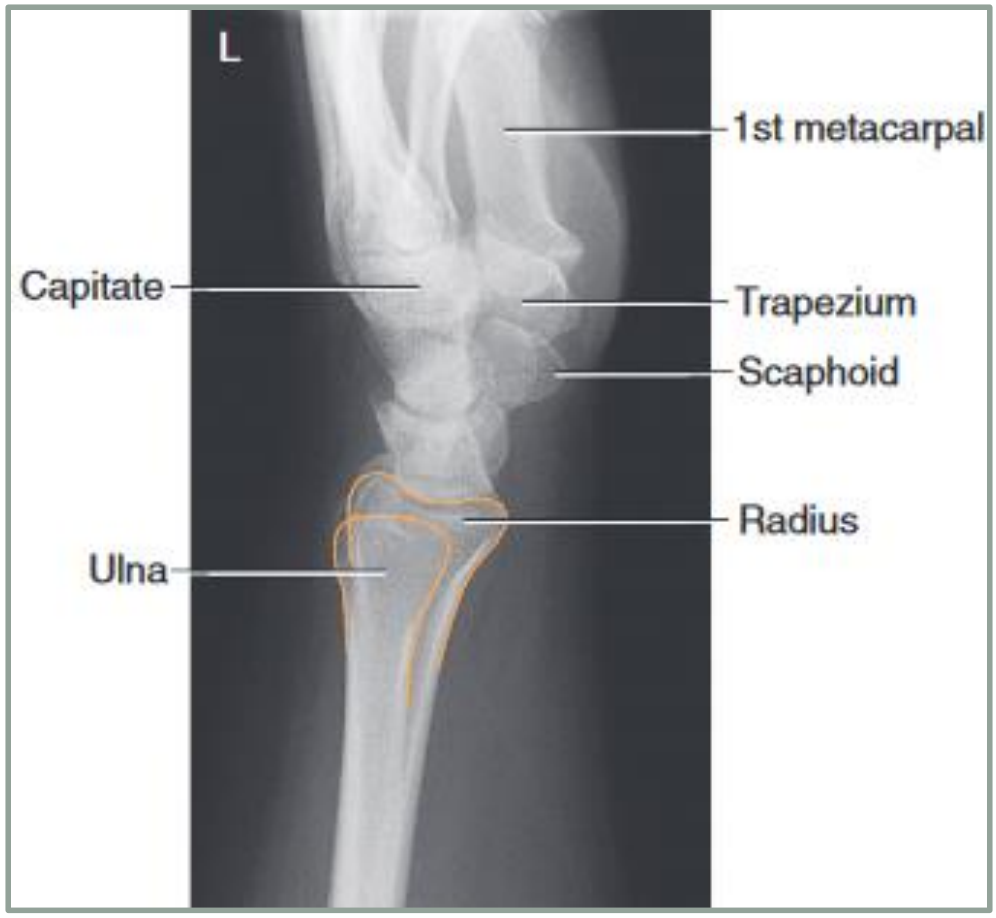
- ***Patient position:-***
  - Seat patient at end of table, with elbow flexed about 90° and arm and forearm resting on table.
- ***Part position:-***
  - From the PA position, the wrist is externally rotated through 90 degree.
  - Adjust hand and wrist into **a *true lateral*** position.
- ***CR:-***
  - Center over the ***styliod processes of the radius*.**

Lateral Wrist cont'd…

- ***Image evaluation:-***
  - ✓Distal radius and ulna, carpals and proximal half of metacarpals.
  - ✓***Superimposed*** distal radius and unla.
  - ✓Superimposed metacarpals.

Fig. LATERAL WRIST

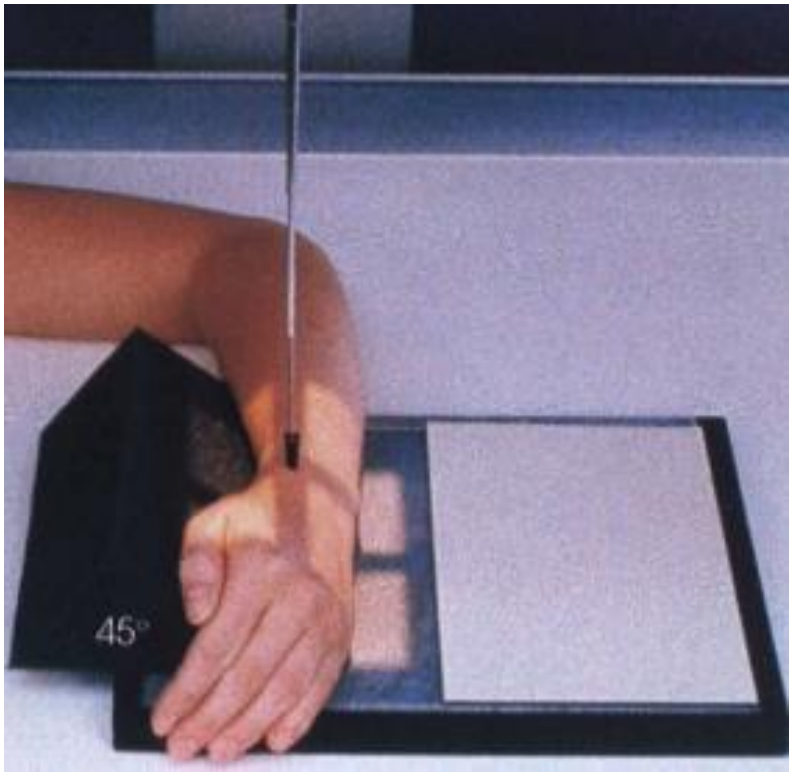


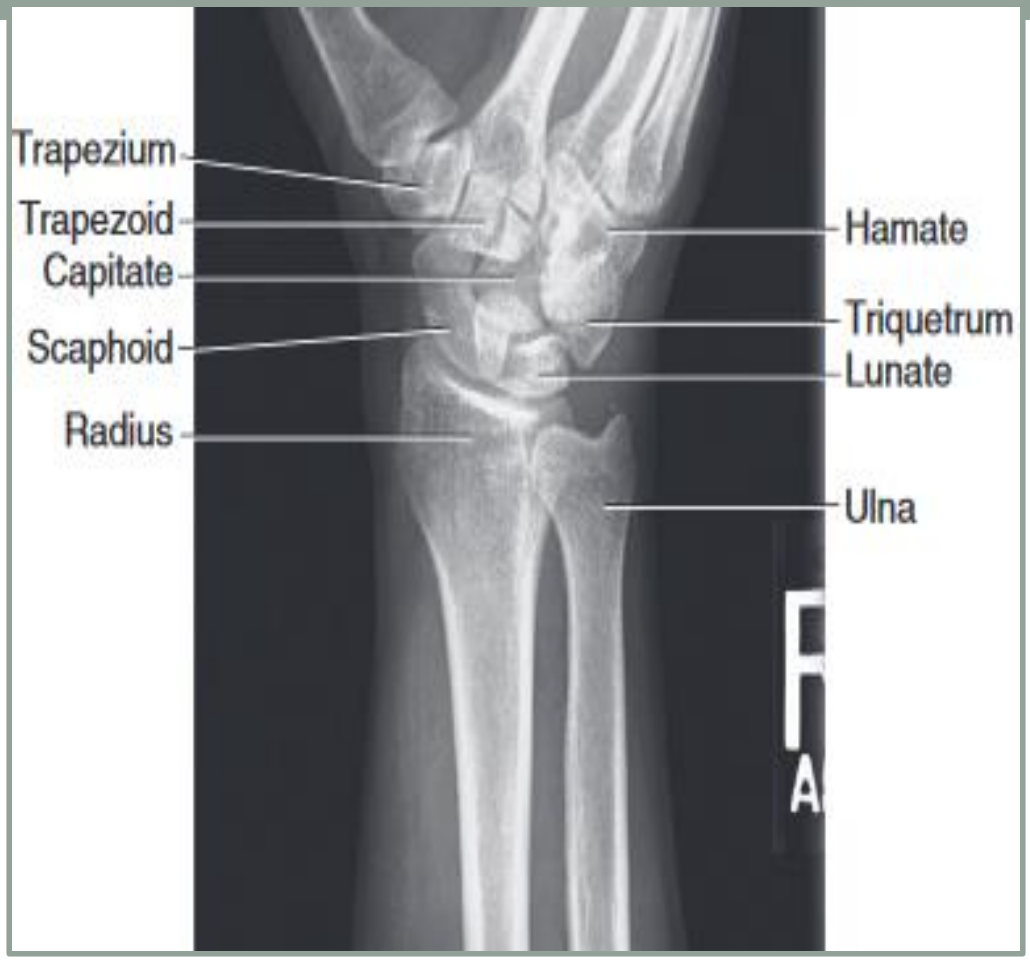


3. PA Oblique Wrist

- ***Patient position:-***
  - Seat patient at the end of the table, with elbow flexed and wrist on the **IR.**
- ***Part position:-***
  - From pronated position, rotate wrist and hand laterally 45°.
  - ***Place 45º degree foam wedge*** on the elevated side.
- ***CR:-***
  - Directed to ***mid-carpal*** area, it enters just distal to radius.

Fig, PA oblique: wrist





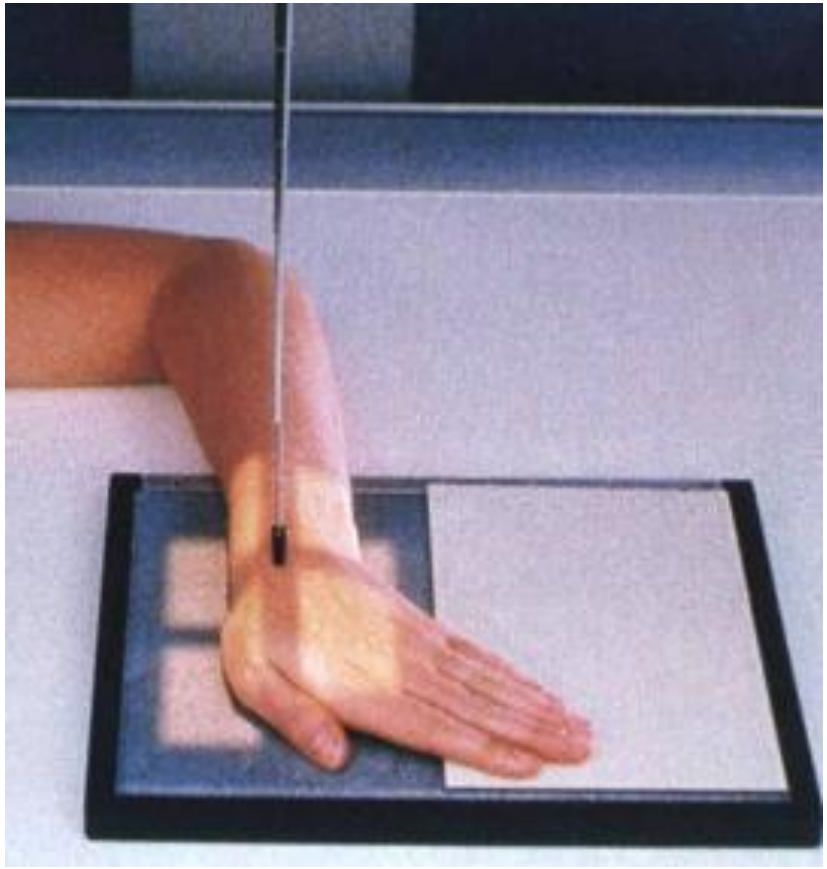
- ***Image evaluation:-***
  - ✓A well demonstrated ***scaphoid and trapizium***.
  - ✓Distal radius and ulna, carpals and proximal half of metacarpals.

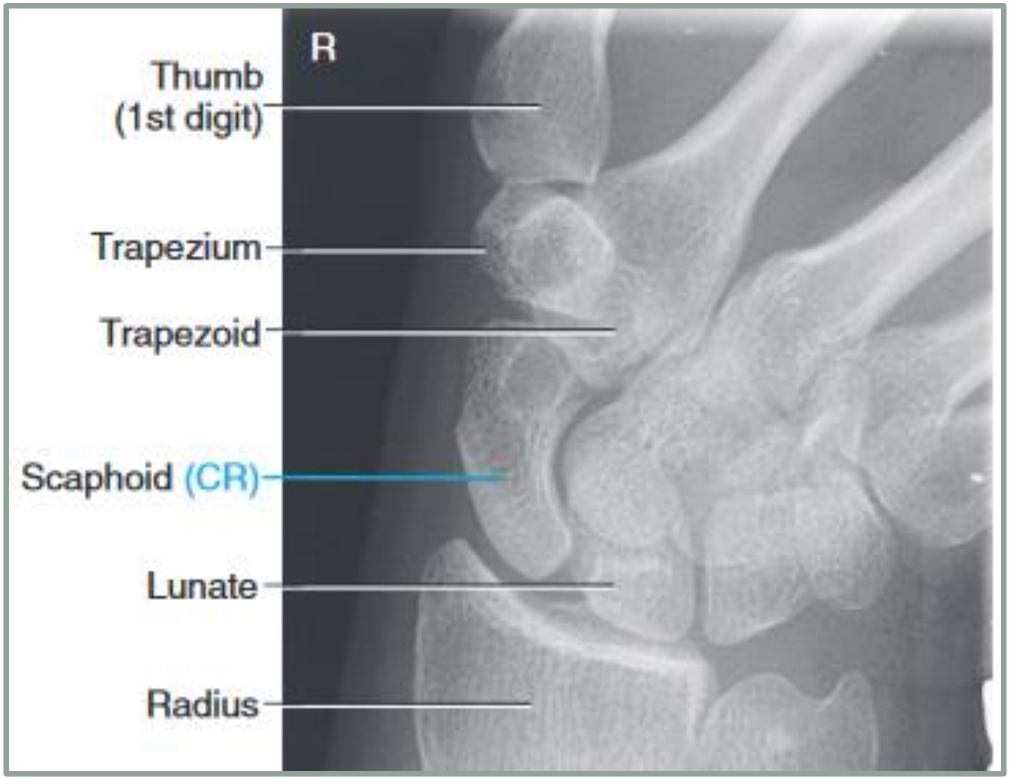
❑ SCAPHOID VIEWS: WRIST

a) PA-Scaphoid (ulnar deviation)

- ***Part position:***
  - ➢Position wrist as for a PA projection.
  - ➢Without moving forearm, gently Evert hand (move toward ulnar side) as far as patient can tolerate.
- ***CR:***
  - ➢Perpendicular to **scaphoid**.
- ***Image evaluation:***
  - ✓Scaphoid with adjacent articulations open clearly demonstrated.
  - ✓No rotation of wrist.
  - ✓Soft tissue and trabeculation.

Fig, PA SCAPHOID: WRIST





NB:- if patient with wrist trauma, do not attempt this position before a routine wrist series has been completed.

Fig, scaphoid fracture

b) PA Oblique (ulnar deviation): SCAPHOID

- ***Part position:-***
  - From the **PA** position, the hand and wrist are rotated **45º** externally and supported with non-opaque.
  - The hand should remain adducted in ulnar deviation.
- ***CR:-***
  - Midway between the ***radial & ulnar styloid processes***.
- ***Image evaluation:-***
  - Include the distal end of the radius and ulna and the proximal end of the metacarpals.
  - The scaphoid should be seen clearly, with its long axis parallel to the cassette.

Fig, PA Oblique: scaphoid

CARPAL TUNNEL

Tangential(GAYNOR-HART METHOD)

- ***Clinical indication:-***
  - ✓Rule out ***carpal tunnel syndrome.***
  - ✓Fractures of the ***hamulus process of hamate.***
- ***Patient position:-***
  - Seat patient at end of table, with wrist and hand on IR.
- ***Part position:-***
  - ***hyperextend wrist*** as far as possible using a piece of tape until the long axis of the fingers are as near vertical (90° to forearm) as possible.
  - ***Rotate entire hand about 10° internally***.

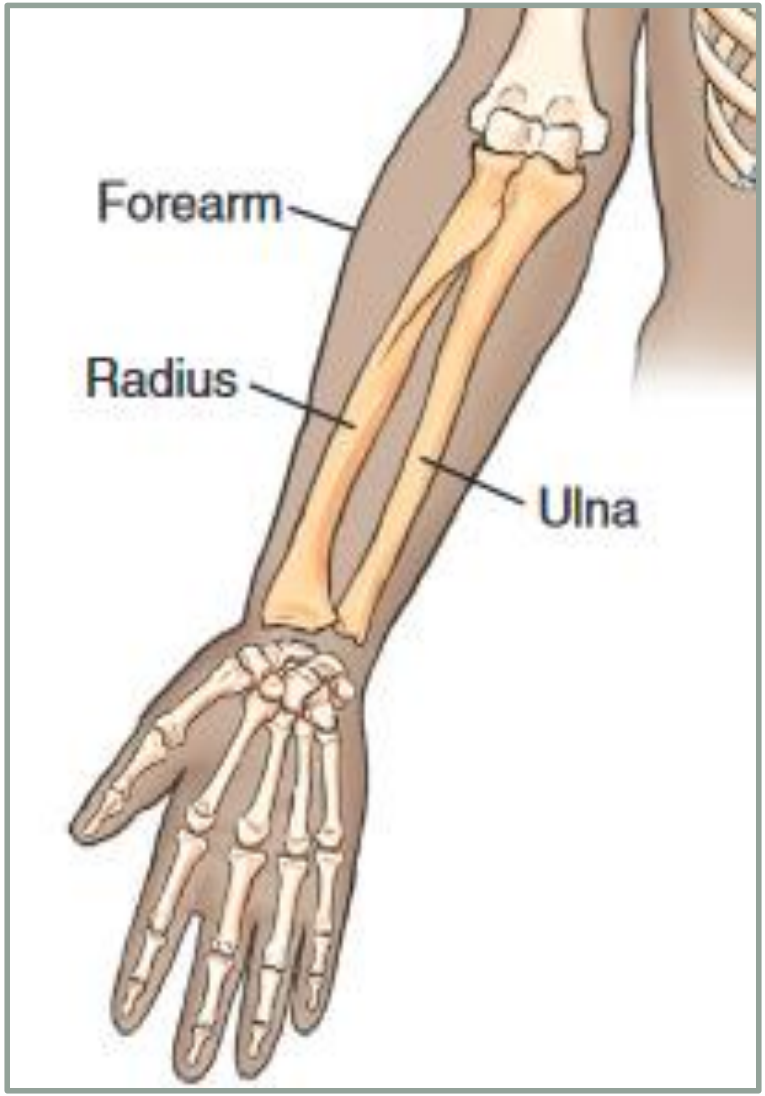
Tangential cont'd…

- ***CR:-*** Angle ***25º-30º*** to the ***point 2 to 3 cm distal to the base of 3rd metacarpal.***
- ***Image evaluation:-***
  - ✓Dorsal aspect of the wrist.
  - ✓Carpals
  - ✓Dorsal surface of carpals free of superimposition.

❖FOREARM

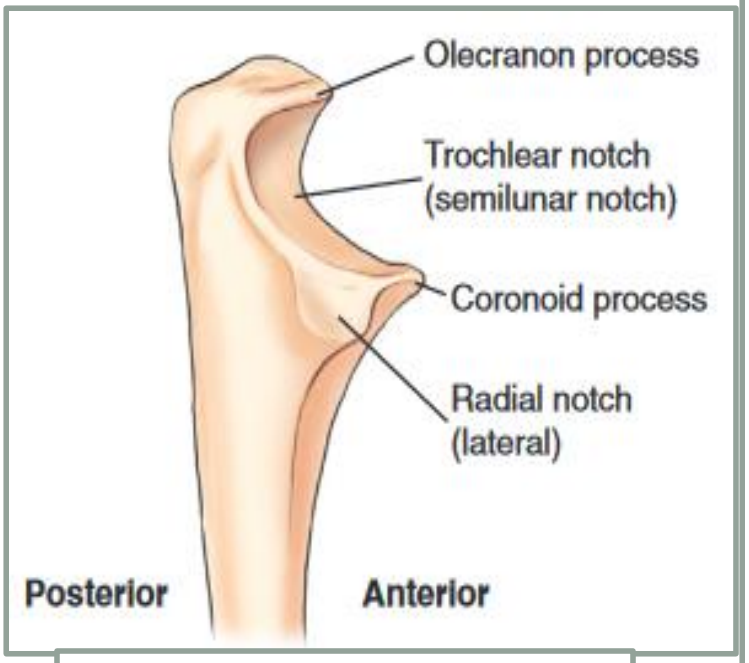
1. FOREARM ANATOMY

- ***Consists of 2 bones:-***
  1. ***Radius***
  2. ***Ulna***

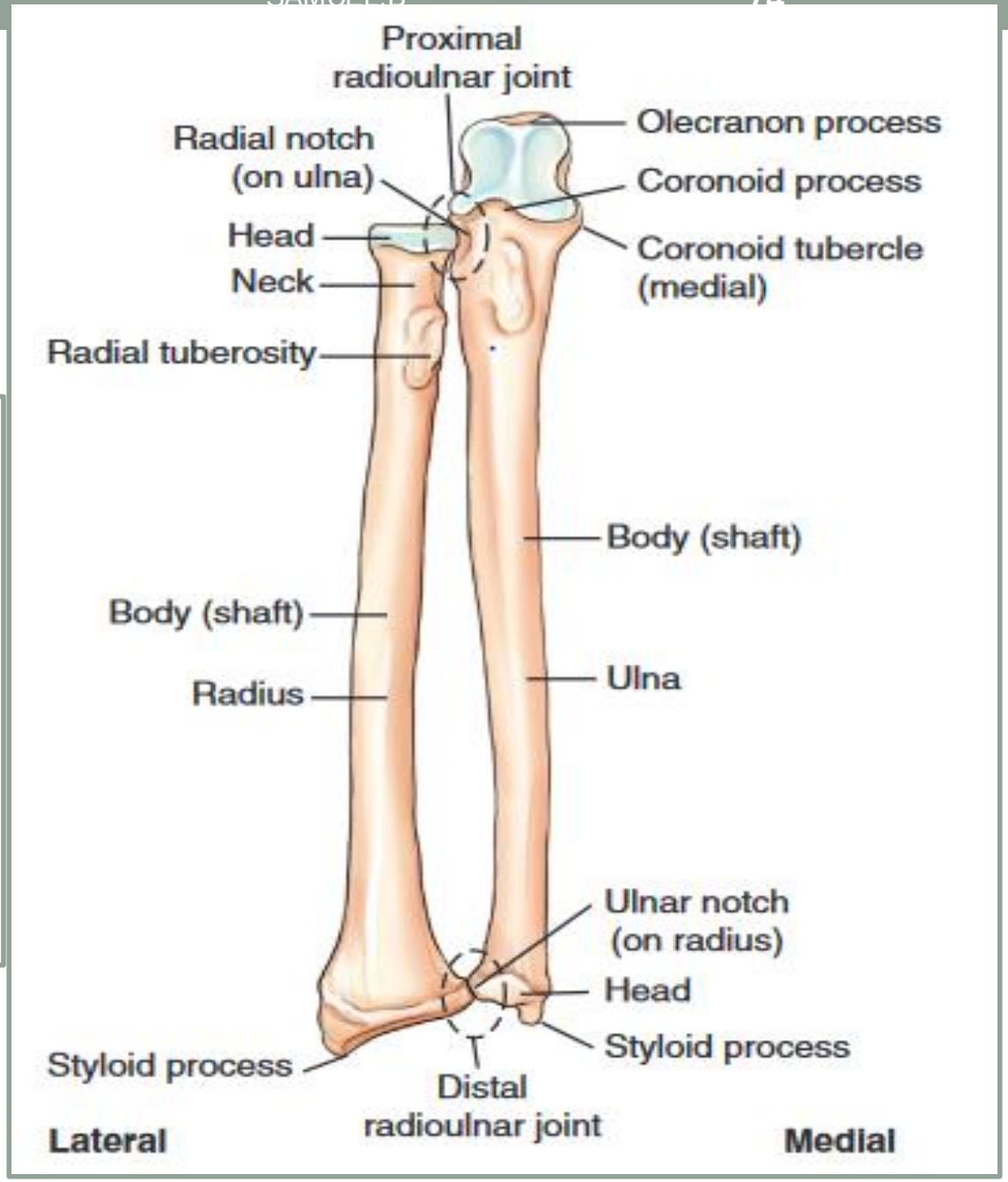


FOREARM	RADIUS	ULNA
Distal end	Ulnar Notch	Head
	Styloid Process	Styloid Process
	Inferior articular surface	Pit for the articular disc
	Dorsal radial tubercle	
Proximal end	Head	Olecranon process
	Neck	Coronoid process
	Radial tuberosity	Tronchlear notch
		Radial notch

Rt. Forearm



Proximal ulna



2. Radiological positioning of FA

- ***Technical factors:***
  - ✓ ***Image receptor:-* 24× 30 cm *(lengthwise)***
  - ✓ ***FFD :-* 100cm**
  - ✓ ***Non grid***
  - ✓ ***Exposure factors:-***
    - **kv-selection**= 60-65 KVp
    - **mA-selection**=80mA
    - **time**=0.02sec
- ***Routine projections:-***
  1. **AP,** &
  2. **LATERAL**

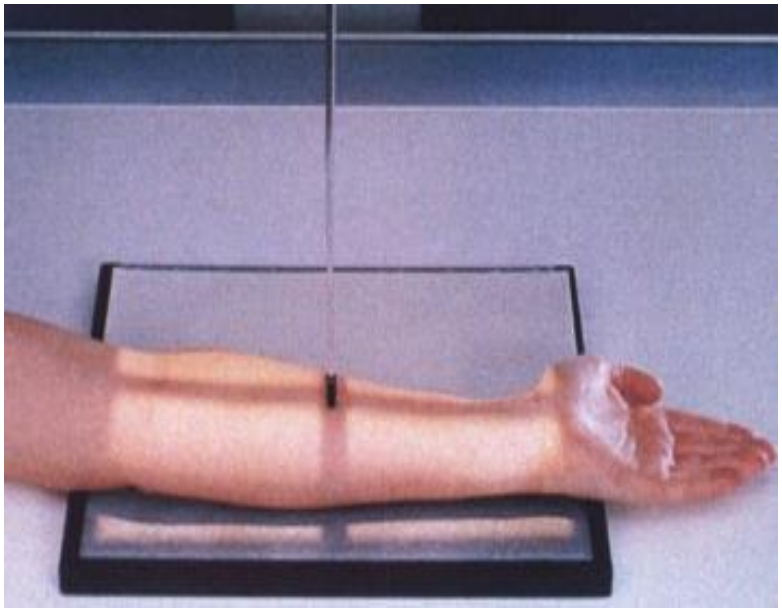
1. AP - FOREARM

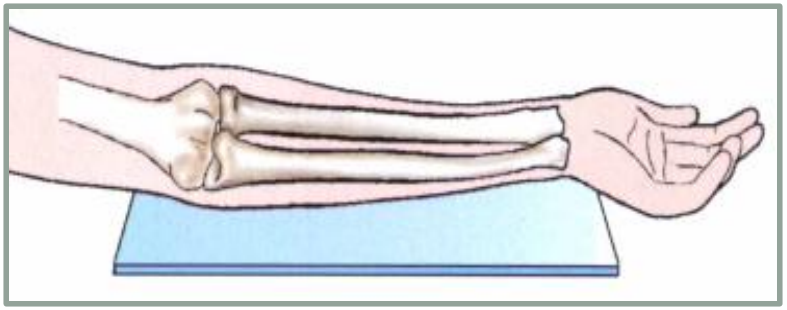
- ***Patient position:-***
  - Seat patient at end of table, with hand and arm fully extended and palm supinated.
- ***Part position:-***
  - Drop shoulder to place entire upper limb on same horizontal plane.
  - Place the dorsum of the forearm on the cassette.
  - Align and center forearm to long axis of IR.
- ***CR:-***
  - Directed to ***mid-forearm.***

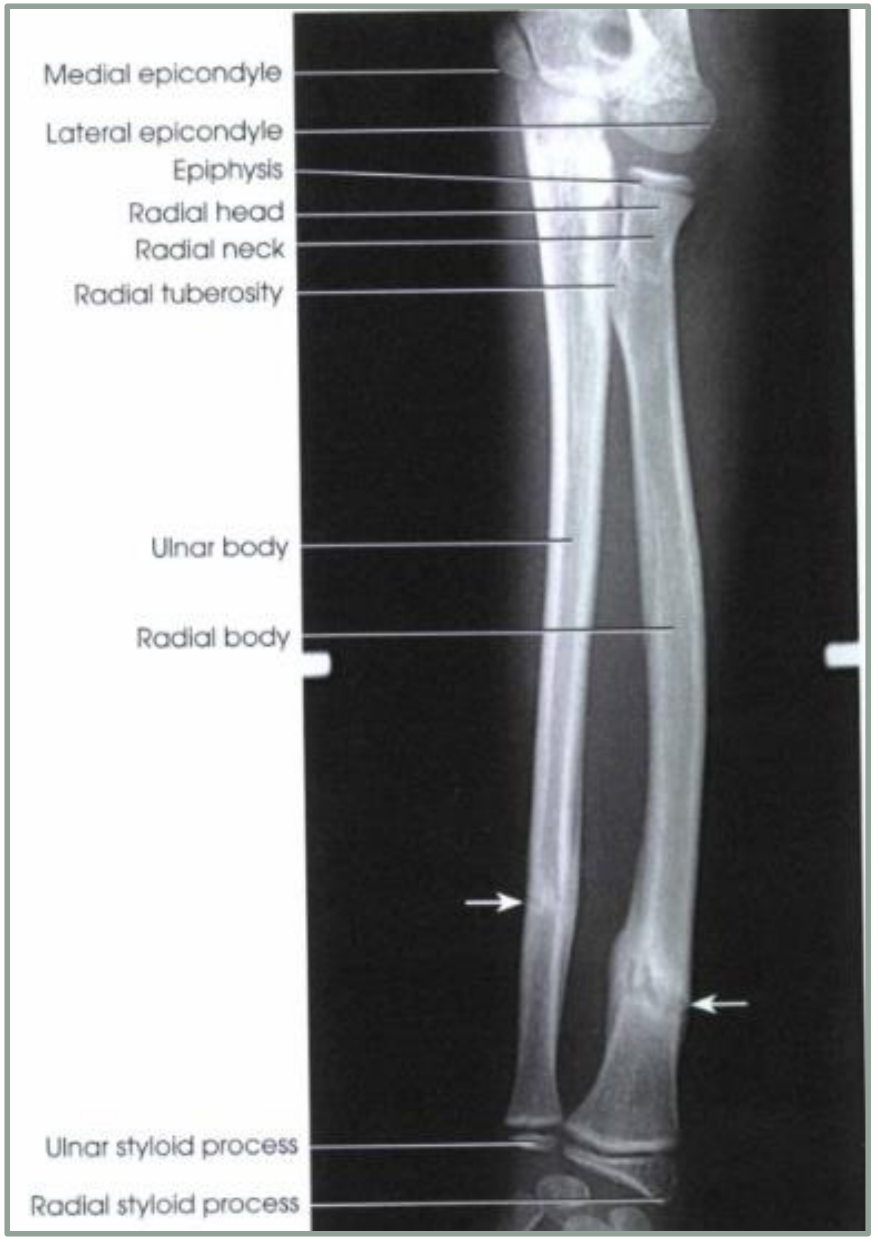
Ap-forearm cont'd…

- ***Image evaluation:-***
  - Wrist and distal humerus.
  - Slight superimposition of the radial head, neck, tuberosity over the proximal unla
  - No enlongation or foreshortening.
  - Partially open elbow joint.

- ***Fig, AP- forearm***







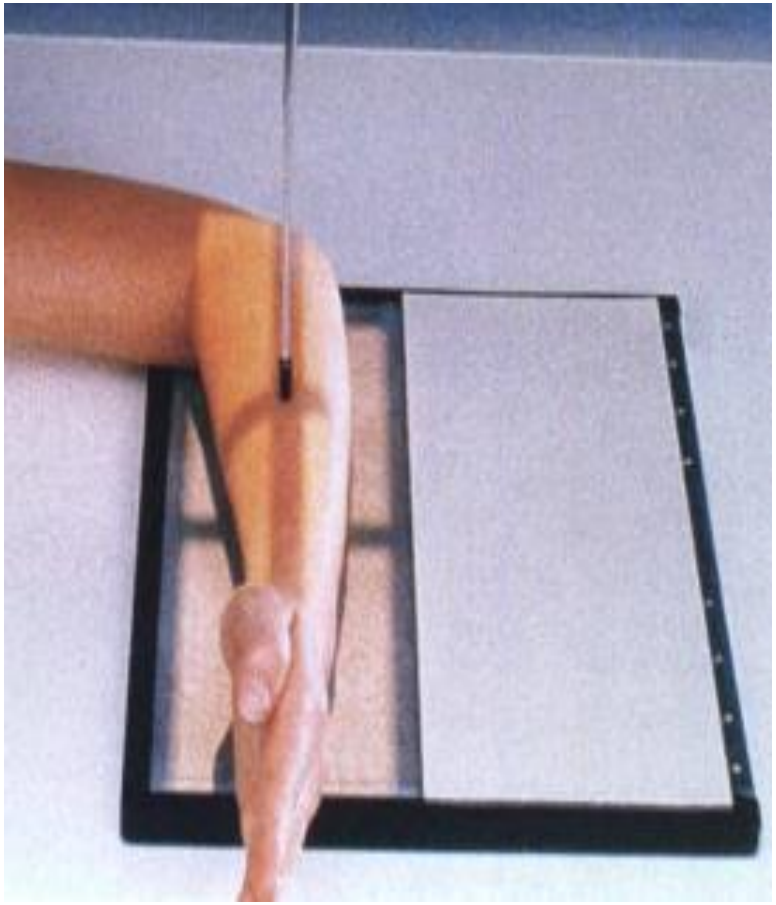
2. LATERAL FOREARM

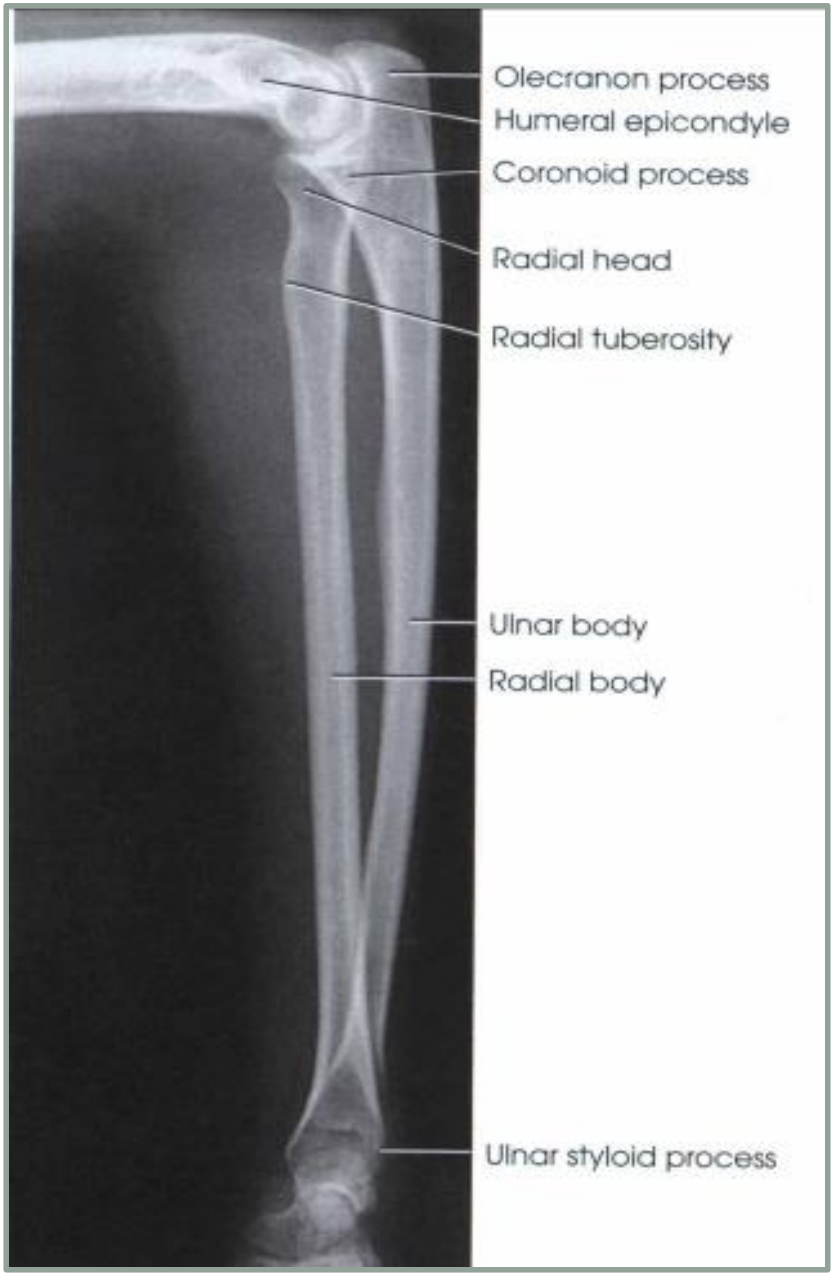
- ***Patient position:-***
  - Seat patient at end of table, with elbow flexed 90°.
- ***Part position:-***
  - Drop the shoulder to place the entire upper limb on the same plane.
  - Place the hand and wrist into ***true lateral position.***
  - Align and center forearm to long axis of IR.
- ***CR:-***
    - Directed to ***mid-forearm.***

Lat- forearm cont'd…

- ***Image evaluation:-***
  - ✓Wrist and distal humerus.
  - ✓Superimposed radius and ulna at their distal end.
  - ✓Superimposed radial head over coronoid process.
  - ✓Superimposed humeral epicondyles.
  - ✓Soft tissue and bony trabeculation.

- ***Fig, lateral - forearm***

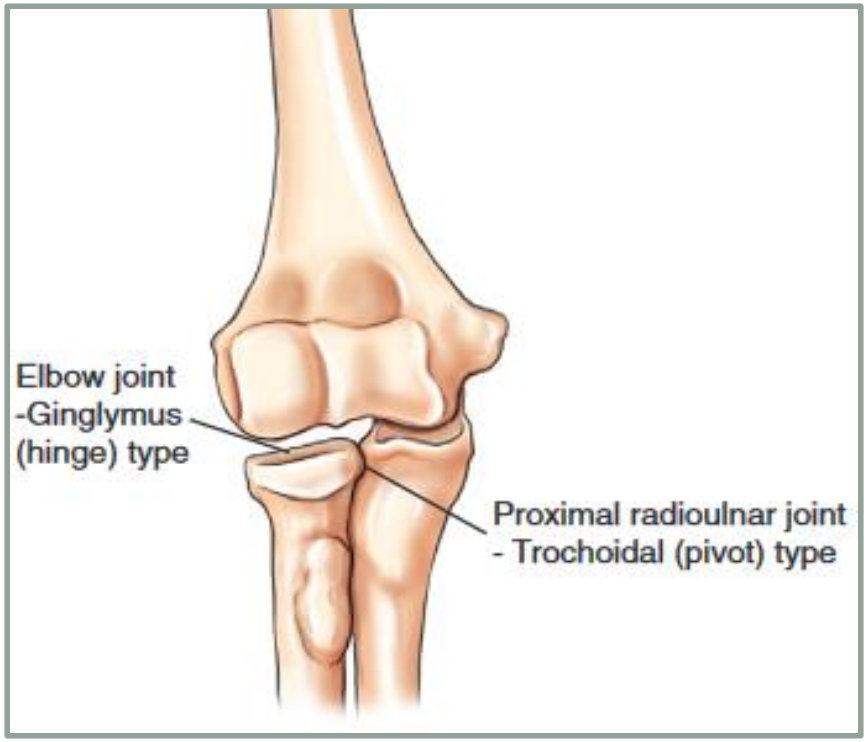




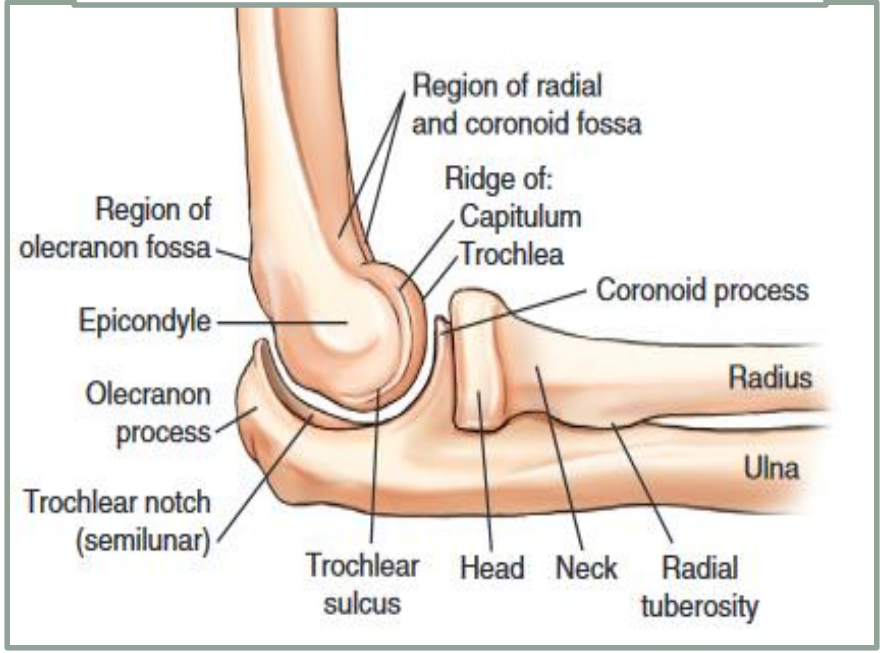
ELBOW JOINT

- The elbow joint is of the ***synovial classification*** of joints and is freely movable.

Ant. view



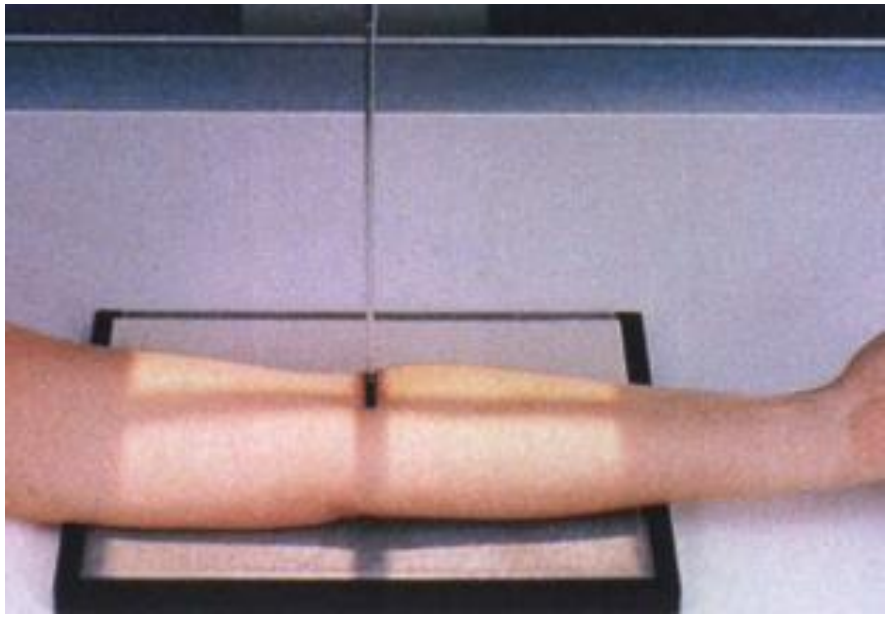
Lateral view

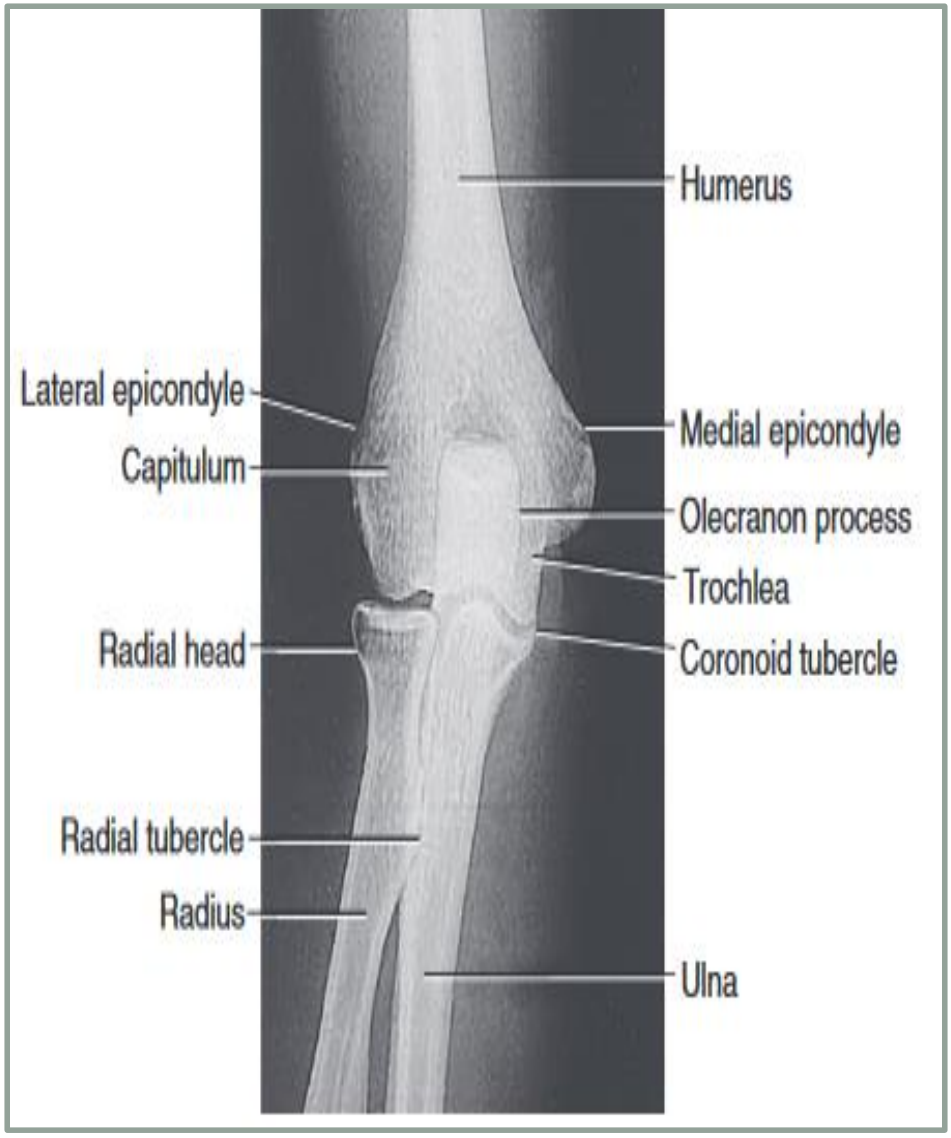


1) AP - ELBOW

- ***Patient position:***
  - Seat patient at end of table, with elbow fully extended.
- ***Part position:***
  - Extend elbow, supinate hand, and align arm and forearm with long axis of IR.
  - Ask the patient to lean laterally as necessary.
  - The shoulder must be well down.
- ***CR:-***
  - ✓ Through the joint space, ***2.5cm below the point between the epicondyles***.

AP - Elbow…





- ***Image evaluation:-***
  - ✓Elbow joint open and centered to the CR.
  - ✓No rotation of humeral epicondyles.

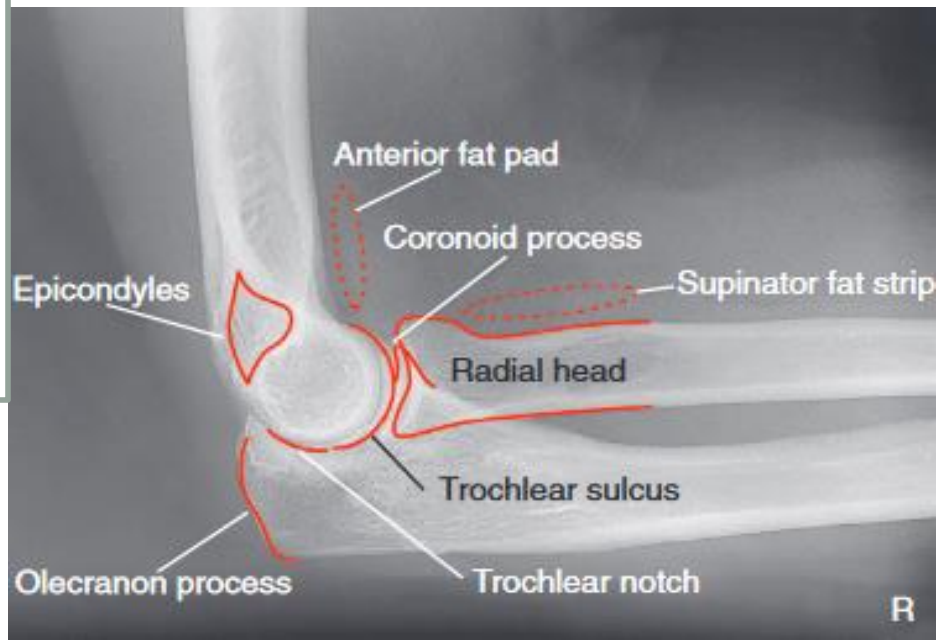
2. LATERAL ELBOW

- ***Patient position:-***
  - Seat patient at end of table, with elbow flexed 90°.
- ***Part position:-***
  - Align long axis of forearm with long axis of IR.
  - Drop shoulder so that humerus and forearm are on same horizontal plane.
  - Rotate hand and wrist into true lateral position.
- ***CR:-***
  - Perpendicular to the ***lateral epicondyle*** of the humerus.

Fig, Lateral elbow

Lateral elbow …

- ***Image evaluation:-***
  - ✓Open elbow joint
  - ✓Superimposed humeral epicondyles.
  - ✓Olecranon process seen in profile.
  - ✓Any elevated ***fat pads*** in the soft tissue.



- **ARM(HUMERUS)**

HUMERUS

- ***Humerus*** is the largest and longest bone of the upper limb.
  - It articulates with the scapula at the shoulder joint.

❖ ***Proximal end*:-**

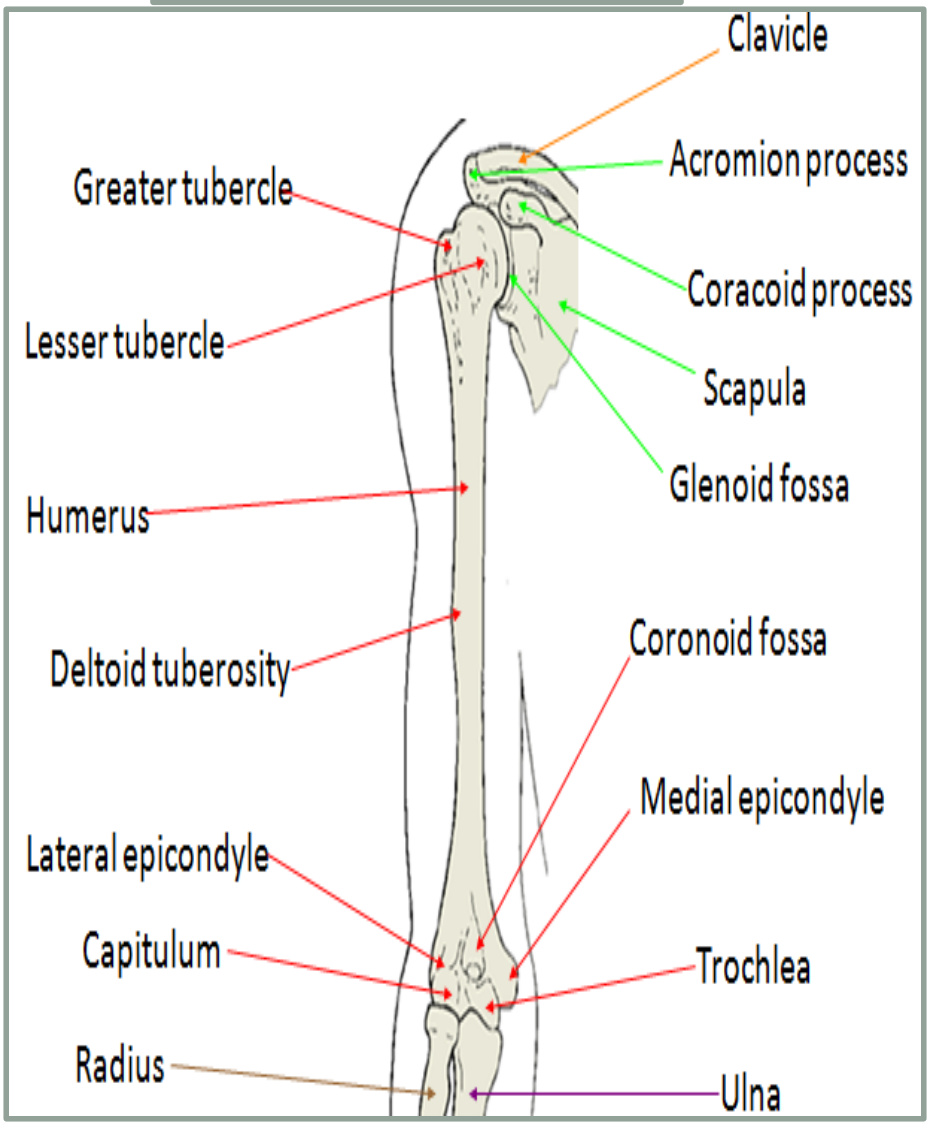
- ✓A ***rounded head*** with a smooth articular surface.
- ✓***Anatomical neck:*** serves as the attachment point for the fibrous articular capsule**.**
- ✓***Greater & Lesser tubercle***, separated by the ***intertubercular (bicipital) groove.***
- ✓***Surgical neck*** is located inferior to both tubercles
- ✓***Deltoid tuberosity*** is located laterally on the shaft of the humerus

Humerus cont'd…

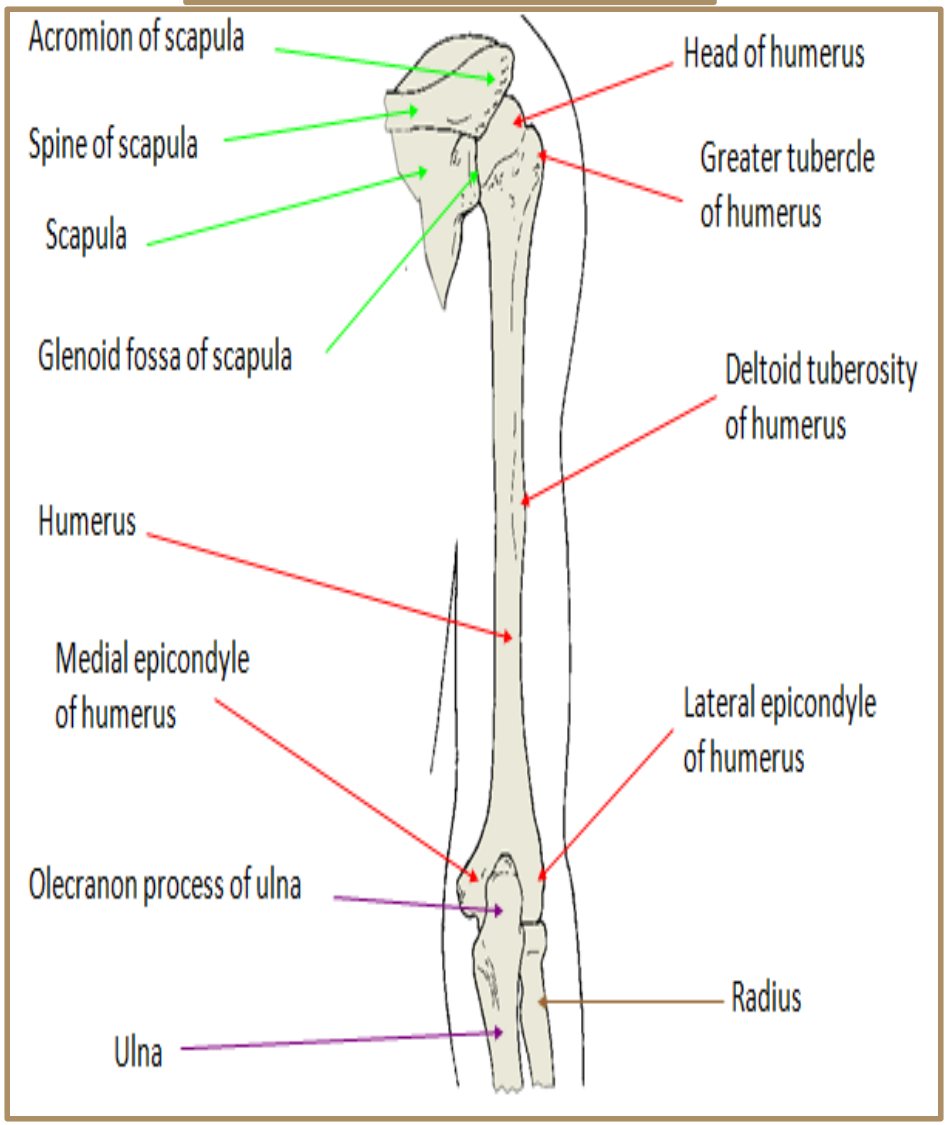
- ***Distal end*:-**
  - ✓Has 2 distinct articular surfaces:-
    - ***capitulum*(lateral) & *trochlea* (medial).**
  - ✓Has 2 more prominent:-
    - ***medial* & *lateral epicondyles*, *and***
    - with ***medial* & *lateral supracondylar ridges*** respectively.
  - ✓Has **3 fossae**:-
    - ***posterior olecranon fossa*, & *Anterior coronoid and radial fossae.***

Humerus…

Anterior view

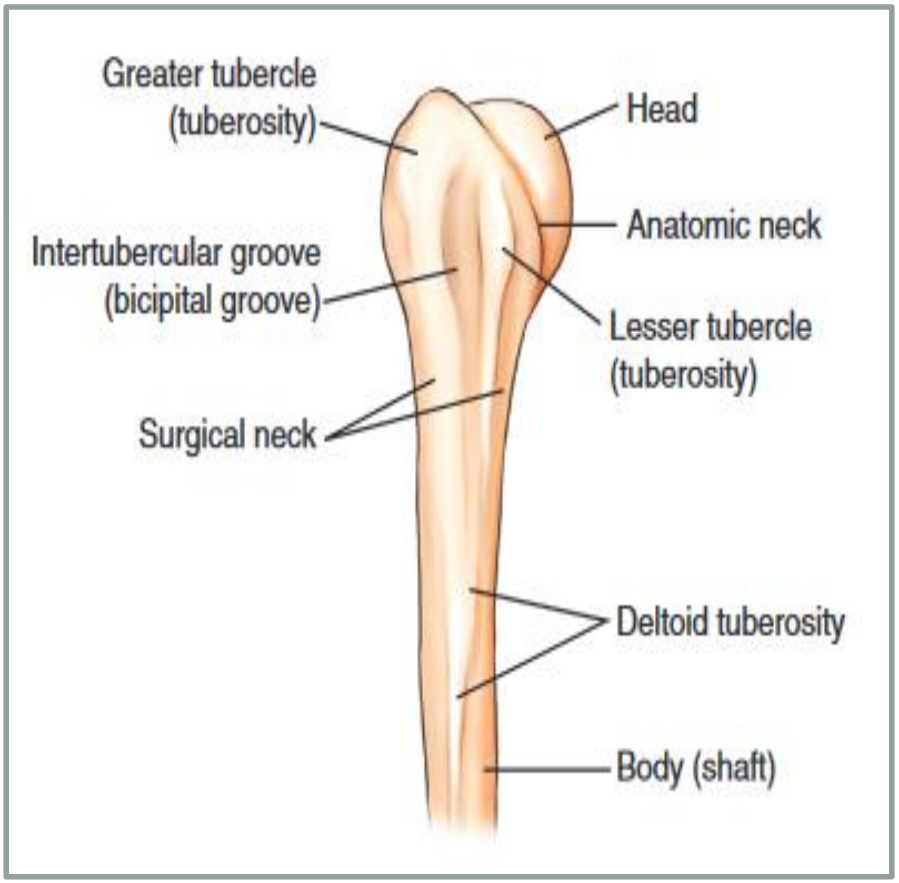


posterior view

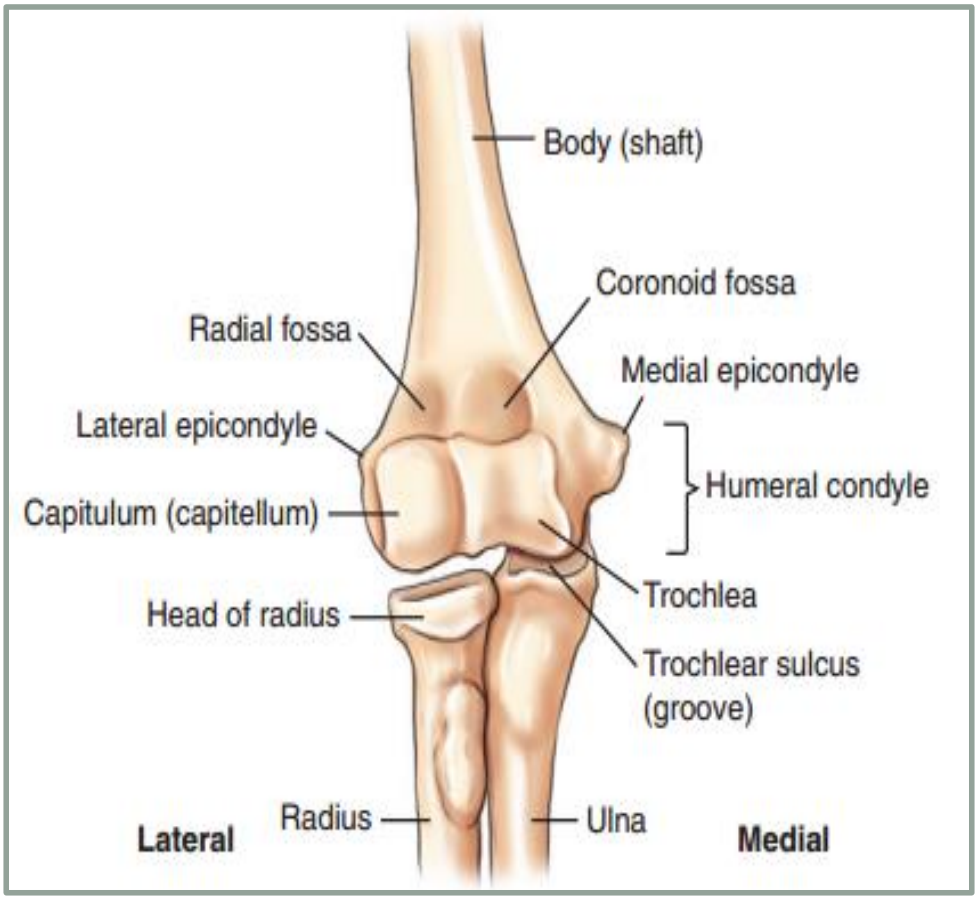


Humerus…

Proximal end



Distal end



Radiographic positioning of humerus

- ***Routine projections*:-**
  1. **AP, &**
  2. **LATERAL**
- ***Technical factors:-***
  - ✓ Film size :- 24 x 30cm (lengthwise)
  - ✓ FFD :- 100cm
  - ✓ KV selection :- 65-70kvp
  - ✓ Grid is recommended,

1. AP - HUMERUS

- ***Patient position:-***
  - Position patient erect or supine.
- ***Part position:-***
  - Rotate body toward affected side.
  - Align humerus with long axis of IR.
  - Extend hand and forearm as far as patient can tolerate.
  - Abduct arm slightly and gently supinate hand.
- ***CR:-***
  - Directed to the ***midpoint of humerus***.

AP - humerus…

- ***Image evaluation:-***

✓Elbow & shoulder joints

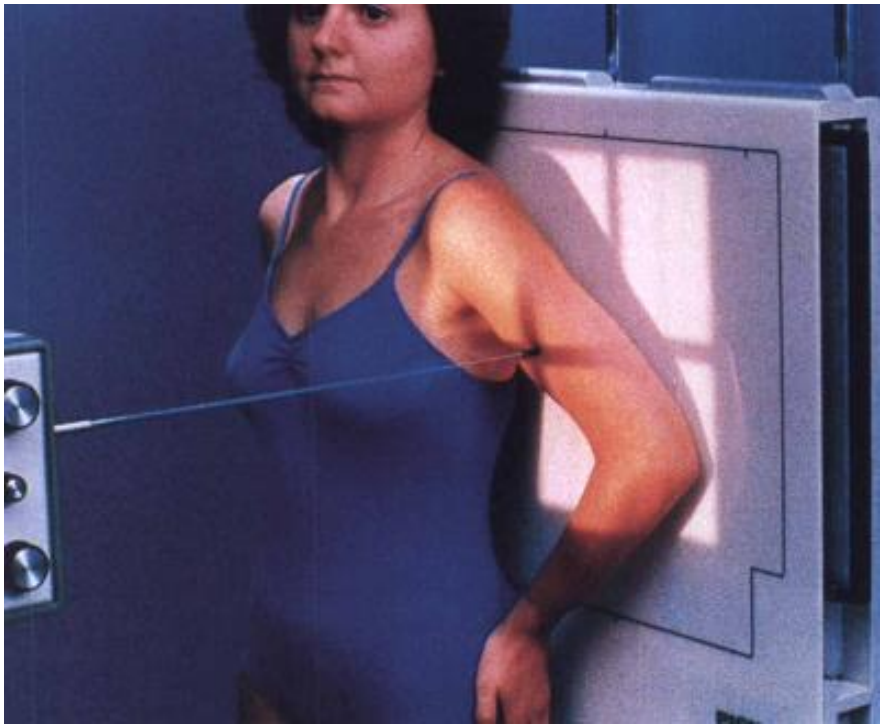
✓Epicondyles with out rotation

✓***Humeral head and greater tubercle in profile***

2. LATERSL HUMERUS

- ***Patient position:-***
  - Position patient erect or supine on the table.
- ***Part position:-***
  - The arm is internally rotated
  - Elbow is flexed to 90 degree and place the hand on the hip.
- ***CR:-***
  - ✓ to the ***mid-shaft of humerus.***

LATERAL HUMERUS…



- ***Image evaluation:-***
  - ✓***Epicondyles*** are superimposed.
  - ✓***Lesser tubercle*** is profile in medially, partially superimposed by lower portion of glenoid cavity.

Transthoracic Lateral projection: Humerus

- ***Patient position:-***
  - ➢Patient erect or supine, in lateral position with side of interest against cassette.
- ***Part position:-***
  - ➢Affected arm at patient's side in neutral rotation, and drop shoulder if possible.
  - ➢opposite arm raised and placed over top of head,
  - ➢thorax must be in true lateral to minimize superimposition.
- ***CR:-***
  - ✓To the surgical neck of the affected arm through the thorax.

Fig, Transthoracic lateral projection

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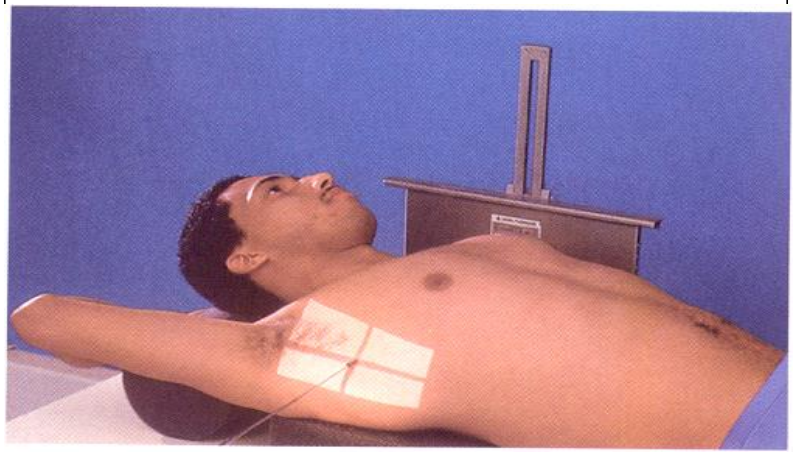

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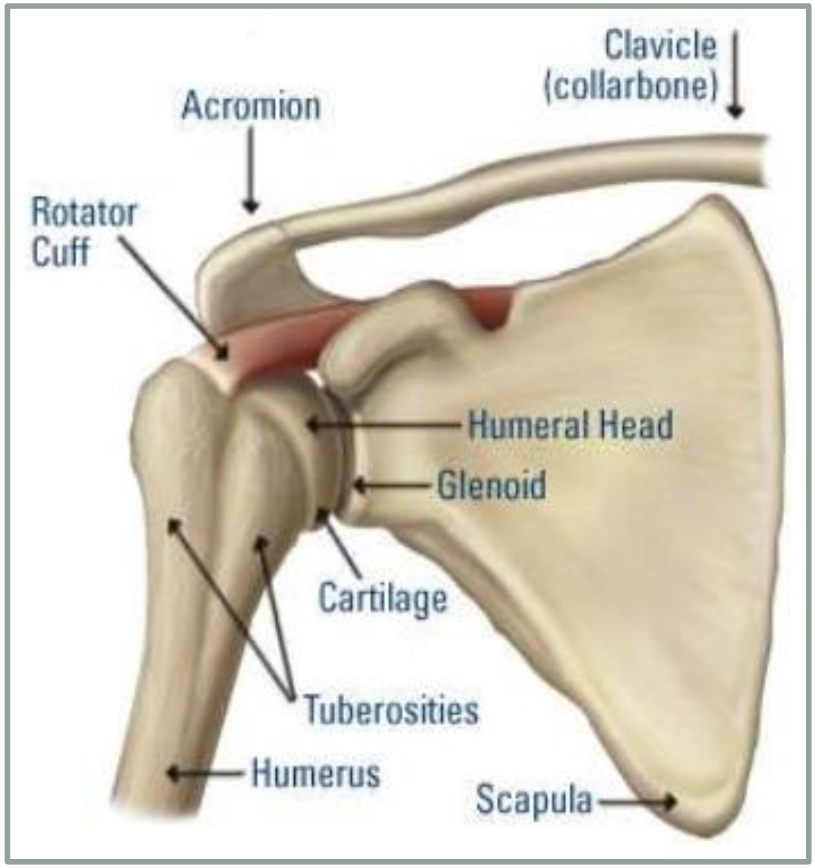
THE SHOULDER

- ***3 bones:-***
  1. Proximal humerus,
  2. Scapula, &
  3. Clavicle.
- ***3 joints:-***
  1. Glenohumeral,
  2. Acromioclavicular, and
  3. Sternoclavicular.



Radiographic positioning of the shoulder

- ***Technical factors:-***
  - ✓ ***Image receptor:- 24 × 30 or 18× 24***
  - ✓ ***FFD :-* 100cm**
  - ✓ ***Collimate*** to include soft tissue, clavicle, acromion, greater tubercle, & surgical neck of humerus.
- ***Radiographic projections:-***
  - ***AP,***
  - ***Supero-inferior, &***
  - ***Lateral Oblique(scapular "Y" view)***

1. AP shoulder

- ***Patient position:-***
  - The patient stands with the affected shoulder against the cassette.
- ***Part position:-***
  - The arm is supinated and slightly abducted.
  - The affected shoulder is **rotated 15 degrees** to bring the shoulder closer to the cassette.
- ***CR:-***
  - directed to ***1 inch (2.5 cm) inferior to coracoid process.***

Fig, AP shoulder

- ***Image evaluation:-***
  - ✓The head of the humerus seen slightly overlapping the glenoid cavity but separate from the acromion process.
  - ✓Superior scapula and lateral half of clavicle

2. Suproinferior - shoulder(axial)

- ***Patient position:-***
  - The patient is seated at the side of the table.
- ***Part position:-***
  - The patient leans towards the table and to ensure that the glenoid cavity is included in the image.
  - The arm should be abducted to a minimum of 45 degrees.
- ***CR:-***
  - Angle **5 to 15 degrees** through the shoulder joint and toward the elbow.

Fig, SI - SHOULDER

- ***Image evaluation:-***
  - Open scapulohumeral joint
  - Coracoid process projected above the clavicle
  - Lesser tubercle in profile.

Outlet projections of shoulder

AP, with CR 30º ⇩

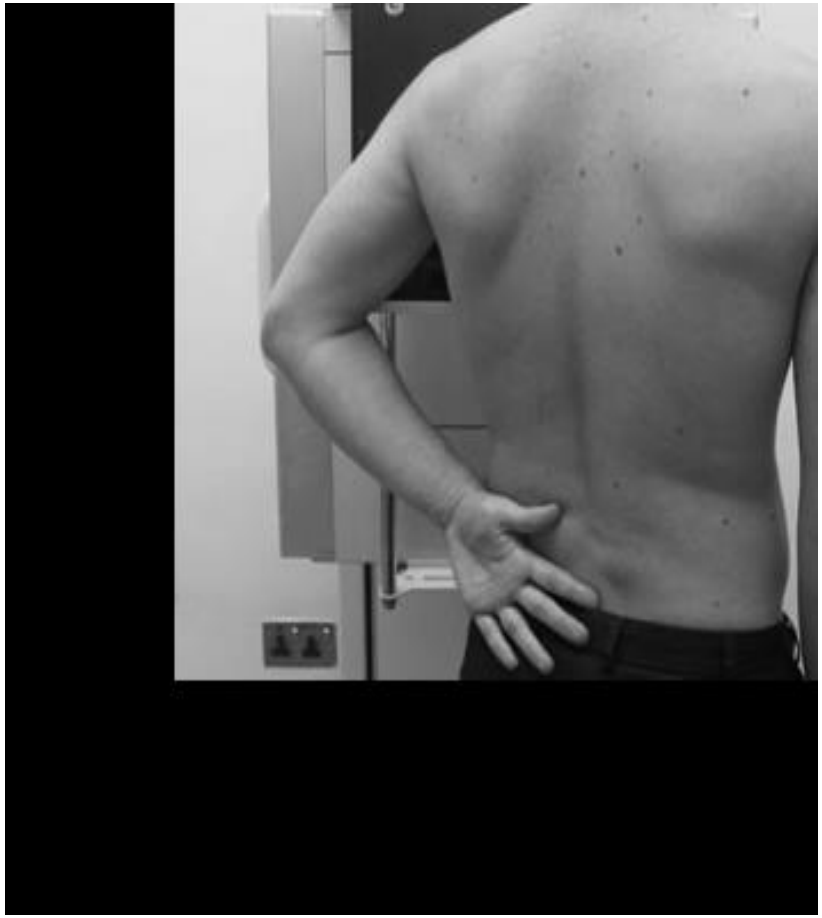
Antero-posterior radiograph of shoulder outlet showing normal under of acromion (incidental calcification of the supraspinatus tendon)

lateral, with CR 10º ⇩

3. LATERAL OBLIQUE(scapular "Y" view)

- ***Positioning:-***
  - The patient stands or sits facing the cassette with the lateral aspect of the affected arm in contact.
  - The dorsum of the hand is resting on the patient`s waist.
- ***CR:-***
  - Over the ***head of the humerus with the tube angled 10^0caudally.***
- ***Image evaluation:-***
  - should demonstrate the extent of the anterior projection of the acromion & the subacromial space.

LATERAL OBLIQUE (scapular "Y" view)

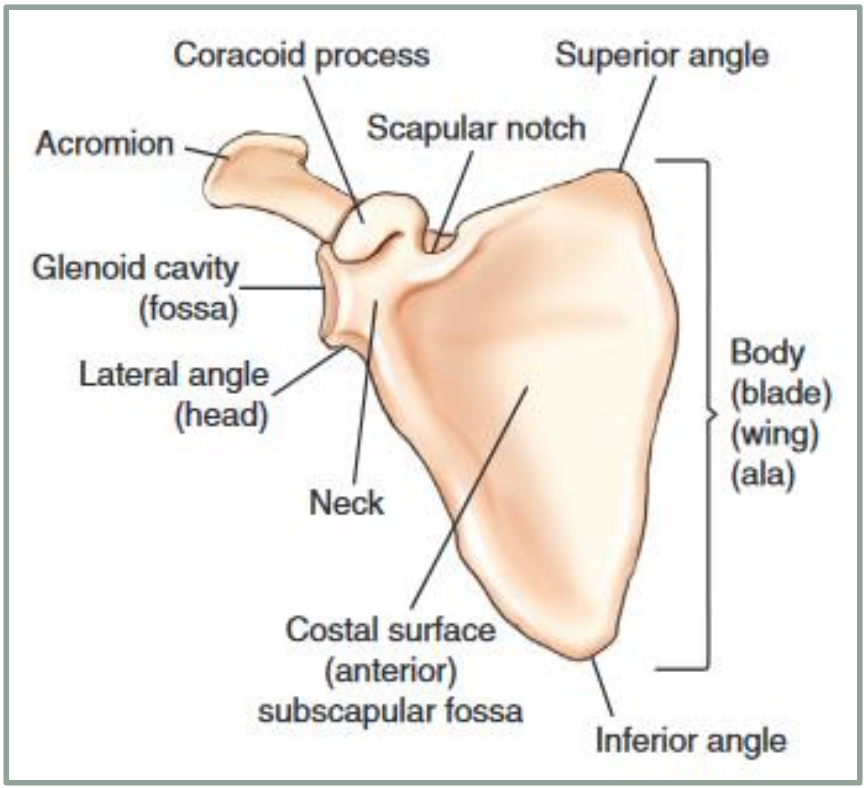


SCAPULA

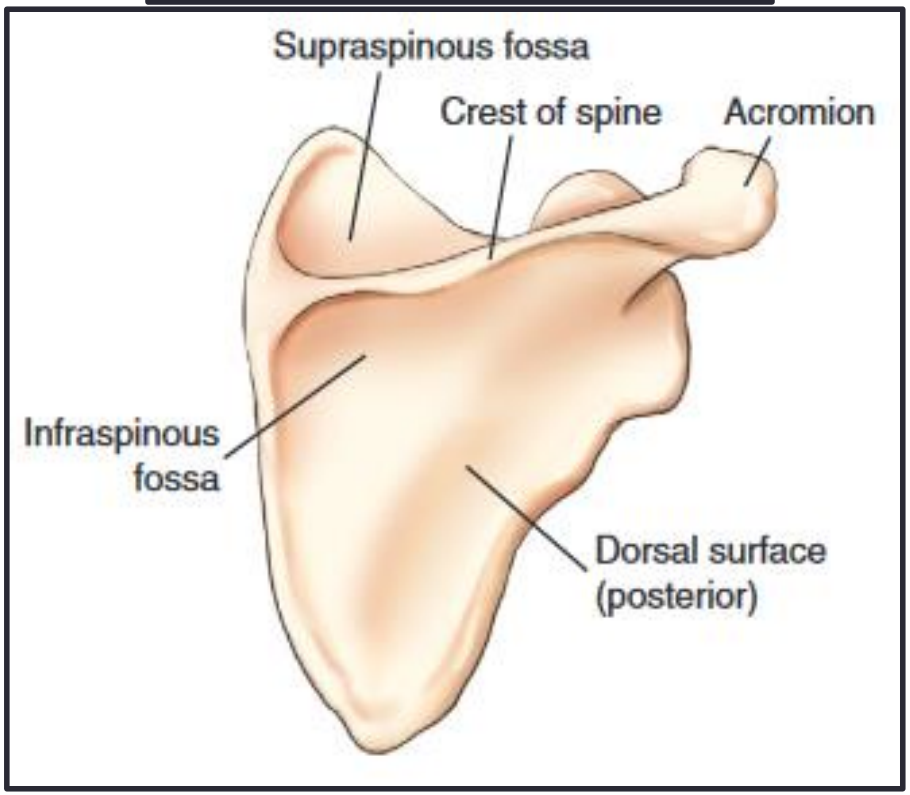
- ***Scapula*** is triangular in shape, having;
  - ✓ ***2 surafces:-*** costal & dorsal
  - ✓ ***2 processes:-*** coracoid & spinous
  - ✓ ***3 borders:-*** superior, medial, & lateral
  - ✓ ***3 fossae:-*** supraspinous, infraspinous & subscapular
  - ✓ ***3 angles:-*** superior, inferior & lateral or acromial.

Fig, SCAPULA

Ant. view



Post. view



Radiographic positioning of scapula

1. AP SCAPULA

- ***Patient position:-***
  - Place the patient in the ***upright or supine position.***
- ***Part position:-***
  - The arm is slightly abducted away from the body and medially rotated,
  - Support the hand in comfortable position.
  - The cassette is positioned so that its upper border is at least 5 cm above the shoulder.

AP – Scapula cont'd…

- ***CR:-***
  - To the a point ***2 inch(5cm)inferior to the coracoid process.***
- ***Image evaluation:-***
- The image should clearly demonstrate the:
  - Lateral portion of scapula free of superimposition from ribs.
  - Scapula detail through superimposed lung and ribs
  - Acromoin process and inferior angle.

Fig, AP SCAPULA…

A

B

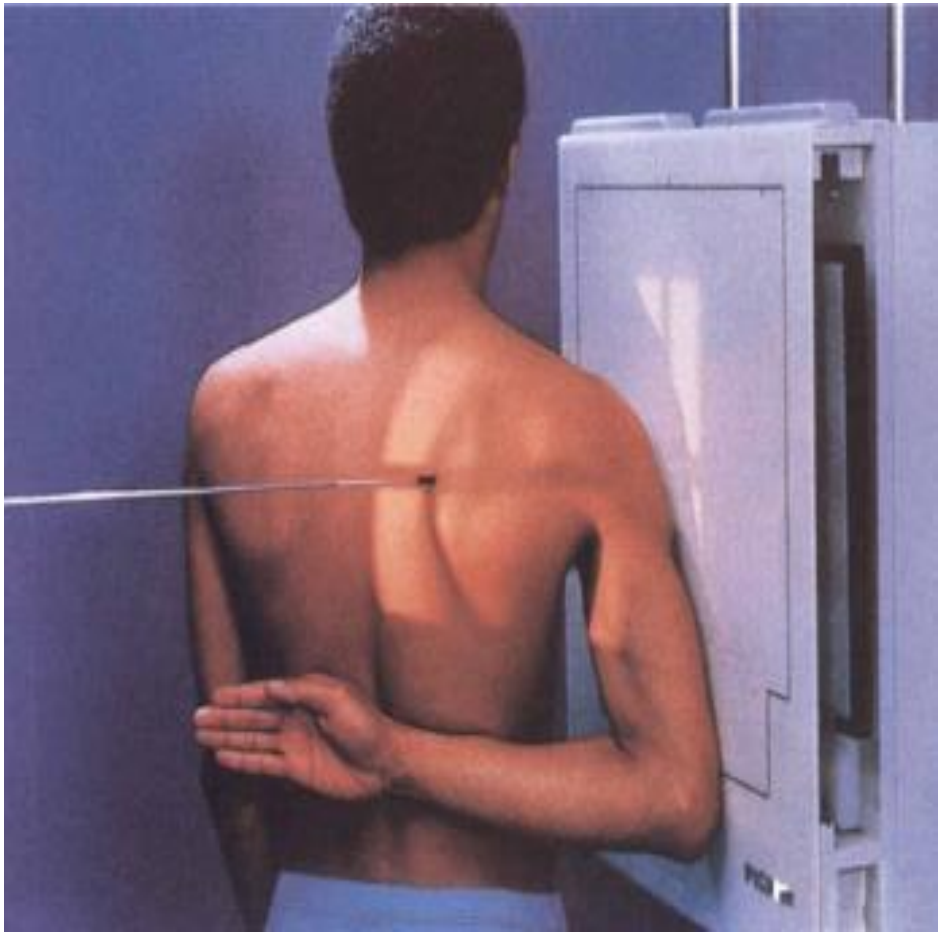
2. LATERAL SCAPULA

- ***Patient position:-***
  - The patient stands with the side being examined against a vertical Bucky.
- ***Part position:-***
  - Adjust the patient in **RAO** or **LAO** position, average patient requires a 45 to 60 degree rotation.
  - The arm is either adducted across the body or abducted with the elbow flexed to allow the back of the hand to rest on the hip.
- ***CR:-***
  - to the ***mid-medail border of the protruding scapula.***

Lateral scapula cont'd…

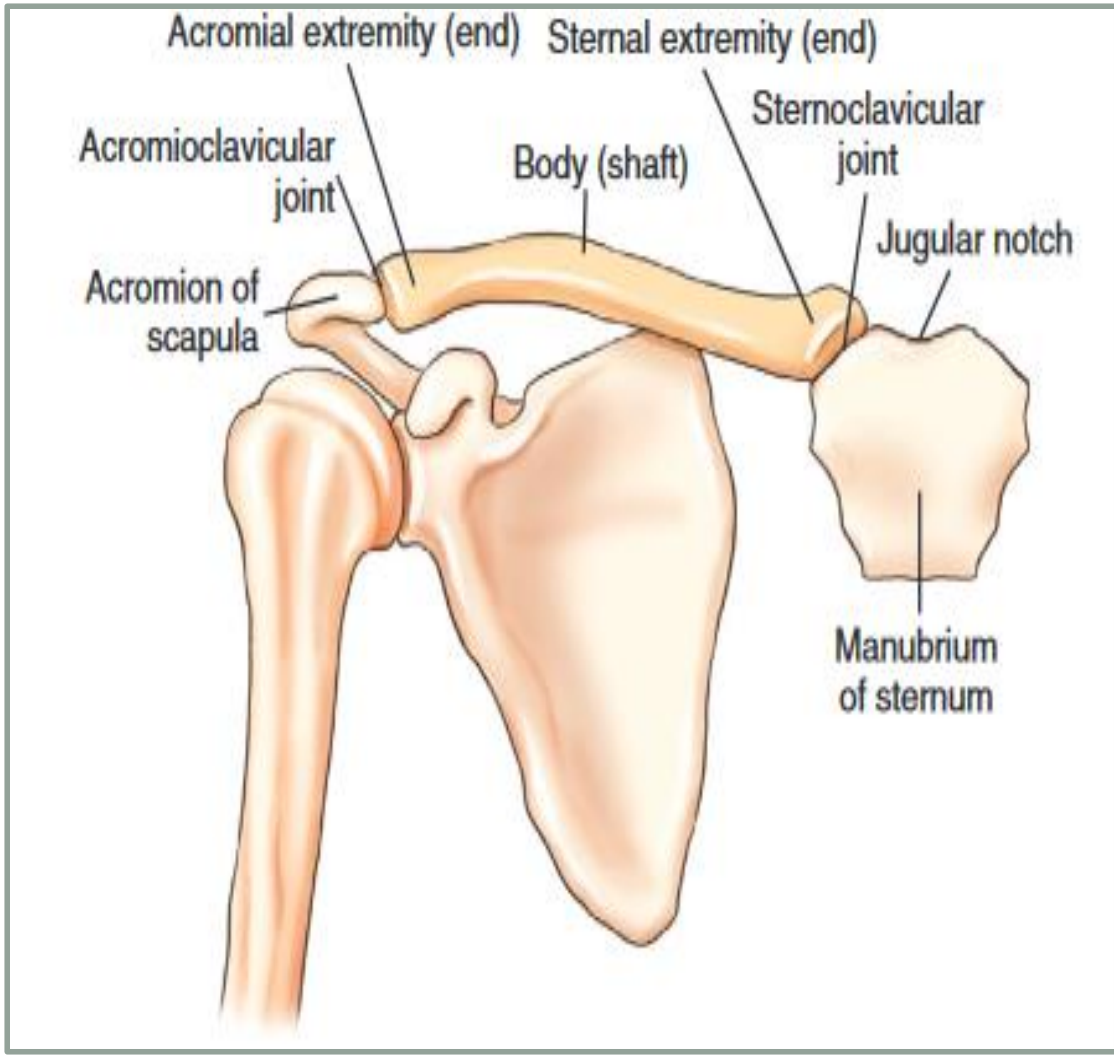
- ***Image evaluation:-***
  - The scapula clear of the ribs.
  - The medial & lateral borders superimposed.
  - The humerus should be projected clear of the area under examination.

Fig. Lateral scapula…



CLAVICLE

- The **clavicle (collarbone)** is a long bone with a double curvature.
- It has two ends, ***sternal & acromial end.***

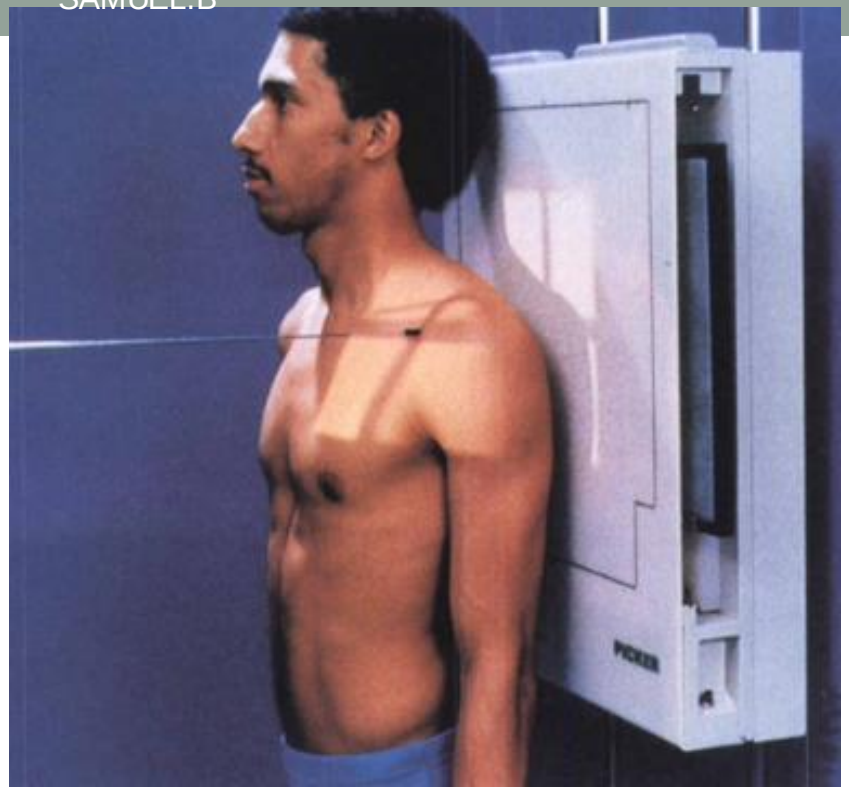


Radiographic position of clavicle

AP CLAVICLE

- ***IR:-*** 24 × 30 cm cross wise.
- ***Patient position:-***
  - Place the patient in supine or upright position.
- ***Part position:-***
  - Place the arm along the sides of the body, and adjust the shoulders to lie in the same horizontal plane.
  - Center the clavicle to the **IR.**
- ***CR:-***
    - To the midshaft of the clavicle.

Fig, AP Clavicle



- ***Image reveals:-***
  - ✓Sternoclavicular joint
  - ✓Acromioclavicular joint
  - ✓Body of clavicle
  - ✓Acromial & Sternal extremity

❑ PA CLAVICLE

- ***Patient position:***
  - The patient sits or stands facing an erect cassette holder.
- ***Part position:***
  - The patient's head is turned away from the side being examined.
  - Center the clavicle to the middle of the cassette.
- ***CR:***
  - ❑Perpendicular central ray exits midshaft of the clavicle.

Fig, PA CLAVICLE

- ***NB:- PA clavicle reduce the OID and dose to the thyroid and eyes.***

END
THANKS……