

- ***BONES OF THE***
- ***UPPER LIMB***

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# *OBJECTIVES*

**At the end of the lecture, students should be able to:**

- List the different bones of the UL.**
- List the characteristic features of each bone.**
- Differentiate between the bones of the right and left sides.**
- List the articulations between the different bones.**

***The Bones of UL are:***

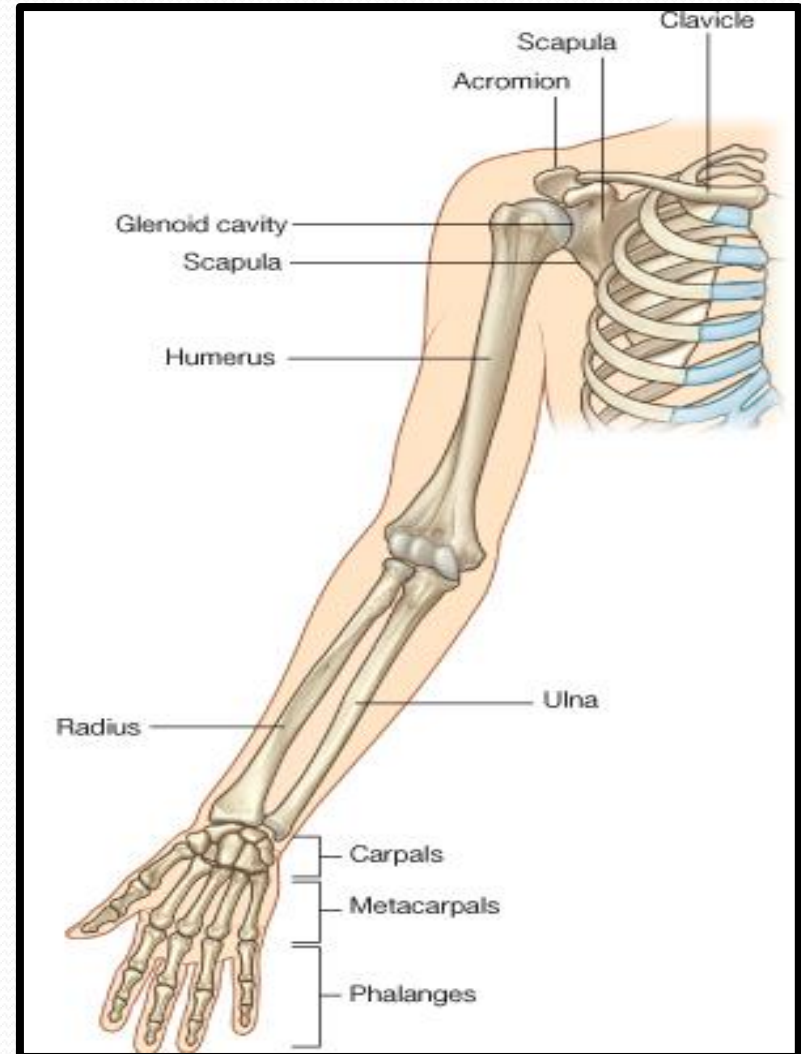
***Pectoral Girdle.***

***Arm : Humerus.***

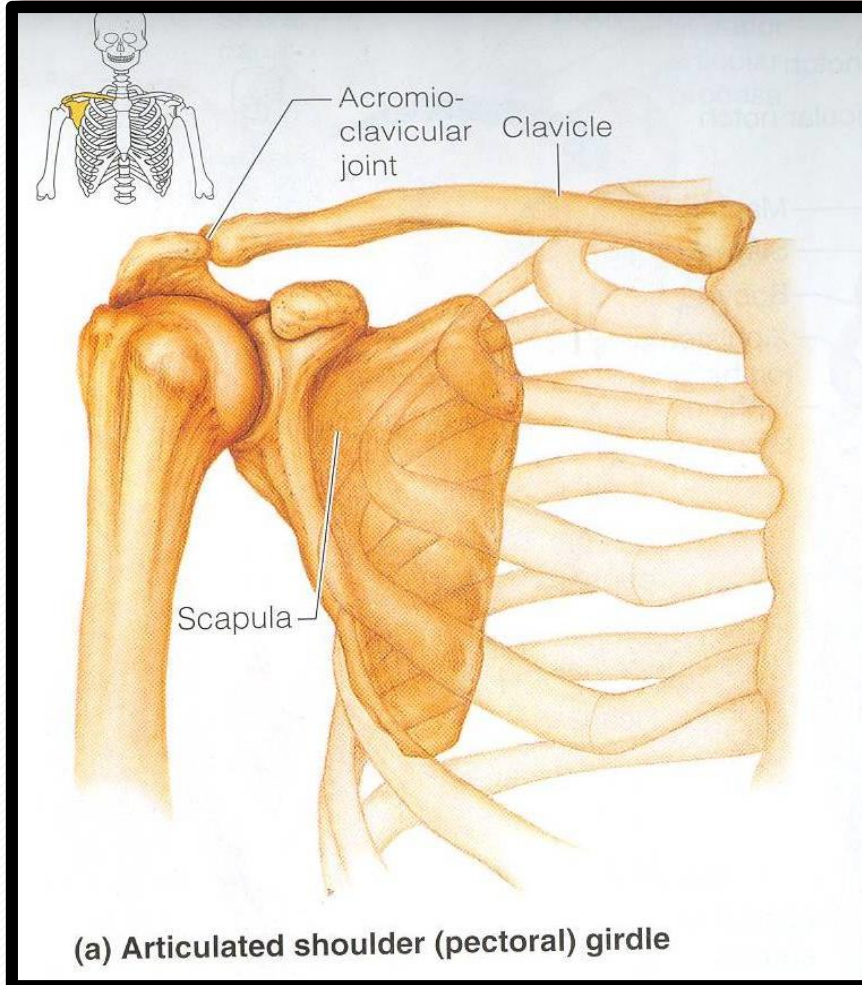
***Forearm : Radius & Ulna.***

***Wrist : Carpal bones***

***Hand: Metacarpals &  
Phalanges***

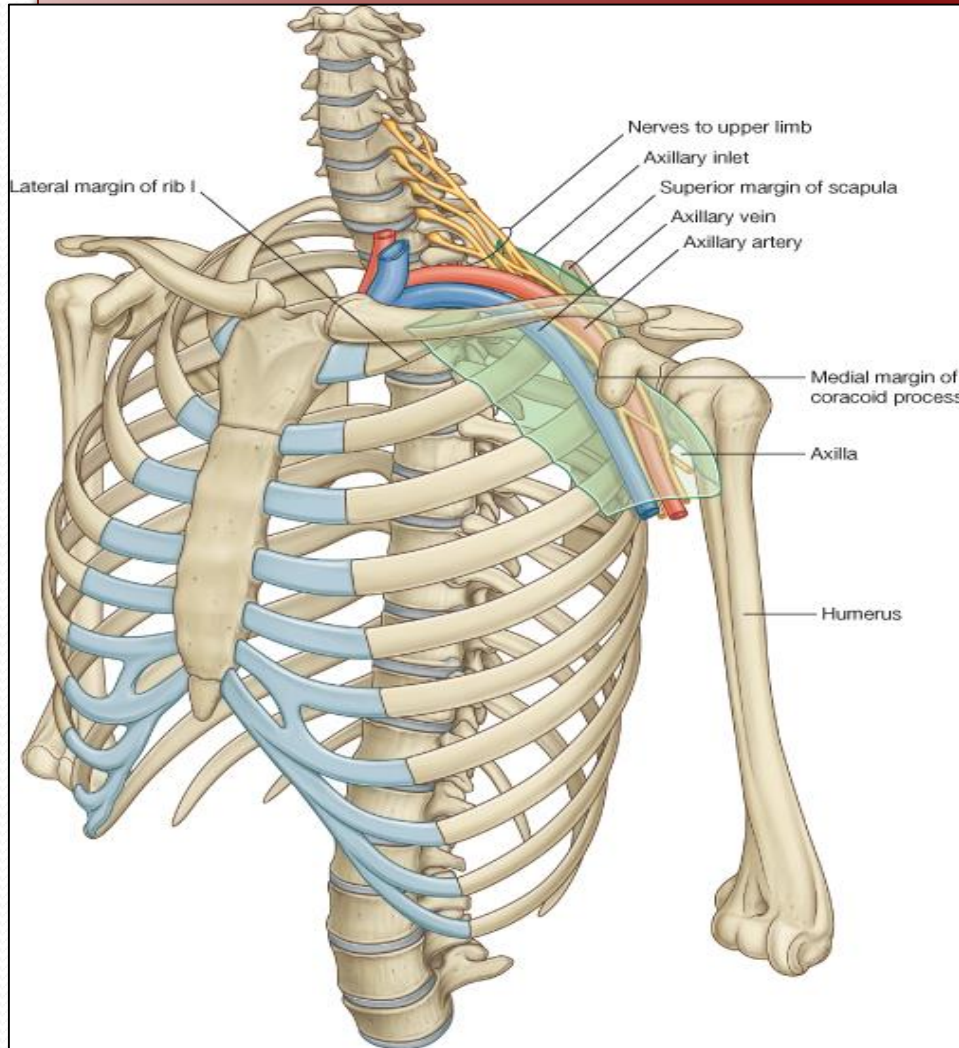


# Pectoral Girdle



- *Formed of Two Bones:*
- **Clavicle** (anteriorly) **and Scapula** (posteriorly).
- *It is very light and allows the upper limb to have exceptionally free movement.*

# Clavicle

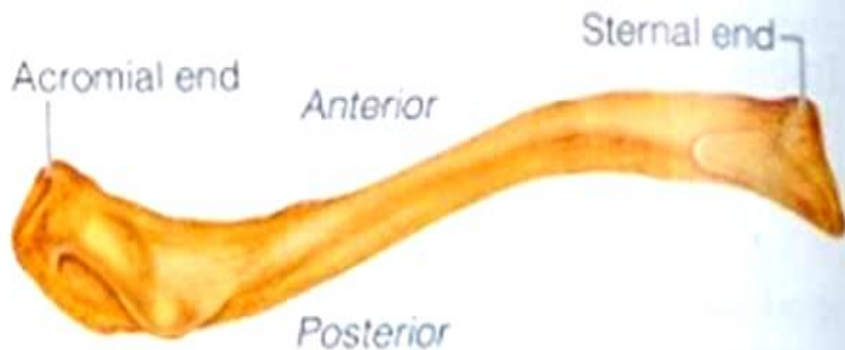


- It is a doubly curved **long bone** lying horizontally across the root of the neck
- It is subcutaneous throughout its length.
- **Functions:**
- 1. It serves as a rigid support from which the scapula and free upper limb are suspended & keep them away from the trunk so that the arm has maximum freedom of movement.
- 2. Transmits forces from the upper limb to the axial skeleton.
- 3. Provides attachment for muscles.
- 4. It forms a boundary of the Cervicoaxillary canal for protection of the neurovascular

# Clavicle



Superior view



Inferior view

(b) Right clavicle

*It is a long bone with no medullary cavity.*

*It has the appearance of an elongated letter Capital (S) lying on one side.*

*It has Two Ends:*

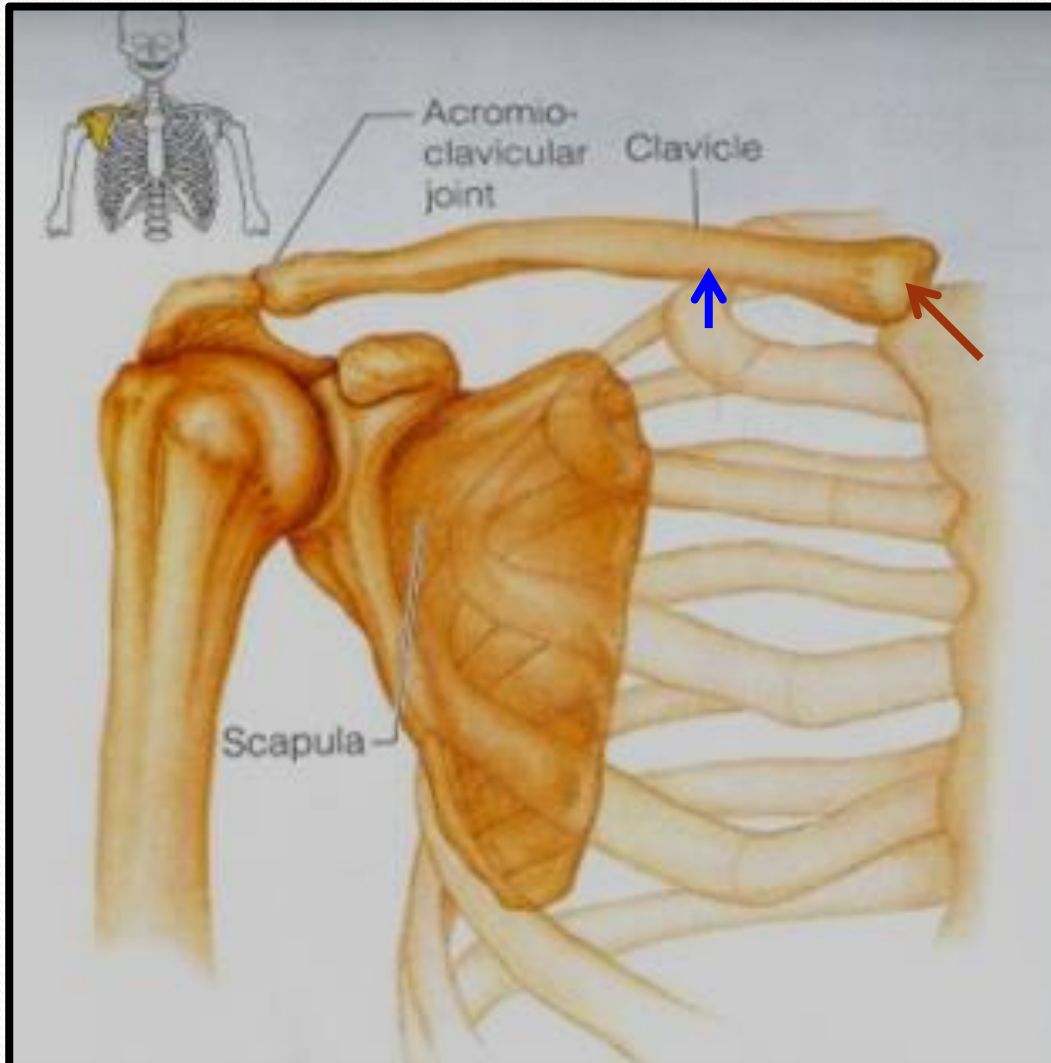
*Medial (Sternal) : enlarged & triangular.*

*Lateral (Acromial) : flattened.*

*Body (shaft):*

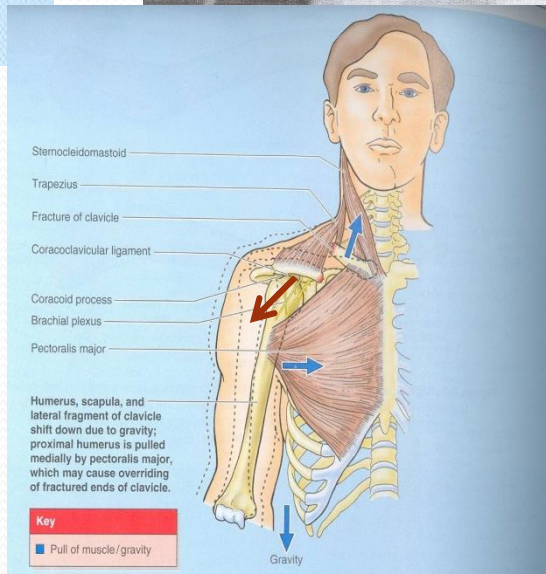
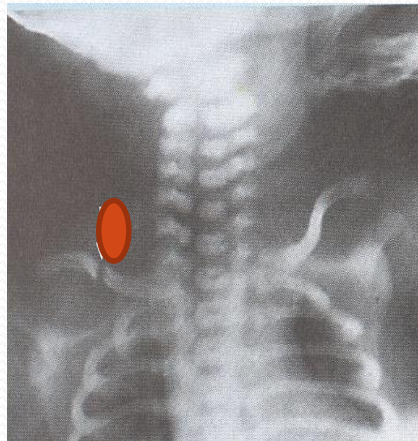
- *Its medial 2/3 is convex forward.*
- *Its lateral 1/3 is concave forward.*
- *Surfaces:*
- ***Superior** : smooth as it lies just deep to the skin.*
- ***Inferior** : rough because strong ligaments bind it to the 1<sup>st</sup> rib.*

# Articulations of Clavicle



- **Medially** with the manubrium at the ***Sternoclavicular joint*** .
- **Laterally** with the ***Scapula at the Acromioclavicular joint***
- **Inferiorly** with the ***1<sup>st</sup> rib at the Costoclavicular Joint***

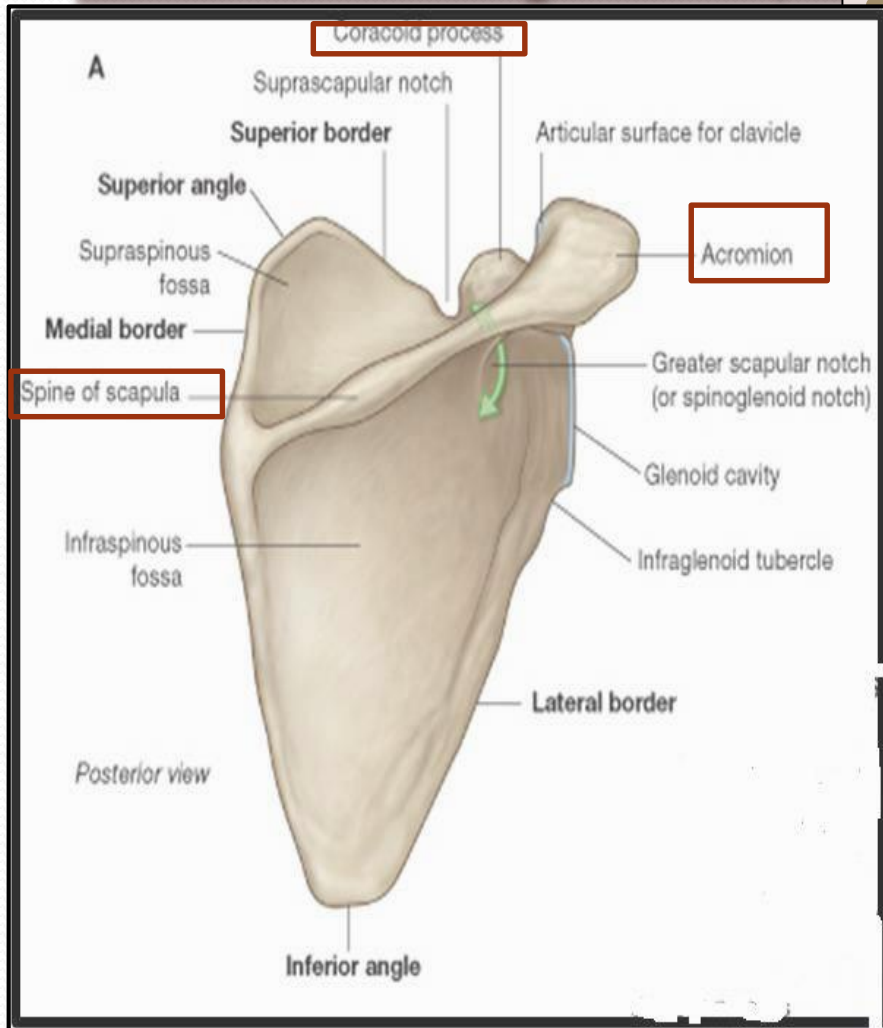
# Fractures of the Clavicle



- The clavicle is commonly fractured especially in children as **forces are impacted to the outstretched hand during falling.**
- **The weakest part of the clavicle is the junction of the middle and lateral thirds.**
- **After fracture, the medial fragment is elevated** (by the sternomastoid muscle), **the lateral fragment drops** because of the weight of the UL.
- It may be pulled medially by the adductors of the arm.
- The sagging limb is supported by the other.



# Scapula (Shoulder Blade)



It is a triangular Flat bone.

Extends between the 2<sup>nd</sup> 7<sup>th</sup> ribs.

It has :

Three Processes:

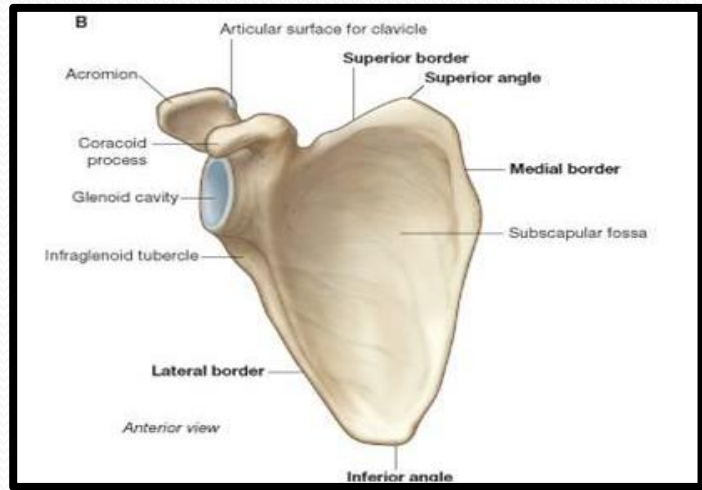
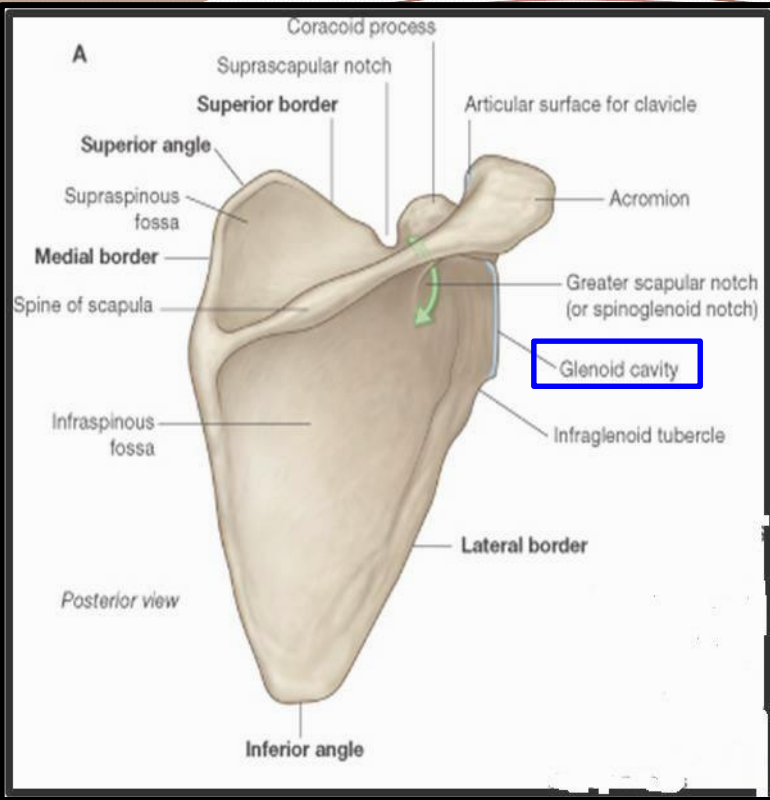
(1) Spine: a thick projecting ridge of bone that continues laterally.

(2) Acromion : forms the subcutaneous point of the shoulder.

(3) Coracoid: a beaklike process.

It resembles in size, shape and direction a bent finger pointing to the shoulder.

Three Borders: Superior, Medial (Vertebral) & Lateral (Axillary) (the thickest) part of the bone, it terminates at the lateral angle .

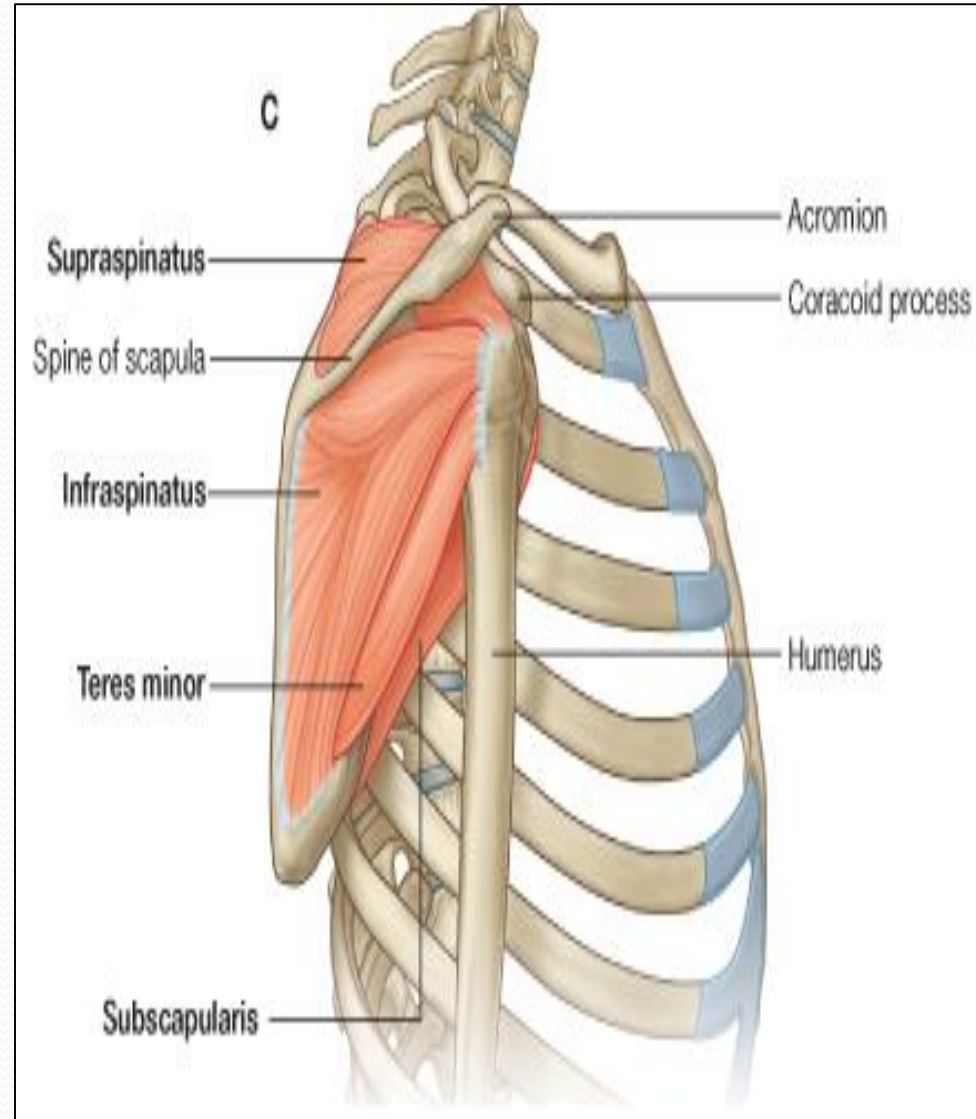


- **Three Angles :**
  - **Superior:**
  - **Lateral (forms the Glenoid cavity) :** a shallow concave oval fossa that receives the head of the humerus.
  - **Inferior:**
  - **Two Surfaces:**
1. **Convex Posterior :** divided by the spine of the scapula into the **Smaller Suprascapular Fossa** (above the spine) and the **larger Infraspinous Fossa** (below the spine).
  2. **Concave Anterior (Costal) :** it forms the large **Subscapular Fossa.**

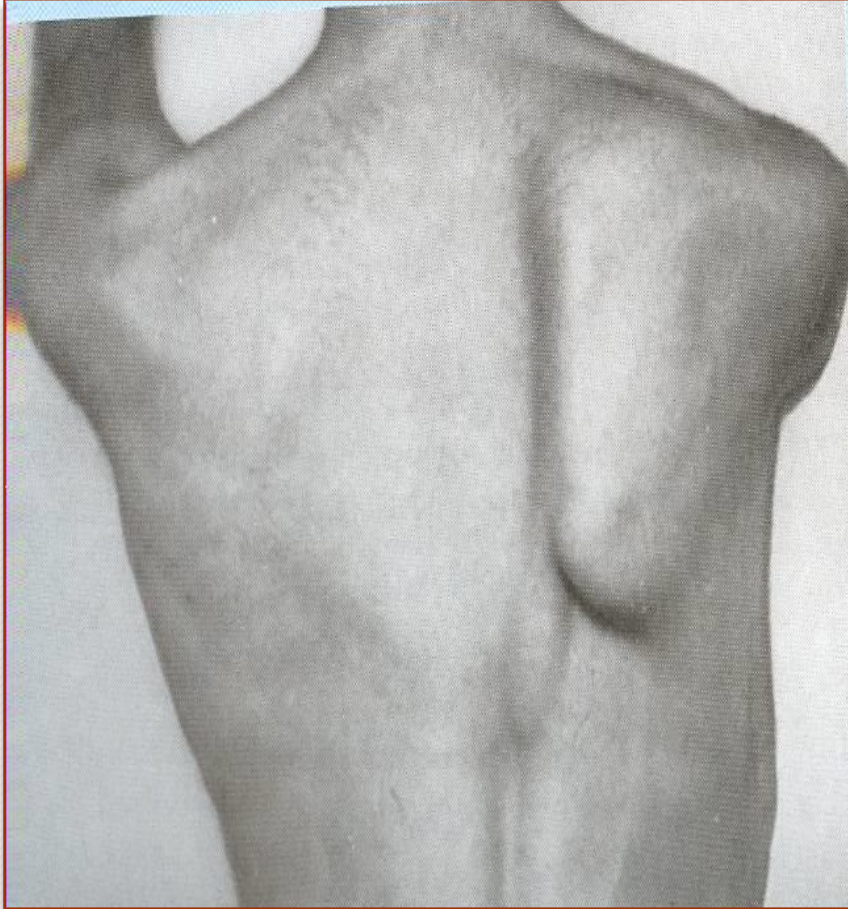
# Functions

1. Gives attachment to muscles.
2. Has a considerable degree of movement on the thoracic wall to enable the arm to move freely.
3. The glenoid cavity forms the socket of the shoulder joint.

**Because most of the scapula is well protected by muscles and by its association with the thoracic wall, most of its fractures involve the protruding subcutaneous **Acromion**.**

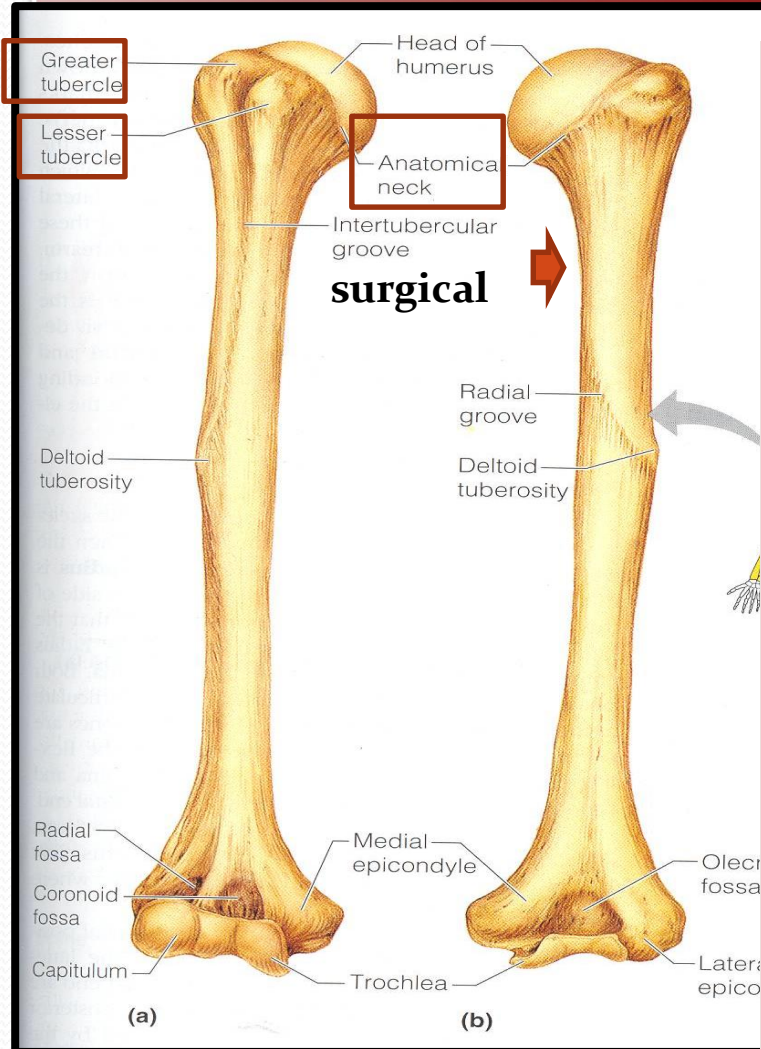


# WINGED SCAPULA

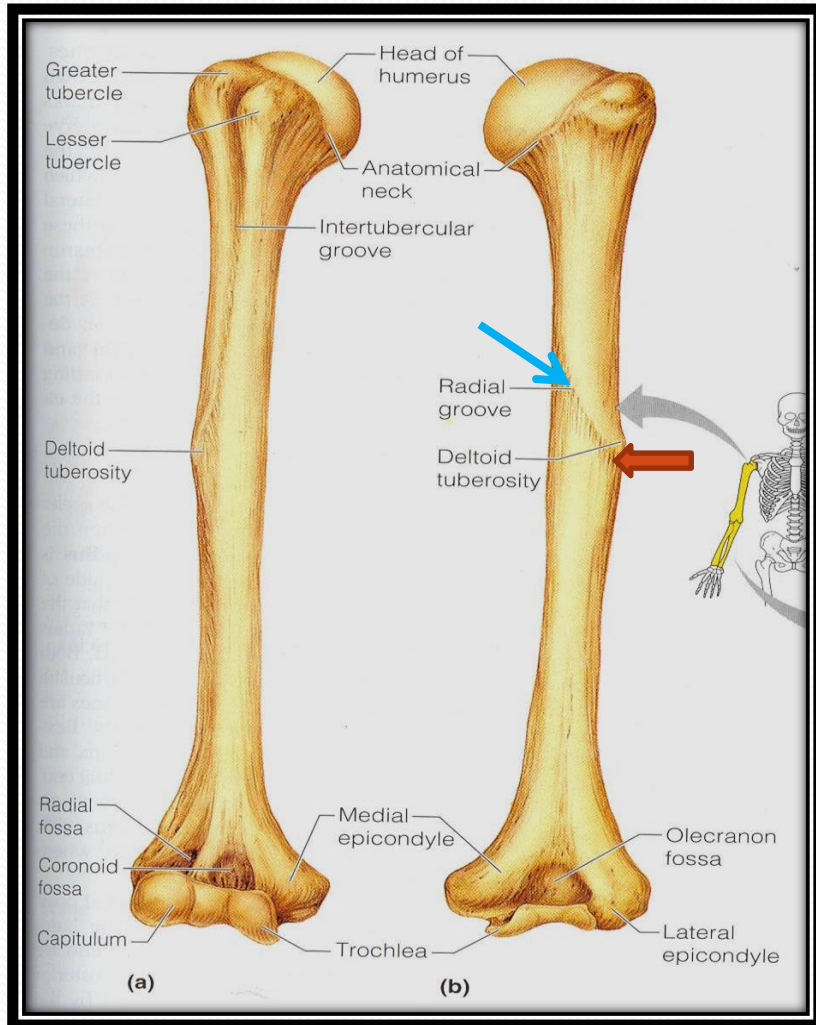


- It will protrude **posteriorly**.
- The patient has **difficulty in raising the arm above the head (difficult in rotation of the scapula)**.
- It is due to injury of the **long thoracic nerve** (as in **radical mastectomy**) which causes paralysis of **serratus anterior muscle**
- The medial border and inferior angle of the scapula will no longer be kept closely applied to the chest wall

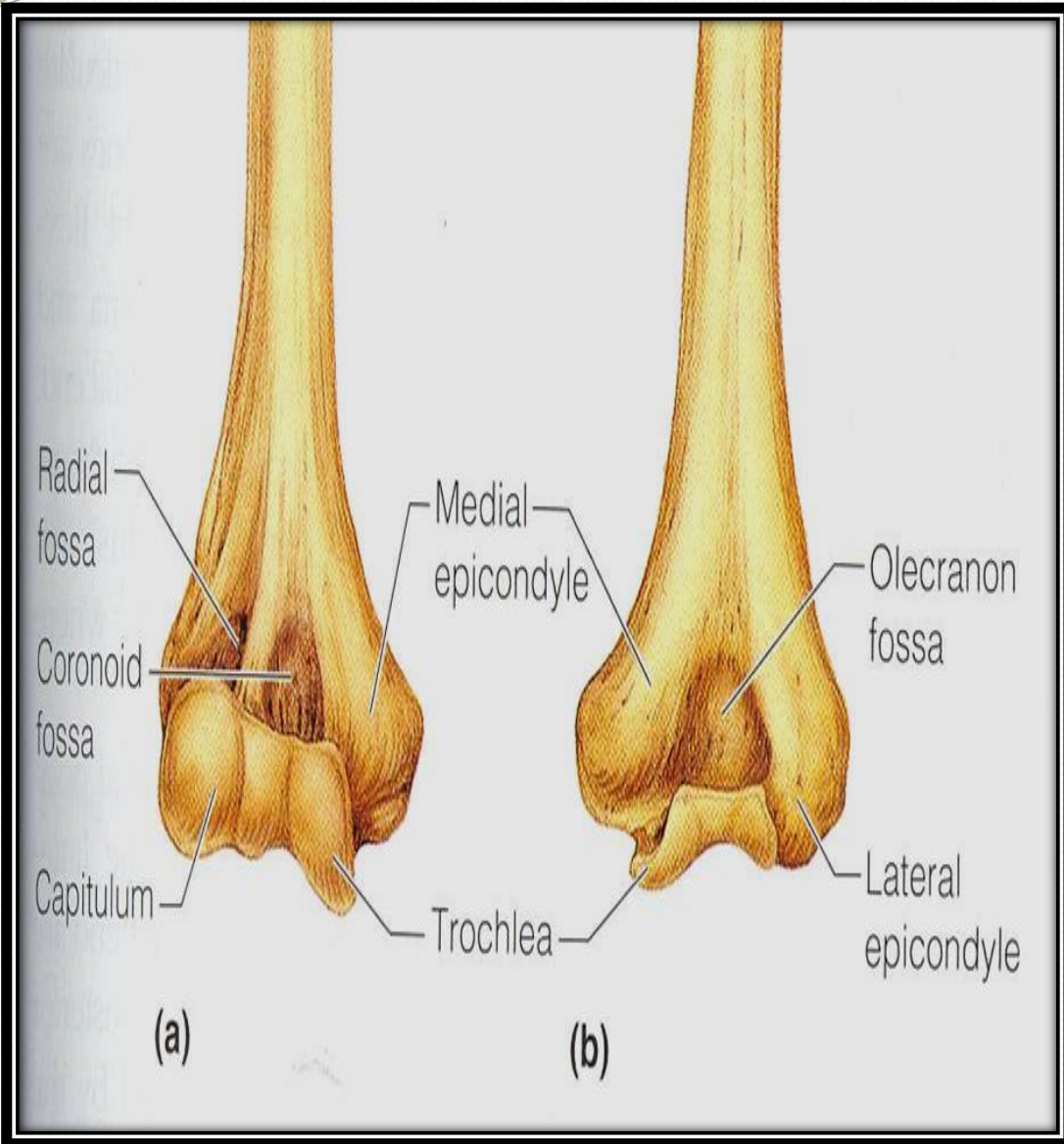
# Humerus



- **Typical Long bone.**
- **It is the largest bone in the UL**
- **Proximal End :**
- **Head, Neck, Greater & Lesser Tubercles.**
- **Head: Smooth**
- **it forms 1/3 of a sphere, it articulates with the glenoid cavity of the scapula.**
- **Greater tubercle: at the lateral margin of the humerus.**
- **Lesser tubercle: projects anteriorly.**
- **The two tubercles are separated by**
- **Intertubercular Groove.**
- **Anatomical neck: formed by a groove separating the head from the tubercles**
- **Surgical Neck: a narrow part distal to the tubercles.**

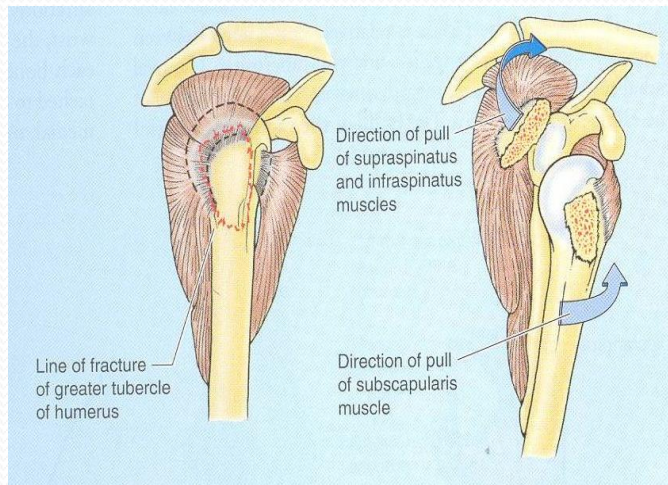
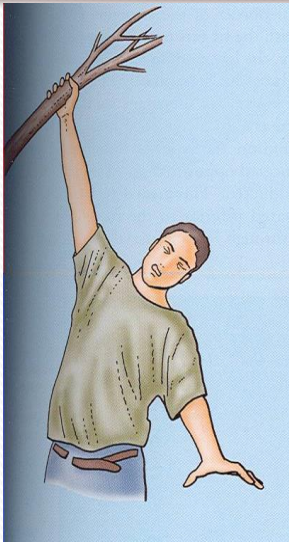


- **Shaft (Body):**
- ***Has two prominent features:***
- ***1. Deltoid tuberosity:***
- ***A rough elevation laterally for the attachment of deltoid muscle.***
- ***2. Spiral (Radial) groove:***
- ***Runs obliquely down the posterior aspect of the shaft.***
- ***It lodges the important radial nerve & vessels.***
- **Distal End:**
- ***Widens as the sharp medial and lateral Supracondylar Ridges and end in the **Medial (can be felt) and Lateral Epicondyles.*****
- ***They provide muscular attachment.***



- **Structures at Distal end:**
- **Anteriorly:**
- **Trochlea:** (medial) for articulation with the ulna
- **Capitulum:** (lateral) for articulation with the radius.
- **Coronoid fossa :**above the trochlea.
- **Radial fossa:** above the capitulum.
- **Posteriorly:**
- **Olecranon fossa :**above the trochlea.
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# Fractures of Humerus



- Most common fractures are of the **Surgical Neck** especially in **elder people with osteoporosis**.
- The fracture results from falling on the hand (transition of force through the bones of forearm of the extended limb).
- In **younger people**, fractures of the **greater tubercle** results from falling on the hand when the arm is abducted .
- The **body of the humerus** can be fractured by a direct blow to the arm or by indirect injury as falling on the outstretched hand.



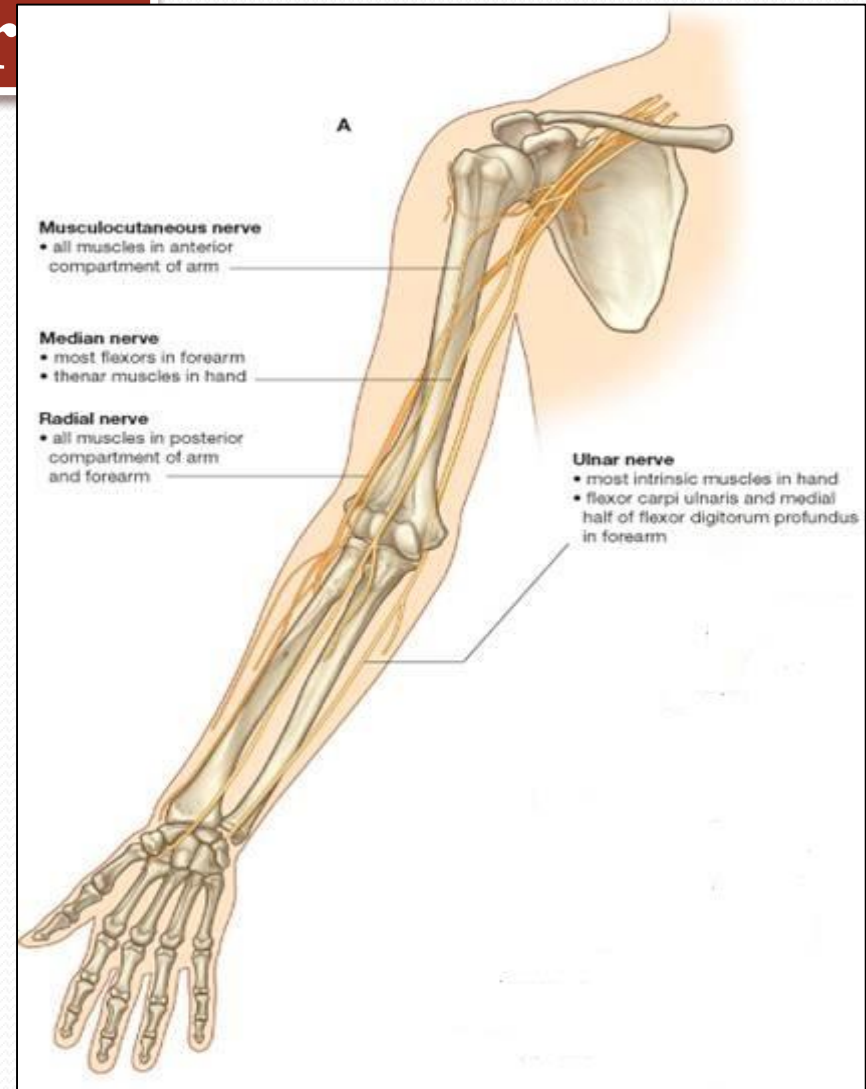
# Nerves affected in fractures of humerus

**Surgical neck:** Axillary nerve  
nerve

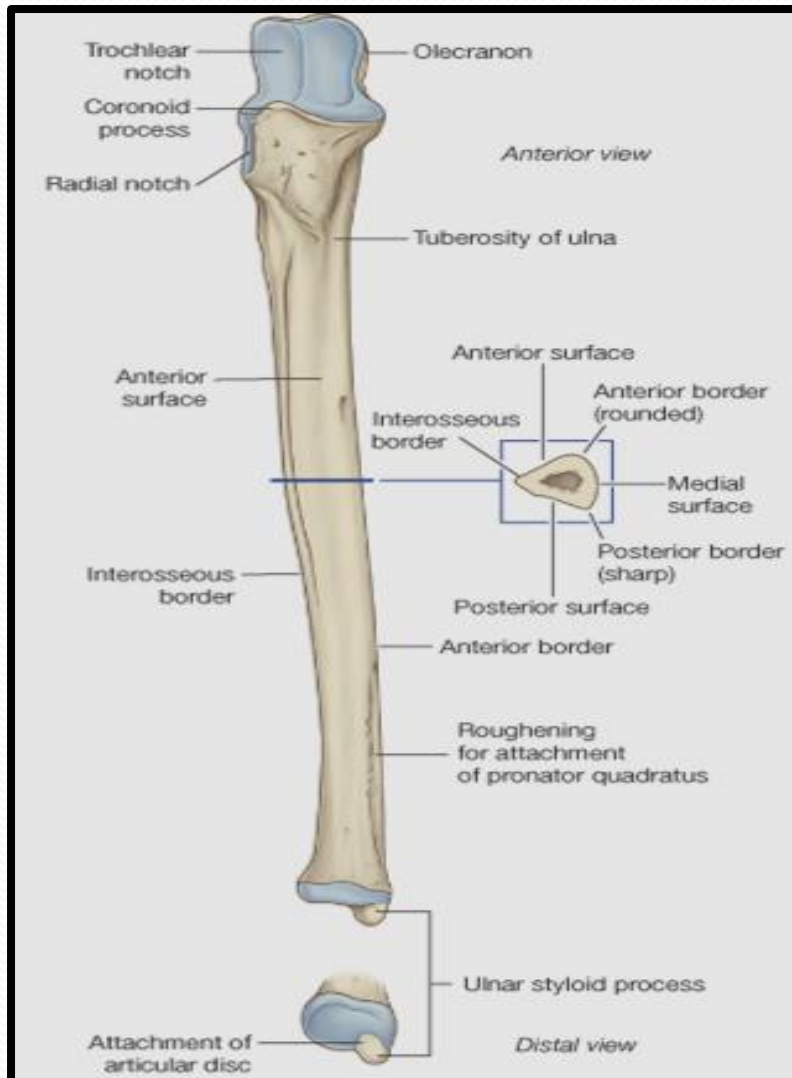
**Radial groove:** Radial nerve.

**Distal end of humerus:**  
Median nerve.

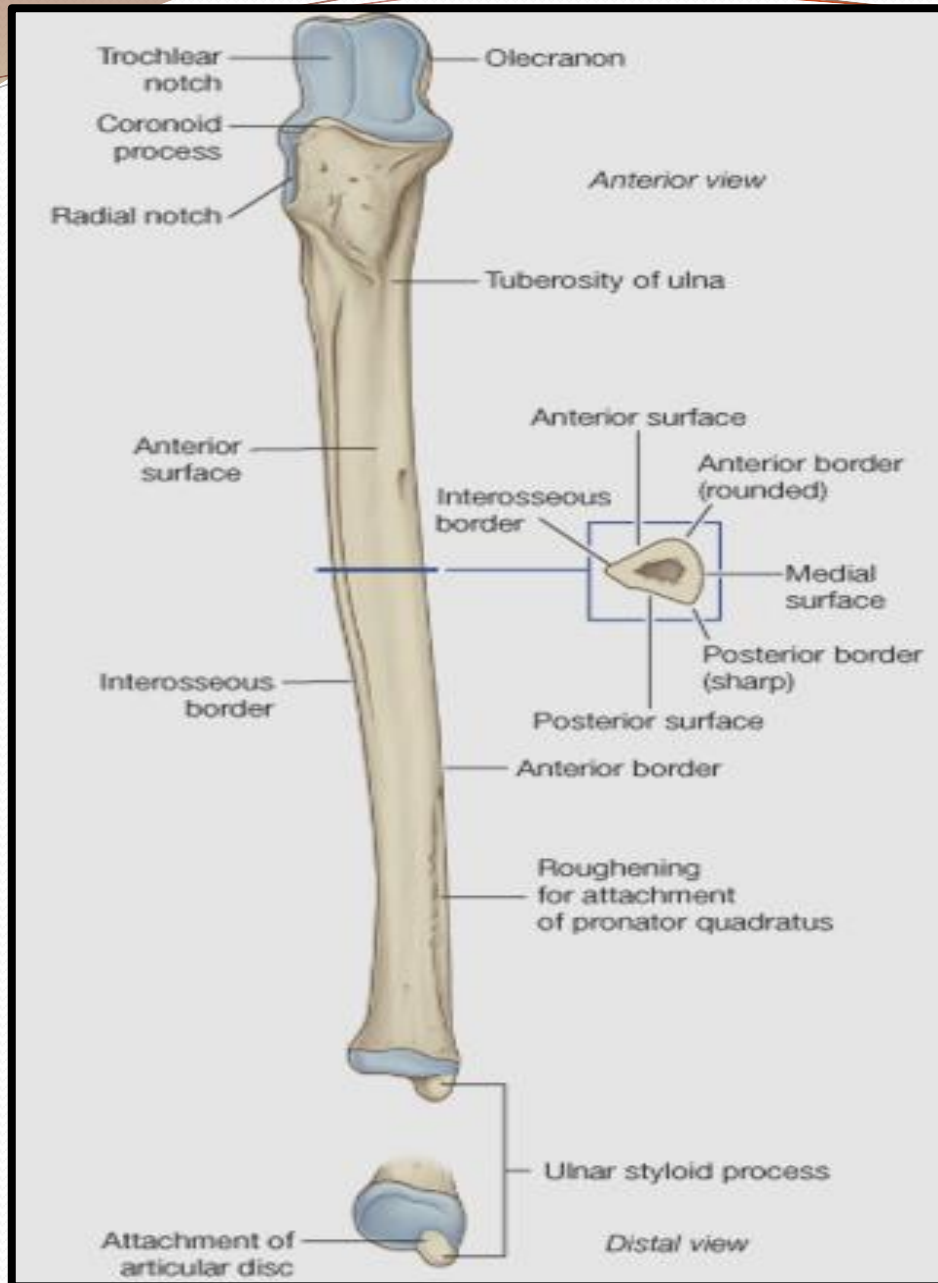
**Medial epicondyle :** Ulnar  
nerve.



# Ulna

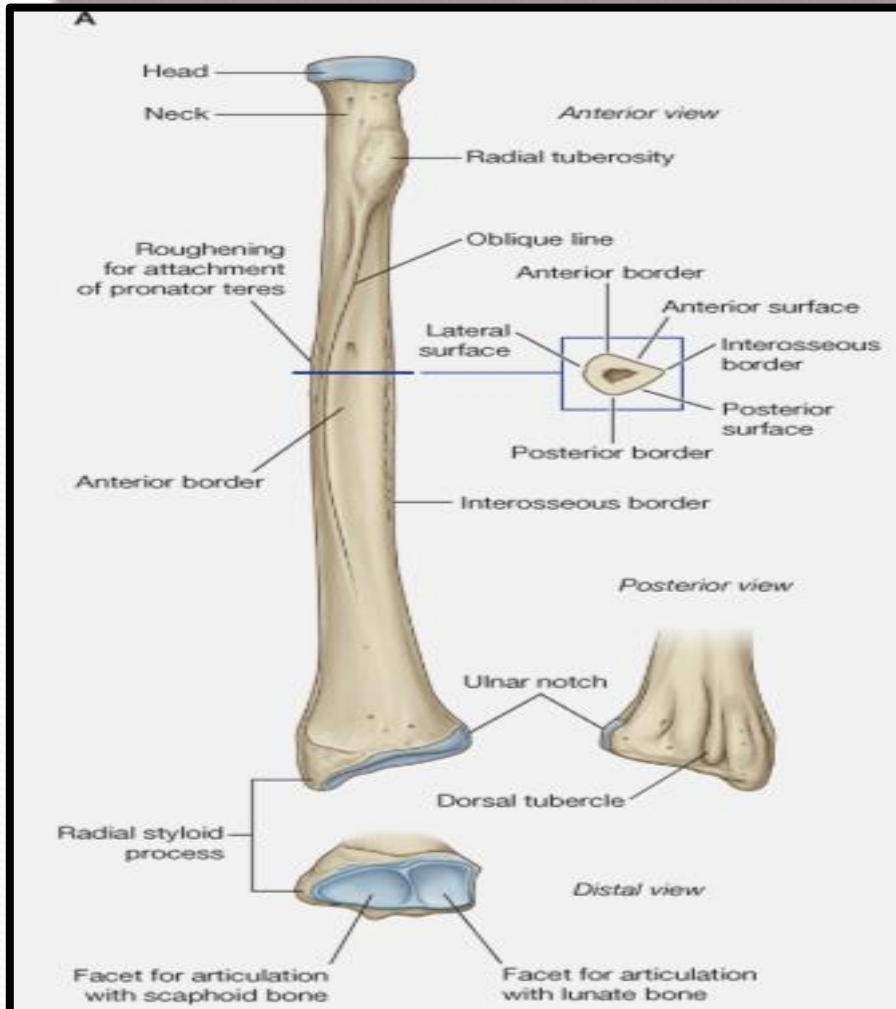


- *It is the stabilizing bone of the forearm.*
- *It is the medial & longer of the two bones of the forearm.*
- *Proximal End*
- *1. Olecranon Process :*
- *projects proximally from the posterior aspect (forms the prominence of the elbow).*
- *2. Coronoid Process :*
- *projects anteriorly.*
- *3. Tuberosity of Ulna:*
- *inferior to coronoid process.*
- *4. Trochlear Notch:*
- *articulates with trochlea of humerus.*
- *5. Radial Notch :*
- *a smooth rounded concavity lateral to coronoid process.*



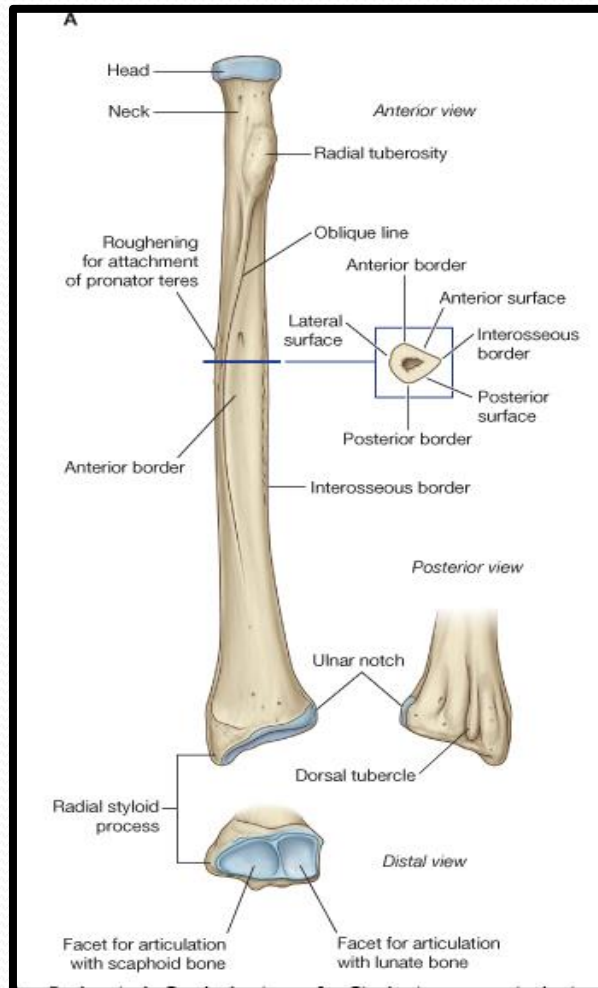
- **Shaft :**
- ***Thick & cylindrical superiorly but diminishes in diameter inferiorly***
- ***It has **Three Surfaces** (Anterior, Medial & Posterior).***
- ***Sharp Lateral Interosseous border.***
- **Distal End: Small rounded**
- ***1. Head: lies distally at the wrist. .***
- ***2. Styloid process: Medial.***

# Radius



- *It is the shorter and lateral of the two forearm bones.*
- **Proximal End:**
- **1. Head:** small & circular
- *Its upper surface is concave for articulation with the Capitulum.*
- **2. Neck.**
- **3. Radial (Bicipital) Tuberosity:** medially directed and separates the proximal end from the body.
- **Shaft:**
- *Has a lateral convexity.*
- *It gradually enlarges as it passes distally.*

# Radius



- **Distal (Lower) End: It is rectangular**
- **1. Ulnar Notch : a medial concavity to accommodate the head of the ulna.**
- **2.Radial Styloid process: extends from the lateral aspect.**
- **3.Dorsal tubercle: projects dorsally.**

# Fractures of radius & ulna

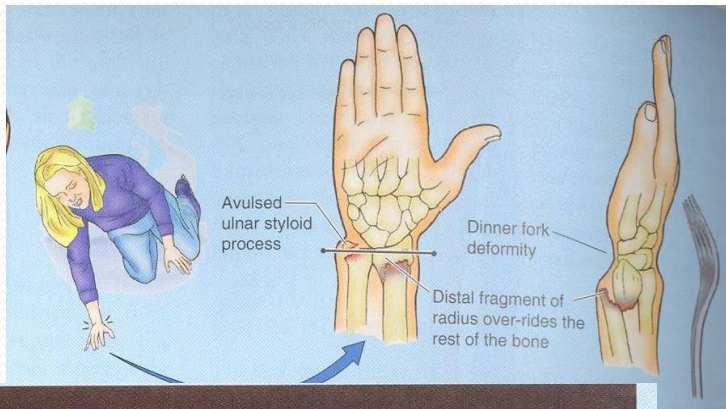
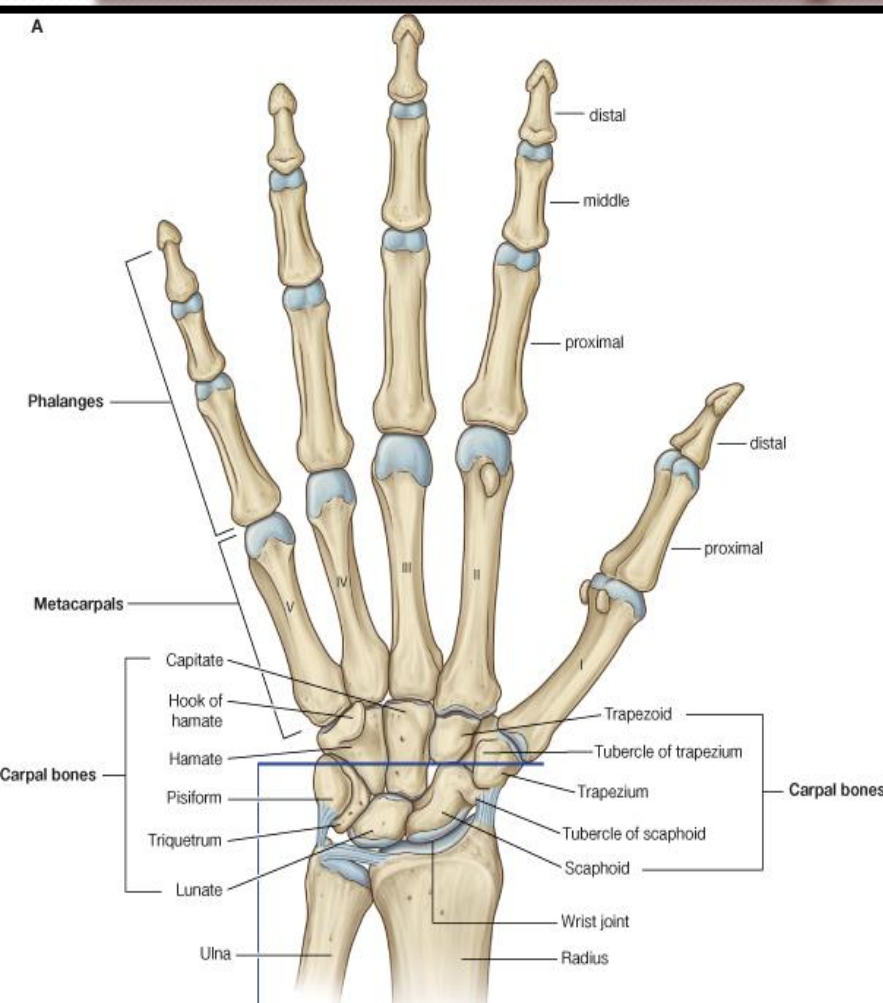


Figure 14.4 (a) Scaphoid fracture (arrow). (b) Colles' fracture showing 'dinner fork' deformity. (c) Colles' fracture, X-ray.

- *Because the radius & ulna are firmly bound by the interosseous membrane, a fracture of one bone is commonly associated with dislocation of the nearest joint.*
- ***Colle's Fracture** (fracture of the distal end of radius) **is the most common fracture of the forearm.***
- *It is **more common in women after middle age because of osteoporosis.***
- ***It causes dinner fork deformity.***
- *It results from forced dorsiflexion of the hand as a result to ease a fall by outstretching the upper limb.*
- *The typical history of the fracture includes **slipping**. Because of the rich blood supply to the distal end of the radius, bony union is usually good.*

# Carpal Bones



- Composed of **Eight short bones** arranged in two irregular rows, **Four each**.
- **These Small bones give flexibility to the wrist.**
- **The carpus presents Concavity on their Anterior surface & Convex from side to side Posteriorly.**
- **Proximal row (from lateral to medial):**
- ***Scaphoid, Lunate, Triquetral & Pisiform* bones.**
- **Distal row (from lateral to medial):**
- ***Trapezium, Trapezoid,***
- ***Capitate & Hamate.***

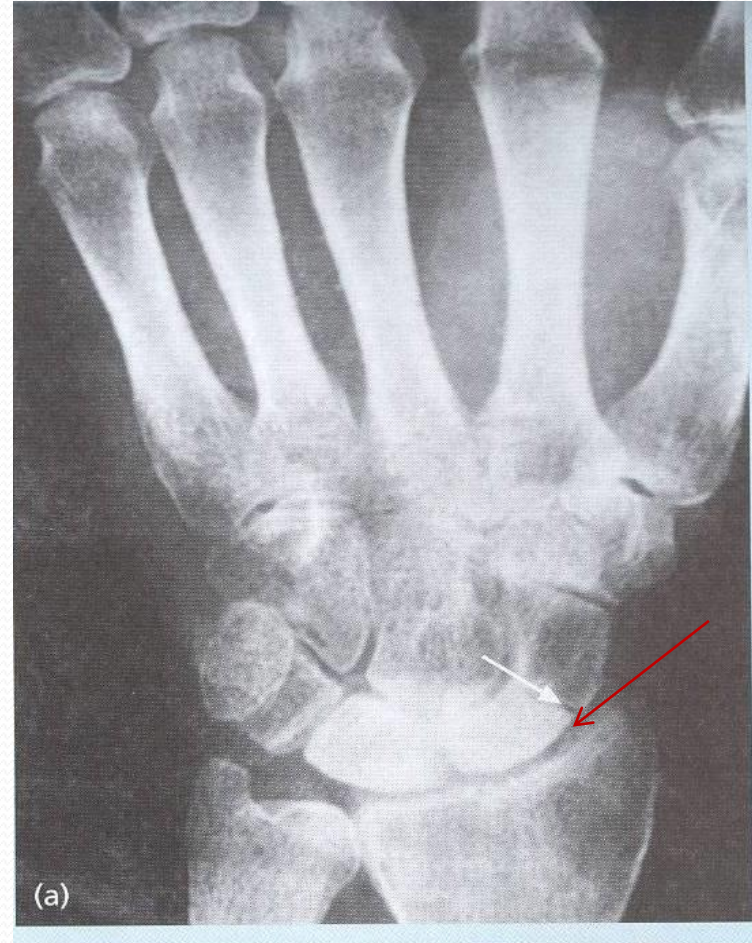
# Fracture of Scaphoid

**It is the most commonly fractured carpal bone and it is the most common injury of the wrist.**

It is the result of a fall onto the palm when the hand is abducted.

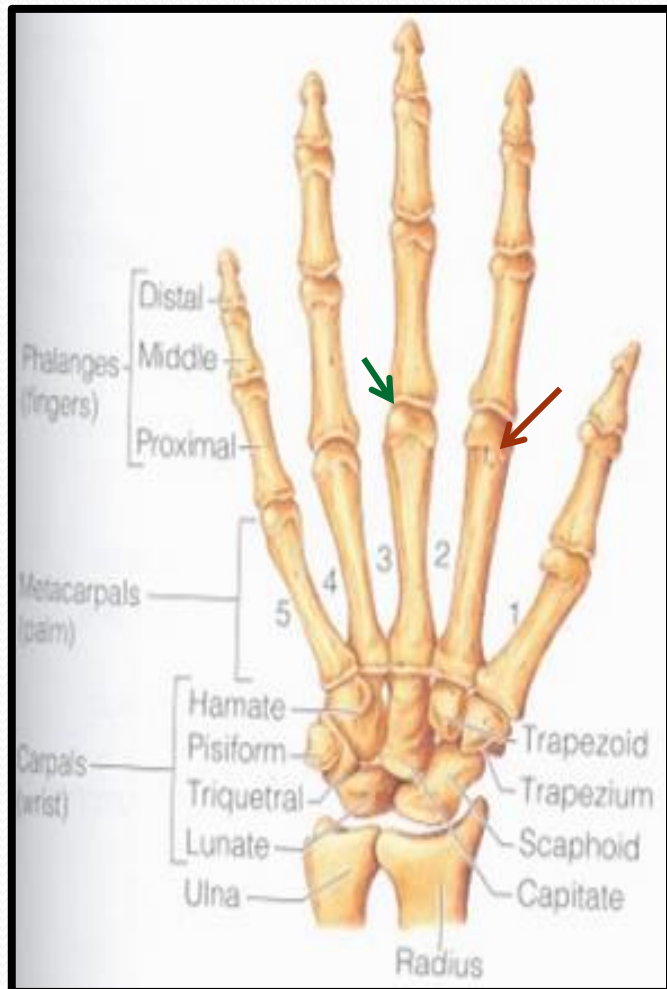
Pain occurs along the lateral side of the wrist especially during dorsiflexion and abduction of the hand.

**Union of the bone may take several months because of poor blood supply to the proximal part of the scaphoid.**



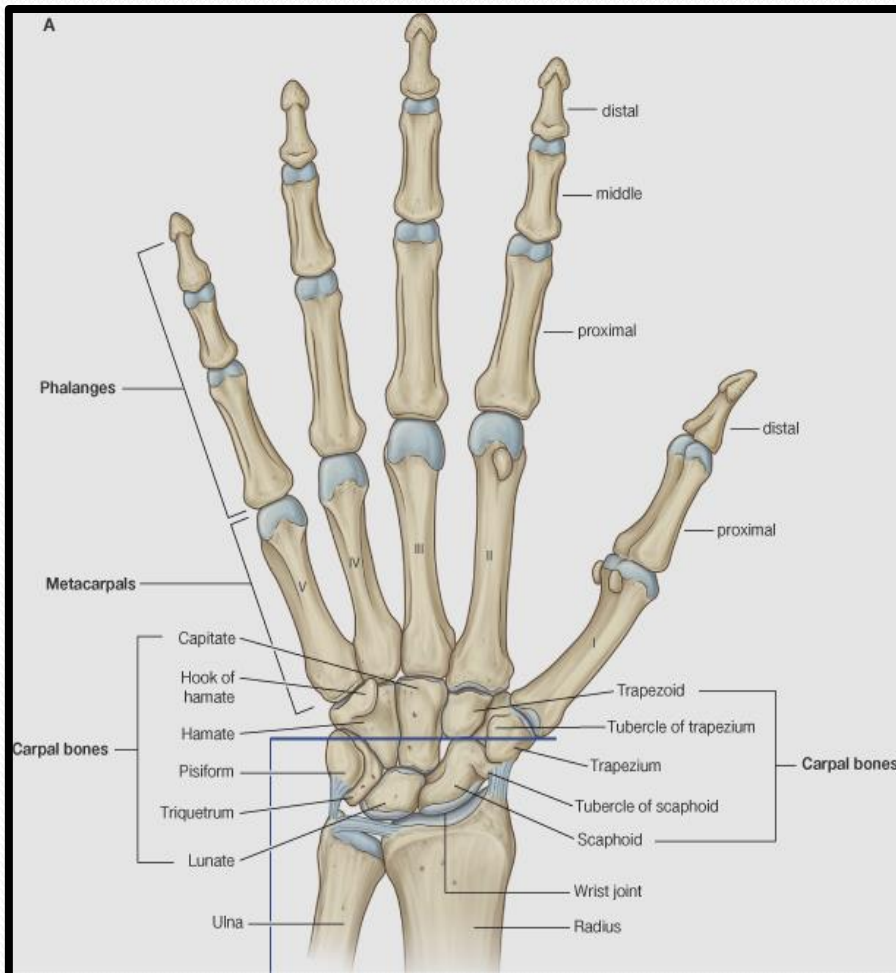


# Metacarpal Bones



- *Form the skeleton of the hand between the carpus and phalanges.*
- *It is composed Of **Five Metacarpal bones**, each has a **Base, Shaft, and a Head.***
- *They are numbered **1-5** from the thumb.*
- *The distal ends (Heads) articulate with the proximal phalanges to form the **Knuckles** of the fist.*
- *The Bases of the metacarpals articulate with the carpal bones.*
- *The **1<sup>st</sup> metacarpal** is the shortest and most mobile.*

# Phalanges



- Each digit has Three Phalanges
- Except the *Thumb* which has only *Two*
- Each phalanx has a *Base Proximally, a Head distally and a Body in between.*
- *The proximal phalanx is the largest.*
- *The middle ones are intermediate in size.*
- *The distal ones are the smallest, its distal ends are flattened and expanded distally to form the nail beds.*



**THANK YOU**