# *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:***

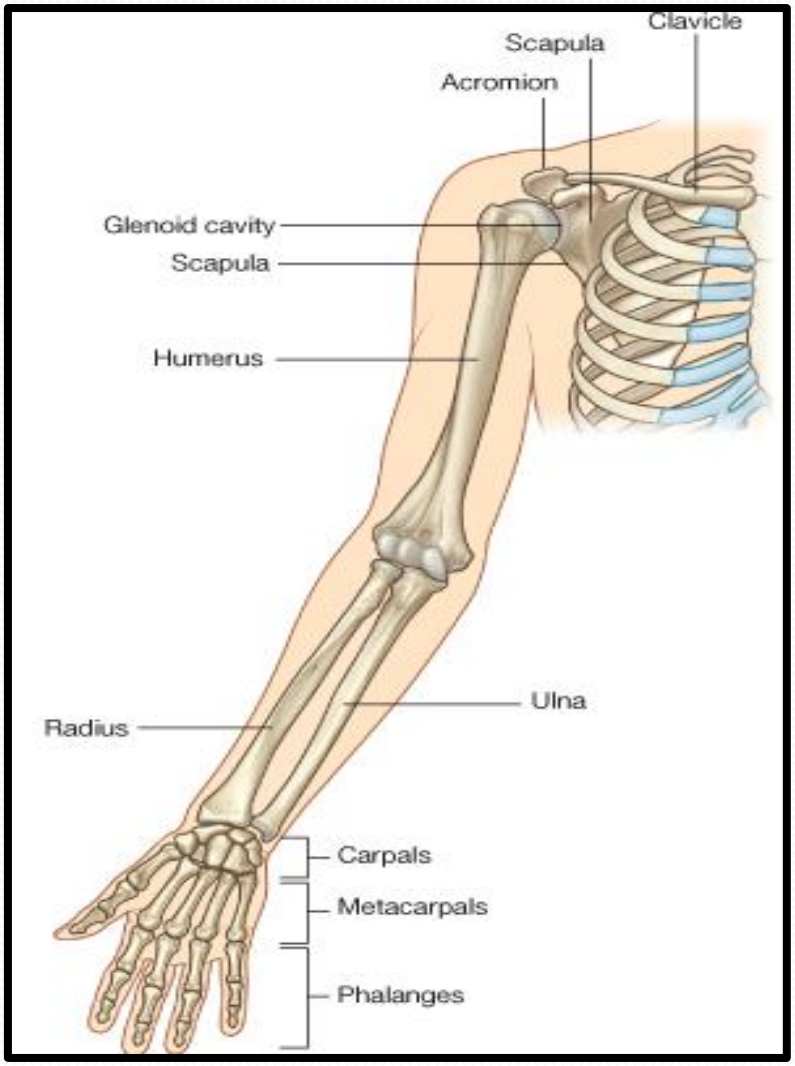
***Pectoral Girdle.***

***Arm : Humerus.***

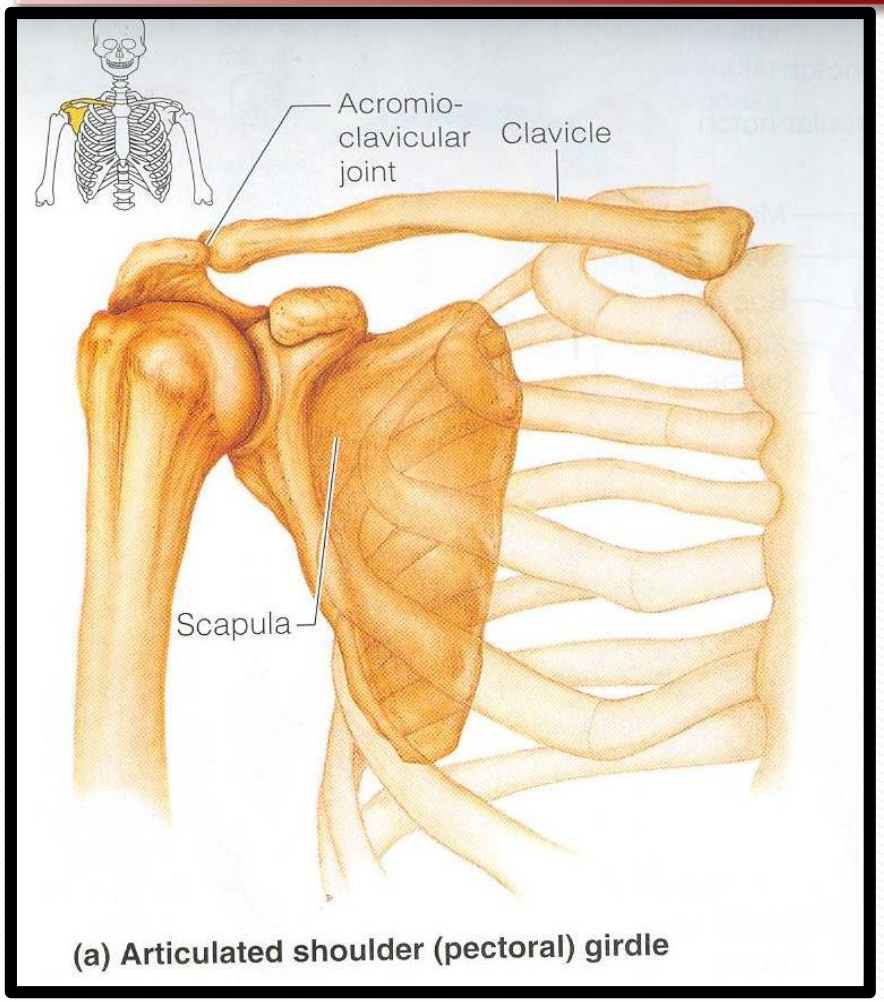
***Forearm : Radius & Ulna.***

***Wrist : Carpal bones***

***Hand: Metacarpals & Phalanges***



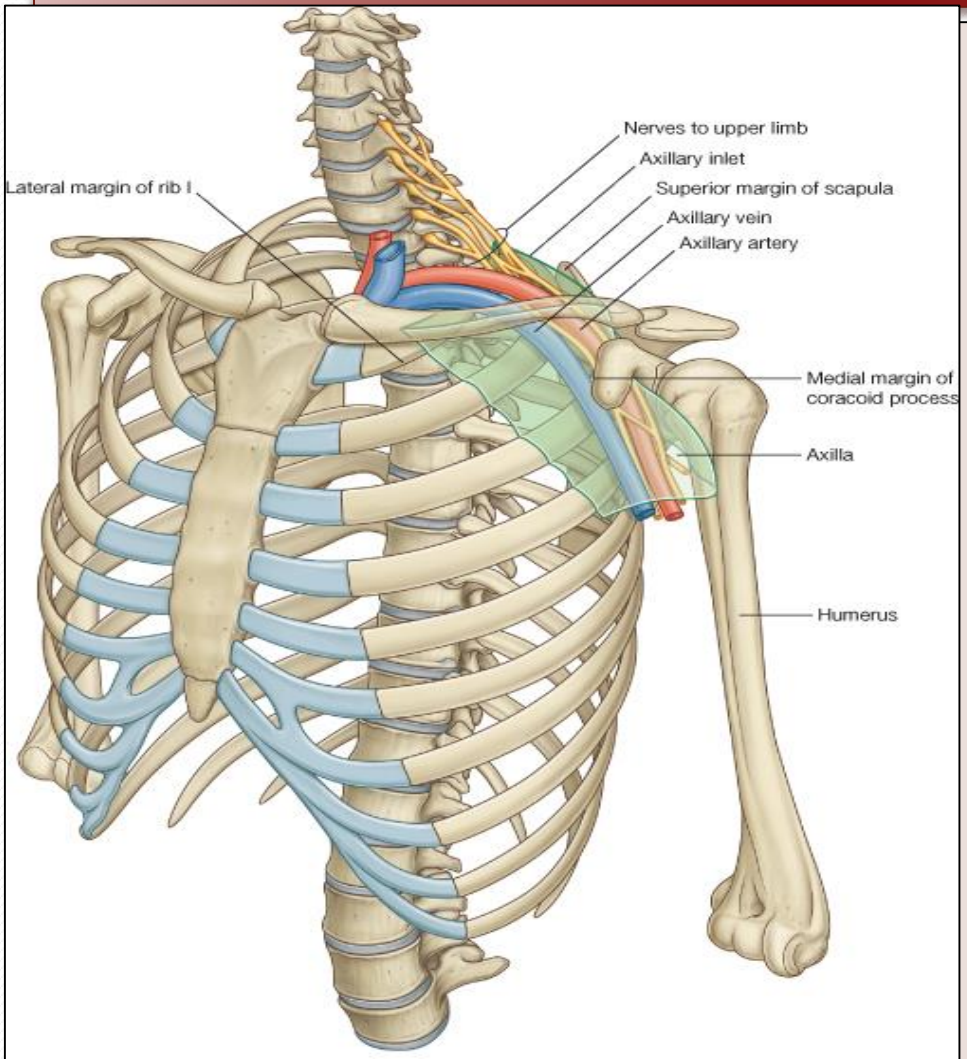
# Pectoral Girdle



(a) Articulated shoulder (pectoral) girdle

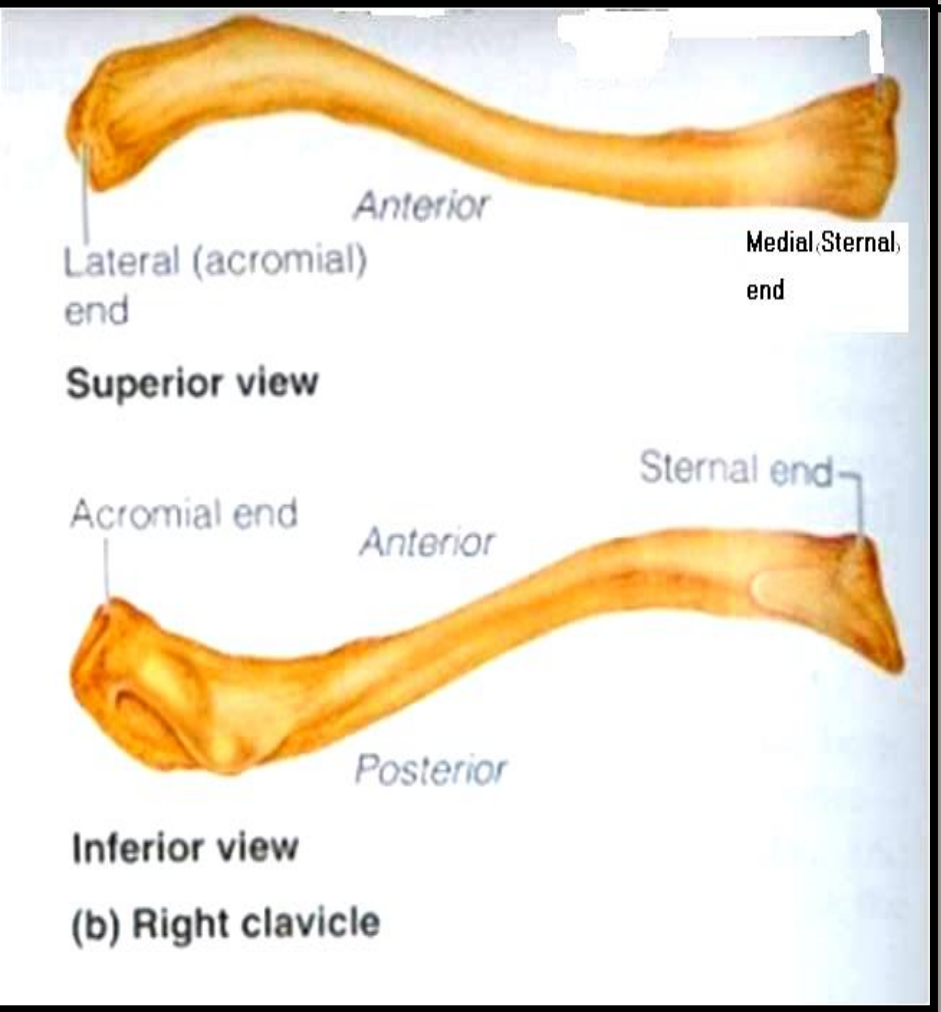
- ***Formed of Two Bones:***
- ***Clavicle (anteriorly) and Scapula (posteriorly).***
- ***It is very light and allows the upper limb to have exceptionally free movement.***

# 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 bundle of the UL.***

# 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 <u>Two Ends:</u>***

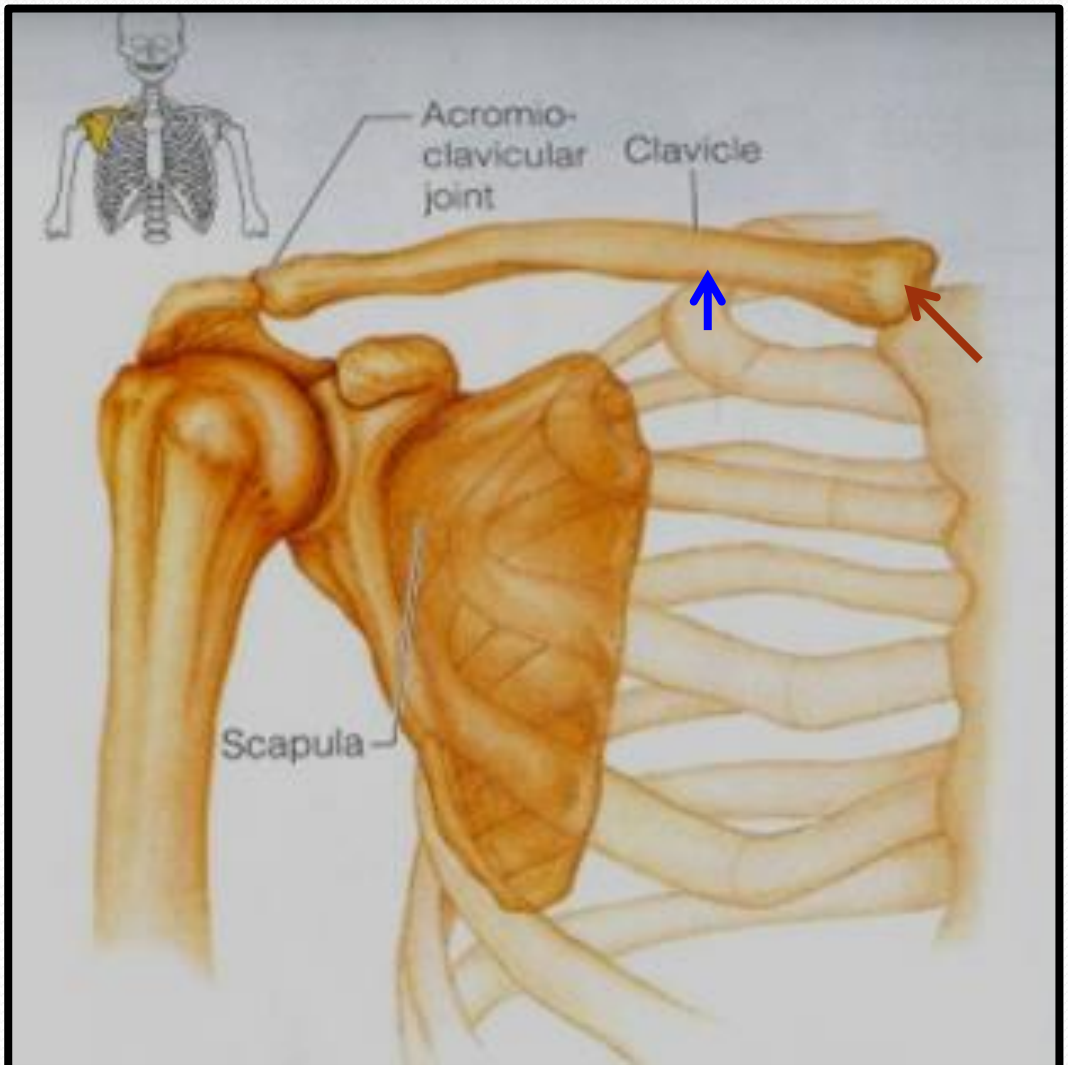
***Medial (<u>Sternal</u>) : enlarged & triangular.***

***Lateral (<u>Acromial</u>) : flattened.***

***<u>Body (shaft):</u>***

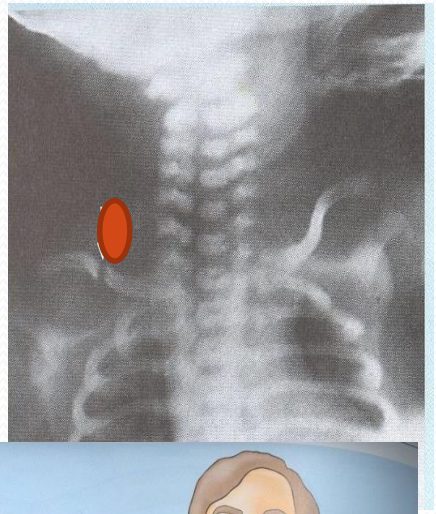
- ***Its medial 2/3 is convex forward.***
- ***Its lateral 1/3 is concave forward.***
- ***<u>Surfaces:</u>***
- ***Superior : smooth as it lies just deep to the skin.***
- ***Inferior : rough because strong ligaments bind it to the 1st rib.***

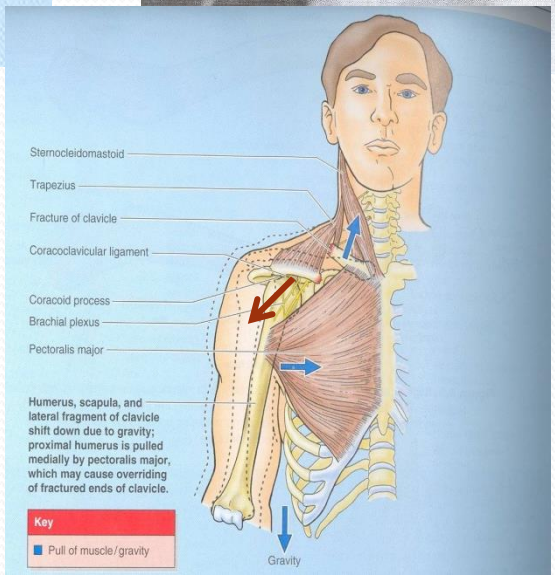
# *Articulations of Clavicle*




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

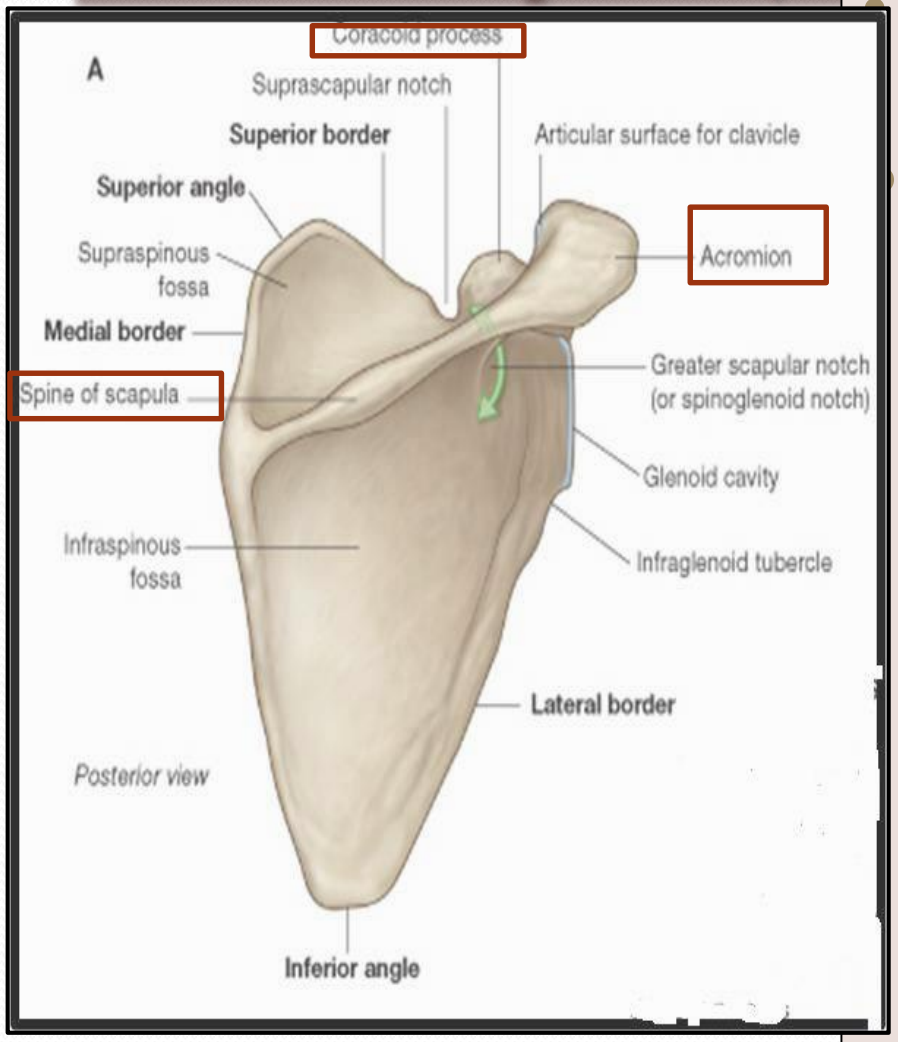
# Fractures of the Clavicle






- 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 2nd _ 7th ribs.***

*It has :*

***Three Processes:***

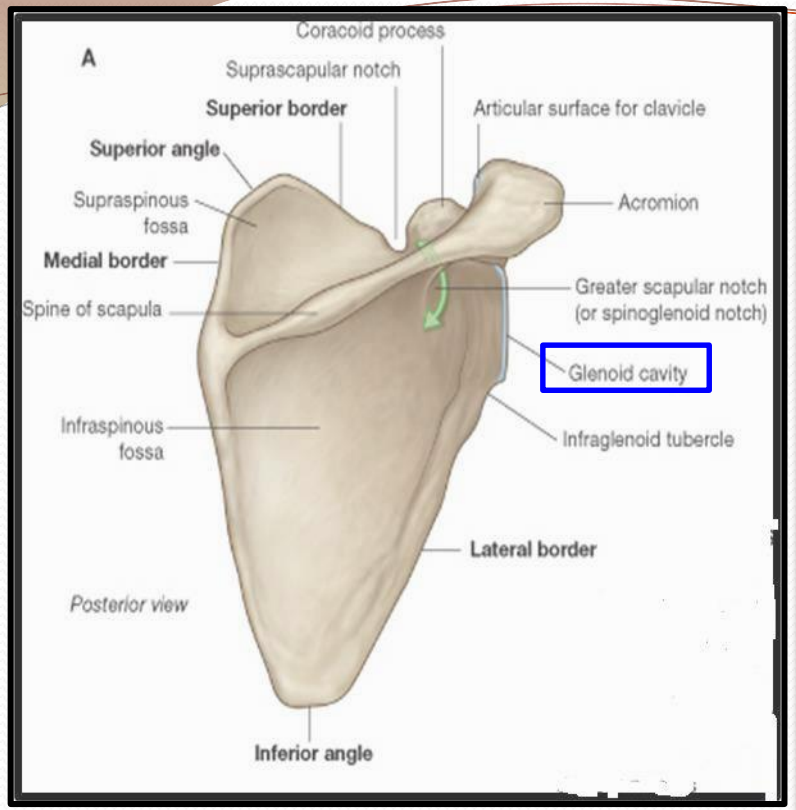
***(1)Spine: a thick projecting ridge of bone that continues laterally.***

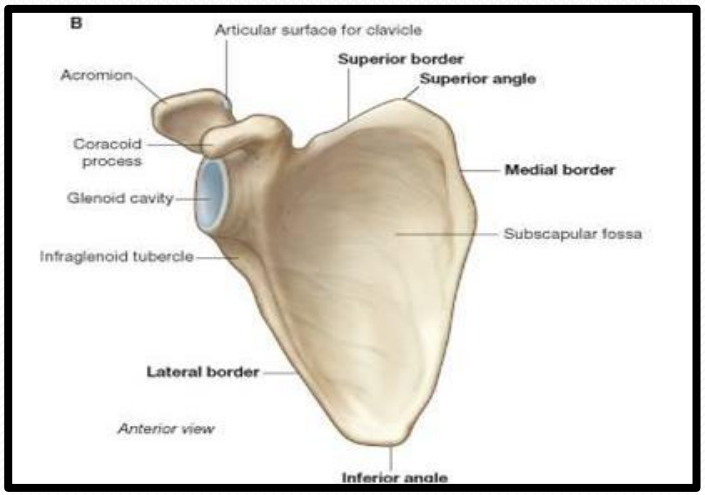
***(2) Acromion : forms the subcutaneous point of the shoulder.***

***(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 Supraspinous Fossa***

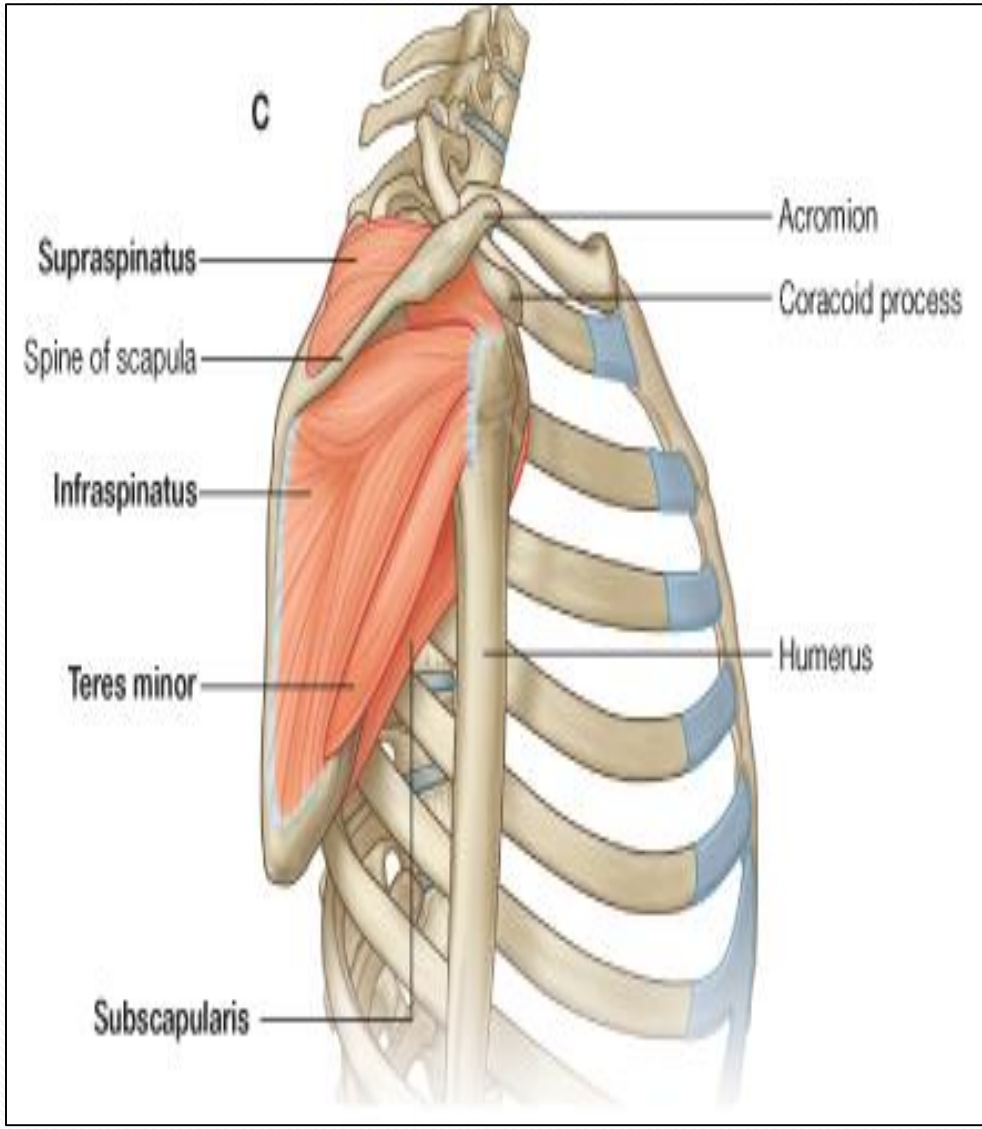
- ***(above the spine) and the***
- ***larger Infraspinous Fossa***
- ***(below the spine).***

***2.Concave Anterior (Costal) : it forms the large Subscapular Fossa.***

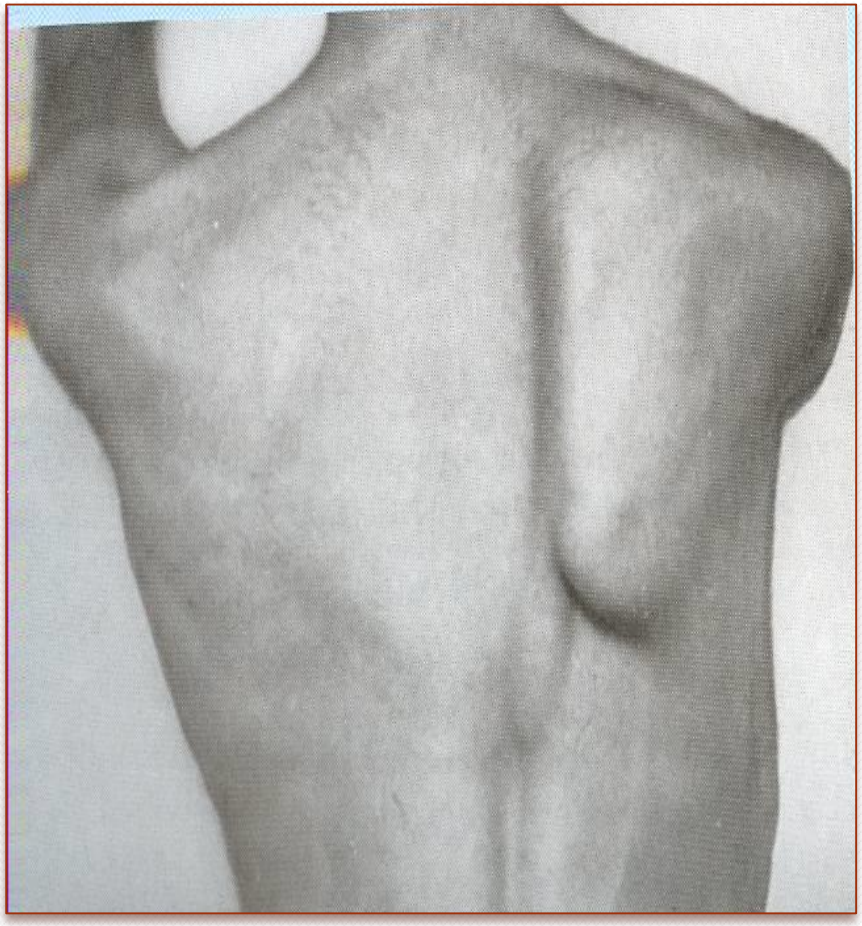
# Functions

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.**

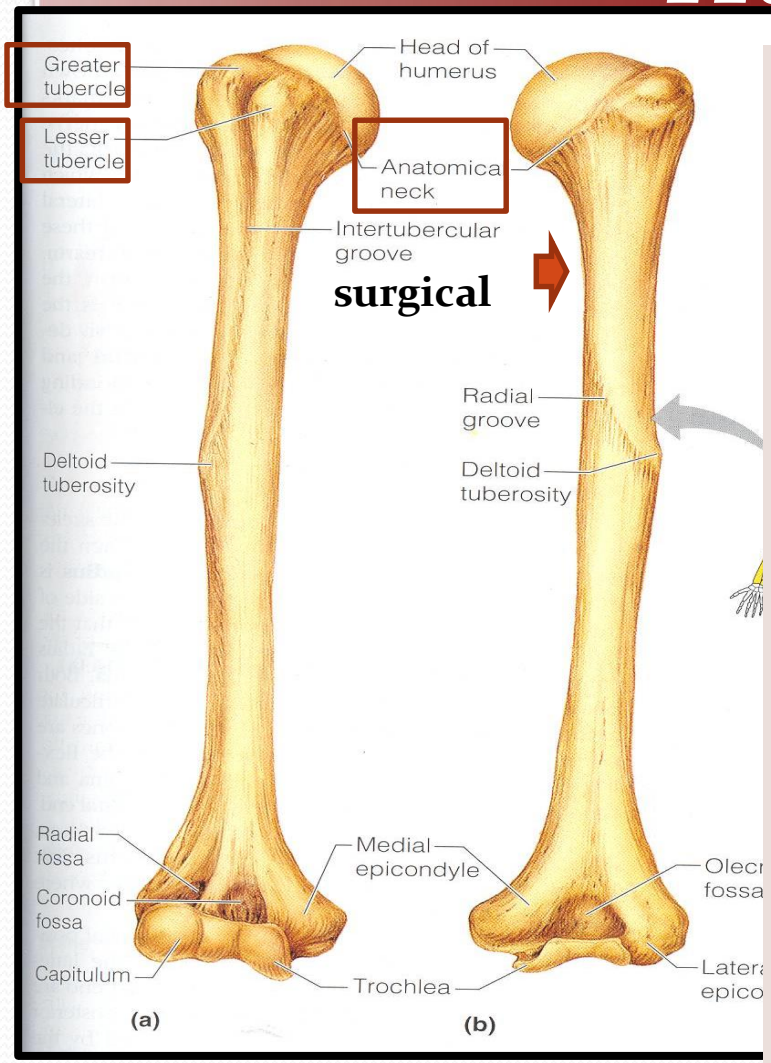


# WINGED SCAPULA

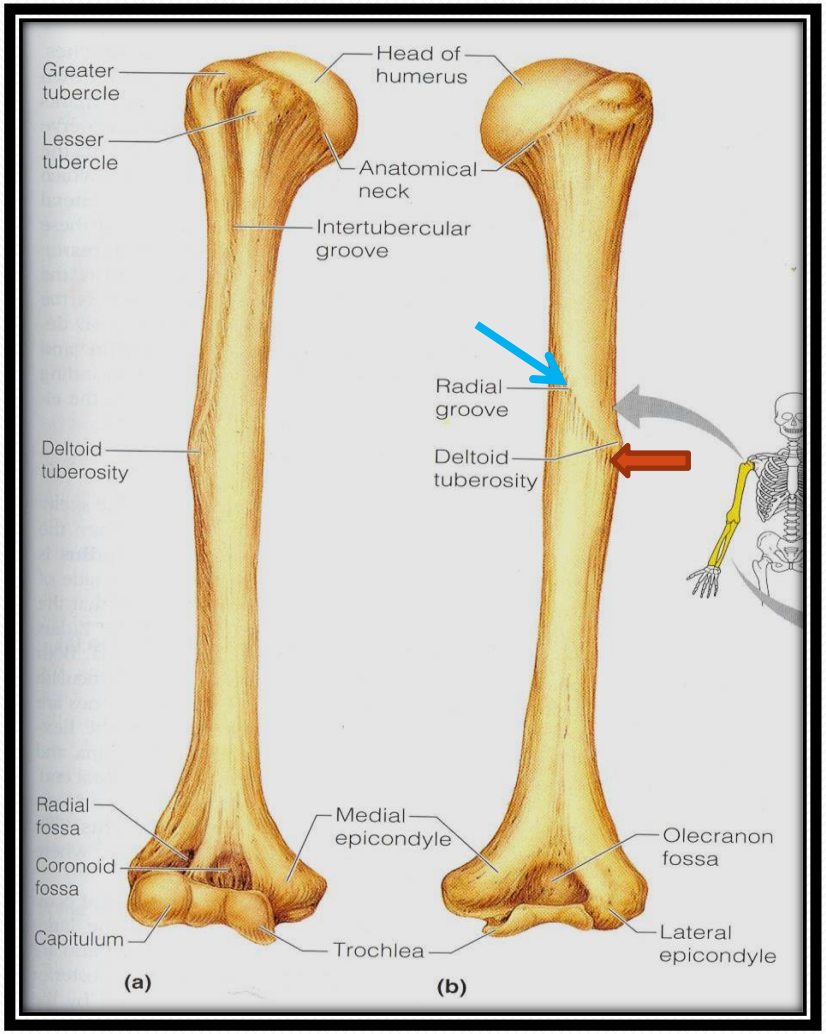


- It will **protrude posteriorly.**
- The patient has **difficulty in raising the arm above the head (difficult in rotation of the scapula).**
- It is due to injury of the **long thoracic** nerve (as in **radical mastectomy**) which causes paralysis of **serratus anterior muscle**
- The medial border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

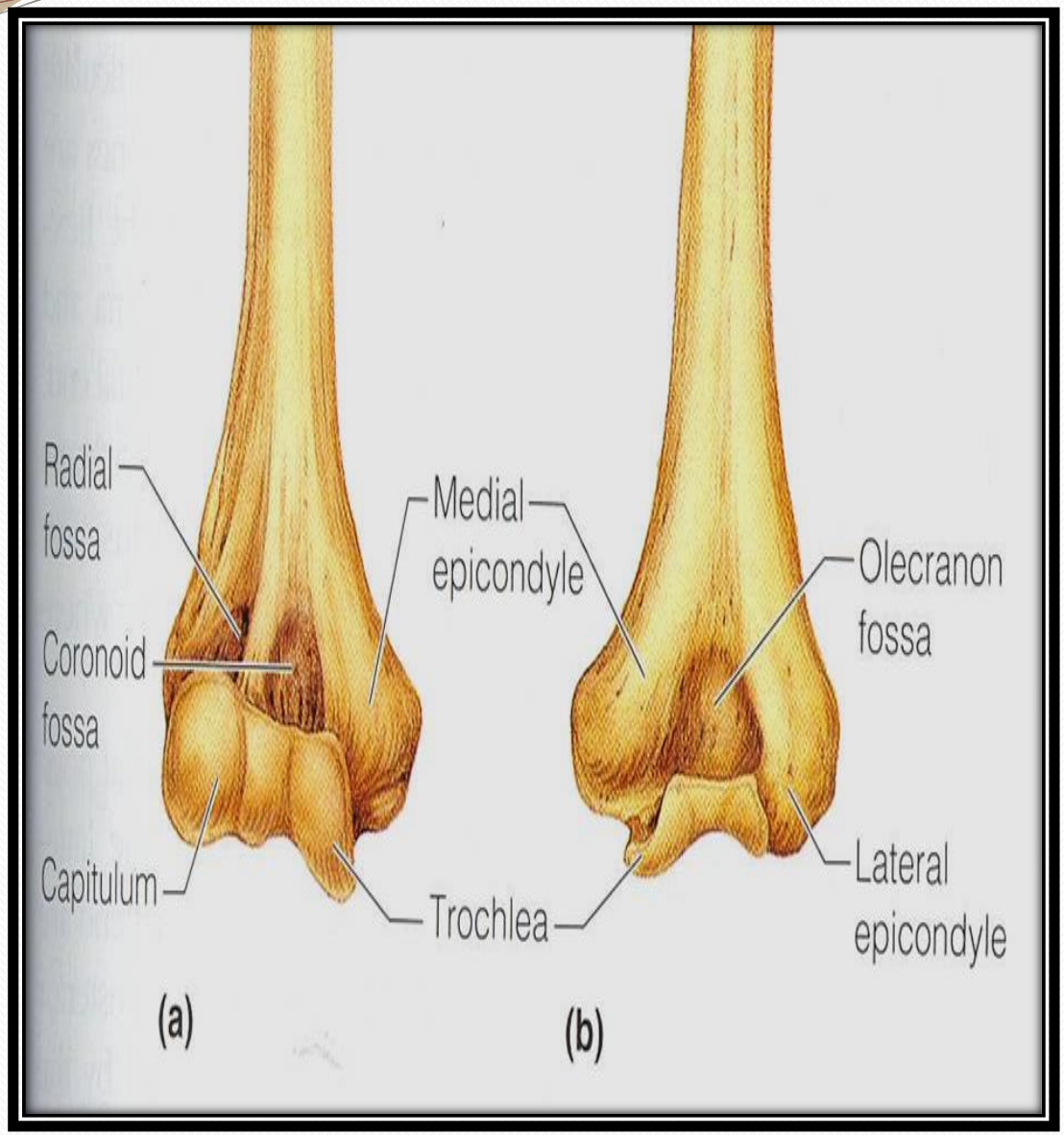
# Humerus




- *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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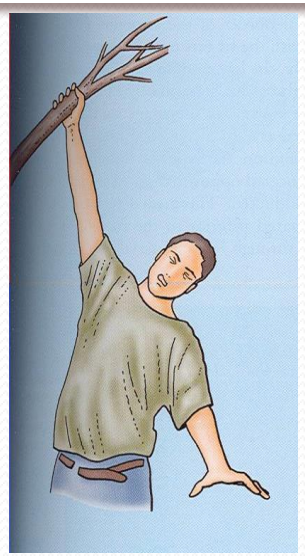
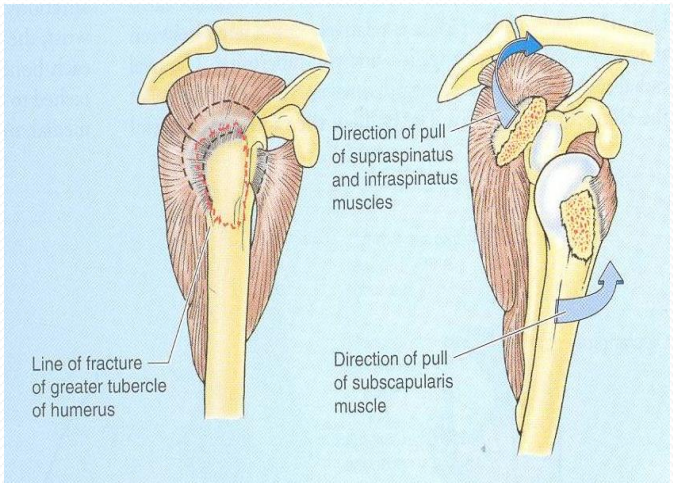
# Fractures of Humerus






- 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 oustretched hand.

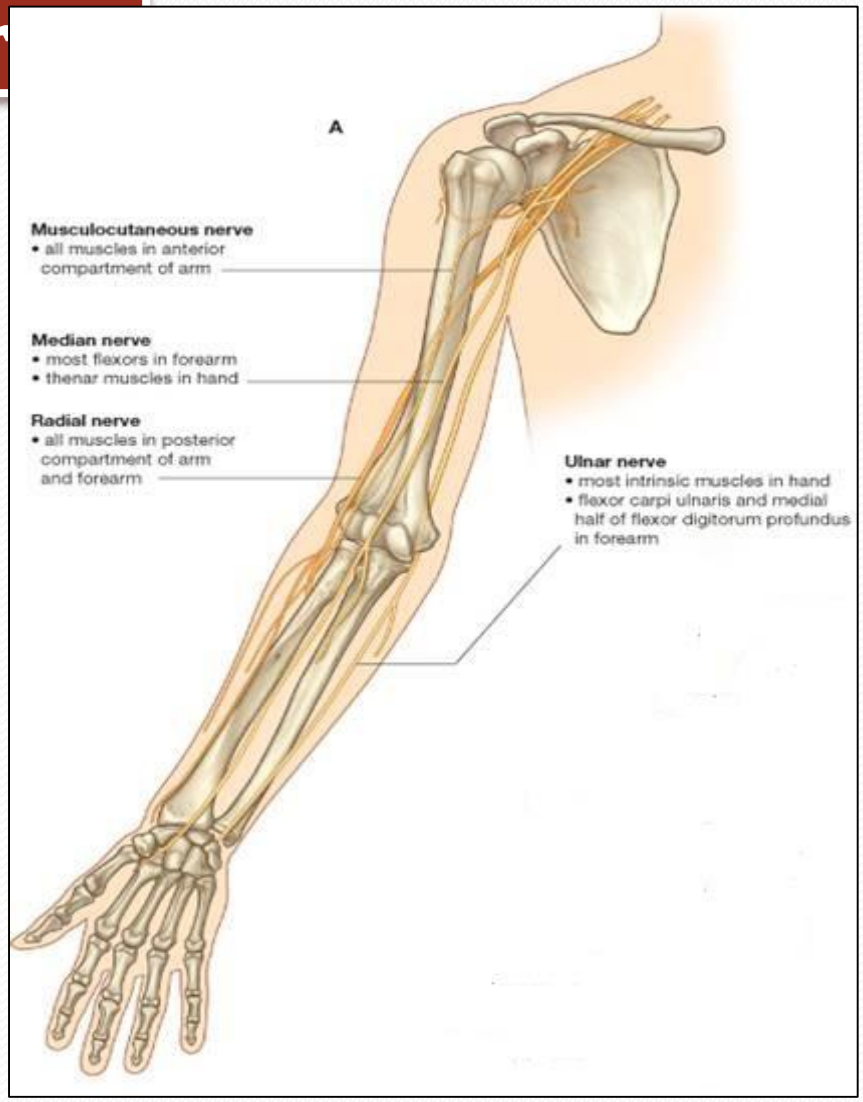
# Nerves affected in fractures of humer

**Surgical neck:** Axillary nerve

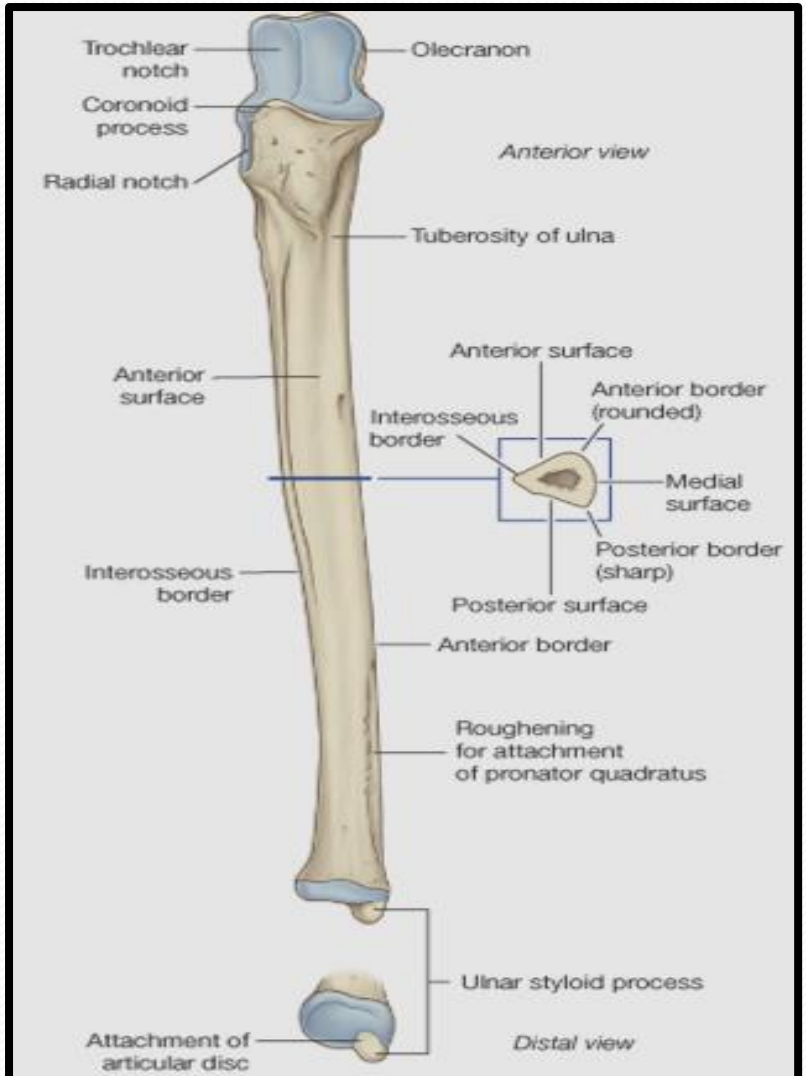
**Radial groove**: Radial nerve.

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

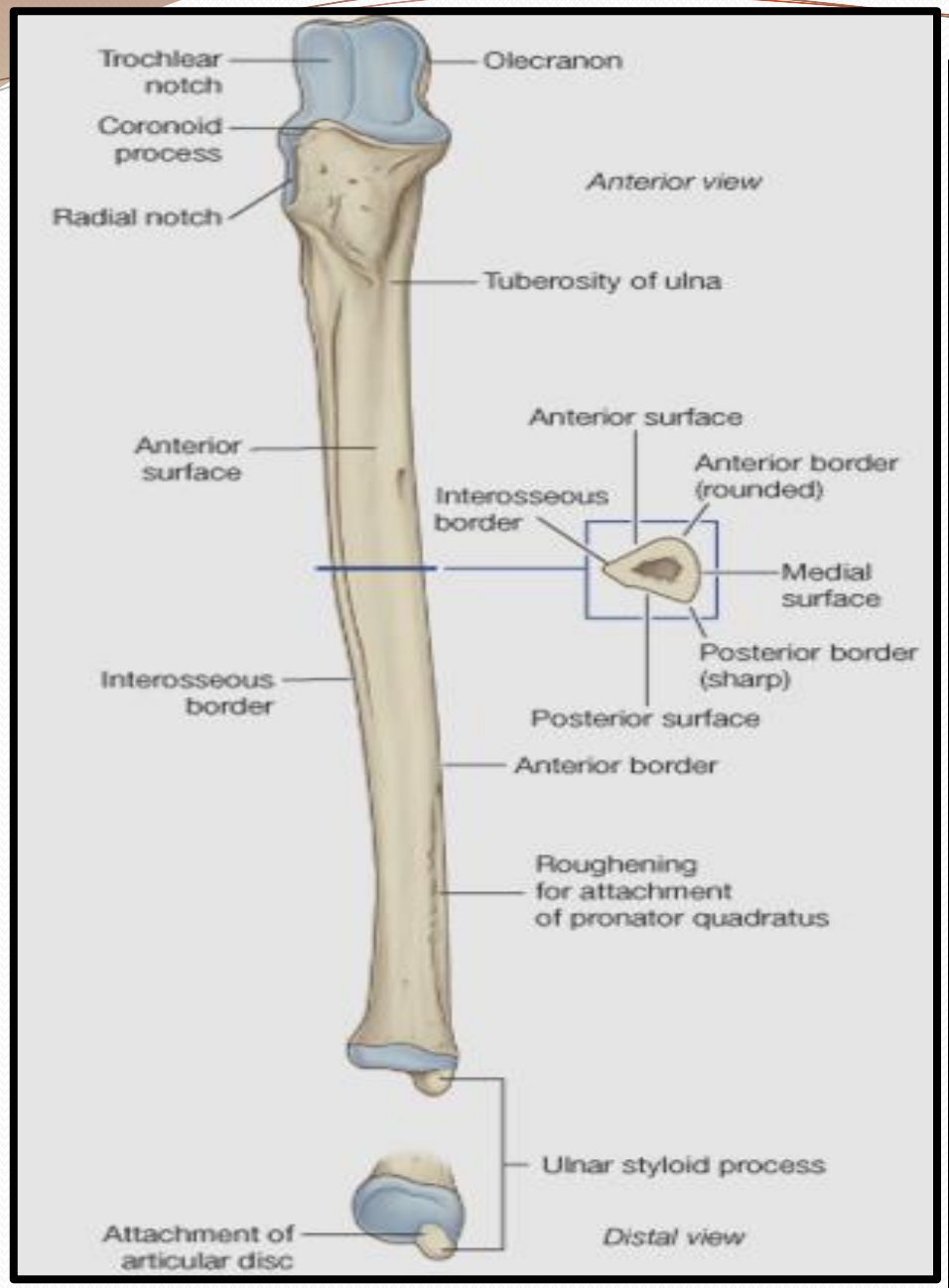
**Medial epicondyle** : Ulnar nerve.



# 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.***

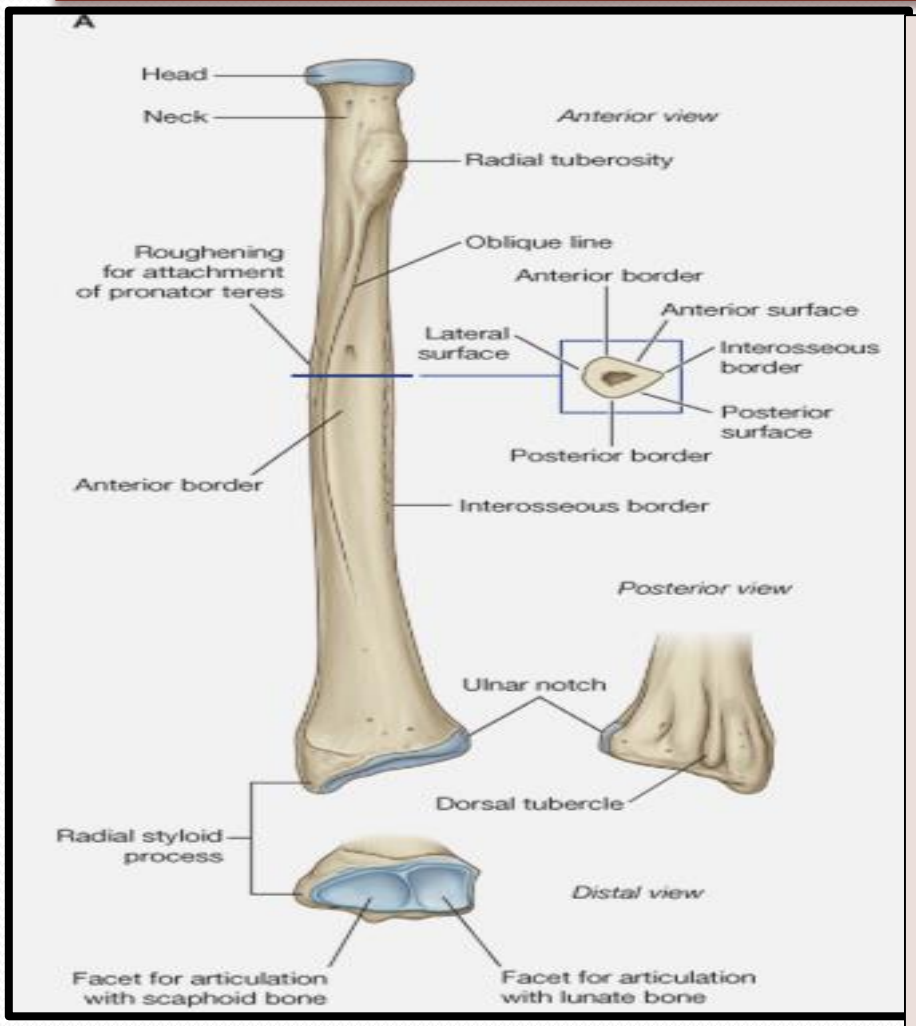



- ***Shaft :***
- ***Thick & cylindrical superiorly but diminishes in diameter inferiorly***
- ***It has Three Surfaces (Anterior, Medial & Posterior).***
- ***Sharp Lateral Interosseous border.***
- ***Distal End: Small rounded***

***1. Head: lies distally at the wrist. .***

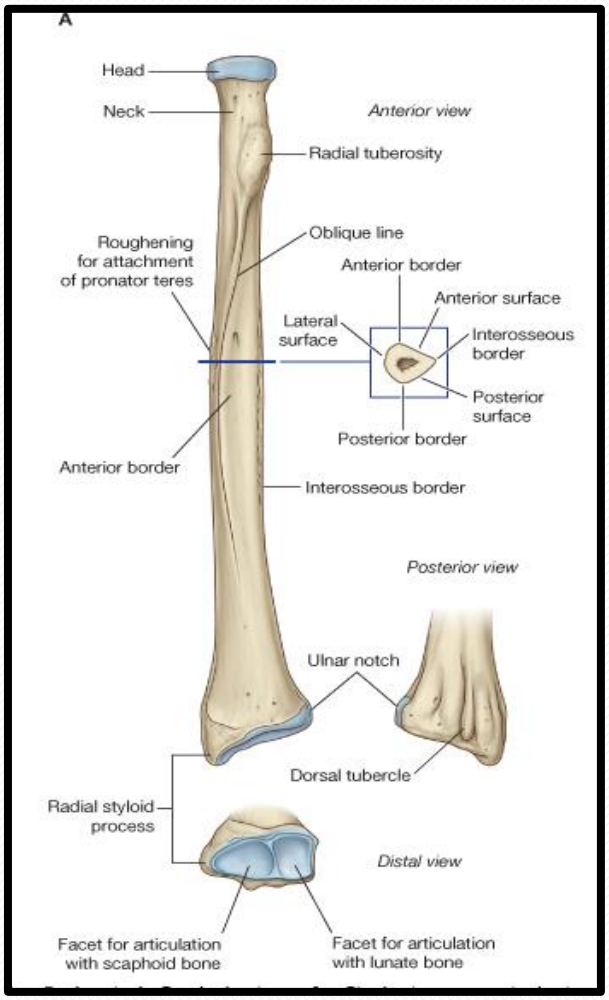
***2. Styloid process: Medial.***

# 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 (Biciptal) 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

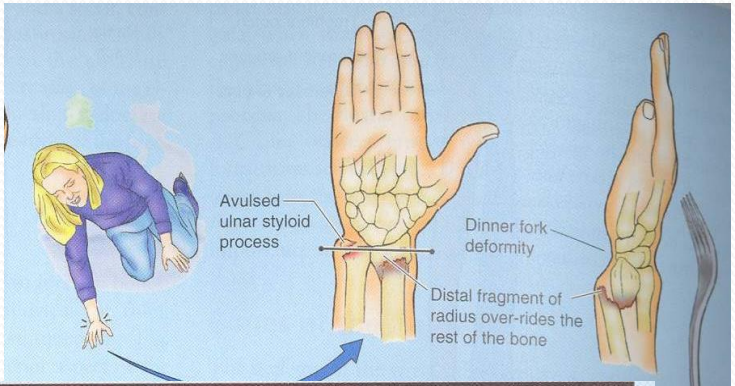
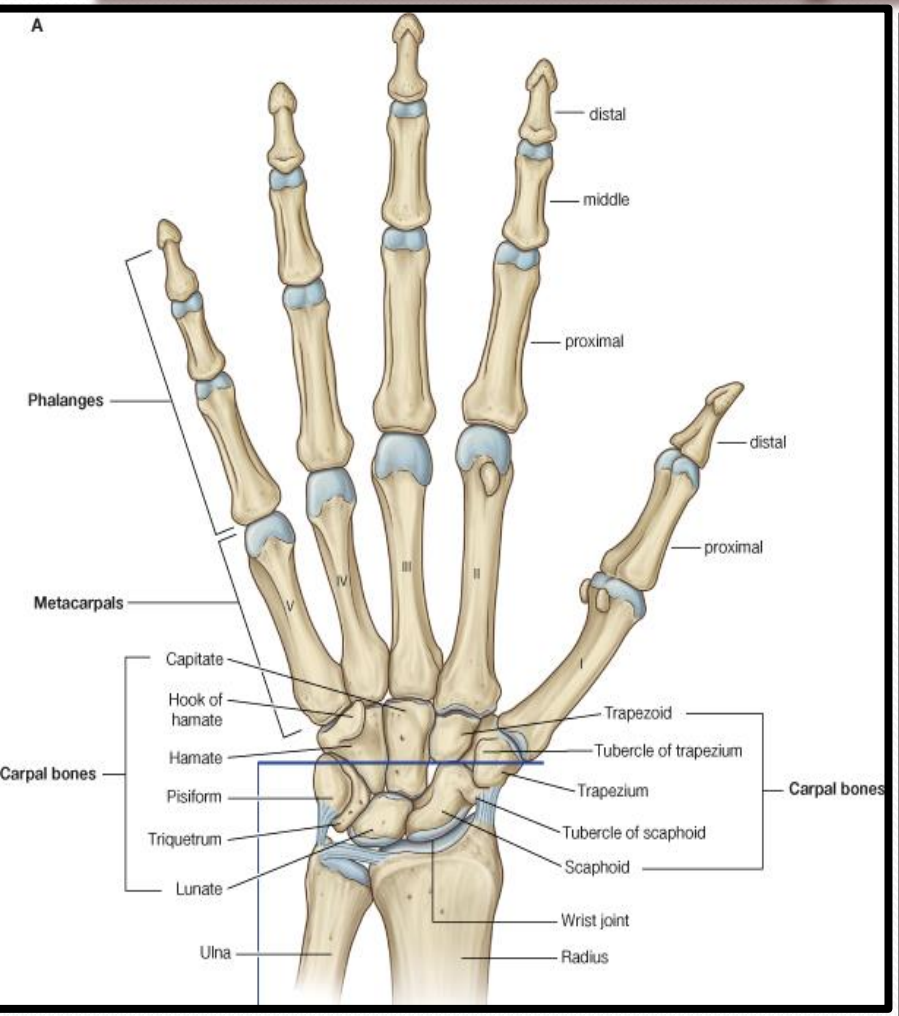




Figure 14.4 (a) Scaphoid fracture (arrow). (b) Colles' fr
showing 'dinner fork' deformity. (c) Colles' fracture, X

- ***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.*

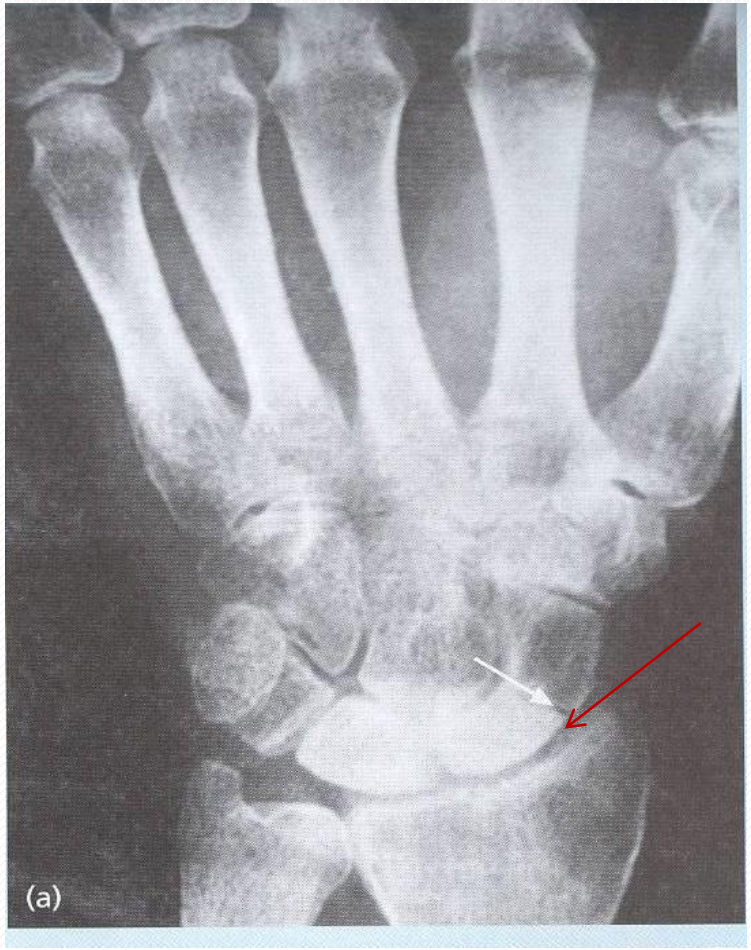
# Fracture of Scaphoid

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

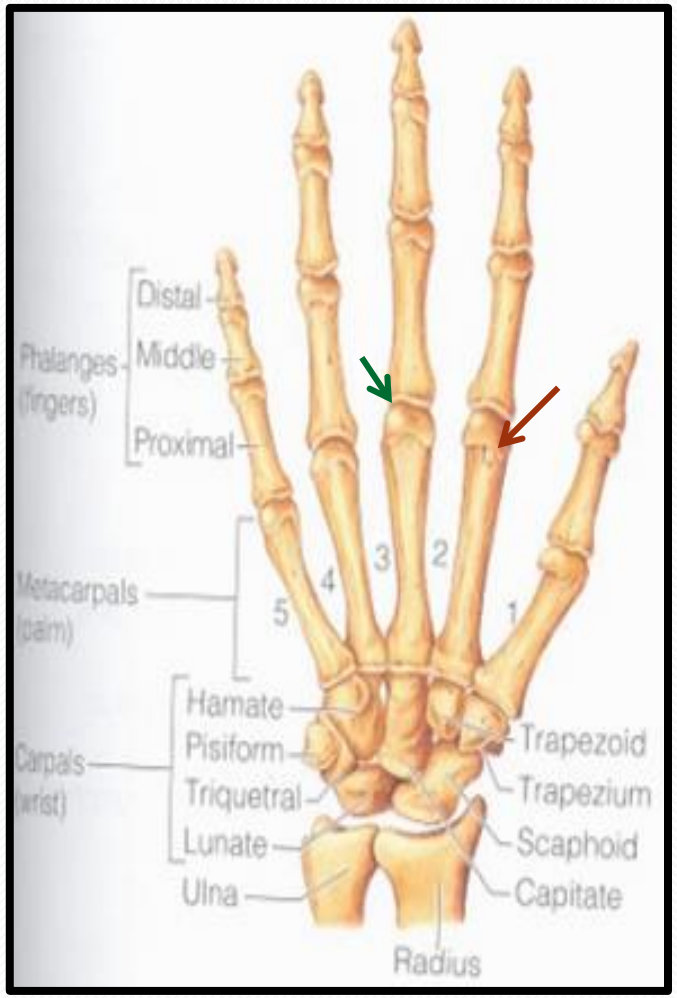
It is the result of a fall onto the palm when the hand is abducted.

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.**

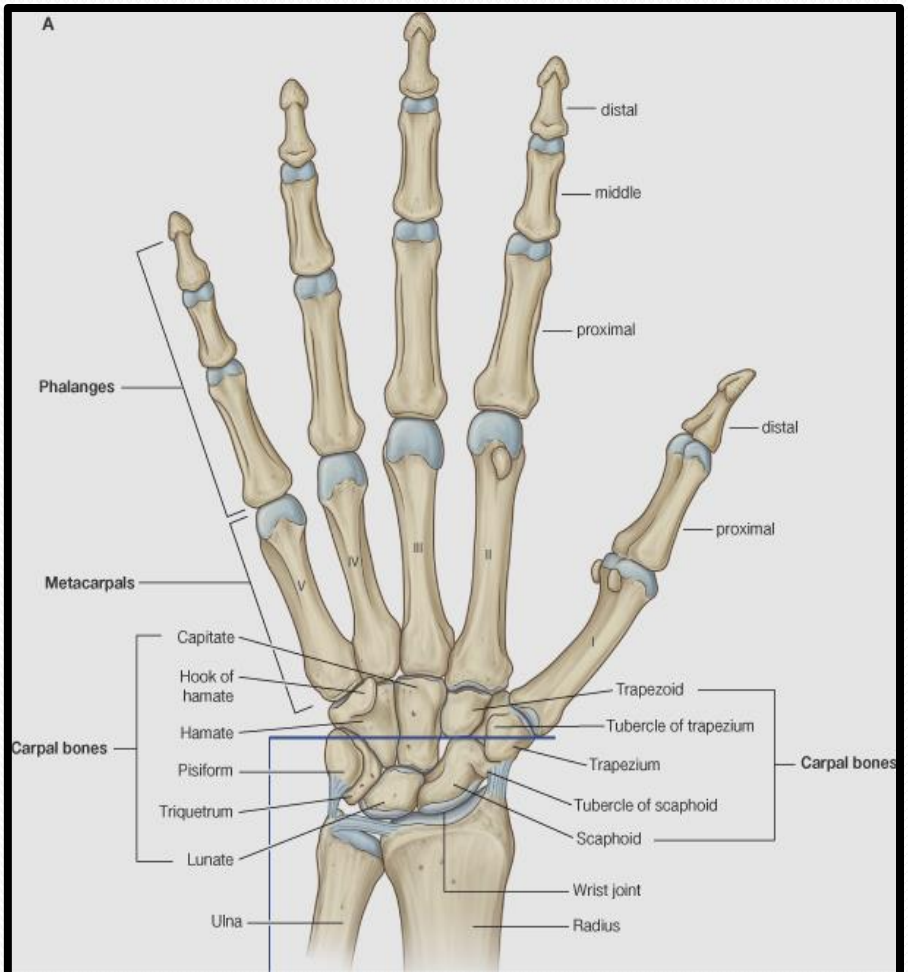


# *Metacarpal Bones*




- *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 1st 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