

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

المحاضرة تتضمن اسئلة متعددة الاختيار و اسئلة خطية



BONES OF THE UPPER LIMB

[Editing File](#)

Color Code

- Important
- Doctors Notes
- Notes/Extra explanation

Objectives

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

- o List the different bones of the Upper Limb.
- o List the characteristic features of each bone.
- o Differentiate between bones of right and left sides.
- o List the articulations between the different bones.

Please make yourself familiar with these terms to better understand the lecture...

| Terms | Meaning | Example |
|---------------------|--|--|
| Ridge | The long and narrow upper edge, angle, or crest of something | The supracondylar ridges (in the distal part of the humerus) |
| Notch | An indentation, (incision) on an edge or surface | The trochlear notch (in the proximal part of the ulna) |
| Tubercles | A nodule or a small rounded projection on the bone | Dorsal tubercle (in the distal part of the radius) |
| Fossa | A hollow place (The Notch is not complete but the fossa is complete and both of them act as the lock of the joint) | Subscapular fossa (in the concave part of the scapula) |
| Tuberosity | A large prominence on a bone usually serving for the attachment of muscles or ligaments (is a bigger projection than the Tubercle) | Deltoid tuberosity (in the humerus) and it connects the deltoid muscle |
| Processes | A V-shaped indentation (act as the key of the joint) | Coracoid process (in the scapula) |
| Groove | A channel, a long narrow depression sure | Spiral (Radial) groove (in the posterior aspect of the humerus) |
| Interosseous border | Between bones (the place where the two parallel bones attach together by the interosseous membrane) | Lateral interosseous sharp end of the ulna |
| Spine | Thick projecting ridge of bone | Spine of the scapula |
| Articulation | Meeting of two bones to make the joints | The articulation between the glenoid cavity and humerus |
| Union of the bone | The healing and coming together of the fracture | Union of the scaphoid bone fracture |

Bones of the upper limb:

it consists of the following:

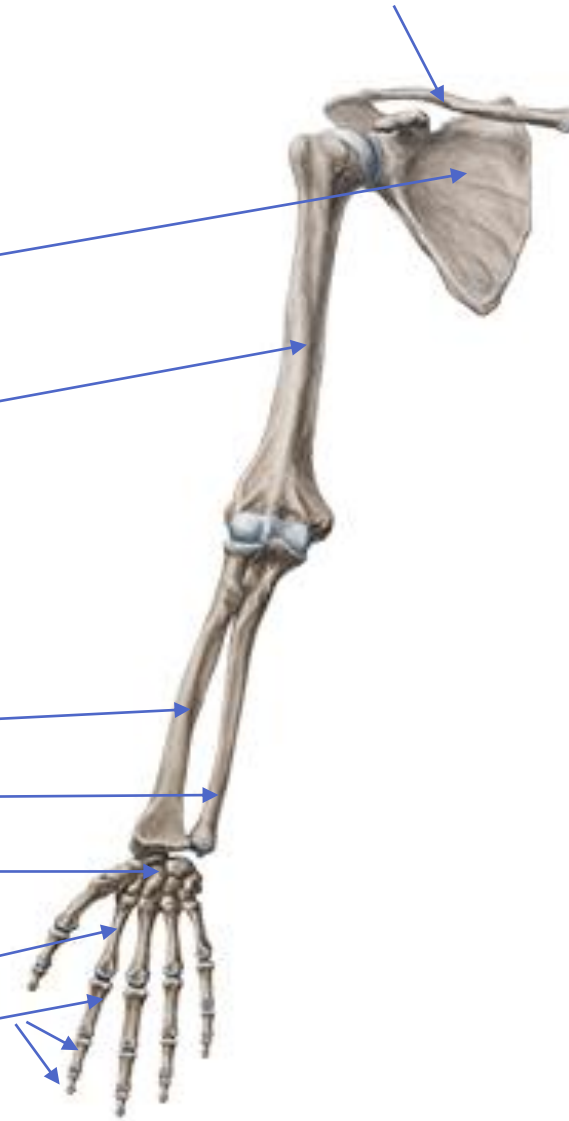
Pectoral girdle (scapula and clavicle) **it is very light and it allows the upper limb to have exceptionally free movement.**

Arm(**humerous**)

Forearm(**radius and ulna**)

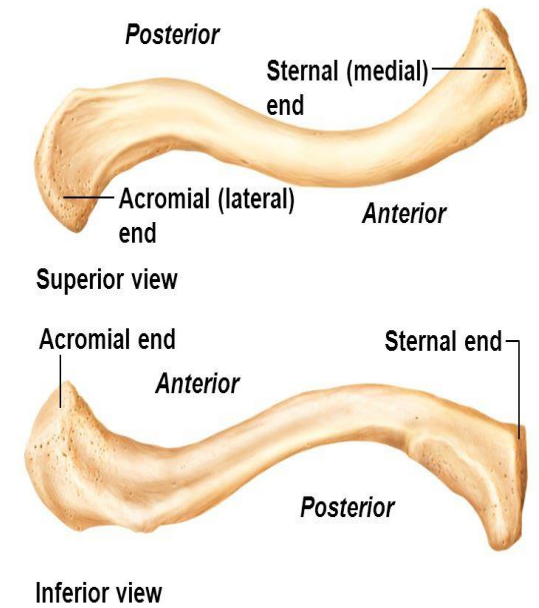
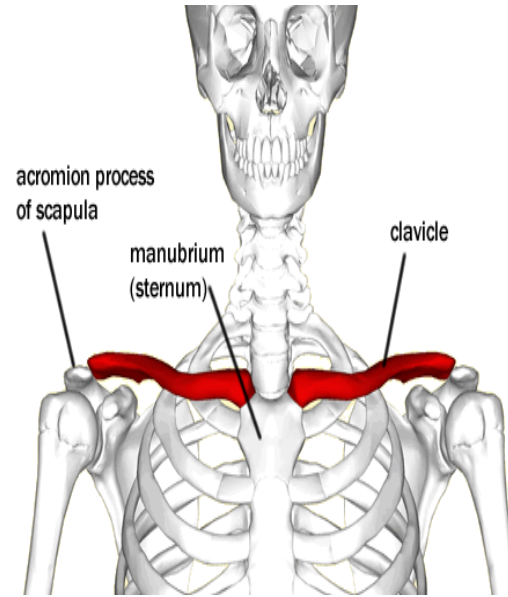
Wrist(**carpals**)

Hand bones(**metacarpals and phalanges**)



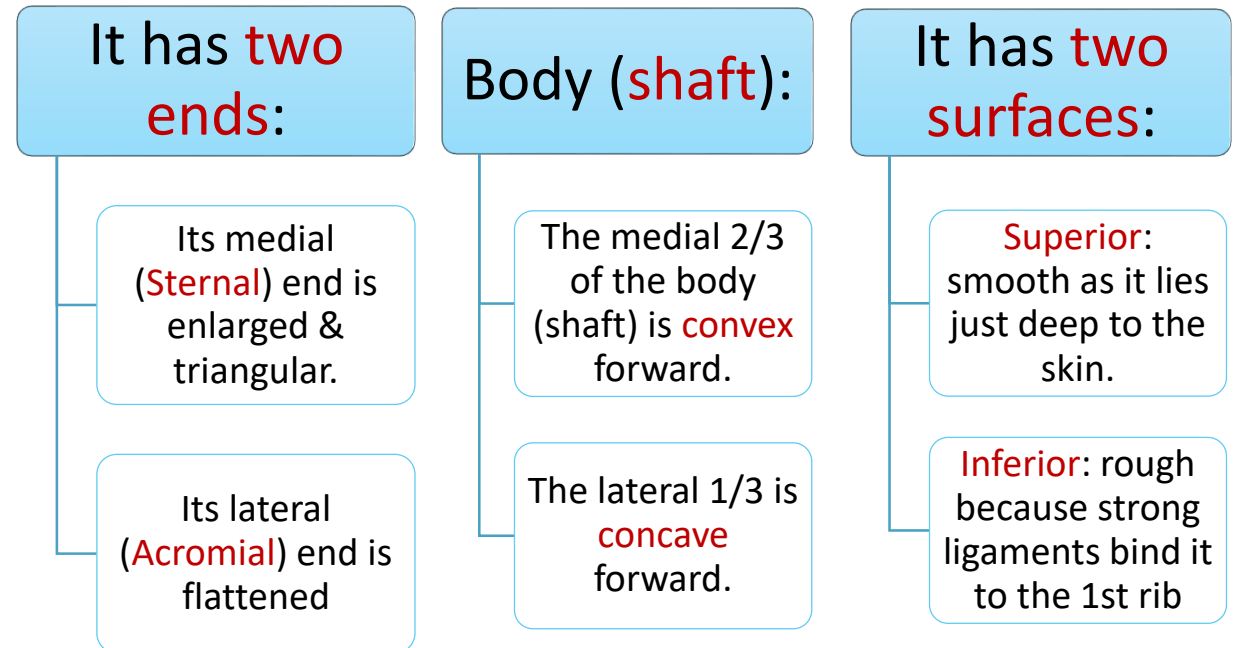
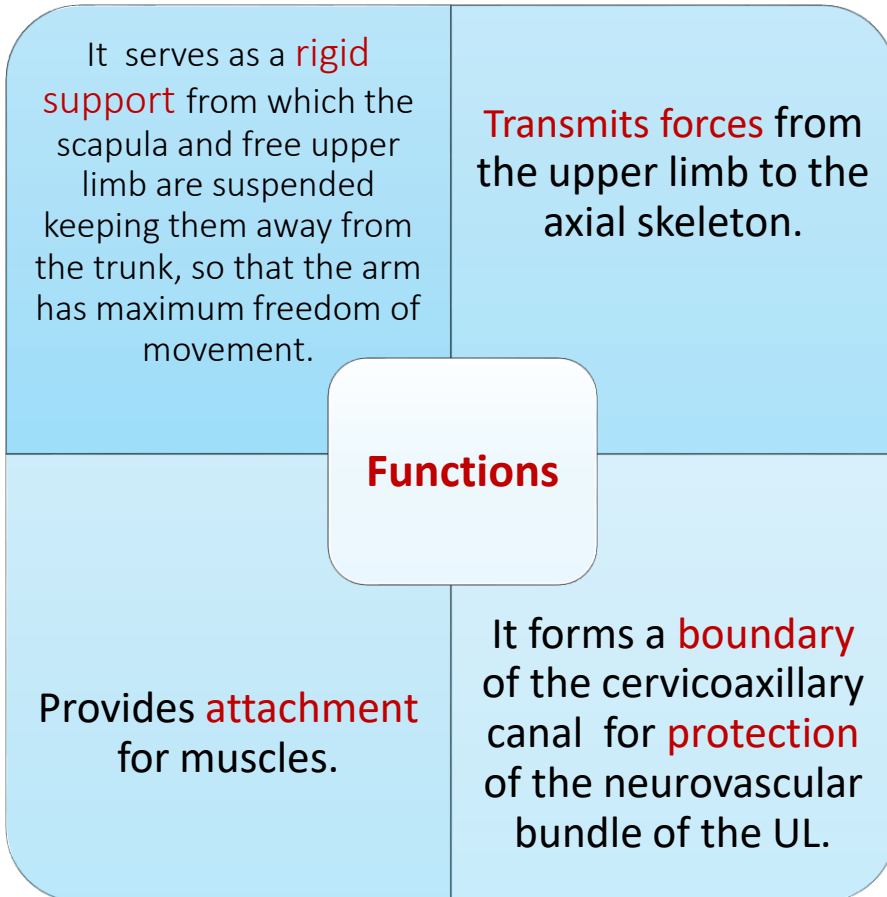
CLAVICLE:

- It is a doubly curved **long bone** with no medullary (**bone marrow**) cavity, lying **horizontally** across the root of the neck. It is **subcutaneous** (**under the skin**) throughout its length.
- It has the appearance of an elongated capital letter (**S**) lying on one side.
- If the clavicle is broken, the whole shoulder region caves in medially.



(b) Right clavicle, superior and inferior views

Figure 5.23b



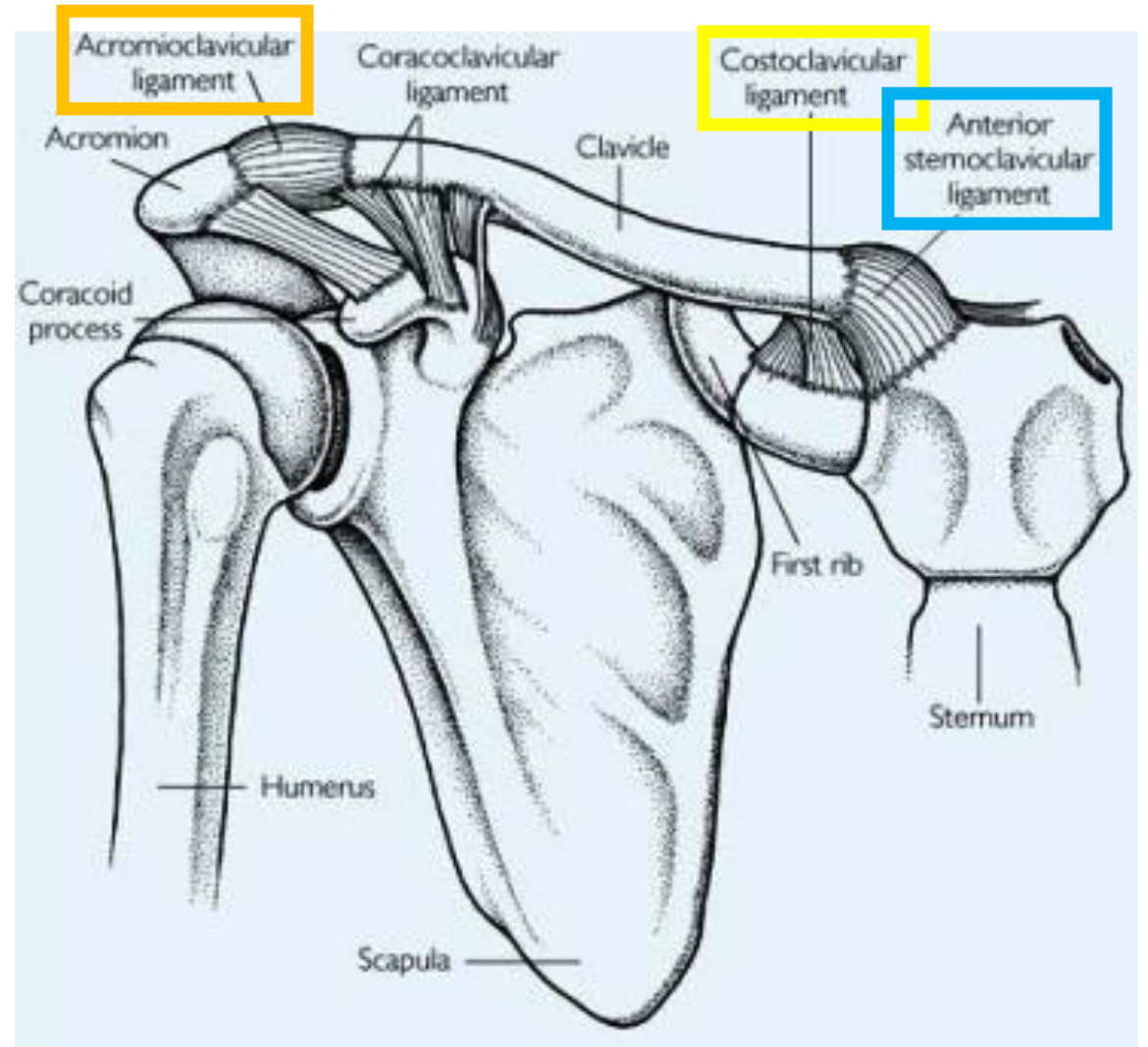
Articulation Of Clavicle:

- Medially, **sternoclavicular Joint**
 - with the **Manubrium**
- Laterally, **Acromioclavicular Joint**
 - with the **Acromial end of the scapula**
- Inferiorly, **costoclavicular Joint**
 - with the **1st rib**

تذكر أن فيه فرق بين ☺

Acromial → Lateral End Of **Clavicle**

Acromion → One Of The Three Processes in **Scapula**



Fractures Of The Clavicle:

The clavicle is commonly fractured especially in children as forces are impacted to the outstretched hand during falling.

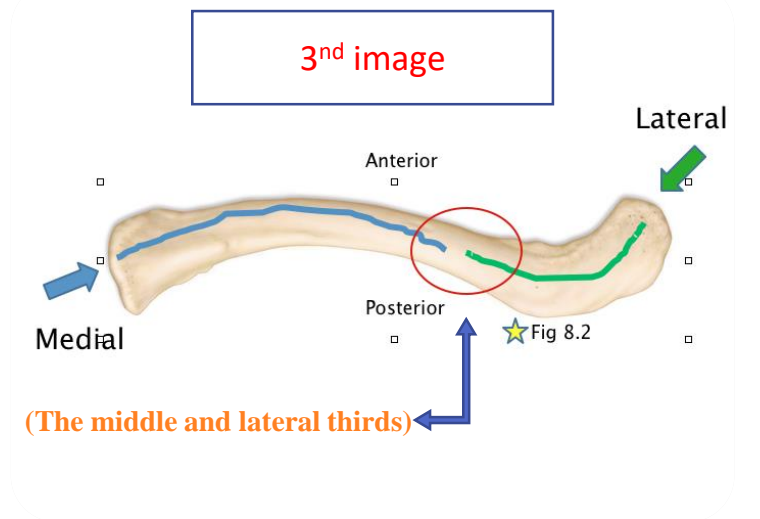
The weakest part of the clavicle is the junction of the middle and lateral thirds. (Check The 3rd Image)

After fracture, the medial fragment is **elevated** يرتفع (by the **sternomastoid** muscle), the lateral fragment **drops** because of the weight of the UL.

UL= Upper Limb

The lateral fragment may be pulled medially by the adductors of the arm.

The sagging (يتدودل 😊) limb is supported by the other.



Clinical significance of clavicle fracture:

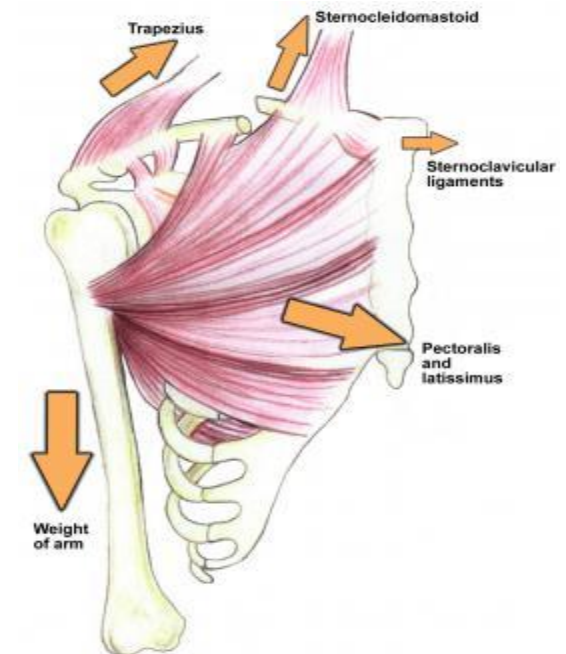
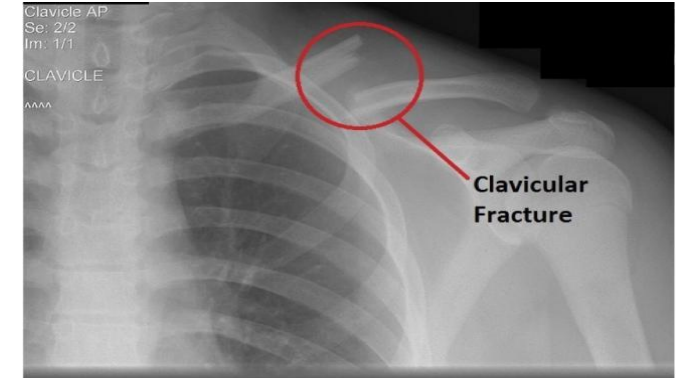
Fracture of the clavicle:

A function of the clavicle is to **transmit forces from the upper limb to the axial skeleton**. Thus, the clavicle is the most commonly fractured bone in the body.

Fractures commonly result from a fall onto the shoulder, or onto an outstretched hand.

□ **The most common point of fracture is the junction of the medial 2/3 and lateral 1/3.**

□ After fracture, the lateral end of the clavicle is displaced inferiorly by the weight of the arm, and medially, by the pectoralis major. The medial end is pulled superiorly, by the sternocleidomastoid muscle.



Scapula:

It is a triangular flat bone, extends between the 2nd to 7th ribs.

Three Processes:

1. **Spine:** a thick projecting ridge of bone that continues laterally as the flat bone expands.
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:

1. **Superior,** 2. **Medial (Vertebral)** 3. **Lateral (axillary):** terminates at the **lateral angle** (the thickest) part of the bone.

Three Angles :

1. **Superior** 2. **Inferior** 3. **Lateral (forms the Glenoid cavity:** a shallow concave oval fossa that receives the head of the humerus.)

Two Surfaces :

Convex posterior: surface is divided by the spine of the scapula into the smaller **Supraspinous Fossa** - above the spine and the larger **Infraspinous Fossa** - below the spine.

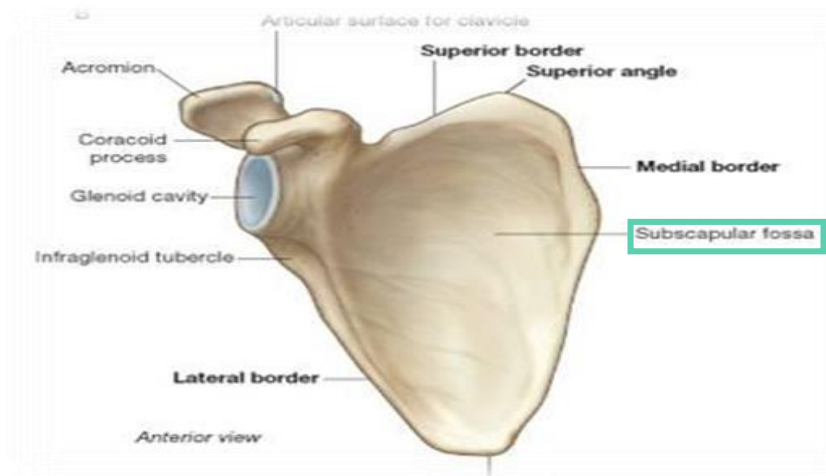
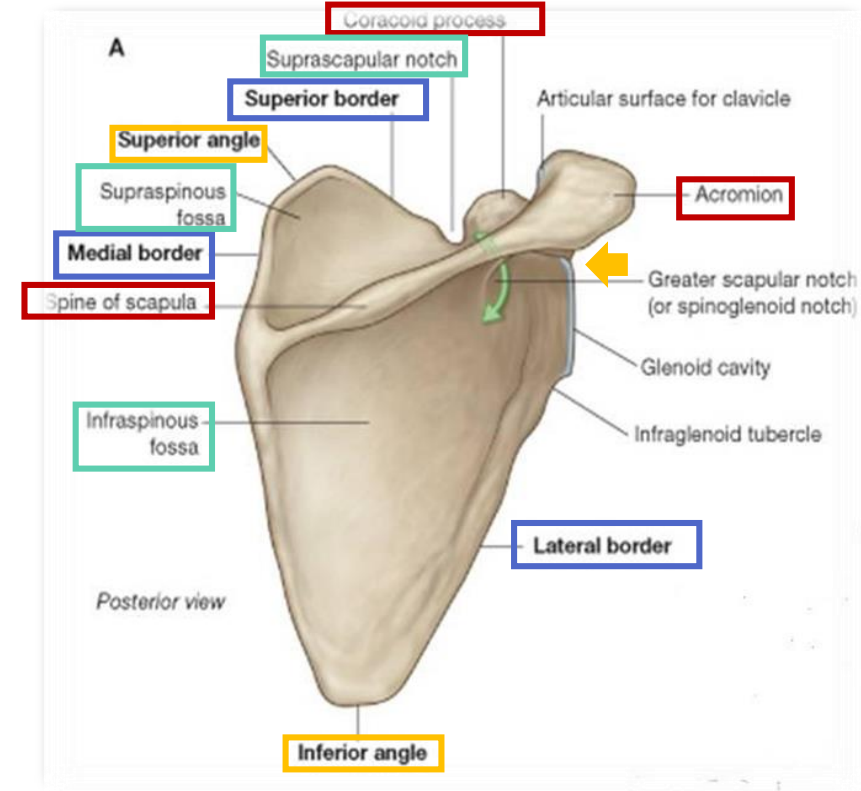
Concave Anterior (Costal) Surface , it forms the large **Subscapular Fossa**.

Suprascapular notch: It is a nerve passageway, medial to coracoid process. - **Suprascapular nerve**

Function:

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

(Because most of the scapula is well protected by muscles most of its fractures involve the protruding subcutaneous **acromion**)



Winged scapula:

Clinical appearance:

It will protrude posteriorly



Etiology :

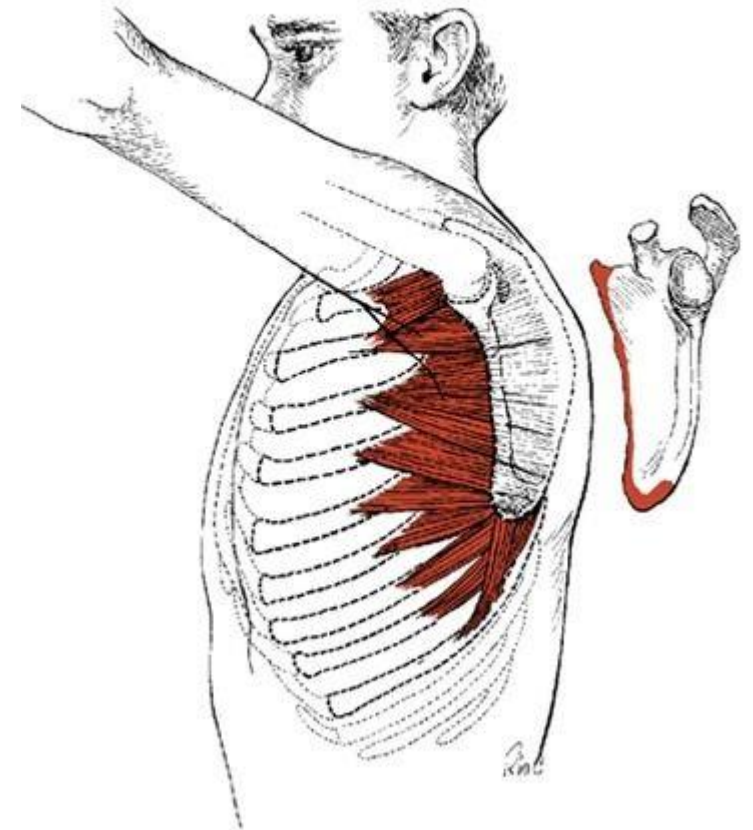
The **serratus anterior** muscle pulls the scapula against the ribcage. **The long thoracic nerve** innervates this muscle , if the nerve becomes injured (as in radical mastectomy) the scapula protrudes.

Symptoms :

The patient **has difficulty in raising the arm above the head** (difficult in rotation of the scapula)

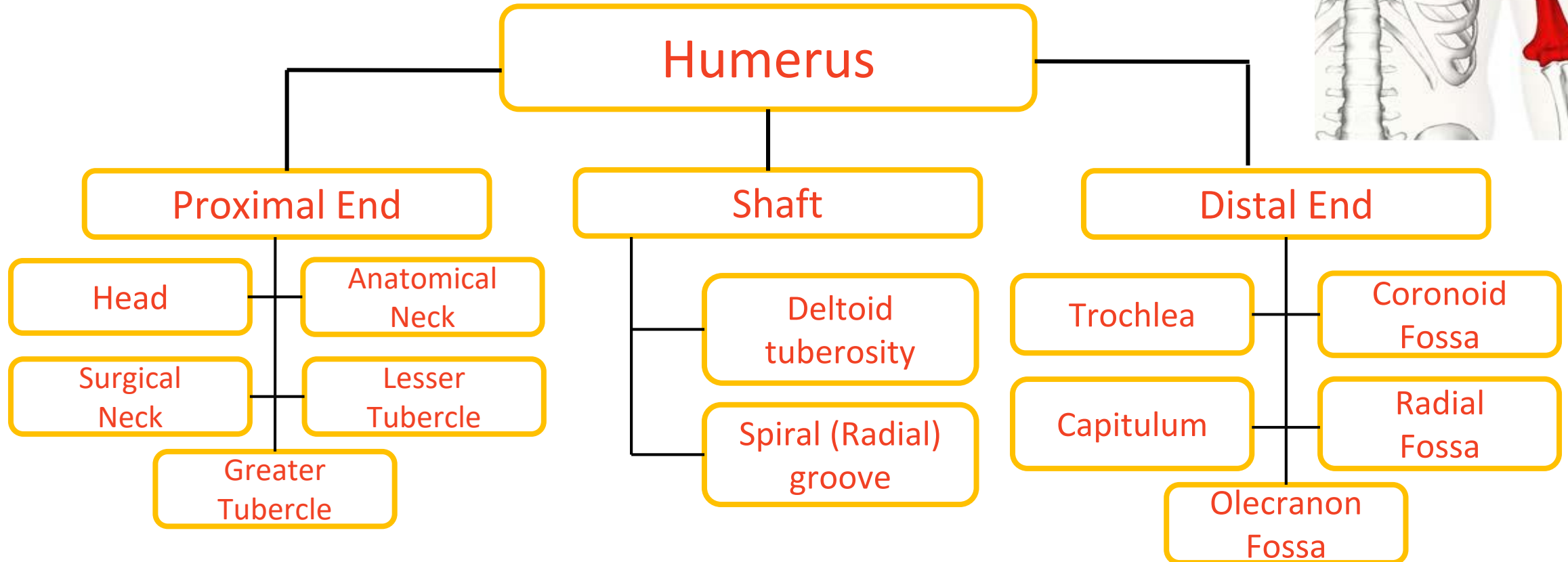
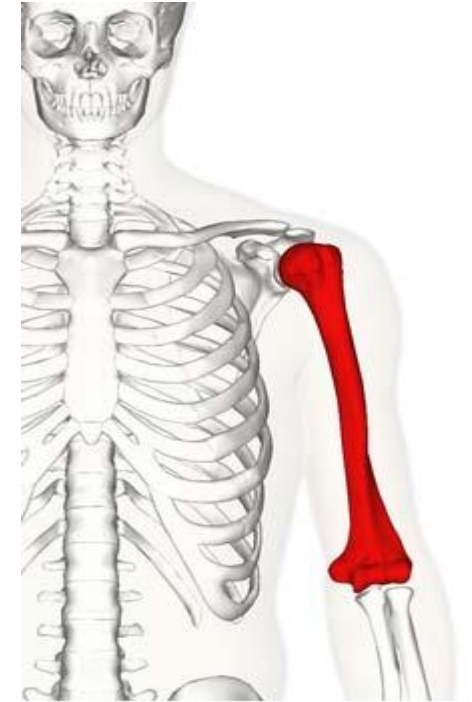
The **medial border and inferior angle of the scapula** will no longer be kept closely applied to the **chest wall**

Serratus Anterior



ARM (HUMERUS):

- A Typical long bone
- It is the largest bone in the Upper Limb



Proximal End of Humerus:

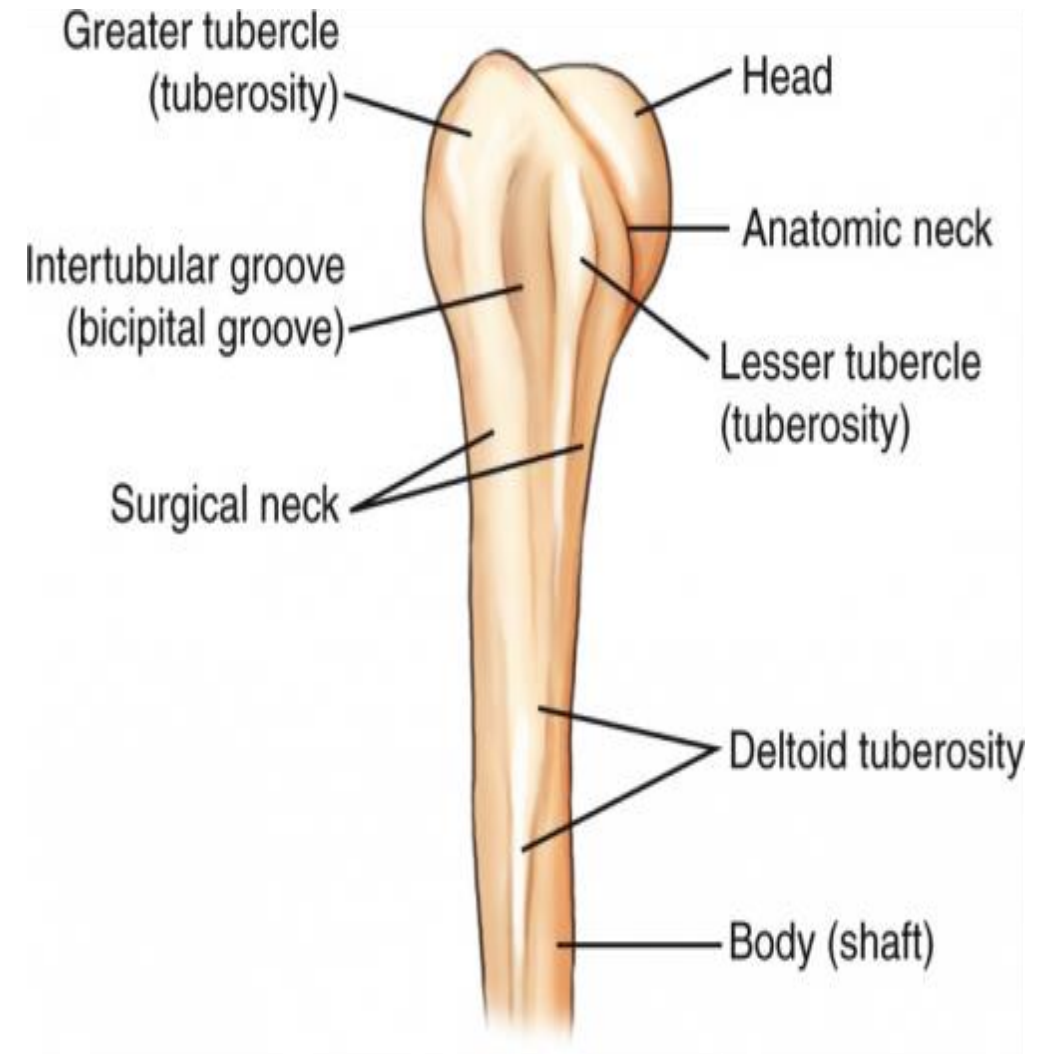
Head : (faces medially) Smooth and forms 1/3 of a sphere , it articulates with the **glenoid cavity** of the scapula .

Anatomical Neck : formed by a groove separating the head from the tubercles .

Surgical Neck : a narrow part distal to the tubercles. It is a common fracture site of the humerus .

Greater tubercle : at the **lateral** margin of the humerus .

Lesser tubercle : projects anteriorly . The two tubercles are separated by Intertubercular Groove (Intertubercular Sulcus/ Bicipital Groove) .



Shaft of Humerus:

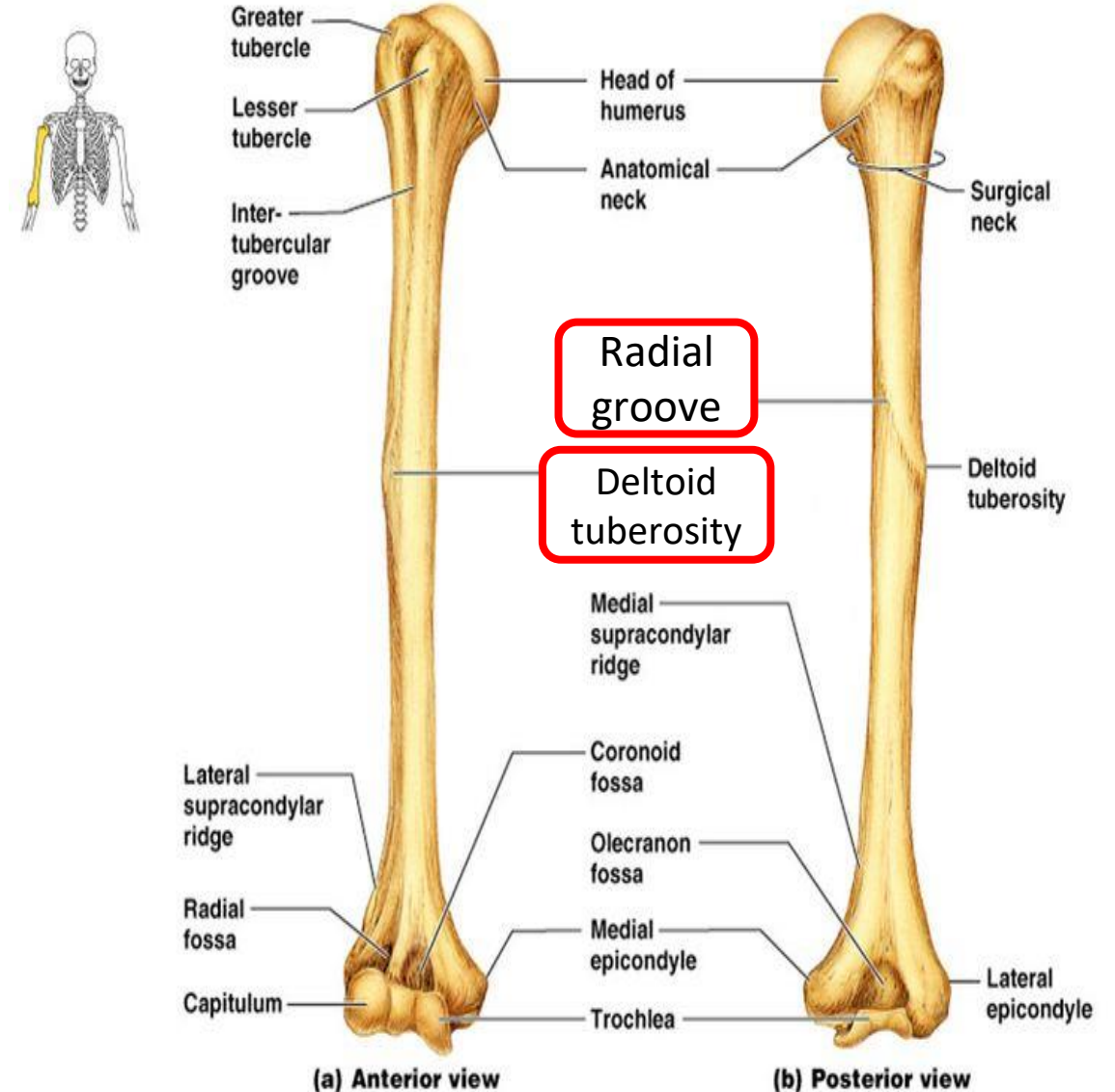
Has two prominent features :

Deltoid Tuberosity (بروز أو نتوء):
A rough elevation laterally for the attachment of deltoid muscle .

Spiral (Radial) groove :

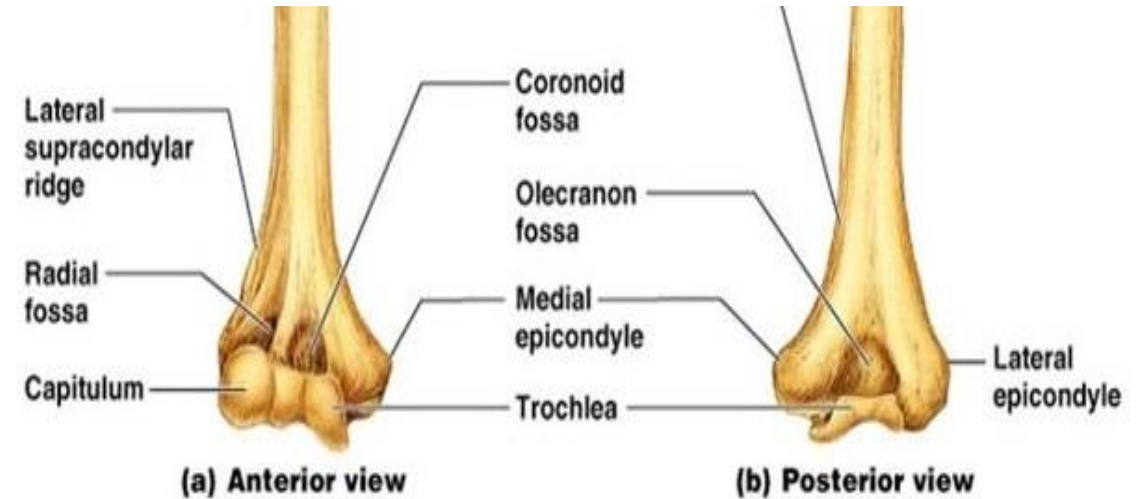
- Runs obliquely down the posterior aspect of the shaft .
- It lodges the important radial nerve and vessels .

Note: Tuberosity in bones are usually for attachment of muscles .

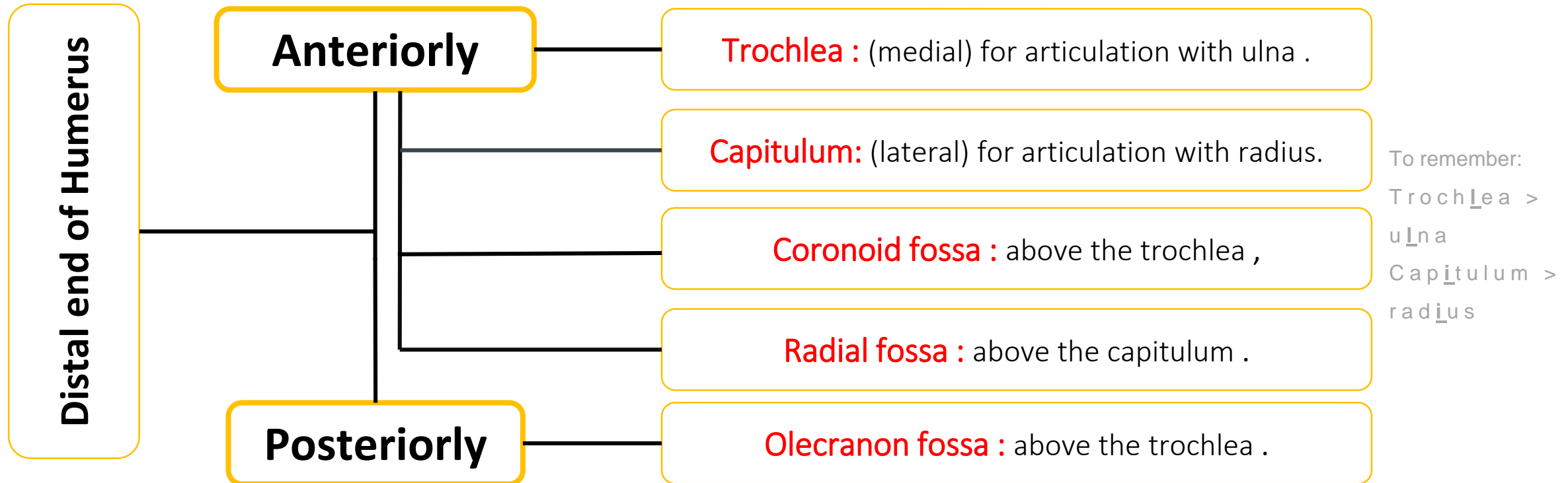


Distal End of Humerus:

- Widens as the sharp medial and lateral Supracondylar Ridges and end in the **Medial (can be felt) and Lateral Epicondyles**.
- They provide muscular attachment.

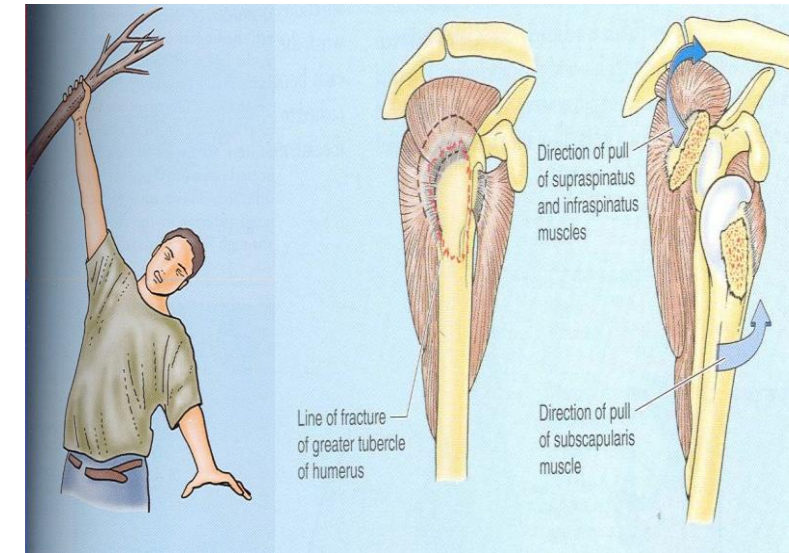


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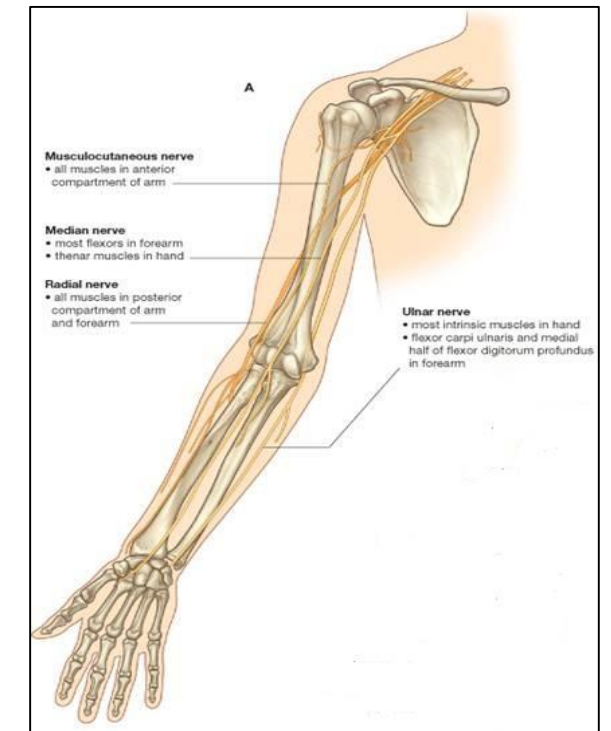
Fractures of the Humerus:

- **Surgical neck** fractures are the most common fractures of the humerus especially in old people with **osteoporosis**.
- Fractures result from direct falling on the hand (transition of force through the bones of forearm of the extended limb).
- In younger people fracture of **the great 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:

| Fracture type | Nerve affected |
|-----------------------|----------------|
| Surgical neck | Axillary nerve |
| Radial groove | Radial nerve |
| Distal end of humerus | Median nerve |
| Medial epicondyle | Ulnar nerve |



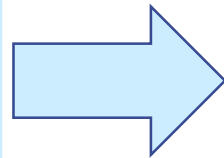
Distal humeral fracture:

Medial epicondyle fractures are common fracture types of the distal humerus

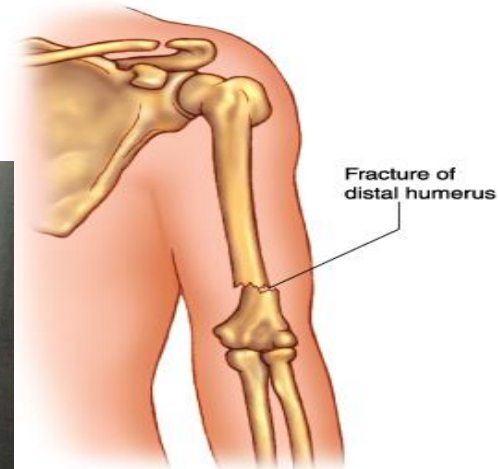
A supraepicondylar fracture occurs by falling on a flexed elbow

It is a transverse (horizontal) fracture, spanning between the two epicondyles

Direct damage or swelling can cause interference to the blood supply of the forearm from the brachial artery.

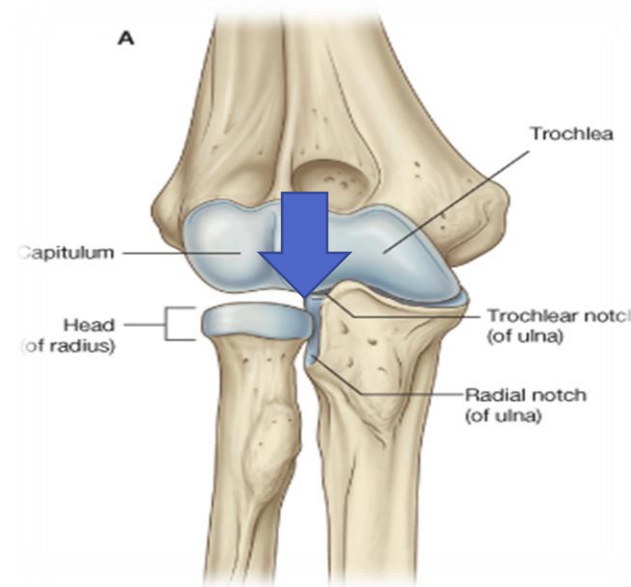
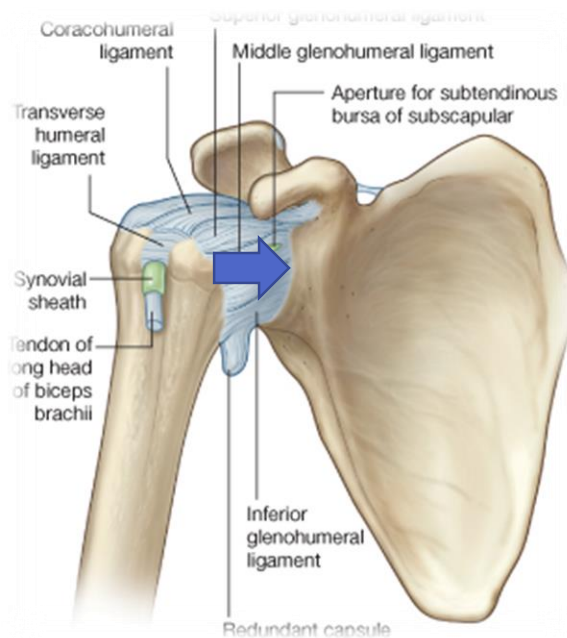


The resulting ischemia **Volkman's ischemic contracture**- uncontrolled flexion of the hand, as flexor muscles become fibrotic and short. There can also be damage to the median ulnar or radial nerves.



Articulations:

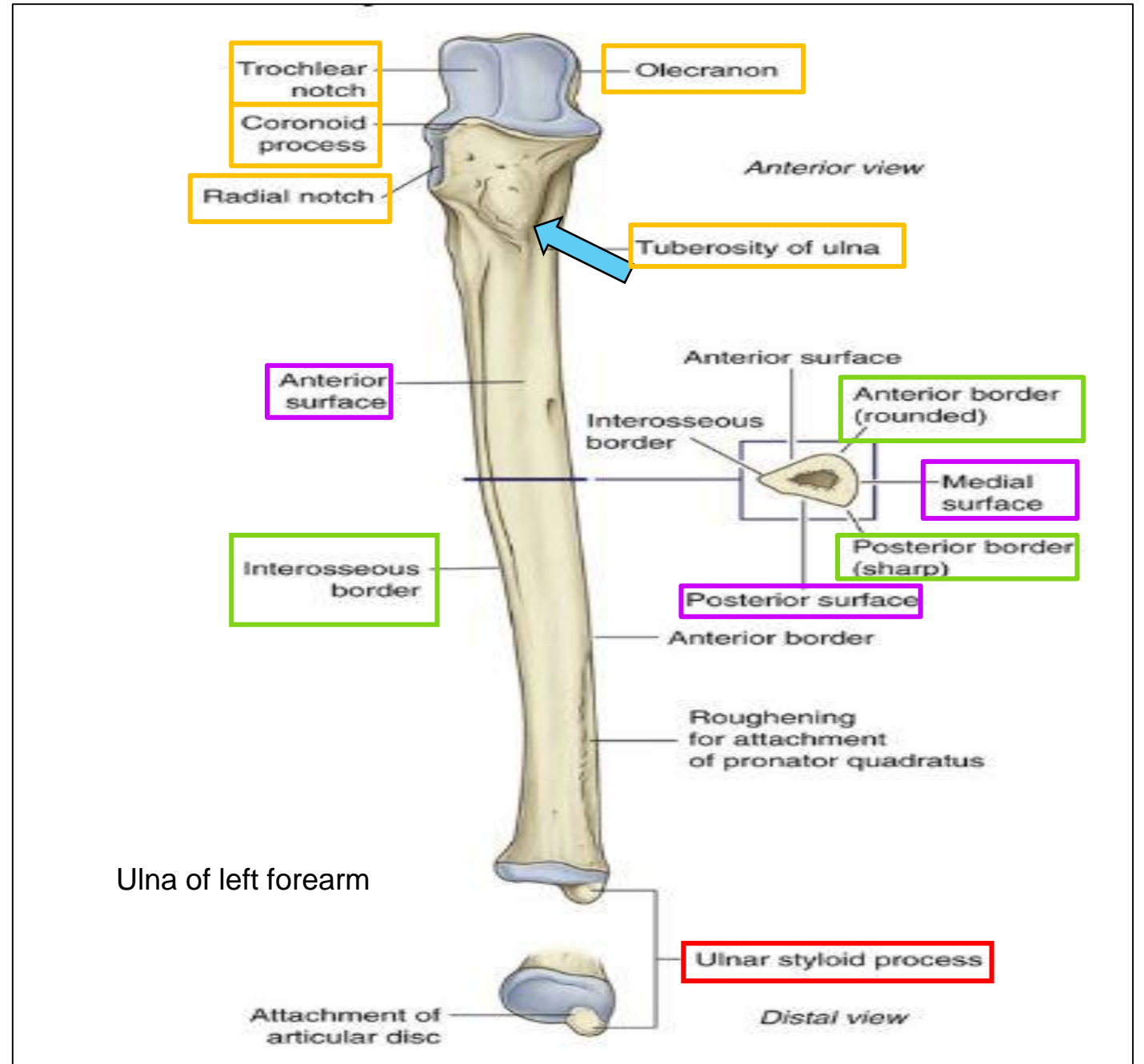
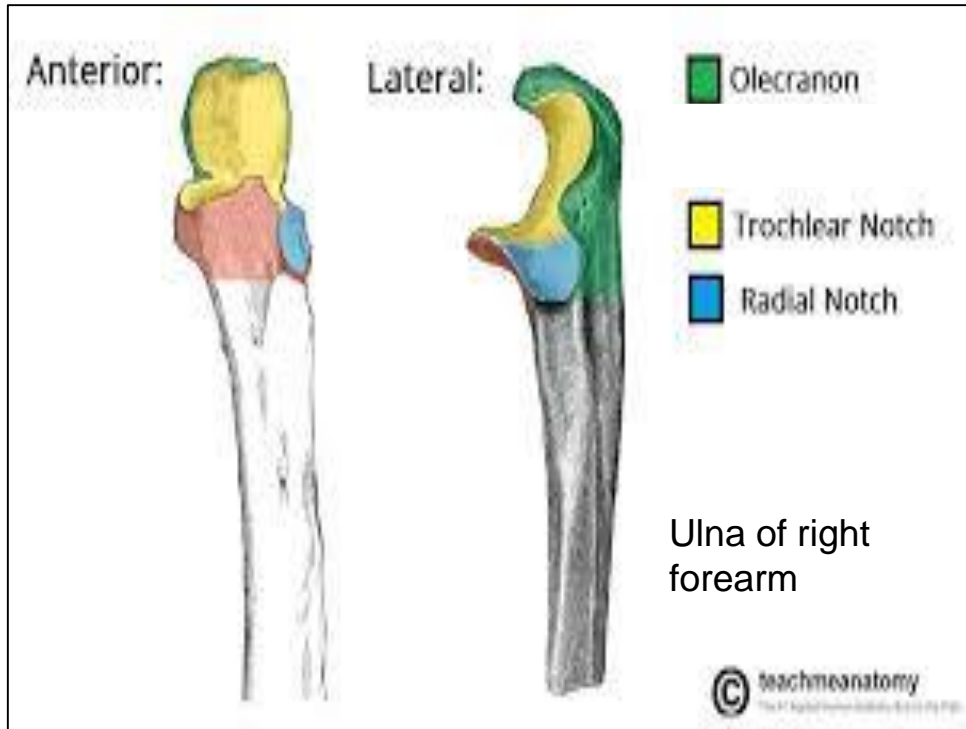
- Head of the humerus with the glenoid cavity of the scapula form the Shoulder joint.
- Lower end (**Trochlea & Capitulum**) with the upper ends of the radius & ulna form the Elbow joint.



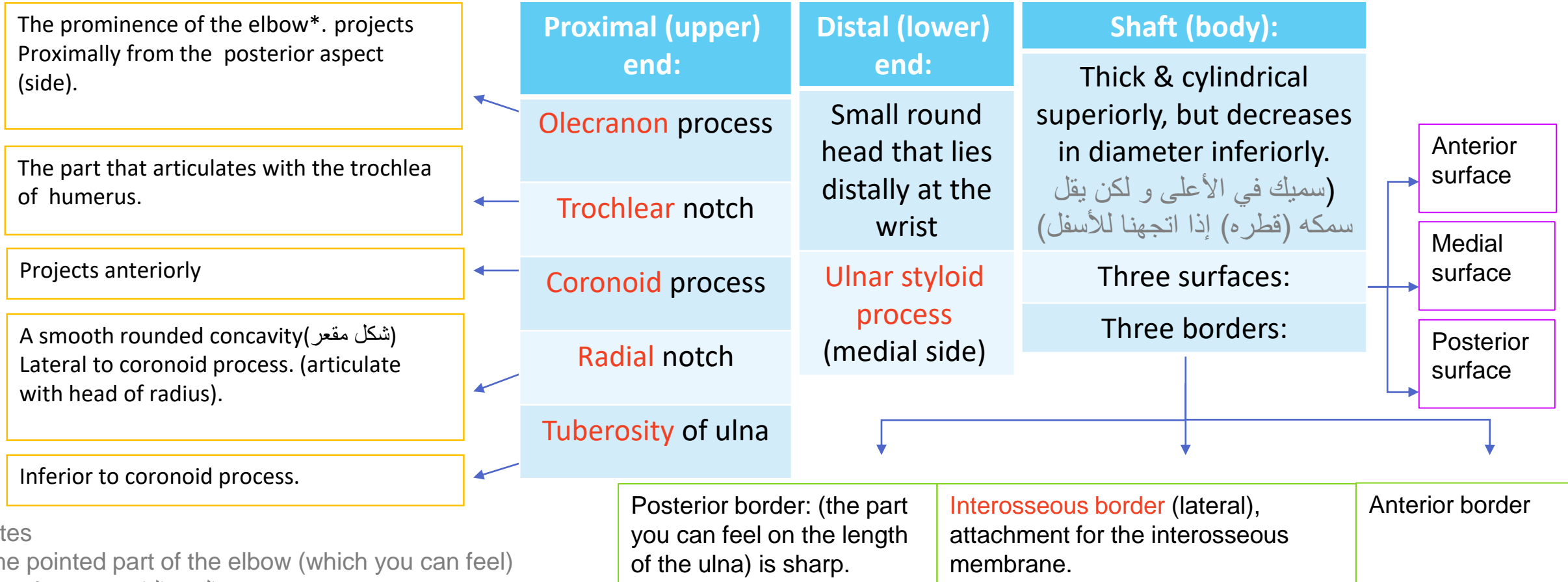
Ulna:

- Is the stabilizing bone of forearm.
- It is the medial and the longer of the two bones of the forearm.

[Video on ulna](#)



Ulna



Notes

*The pointed part of the elbow (which you can feel)

-Prominence: الجزء البارز

-Projects: يبرز

-Articulates: يرتبط (يكون مفصل)

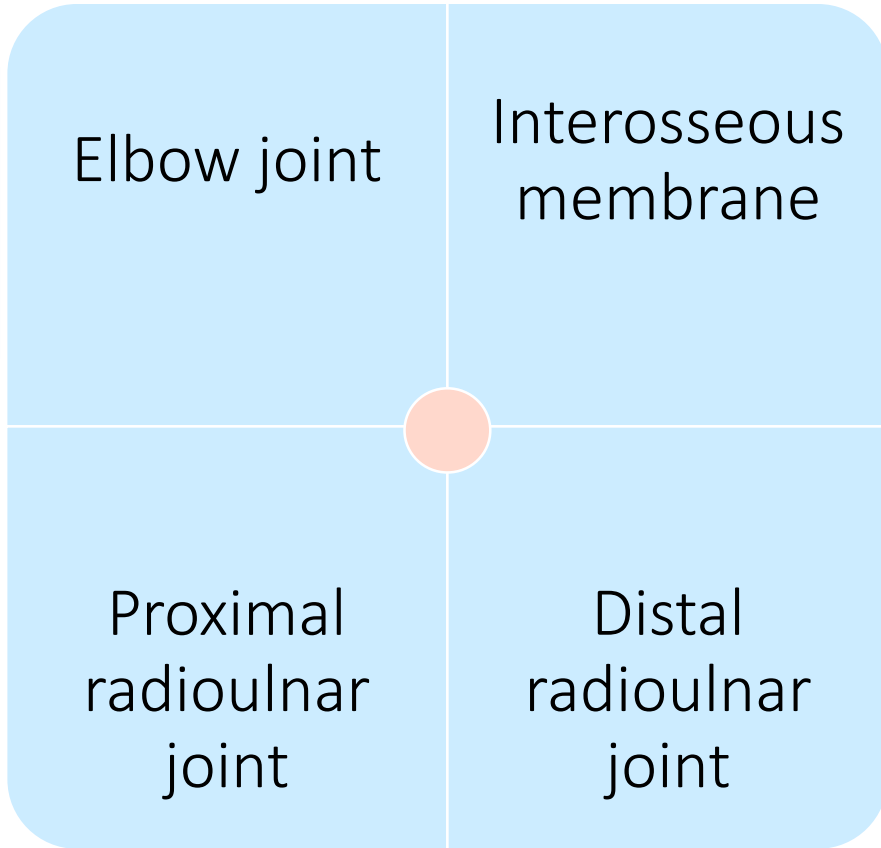
-surfaces are between borders

- The process lodges with the fossa.

Ex: coronoid fossa (on humerus) & coronoid process (on ulna)

Extra: Also in the upper end: supinator fossa that allows for the movement of the radial tuberosity. There is also a supinator crest posterior to the supinator fossa.

Ulna and Radius Articulations:

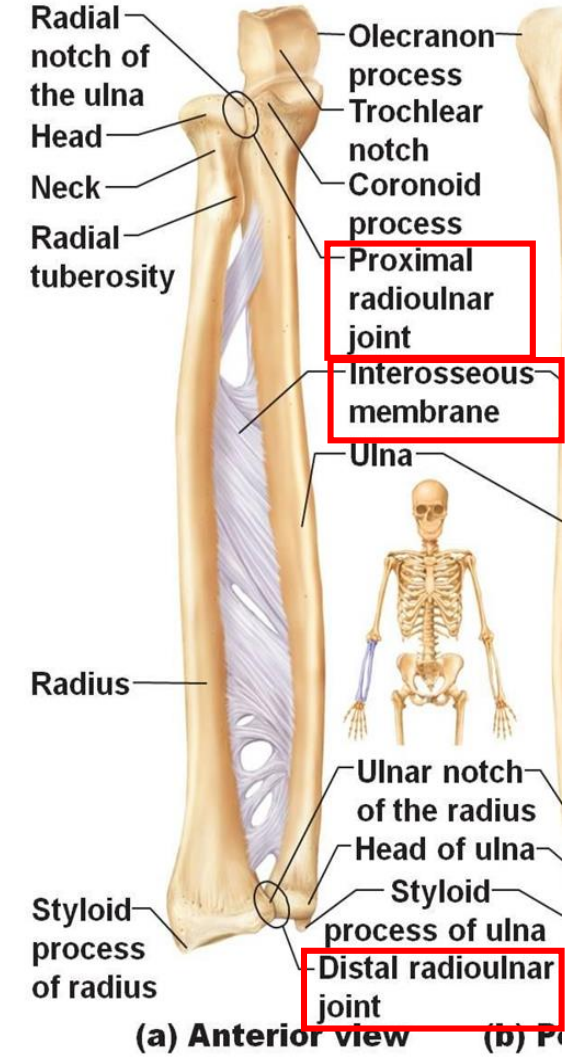


The distal end of the humerus with the proximal ends of the radius and ulna.
It mainly allows for flexion and extension.

Between the head of the radius and the radial notch of the ulna

A flexible membrane that connects ulna and radius

Between the head of the ulna and the ulnar notch of the radius

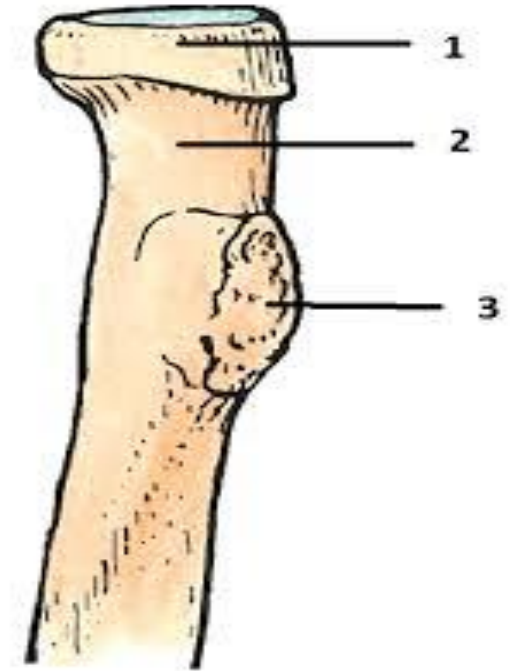
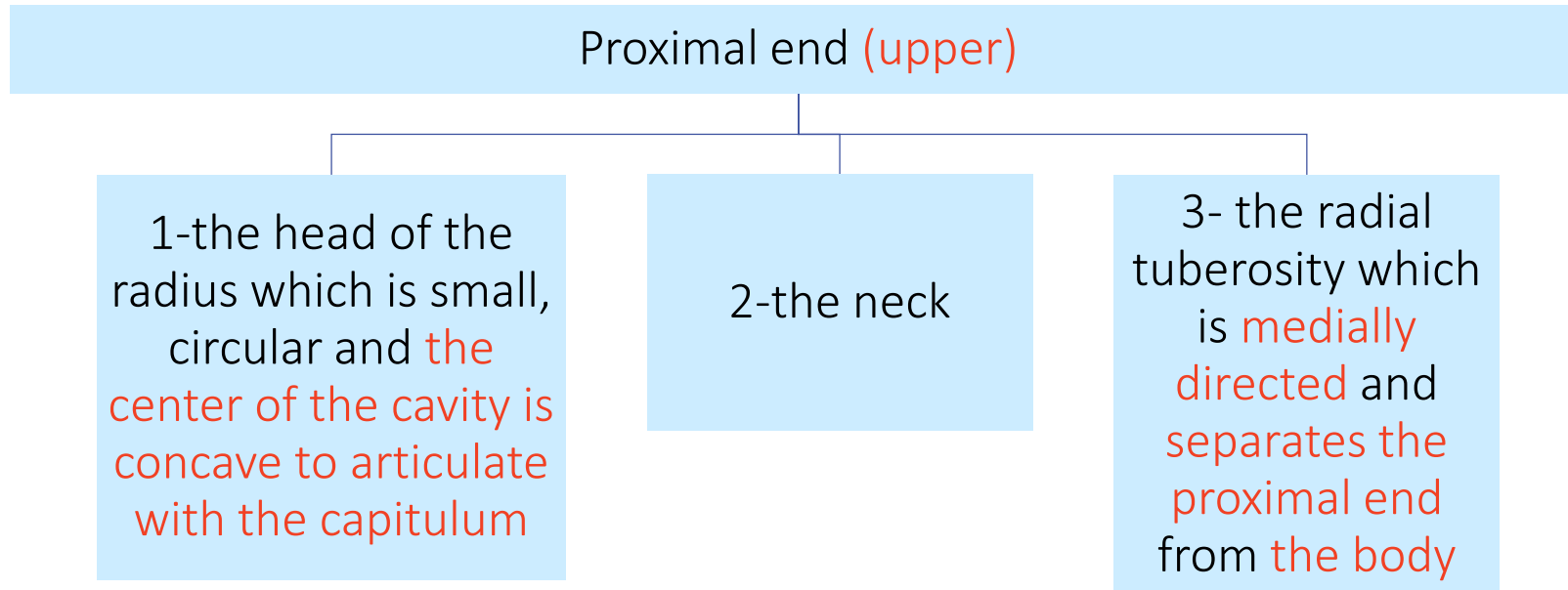


Only on the boys' slides

extra: the distal end of the radius articulates with the scaphoid and lunate bones at the wrist joint.

The Radius:

it is the shorter and the **lateral** bone of the forearm.

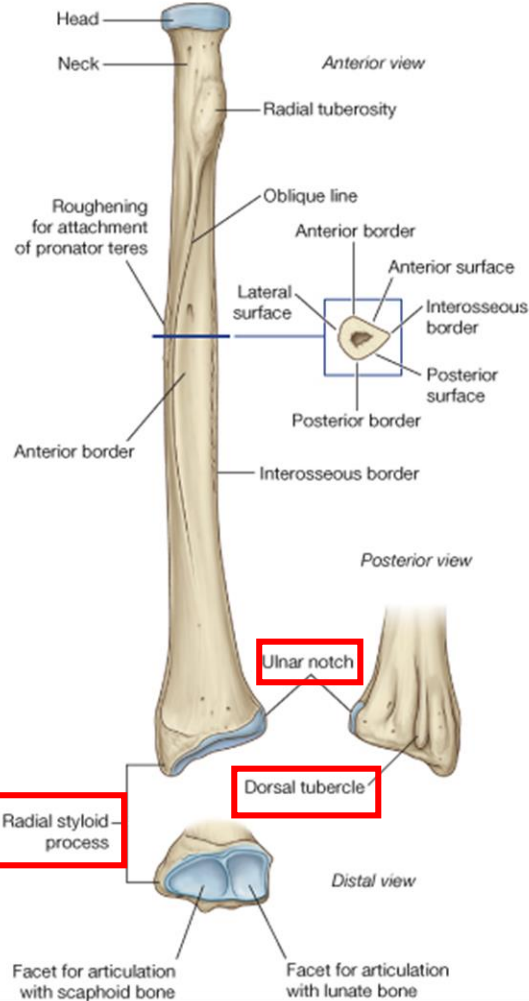


The Shaft and Distal End of the Radius

The shaft

It has a lateral convexity

It gradually enlarges as it passes distally



The distal end (lower)

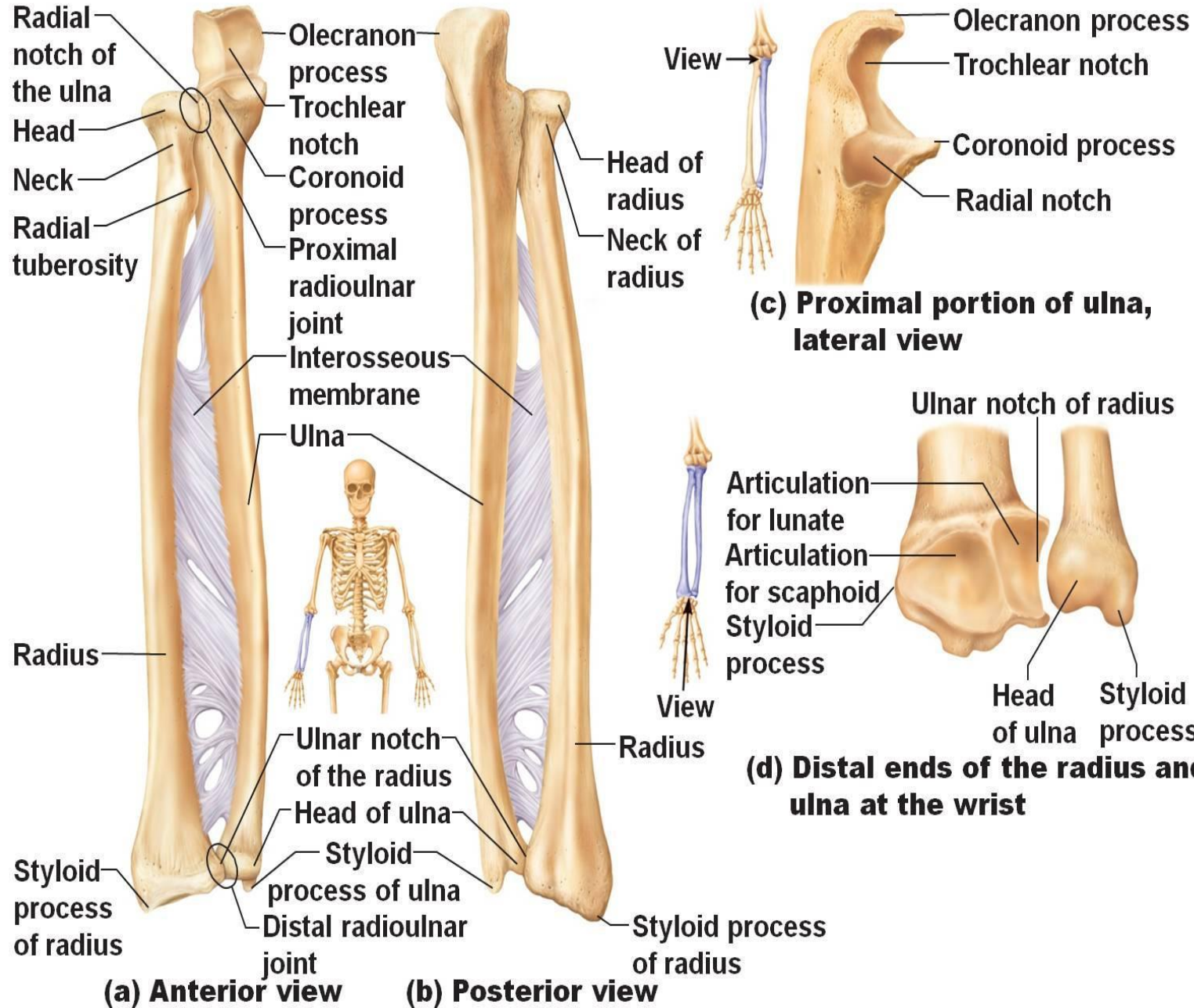
Its rectangular

Its medial aspect (side) forms a concavity called the **Ulnar notch** to accommodate the head of the ulna.

Dorsal tubercle that projects dorsally.

Radial **Styloid process** that extends from the **lateral aspect**.

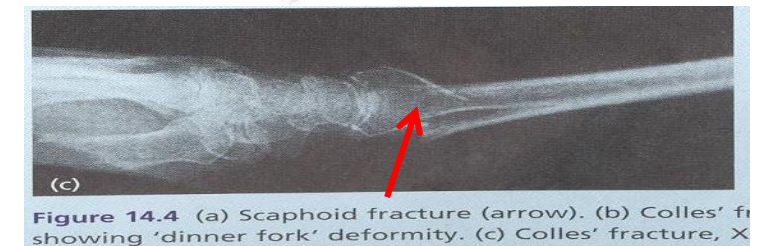
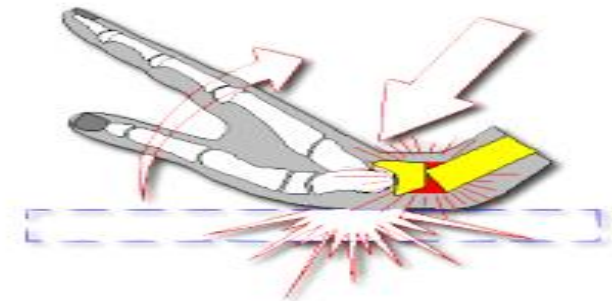
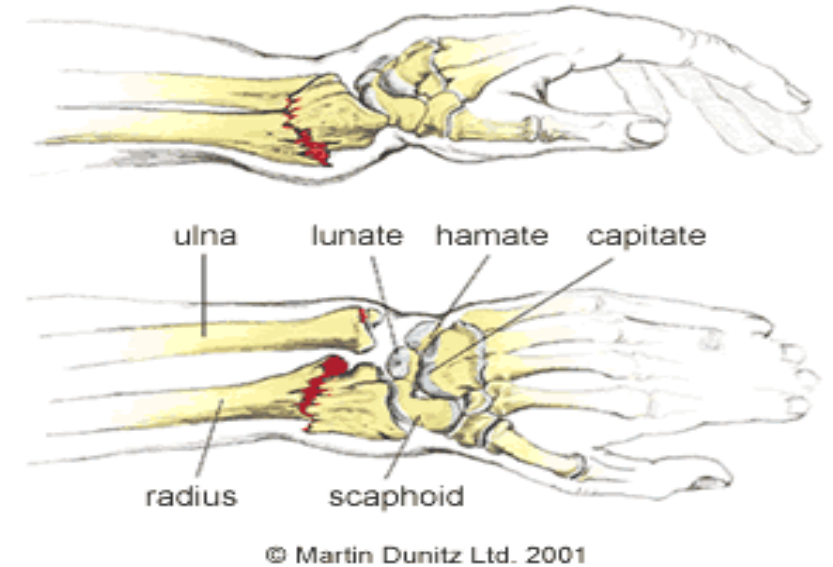
Extra picture for understanding

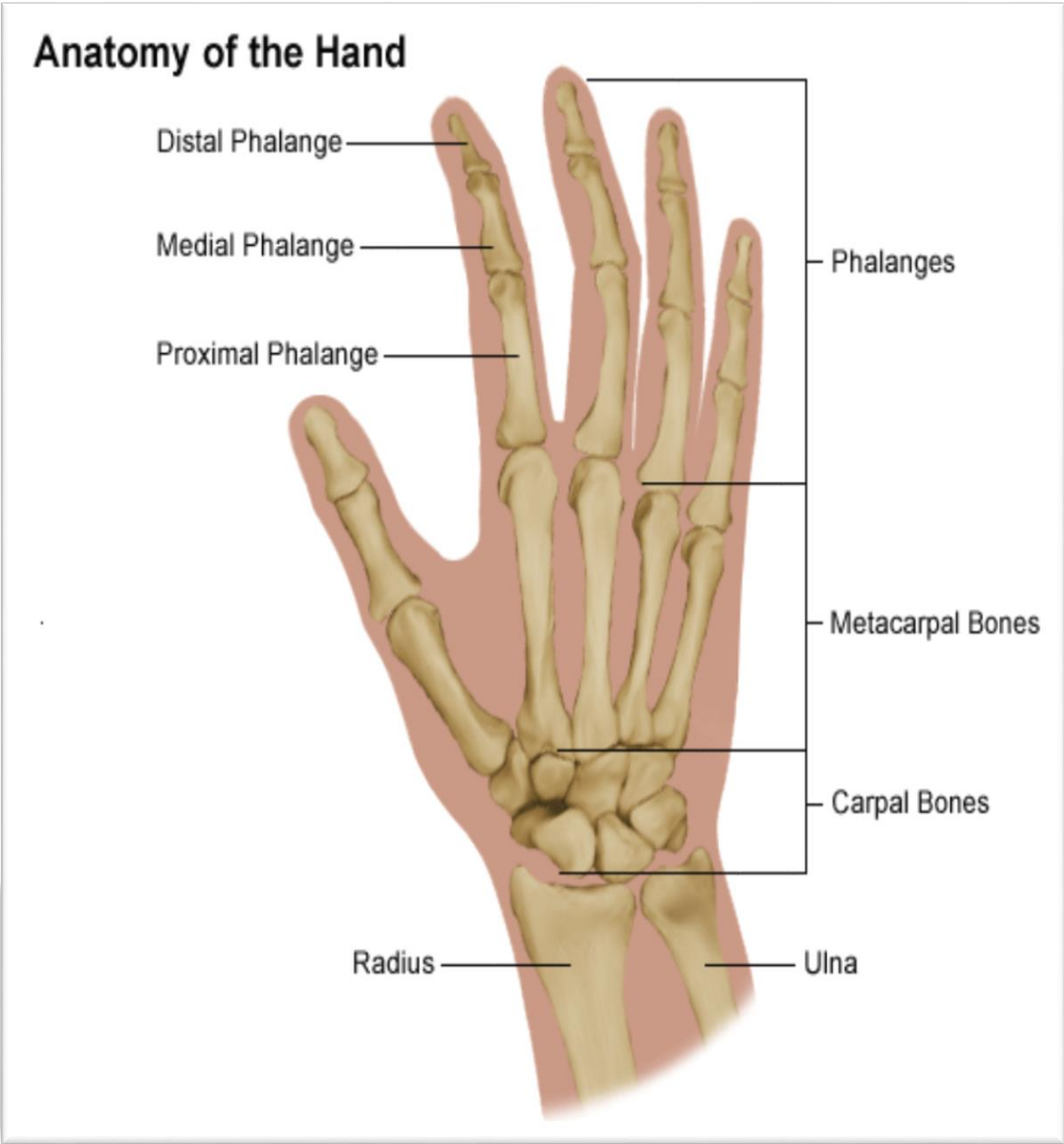
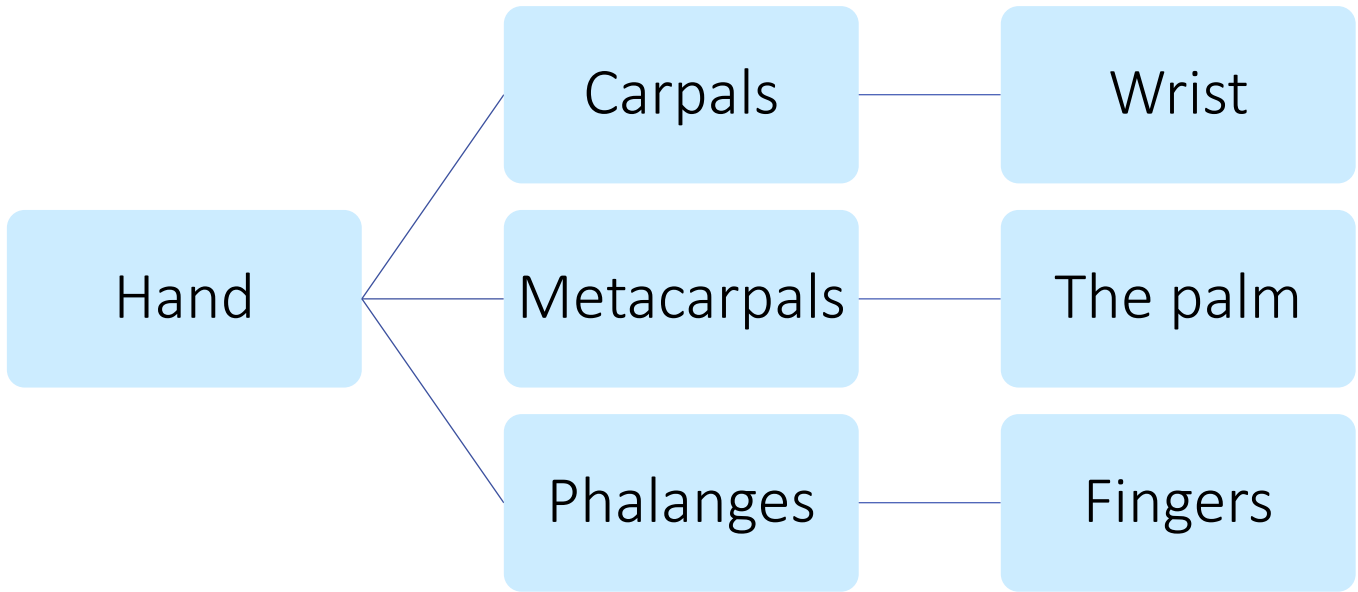


Fracture of the Radius and Ulna

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**. بسبب انخفاض مستوى الاستروجين بعد سن الياس (تم شرحه بالتفصيل في الباثولوجي)
- 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, bone union is usually good. (only in girls slides)



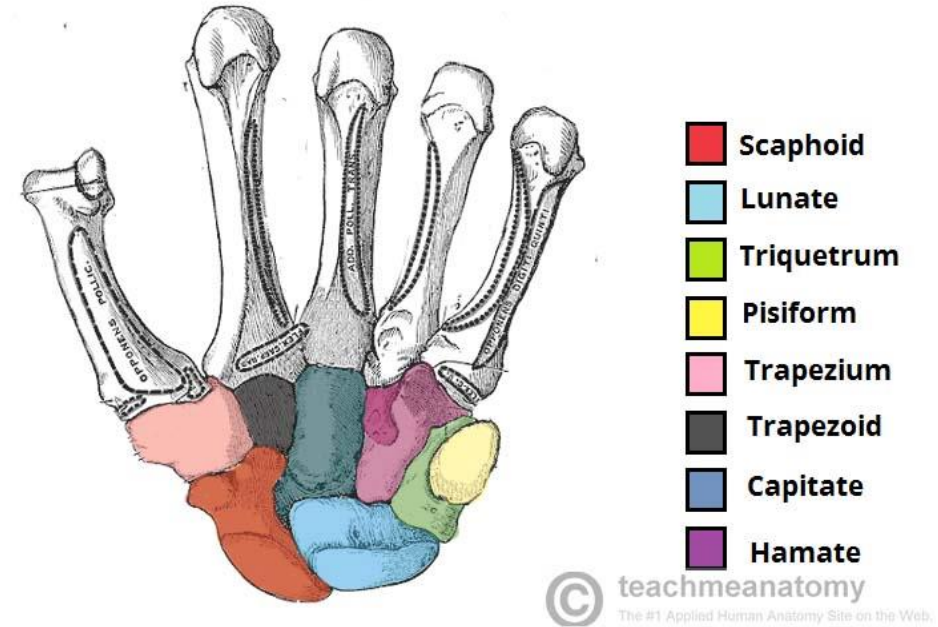
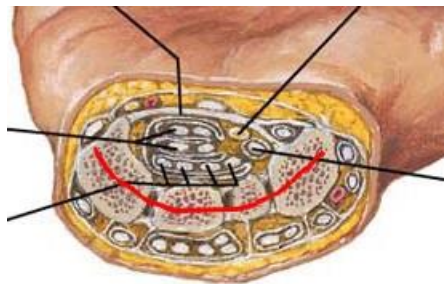


The Wrist:

Composed of **8 carpal bones** arranged in two irregular rows, each of **4 bones**.

These small bones give **flexibility** to the wrist.

The Carpus presents **Concavity** on their Anterior surface & **convex** from side to side posteriorly.



From Lateral to Medial

The Distal row : 1- Trapezium 2- Trapezoid 3- Capitate 4- Hamate

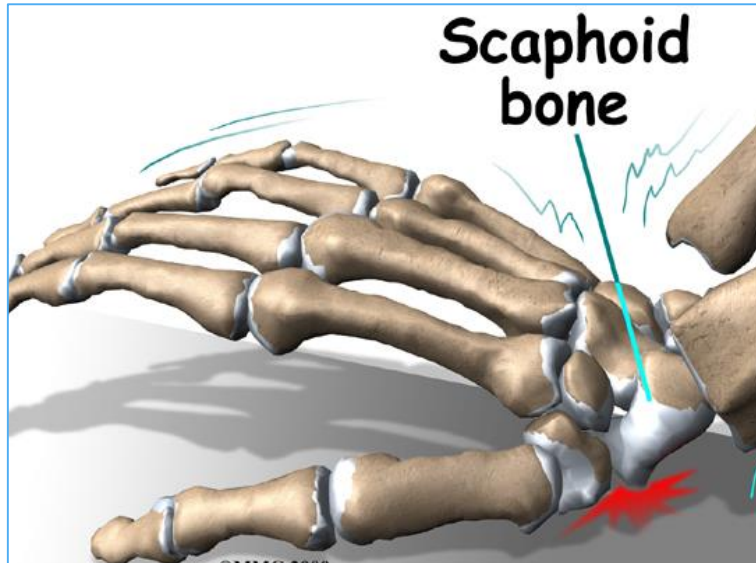
The Proximal row : 1- Scaphoid 2- Lunate 3- Triquetrum 4- Pisiform

To remember the carpal bones (435) :
Sally Left The Party To Take Cathy Home

سلوی لازم تلعب بوکر تلعب تخسر كله هلس

Fracture of The Scaphoid:

scaphoid 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.

Metacarpals:

Forms the skeleton of the hand

Position:

Between the carpus and the phalanges.

Features:

Head(distal), shaft(middle), and base(proximal).

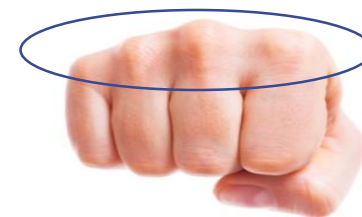
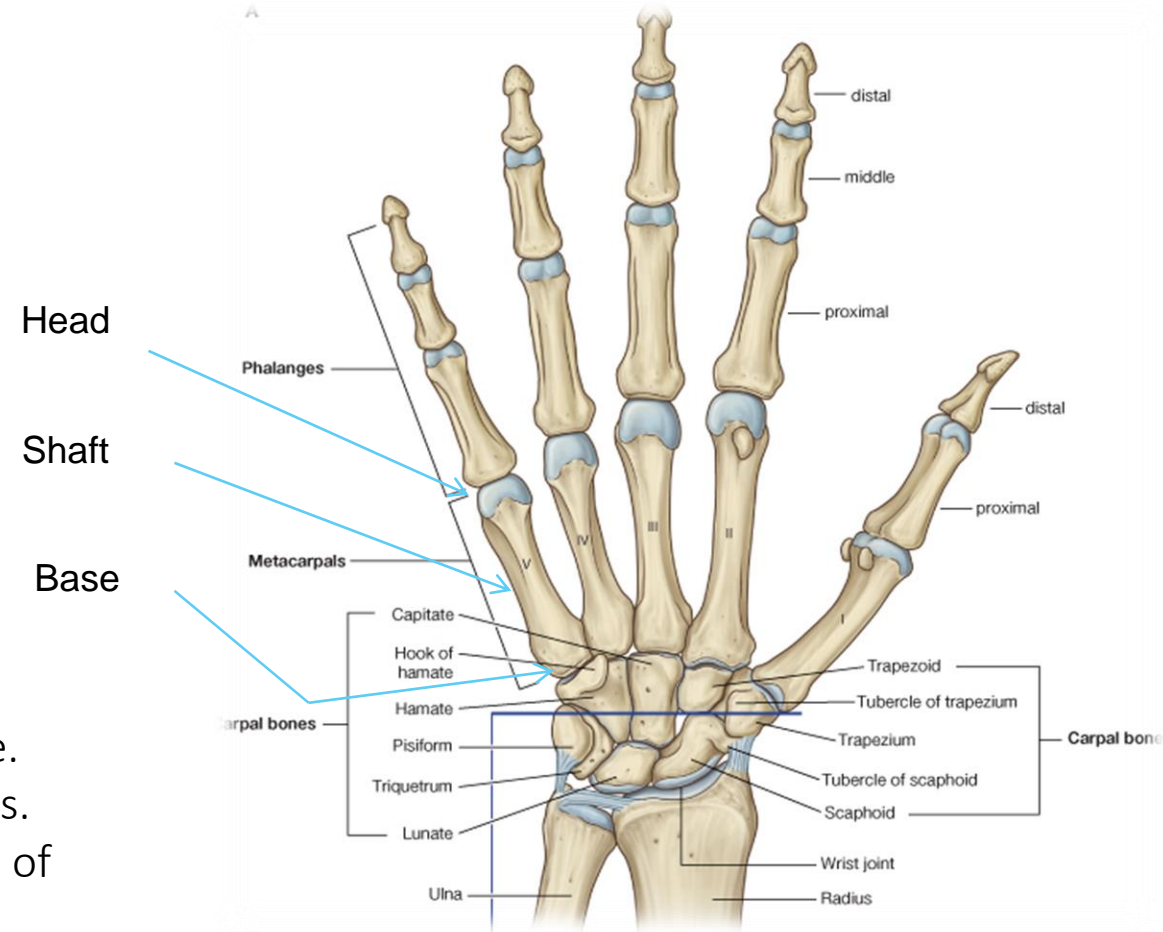
Count:

5 metacarpal starting from the thumb 1-5.

N.B:

1. The first metacarpal (thumb) is the shortest and most mobile.
2. The base of the metacarpals articulates with the carpal bones.
3. The third metacarpal has a styloid process on the lateral side of the base.
4. The distal ends (Heads) articulate with the proximal phalanges to form the **Knuckles** of the fist.

Notes: In the hand the head is always distal and the base is proximal (the opposite of the arm and forearm).



Knuckles

عشان ما تنسونها نقدر
نطرق بها الباب ودايم
نعبر عن صوت الطبق بـ
(knock knock)

Phalanges (digits):

Position:

Connected to the metacarpals distally.

Features:

Head(distal), body(middle shaft), base(proximal).

Count:

- 14 total.
- 3 in each finger.
- Except 2 in the thumb.

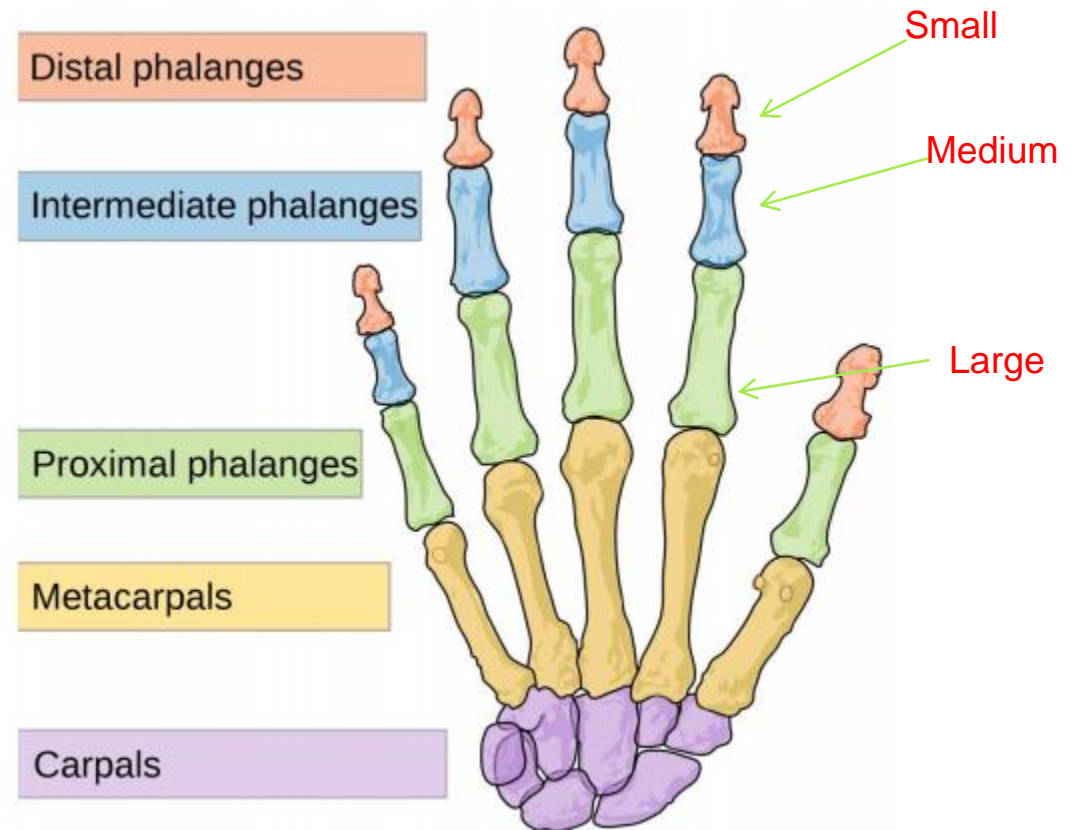
N.B:

The proximal phalanx are the largest.

The middle are medium sized.

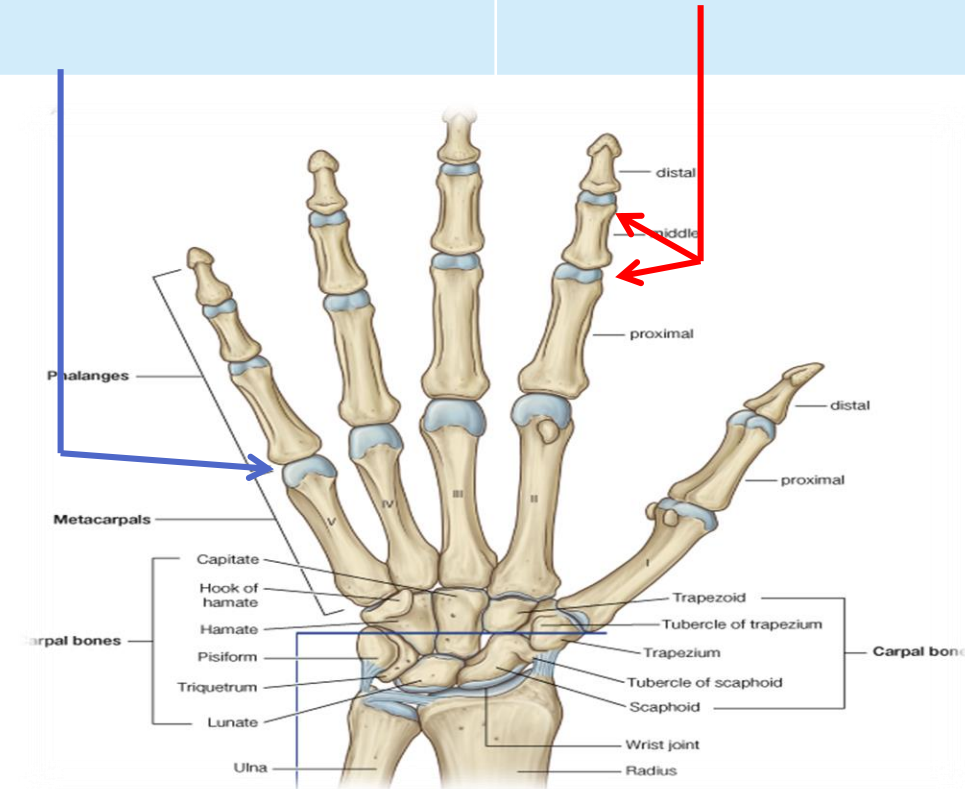
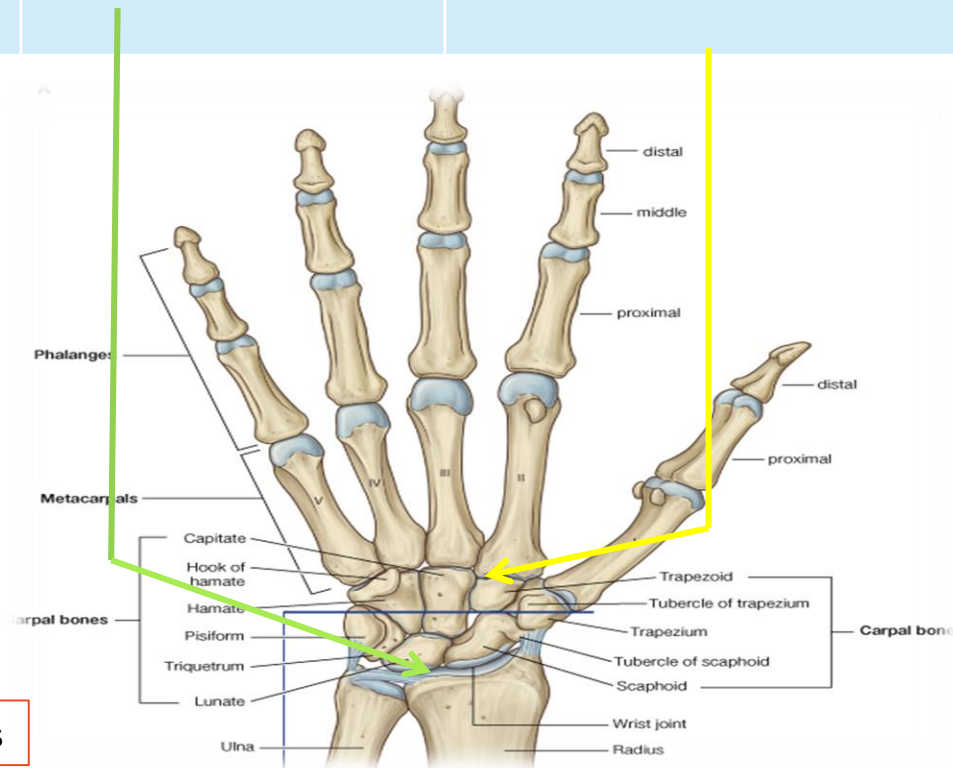
The distal are the smallest, **flattened and expanded distally to form the nail beds.**

Notes: In the hand the head is always distal and the base is proximal (the opposite of the arm and forearm).

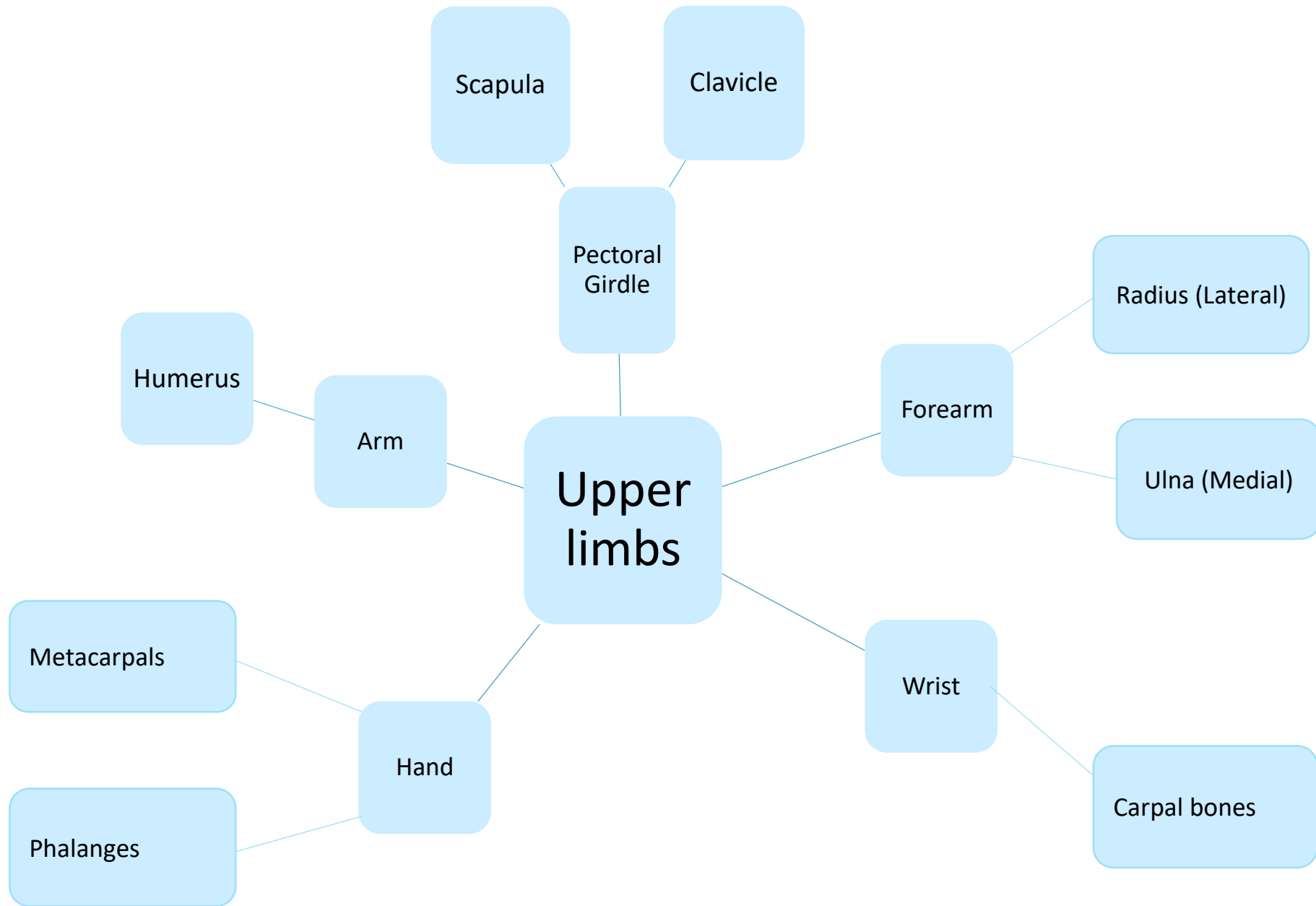


Articulations:

| Name of articulation | Wrist joint | Carpometacarpal joints | Metacarpophalangeal joints | Interphalangeal joints |
|----------------------|---|--|---|--------------------------------|
| Description | Distal end of the radius + row of proximal carpals. | Distal row of the carpals + proximal row of metacarpals. | Distal heads of metacarpal + proximal row of phalanges. | The phalanges with each other. |



Only on the boys' slides



Multiple choice questions

1-Transmits forces from the upper limb to the axial skeleton:

- A-Humerus
- B-Clavicle
- C-Scapula
- D-Femur

Answer :B

2 – What is the most common carpal bone to be subjected to fracture ?

- A – Lunate
- B – Trapezoid
- C – Scaphoid
- D – Surgical line

Answer : C

3-Which of the following form the fingers ?

- A-Metacarpals
- B-phalanges
- C-Carpals
- D-Tarsals

Answer :B

5-The part of the ulna that allows for the movement of the head of the radius in the proximal radioulnar joint is:

- a. Radial notch
- b. Ulnar notch
- c. Trochlear notch
- d. Supinator fossa

Answer : A

6-What is connected to the wrist joint?

- a) Distal row of the carpals + proximal row of metacarpals.
- b) Distal end of the radius + row of proximal carpals.
- c) Distal heads of metacarpal + proximal row of phalanges.
- d) The phalanges with each other.

Answer: B

7- The most common place of fractures in Humerus is :

- A. Head
- B. Medial epicondyle
- C. Surgical Neck
- D. Trochlea

Answer : C

8- Which one of these structures of the distal end of Humerus helps in articulation with

Radius :

- A.Trochlea
- B. Capitulum
- C. Olecranon fossa
- D. Coracoid process

Answer : B

SHORT ANSWER QUESTIONS:

Q1-Identify the proximal row of carpals:

Answer: scaphoid, lunate, triquetral, pisiform

Q2-The part of the ulna that forms the prominence of the elbow is known as:

Answer: olecranon process

Q3-What are the features of the metacarpals and which is distal or proximal or middle?

Answer:

Head(distal)

Shaft(middle)

Base(proximal)

Q4-A 70 years old male present to the emergency with a fracture in his arm , the history of the patient shows that he fell on his arm in the bathroom .

1. What is the most common site of fracture in this case ?

Ans : The surgical neck in the Humerus

2. What nerve in his arm is going to be affected ?

Ans : The Axillary nerve

3. What is the pathological cause that can be seen here , Explain why ?

Ans: Osteoporosis since that he is an elderly person .

Q5:A man had trauma in his back , his scapula protrudes posteriorly and he can't rise his hand above his head .

What does he complain of ? And what's the name of the muscle and the nerve ?

Answer: winging of the scapula, Serratus anterior that is innervated by the long thoracic nerve

The weakest part of the clavicle is :

Answer: The junction between the medial 2/3 and the lateral 1/3

Q6:what are the functions of scapula ?

Answer:

- 1.attachment to muscles.
- 2.Arm movement
- 3.Formation of shoulder joint



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