



MED437
KING SAUD UNIVERSITY



Bones of the Upper Limb

Lecture 1

Please check our [Editing File](#).

هذا العمل لا يعني عن المصدر الأساسي للمذاكرة

{ وَمَنْ يَتَوَكَّلْ عَلَى اللَّهِ فَهُوَ حَسْبُهُ }

Objectives

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

- Text in **BLUE** was found only in the boys' slides
- Text in **PINK** was found only in the girls' slides
- **Text in RED is considered important**
- Text in **GREY** is considered extra notes

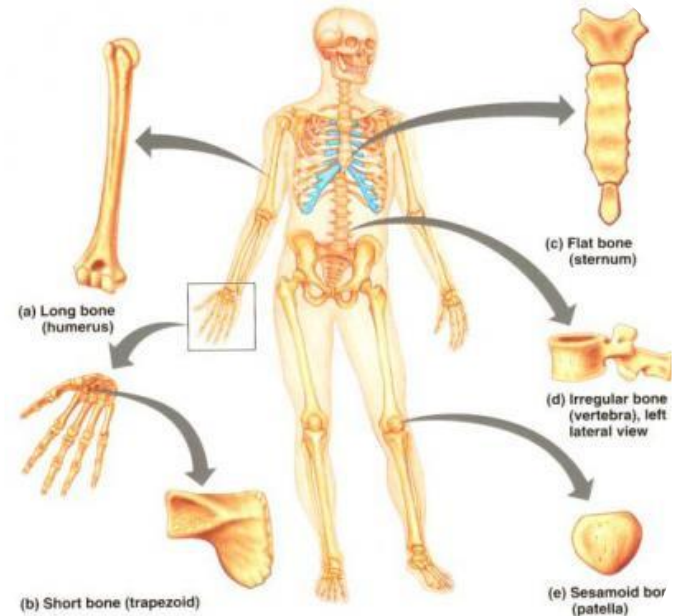
Terminology (Team 434)

General	Term	Meaning
Processes that helps to form joints	Condyle	Large, rounded articular
	Facet	Smooth, flat surface
	Head	Enlarged portion at an end of a bone
	Ramus	Branch or extension of a bone
Processes that provide for the attachment of muscles and ligaments	Crest	Narrow ridge
	Epicondyle Linea (line)	Process on or above a condyle Narrow ridge (less prominent than a crest)
	Spine	Sharp or pointed process (spinous process)
	Trochanter	Large, irregularly shaped process (found only on the femur) (for attachment of other structures (ligaments))
	Tubercle	Small, knoblike process (tabecular : site of muscle attachment)
	Tuberosity	Large, knoblike process
	Eminence	a small projection or bump / شيء مرتفع

General	Term	Meaning
Depressions or openings (may provide passageways for blood vessels and nerves)	Notch	An indentation, (incision) on an edge or surface
	Fissure	Narrow opening
	Fontanel	Membrane-covered spaces between skull bones
	Interosseous border	Between bones (the place where the two parallel bones attach together by the interosseous membrane)
	Foramen	Round opening
	Fossa	Shallow depression
	Fovea	Pit-like depression
	Meatus	Tube-like passage
	Sinus	Interior cavity
	Sulcus "groove"	Long, narrow depression

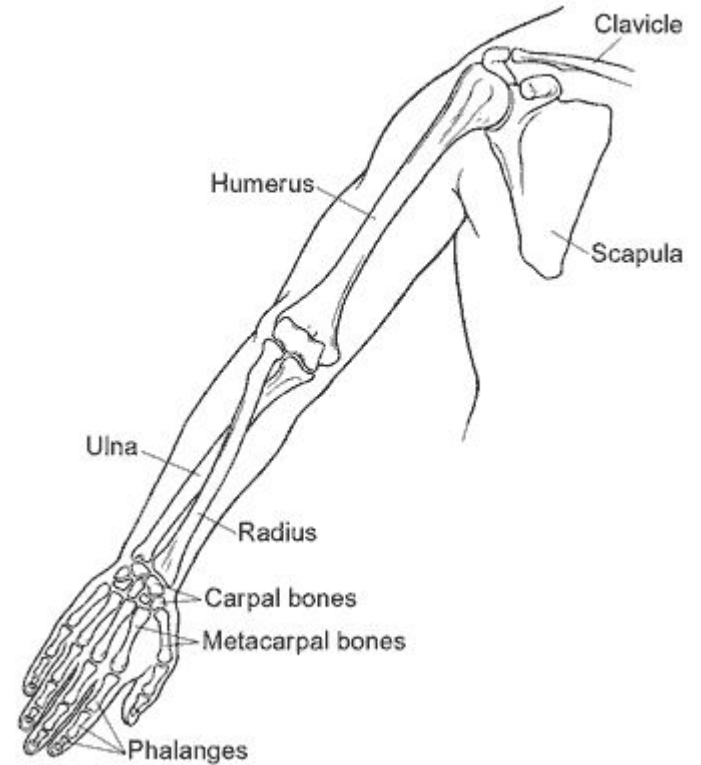
Bones

1. Bones support and protect the various organs of the body “the chest”
 2. Produce red and white blood cell “bone marrow”
 3. Store minerals “مثل الكالسيوم”
 4. Enable movement
 5. Provides attachment for muscles
 6. Come in a variety of shapes and sizes
- There are **FIVE** types of bones in the Human body:
 - Long bones (limbs and fingers)
 - Short bones (wrist and ankles)
 - Flat bones (skull and sternum)
 - Irregular bones (spine and pelvis)
 - Sesamoid bones (patella)



Bones of upper limb

- **pectoral girdle** { Scapula , Clavicle }
- **Arm** {Humerus}
- **Forearm** {Radius , Ulna }
- **Wrist** {Carpal bones }
- **Hand** { Metacarpal , Phalanges }

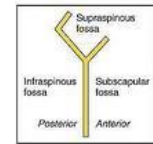
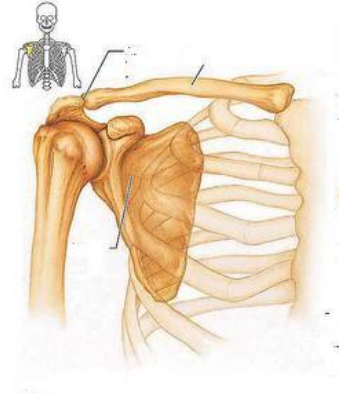


Pectoral girdle

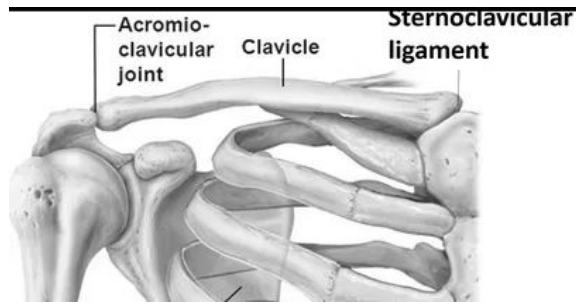
Formed of Two Bones:

- Clavicle (anteriorly)
- 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** “under skin” throughout its length.
- with no medullary cavity.
- It has the appearance of an elongated letter Capital (S) lying on one side.
- **If the clavicle is broken, the whole shoulder region caves in medially.**

functions

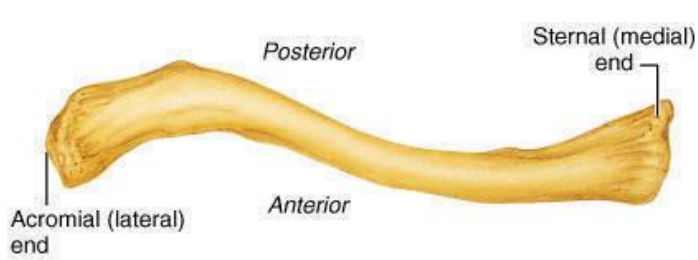
It serves as a **rigid support** from which the scapula and free upper limb are suspended & keep them away from the trunk so that the arm has maximum .freedom of movement

Transmit forces from the upper limb to the axial skeleton

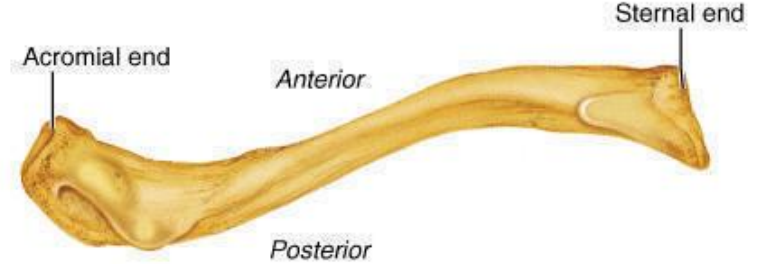
Provides **attachment** for muscles

It forms a **boundary** of the cervicoaxillary canal for **protection** of the neurovascular .bundle of the UL

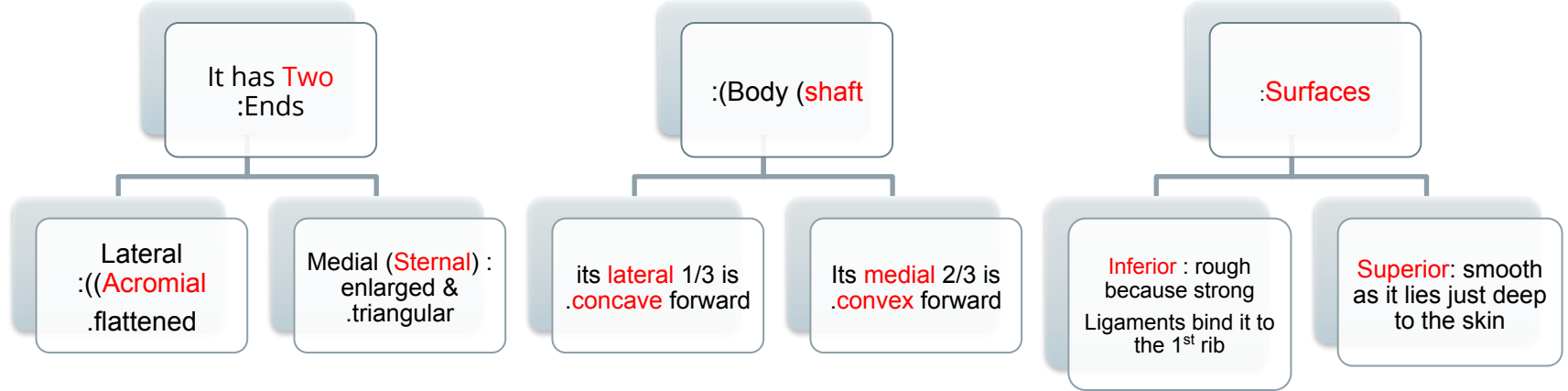
Clavicle



(b) Right clavicle, superior view

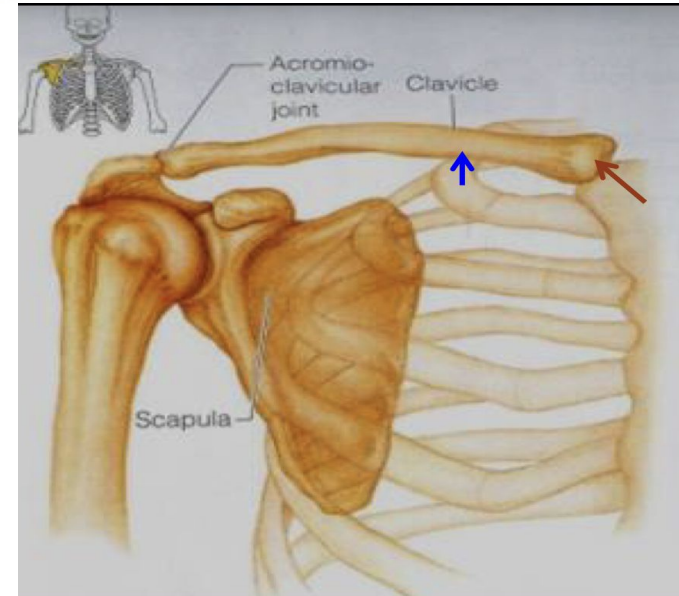
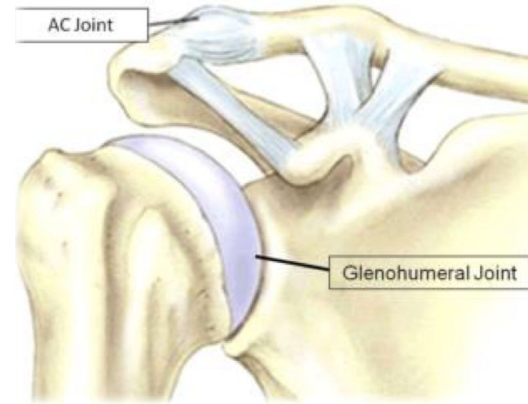


(c) Right clavicle, inferior view



Articulation of clavicle

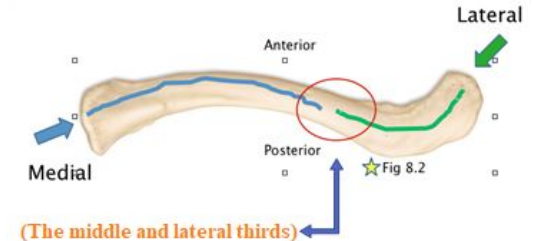
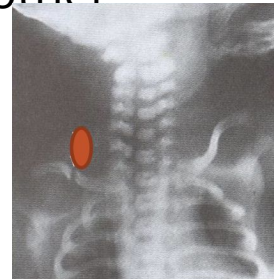
Medially	With the <u>manubrium</u> at the <u>Sternoclavicular joint</u>
Laterally	With the <u>scapula</u> (Acromion) at the <u>Acromioclavicular joint</u>
Inferiorly	With the <u>first rib</u> at the <u>Costoclavicular joint</u>





Fractures of the Clavicle

- The clavicle is commonly fractured, especially in children as forces are impacted to outstretched hand during falling.
- The weakest part of clavicle is the junction of the medial and lateral thirds
- After fraction, the **medial** fragment is **elevated** [by the sternomastoid muscle] , the **lateral** fragment **drops** because of the weight of the upper limbs
- The whole shoulder joint may be caves in(pulled)medially by the adductor of the arm
- The sagging limb is supported by the other



Scapula (Shoulder Blade)

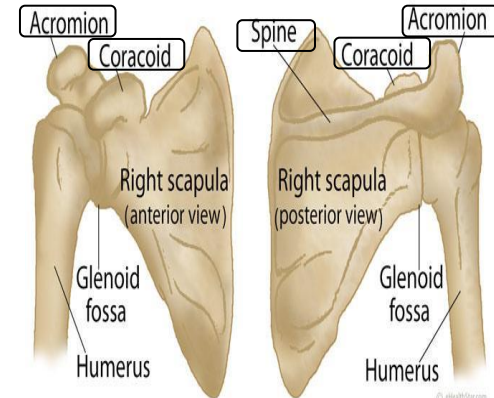
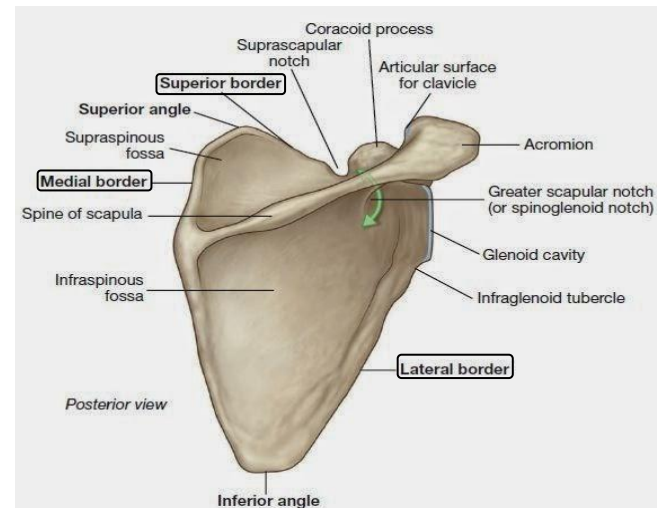
- It is a triangular **Flat bone**.
- Extends between the 2nd - 7th ribs.
- **It has three Processes:**

1-Spine: a thick projecting ridge of bone that continues laterally as the flat expanded posteriorly.

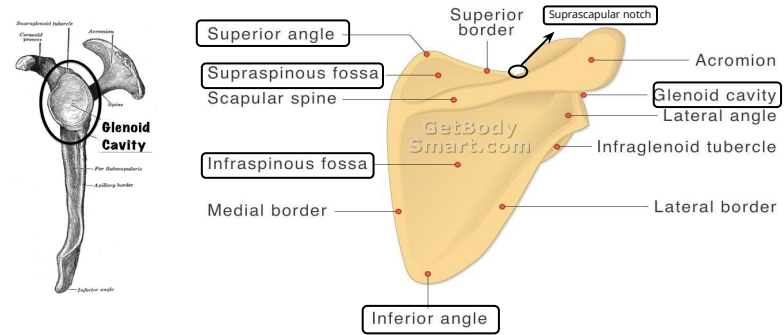
2- Acromion : forms the subcutaneous point of the shoulder.

3- Coracoid: a beak like "منقار" process , It resembles in size, shape & direction a bent finger pointing to the shoulder.

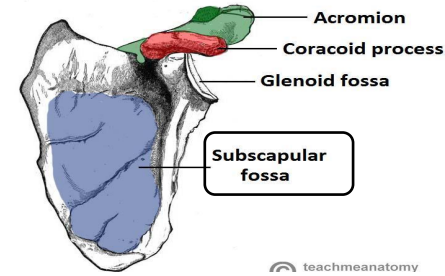
- **It has three Borders:** Superior, Medial (Vertebral) & Lateral (Axillary) it's the thickest part of the bone, it terminates at the lateral angle .



Scapula (Shoulder Blade)

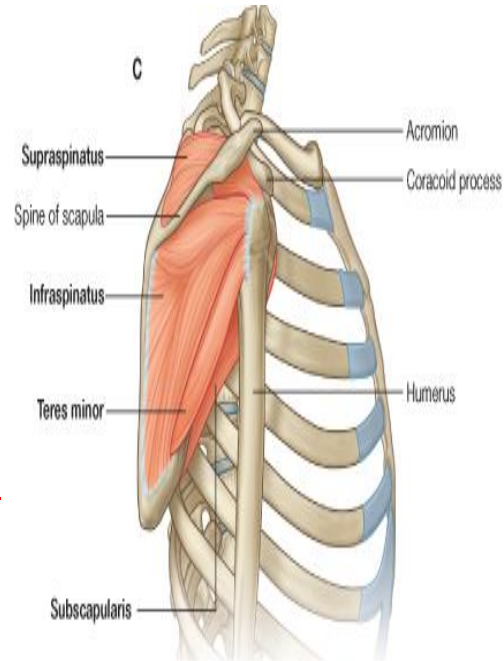


- **It has Three Angles** : Superior, Inferior & Lateral forms the **(Glenoid cavity)** : a shallow concave oval fossa that **receives the head of the humerus**.
- **It has Two Surfaces:**
 - 1- Convex Posterior** : divided by the spine of the scapula into :
 - **Supraspinous Fossa**: it's small & above the spine.
 - **Infraspinous Fossa**: it's large & below the spine.
 - 2- Concave Anterior (Costal)** : it forms the large Subscapular Fossa.
- **Suprascapular notch**: It is a nerve passageway, medial to coracoid process.
 - **Suprascapular nerve**



Functions of Scapula

- Gives attachment to muscles.
- Has a considerable degree of movement on the thoracic wall to enable the arm to move freely (give us extra movement)
- 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 "استئصال الثدي") 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.



WINGED SCAPULA

Humerus

- Typical **Long bone**.
- It is the **largest bone of the UL** (upper limb)

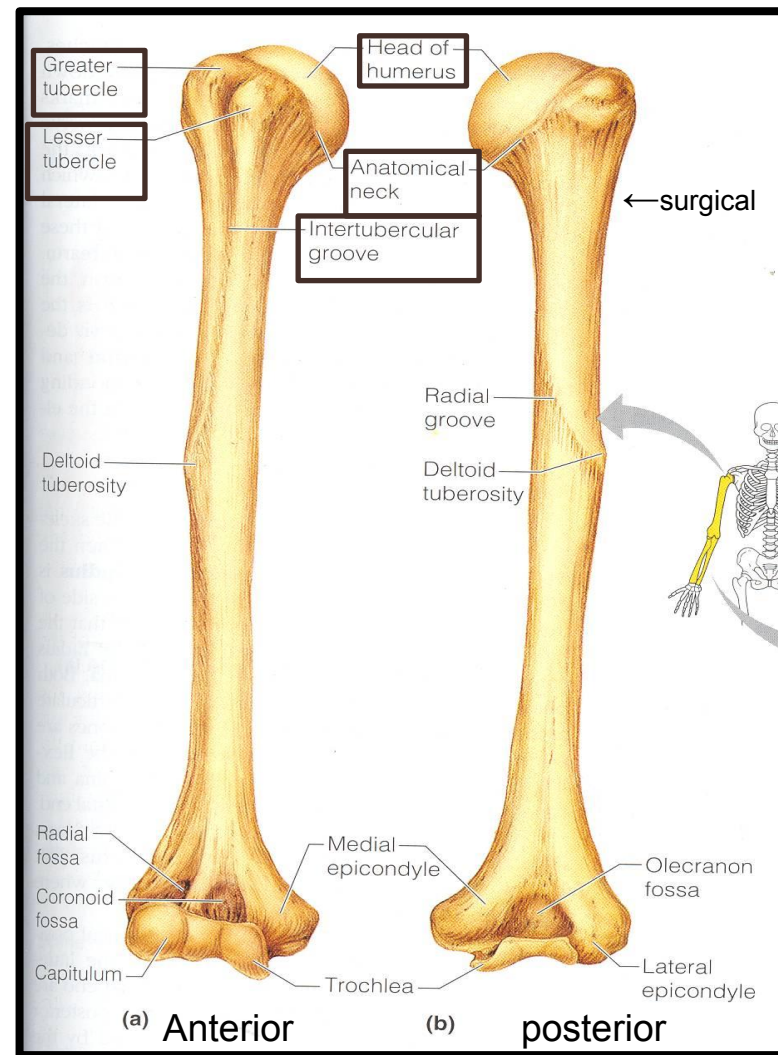
❖ Proximal End: Head, Neck, Greater & Lesser Tubercles.

- **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** "bicipital groove")

• **Anatomical neck**: formed by a groove separating the head from the tubercles. "between the head and greater tubercle"

• **Surgical Neck**: a narrow part distal to the tubercles, it is the **most common fracture site of the humerus**.



Humerus

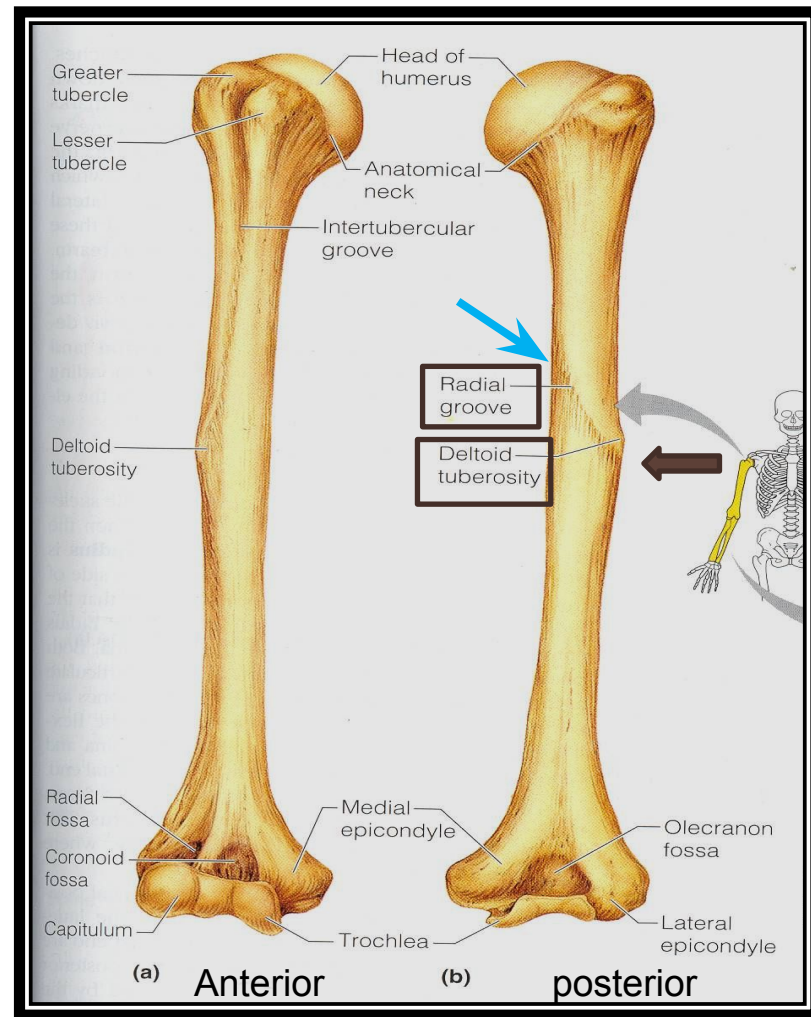
❖ **Shaft (Body):** Has two prominent features:

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.



Humerus

❖ Distal End:

Widens as the sharp medial and lateral Supracondylar Ridges and end in the Medial (can be felt) and Lateral **Epicondyles**, they providing muscular attachment.

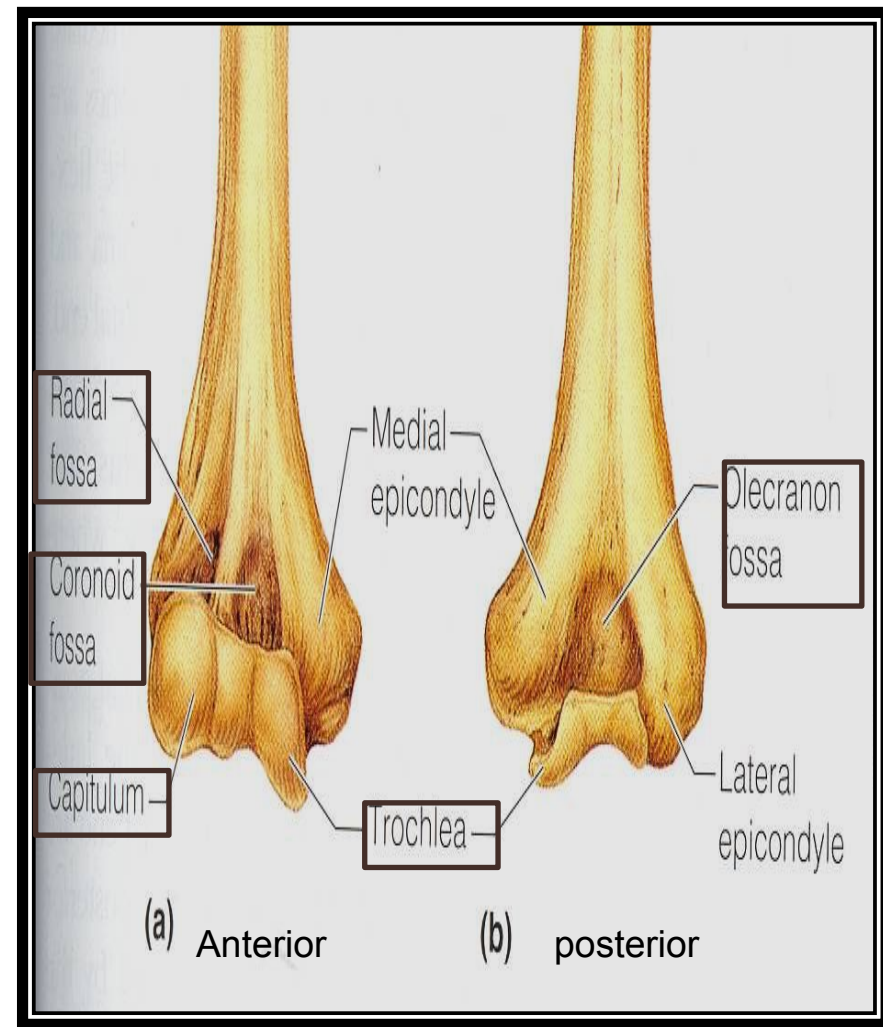
- Anteriorly:

- Trochlea: (**medial**) for articulation with the ulna
- Caputulum: (**lateral**) for articulation with the radius.
- Coronoid fossa: above the trochlea.
- Radial fossa: above the caputulum.

- Posteriorly:

- Olecranon fossa : above the trochlea.

Fossa= تجويف بسيط في العظام



Articulations of Humerus

Proximal End:

Articulate with the Glenoid cavity in the Scapula to form

Shoulder Joint



Distal End:

Articulate with the Radius and Ulna to form

Elbow joint

Fractures of Humerus

fractures of the Surgical Neck

Most common fractures are of the Surgical Neck especially in **older people** with osteoporosis "هشاشة العظام"

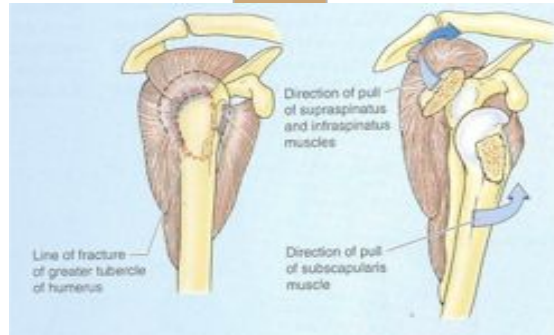
The fracture results from falling on the hand (transition of force through the bones of forearm of the extended limb).



ملاحظة من الدكتور : الكسر في هذا الموقع شائع لأنه يعتبر أضعف نقطة في هذه العظمة يحدث هذا النوع من الكسر خصوصا إذا كان الشخص يسقط من ارتفاع فيسند بيده

fractures of the greater tubercle

In **younger people**, fractures of the greater tubercle results from falling on the hand when the arm is abducted .



fractures of The body of the humerus

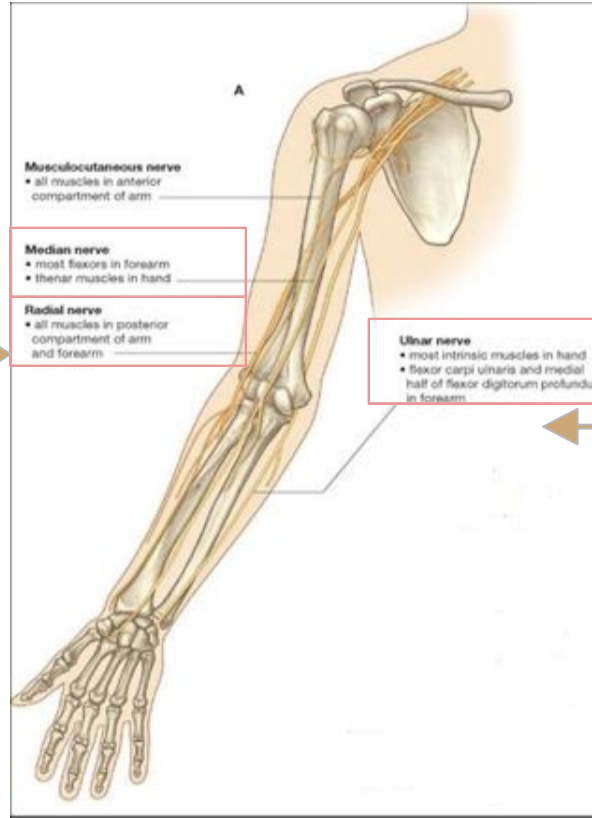
The body of the humerus can be fractured by a direct blow to the arm or by indirect injury as falling on the outstretched hand.

ملاحظة من الدكتور : هذا المكان هو أقل واحد عرضة للكسر ، يحتاج ضربة قوية عشان يحدث فيه كسر

Nerves Affected in Fractures of Humerus

Distal end of humerus:
Median nerve.

Radial groove:
Radial nerve.



Surgical neck:
Axillary nerve

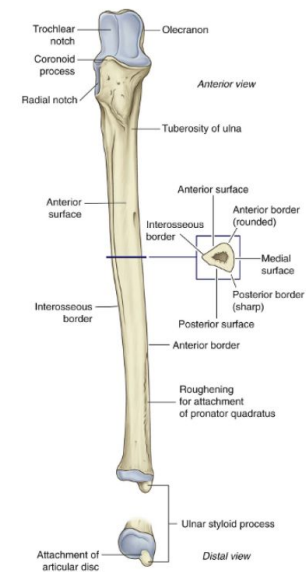
Medial epicondyle :
Ulnar nerve.

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.



The olecranon process and the coronoid process articulate with the humerus through the humerus fossa.

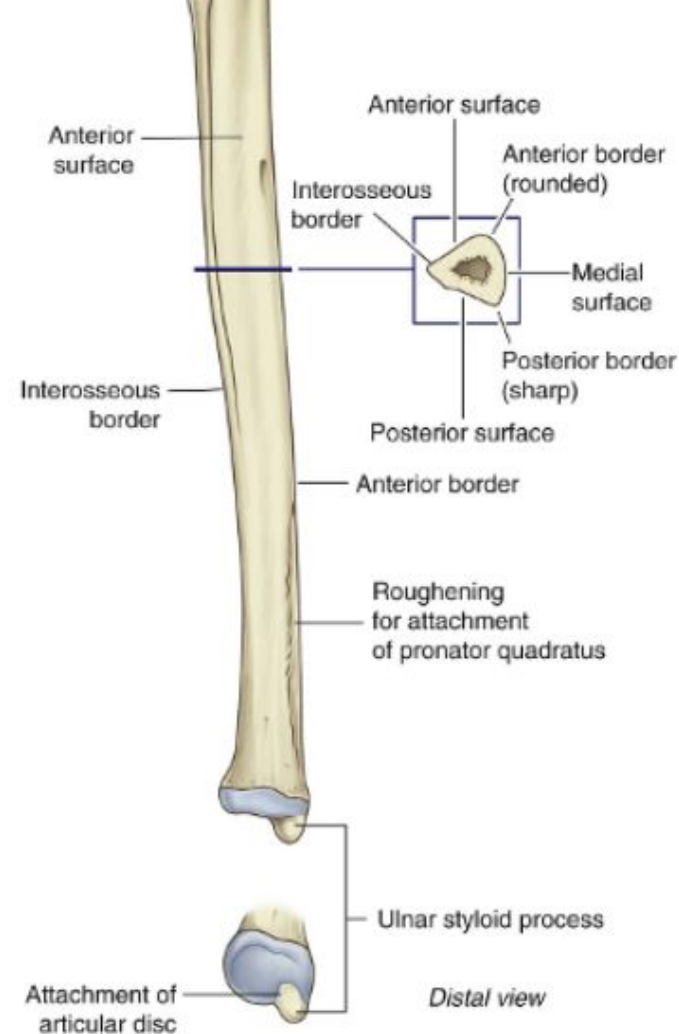
Ulna

Shaft:

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

Distal End:

- Head: Small rounded lies distally at the wrist.
- styloid process: medial site.
- The articulations between the ulna and humerus at the elbow joint allows primarily only flexion and extension (small amount of abduction and adduction occurs).



Radius

It is the **shorter** and the **lateral** of the two forearm bones.

Proximal End

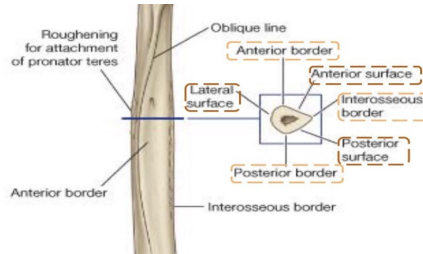
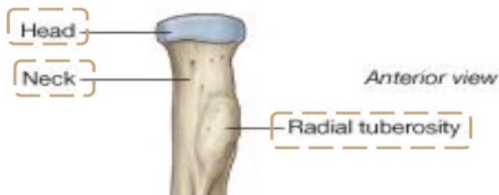
- 1) **Head:** small and circular, its upper surface is concave for articulation with the Capitulum.
- 2) **Neck.**
- 3) **Radial (Bicipital) Tuberosity:** medially directed and separates the proximal end from the body.

Shaft

- Has a lateral convexity.
- It gradually enlarges as it passes distally.
- It has **3 borders**: anterior border, interosseous border, posterior border
- It has **3 surfaces**: anterior surface, posterior surface, lateral surface

Distal (lower) End

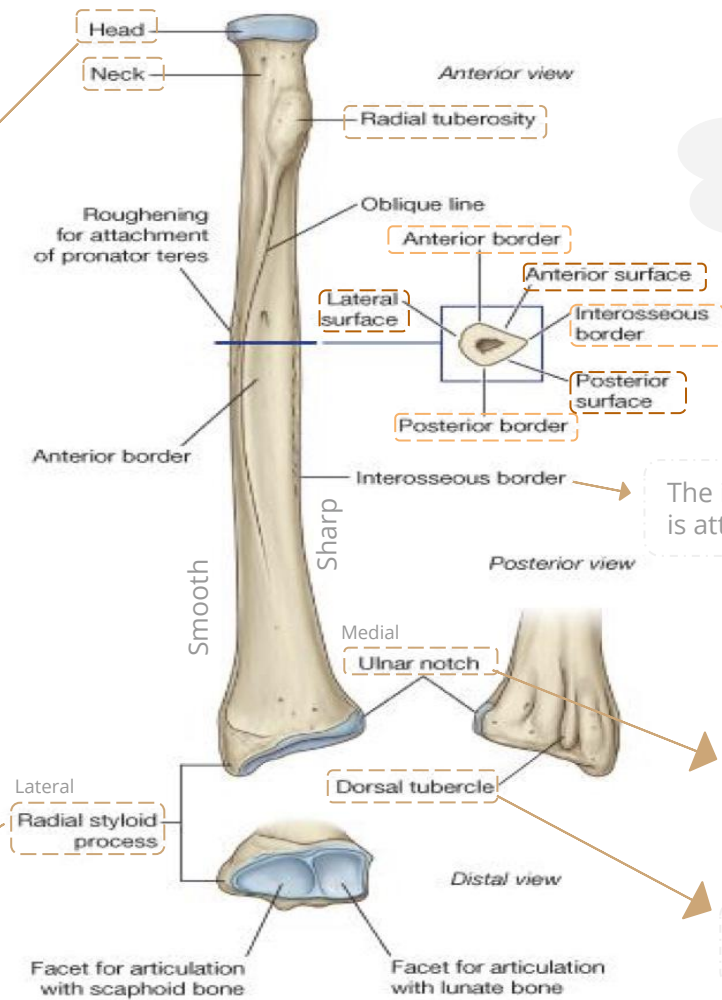
- It is rectangular.
- 1) **Ulnar Notch:** a medial concavity to accommodate the head of the ulna.
- 2) **Radial styloid process:** extends from the lateral aspect.
- 3) **Dorsal tubercle:** projects dorsally.



Radius

Articulation with the Capitulum of the humerus

Note: Ulna and Radius both have the same surfaces and borders BUT since Radius is on the lateral side it has a lateral surface, and Ulna on the medial side has a medial surface.



The interosseous border is sharp because it is attached to the interosseous membrane.

Attaches to the head of ulna.

Forms the lateral border to the proximal row of carpal bones.

Divides the posterior surface into cavities for tendons to pass through.

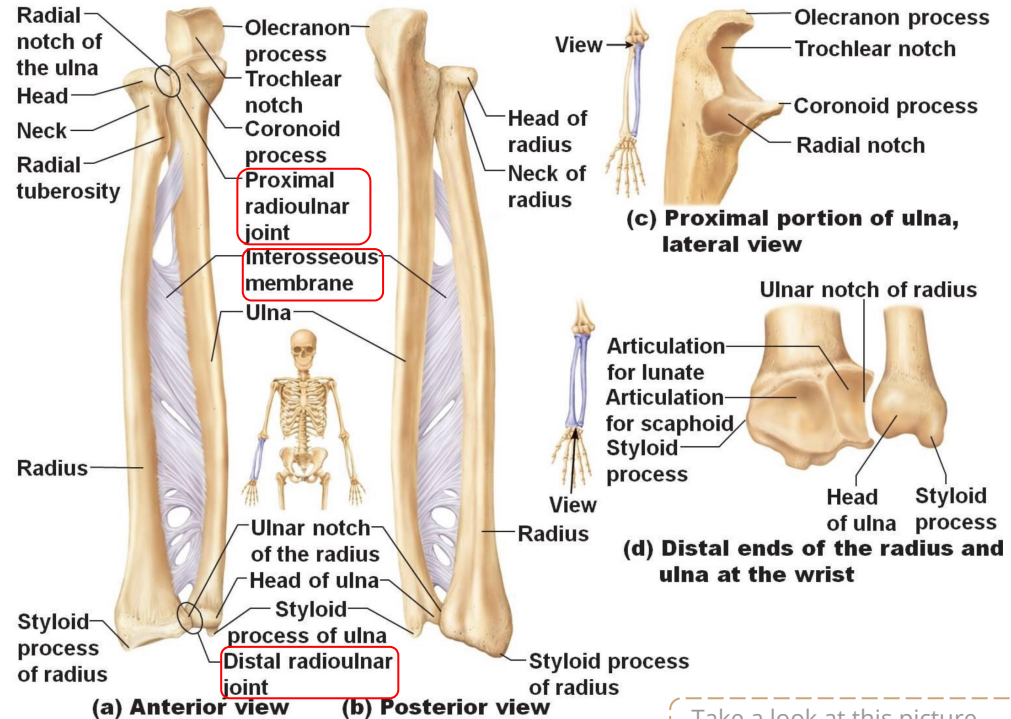
Articulations of Radius and Ulna

Distal end of Humerus with the proximal ends of Radius and Ulna form the **Elbow joint**

The two bones are connected by the flexible **interosseous membrane**

Distal Radioulnar joint: between the head of the ulna and the ulnar notch of the radius

Proximal Radioulnar joint: between the head of the radius and the radial notch of the ulna



Take a look at this picture for a better understanding.

Fractures of 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. (If the force causing fracture in Radius is strong, it might transmit to ulna, humerus, and clavicle. This happens in seconds.)
- ❖ **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. (Rapid healing in young people because of the rich blood supply. On the other hand, surgical interference is needed in old people because of the poor blood supply.)

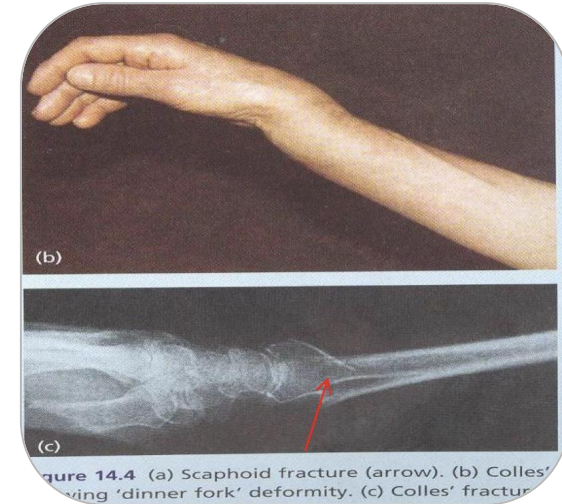
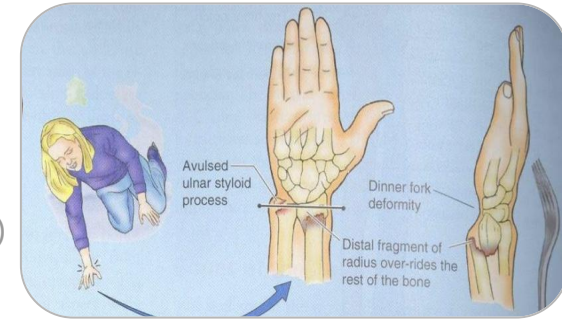
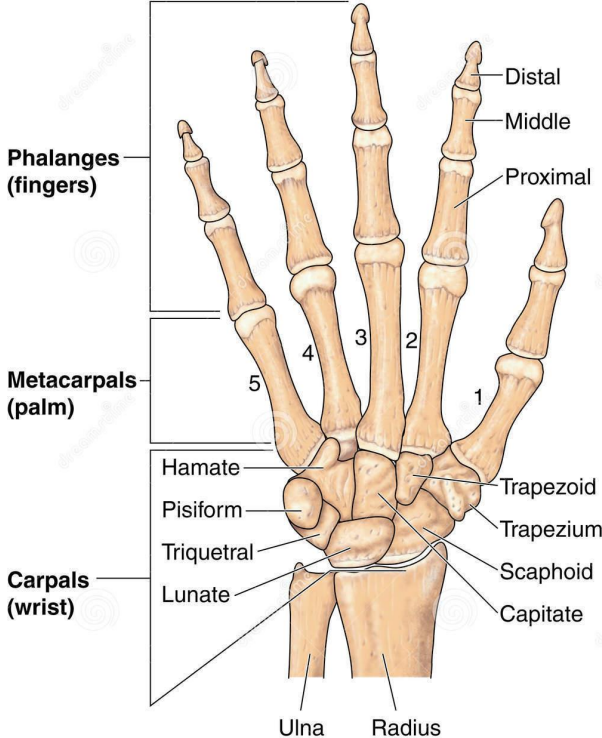


Figure 14.4 (a) Scaphoid fracture (arrow). (b) Colles' fracture showing 'dinner fork' deformity. (c) Colles' fracture

Hands

The skeleton of the hand consists of:

- Carpals for the carpus (wrist)
- Metacarpals for the palm
- Phalanges for the fingers



Carpal Bones (Carpus)

- Composed of Eight short bones arranged in two irregular rows, Four bones in each row.
- These Small bones give flexibility to the wrist.
- The carpal bones are small so they won't interfere with the movement of the wrist so that give it flexibility
- The carpus presents Concavity on their Anterior surface & Convex from side to side Posteriorly.

Proximal row (from lateral to medial):

Scaphoid, Lunate, Triquetrum & Pisiform bones.

Distal row (from lateral to medial):

Trapezium, Trapezoid, Capitate & Hamate.



To help you memorize:

**Sally Left The Party To Take Cathy Home
She Looks Too Pretty Try To Catch Her**

Metacarpals

Metacarpals form the skeleton of the hand.

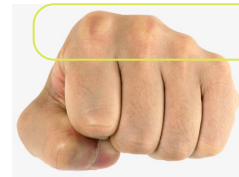
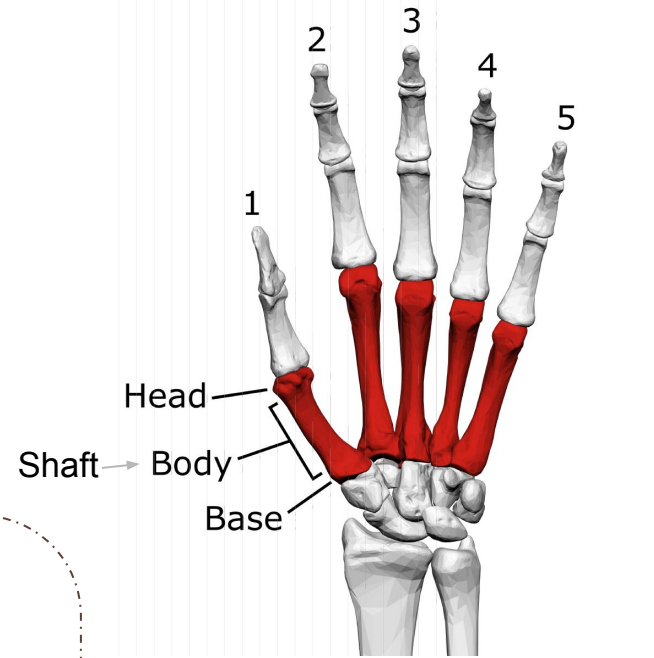
Position: Between the carpus and the phalanges.

Features: Head (distal), Shaft (middle), Base (proximal).

Count: 5 metacarpal, numbered 1-5 from the thumb.

N.B: The *1st metacarpal* is the shortest and most mobile.

- The distal ends (Heads) articulate with the proximal phalanges to form the **Knuckles** of the fist.
- The base of the metacarpals articulates with the carpal bones.
- The third metacarpal has a styloid process on the lateral side of the base.



قبضة اليد
Knuckles

Phalanges

Position: connected to the metacarpals distally.

Features: Head(Distal), Body(middle shaft), Base(proximal).

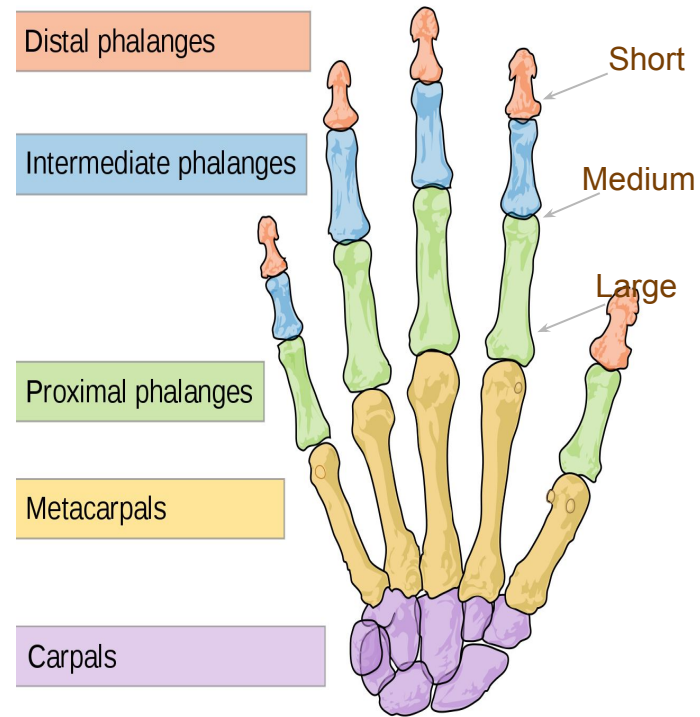
Count: Total 14. (each finger has 3 **Except** the thumb has 2)

N.B:

-The proximal phalanx are the largest.

-The middle ones are medium sized.

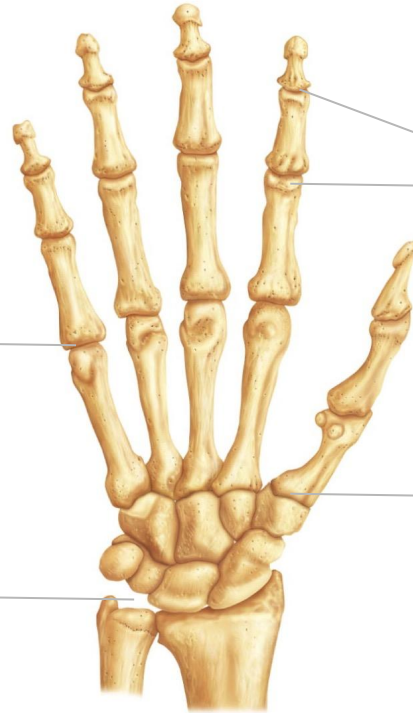
-The distal ones are the smallest. (flattened and expanded distally to form the nail beds)



Articulations of the Hand

Head of metacarpals articulate with the proximal phalanges.
Metacarpophalangeal joint

Distal end of the radius articulate with the Proximal row of carpal bones.
Wrist joint.



The phalanges articulate with each other.
Interphalangeal joints.

Bases of the Metacarpal bones articulate with the distal row of the carpal bones .
Carpometacarpal Joint.

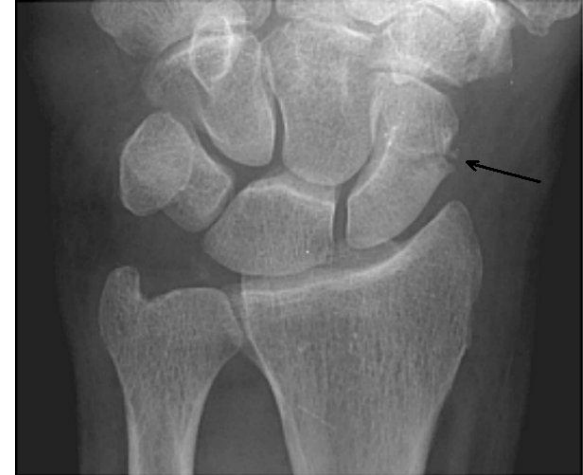
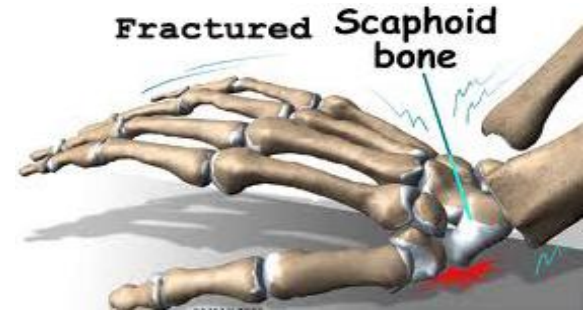
Fracture of Scaphoid

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.



QUESTIONS

1-clavicle has
rough surface which
attaches with the first
rib by a ligament .

A-anterior

B-posterior

C-inferior

D-superior

2-the thickest border of
the scapula is

A- medial

B-lateral

C-superior

3-this bone has 2
prominent features which
are deltoid tuberosity and
radial groove .

A-humerus B-femoris

4- ulna has a head at the
proximal end (true/false)

5- a bone that get wider
as it goes distally and has
rectangular distal end

.....

A-radius

B- femur

C- ulna

D- tibia

1-c

2-b

3-a

4-False

5-a

Test yourself!

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<https://tiny.cards/decks/ce81f413-ca8e-4372-9b4f-3dedb867bc2c>

Team Members

Lamia Abdullah Alkuwaiz (Team Leader)

Rawan Mohammad Alharbi

Abeer Alabduljabbar
Afnan Abdulaziz Almustafa
Ahad Algrain
Alanoud Almansour
Albandari Alshaye
AlFhadah abdullah alsaleem
Arwa Alzahrani
Dana Abdulaziz Alrasheed
Dimah Khalid Alaraifi
Ghada Alhaidari
Ghada Almuhanha
Ghaida Alsanad
Hadeel Khalid Awartani
Haifa Alessa
Khulood Alwehabi
Layan Hassan Alwatban
Lojain Azizalrahman
Lujain Tariq AlZaid

Maha Barakah
Majd Khalid AlBarrak
Norah Alharbi
Nouf Alotaibi
Noura Mohammed Alothaim
Rahaf Turki Alshammari
Reham Alhalabi
Rinad MUSAED Alghoraiby
Sara Alsultan
Shahad Alzahrani
Wafa Alotaibi
Wejdan Fahad Albadrani
Wjdan AlShamry

Faisal Fahad Alsaif (Team Leader)

Abdulaziz Al dukhayel

Fahad Alfaiz
Akram Alfandi
Saad Aloqile
Saleh Almoaiqel
Abdulaziz Alabdulkareem
Abdullah Almeaither
Yazeed Aldossari
Muath Alhumood

Abdulelah Aldossari
Abdulrahman Alduhayyim
Hamdan Aldossari
Abdullah Alqarni
Mohammed Alomar
Abdulrahman Aldawood
Saud Alghufaily
Hassan Aloraini

Abdulmajeed
Alwardi
Abdulrahman Alageel
Rayyan Almousa
Sultan Alfuhaid
Ali Alammari
Fahad alshughaihthry
Fayez Ghiyath
Aldarsouni
Mohammed Alquwayfili
Abduljabbar Al-yamani
Sultan Al-nasser
Majed Aljohani
Zeyad Al-khenaizan
Mohammed Nouri
Abdulaziz Al-drgam
Fahad Aldhowaihy
Omar alyabis