Anatomy Team
433

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King Saud University
College of medicine
Musculoskeletal block

Bones of the upper limb

Done by: Othman Abed

Revised by: Jumanah Albeeybe

For any comments

Please don't hesitate to contact with us by

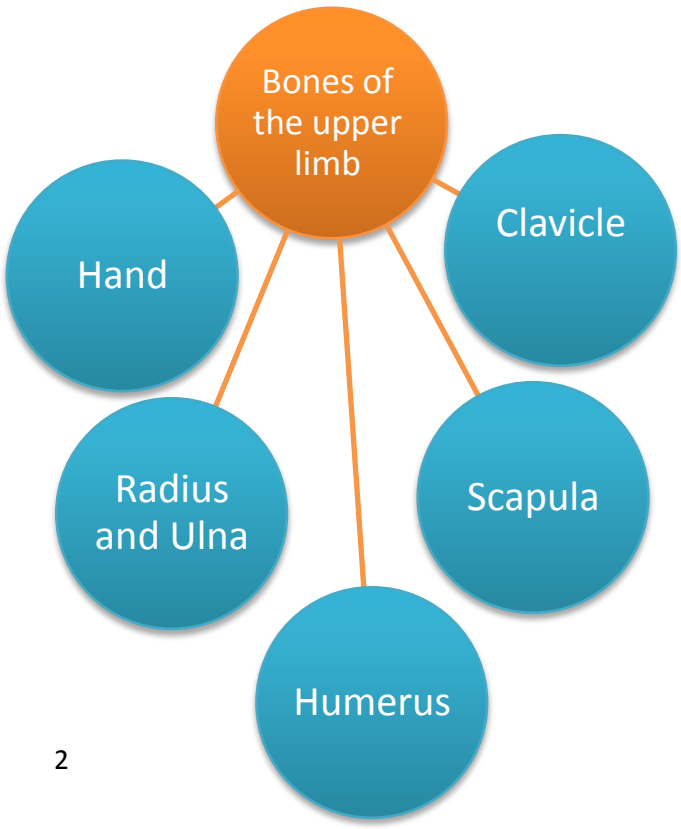
anatomy433@live.com

Objectives

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

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

Mined Map



Color Index

- Red : Important.
- Violet: Explanation.
- Gray: Additional Notes.

Other colors are for Coordination

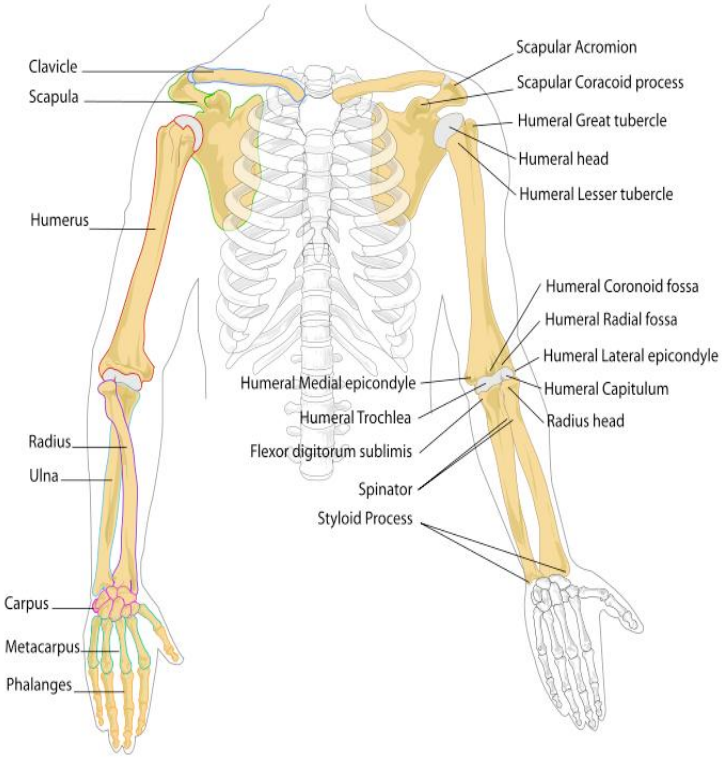
Say "bsm Allah" then start

Bones of the upper limb

Bones of Upper Limb :-

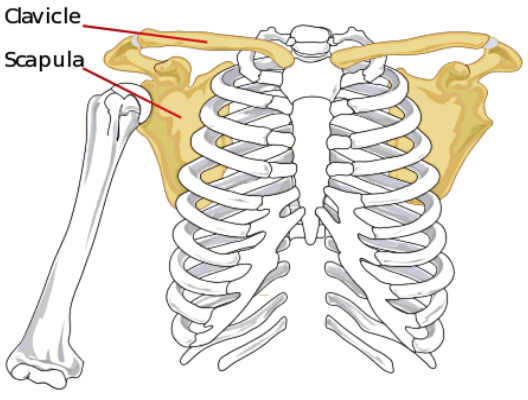
It consists of the following:

- Pectoral Girdle
- Arm : Humerus.
- Forearm: Radius & Ulna.
- **Wrist: Carpal bones.**
- Hand: Metacarpals & Phalanges.



Pectoral Girdle :-

- It composed of Two bones: Clavicle and Scapula
- It is very light and it allows the upper limb to have exceptionally free movement.



Front view

Clavicle: It is a 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 keeping 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 to protect the neurovascular bundle.

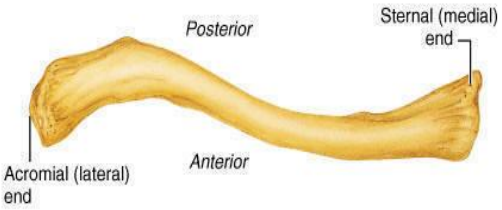
It is considered as a long bone, but it has no medullary (bone marrow) cavity. Its medial end "Sternal end" is enlarged & triangular. Its lateral end "Acromial end" is flattened.

The medial 2/3 of the shaft is convex forward.

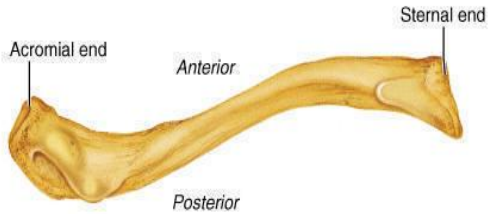
The lateral 1/3 is concave forward. These curves give the clavicle its appearance of an elongated capital (S).

It has two surfaces:

- Superior: smooth as it lies just deep to the skin.
- Inferior: rough because strong ligaments bind it to the 1st rib.



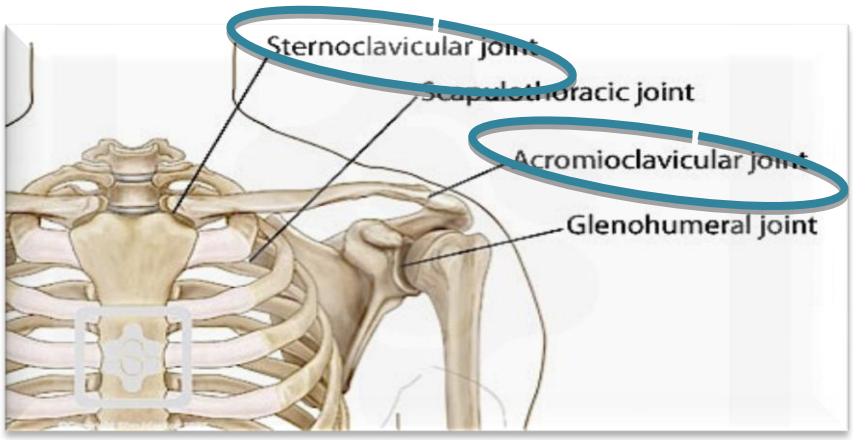
(b) Right clavicle, superior view



(c) Right clavicle, inferior view

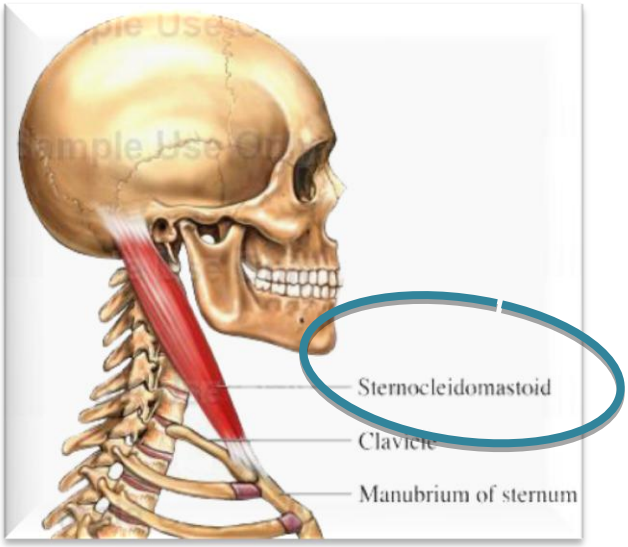
If the clavicle is broken, the whole shoulder region caves in medially.

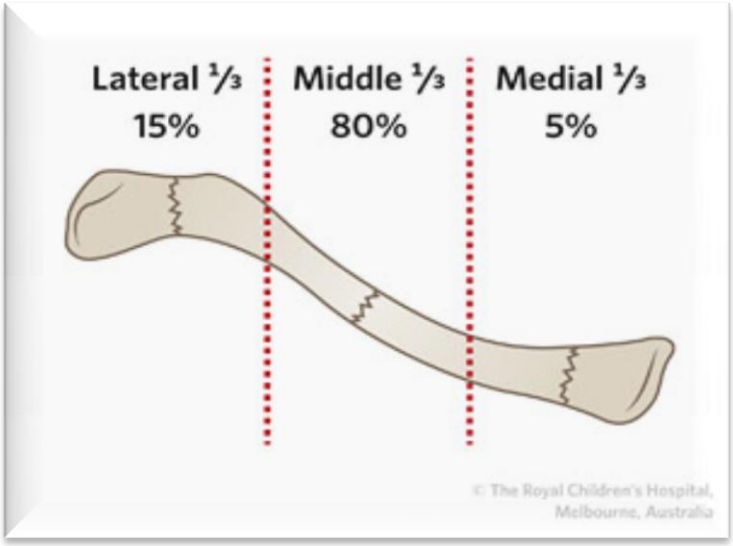
- Articulations
  - Medially "Sternoclavicular joint" — with the Manubrium
  - Laterally "Acromioclavicular joint" — with the Acromial end of the scapula
  - Inferiorly "Costoclavicular joint" — with the 1st rib



Fractures of the Clavicle

- Falling. "Commonly in childern"
- 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 upper limb.
- It may be pulled mediallyby the adductors of the arm.





Scapula: It is a triangular flat bone. Extends between the 2^{nd} _ 7^{th} ribs, that has:

Three Processes

Spine	Acromion	Coracoid
Thick projecting ridge of bone that continues laterally as the flat expanded	forms the subcutaneous point of the shoulder	a beaklike process. It resembles in size, shape and direction a bent finger pointing to the shoulder.

Three Borders

Superior | Medial (vertebral) | Lateral (axillary)

Three angles

Superior | Lateral | Inferior

Forms the (glenoid cavity): a shallow concave oval fossa that receives the head of the humerus

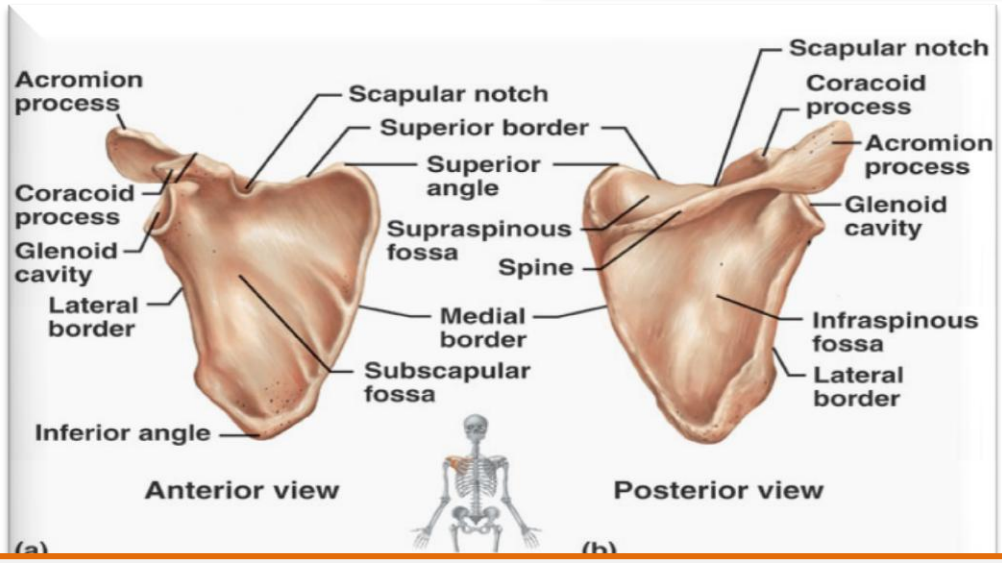
Two Surfaces

Concave Anterio (Costal) Surface

it forms the large **Subscapular Fossa.**

Convex Posterior Surface

Divided by the spine of the scapula into the smaller **Supraspinous Fossa** "above the spine" and the larger **Infraspinous Fossa** - "below the spine".



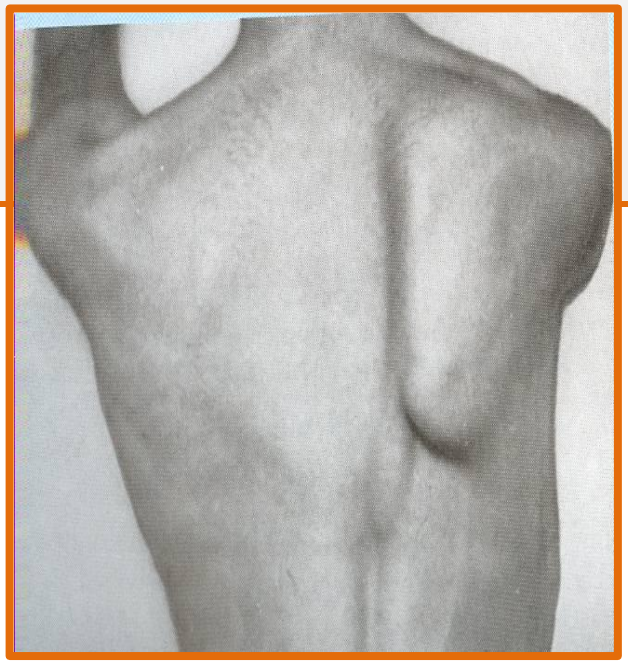
Suprascapular notch: It is a nerve passageway, medial to coracoid process

Functions of the Scapula

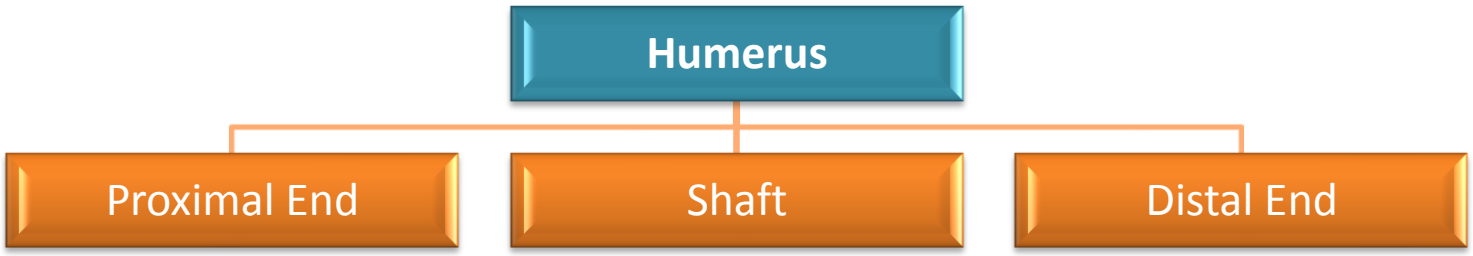
- Gives attachment to muscles.
- Has a considerable degree of movement on the thoracic wall to enable the arm to move freely.
- The glenoid cavity forms the socket of the shoulder joint.
- Because most of the scapula is well protected by muscles and by its association with the thoracic wall, most of its fractures involve the protruding subcutaneous acromion.
  "Nothing may happen to the scapula because of its muscles, but the subcutaneous acromion may be the victim"

*WingedScapula

The scapula will **protrude posteriorly**, so the patient will have a difiiculty in rising the arm above his head. It is due the injury of **Long Thoracic nerve** which causes paralysis of serratous anterior muscle, and the medial bordr and inferior of the scapula will no longer kept closely to the chest wall.

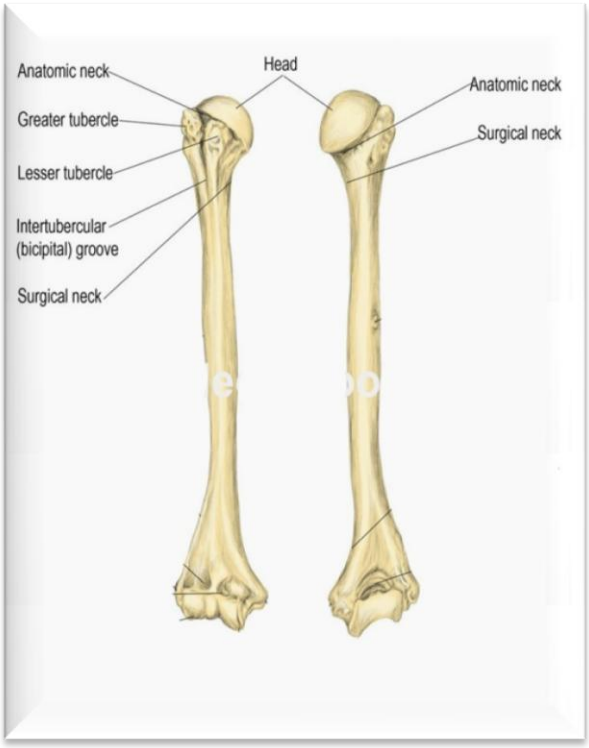


Arm (Humerus): It is a typical long bone, and it is the largest bone in the upper limb.



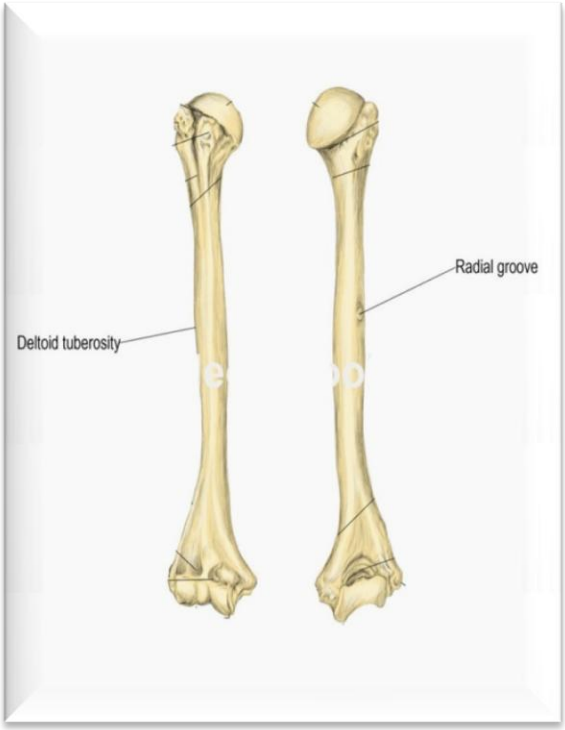
- **Proximal End:** it is composed of "Head, Neck, Greater and Lesser tubercles".

1. **Head:** Smooth, and it forms 1/3 of a sphere, it articulates with the glenoid cavity of the scapula.
2. **Anatomical neck:** formed by a groove separating the head from the tubercles.
3. **Greater tubercle:** at the lateral margin of the humerus.
4. **Lesser tubercle:** projects anteriorly "The two tubercles are separated by **Intertubercular Groove(Bicipital Groove)** ".
5. **Surgical Neck:** a narrow part distal to the tubercles. It is a common fracture site of the humerus.



Shaft (Body): it has two prominent features.

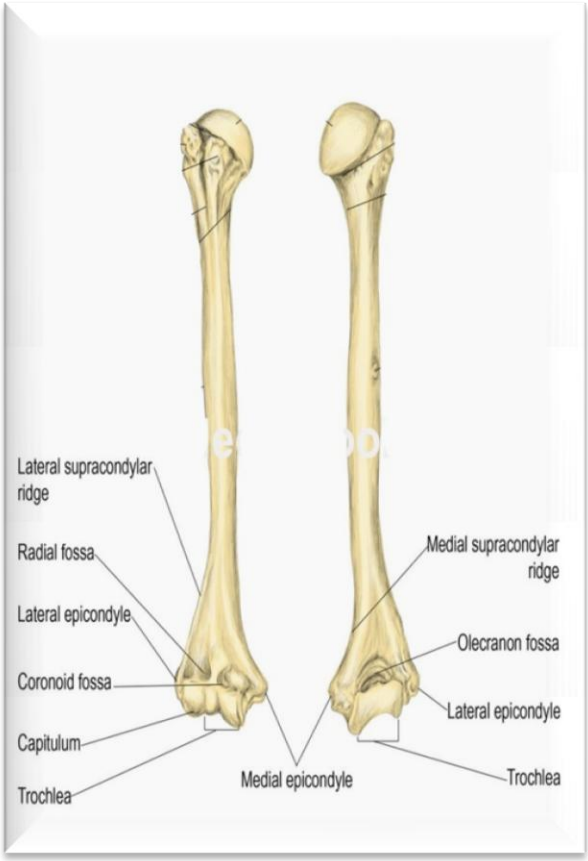
1. **Deltoid tuberosity:**
   - A rough elevation laterally for the attachment of deltoid muscle.
2. **Spiral (Radial) groove:**
   - Runs obliquely down the posterior aspect of the shaft, and it lodges the important radial nerve and vessels.



Distal End: Widens as the sharp medial and lateral Supracondylar Ridges form and end in the medial and lateral Epicondylesproviding muscular attachment.

1. **Trochlea:** (medial) for articulation with the ulna.
2. **Capitulum:** (lateral) for articulation with the radius.
3. **Coronoid fossa:** above the trochlea (anteriorly).
4. **Radial fossa:** above the capitulum.
5. **Olecranon fossa:** above the trochlea (posteriorly).

What dose "Fossa" mean?
A cavity was made for another bone to fuse in.



Fractures of the Humerus

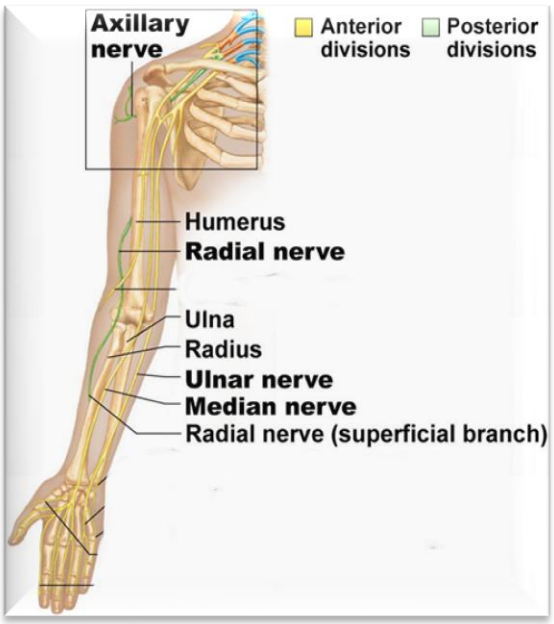
- Most common fractures of the surgical neck especially in elder people with osteoporosis.
- The fracture results from falling on the hand (transmittion of force through the bones of forearm of the extended limb).
- In younger people, fractures of the greater tubercle results from falling on the hand 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 Humerus

- Surgical neck: Axillary nerve
- Radial groove: Radial nerve
- Distal end: Median nerve
- Medial epicondyle: Ulnar nerve

Articulations of the Humerus

- 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.**



Forearm

Formed of two bones

- ***Radius*** is the lateral bone
- ***Ulna*** is the medial bone

Ulna: It is the stabilizing bone of the forearm. It is the medial & longer of the two bones of the forearm.

- Proximal End
- Shaft
- Distal End

Proximal End

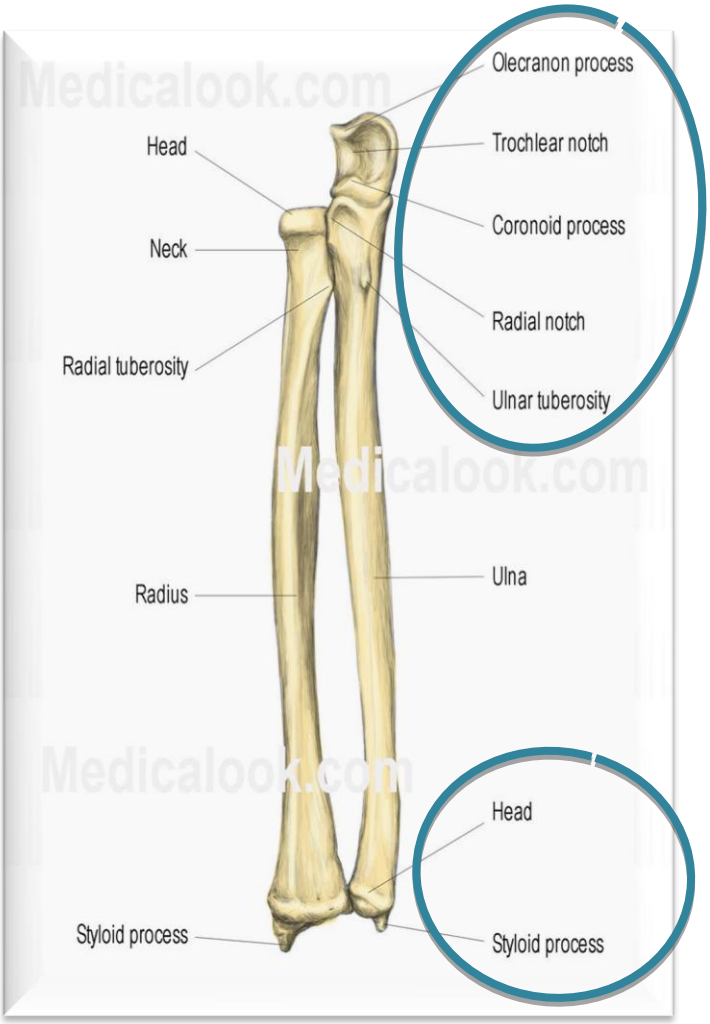
1. It has two prominent projections:
   - **Olecranon process**: projects proximally from the posterior aspect (Forms the prominence of the elbow).
   - **Coronoid process**: projects anteriorly.
2. - **Trochlear notch**: articulates with trochlea of humerus.
   - **Radial notch**: a smooth rounded concavity lateral to coronoid process.
3. - **Tuberosity of ulna**: inferior to coronoid process.

Shaft

- Thick & cylindrical superiorly but diminishes in diameter feriorly.
- Three surfaces (Anterior, Medial & Posterior).
- Sharp lateral interosseous border.

Distal End

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



Radius: It is the shorter and lateral of the two forearm bones.

Proximal End | Shaft | Distal End

Proximal End

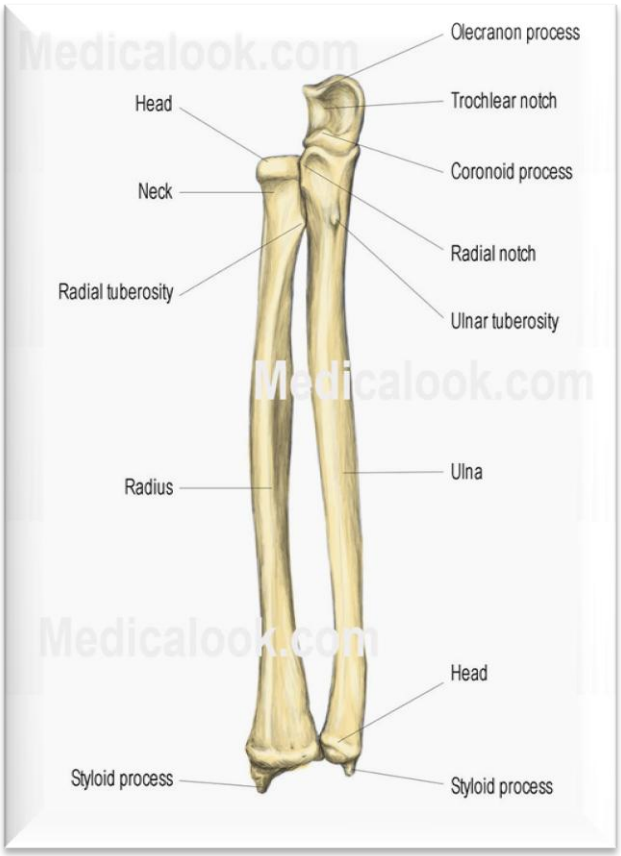
- Head: small, circular and its upper surface is concave for articulation with the capitulum.
- Neck
- Radial Tuberosity: Medially directed and separates the proximal end from the body.

Shaft

- Has a lateral convexity.
- It gradually enlarges as it passes distally.

Distal End

- It is rectangular.
- Its medial aspect forms a concavity: Ulnar notch to accommodate the head of the ulna.
- Radial Styloid process: extends from the lateral aspect.
- Dorsal tubercle: projects dorsally.



Articulations of Radius and Ulna

- Distal end of Humerus with the proximal ends of Radius & Ulna Elbow joint.
- Proximal Radioulnar joint.
- Distal Radioulnar joint.
- The two bones are connected by the flexible interosseous membrane.

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.
- 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 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.

Hand: The skeleton of the hand consist of:

- Carpals: 8 bones
- Metacarpals: 5 bones
- Phalanges: 14 bones

Wrist

- Compose of eight carpal bones arranged in two irregular rows, each of four.
- 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
- Triquentral
- Pisiform

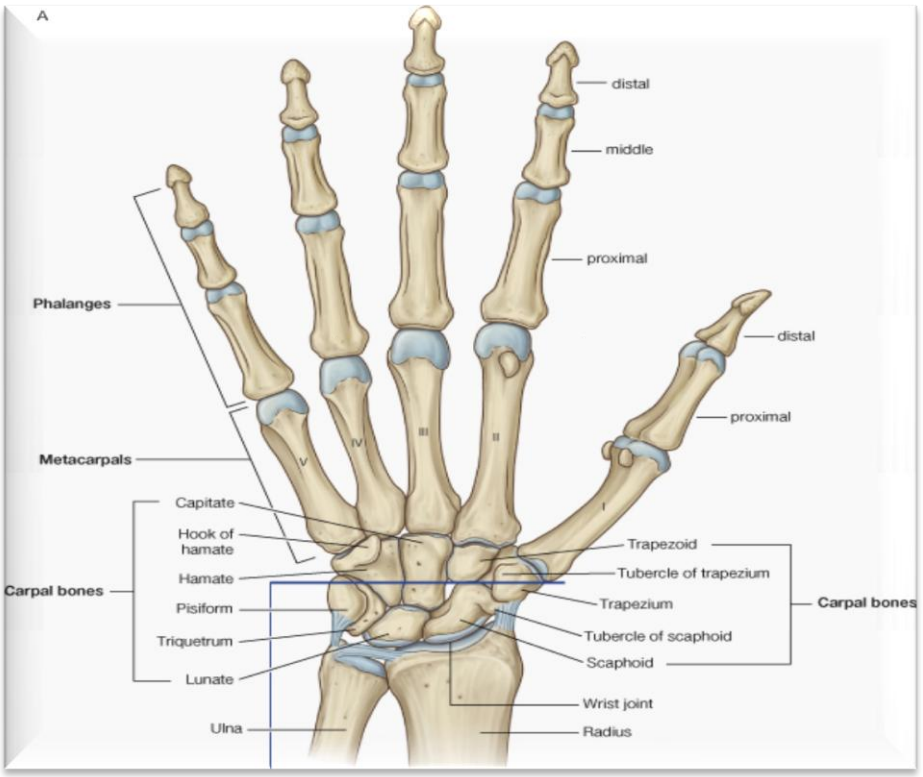
Distal row, from lateral to medial

- Trapezium
- Trapezoid
- Capitate
- Hamate

Mnemonics

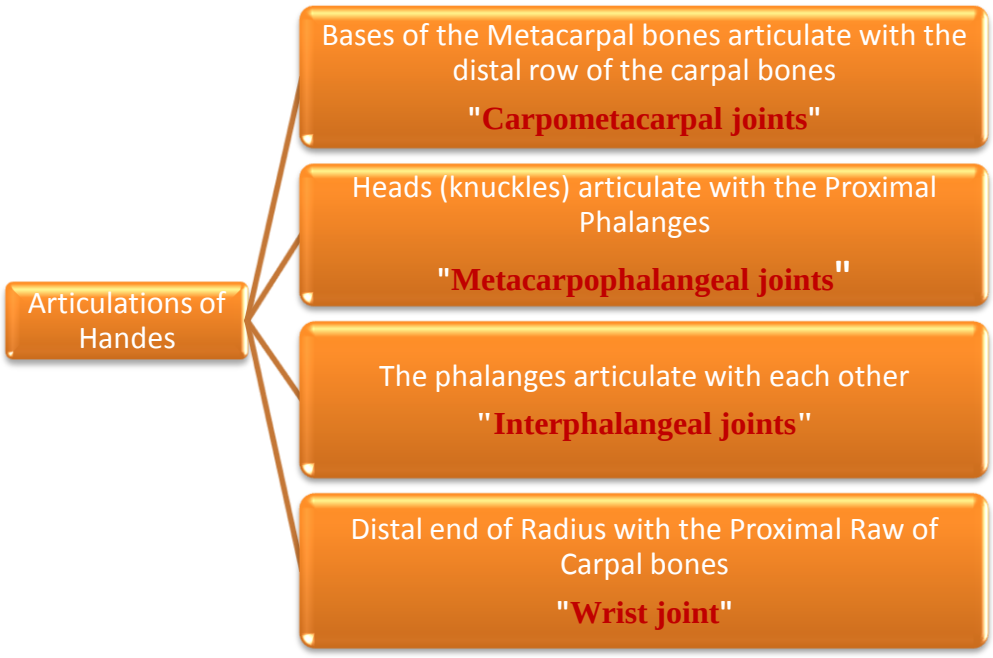
1- She Looks Too Pretty,
Try To Catch Her.

2- سلوى لمّا تلعب بوكر، تكسب تخسر كله ه لس.



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.



The articulations between the different bones.

- ✓ Humerus head articulates with the glenoid cavity of the scapula forming shoulder joint.
- ✓ HumerusTrochleaat the distal end articulates with the ulnar Trochlear Notch.
- ✓ The distal ends (Heads) of the metacarpels articulate with the proximal phalanges to form the Knuckles of the fist.
- ✓ TheHeadof the Radius is concave for articulation with the Capitulum.

Articulations of Clavicle:

1. Medially with the manubrium of the sternum to form Sternoclavicular joint.
2. Laterally with the Scapula at the acromial end forming Acromioclavicular joint.
3. Inferiorly with the 1st rib forming Costoclavicular Joint.

Summary

Upper Limb	Bones	Characteristic features
Pectoral Girdle	Clavicle	-The only long bone which lying horizontally. -Subcutaneous. -Commonly fractured especially in children. -Forces are impacted to the out-stretched hand during falling. -Its weakest part (junction of the middle and lateral thirds). -After fracture, medial – elevated Lateral – drops (Because the weight of the upper limb)
	Scabula	- a triangular Flat bone (Irregular). - Extends between the 2nd - 7th ribs - It has ThreeProcesses (1)Spine(2) Acromion(3) Coracoid -Three Borders: Superior, Medial (Vertebral) & Lateral (Axillary the thickestpart of the bone). - ThreeAngles, TwoSurfaces. -most of it is protected by muscles - subcutaneous part----Acromion
Arm	Humerus	-Long bone - the Most common fractures are of the Surgical Neck especially in elder people with osteoporosis - In younger people, fractures of the greater tubercle - Surgical neck ----Axillary nerve
Forearm	Radius	-It has a wider distal end. -Colle' s Fracture is the most common fracture of the forearm in radius. -It is more common in women after middle age because of osteoporosis. -It causes dinner fork deformity, history includes slipping.
	Ulna	-the stabilizing bone of the forearm. -medial &longer than the two bones of the forearm. -proximal end is bigger than distal end.
WRIST	Carpals	-Eight Carpal, short bones, arranged in two irregular rows, four for each row. - give flexibility to the wrist. - Scaphoid most commonly fractured, poor blood supply to the scaphoid.
Hand	Metacarpals	-Five Metacarpal bones. -The distal ends (Heads) articulate with the proximal phalanges to form the Knuckles of the fist. -The1st metacarpal is the shortest and most mobile.
	Phalanges	-Each digit hasthreephalanges,except the Thumb which has only Two. -The middle ones are intermediate in size. -The distal ones are the smallest.

Remember That:

- ✓ Thumb has 2 phalanges.
- ✓ The scapula is harder to be fractured because of the muscles surrounding it.
- ✓ Scaphoid fracture takes several days to heal due to poor blood supply.
- ✓ Colle's fracture (radial distal end) the heal is usually good due to rich blood supply.

To differentiate between the bones of the right and left sides.

- **Humerus:** the head is directed medially, the intertubercle groove is anterior, and the radial groove is posterior.
- **Ulna:** the styloid process is medial, and Radial notch is lateral to coronoid process at the proximal end.
- **Radius:** the radial tuberosity is directed meially, and its styloid process at the distal end is lateral with medial ulnar notch at the other side.

Multiple Choice Questions

Q1: Colle' s Fracture is the most common fracture of the forearm in ?

A-ulna B- Radius C- Humerus D- Wrist

Q2: The only long bone which lying horizontally is ?

A- Radius B-ulna C-clavicle D- humerus

Q3: If the clavicle is broken, the whole shoulder region caves in ?

A- Laterally B- posteriorly C- inferiorly D- medially

Q4:In the fracture of the scaphoid bone union of the bone may take several months because of ?

A- Poor blood supply B- regenerative capacity C- Time needed D- Bone structure

Q5:Humerus head articulates with which part of the scapula ?

A- Coracoid B- Spine C- Glenoid cavity D- Acromion

Q6:In hand each digit has three phalanges except the?

A- thumbB- distal phalangeC- medial phalangD- proximal phalange

Very useful link: (click the title name)

Scapula and Clavicle - Shoulder Girdle(7:11m)

Radius or Radial Bone(5:48m)

whole lecture (contain music)(11:14 m)

Q Ans. :

1-B 2-C 3-D
4-A 5-C 6- A

Good luck