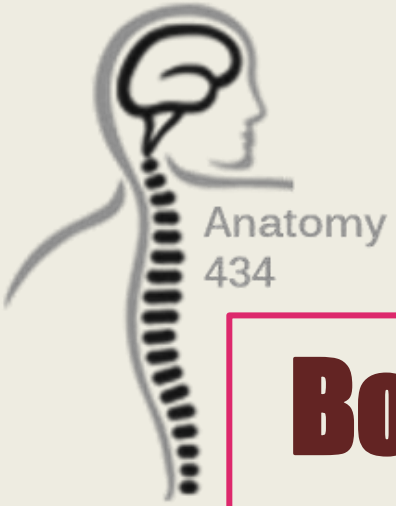


Bones of The Upper Limbs

Anatomy Team 434

Color ***Index:***

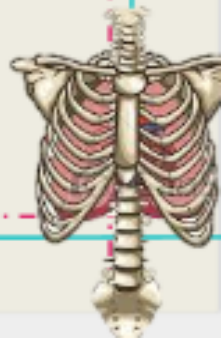
- **Important Points**
- Helping notes
- **Explanation**

If you have any complaint or suggestion please don't hesitate to contact us on:

AnatomyTeam434@gmail.com

OBJECTIVES

- 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.



New Terms

Term	Meaning	Example
Processes	A V-shaped indentation (act as the key of the joint)	Coracoid process in the scapula
Notch	An indentation, (incision) on an edge or surface	Radial notch in the ulna
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)	Radial fossa in the humerus
Tubercles	A nodule or a small rounded projection on a bone	Dorsal tubercle in the radius
Tuberosity	A large prominence on a bone usually serving for the attachment of muscles or ligaments (is a bigger projection than the Tubercle)	Tibial tuberosity in the tibia
Groove	A channel, a long narrow depression sure	Intertubercular groove in the humerus
Interosseous border	Between bones (the place where the two parallel bones attach together by the interosseous membrane)	Sharp medial interosseous in the radius
Ridge	The long and narrow upper edge, angle, or crest of something	the lateral supracondylar ridge in the femur
Spine	Thick projecting ridge of bone	Spine of the Scapula
Articulation	Meeting of two bones to make the joints	Any type of joint
Styloid process	usually serves as point of attachment for muscles, ligaments, and might form joints	Radial styloid process (wrist joint)
Union of the bone	إعادة إلتحام العظام ببعظها عشان ترجع للحالة الطبيعية	union of scaphoid bone fracture

Bones Process

Eminence

is a projection on the bone
(زيادة بسيطة على العظمة).

Tubercle

is a bigger projection .. than the eminence ("زيادة أكبر من ال eminence)

Tuberosity

is a bigger projection than the Tubercle
(زيادة" أكبر من الTubercle)

Trochanter

is a bigger projection than the tuberosity
(زيادة" أكبر من ال Tuberosity)

NOTE: they all may be for attachment of ligaments and muscles.

The bones of the upper limb are :

- **Pectoral Girdle**
  - Formed of Two Bones :
    - 1) Clavicle
    - 2) Scapula
- **Arm**
  - Humerus
- **Forearm**
  - Radius
  - Ulna
- **Wrist**
  - Carpal bones
    - Distal Row
      - Trapezium
      - Trapezoid
      - Capitate
      - Hamate
    - Proximal Row
      - Scaphoid
      - Lunate
      - Triquetral
      - Pisiform
- **Hand**
  - Metacarpals & Phalanges

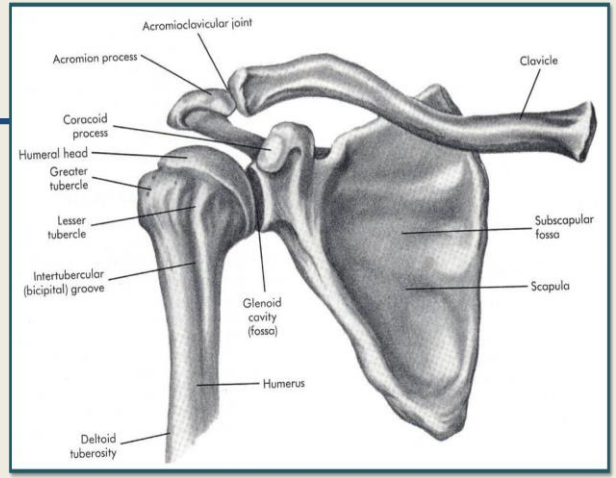
It is very light and allows the upper limb to have exceptionally free movement.

Note :free movement for upper limb from pectoral girdle (specially clavicle)

Pectoral Girdle:-

Clavicle:

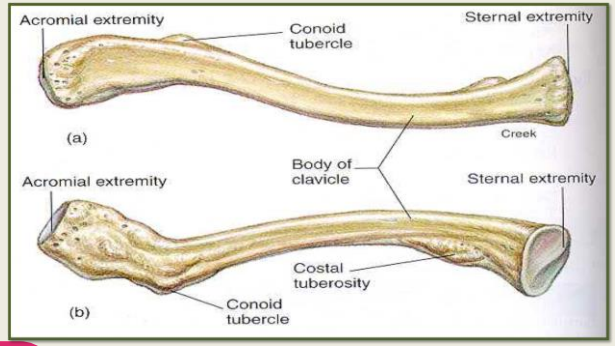
It is a doubly curved long bone with no medullary cavity lying horizontally across the root of the neck. It is subcutaneous throughout its length.



It has Two Ends:

Medial (Sternal) : enlarged & triangular.

Lateral (Acromial) : flattened.



Body (shaft):

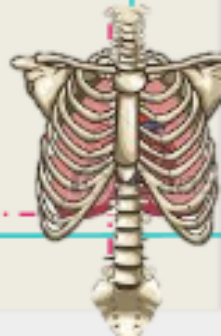
It is medial which is 2/3 of the body is convex forward.

It is lateral which is 1/3 of the body is concave forward.

Surfaces:

Superior : smooth as it lies just deep to the skin.

Inferior : rough because strong ligaments bind it to the 1st rib.

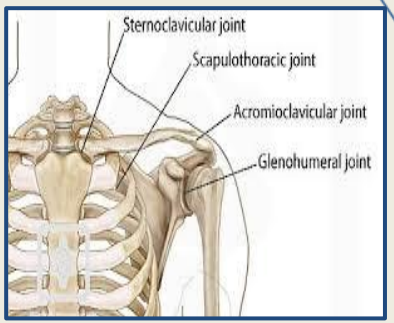


Clavicle:

Articulation

Articulations

- Medially "sternoclavicular joint" → With the manubrium
- Laterally "Acromioclavicular joint" → With the Acromial end of the scapula
- Inferiorly "costoclavicular joint" → With the 1st rib



Functions

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.

Transmits 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 Upper Limb. -[cervicoaxillary canal] runs through the clavicle containing nerves and blood vessels for the upper limb and underarm(axilla)

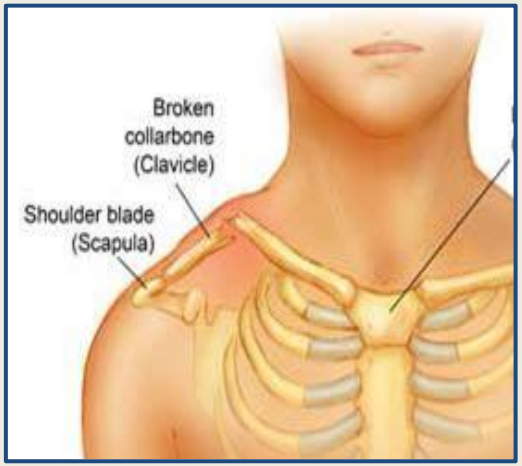
Clavicle:

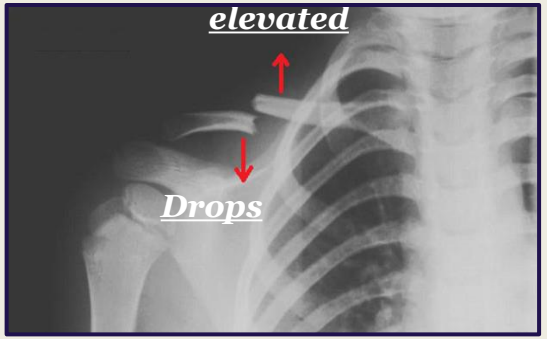
Fractures

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

•***After fracture, the medial fragment is elevated*** *(by the sternomastoid muscle),*
the lateral fragment drops because of the weight of the Upper Limb

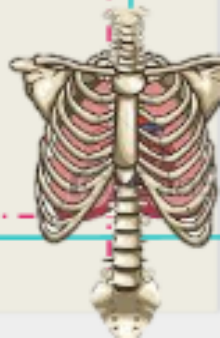
BUT It may be pulled medially by the adductors of the arm.
The sagging limb is supported by the other.





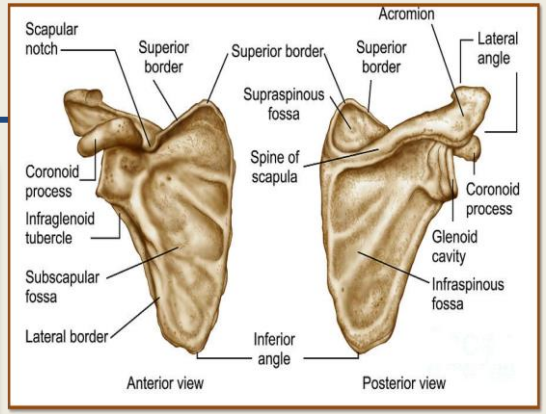
Important note:

* *If the clavicle is broken, the whole shoulder region caves in medially.*
* ***The weakest part of the clavicle is the junction of the middle and lateral thirds****.due to the thickness*



Scapula:

(Shoulder Blade)



Three process

Spine: a thick projecting ridge of bone that continues laterally. the spine process starts from the medial end of the scapula to the lateral end forming the **acromion**.

Coracoid: a beaklike process , it has a finger like shape pointed to the shoulder. it resembles in size, shape and direction

Acromion: forms the subcutaneous point of the shoulder. acromion articulate with the clavicle, to form acromioclavicular joint.

Three angles

Inferior

Lateral (forms the Glenoid cavity) a shallow concave oval fossa that receives the head of the humerus.

Superior.

Two surfaces

Convex Posterior: divided by the **spine** of the scapula into the:

-**Supraspinous Fossa** (the small part above the spine of the scapula)

-**Infraspinous Fossa** (The large part below the spine of the scapula)

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

Three borders

Superior

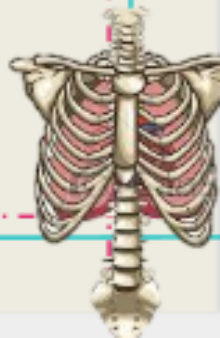
Lateral (Axillary): (the thickest) part of the bone, it terminates at the lateral angle.

Medial: (Vertebral)

-It is a triangular **Flat** bone

-Extends between the **2nd** Rib till the **7th** Rib

Suprascapular notch: is a small 'hole' that acts as nerve's pathway that supply the coracoid.



Scapula: Functions

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.

Winged Scapula

Clinical Appearance: It will protrude posteriorly

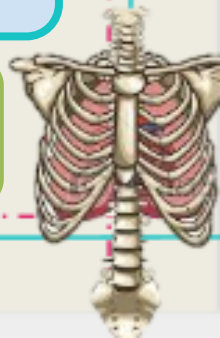
Symptoms: the patient has difficult in raising the arm above the head.(difficult in rotation of the scapula)

Etiology: it's due to injury of thoracic long nerve(as in radial 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.

winged scapula: يعني تكون بارزة
ومثال عليها انو النساء لمن يسو عملية عشان سرطان الثدي ممكن الدكتور يغلط ويقطع nerve
فتقعد كدا ثابتة على برا

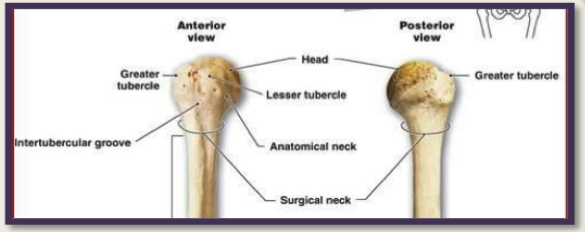
REMEMBER: Because most of the scapula is well protected by muscles and by its association with the thoracic wall , most of its fractures involve the protruding subcutaneous Acromion.



Humerus:

*Typical **Long bone** , it is the largest bone in the upper limb*

Proximal End



Head: Smooth, it forms 1/3 of a sphere, it articulates with the glenoid cavity of the scapula. (Shoulder joint)

Greater tubercle: at the lateral margin of the humerus.

-trabeculas are important in attachment to muscles, tendons, and ligaments.

Lesser tubercle: projects anteriorly.

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

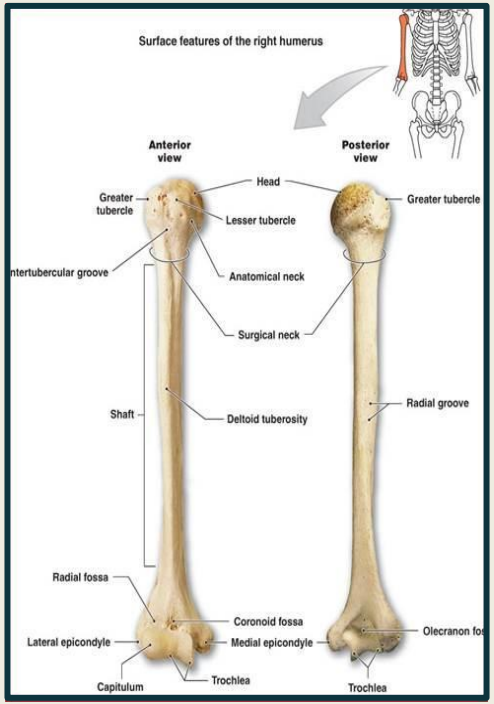
Surgical Neck: a narrow part distal to the tubercles, **It is a common fracture site of the humerus.**

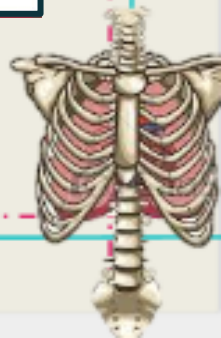
is smooth because of friction with the glenoid cavity

The two tubercles are separated by Intertubercular Groove.

the anatomical neck is simply a divider between two regions.

the surgical neck is more sustainable to injury

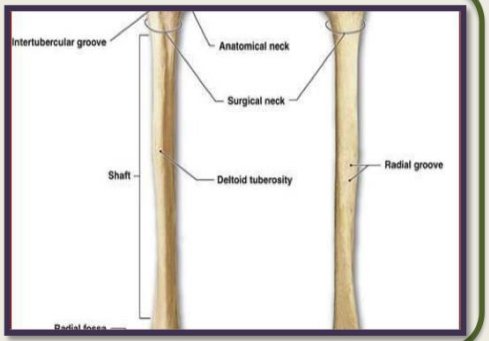




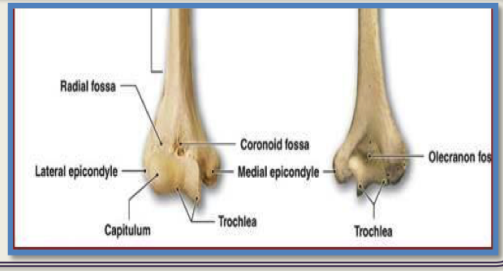
Humerus:

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

Shaft(body) of the Humorous



Distal End



Deltoid tuberosity:

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 & vessels.

Has two prominent features

Anterior

Posterior

Trochlea: (medial) for articulation with the ulna.

Capitulum: (lateral) for articulation with the radius.

Coronoid fossa: above the trochlea.

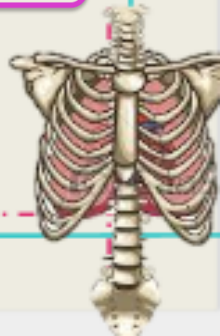
Radial fossa: above the capitulum.

Olecranon fossa : above the trochlea. Receives Ulna's olecranon process.

-The medial Epicondyle can be felt.

-the distal end of the humerus has two regions (epicondyle) one lateral (radius) and one medial (ulna)

-there is two anterior fossas and one posterior



Humerus:

Articulations

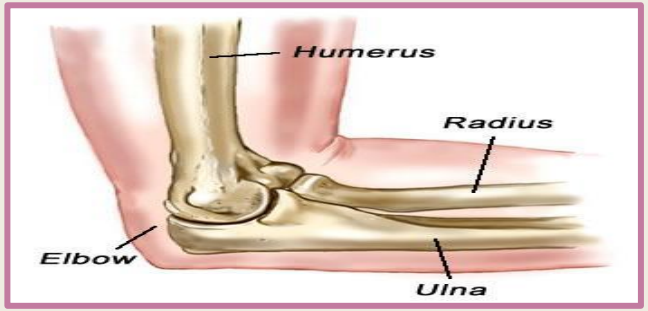
Head of the humerus with the glenoid cavity

of the scapula form the *Shoulder joint (glenohumeral joint).*

Lower end (Trochlea & Capitulum)

with the upper ends of the radius & ulna form the

Elbow joint.



Fractures

Most common fractures are of the Surgical Neck especially in elder people with osteoporosis.

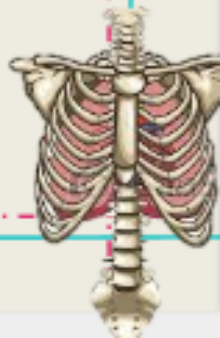
The fracture results from falling on the hand

(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.

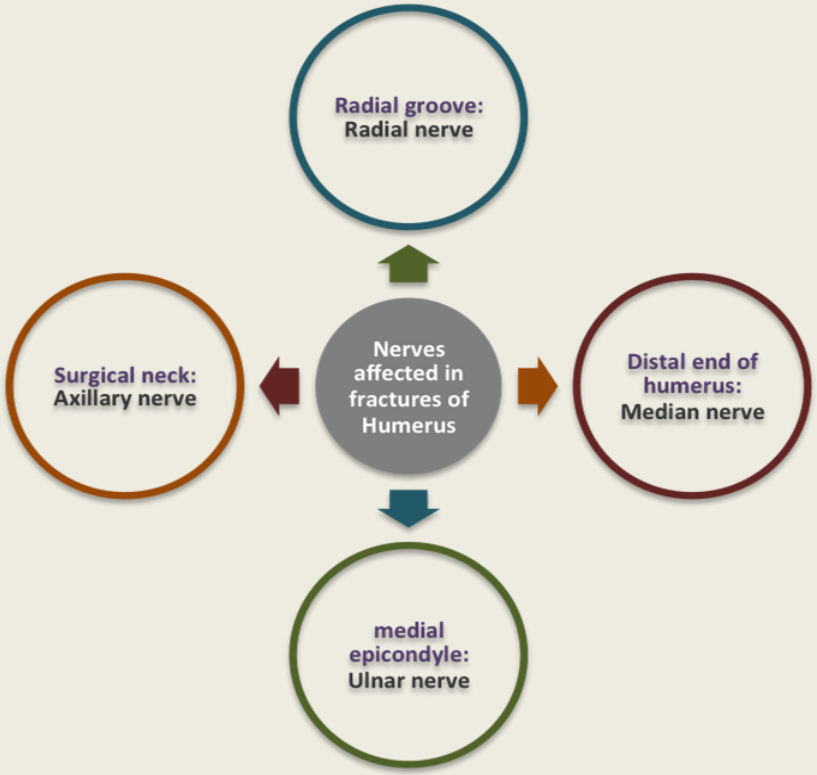
The body of the humerus can be fractured by a direct blow to the arm or by

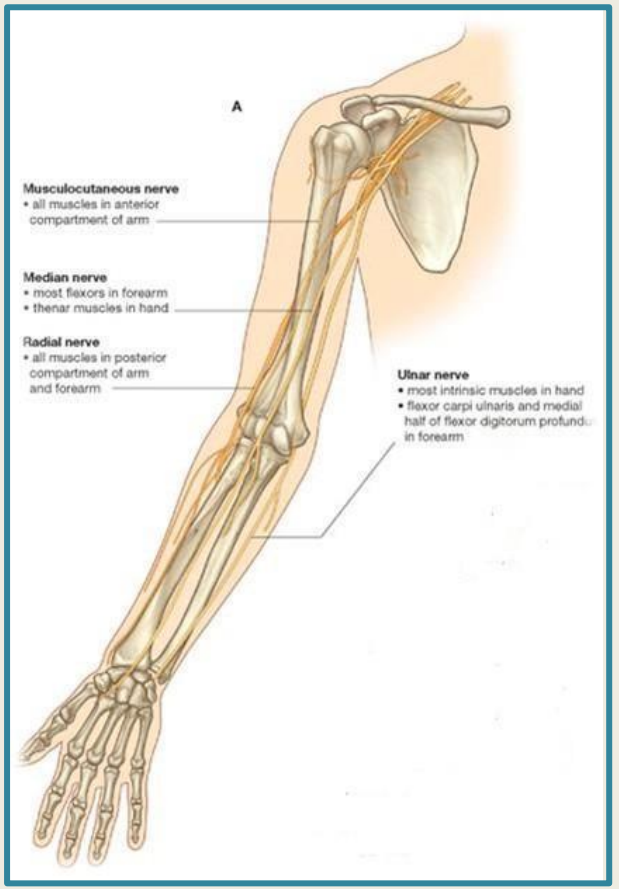
indirect injury as falling on the outstretched hand.



Nerves affected from the fracture of Humerus:

Depend on the location of the fracture





Forearm:-

The is *Radius* the lateral bone.

The is *Ulna* the medial bone.

Ulna stabilizing bone because it articulates with both bones(radius,& humerus)

Ulna bigger than the radius

Ulna is has a Proximal end , Shaft and Distal End

Ulna:

Proximal End

It has two prominent projections:

Olecranon process: projects proximally from the posterior aspect (Forms the prominence of the elbow).

Coronoid process: projects anteriorly.

Trochlear notch: articulates with trochlea of humerus.

Radial notch: a smooth rounded concavity lateral to coronoid process.

Tuberosity of ulna: inferior to coronoid process.

Shaft

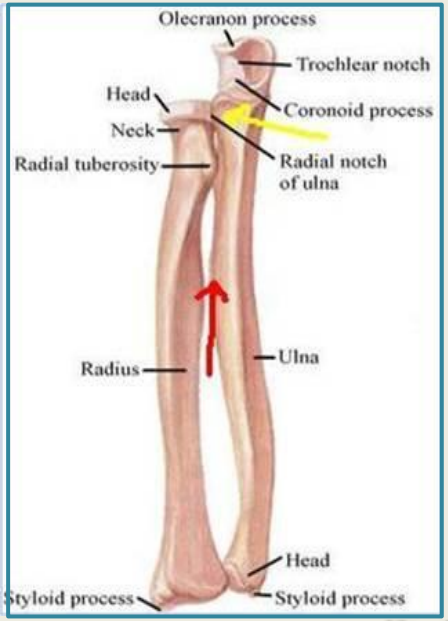
Thick & cylindrical superiorly but diminishes in diameter inferiorly.

Three surfaces (Anterior, Medial & Posterior).

Sharp lateral interosseous border. Where the interosseous membrane bend.

Distal End

Small rounded Head: Styloid process, 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:

Radius is a short bone

Radius is a lateral bone in the forearm

Radius is has a Proximal end , Shaft and Distal End

Proximal End

Head: small, circular and its upper surface is concave for articulation with the capitulum.

Radial (Bicipital) Tuberosity: medially directed and separates the proximal end from the body.

Neck

Shaft

Has a lateral convexity.

it gradually enlarges as it passes distally.

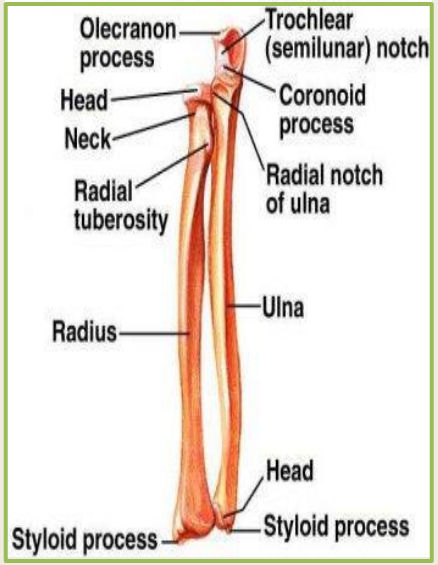
Distal End

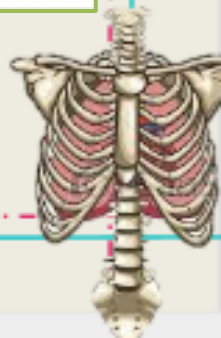
It is rectangular.

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 — Radius & Ulna — Fractures

Distal end of Humerus with the proximal ends of Radius & Ulna Elbow joint

Proximal Radioulnar joint (between the radius and ulna in the proximal region)

Distal Radioulnar joint (between the radius and ulna in the Distal region)

The two bones are connected by the flexible interosseous membrane

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.

Colles' 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.

The reason is: from forced dorsiflexion of the hand as a result from falling by outstretching the upper limb.

-"It causes dinner fork deformity"
-the radius- is the one that usually breaks .. then might result in displacement of the Ulna .. why?
because they are both attached together.

Hande:-

Carpals:

Carpals for the carpus (wrist)

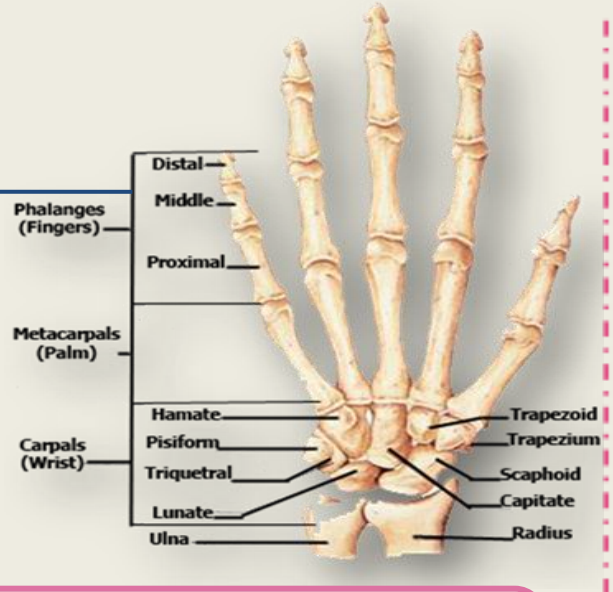
Metacarpals for the palm

Phalanges for the fingers

CARPALS: Composed of eight carpal bones arranged in two irregular rows.

Proximal Row				Distal Row			
Scaphoid	Lunate	Triquetral	Pisiform	Trapezium	Trapezoid	Capitate	Hamate

"From lateral to media"



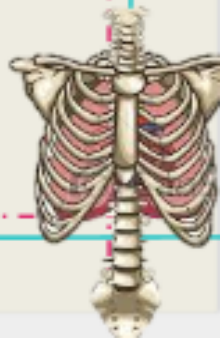
"MNEMONIC " to make it easier to memorize The sequence"

She Looks Too Pretty, Try To Catch Her.

To help you in memorizing the names

Hello, hey there classmate
This is easy , clear, and straight
Wrist carpals are only eight
Scaphoid, Triquetral, and Lunate
Pisiform and Capitate
Let's not forget the Hamate
Trapezium, Trapezoid, that's great!
We're not done yet, just wait
All you need now is to locate
And see if you can demonstrate ^_*

By the poet: Lina Aljurf



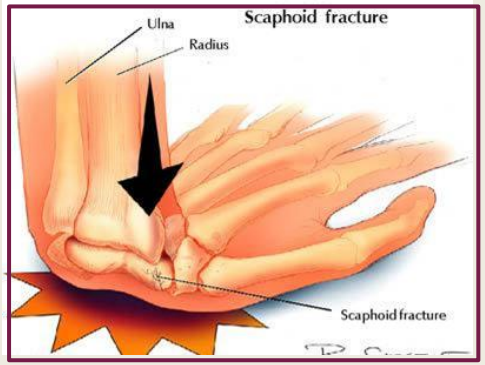
Functions Carpals: Fractures

It's FUNCTION: gives flexibility to the wrist.

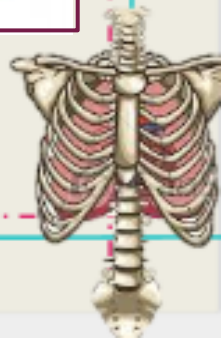
It's PRESENTS: Concavity on their Anterior surface & convex from side to side posteriorly.

Fracture of Scaphoid

- **it is the most common Fracture of:** the Wrist joint and also the Carpal bones
- **Results from:** a fall onto the palm when the hand is abducted.
- **PAIN** might Occur along the lateral side of the wrist especially during dorsiflexion and abduction of the hand.



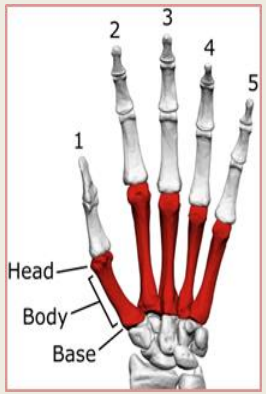
REMEMBER: Union of the bone may take several months because of poor blood supply to the proximal part of the scaphoid.



Metacarpals:

It is 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.

From Lateral to medial.

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.

3rd metacarpal has a styloid process on the lateral side of the base.

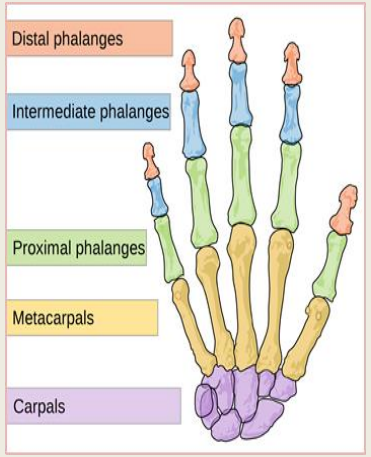
The 1st metacarpal is the shortest and most mobile.

Phalanges:

Each digit has Three Phalanges

Except the Thumb which has only two.

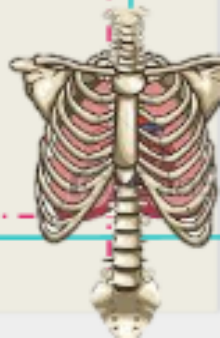
Each phalanx has a base proximally, a head distally and a body between the base and the head.



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.



Bones of the Hand and Wrist

Articulations

Wrist joint	Carpometacarpal joints	Metacarpophalangeal joints	Interphalangeal joints
Distal end of Radius with the Proximal Row of Carpal bones	Bases of the Metacarpal bones articulate with the distal row of the carpal bones	Heads (knuckles) of the metacarpal articulate with the Proximal Phalanges	The phalanges articulate with each other

(Brachial plexus)

Upper Extremity Nerves

The brachial plexus provides the motor and sensory innervation to the upper limb and is formed by the : ventral rami of C5 through T1 spinal nerves.

Five major nerves arise from the brachial plexus :

1- Musculocutaneous

2- Median

3-Ulnar

4-Axillary

5-Radial

MSQ

1- which one of these have the function of lodges the important radial nerve and vessels:

A- deltoid tuberosity
B- spiral groove
C- surgical neck
D- greater tubercle

2-colles' fracture is the most common fracture in forearm in:

A- distal end of ulna
B- proximal end of radius
C- proximal end of ulna
D- distal end of radius

3- which one of these has no medullary :

A- scapula
B- clavicle
C- radius
D-ulna

4- the most common fracture in humerus is:

A- anatomical neck
B- lesser tubercle
C- intertubercular groove
D- surgical neck

5- the distal end of radius shape is:

A- rectangular
B- rounded
C- flat
D-triangular

6- Ali is 70 years old, he had injury in his arm ,so he went to the doctor and the doctor investigated by x-ray.
The x-ray shows fracture in surgical neck of his humerus. According to this the nerve that is affected is:

A- Axillary nerve
B- Radial nerve
C- Median nerve
D- Ulnar nerve

7- what is the bone that forms boundary of cervicoaxillary canal for protection of neurovascular bundle of the upper limb :

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

8- which of the following is used to nerve passageway , from medial to coracoid process :

A- subscapular Fossa
B- Suprascapular notch
C- supraspinous Fossa
D- infraspinous Fossa

9- How many nerves arise from brachial plexus in upper limb :

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

1-B
2-D
3-B
4-D
5-A
6-A
7-C
8-B
9-D

GOOD LUCK

Done By Anatomy Team 434 ..

Helpful video **(There is music):**

[upper limb skeleton]