



# Anatomy of the Hand Joints of Upper Limb

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# Intended Learning Outcomes (ILOs)

- 1. Describe attachments and structures related to flexor and extensor retinacula of the hand.**
- 2. Mention the attachments and importance of palmar aponeurosis.**
- 3. Describe the boundaries and contents of the anatomical snuffbox.**
- 4. List muscle groups of the hand (its nerve supply and action).**
- 5. Identify the cutaneous innervation of the hand.**
- 6. Summarize joints of upper limb (type, support and movements)**

# Agenda

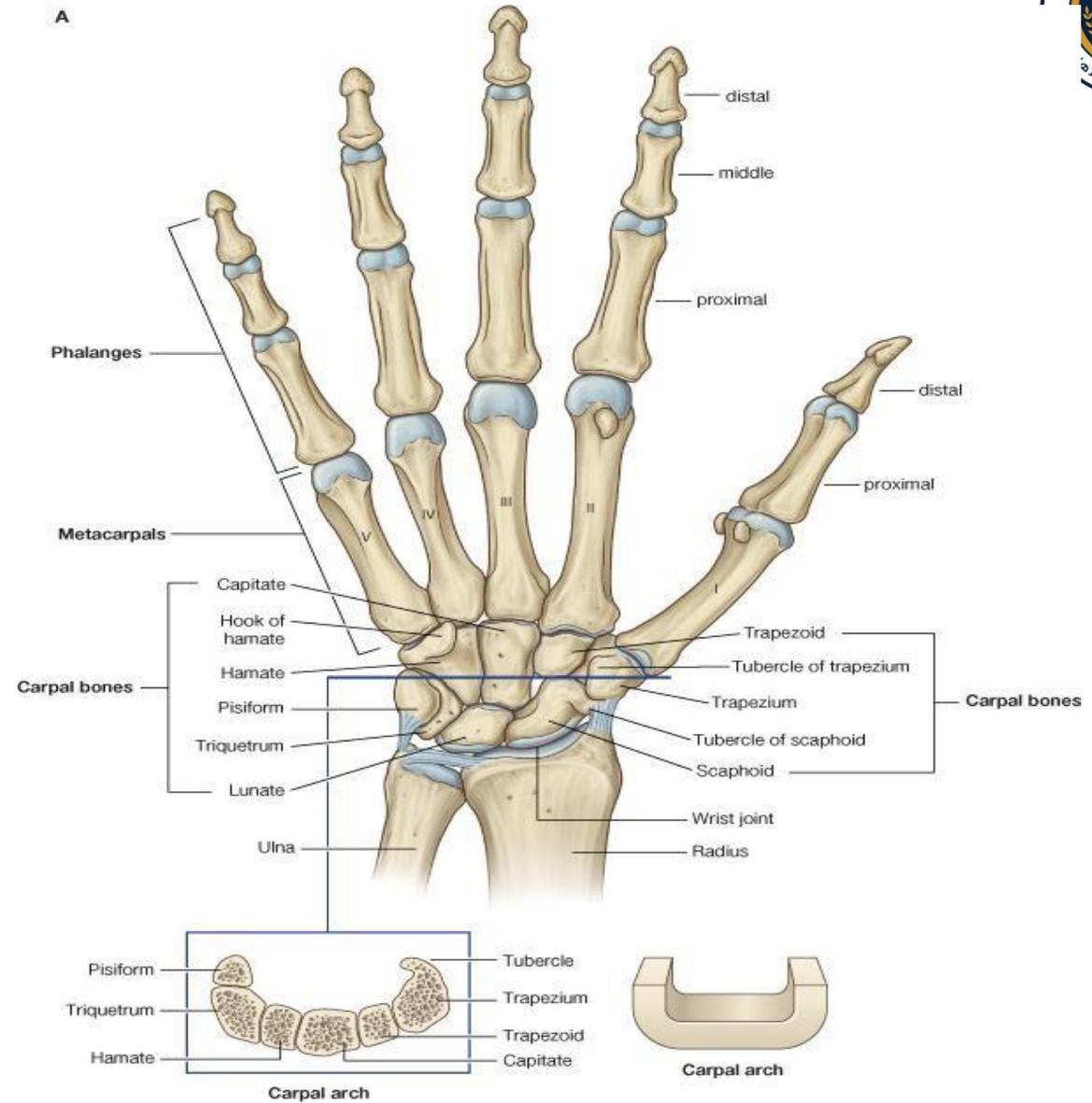
- 1. Attachment and structures related to flexor and extensor retinacula of the hand.**
- 2. Attachment and importance of palmar aponeurosis.**
- 3. Boundaries and contents of the anatomical snuffbox.**
- 4. Muscle groups of the hand (its nerve supply and action).**
- 5. Cutaneous innervation of the hand.**
- 6. Joints of upper limb (type, support and movements).**



# Anatomy of the hand



# Bones of the hand:



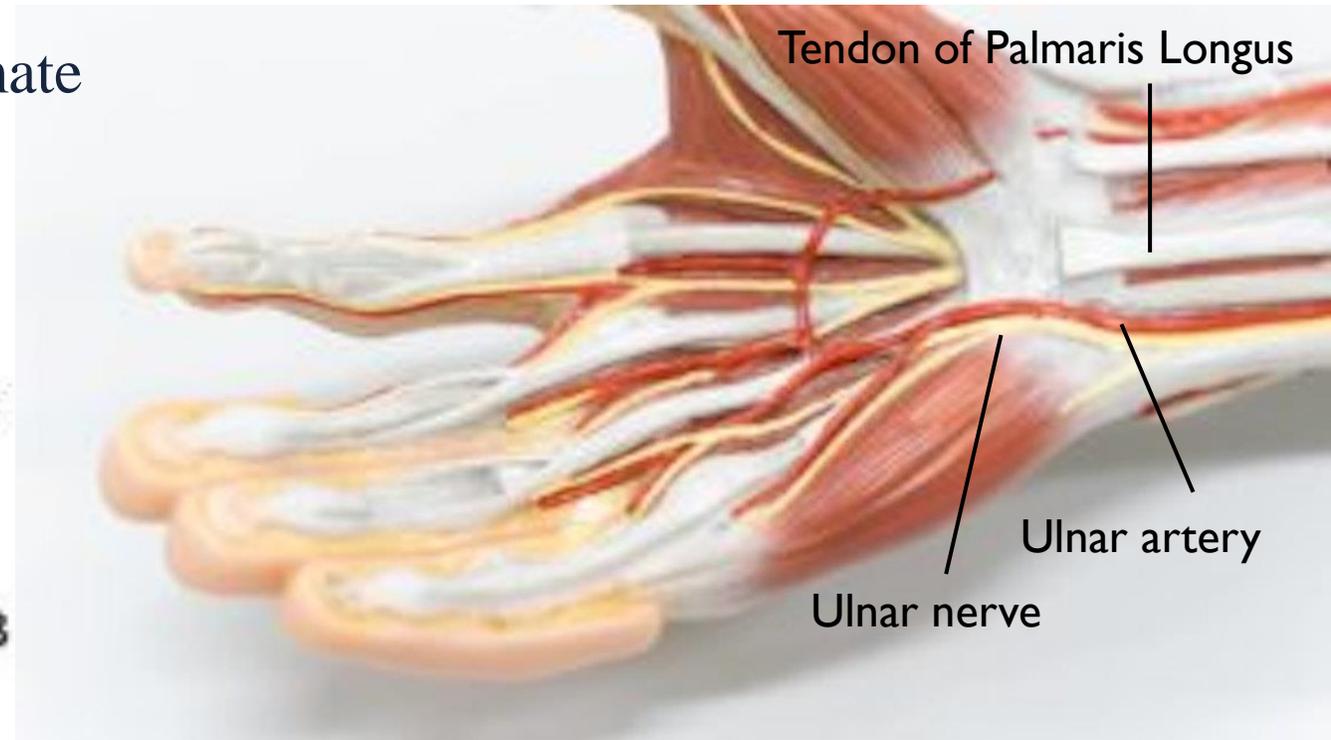
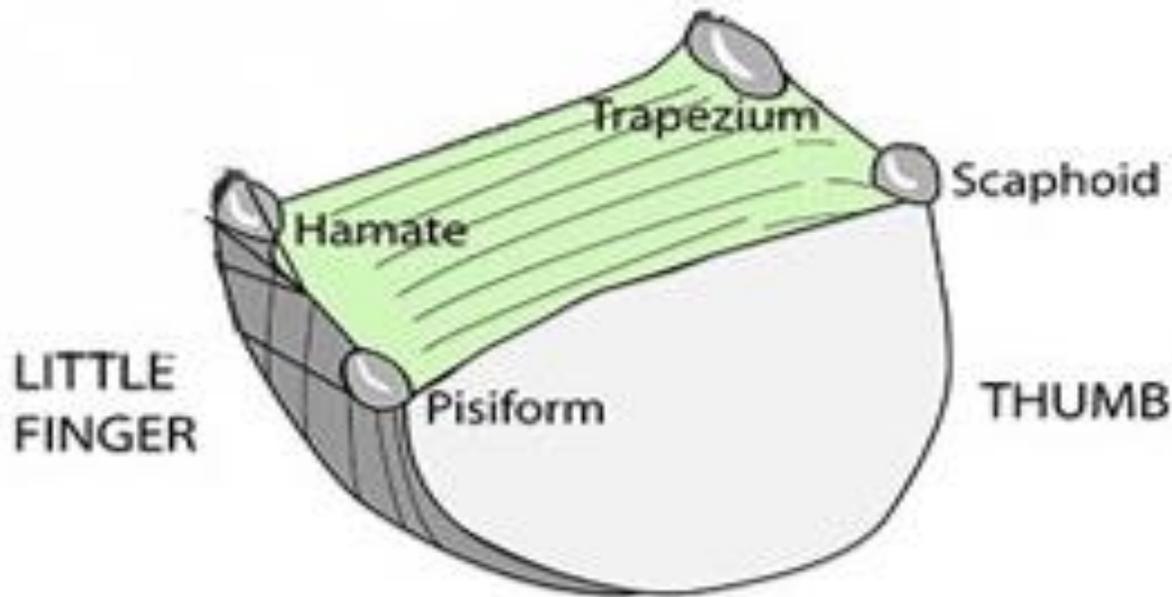
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# Flexor Retinaculum

**Definition:** A thickened band of deep fascia in front of the wrist.

**Attachments:**

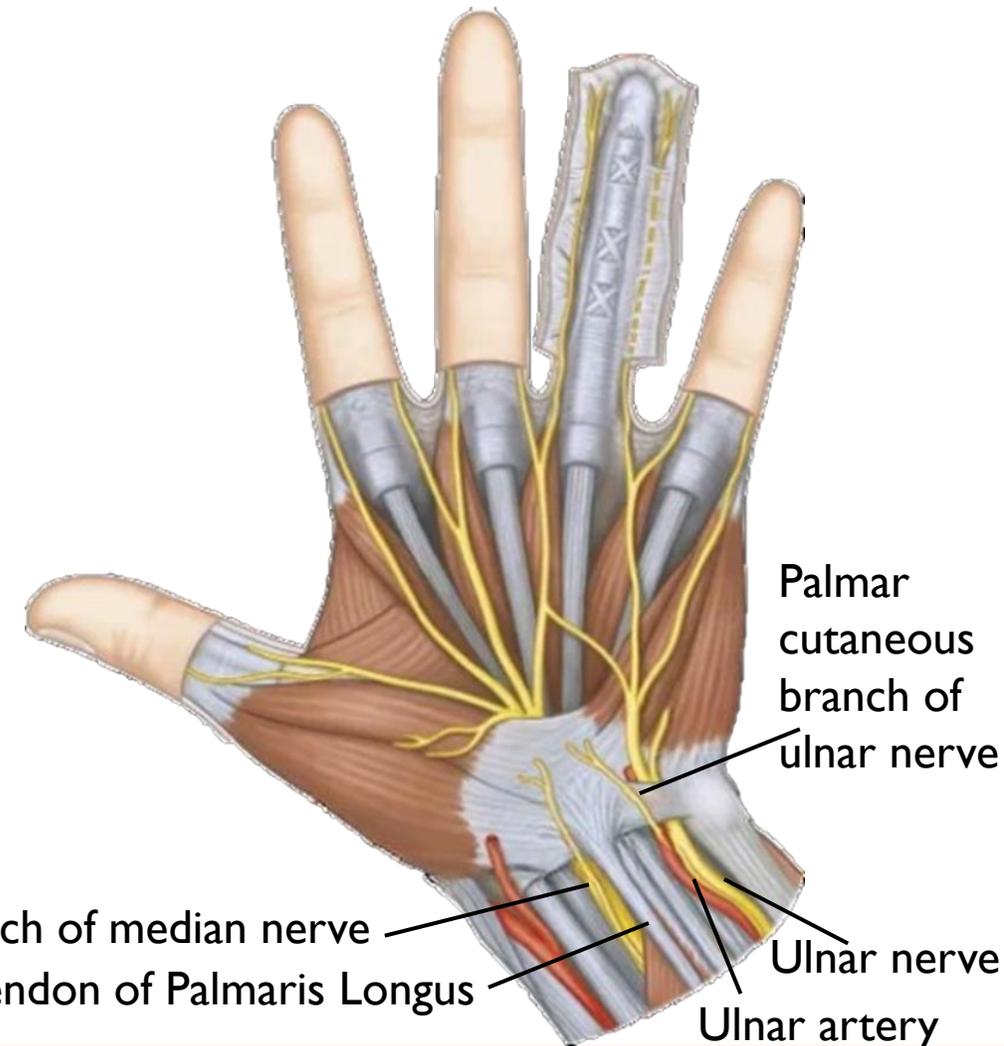
- **Medially:** Pisiform & Hook of the Hamate
- **Laterally:** Scaphoid & Trapezium



# Flexor Retinaculum

Structures passing superficial to it:  
**MEDIAL TO LATERAL**

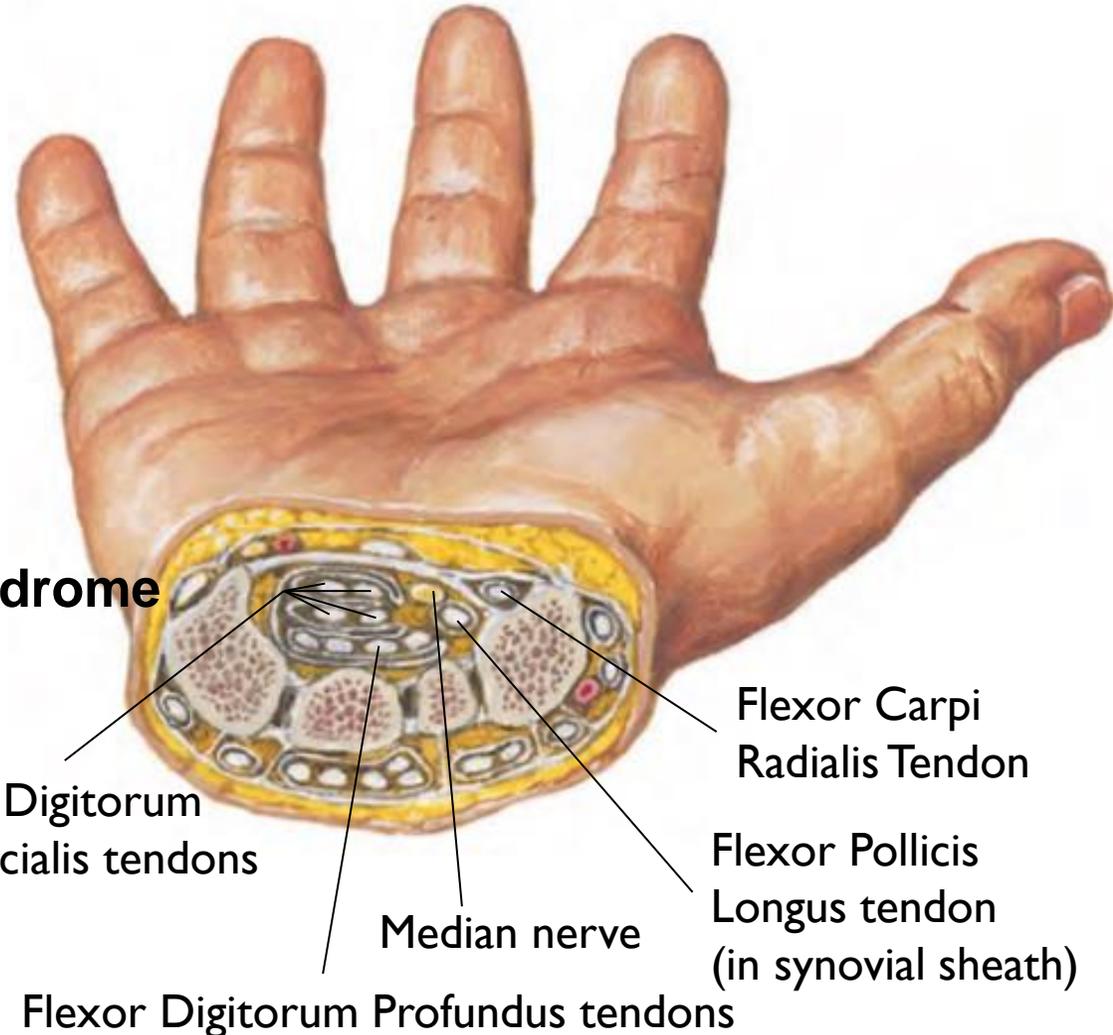
1. Ulnar nerve
2. Ulnar artery (& vein)
3. Palmar cutaneous branch of ulnar nerve
4. Tendon of Palmaris Longus
5. Palmar cutaneous branch of median nerve



# Flexor Retinaculum

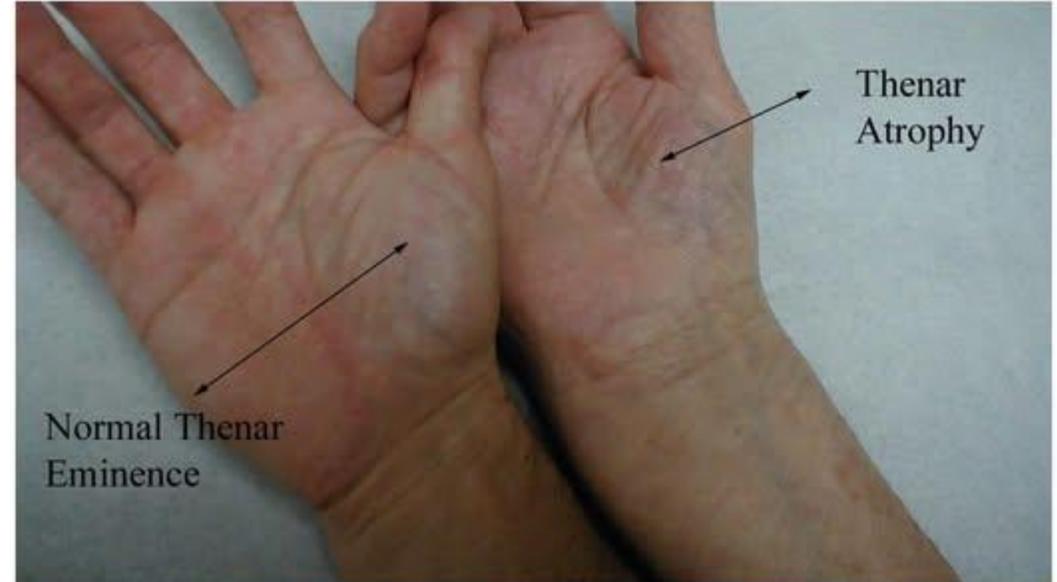
**Structures passing deep to it  
(Through the **Carpal Tunnel**)**

1. Flexor Carpi Radialis Tendon  
(In a special compartment)
2. Flexor Pollicis Longus Tendon
3. **Median nerve** <sup>compression</sup> → **Carpal Tunnel Syndrome**
4. Flexor Digitorum Superficialis & Profundus tendons
5. Synovial sheaths around tendons



# Carpal Tunnel Syndrome

- ❑ Is **pressure** on the **median nerve** Infront of the wrist.
- ❑ It causes **tingling**, numbness and pain in the hand and fingers.
- ❑ long term severe pressure cause **wasting** of the thenar muscles at the base of the thumb

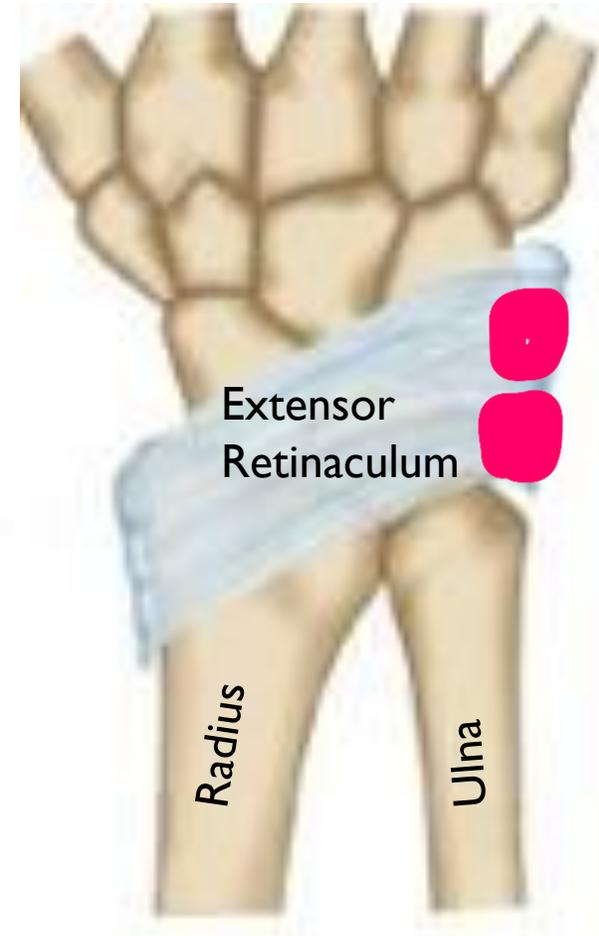
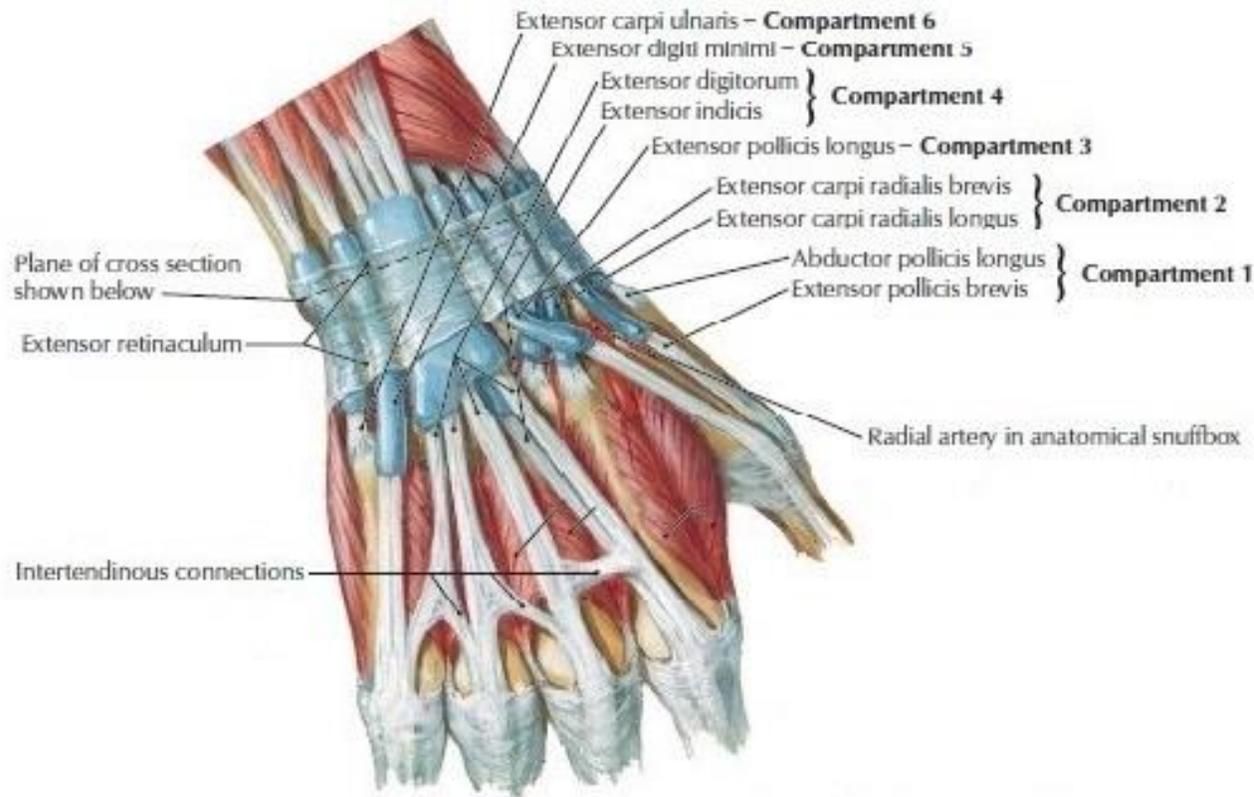


# Extensor Retinaculum

**Definition:** A thickened band of deep fascia on the dorsum of the wrist.

**Attachments:**

- **Medially:** Styloid process of ulna, triquetrum & pisiform
- **Laterally:** To the radius

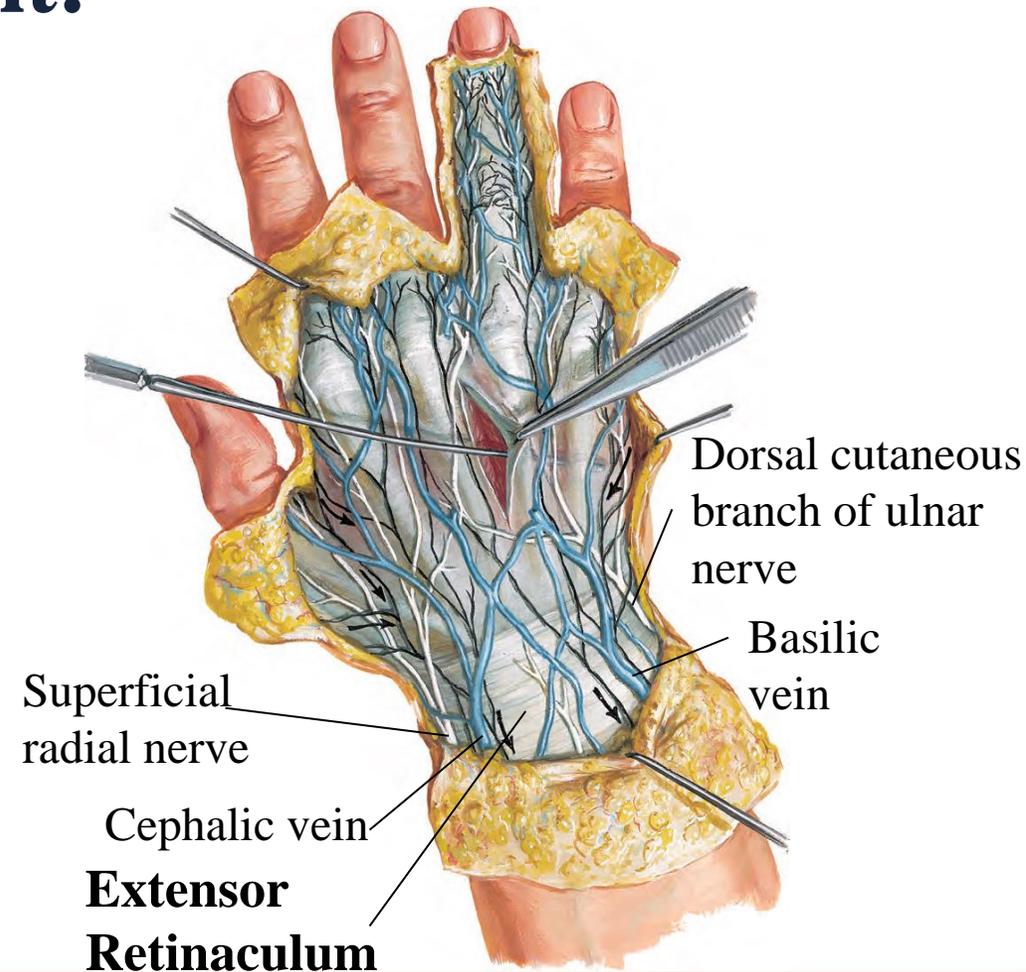


# Extensor Retinaculum

Structures passing superficial to it:

**MEDIAL TO LATERAL**

1. Dorsal cutaneous branches of ulnar nerve
2. Beginning of basilic vein
3. Beginning of cephalic vein
4. Terminal branches of superficial branch of radial nerve

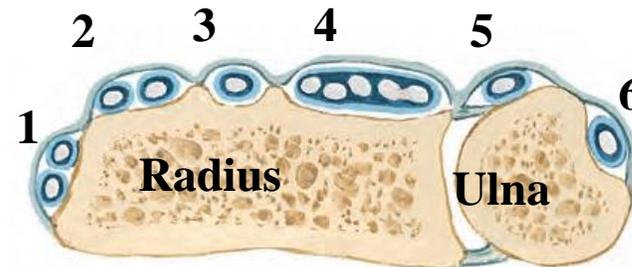
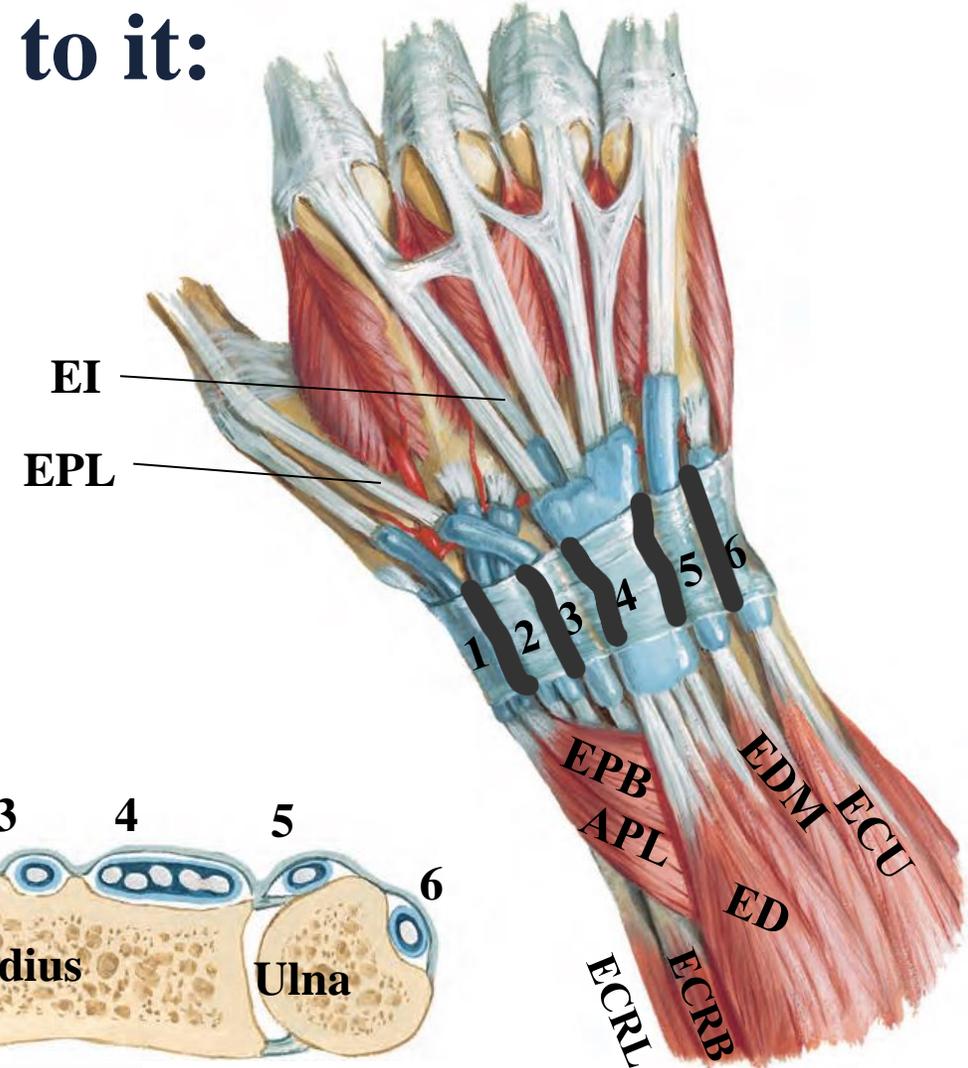


# Extensor Retinaculum

## Structures passing deep to it:

Five septa pass to the underlying radius and ulna and form **6 compartments**:

- ❑ **1<sup>st</sup> Compartment:**
  - **Abductor Pollicis Longus (APL)**
  - **Extensor Pollicis Brevis (EPB)**
- ❑ **2<sup>nd</sup> Compartment:**
  - **Extensor Carpi Radialis Longus (ECRL)**
  - **Extensor Carpi Radialis Brevis (ECRB)**
- ❑ **3<sup>rd</sup> Compartment: Extensor Pollicis Longus (EPL)**
- ❑ **4<sup>th</sup> Compartment:**
  - **Extensor Indices (EI)**
  - **Extensor Digitorum (ED)**
- ❑ **5<sup>th</sup> Compartment: Extensor Digiti Minimi (EDM)**
- ❑ **6<sup>th</sup> Compartment: Extensor Carpi Ulnaris (ECU)**



**Compartment 4**

Extensor digitorum  
Extensor indicis

**Compartment 3**

Extensor pollicis longus

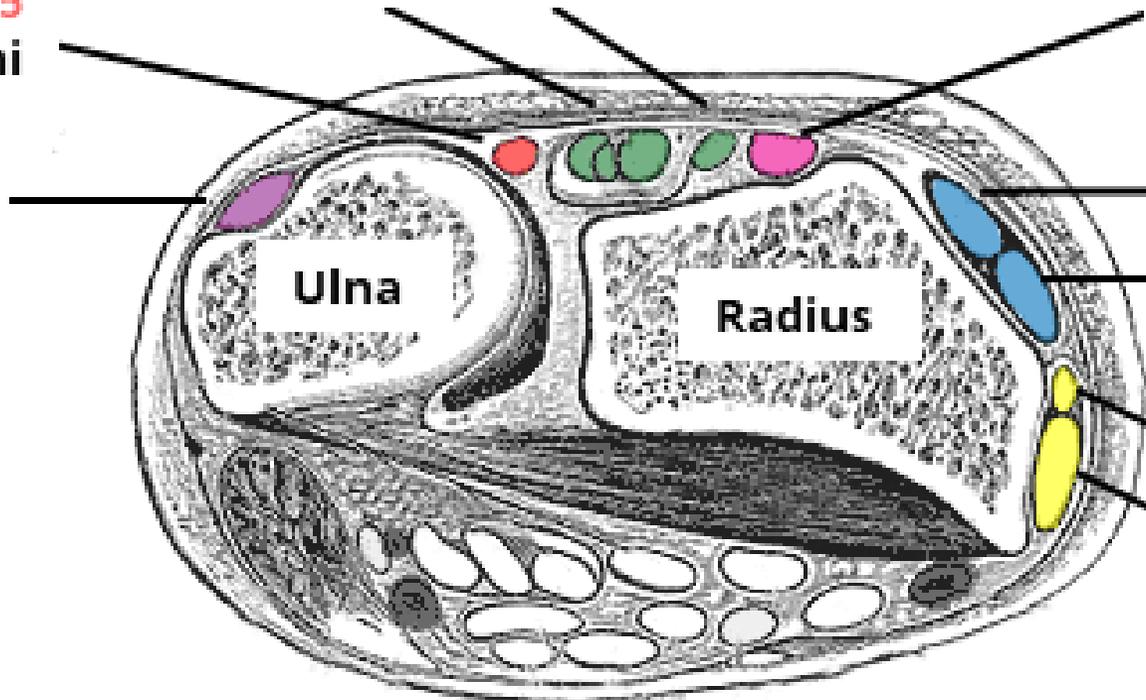
**Compartment 5**  
Extensor digiti minimi

**Compartment 2**

Extensor carpi radialis brevis  
Extensor carpi radialis longus

**Compartment 6**

Extensor carpi ulnaris

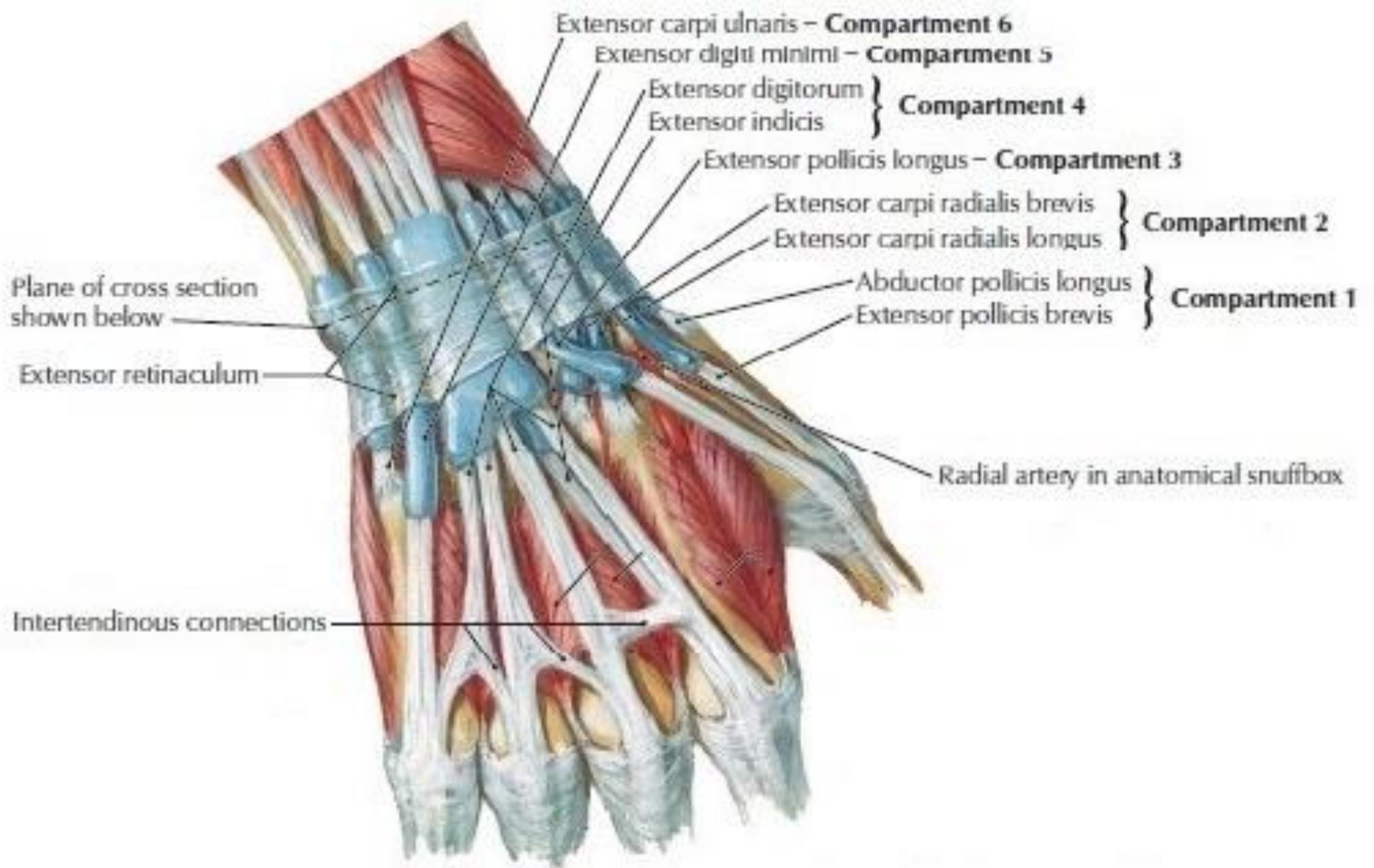


**Compartment 1**

Extensor pollicis brevis  
Abductor pollicis longus

Anterior





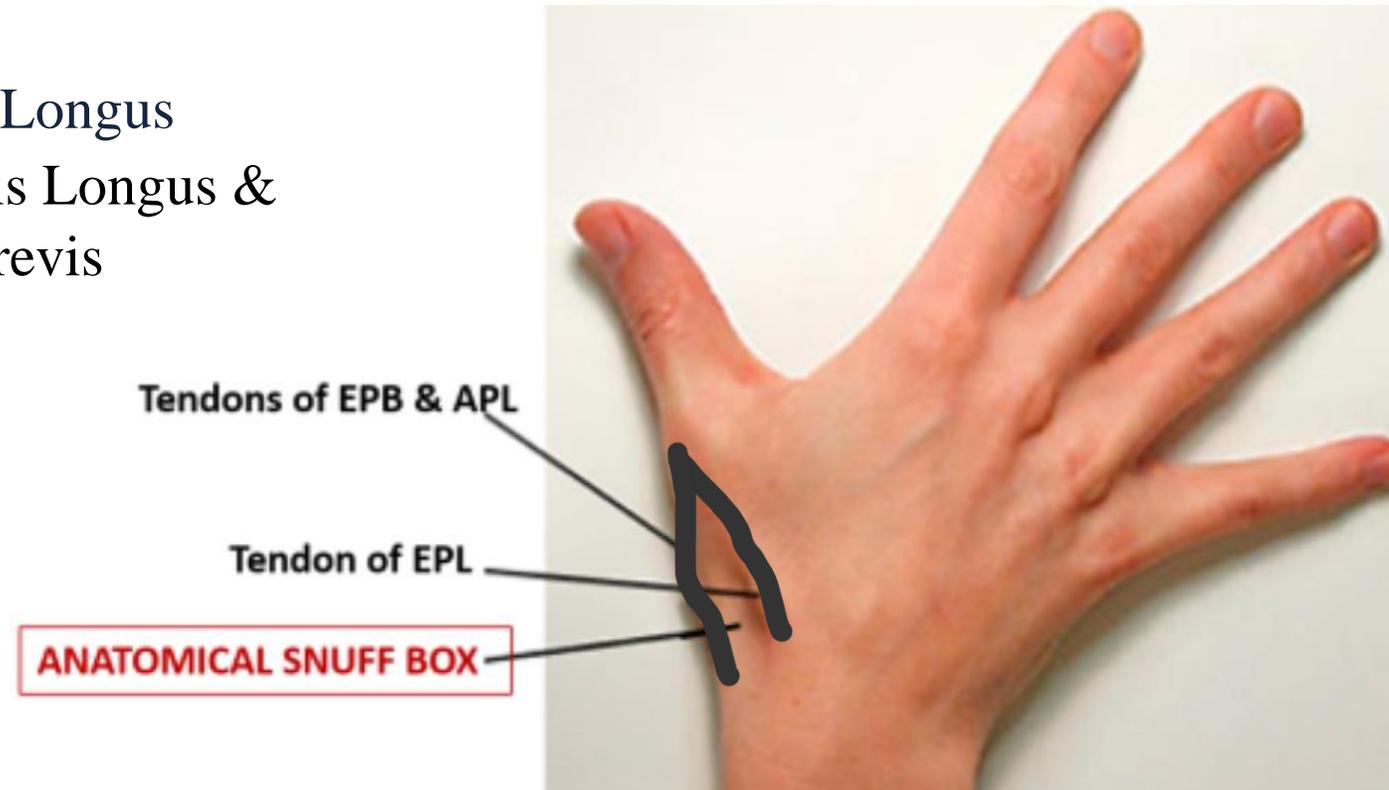
# Anatomical Snuffbox

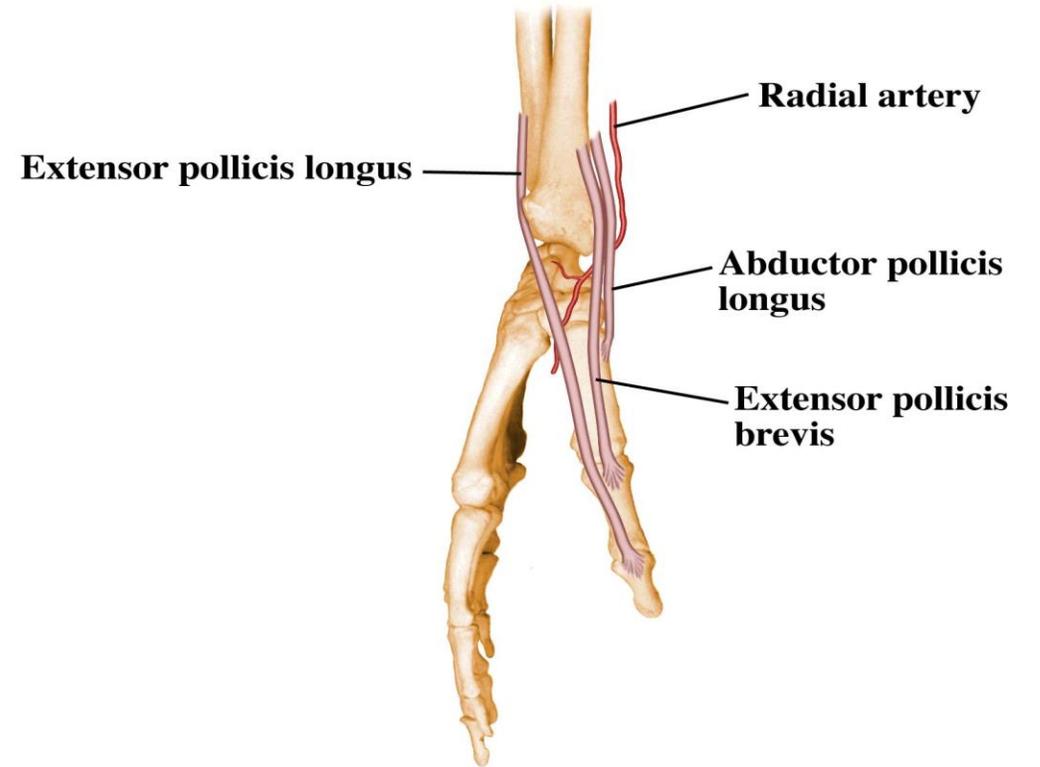
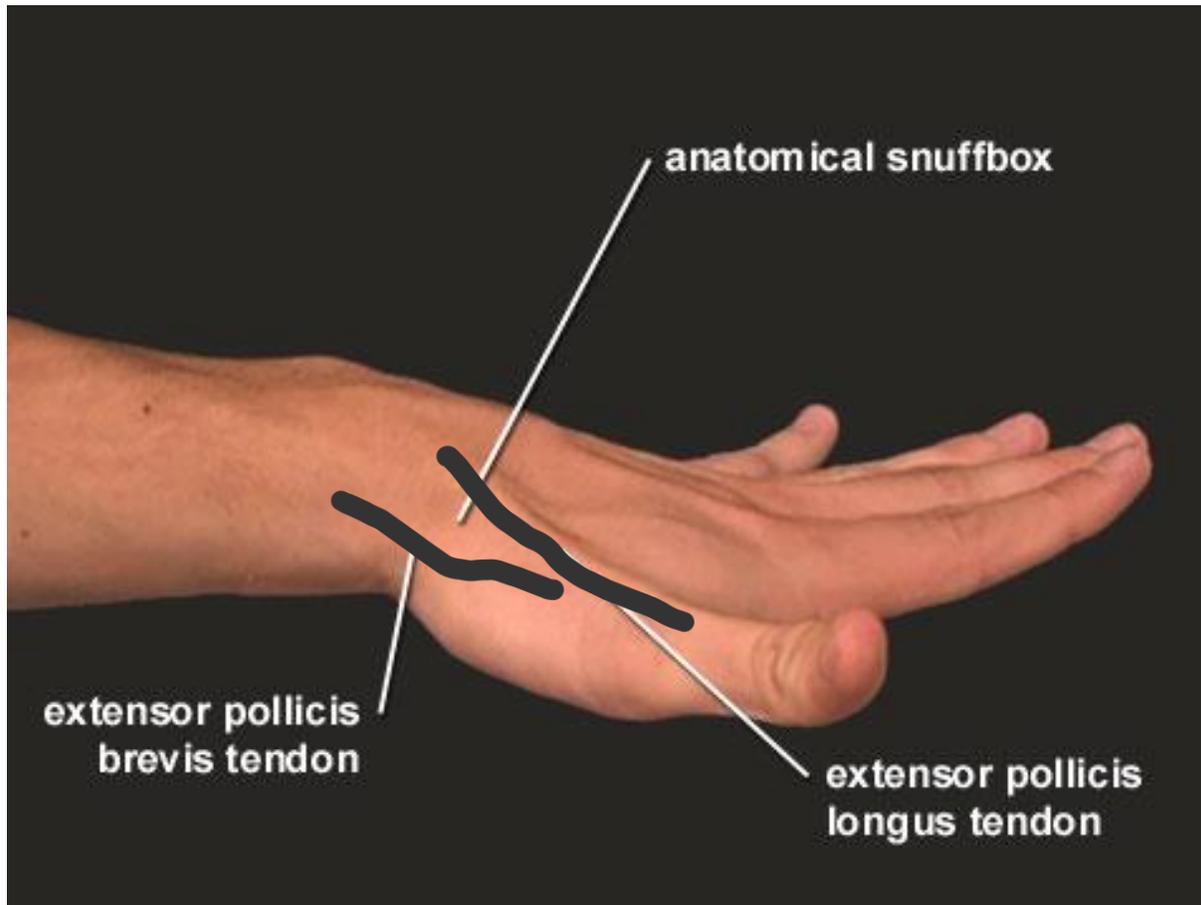
**Definition:** A depression on the lateral side of wrist.

It can be identified when the thumb is abducted and extended.

**Boundaries:**

- **Medially:** Tendon of Extensor Pollicis Longus
- **Laterally:** Tendons of Abductor Pollicis Longus & Extensor Pollicis Brevis
- **Contents:** **Radial artery**
- **Floor:**
  - Styloid process of radius
  - Scaphoid & Trapezium bones
- **Roof:** Skin containing:
  - Cephalic vein.
  - Radial nerve.**
  - Lateral cutaneous nerve of the forearm (continuation of musculocutaneous nerve).





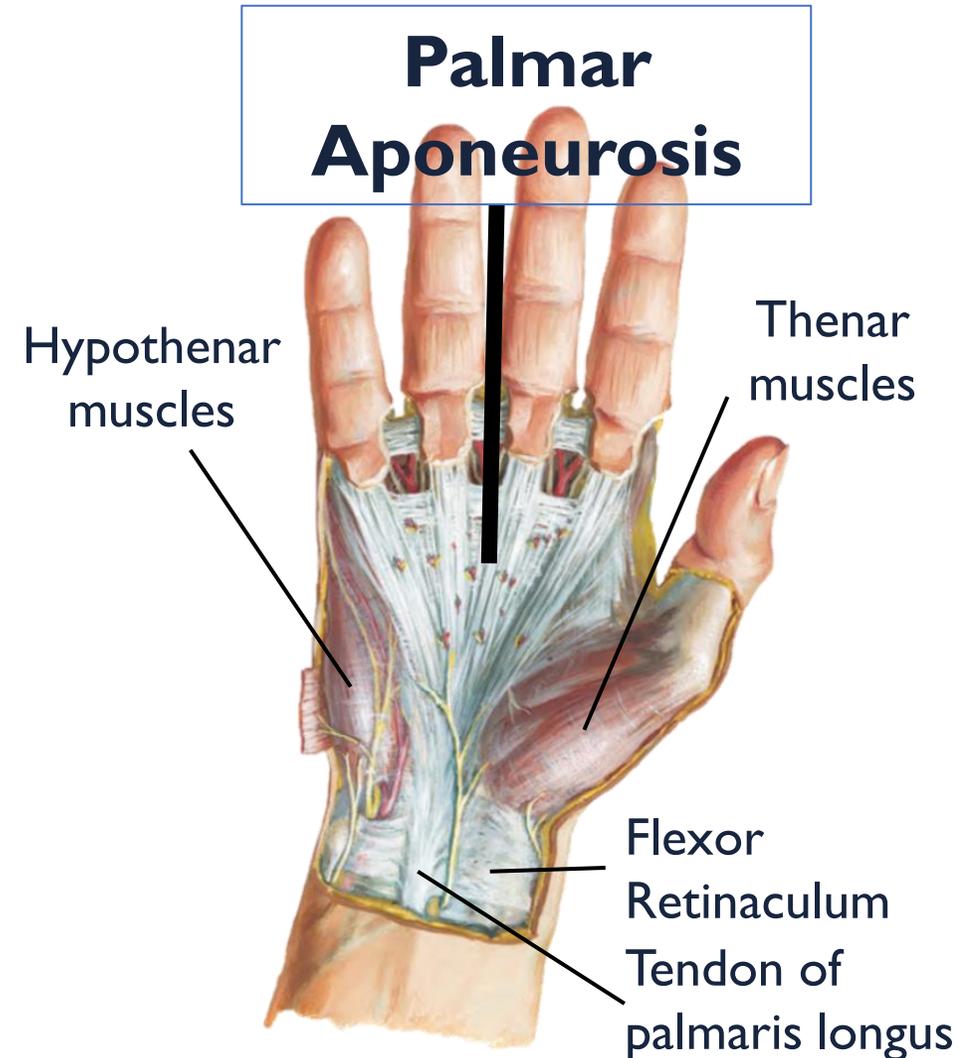
# Palmar Aponeurosis

**Definition:** A thickened part of the deep fascia that occupies the central area of the palm.

**Shape:** Triangular (tensed by palmaris longus muscle)

## Functions:

1. Gives attachment to the overlying skin to improve the grip of the palm of the hand.
2. Protects the underlying tendons.
3. Insertion of palmaris longus muscle

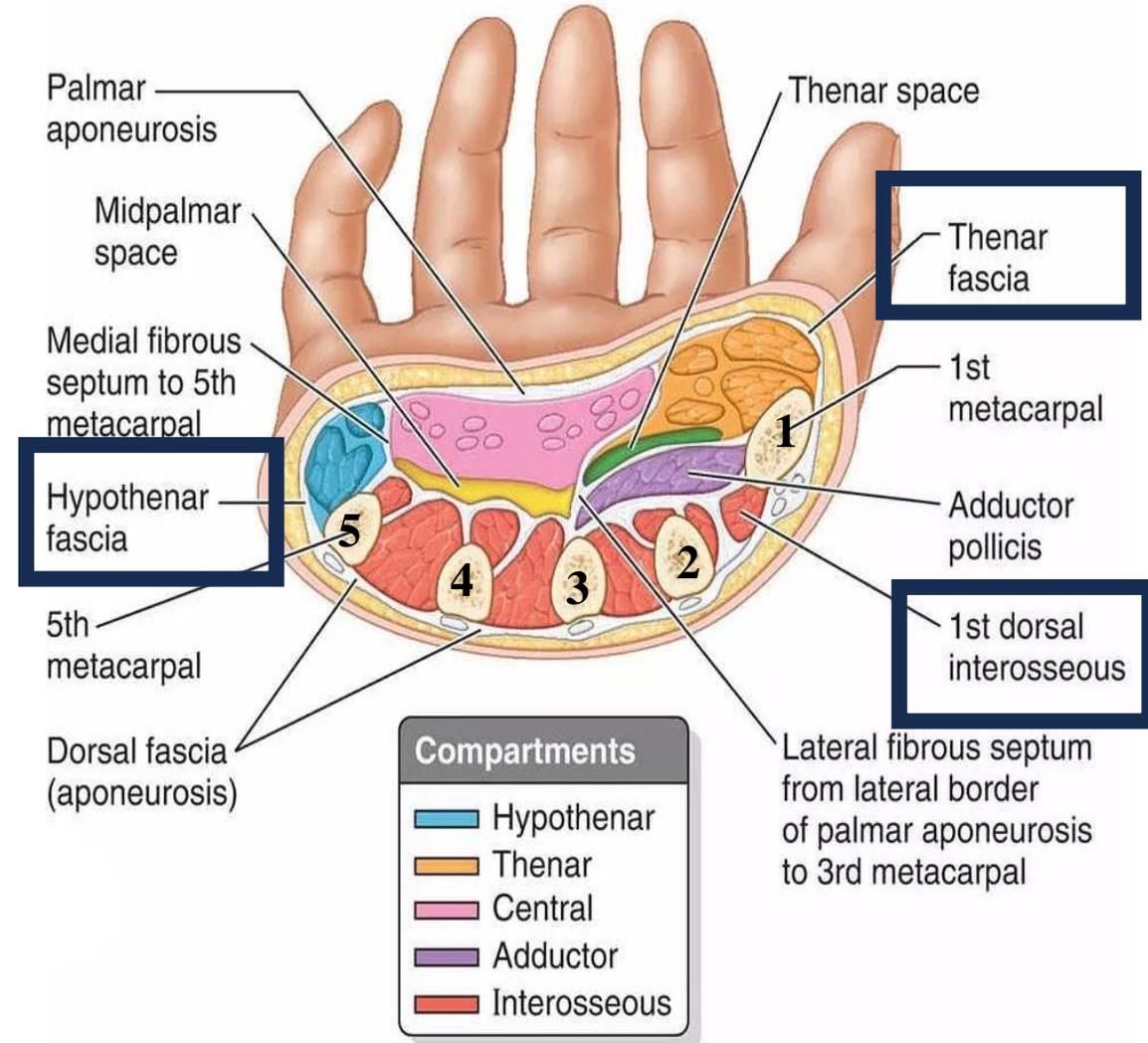


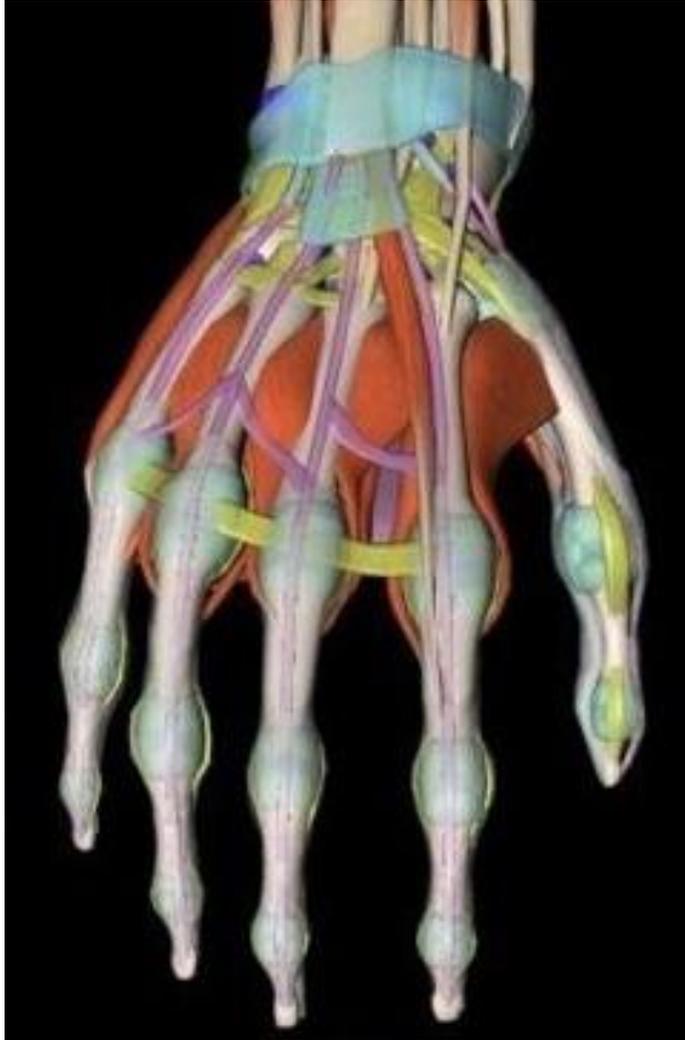
# Compartments of the hand

## Three fascial compartments

1. Lateral compartment: **thenar** muscles
2. Medial (hypothenar) compartment: **hypothenar** muscles.
3. Intermediate compartment:  
Between the lateral and medial palmar septa  
deep to the palmar aponeurosis.

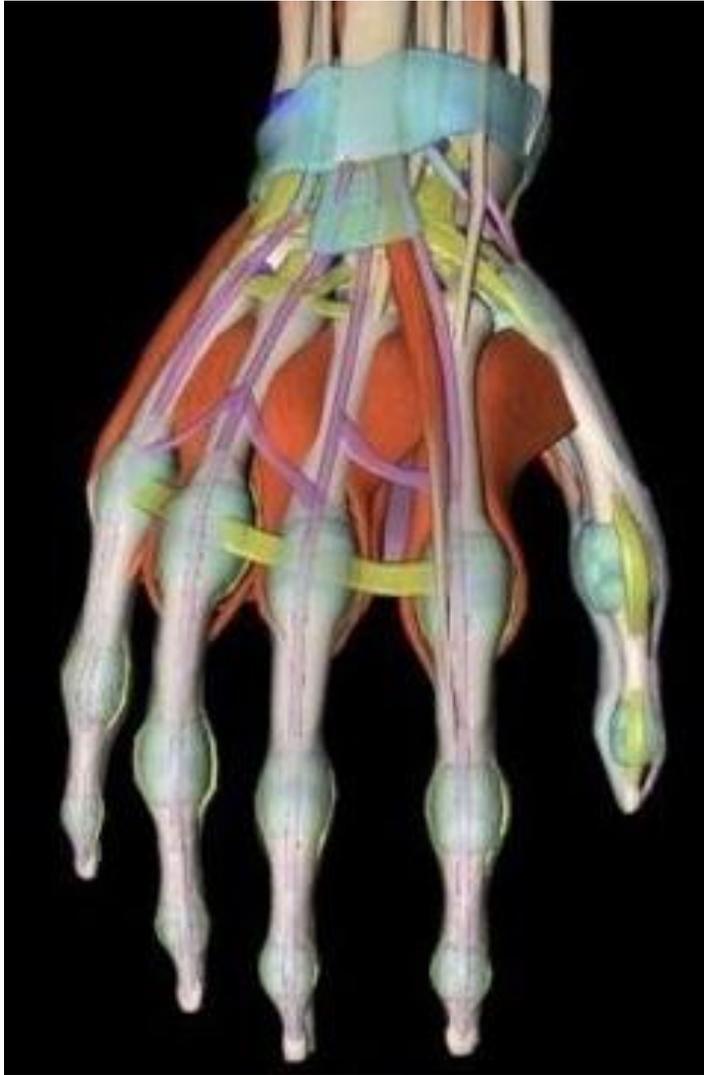
## Lumbricals & Interossei



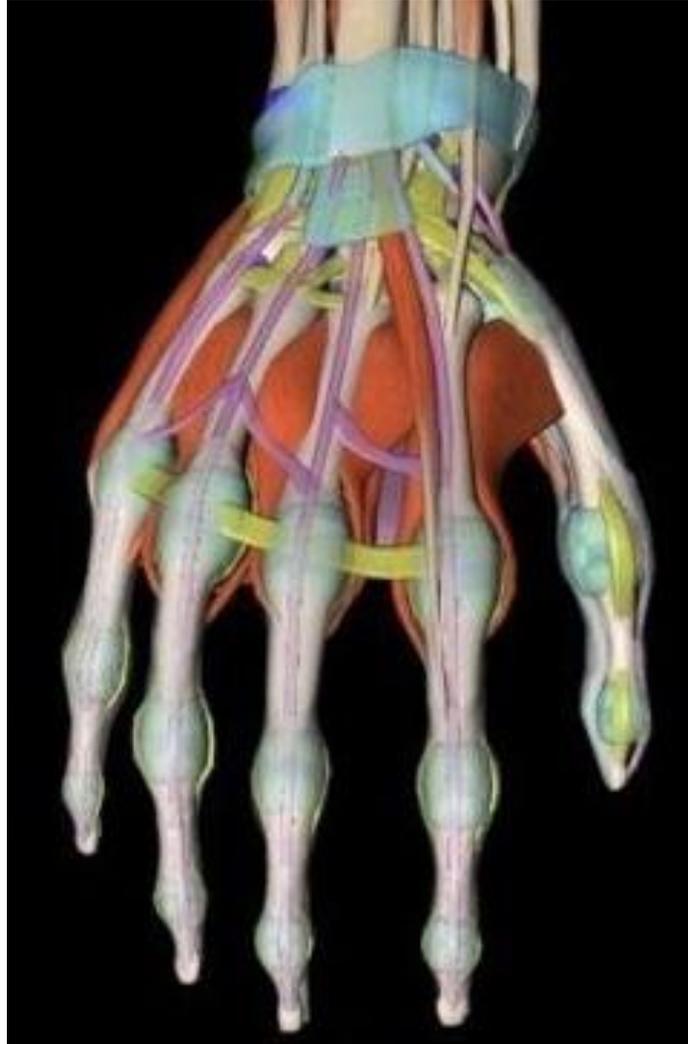


# Thenar muscles





# HYPOTHENAR MUSCLES



# Intermediate muscles

# Quiz

**Which vein originates at the anatomical snuffbox?**

- A) Median cubital vein**
- B) Cephalic vein**
- C) Ulnar vein**
- D) Axillary vein**
- E) Basilic vein**

**Answer: B**



# Muscles of the hand

## 20 Muscles

### 4 Lateral Muscles

### 4 Medial Muscles

### 4 Dorsal Interossei

### 4 Palmar Interossei

### 4 Lumbricals

1. Adductor Pollicis
2. Flexor Pollicis Brevis
3. Opponens Pollicis
4. Abductor Pollicis Brevis

Form the  
Thenar Muscles

1. Palmaris Brevis
2. Flexor Digiti Minimi
3. Opponens Digiti Minimi
4. Abductor Digiti Minimi

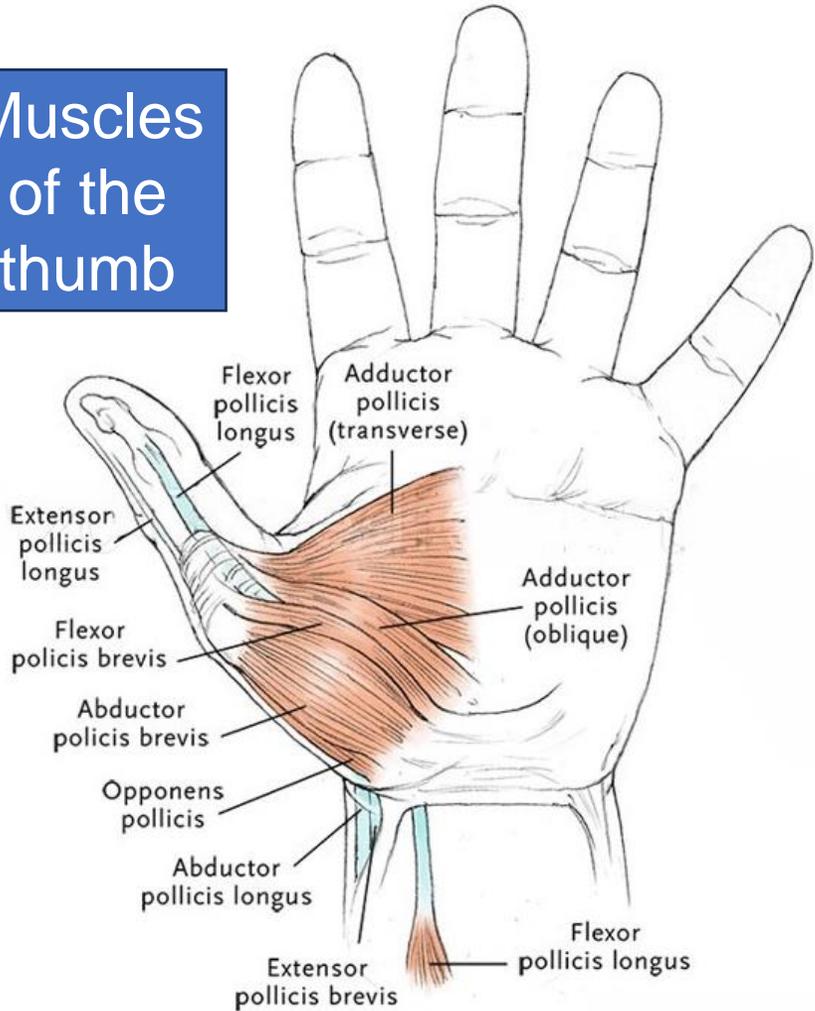
Form the  
Hypothenar Muscles

Between tendons of  
flexor digitorum  
profundus

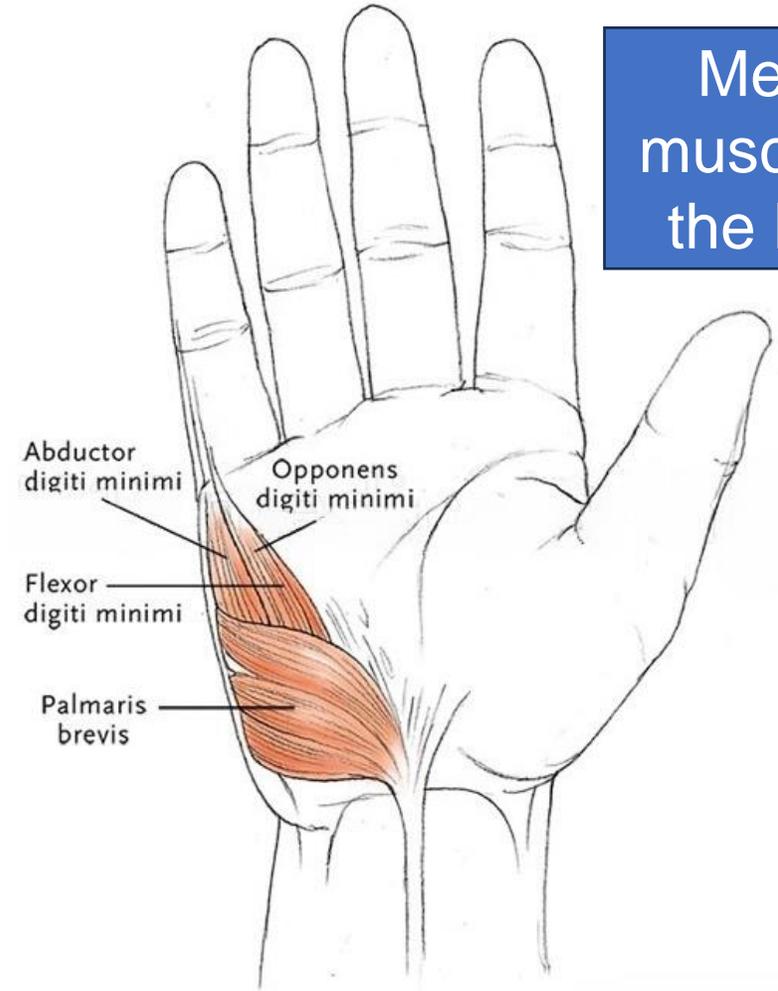
INTERMEDIATE COMPARTMENT

# Muscles of the hand

## Muscles of the thumb



## Medial muscles of the hand



# Palmaris Brevis

## Origin

Medial sides of flexor retinaculum & palmar aponeurosis

## Insertion

Skin on the ulnar border of the hand

## Nerve Supply

Superficial branch of ulnar nerve

## Action

Corrugates skin to improve grip of the hand  
(Cupping of the hand)



# Lumbricals

## Origin

From the lateral sides of the tendons of flexor digitorum profundus

## Insertion

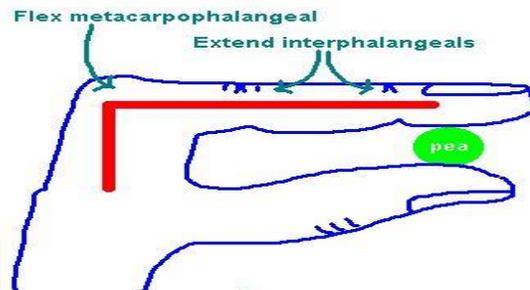
Corresponding extensor expansion of medial 4 fingers

## Nerve Supply

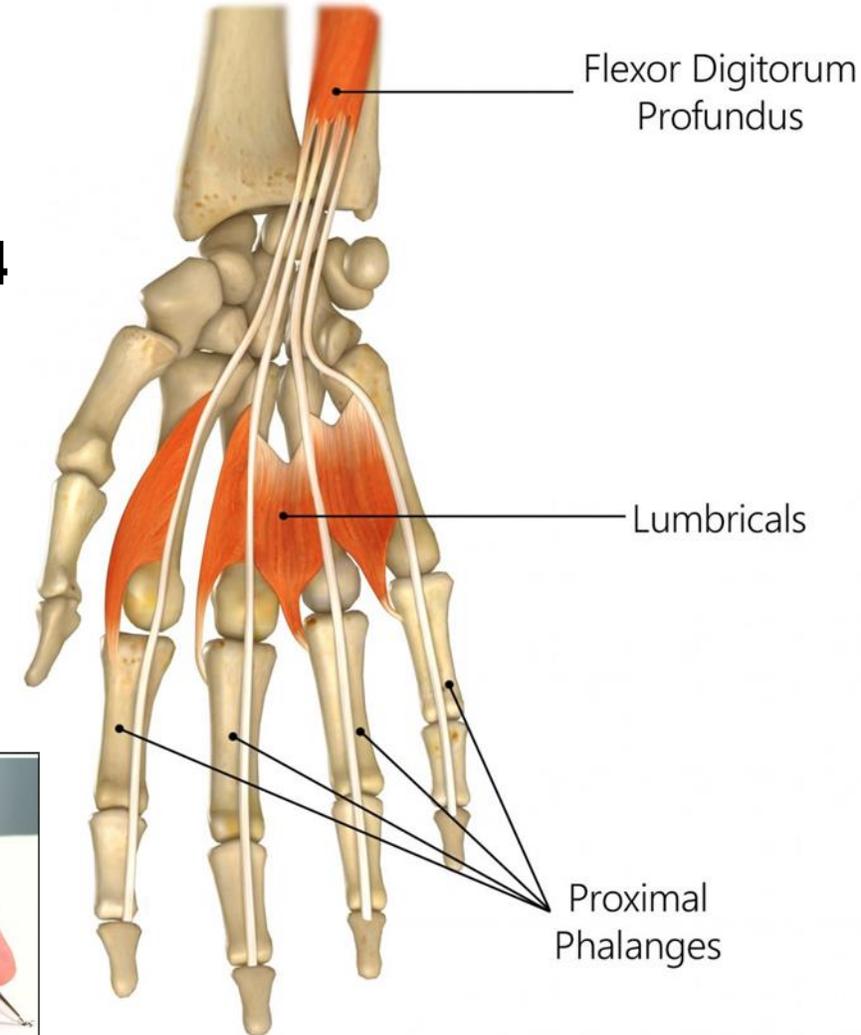
- Medial 2: Ulnar nerve
- Lateral 2: Median nerve

## Action

Flexion of the metacarpophalangeal joint & Extension of interphalangeal joints of the medial 4 fingers (**Writing Position**)



Lumbrical



# Dorsal Interossei

## Origin

By 2 heads from adjacent sides metacarpal bones

## Insertion

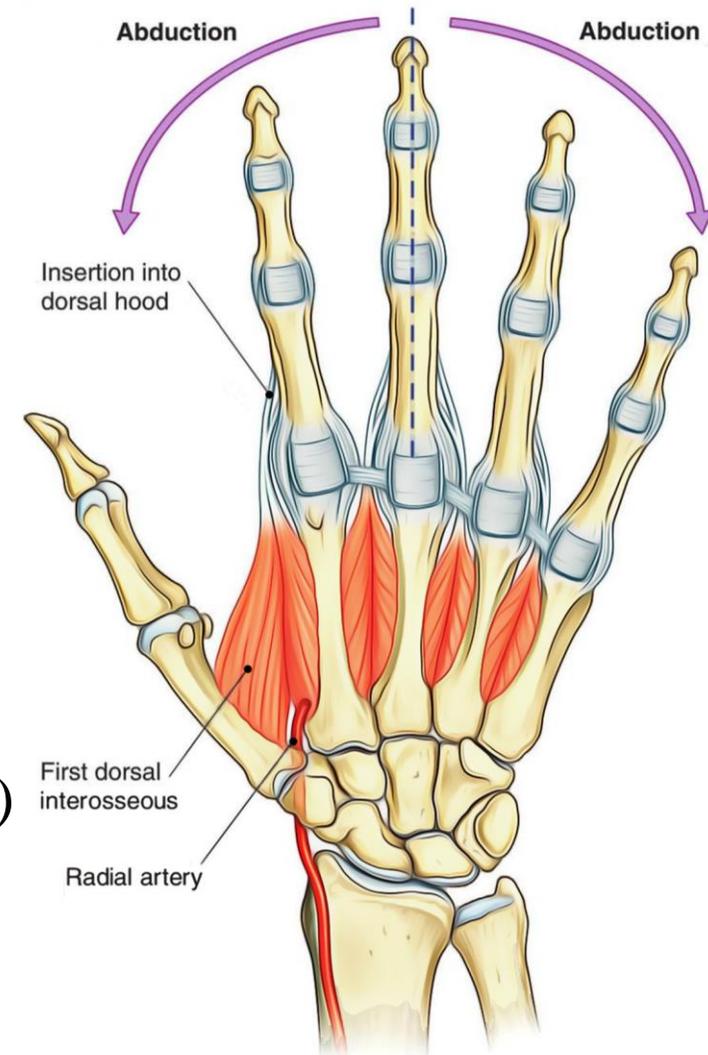
Into the lateral sides of extensor expansion of the middle 3 fingers:

## Nerve Supply

Deep branch of ulnar nerve

## Action

- **Abduct** Fingers Away from the center (middle finger)
- Flexion of the MCP joint & Extension of IP joints of the middle 3 fingers (**Writing Position**)



# Palmar Interossei

**Number:**

**Three - four**

**Nerve Supply**

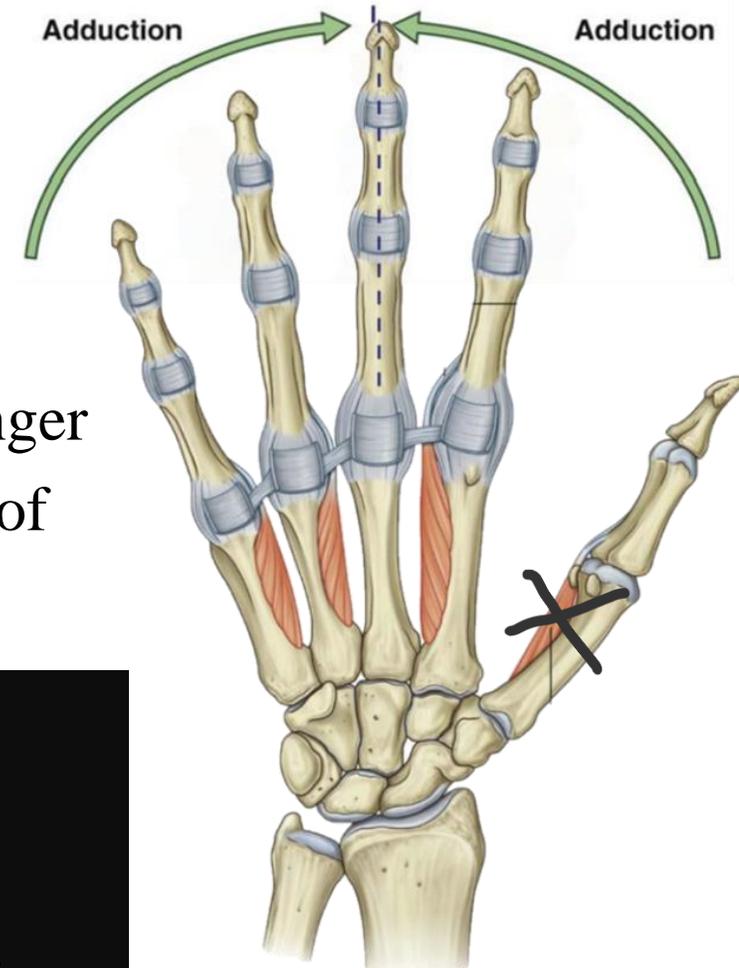
**Deep branch of ulnar nerve**

**Action**

- **Adduct** the other 4 Fingers towards the middle finger
- Flexion of the MCP joint & extension of IP joints of the index, ring & little finger (**Writing Position**)

**NB:**

- The first may be absent
- The middle finger has no palmar interossei



# Motor supply of the hand

❖ **All the muscles of the hand are supplied by deep branch of ulnar nerve except:**

**A. the three muscle of the thenar eminence ➡ Supplied by the median nerve**

**B. the 1st & 2nd lumbricals ➡ Supplied by the median nerve**

# Cutaneous Innervation of the hand

## A) Palm of the hand:

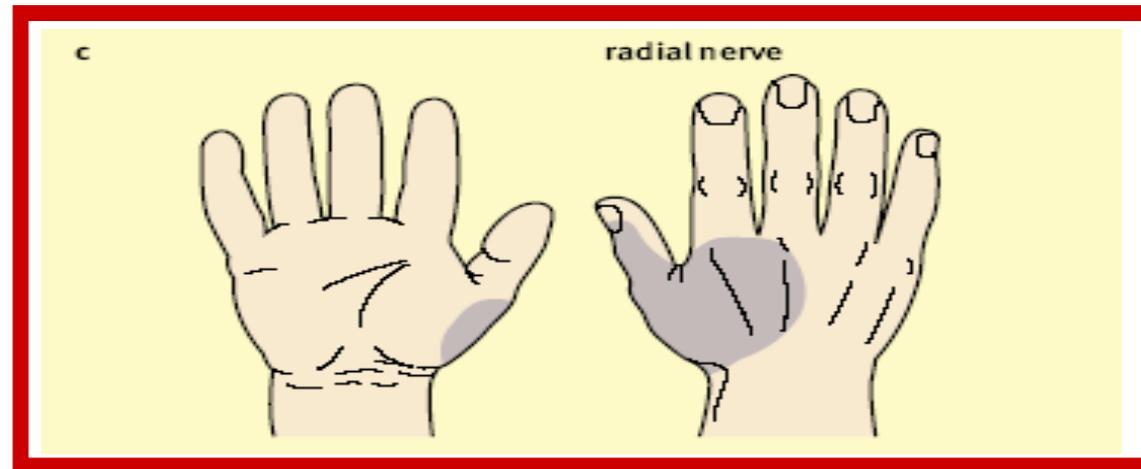
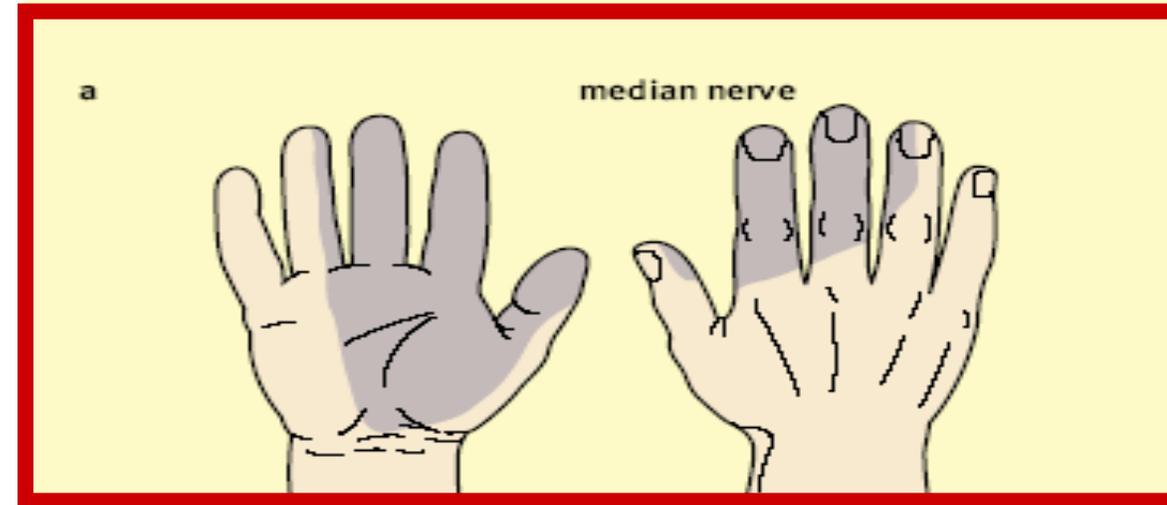
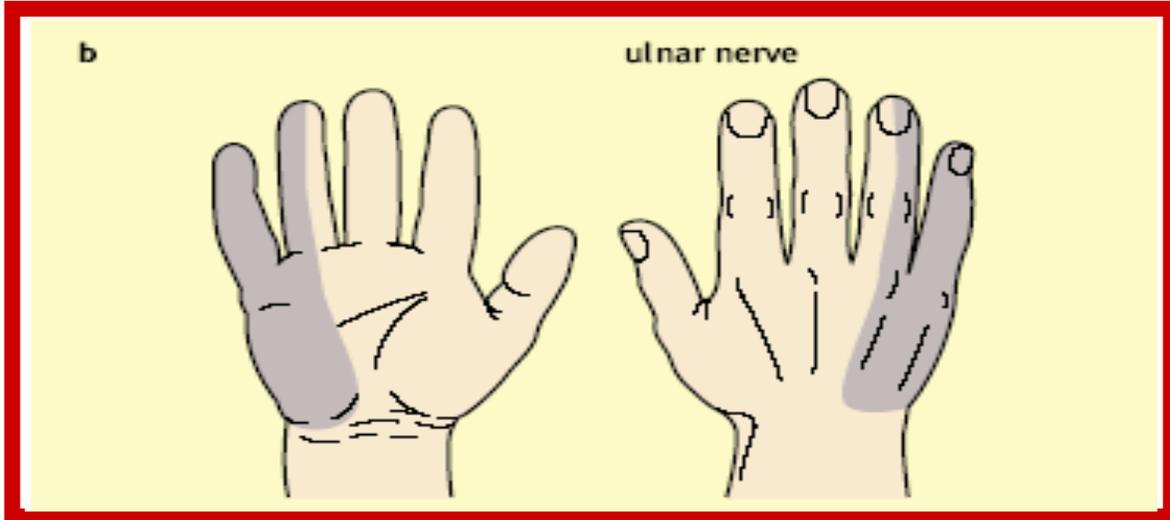
1. lateral two-thirds of the palm and the lateral three and half fingers (reaching the nail bed and middle phalanx on the dorsum): **median nerve**
2. Medial third of the palm hand and the medial one and half fingers: **ulnar nerve**

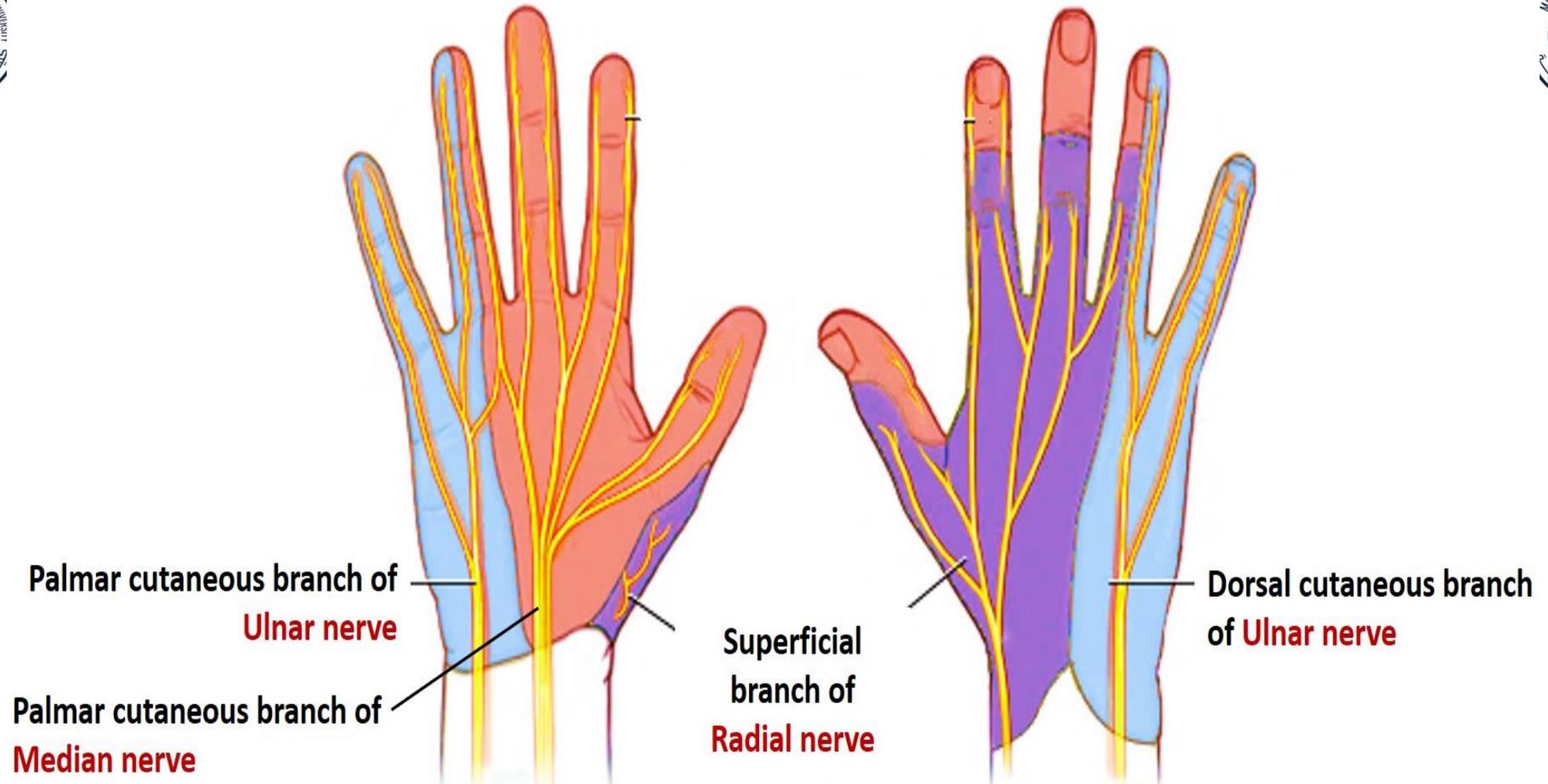
# Cutaneous Innervation of the hand

## B) Dorsum of the hand:

1. Lateral two-thirds of the dorsum of the hand and the lateral three and half fingers as far as the middle phalanx: **radial nerve**
2. Medial third of the dorsum of the hand and the medial one and half fingers: **ulnar nerve**

# Nerve supply of the hand





 Area supplied by ulnar nerve

 Area supplied by median nerve

 Area supplied by radial nerve

# Quiz

Which finger has no palmar interossei acting on it?

- A) Thumb
- B) Index
- C) Middle finger
- D) Ring finger
- E) Little finger

**Answer: C**

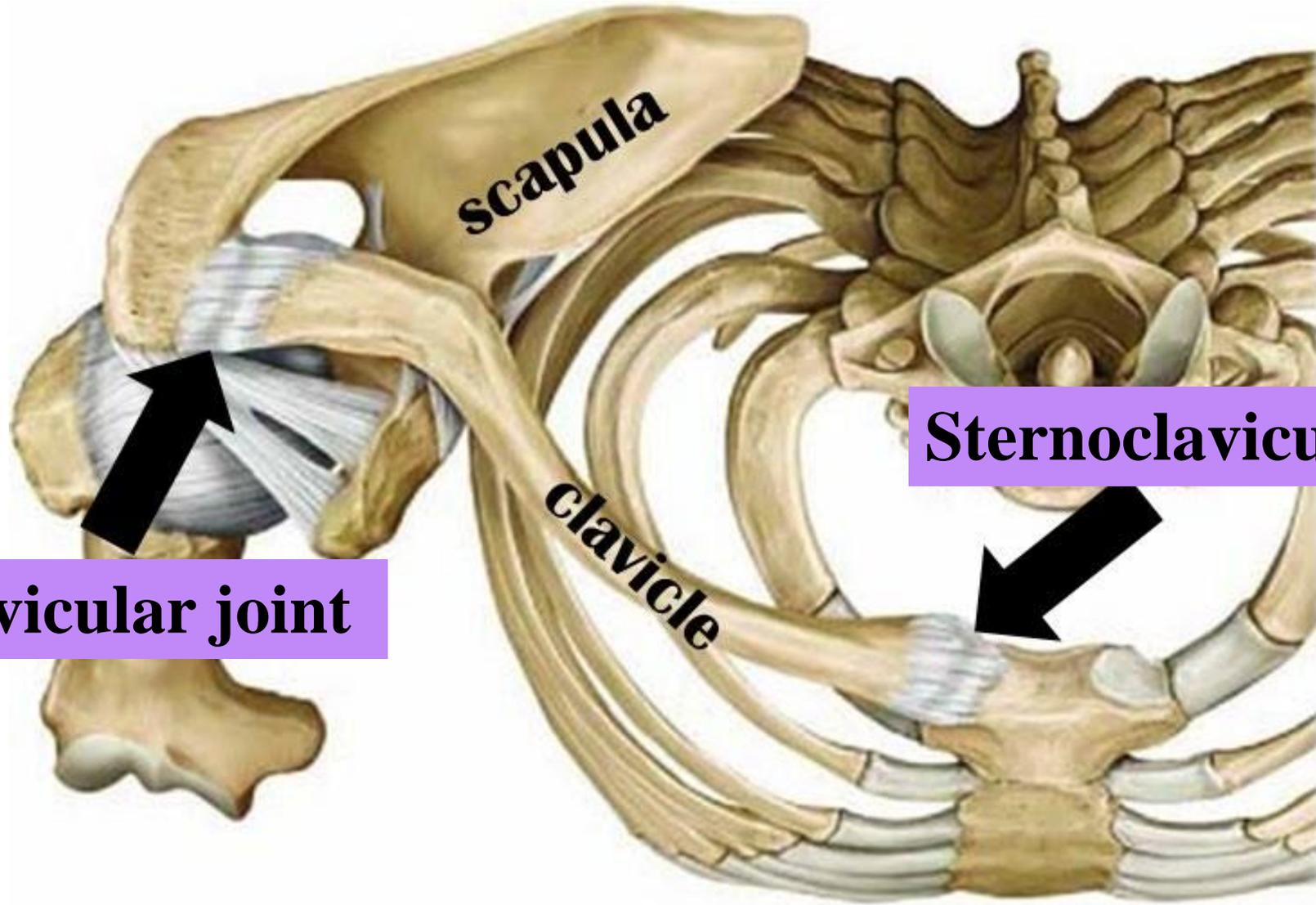


# Joints of upper limb





# Shoulder Girdle



scapula

clavicle

Sternoclavicular joint

Acromioclavicular joint

# SHOULDER GIRDLE

## Def:

Bones through which upper extremity is attached to trunk.

**Bones:** Scapula and clavicle.

## Joints:

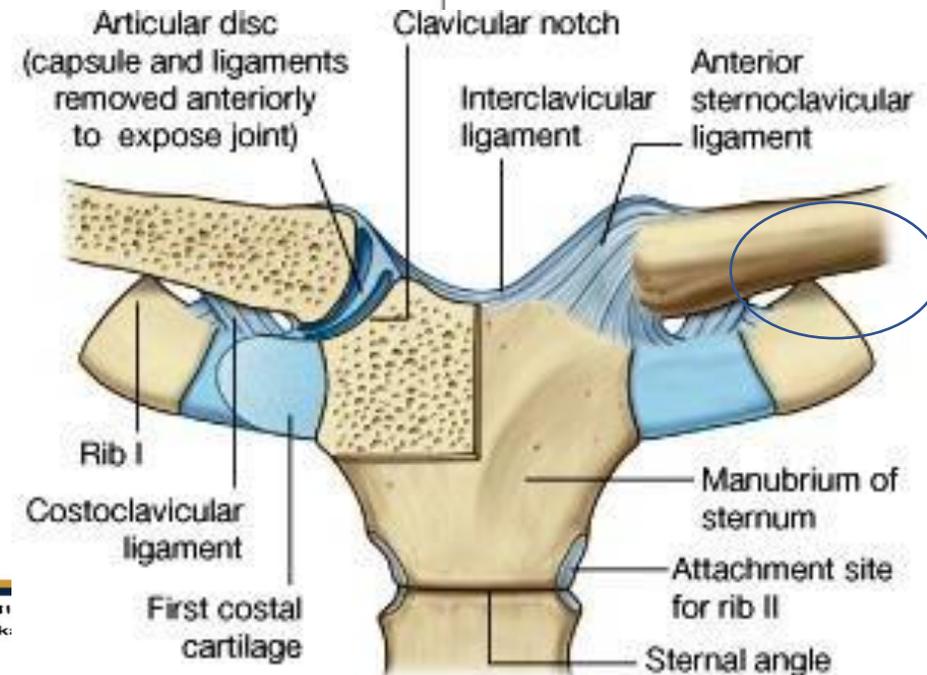
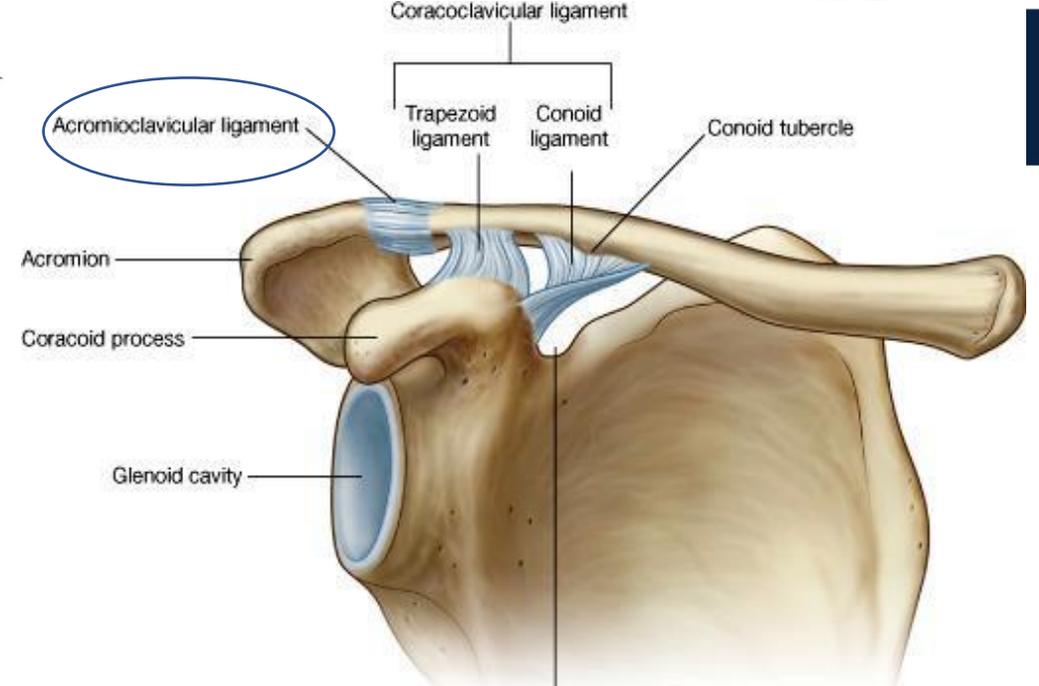
1. Acromioclavicular.
2. Sternoclavicular.

## 1. Acromioclavicular joint

•Type: Synovial plane.

## 2. Sternoclavicular joint

•Type: Synovial saddle.

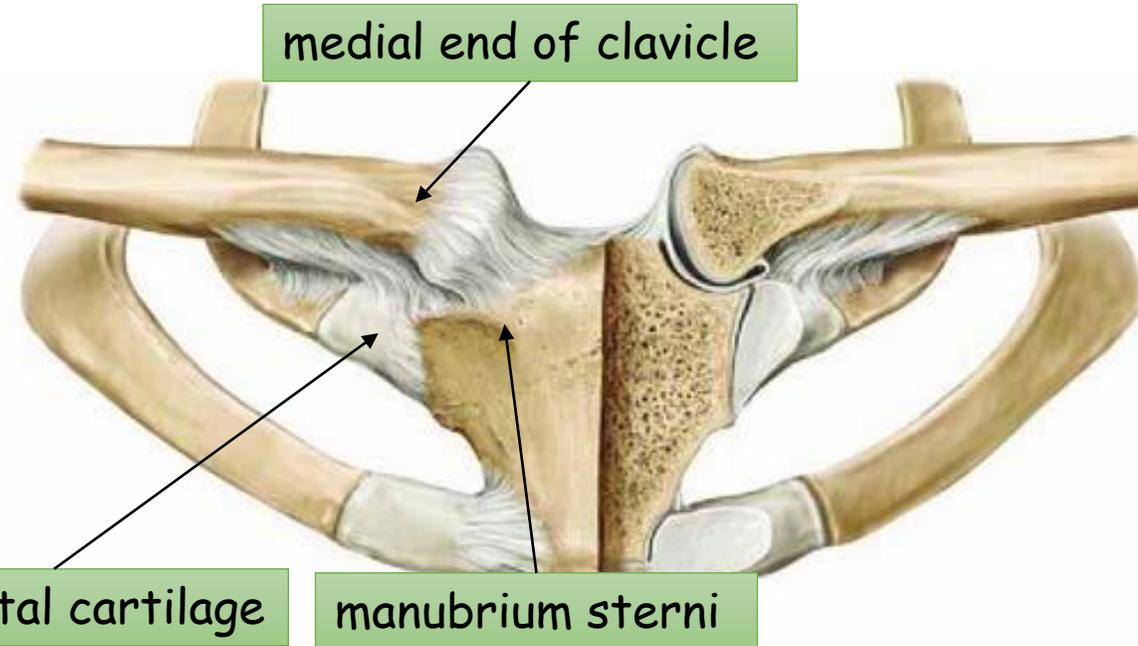


# Sternoclavicular joint

Type

Synovial saddle

bones



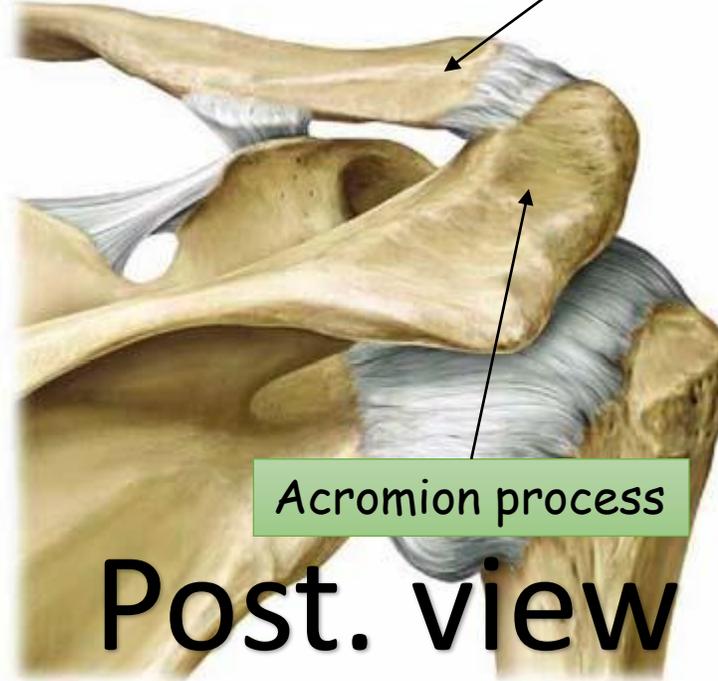
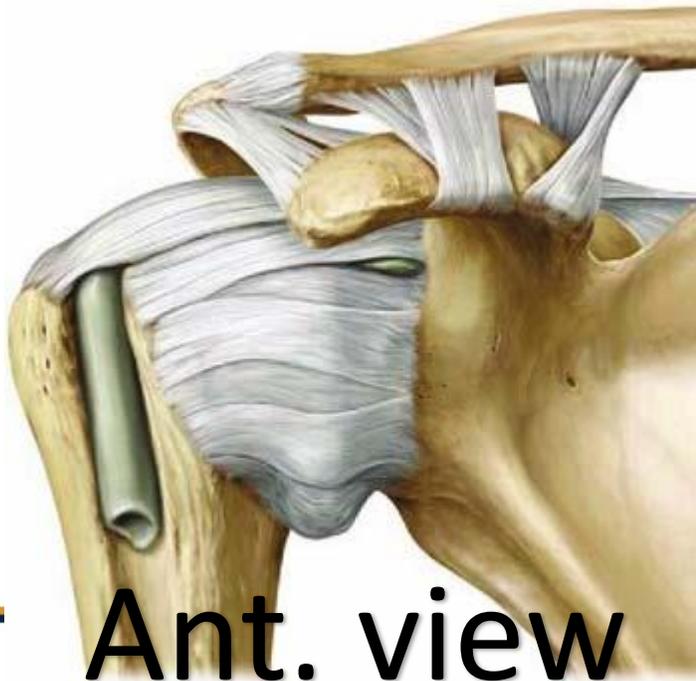
## Ant. view

# Acromioclavicular joint

Type

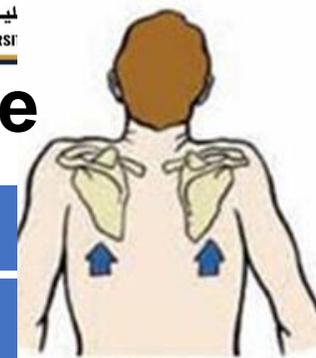
Synovial plane

bones

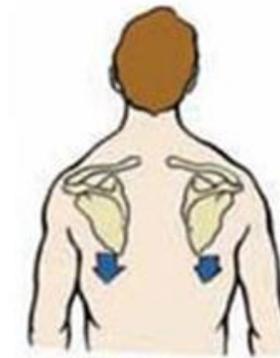


# Movements of shoulder girdle

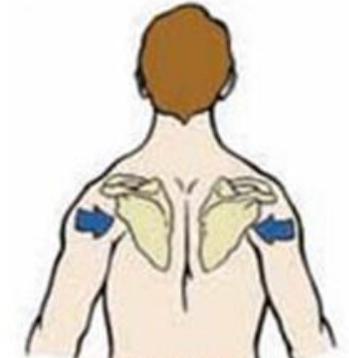
Movement	Muscles producing it
Elevation of shoulder	Upper trapezius, Levator scapulae.
Depression of shoulder	Subclavius, Pectoralis minor and Lower trapezius.
Protraction (abduction of scapula)	Serratus anterior and Pectoralis minor.
Retraction (adduction of scapula)	Rhomboids, trapezius
Upward rotation of the scapula	Upper trapezius and lower 5 digitations of Serratus anterior
Downward rotation of the scapula	Levator scapulae, Rhomboids.



Elevation



Depression



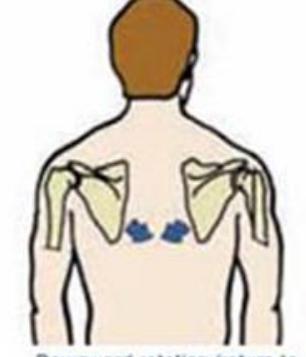
Adduction (retraction)



Abduction (protraction)



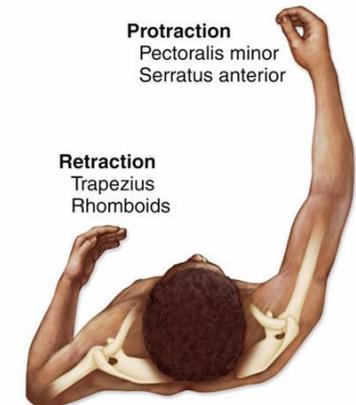
Upward rotation



Downward rotation (return to anatomical position)



Retracted scapulae ("good posture")



Protracted scapulae ("poor posture")

**Protraction**  
Pectoralis minor  
Serratus anterior

**Retraction**  
Trapezius  
Rhomboids

# Movements of shoulder girdle

**Elevation**

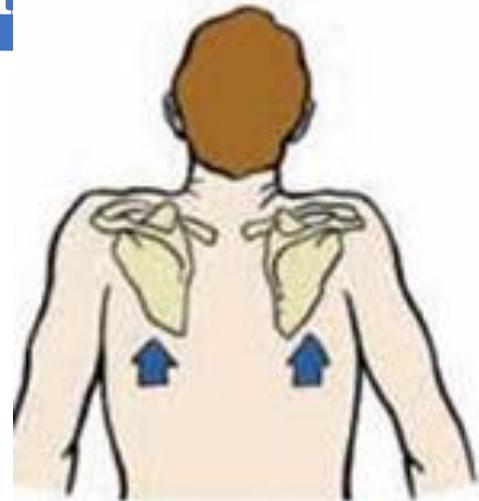
**Depression**

**Protraction**

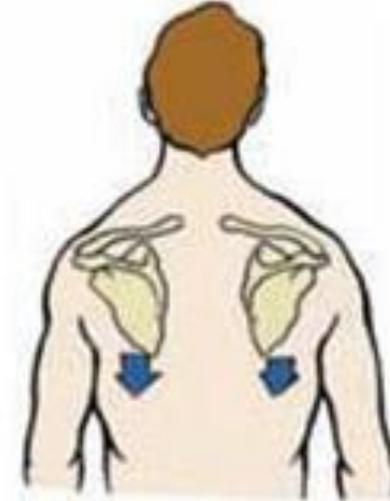
**Retraction**

**Downward rotation**

**Upward rotation**



Elevation



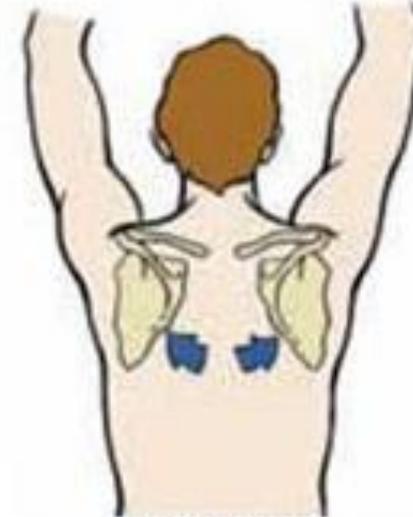
Depression



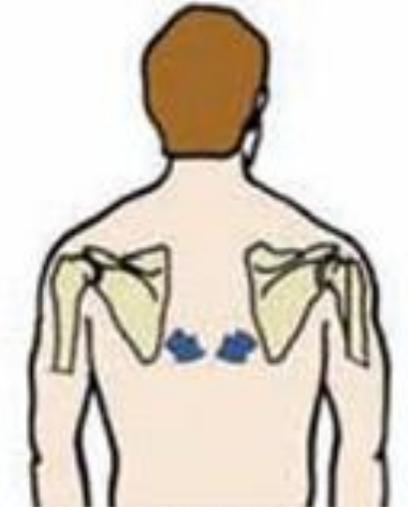
Adduction (retraction)



Abduction (protraction)



Upward rotation



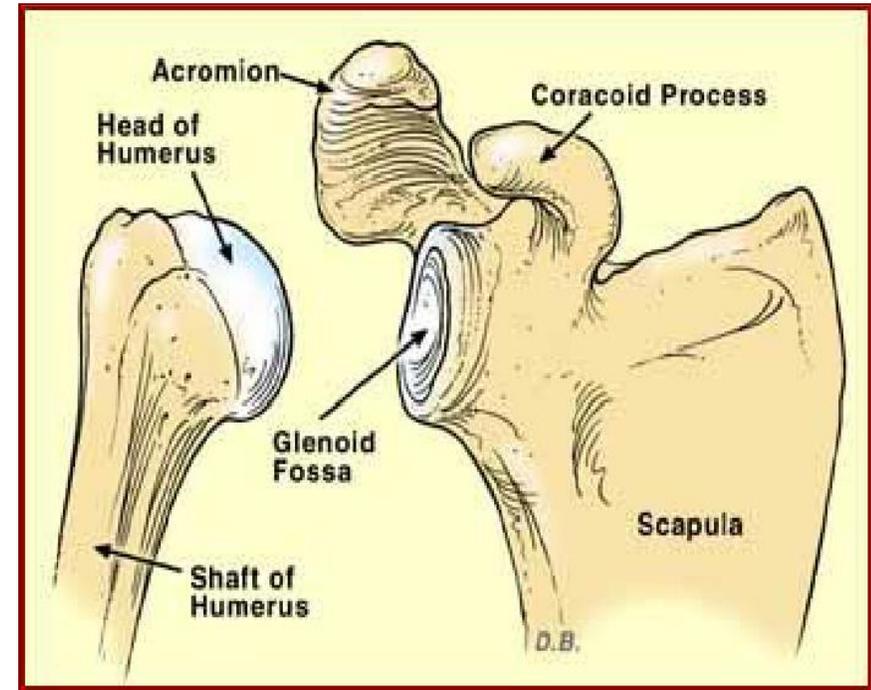
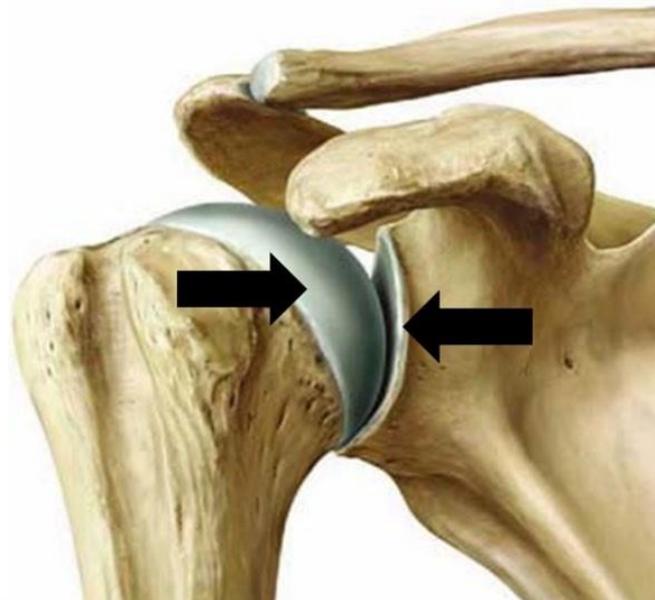
Downward rotation (return to anatomical position)



# Shoulder joint

# Shoulder joint

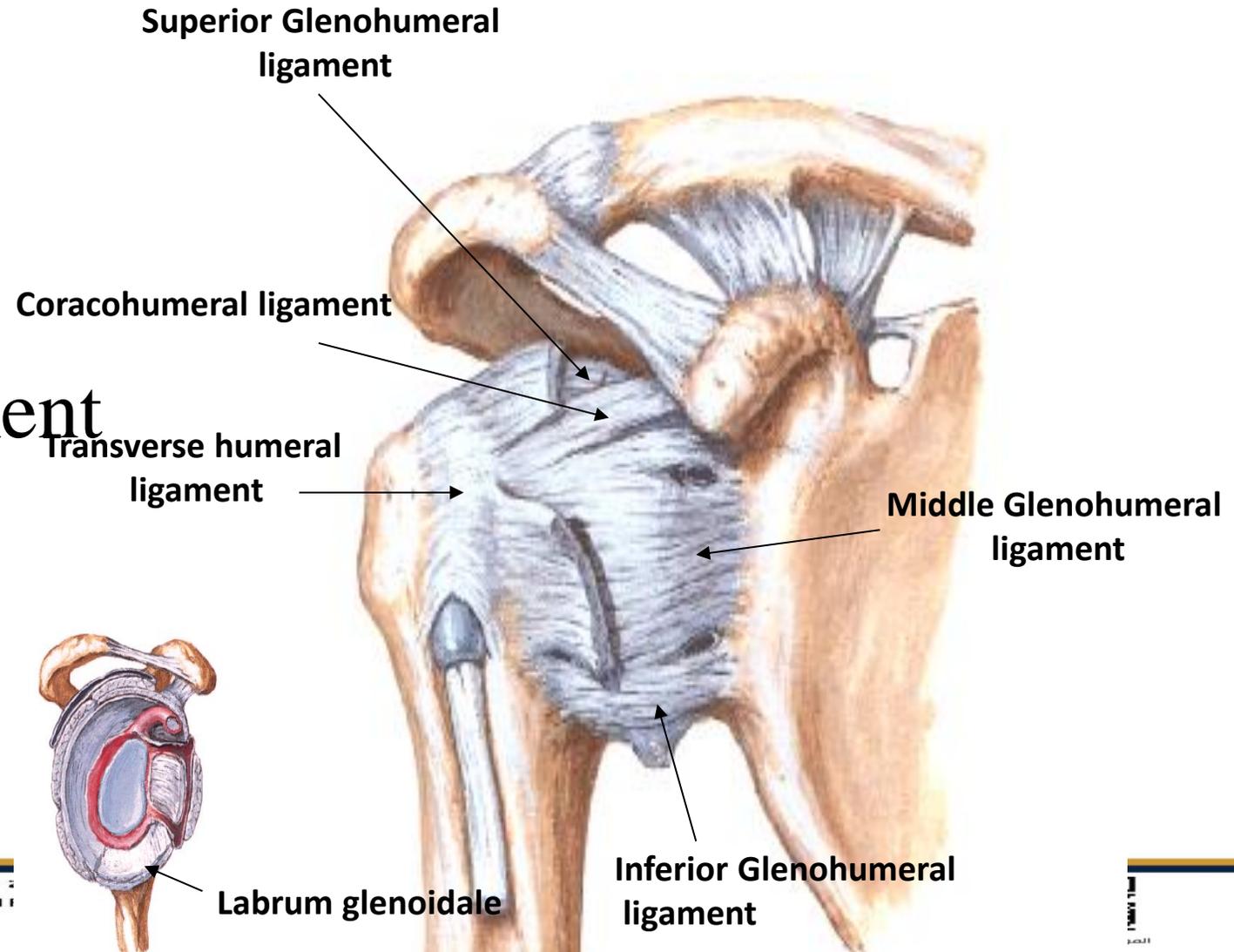
- **Type: synovial ball & socket.**
- **Articulating bones:** head of humerus & glenoid cavity of scapula.



# Shoulder joint

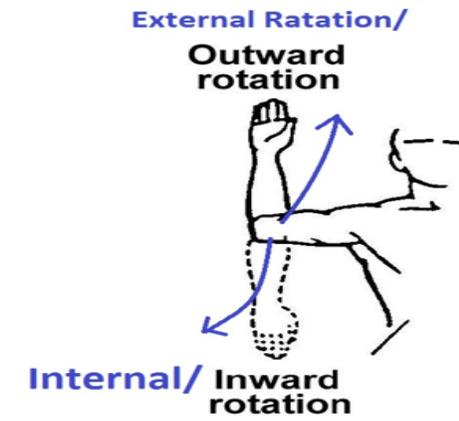
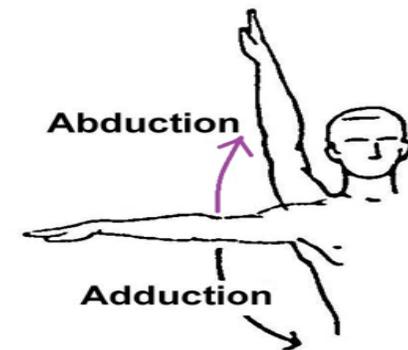
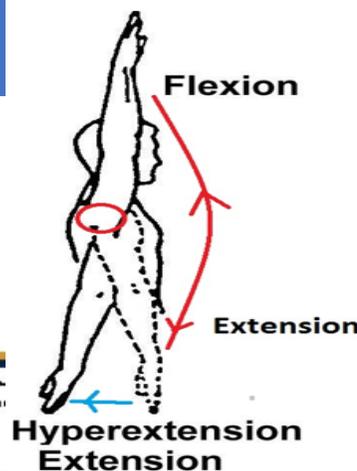
## • Ligaments:

1. Coracohumeral ligament
2. Glenohumeral ligament
3. Transverse humeral ligament

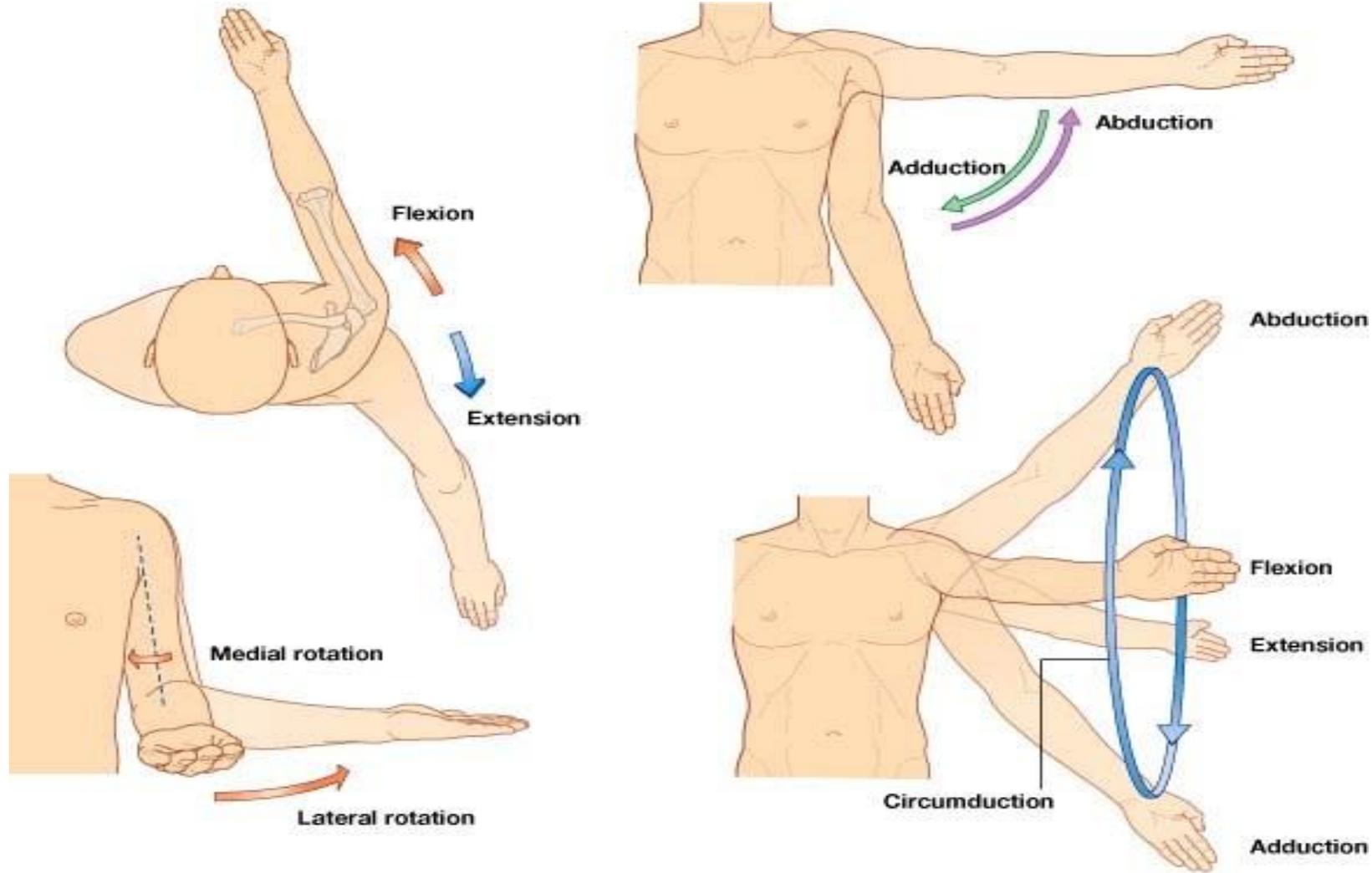


	<u>Flexion</u>	<u>Extension</u>
<b>Main muscles:</b>	Pectoralis major (clavicular head). Deltoid (ant. fibers). Coracobrachialis	Latissimus dorsi Teres major. Deltoid (post fibers).
	<u>Abduction</u>	<u>Adduction</u>
<b>Main muscles:</b>	Supraspinatus (0-15°) Deltoid, Middle fiber (15-90°).	- Pectoralis major (whole). -Latissimus dorsi. -Teres major.
	<u>Medial rotation</u>	<u>Lateral rotation</u>
<b>Main muscles:</b>	-Pectoralis major (whole). Latissimus dorsi. Teres major Subscapularis	Infraspinatus Teres minor.

**Circumduction:** association of flexion, abduction, extension and adduction in succession



# Movements of the shoulder joint

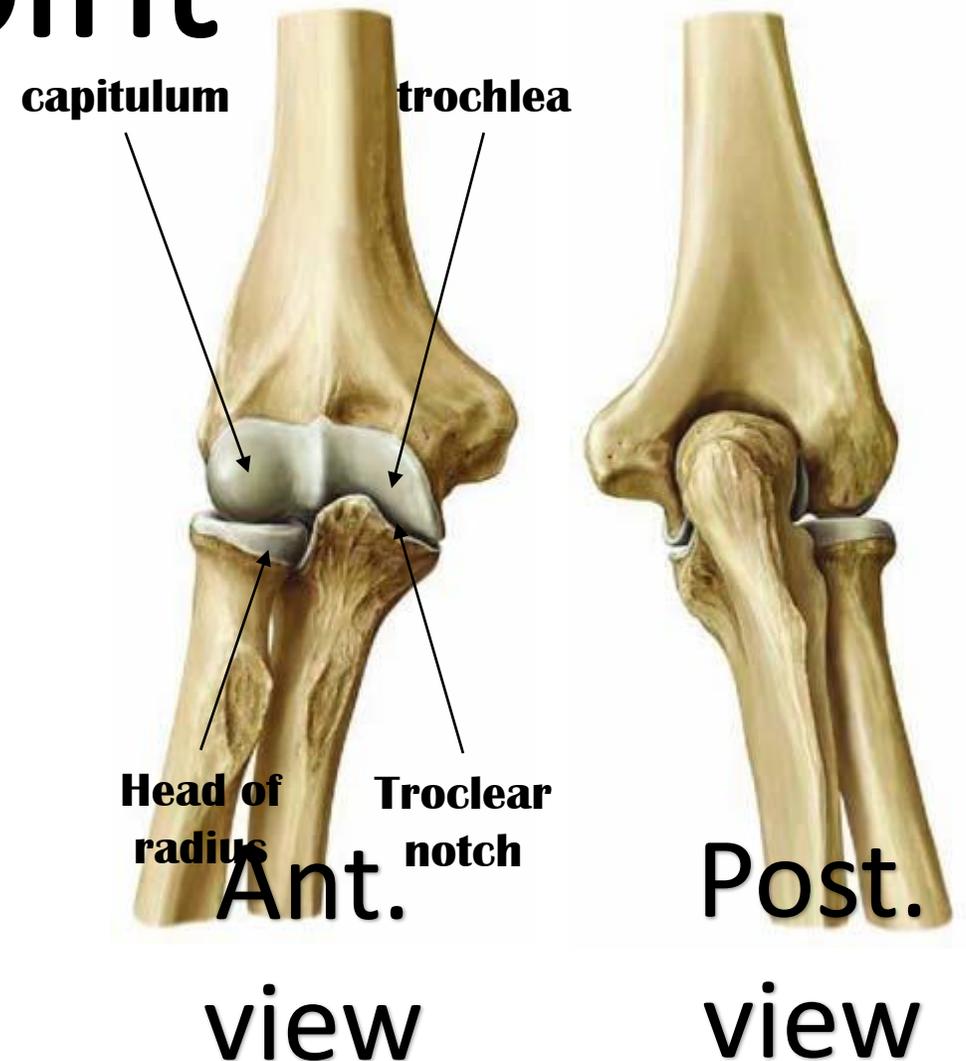


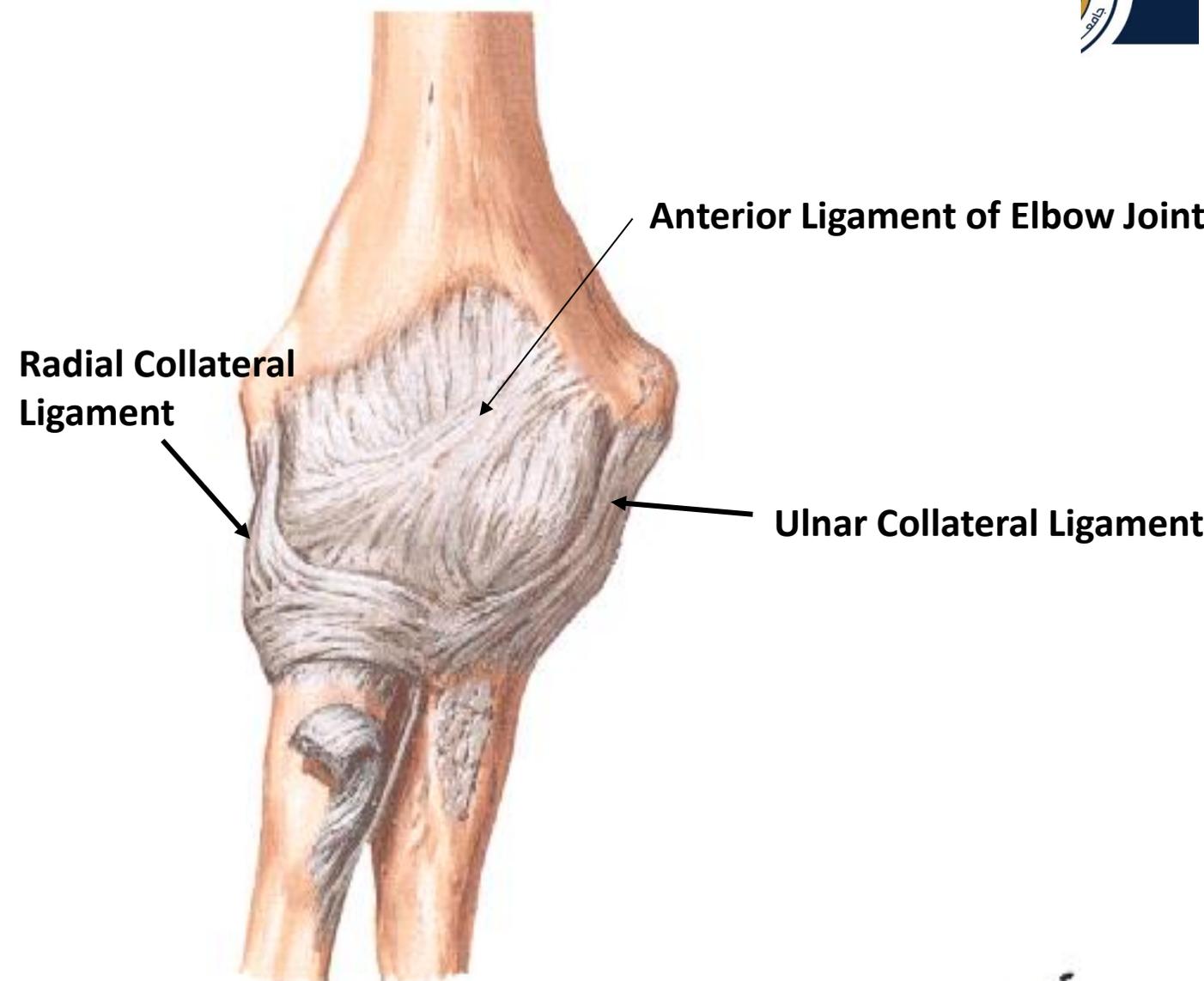
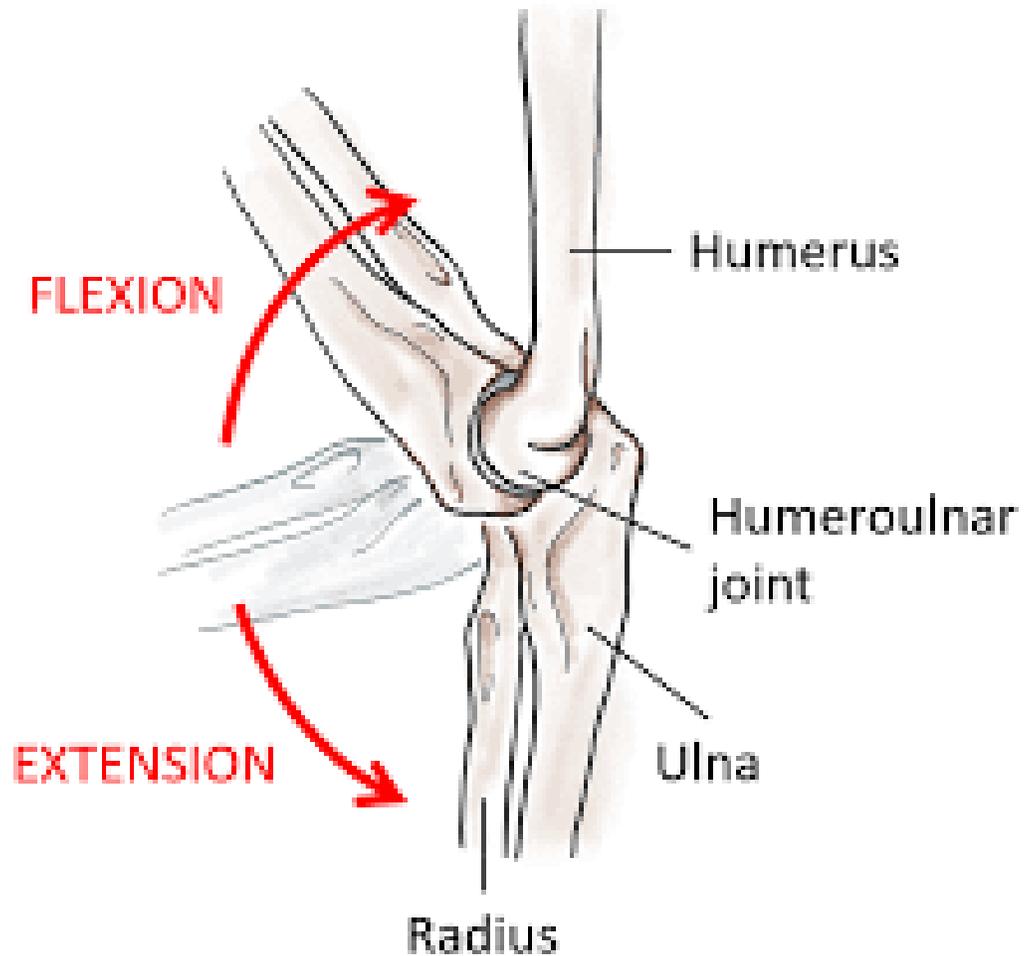


# ELBOW JOINT

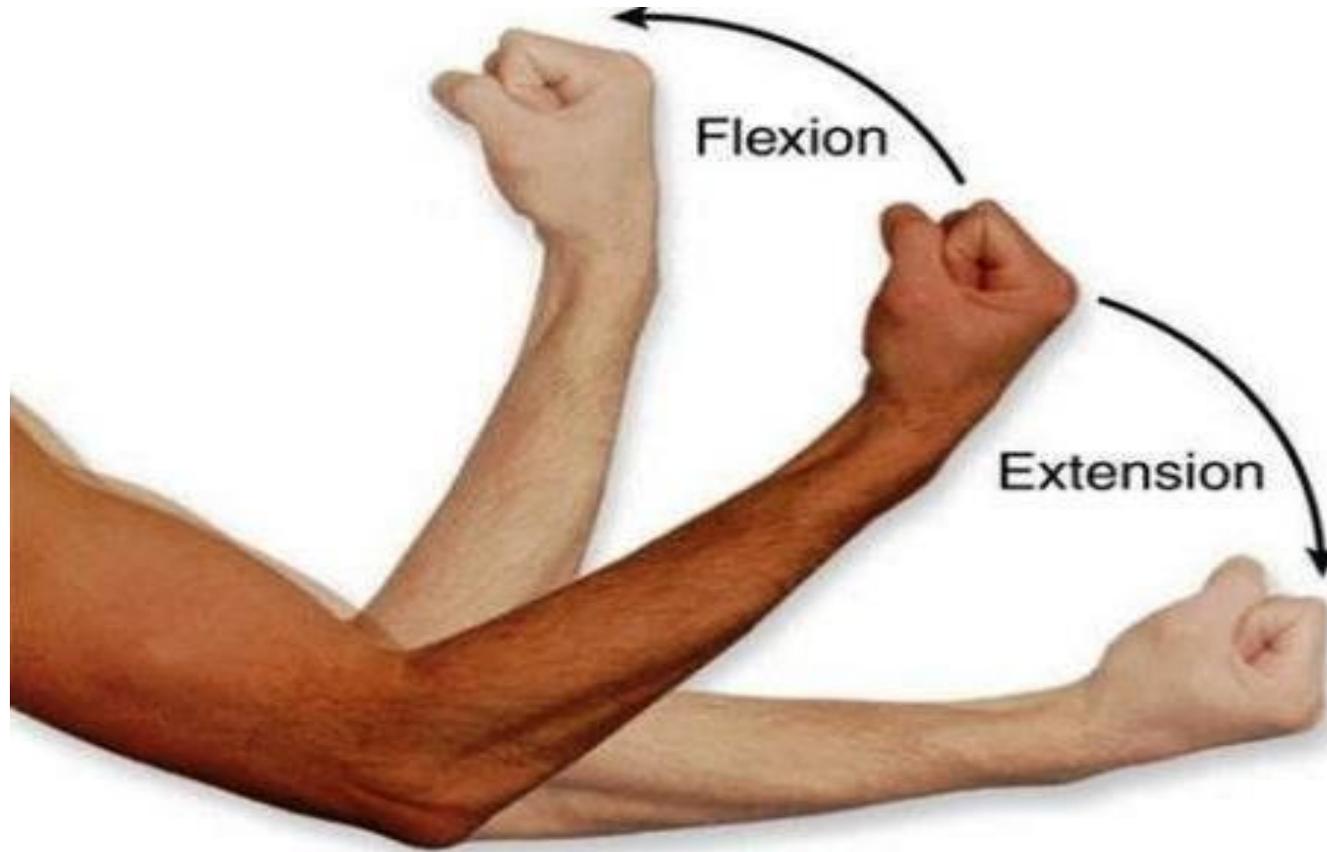
# Elbow joint

- **Type:** **synovial hinge.**
- **Articulating bones:**
  1. Trochlea of humerus with trochlear notch of ulna.
  2. Capitulum of humerus with head of radius.
- **Ligaments:**
  1. Radial collateral ligament
  2. Ulnar collateral ligament





# Movement of the elbow joint



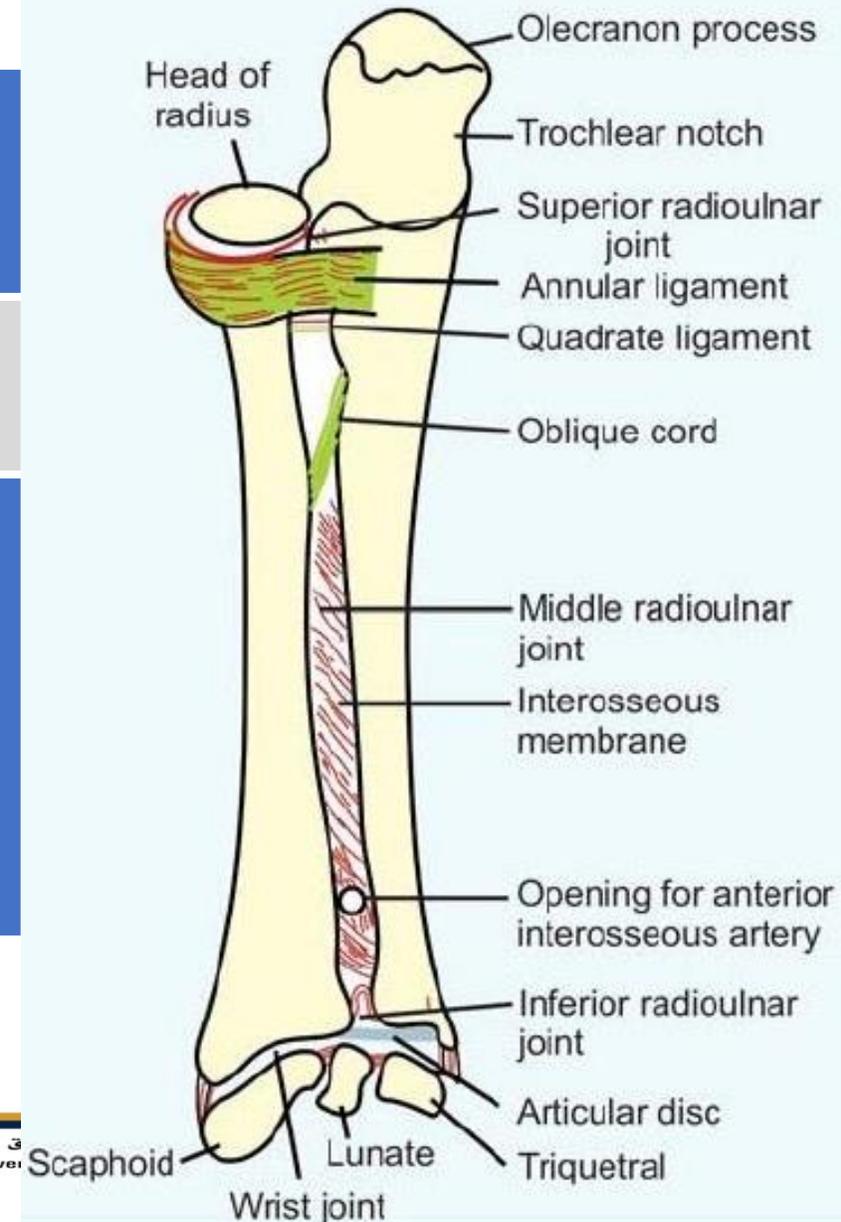


# Radioulnar Joints



# RADIO-ULNAR JOINTS

	1. Superior radio-ulnar joint	2. Middle radio-ulnar joint	3. Inferior radio-ulnar joint
Type	<b>Synovial, pivot.</b>	<b>Syndesmosis.</b>	<b>Synovial, pivot</b>
Articulating bones	1. Head of radius. 2. Annular ligament & radial notch of ulna	Shaft of radius and ulna are connected by interosseous membrane.	✓ Head of ulna. ✓ Ulnar notch of radius.



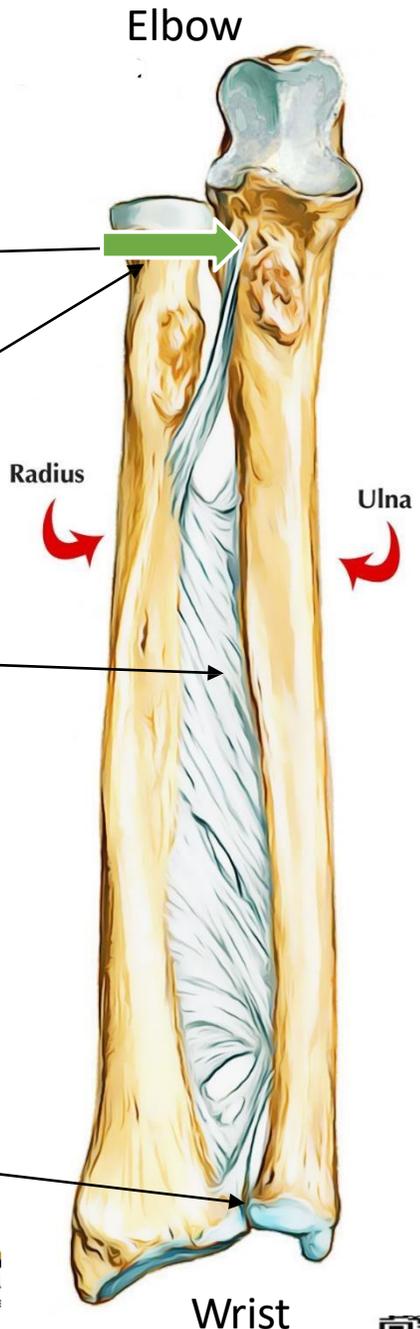
# Radio-ulnar joints

Superior radio-ulnar joint

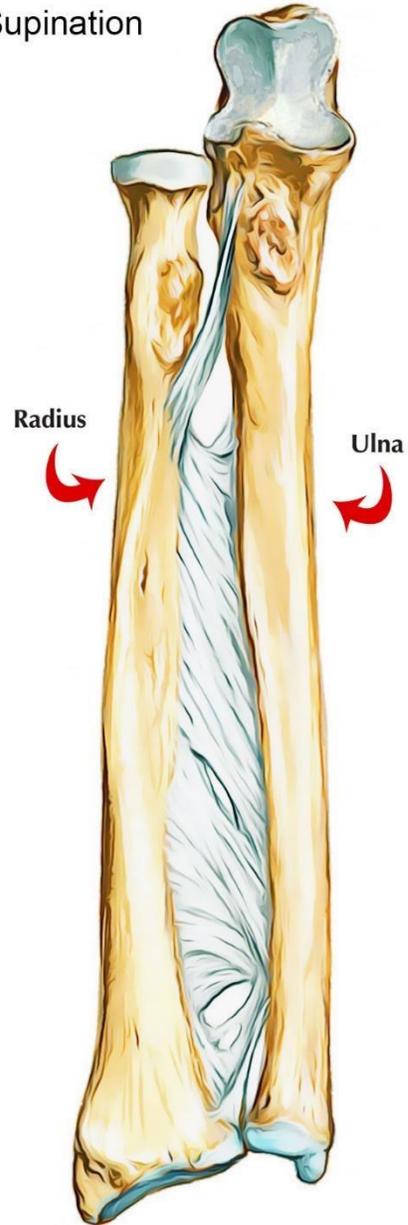
Annular ligament

middle radio-ulnar joint  
(interosseus membrane)

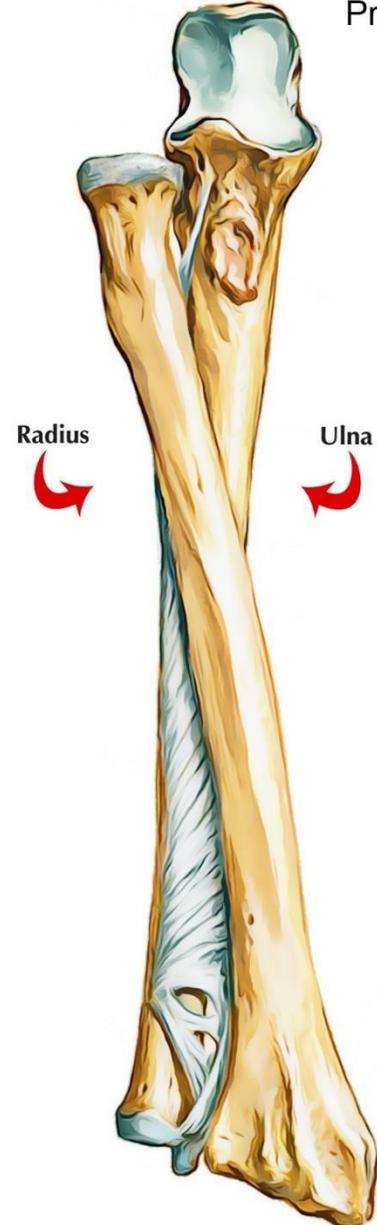
Inferior radio-ulnar joint



Supination



Pronation



Movements of radioulnar joints

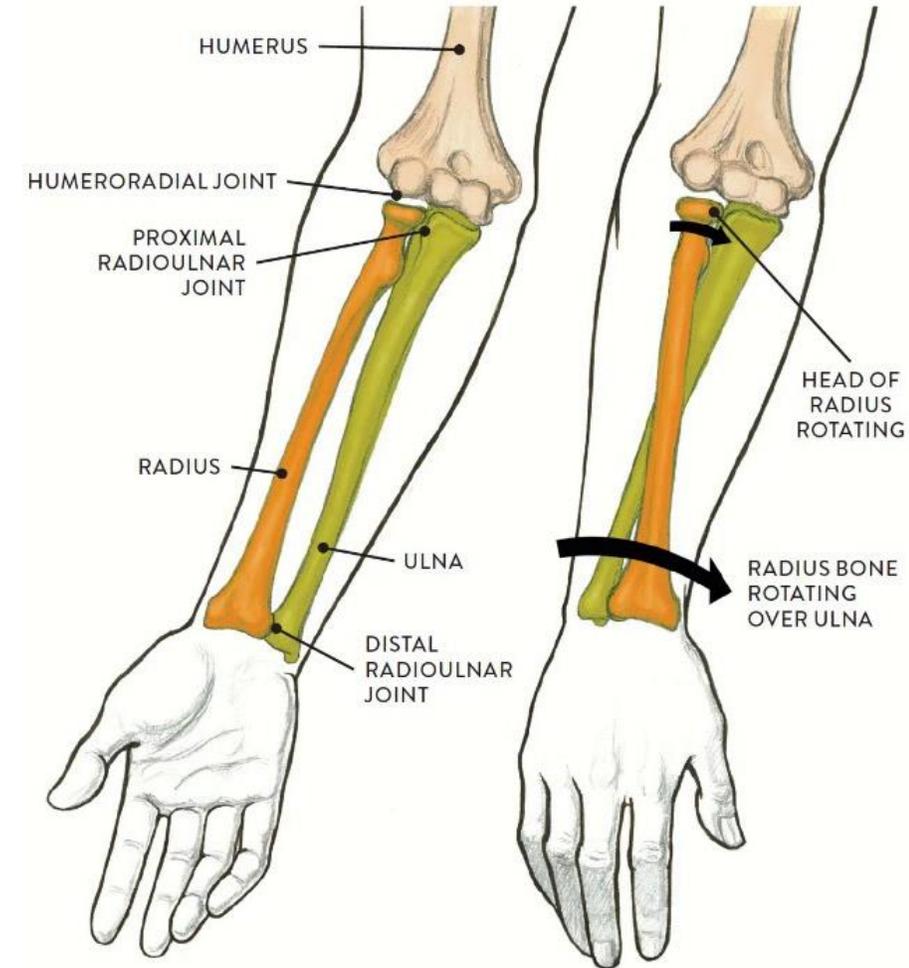
# Muscles acting on Radio-Ulnar Joint

## Supination

## Pronation

1. Brachioradialis.
2. Supinator (extension).
3. Biceps (flexion).

1. Brachioradialis.
2. Pronator teres.
3. Pronator quadratus.





# Wrist Joint



## 2) Wrist joint:

Anterior [Palmar] View

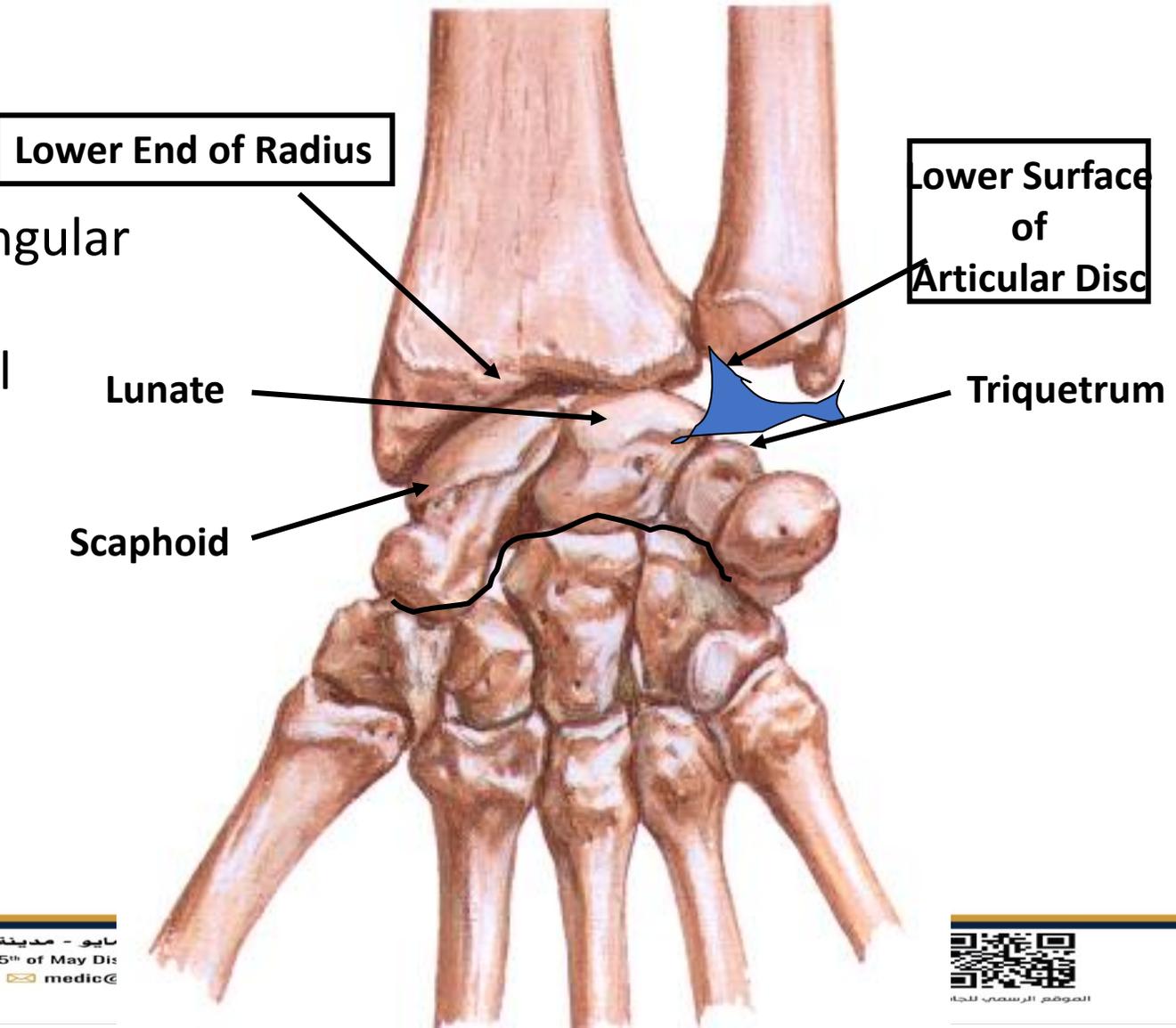
- Type : **synovial, ellipsoid**

- **Articular bones:**

- Superiorly: the lower end of radius & triangular articular disc below the head of ulna.
- Inferiorly: the scaphoid lunate & triquetral bones of the proximal carpal row.

- **Movement :**

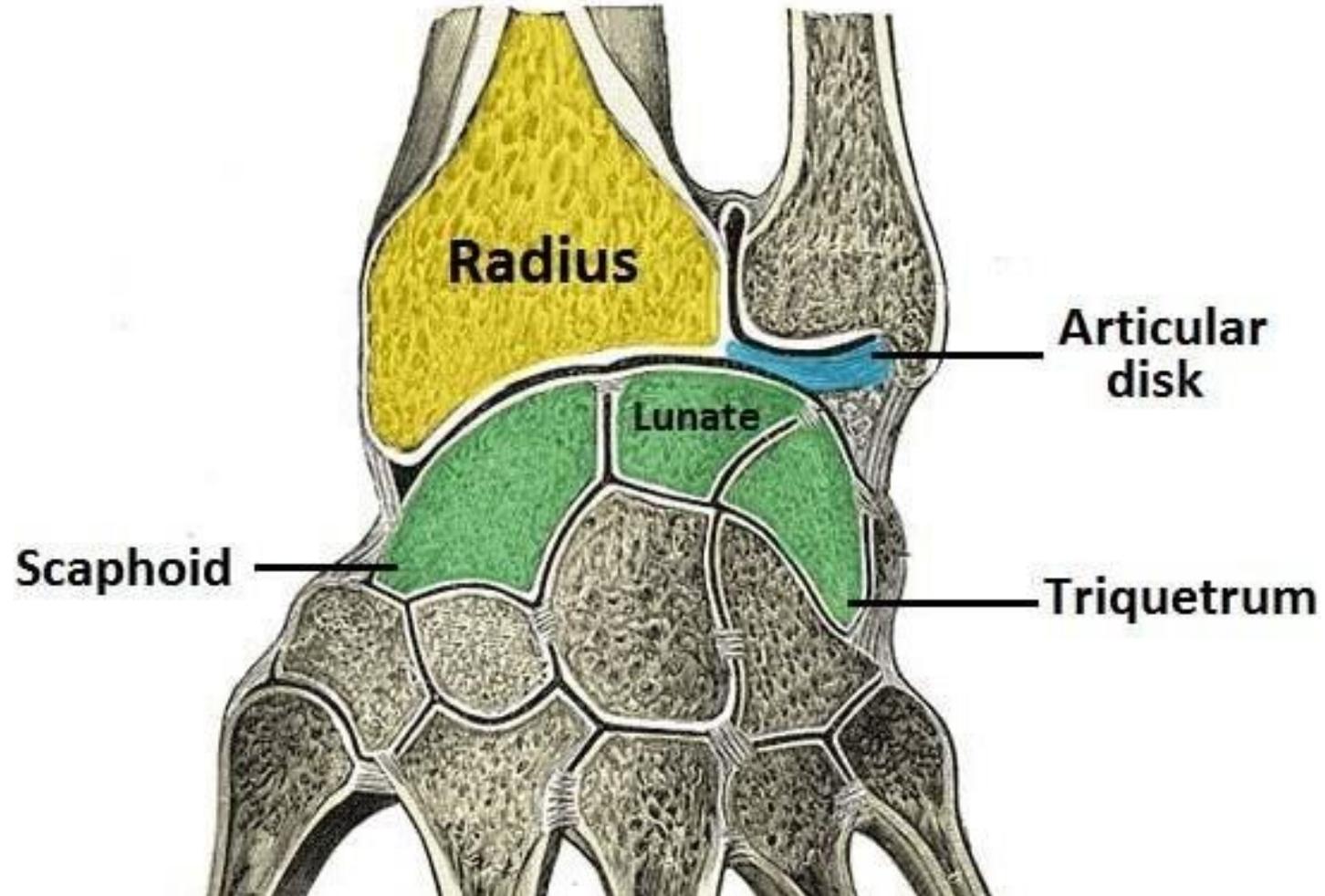
1. Flexion
2. Extension
3. Abduction
4. adduction



# Muscles acting on wrist Joint

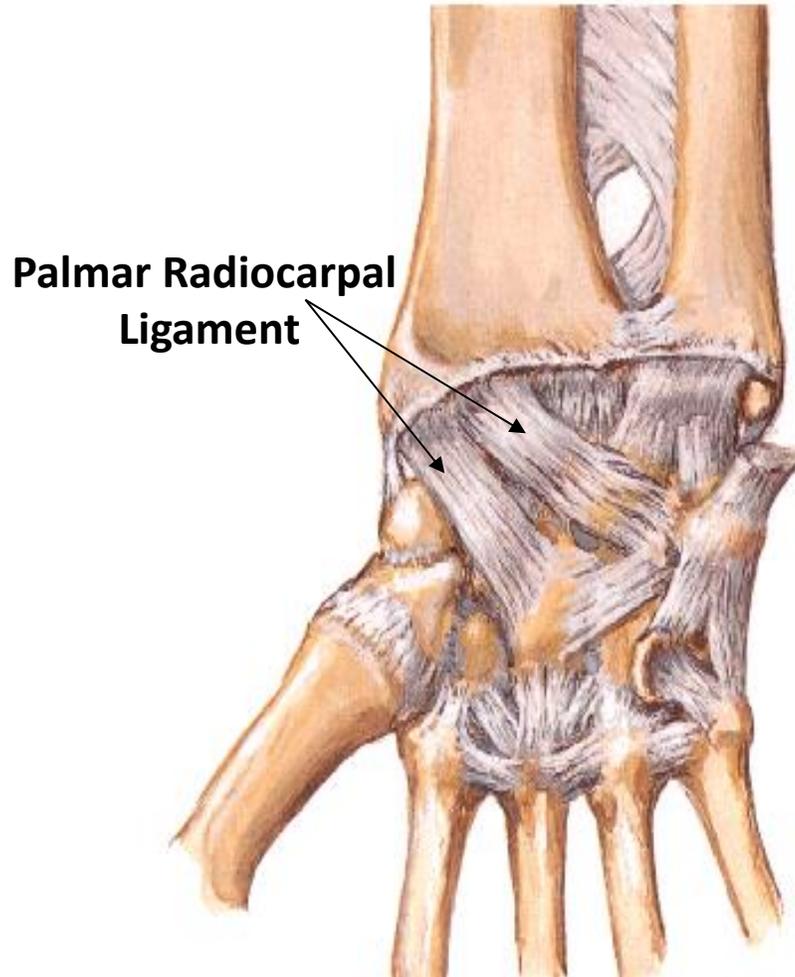
Flexion	Extension	Abduction (radial deviation)	Adduction (ulnar deviation)
<ol style="list-style-type: none"> <li>1. Flexor carpi radialis.</li> <li>2. Flexor carpi ulnaris.</li> <li>3. Palmaris longus.</li> </ol>	<ol style="list-style-type: none"> <li>1. Extensor carpi radialis brevis.</li> <li>2. Extensor carpi ulnaris.</li> <li>3. Extensor carpi radialis longus.</li> </ol>	<ol style="list-style-type: none"> <li>1. Flexor carpi radialis.</li> <li>2. Extensor carpi radialis longus.</li> <li>3. Extensor carpi radialis brevis.</li> </ol>	<ol style="list-style-type: none"> <li>1. Flexor carpi ulnaris.</li> <li>2. Extensor carpi ulnaris.</li> </ol>





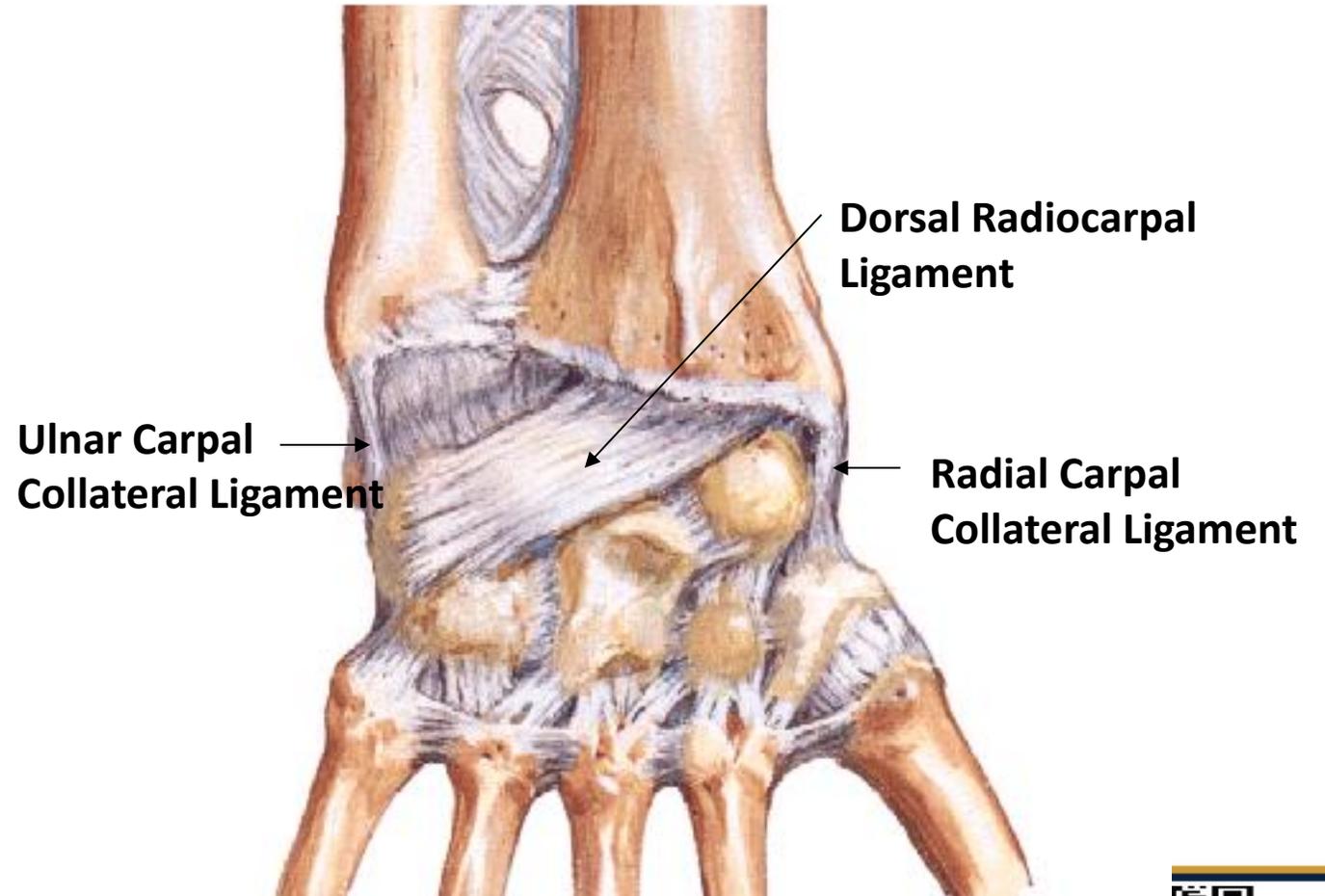
## Ligaments of Wrist

Flexor Retinaculum Removed - Palmar View



Palmar Radiocarpal Ligament

Posterior [Dorsal] View

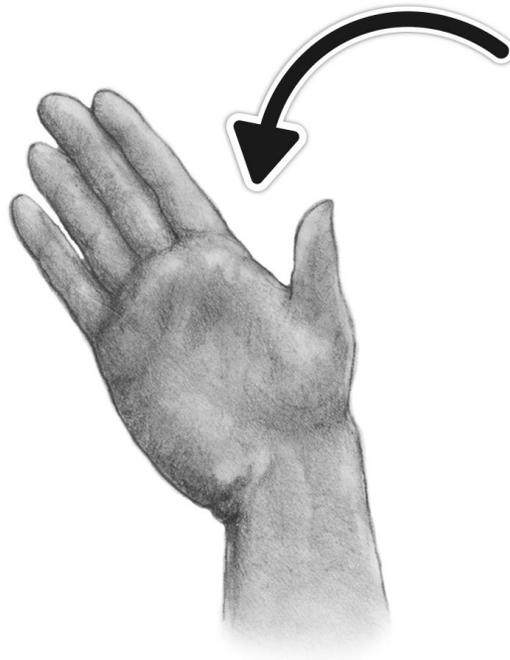


Dorsal Radiocarpal Ligament

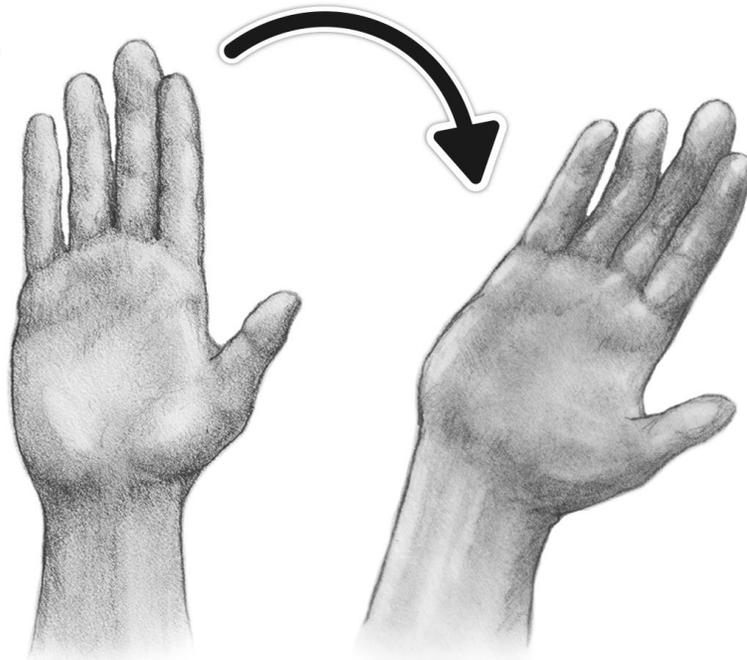
Ulnar Carpal Collateral Ligament

Radial Carpal Collateral Ligament

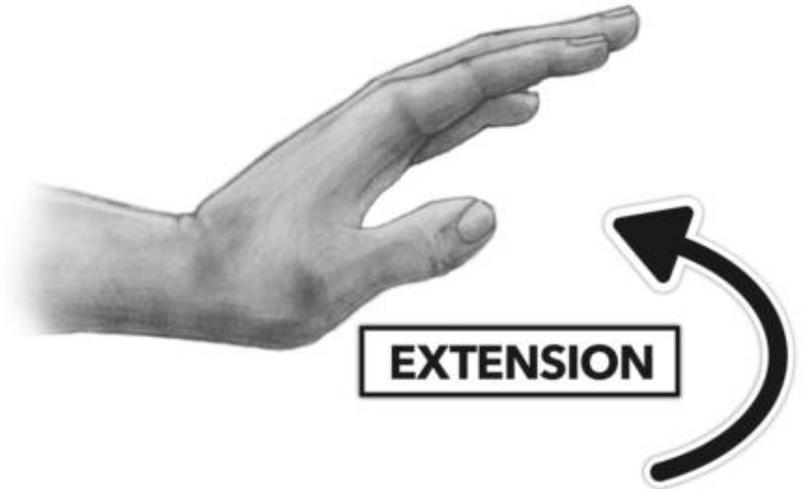
**ADDUCTION**



**ABDUCTION**



**EXTENSION**



**FLEXION**



# Quiz

Is the type of wrist joint?

- A) synovial plane
- B) synovial hinge
- C) synovial ellipsoid
- D) secondary cartilaginous
- E) symphyseal joint

**Answer: C**





# References

1. [Fundamentals of Anatomy & Physiology \(11th Edition\)](#)
2. [Gray's Anatomy for Students - 4th Edition - Elsevier](#)

