



Pivot joint  
e.g. radio-ulnar



Ball and socket  
e.g. shoulder



Gliding joints  
e.g. between  
carpals



Hinge joint  
e.g. elbow



1. Ball and Socket  
Joint



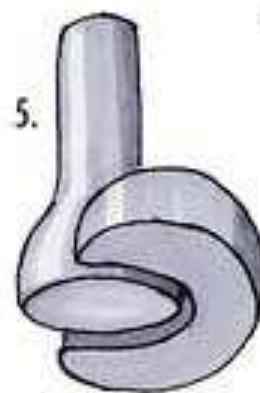
2. Ellipsoid  
Joint



3. Saddle Joint



4. Hinge Joint



5. Pivot Joint

# JOINTS OF THE UPPER LIMB

## I. Joints of the shoulder girdle :

A. The **clavicle** and **sterno-clavicular joint** is the only bone and joint which connects the upper limb to the axial skeleton.

B. The clavicle is connected **to the scapula** by a joint and a ligament.

### 1. Acromio-clavicular joint

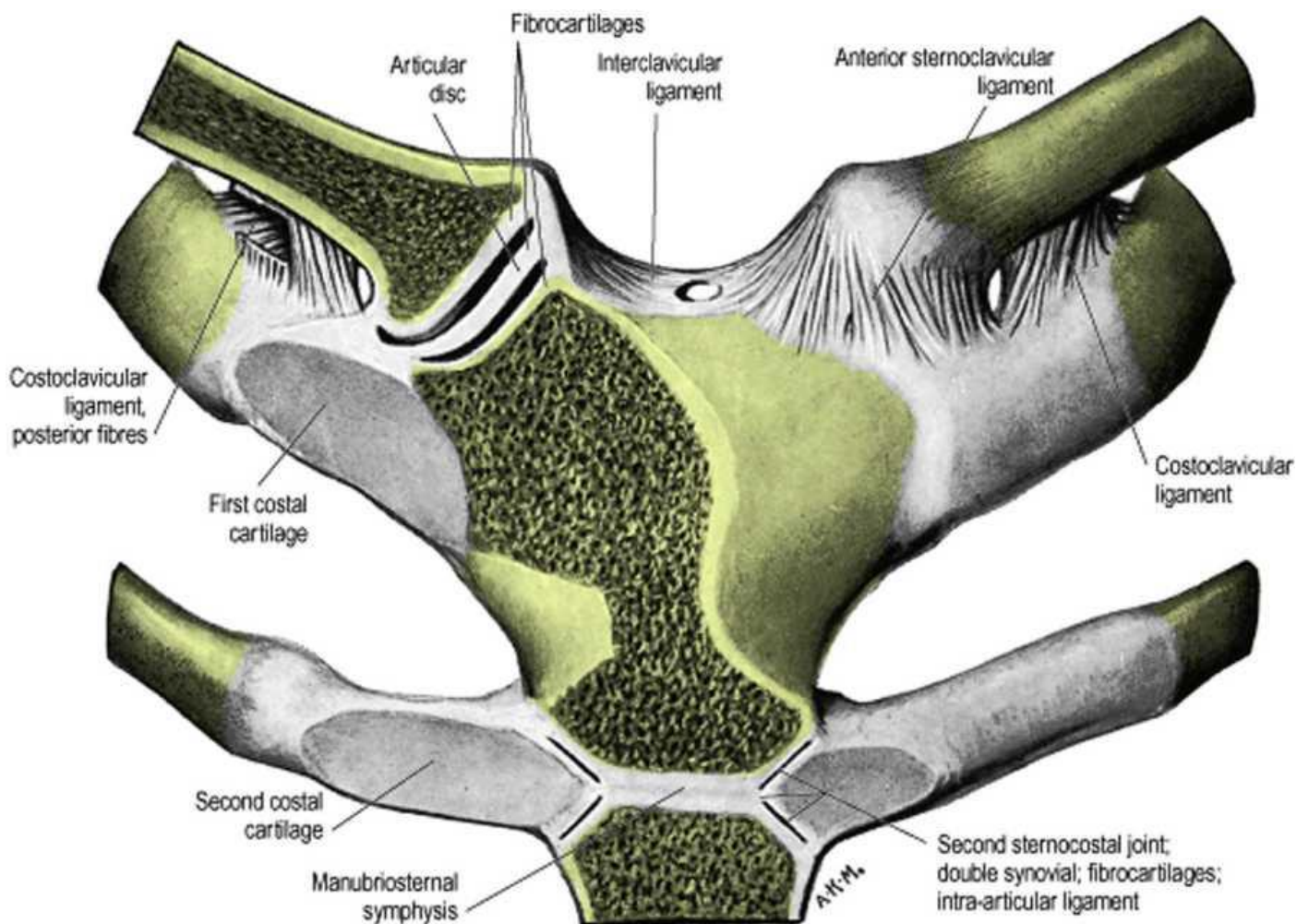
### 2. Coraco-clavicular ligament

C. The **humerus** articulates with the scapula and not with the clavicle, therefore **forces and weight from the arm are transmitted** as follows :

1. First to the scapula .

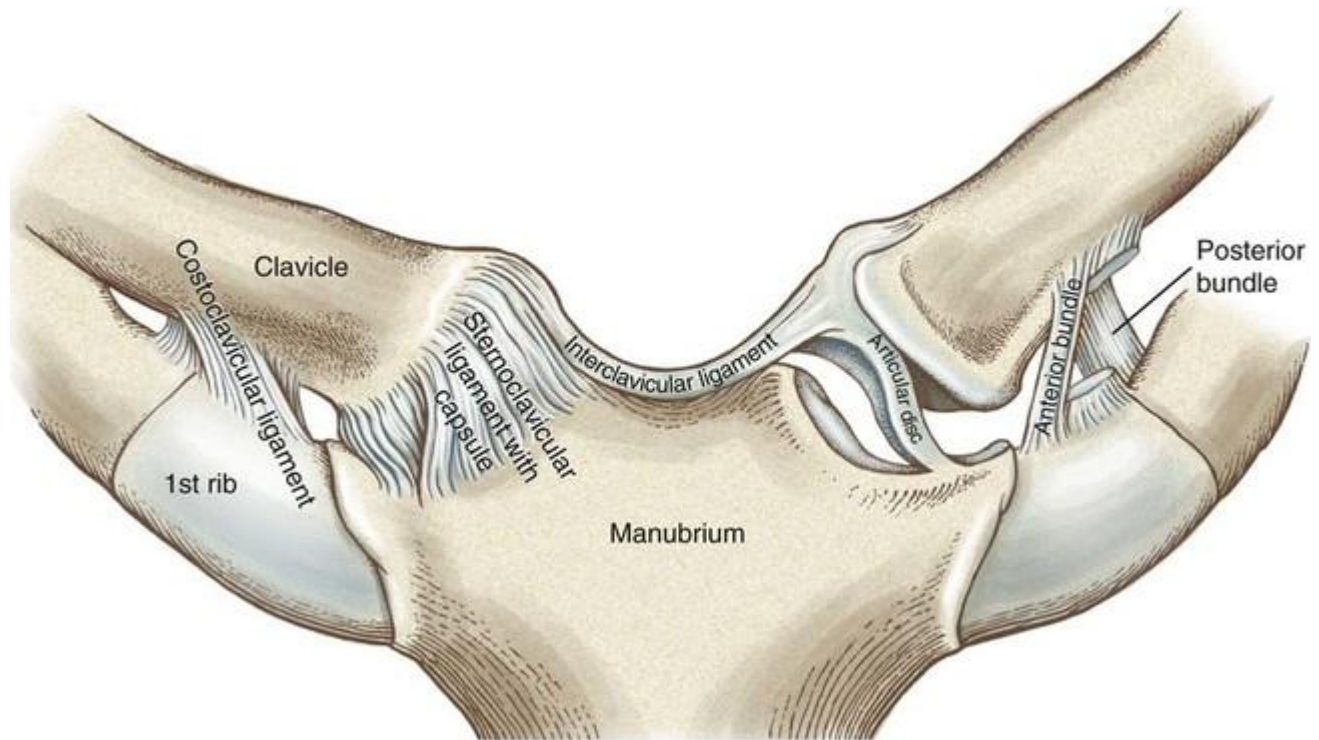
2. Then to the clavicle .

3. Then to the axial skeleton at the sterno-clavicular joint .



# Sterno-clavicular Joint

- ★ **Type:** Synovial joint ; modified saddle variety.
- ★ **Articular surfaces :** Covered by fibro-cartilage .
  - A. **Clavicular notch** of manubrium sterni and first costal cartilage.
  - B. **Sternal (medial) end** of the clavicle.
- ★ **Capsule:**
  - A. Surround the joint **completely** and attached to the margins of the articular surface. It is **thicker** in front and behind, but is **thin** above and below.
  - B. Ligaments:**
    - 1. Anterior sterno-clavicular ligament:**
      - It is attached to the **front** of the sternal end of the clavicle and the front of the manubrium sterni.
    - 2. Posterior sterno-clavicular ligament:**
      - It is attached to the **back** of sternal end of clavicle and to the back of manubrium sterni.
    - 3. Interclavicular ligament:**
      - Connect **sternal end** of one clavicle **on both sides** together , crossing above the suprasternal notch of the manubrium and is attached to it.
      - Ligaments number 1,2&3 **support** the anterior , posterior & upper part of the capsule anteriorly , posteriorly & superiorly respectively .
    - 4. Costo-clavicular ligament:**
      - Attached below to the **1<sup>st</sup> costo-chondral junction** and above to the **impression** on the inferior surface of the clavicle.
      - This ligament **prevents excessive elevation and protraction** of the clavicle (the same function of subclavius muscle which acts as a dynamic ligament).



★ **Synovial membrane :**

- It lines the inner surface of the joint capsule and extends to the margin of the articular surfaces .

★ **Intra-articular disc of cartilage:**

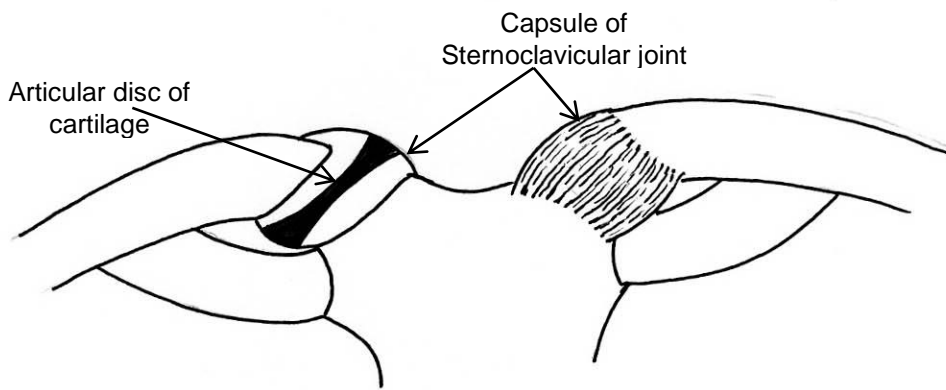
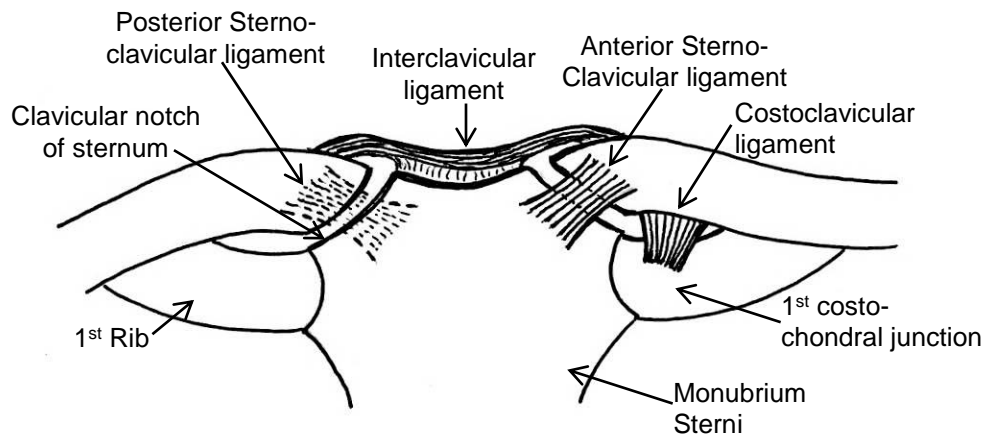
- A circular disc of fibro-cartilage interposed **between** the articular surfaces of the sternum and the clavicle.
- **Attached** by its circumference to the fibrous capsule.
- **Divides** the joint cavity into two separate cavities.
- Functions : **Absorbs the forces** transmitted to the joint from the upper limb .

★ **Stability:** It is a **stable** joint due to its ligaments and the intra-articular disc.

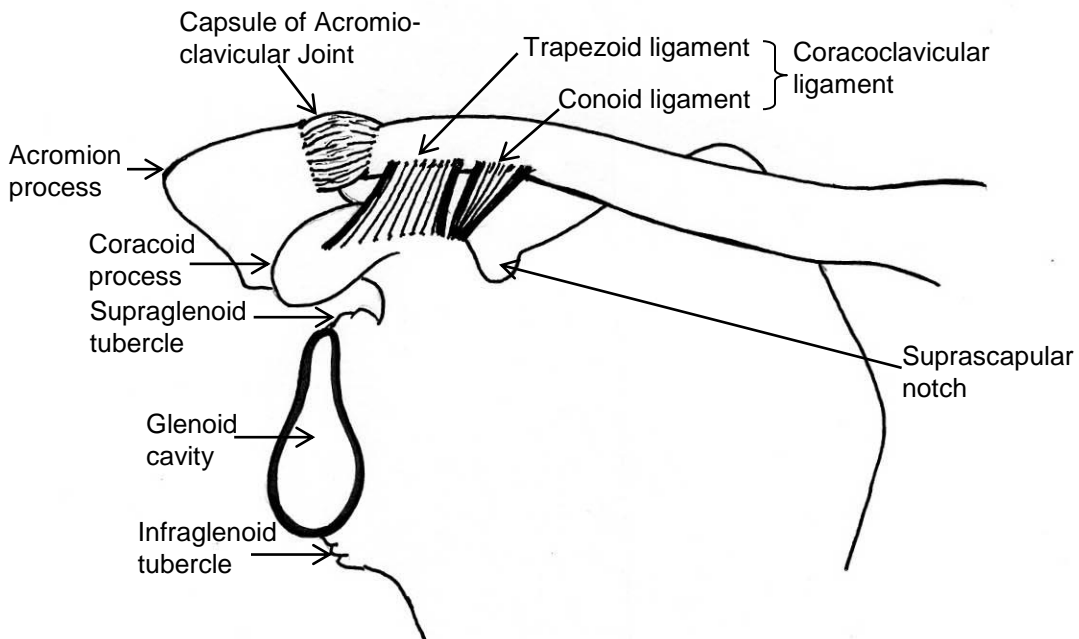
★ **Arterial supply:** Supra-scapular & internal thoracic arteries .

★ **Nerve supply:** Medial supra-clavicular nerve & nerve to subclavius .

★ **Function:** Movements of the shoulder girdle occur mainly at this joint.



### Sternoclavicular Joint



### Acromio clavicular Joint

## Acromio-Clavicular Joint

- I. Type:** Synovial, *plane* variety.
- II. Articular surfaces :** Both surfaces covered by fibro-cartilage.
  - A. *Acromial end* of clavicle.
  - B. Medial border of *acromion process* of the scapula .
- III. Capsule:** Completely surrounds the joint and is strengthened above by *acromio-clavicular ligament*.
- IV. Arterial supply:** Supra-scapular and thoraco-acromial arteries.
- V. Nerve supply:** Supra-scapular and lateral pectoral nerves.
- VI. Functions:**
  - A. Shares a *little in the movements* of shoulder girdle.
  - B. Shares in *transmitting forces & weight* from the upper limb to the clavicle; but the main factor transmitting forces from the upper limb to clavicle is the *coraco-clavicular ligament*.

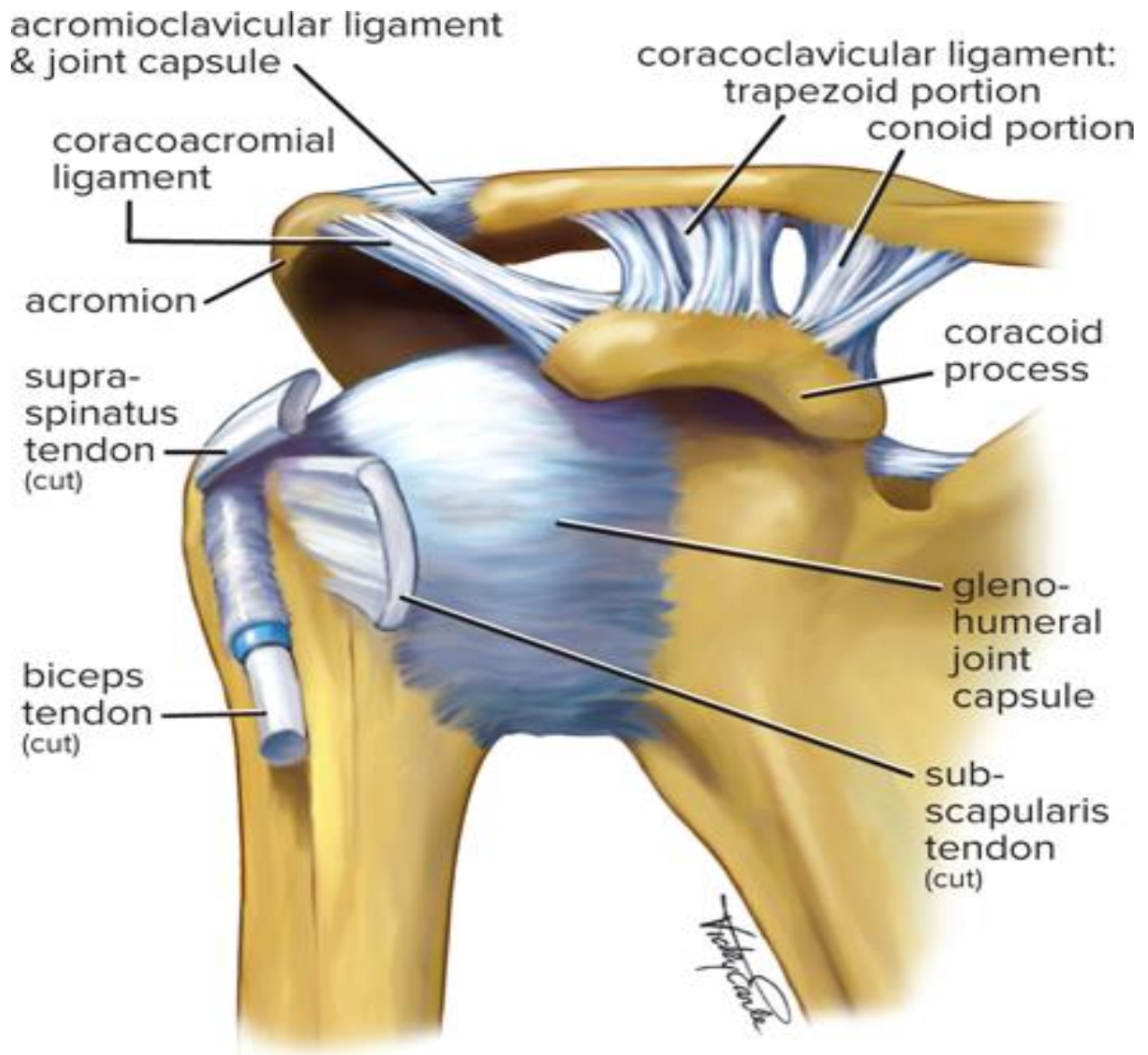
## CORACO-CLAVICULAR LIGAMENT

\* It *connects* the clavicle with the coracoid process of the scapula.

- I. Parts:** It consists of two incompletely separated parts:
  - A. Trapezoid part:**
    - 1. Forms the *anterolateral part* of the coraco-clavicular ligament.
    - 2. Attached below to the *upper surface of the coracoid* process and above to the *trapezoid line* on the lower surface of the clavicle.
  - B. Conoid part:**
    - 1. Forms the *posteromedial part* of the coraco-clavicular ligament.
    - 2. Attached below to the *upper surface* coracoid process of scapula and above to the *conoid tubercle* of clavicle.

## II. Function:

- A. It **limits the movements** of acromio-clavicular joint and **prevents dislocation** of the acromial end of the clavicle.
- B. It is the **main structure suspending** the upper limb from the clavicle . If the clavicle is **fractured medial** to the attachment of coraco- clavicular ligament, the **upper limb droops**.



Source: Peter Brukner: *Brukner & Khan's Clinical Sports Medicine: Injuries, Volume 1, 5e*: [www.csm.mhmedical.com](http://www.csm.mhmedical.com)  
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## **ON THE SHOULDER GIRDLE**

### **A. Elevation**

1. Upper fibres of trapezius
2. Levator scapulae

### **B. Depression**

1. Pectoralis minor
2. Pectoralis major

### **C. Rotation up (glenoid cavity faces upwards):**

1. Upper and lower fibres of trapezius
2. Serratus anterior

### **D. Rotation down (glenoid cavity faces downwards):**

1. Levator scapulae
2. Rhomboids major
3. Rhomboids minor

### **E. Protraction (pulling forwards):**

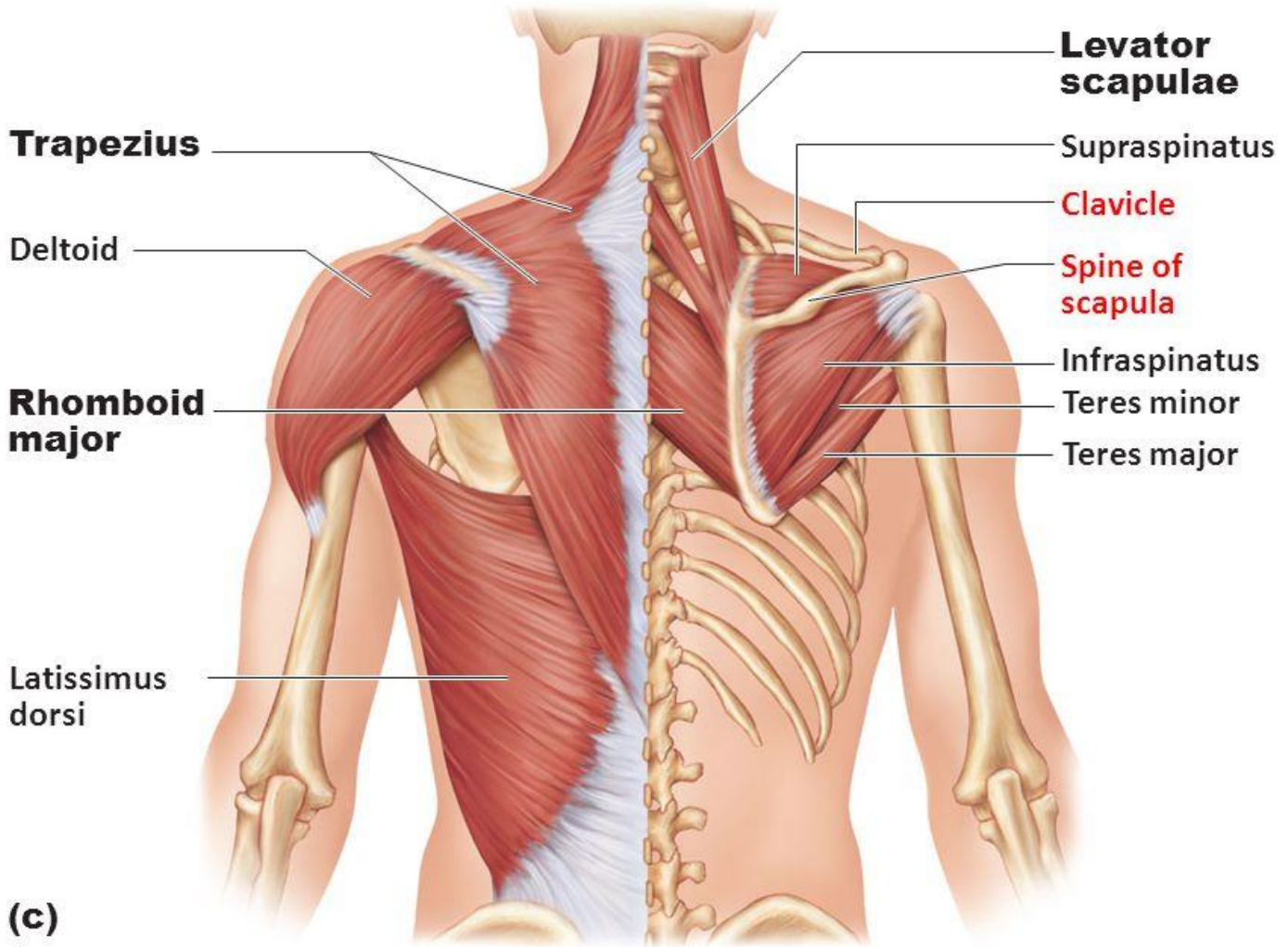
1. Serratus anterior
2. Pectoralis minor

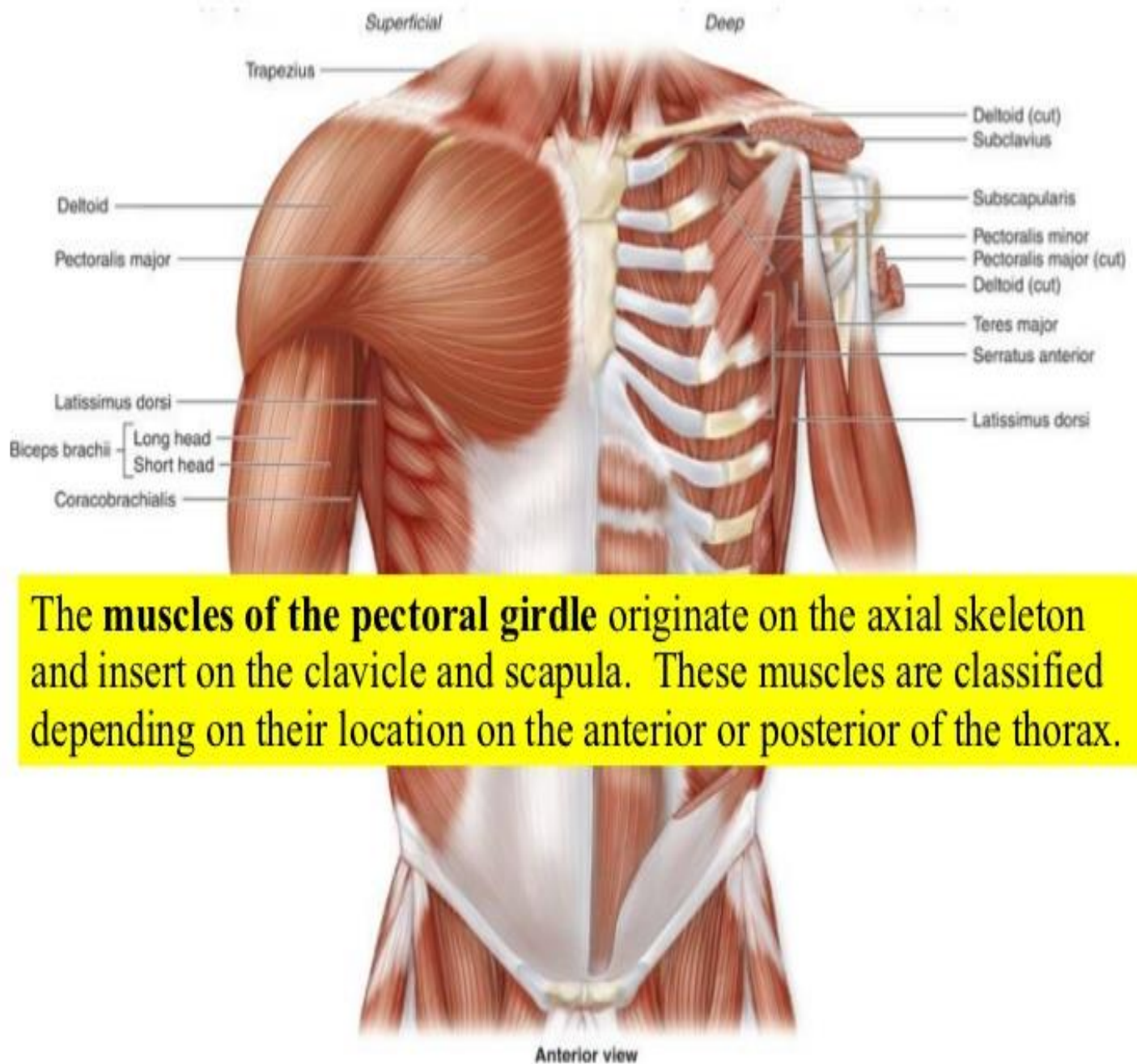
### **F. Retraction (pulling backwards towards the vertebrae):**

1. Middle fibres of trapezius
2. Rhomboids major
3. Rhomboids minor



Figure 10.13c Superficial muscles of the thorax and shoulder acting on the scapula





The **muscles of the pectoral girdle** originate on the axial skeleton and insert on the clavicle and scapula. These muscles are classified depending on their location on the anterior or posterior of the thorax.

# SHOULDER JOINT (Glenohumeral Joint )

★ **Type:** Synovial, polyaxial (ball and socket)

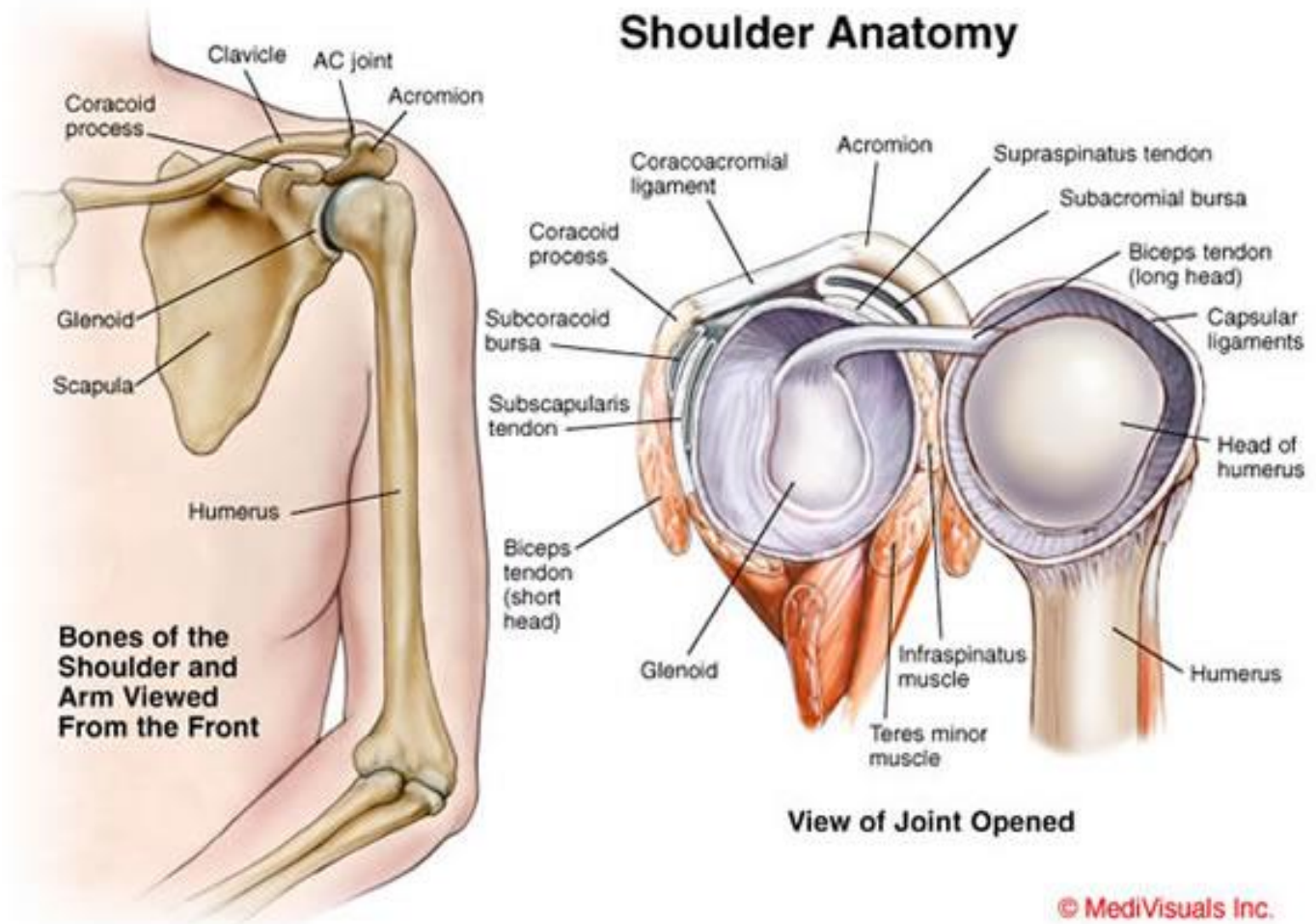
★ **Articular surfaces :** are *smooth* covered by *hyaline* cartilage .

## A. Socket (glenoid cavity):

- A pear-shaped, *shallow* concave fossa , forms a *poor socket* for the larger head of humerus & slightly *deepened by* a fibro-cartilagenous rim called the *labrum glenoidale*.

## B. Ball (head of humerus):

- It is less than half of a large sphere. It is much larger than the glenoid cavity and at rest only the *antero-inferior quadrant* of the head articulates with the glenoid cavity .



## ★ Fibrous capsule:

**A. Attachment:** It is attached to the margins of the articular surfaces

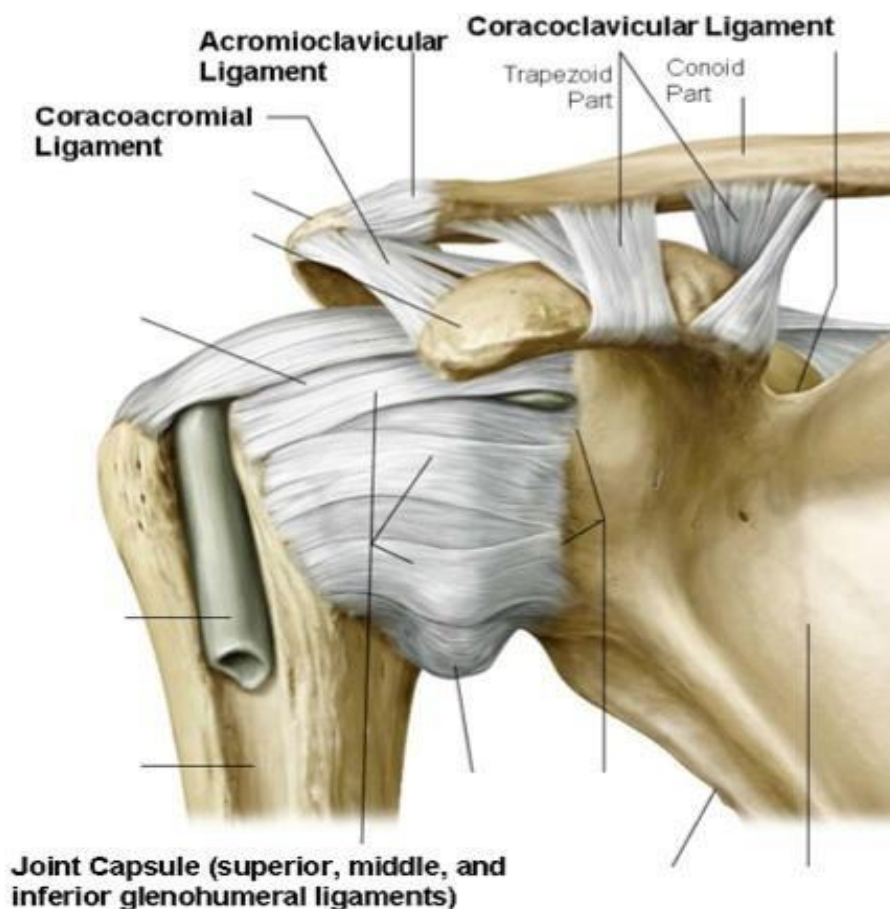
1. Medially: It includes the **supra-glenoid tubercle** within the capsule.
2. Laterally: It descends for half an inch on the medial side of the **surgical neck** of the humerus .

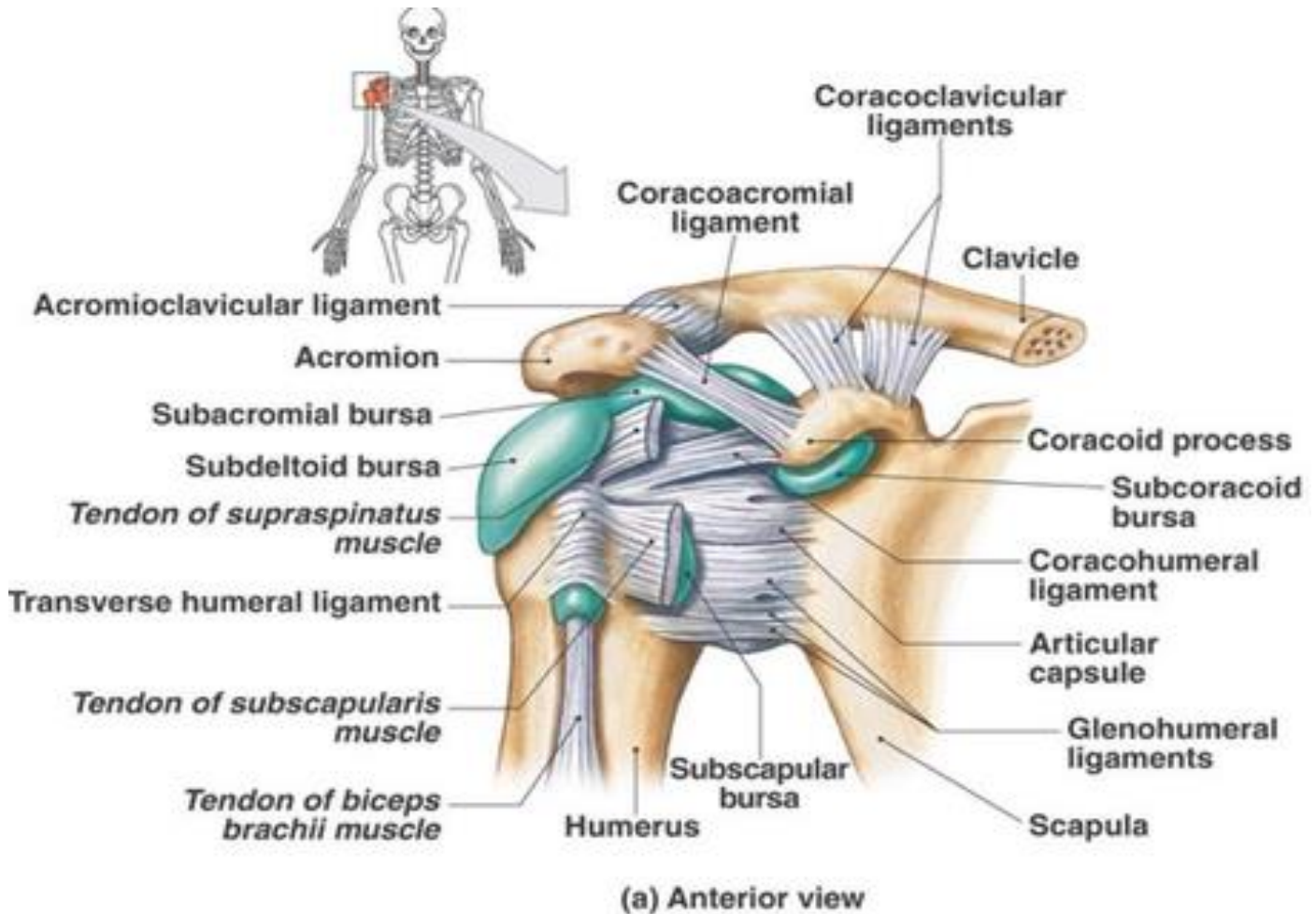
**B. Strength:** The capsule is markedly **loose and lax**. It is especially **weak**:

1. **Anteriorly** where it shows **two openings**:

- One through which the synovial membrane of the joint communicates with the **subscapularis bursa**.
- Another placed **between the two tuberosities** of the humerus and gives passage to the **tendon of long head of biceps** and its synovial sheath.

2. **Inferiorly** where the capsule is **lax and is folded** into the **quadrangular space** (to allow abduction).





### C. Ligaments:

#### 1. *Three gleno-humeral ligaments* (are weak):

- Strengthen the **anterior** surface of the capsule.
- Extend from the anterior margin of the **glenoid** cavity to the lesser tuberosity and **anatomical neck** of the humerus.

#### 2. *Coraco-humeral ligament* (stronger):

- Strengthens the **upper** part of the capsule.
- Extends from the **coracoid** process , immediately above the capsule ,to be attached to the upper border of the **greater tuberosity** of the humerus.

### 3. ***Transverse humeral ligament.***

- It passing from **lesser to greater tuberosity** of the humerus converting the inter-tubercular groove into canal.
- It acts as a **retinaculum** for the tendon of long head of biceps.

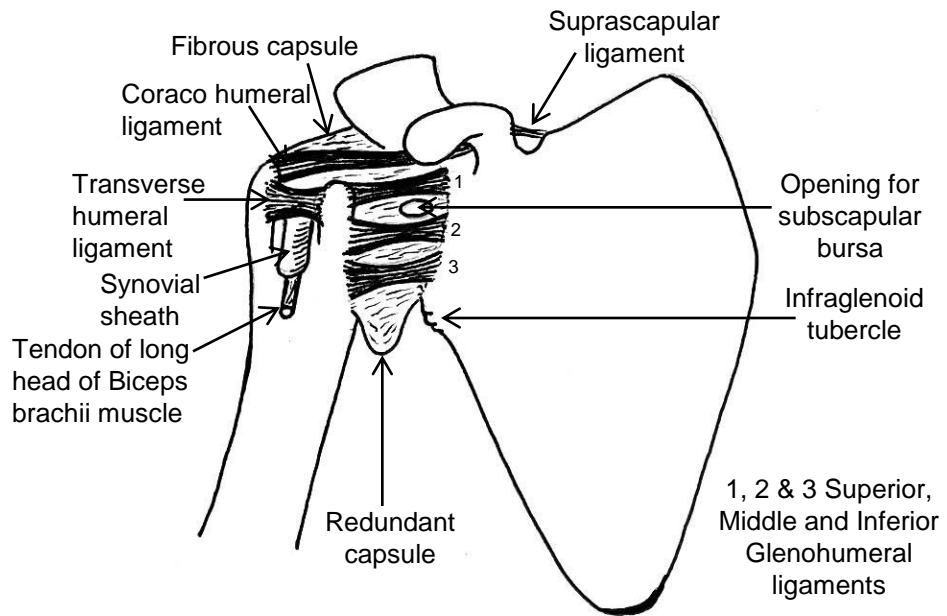
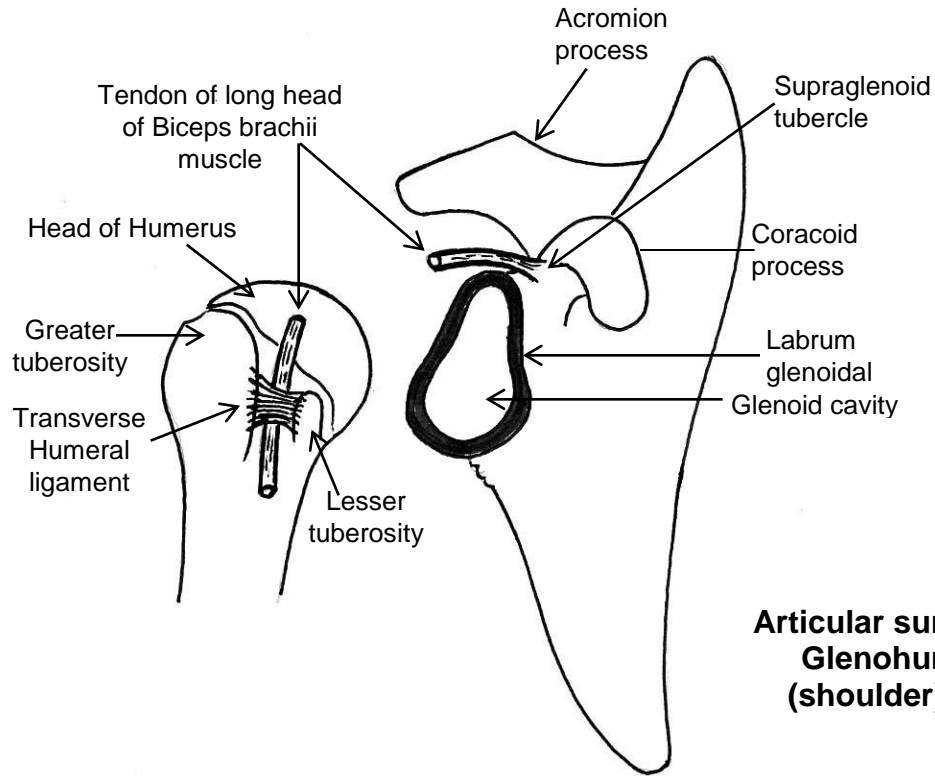
### 4. **Labrum glenoidale:**

- A fibro-cartilagenous rim attached around the margin of the glenoid cavity within the fibrous capsule.
- Deepens the articular socket .

### **D. Intra-capsular structures:**

1. Glenoid cavity and supra-glenoid tubercle
2. Tendon of long head of biceps.
23. Labrum glenoidal.
4. . Head of humerus and medial part of its surgical neck.
5. Synovial membrane.

★



**Capsule of Shoulder (Glenohumeral) Joint**

★ **Synovial membrane:**

1. **Lines** the inner surface of the fibrous capsule and **covers** the intracapsular non-articular bony parts.
2. Forms a tubular synovial sheath which encloses the **tendons of long head of biceps** and extends outside the capsule around the tendon into the bicipital groove.
3. Communicates anteriorly with the large **subscapularis bursa**.

★ **Synovial bursae lie around the capsule:**

1. Bursa between the tendon of **infra-spinatus and the back** of the capsule.
2. Subscapularis bursa: Lies between the tendon of **subscapularis and the front of the capsule**. It communicates with the joint cavity through an opening in the anterior wall of the capsule.
3. **Subacromial bursa**: Lies between **the deltoid and the capsule**. It is **prolonged** under the acromion and coraco-acromial arch separating them from the tendon of **supra-spinatus**. It does not communicate with the joint cavity.

★ **Stability:**

**A. The shoulder joint is weak.** It is **unstable** and is easily dislocated because:

1. The **poor fitting of its bony parts** together as the head of the humerus is very large compared with the small, shallow, poor glenoid cavity.
2. The **capsule and its ligaments** are weak and lax.

**B. The stability of shoulder joint depends on :**

**1-The strength of the muscles which surround it:** The joint is strengthened:

- i. **Above:** By tendons of supraspinatus and long head of biceps
- ii. **In front:** By tendon of subscapularis



iii. **Behind:** By tendons of infraspinatus and teres minor

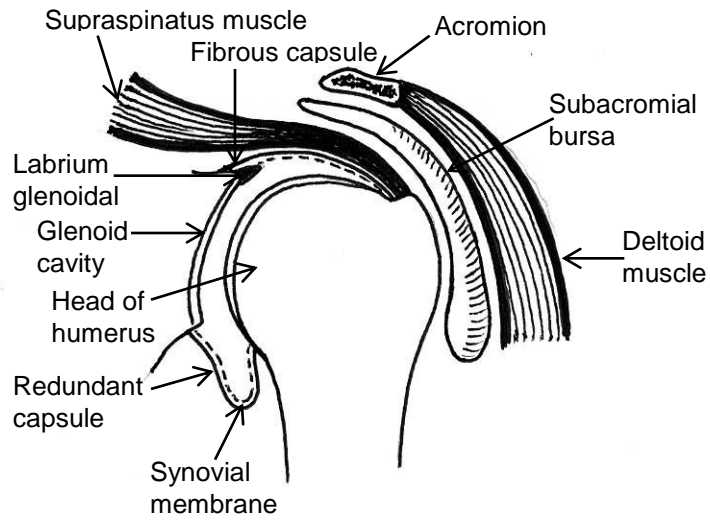
- These tendons are all intimately related to the fibrous capsule and form the **rotator cuff**, which inforce the capsule and provide an active support for the joint during movement.
- The **deltoid muscle** covers the joint in front, behind and laterally.

iv. **Below:** The joint is **not supported** by any muscle from below where the capsule is lax and forms a fold which bulges downwards into the upper part of the axilla. This fold is stretched when the arm is fully abducted. **Long head of triceps** supports the capsule from below when the arm is **abducted**.

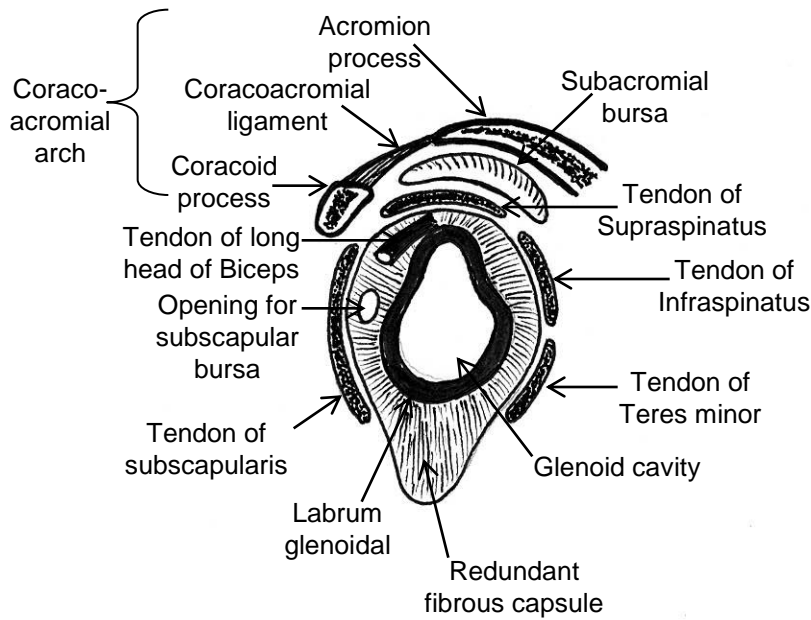
## 2- Coraco-acromial ligament and arch:

a. **Coraco-acromial ligament** is a **strong triangular** ligament. Its **apex** is attached to the tip of the acromion while its **base** is attached to the upper surface of the coracoid process.

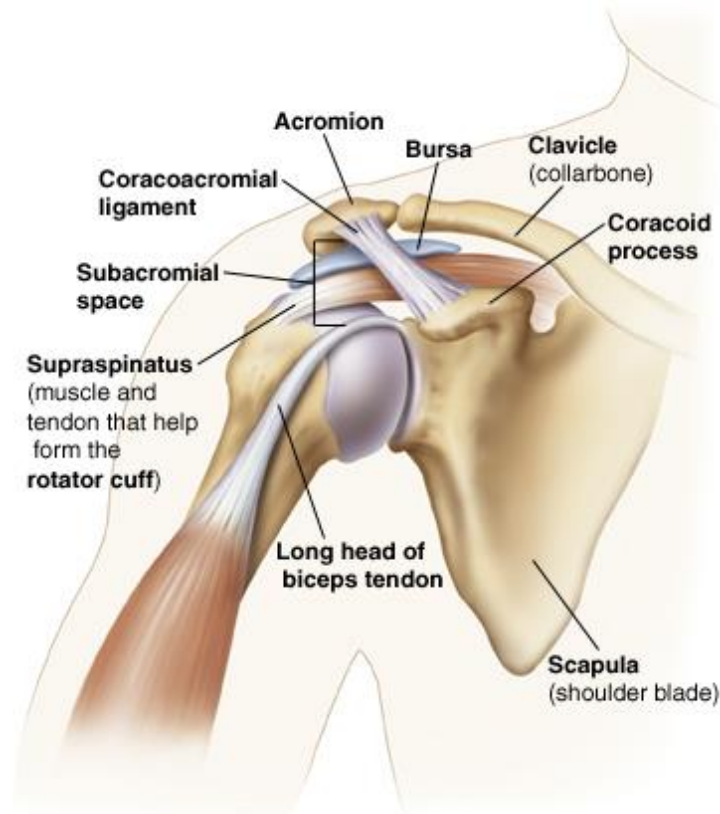
b. This ligament together with the two processes form the **coraco-acromial arch** which lies immediately above the shoulder joint forming a **secondary socket** for the head of the humerus supporting it from above.



**Shoulder (Glenohumeral) Joint**



**Shoulder (Glenohumeral) Joint**  
**Rotator Muscle Cuff**  
**Coracoacromial Arch.**



- ★ **Arterial supply:** From the anterior and posterior circumflex humeral and suprascapular arteries.
- ★ **Nerve supply:** From suprascapular, axillary and lateral pectoral nerves.
- ★ **Movements:** The shoulder joint is structurally weak and has a loose and lax capsule. This construction permits a very wide range of movement but on the expense of the stability of the joint.

#### **A. Flexion:**

1. Clavicular head of pectoralis major
2. Anterior fibres of deltoid
3. Biceps brachii & Coraco-brachialis
4. Sternocostal head of pectoralis major ( from full extension to coronal plane )

#### **B. Extension:( TLP)**

1. Sterno-costal head of pectoralis major (from full flexion to coronal plane)
2. Posterior fibres of deltoid
3. Teres major
4. Latissimus dorsi

#### **C. Abduction:**

1. Supra-spinatus ( 0- 15 degrees )
2. Middle (acromial) fibres of deltoid ( 15-90 degrees )

#### D. Adduction:( TLP )

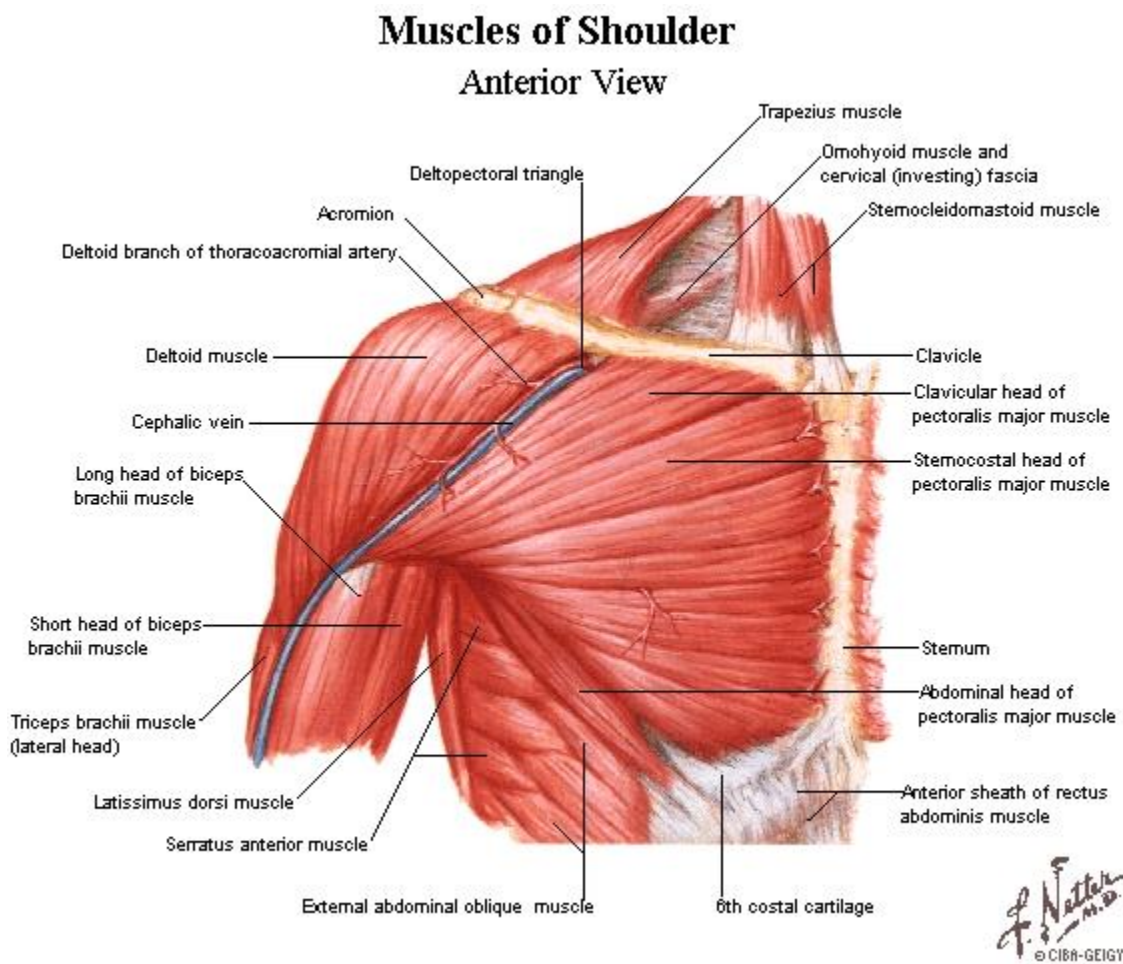
1. Pectoralis major
2. Teres major
3. Latissimus dorsi
4. Coraco-brachialis
5. Subscapularis

#### E. Medial rotation: ( TLP )

1. Pectoralis major
2. Teres major
3. Latissimus dorsi
4. Anterior fibres of deltoid
5. Subscapularis

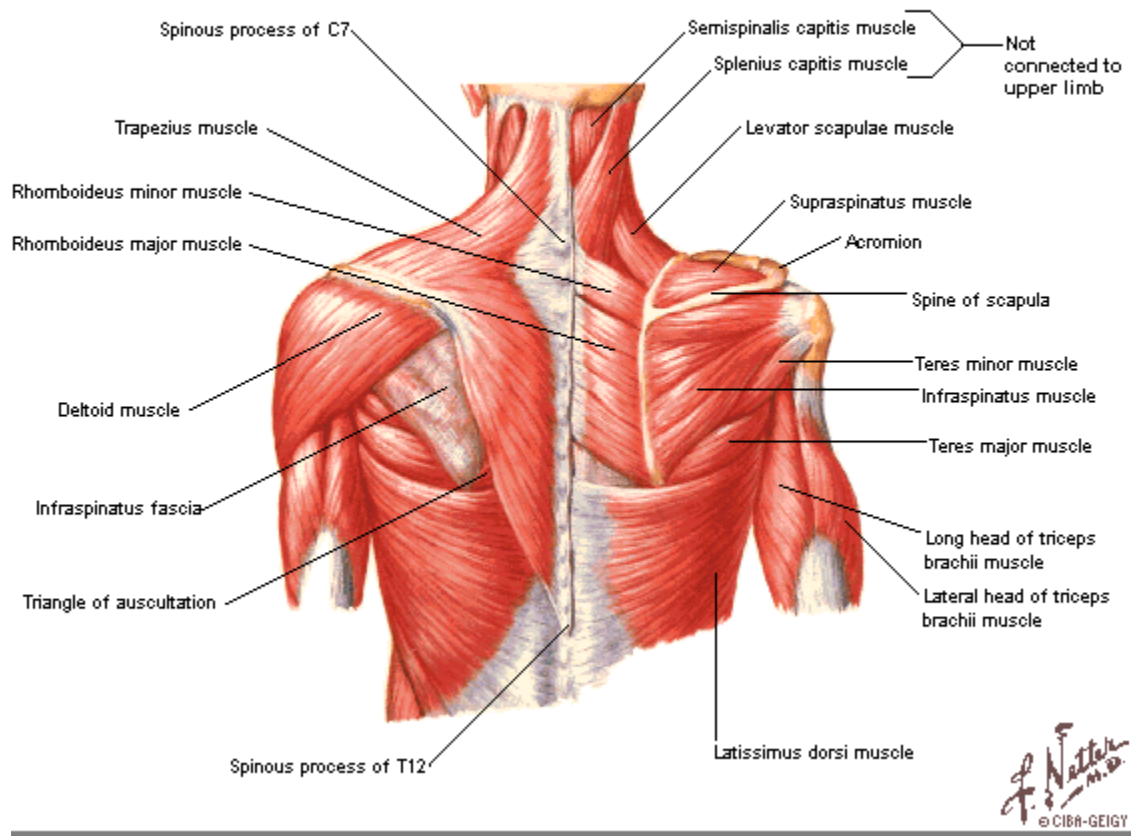
#### F. Lateral rotation:

1. Infra-spinatus
2. Posterior fibres of deltoid
3. Teres minor.



## Muscles of Shoulder

### Posterior View



### ★ Mechanism of abduction of the shoulder

- ***Supraspinatus*** initiates abduction from 0-15 degrees.
- The middle (acromial) fibres of ***deltoid*** then continue abduction to 90 degrees. After this range, the head cannot move any more because it impinges on ***coraco-acromial ligament***.
- Raising the arm above the head from 90-180 degrees, the scapula rotates over the chest wall so that the glenoid cavity becomes directed upwards, i.e., it is a movement of the ***shoulder girdle***. This is done by ***upper & lower fibers of trapezius and serratus anterior muscles***.

# THE ELBOW JOINT

★ **Type:** Synovial, uniaxial (hinge) joint.

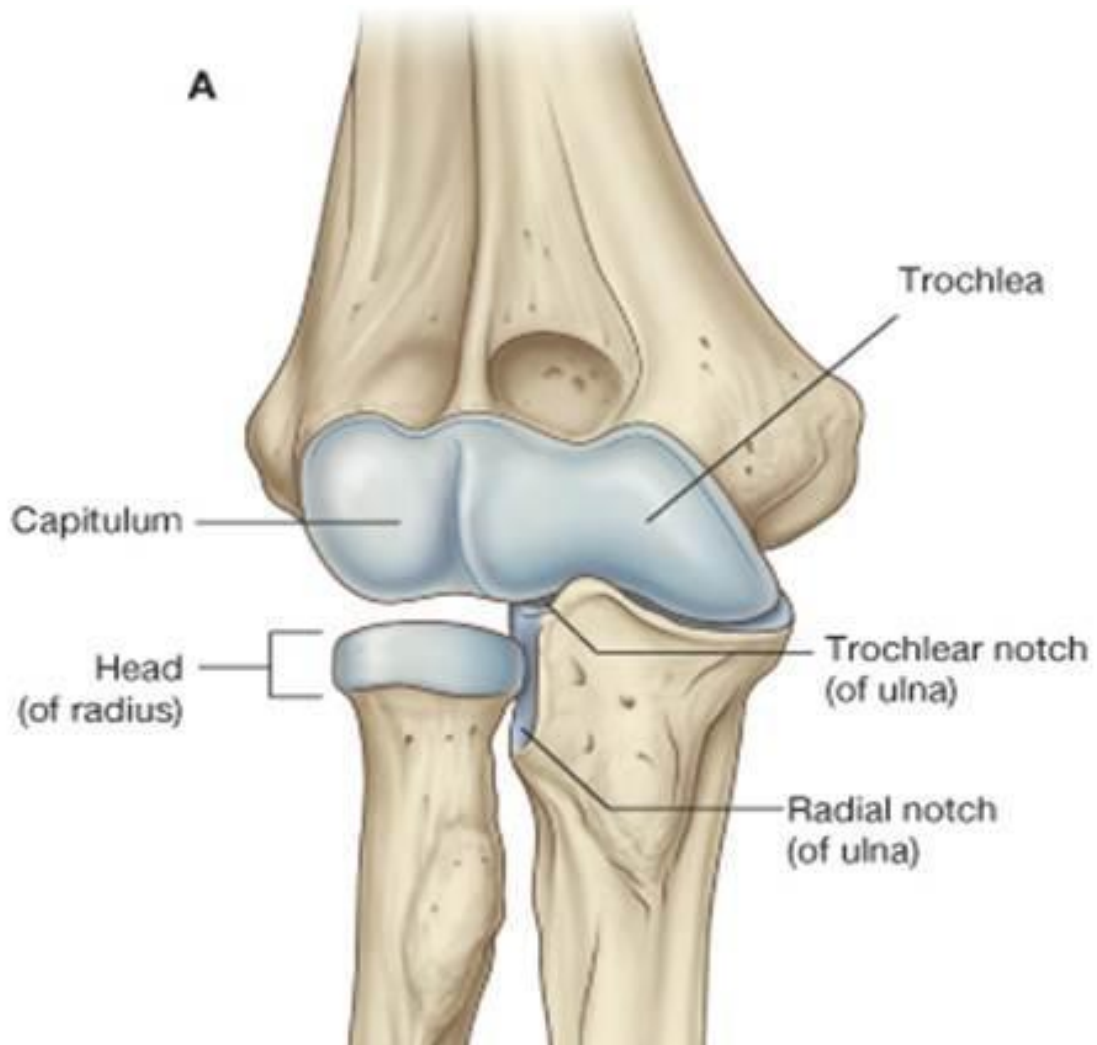
★ **Articular surfaces :**

**A. Proximally:** trochlea and capitulum of *humerus*.

**B. Distally:** Trochlear notch of *ulna* and head of *radius*.

1. Medially trochlea articulates with trochlear notch of ulna.

2. Laterally capitulum articulates with upper surface of the head of radius.

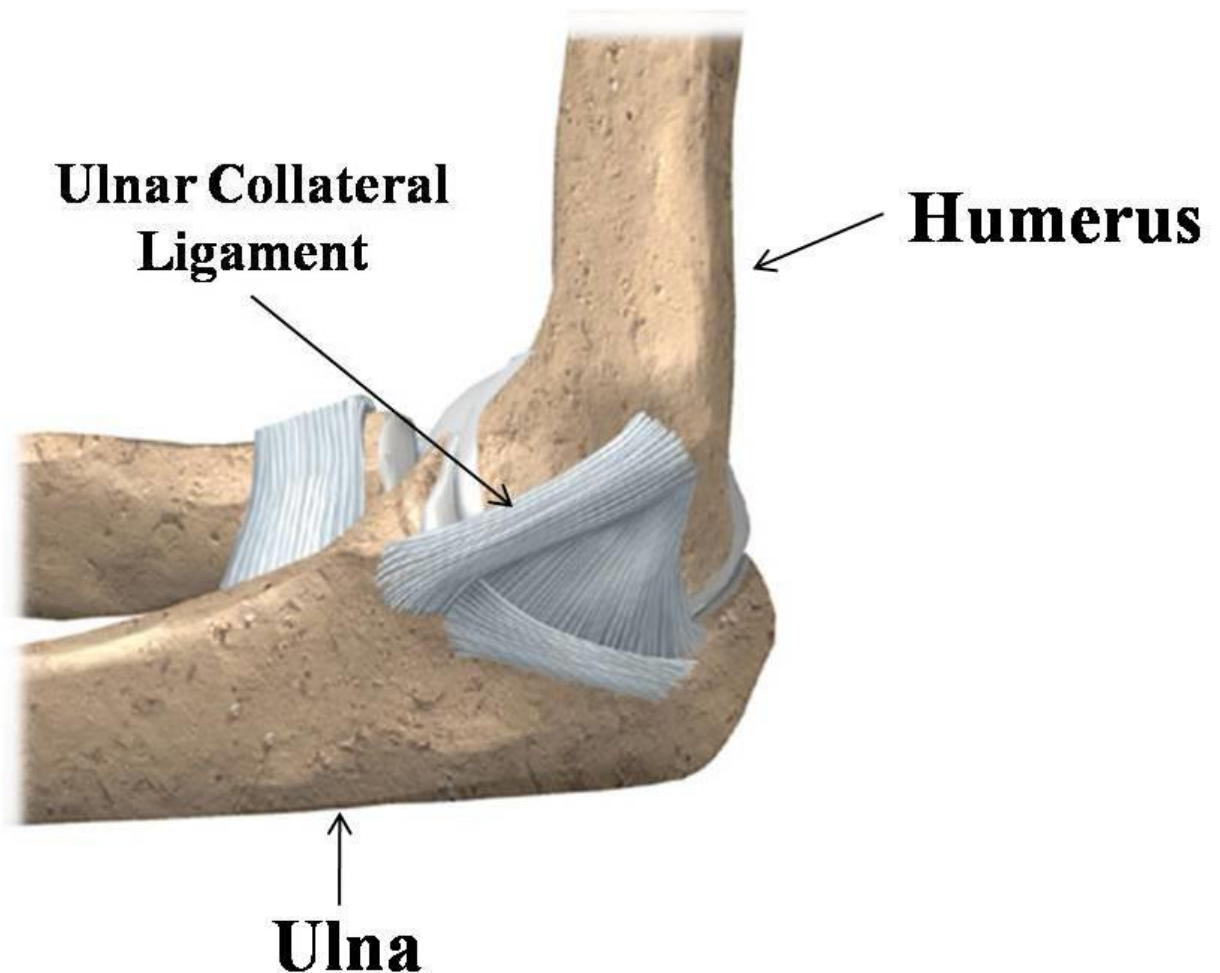


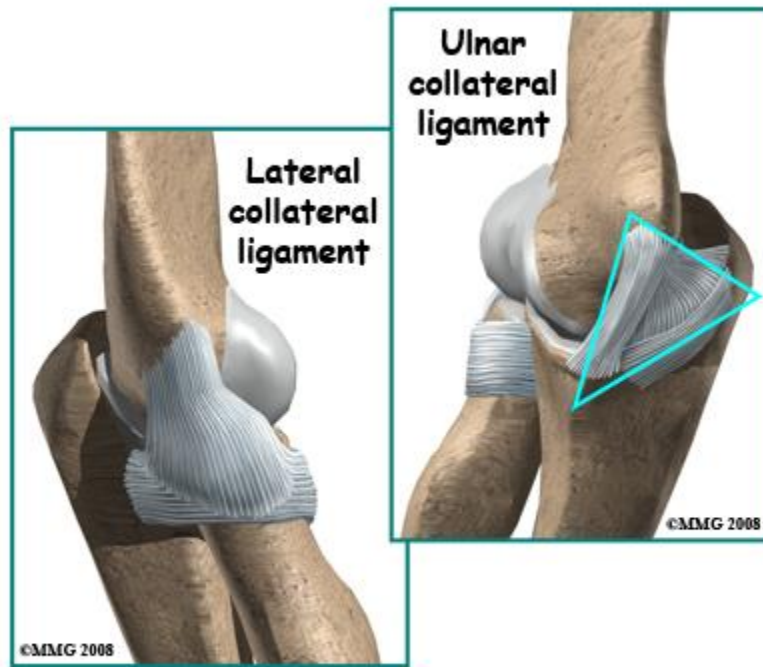
## ★ Capsule:

**A. Attachment:** the capsule is attached to the **margins** of the articular surfaces and **including** front & back of medial and lateral epicondyles , immediately above the coronoid , radial & olecranon fossae and annular ligament.

### B. Ligaments:

1. **Medial (ulnar) collateral ligament:** **Fan-shaped** and is attached above to the **medial epicondyle** and below to the medial border of **trochlear notch**. It **prevents abduction** of the elbow joint.
2. **Lateral (radial) collateral ligament:** Is attached above to the **lateral epicondyle** and below to the outer surface of **annular ligament**. It **prevents adduction**.





**C. Strength:** As any hinge joint, the capsule is thin both in front and behind to allow flexion and extension and thick at the sides to prevent abduction and adduction.

**D. Intra-capsular structures:** The articular surfaces and the coronoid, radial and olecranon fossae of the humerus and the synovial membrane.

**N.B.** Medial and lateral epicondyles are extra-capsular.

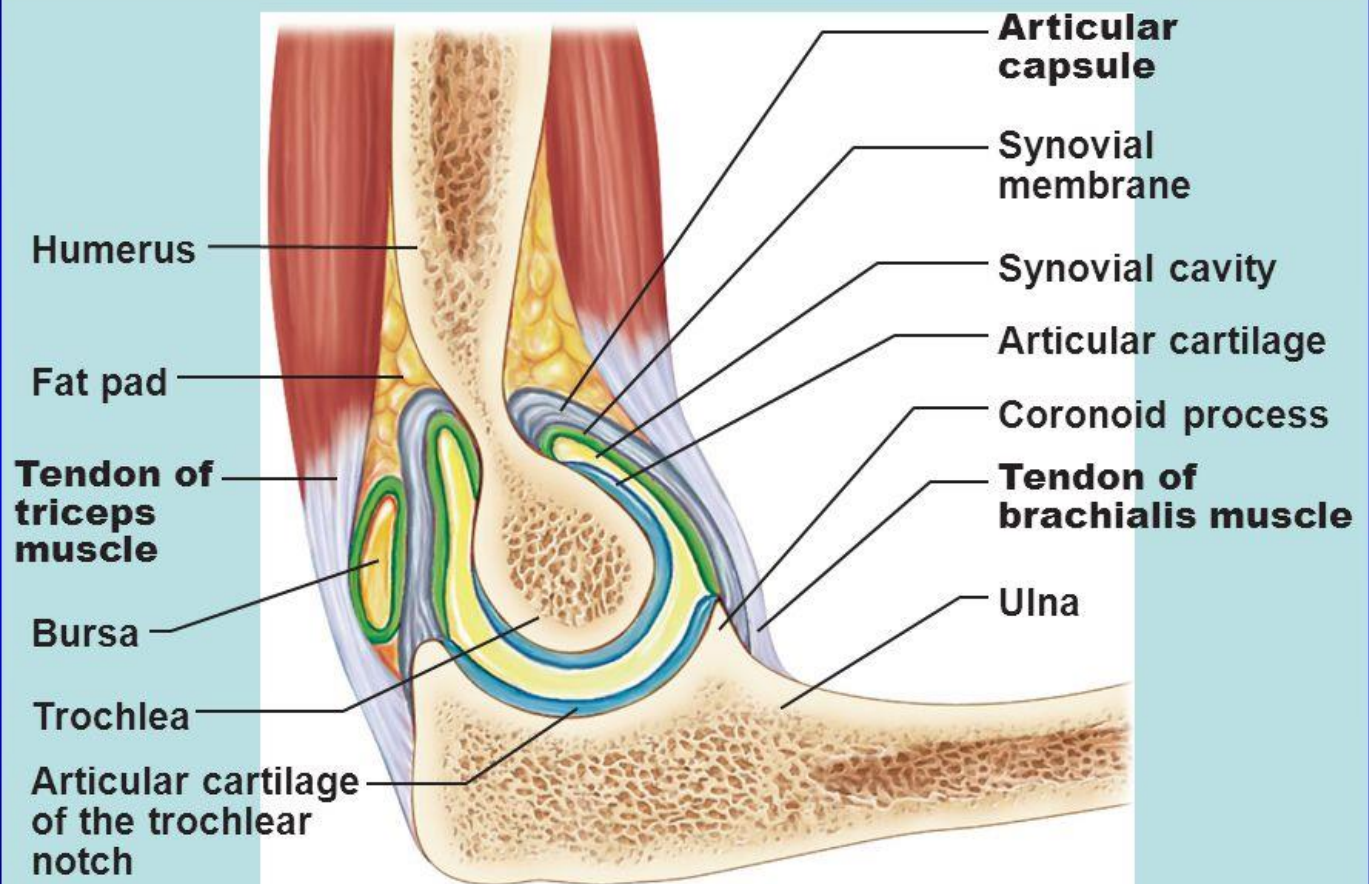
- ★ **Synovial membrane:** Is *continuous with* that of superior radio-ulnar joint.
- ★ **Bursa:** A bursa separates the tendon of triceps from the back of the capsule.
- ★ **Arterial supply:** From the anastomosing arteries around the elbow.
- ★ **Nerve supply:** Mainly from musculo-cutaneous and radial nerves.



### ★ **Movements:**

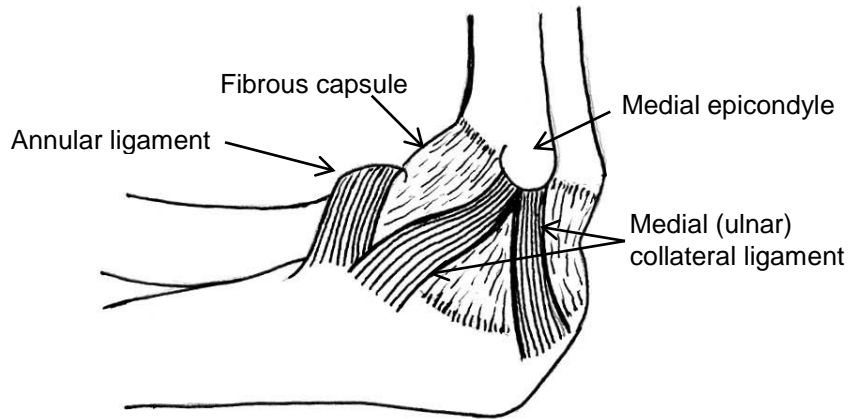
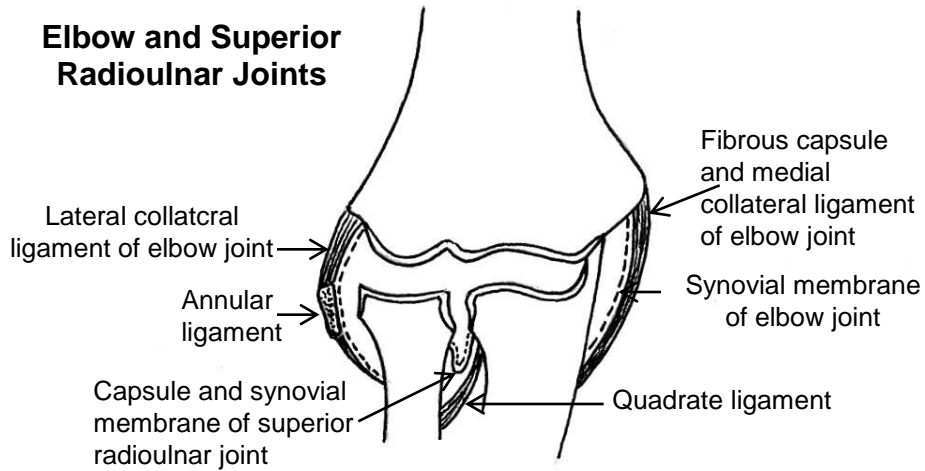
1. **Extension:** Triceps ( main extensor ) , anconeus and superficial extensors of the forearm .
  2. **Flexion:** Brachialis ( main flexor ), biceps, brachio-radialis ( in midprone position ) and superficial flexors of the forearm.
- ★ **Carrying angle :** is the angle between the long axes of the arm and forearm when the elbow is fully extended . It is about 15 degree . It is wider in females to allow for clearance of the wider female pelvis as the upper limbs swings during walking .

## The Elbow Joint



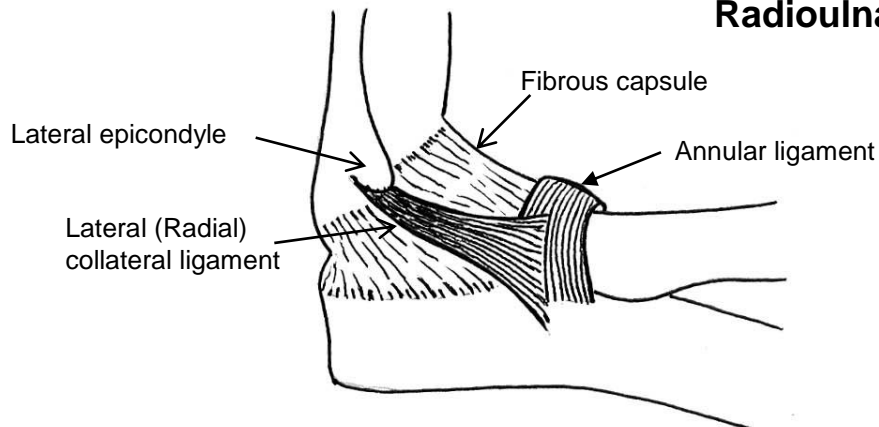
(a) Mid-sagittal section through right elbow (lateral view)

### Elbow and Superior Radioulnar Joints



**Medial View**

### Ligaments of Elbow and Superior Radioulnar Joints

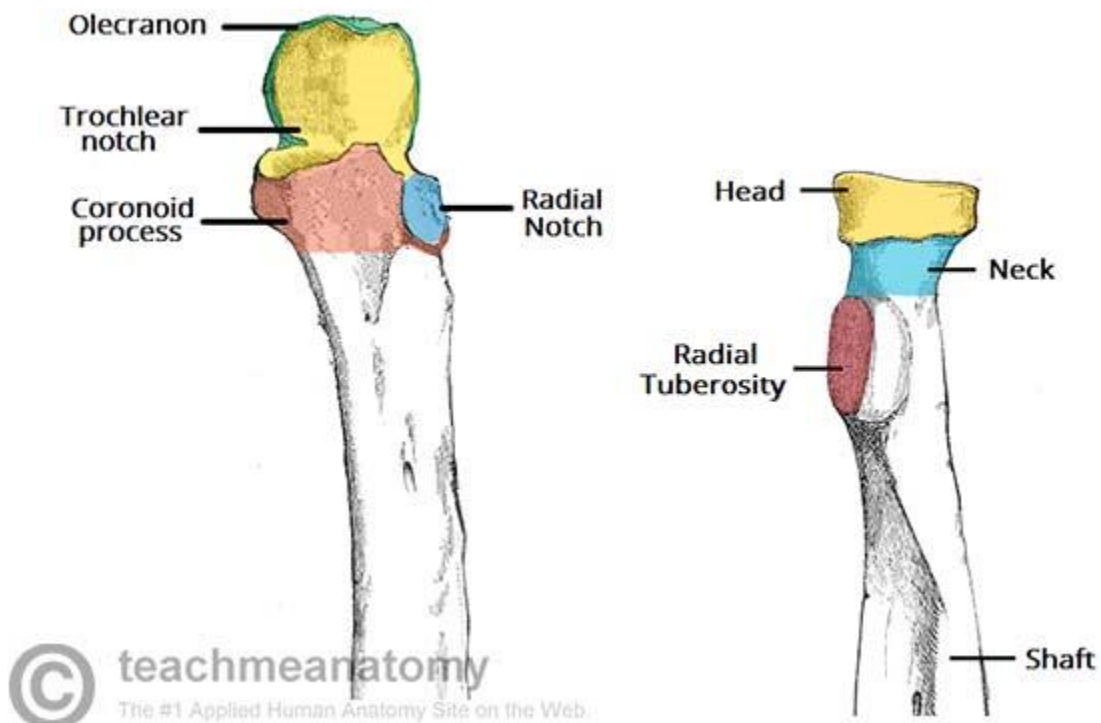


**Lateral view**

## SUPERIOR RADIO-ULNAR JOINT

I. **Type:** Synovial, uniaxial (pivot) joint.

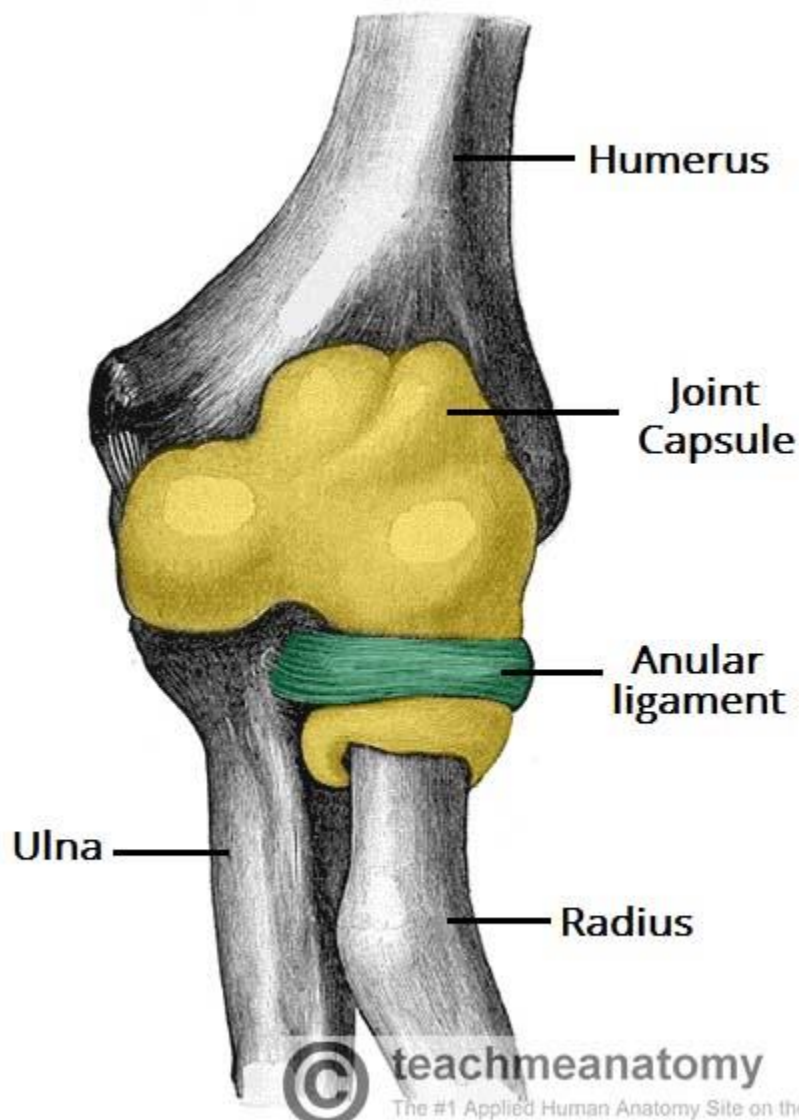
- ★ **Articular surfaces :** The circumference of the **head of radius** rotates against the **radial notch of ulna**. At any time in pronation or supination only **one quarter** of the circumference of the head of radius articulates with the radial notch of ulna. The **remaining** three quarters of the head articulates with the **annular ligament**.



### III. Capsule and Ligaments:

1. **Continuous above** with the capsule of the elbow joint. Their joint spaces are continuous together.
2. The synovial membrane is a downward prolongation of the synovial membrane of the elbow joint.

3. **Annular ligament:** Is about *three quarters of a circle* attached to the *anterior and posterior margins* of the radial notch of ulna and encircles the head of radius. It gives *attachment to* the capsule and lateral collateral ligament of the elbow joint. It is slightly *narrower below* than above and this *prevents* the head of radius from being *dislocated* downwards.
4. **Quadrante ligament:** Connects the lower margin of the radial notch of the ulna to the medial aspect of the neck of radius just above its tuberosity.



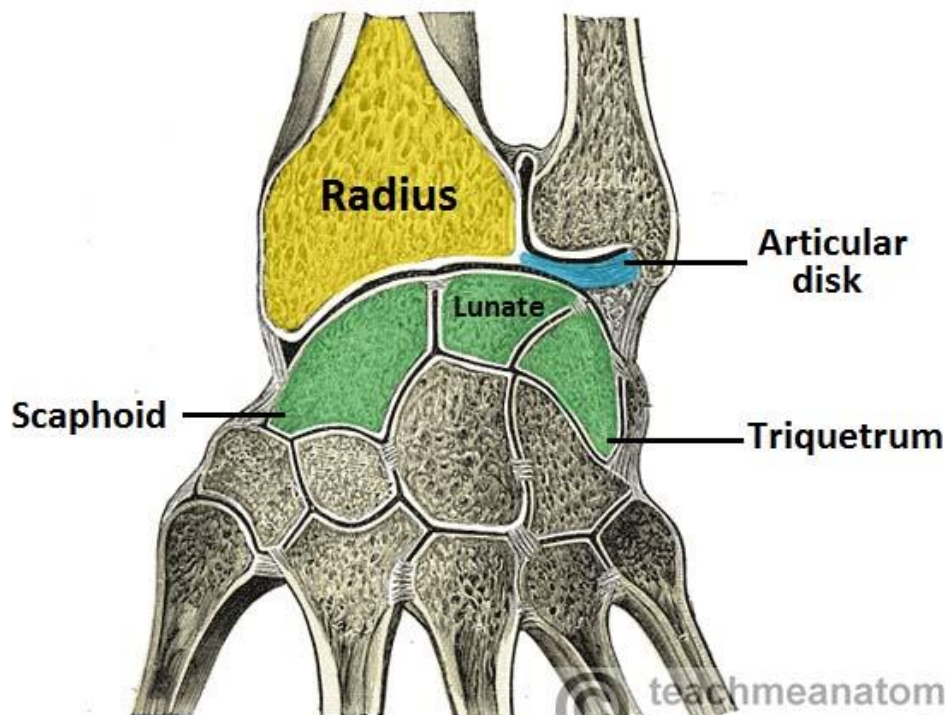
## INFERIOR RADIO-ULNAR JOINT

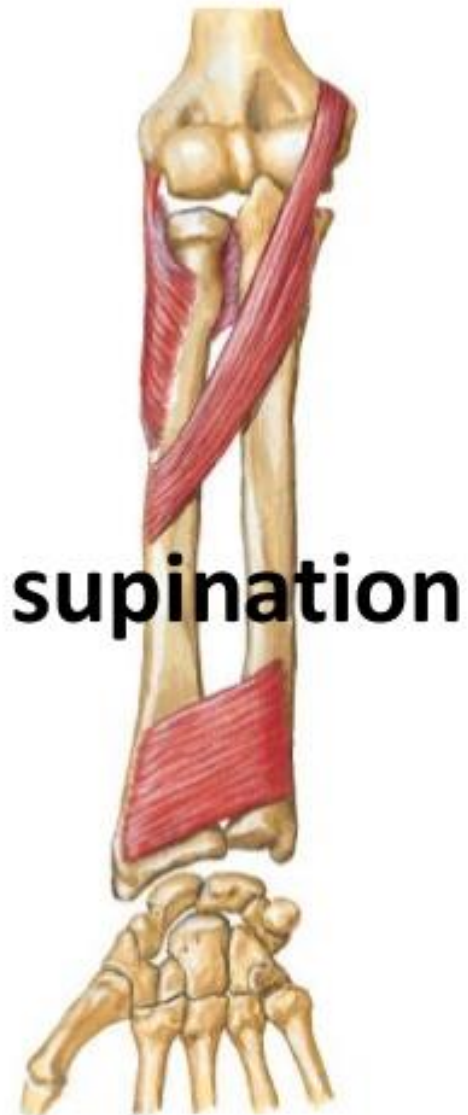
- **Type:** Synovial, uniaxial (*pivot*) joint.

★ **Articular surfaces :** The *head of ulna* articulates with the *ulnar notch of radius*.

★ **Capsule:**

- **Lax** to allow for the *wide range* of pronation.
- **Continuous** above to the lower end of the *interosseous* membrane.
- **The articular disc of cartilage of inferior radio-ulnar joint:**
  1. A thick *triangular* plate of *fibro-cartilage* which lies *below the head of ulna*.
  2. It *separates* the head of ulna from the *triquitral* bone, thus the head of ulna does not enter in the formation of the wrist joint which is thus referred to as radio-carpal joint.
  3. It separates the **cavity** of inferior radio-ulnar joint from that of the wrist joint (i.e., the synovial membrane of the inferior radio-ulnar joint is separated from that of wrist joint by the disc).
  4. It is **attached** by its **apex** to a rough impression near the *root of the styloid process* of ulna and by its **base** to the lower margin of the *ulnar notch of radius*. This disc **allows** the radius to rotate around the head of ulna, but **prevents** the separation of the two bones from each other.





## The Interosseous Membrane

**I. Attachment:** In addition to superior and inferior radio-ulnar joints, the radius and ulna are also joined by a fibrous membrane called interosseous membrane.

1. **Laterally:** It is attached to the interosseous border of radius.
2. **Medially:** It is attached to the interosseous border of ulna.
3. **Above:** It ends at a **free border** 2.5cm below the radial tuberosity.
4. **Below:** It blends with the capsule of inferior radio-ulnar joint.

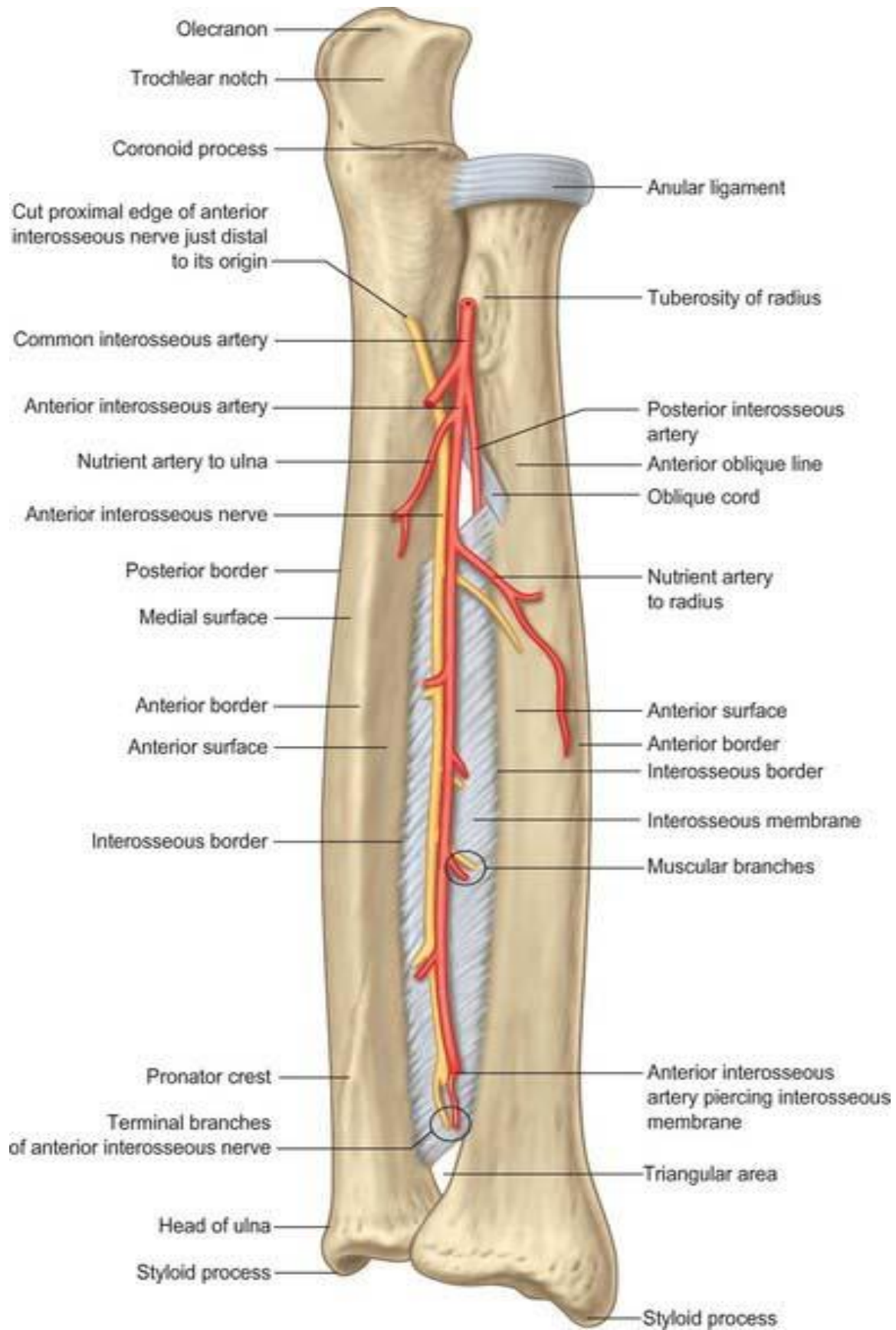
**II. Direction of fibres:** The fibres of interosseous membrane run obliquely **downwards and medially from radius to ulna.**

### III. Functions:

1. Increases the area for **attachement of muscles** of the forearm.
  - Muscles which take origin from the anterior surface of interosseous membrane:
    - i. Flexor pollicis longus
    - ii. Flexor digitorum profundus
  - Muscles which take origin from the posterior surface:
    - i. Abductor pollicis longus
    - ii. Extensor pollicis longus
    - iii. Extensor pollicis brevis
    - iv. Extensor indices
2. The radius receives forces from the hand. The interosseous membrane, due to the direction of its fibres, **transmits forces from radius to ulna** which in turn transmits forces upwards to the humerus.

### IV. Relations:

1. The anterior interosseous nerve and vessels lie on its anterior surface.
2. The anterior interosseous artery pierces it 5 cm above its lower end.
3. The posterior interosseous vessels pass backwards above its upper border.
4. Pronator quadratus crosses in front of its lower part.
5. Muscles attached to its anterior and posterior surfaces.



## THE WRIST JOINT



★ **Type:** Synovial, biaxial (*ellipsoid*) joint.

★ **Articular surfaces:**

**A. Proximal articular surface:** Formed by:

1. The inferior surface of lower end of *radius*
2. Inferior surface of *articular disc* of inferior radio-ulnar joint which lies below the head of ulna (separating it from the triquetral bone & wrist joint).
  - This proximal articular surface has an *ellipsoid* outline with a transverse diameter of about **5 cm.** and an antero-posterior diameter of about **2 cm.** It is *slightly concave* in both directions.

**B. Distal articular surface:** Is formed of three carpal bones;

1. *Scaphoid and lunate* lie below the radius.
2. *Triquetral* lies below the articular disc below the head of ulna.
  - These three bones form an *oval* surface which is *convex* in all directions.

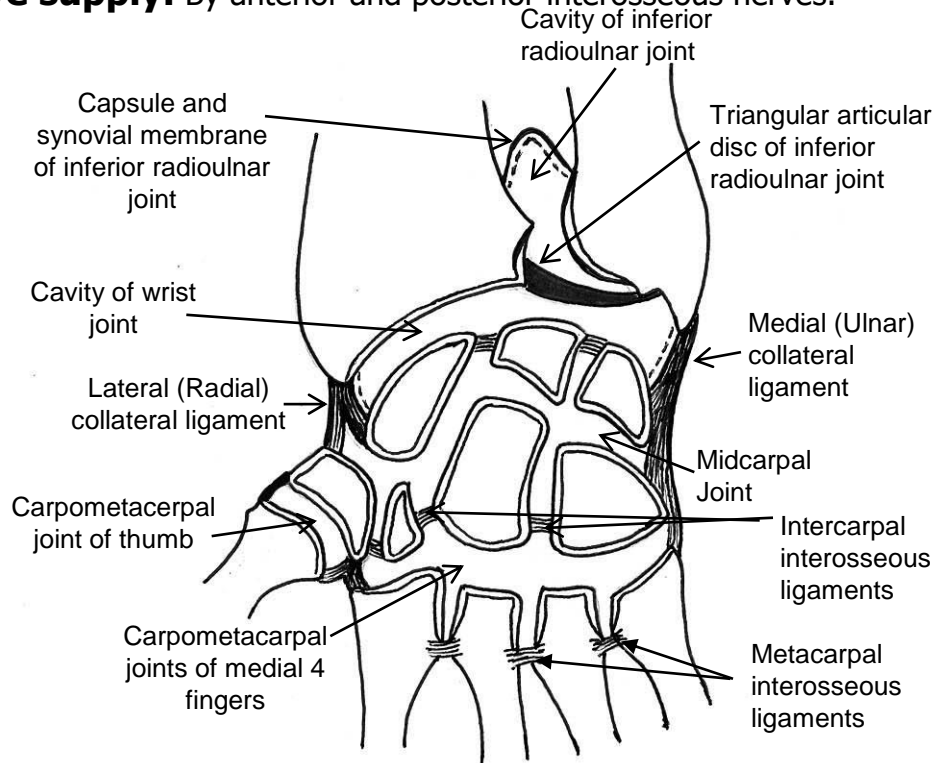
**N.B. The ulna does not come in direct contact with the carpal bones due the presence of the articular disc of cartilage below the head of ulna. Therefore, the wrist joint is called radio-carpal joint.**

★ **Capsule and ligaments:**

1. The capsule is attached to the *margins* of the articular surfaces.
2. The lateral and medial parts of the capsule are **thickened** to form *radial (lateral)* and *ulnar (medial) collateral* ligaments of the wrist. They descend from the **styloid processes** of both radius and ulna to become attached to the **proximal carpal bones** below.
3. The capsule is strengthened in front and behind by *anterior and posterior* ( palmar and dorsal ) *radio-carpal ligaments* which pass obliquely downwards and medially from the **lower end of the radius to the carpal bones.** They are important as they **force the carpus to move with the radius** as one unit during *pronation and supination.*

★ **Arterial supply:** (anastomosis around the wrist ).

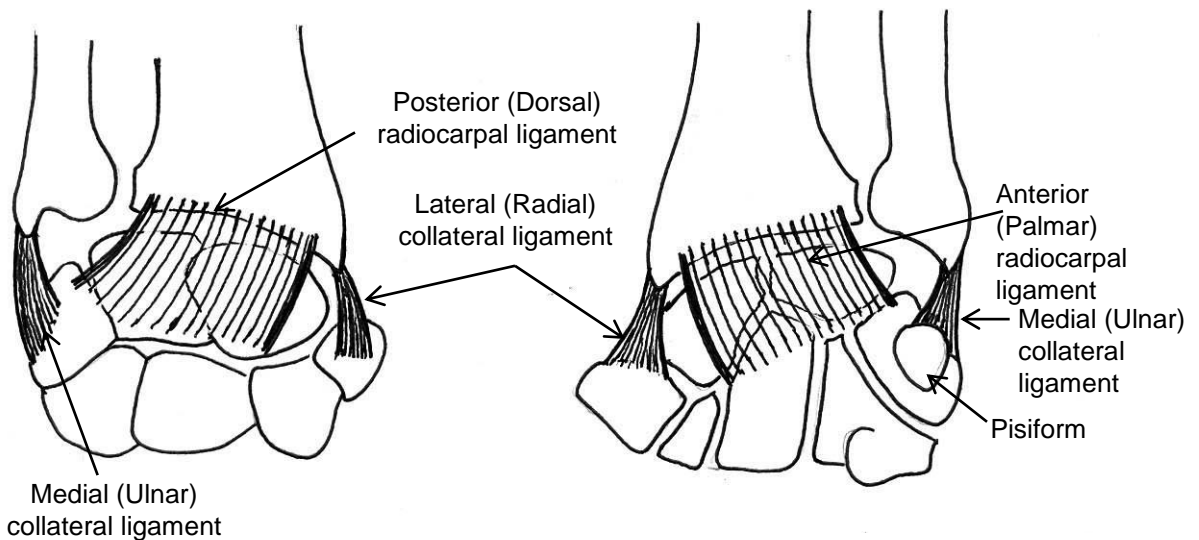
★ **Nerve supply:** By anterior and posterior interosseous nerves.



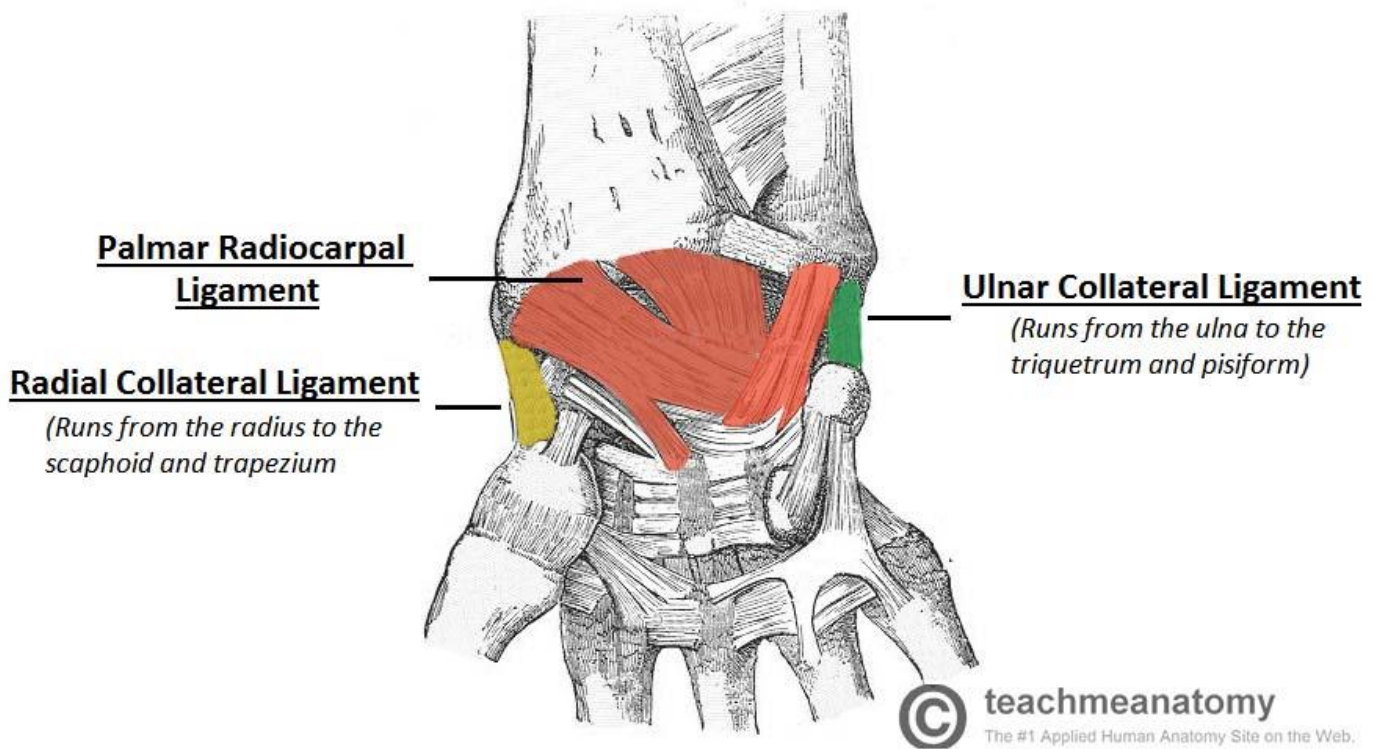
**Wrist Joint, Inferior Radioulnar Joint  
Midcarpal and Carpometacarpal  
Joints**

\* **Posterior View**

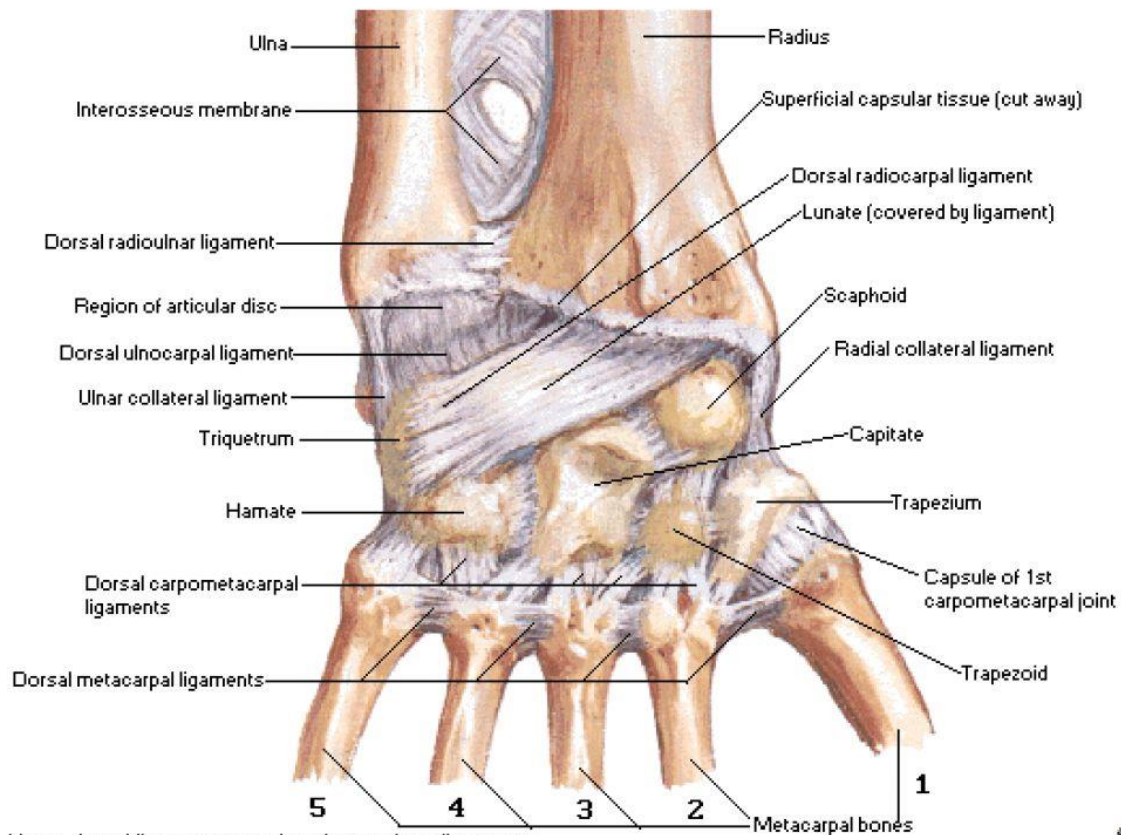
\* **Anterior View**



**Ligaments of Wrist Joint**



## Ligaments of Wrist Posterior [Dorsal] View



Note: dorsal ligaments weaker than palmar ligaments

## ★ Movements:

### A. Flexion:

1. Flexor carpi radialis is a main flexor
2. Flexor carpi ulnaris is a main flexor
3. Palmaris longus
4. All the long muscles whose tendons cross in front of the wrist help in flexion.

### B. Extension:

1. Extensor carpi radialis longus is a main extensor
2. Extensor carpi radialis brevis is a main extensor
3. Extensor carpi ulnaris is a main extensor
4. All the long muscles whose tendons cross behind the wrist help in extension.

### B. Adduction:

1. Flexor carpi ulnaris
2. Extensor carpi ulnaris

### C. Abduction:

1. Extensor carpi radialis longus
2. Extensor carpi radialis brevis
3. Flexor carpi radialis
4. Abductor pollicis longus

**D. Circumduction:** Combination of the above mentioned four movements.

## THE MID-CARPAL JOINT

**I. Type and Variety:** Synovial; modified ellipsoid joint.

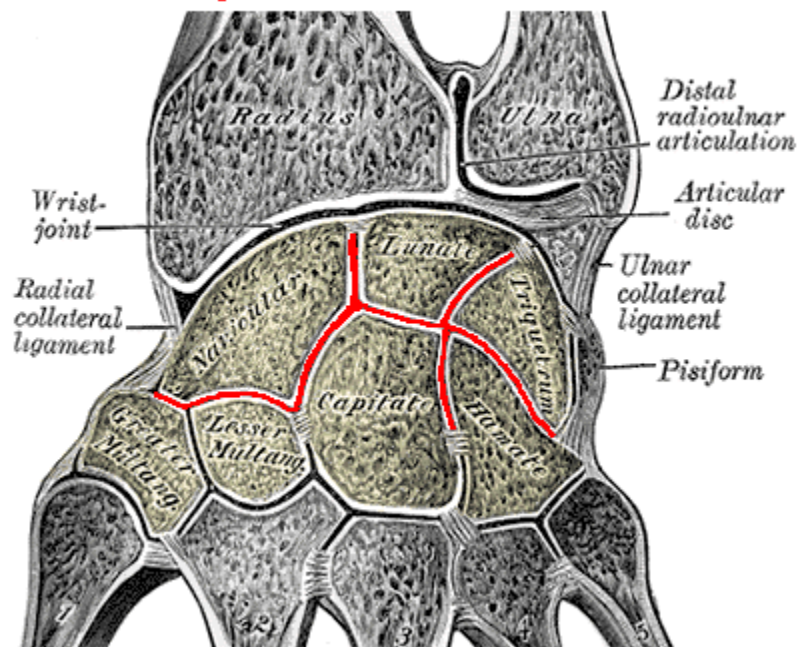
**II. Articular surfaces :** It is the joint between:

1. The proximal row of carpal bones ( except pisiform ) , as one unit.
2. The distal row of carpal bones, as the second unit.

**III. Capsule:** It has a *common capsule* and a common joint *cavity*.

**IV. Movements:** Its movements are **complimentary** to those of wrist joint but much more limited. It allows *limited flexion, extension, abduction and adduction* (the same muscles as the wrist are concerned).

### Midcarpal Joints



## THE CARPO-METACARPAL JOINTS

1. All the **metacarpal bones, except** that of the thumb, join the carpus in such a way that their palmar surfaces look forwards. The **metacarpal bone of the thumb** joins the trapezium in such a way that it is **rotated 90 degrees** so that its **palmar surface looks medially**. The **plane of the thumb lies at right angle to that of the other fingers**. This makes the thumb **able to oppose** the other fingers.
2. **Articular surfaces:** The distal row of carpal bones articulate with the bases of the metacarpal bones in the following manner:
  - **Trapezium** articulates with the **1<sup>st</sup>** metacarpal bone (of the thumb).
  - **Trapezoid** articulates with the **2<sup>nd</sup>** metacarpal bone (of the index).
  - **Capitate** articulates with the **3<sup>rd</sup>** metacarpal bone (of middle finger).
  - **Hamate** articulates with the **4<sup>th</sup> and 5<sup>th</sup>** metacarpal bones (of the ring and little fingers).

## CARPO-METACARPAL JOINT OF THE THUMB

**I. Type:** Synovial, biaxial (**saddle** joint).

**II. Articular surfaces:** **Trapezium** articulates with the base of **1<sup>st</sup> metacarpal** bone. The articular surface of each bone is concavo-convex (i.e., concave in one direction and convex in the other perpendicular direction).

**III. Movements:** It is the **next freely moveable** joint after the ball and socket variety. It allows:

**1. Flexion and extension:** In a plane **parallel** to the palm.

**2. Abduction and adduction:** In a plane at **right angle** to the palm.

**N.B.** Movements of the thumb occur in planes at right angles to the planes of similar movements of the other four fingers.

**3. Circumduction:** Combination of the upper four movements.

**4. Opposition:** The thumb is flexed, then rotated medially so that its palmar surface opposes the palmar surface of any of the other four fingers.

**N.B. *The thumb is the most important finger*** because of its ability to oppose the other four fingers, performing fine movements & responsible for grasping function of the hand .

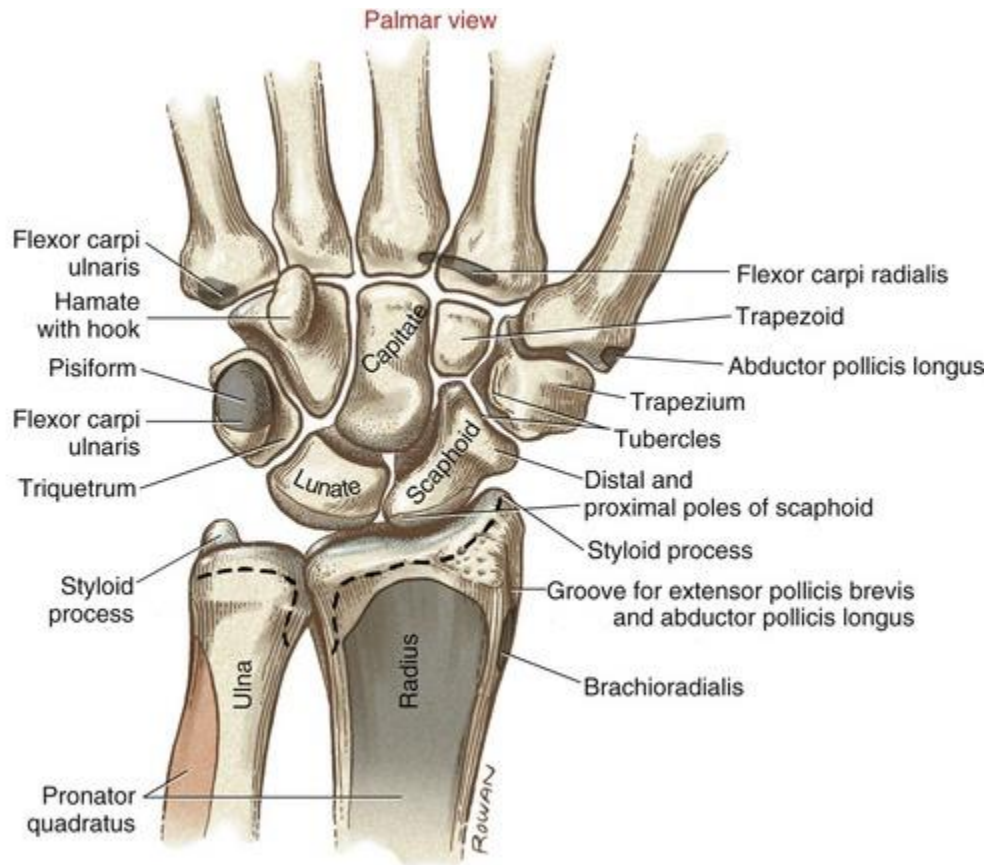
#### **IV. Muscles acting on the thumb, at the carpo-metacarpal joint:**

##### **A. Four long muscles:**

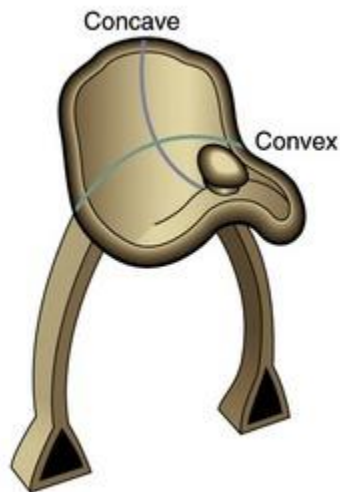
1. Flexor pollicis longus
2. Abductor pollicis longus
3. Extensor pollicis longus
4. Extensor pollicis brevis

##### **B. Four short muscles: (thenar muscles )**

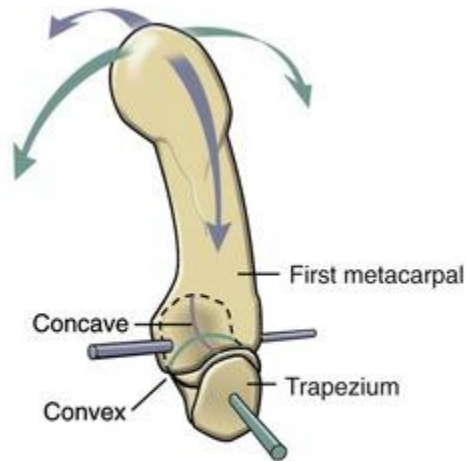
1. Abductor pollicis brevis.
2. flexor pollicis brevis .
3. opponens pollicis
4. Adductor pollicis



A

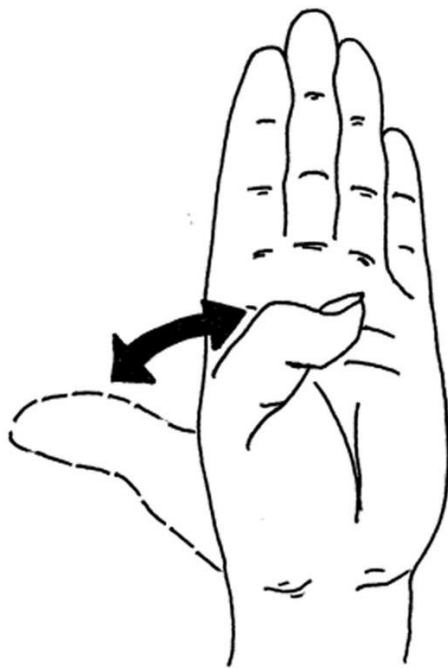


A



B

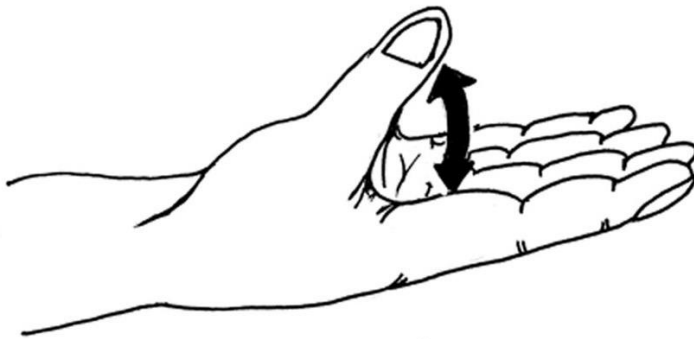




Flexion →  
Extension ←



Oposition  
(Flexion+ Medial rotation)



Abduction ↑  
Adduction ↓

**MOVEMENTS OF THUMB**

## CARPO-METACARPAL JOINT OF MEDIAL FOUR FINGERS

- I. **Type:** Synovial, plane variety.
- II. **Movement:** Minimal gliding movement. The *little finger* has an *opponens* muscle which can move its metacarpal bone *forwards and laterally* toward the thumb and helps in *cupping* the hand.

## THE METACARPO-PHALANGEAL JOINTS

- I. **Type:** Synovial joints , *condyloid* variety:
- II. **Articular surfaces:**
  - A. Heads of the *metacarpal* bones.
  - B. Bases of the *proximal phalanges*.
- III . **Ligaments :**
  1. **Medial and lateral collateral ligaments** pass distally *from the head* of metacarpal *to the base* of proximal phalanges .
  2. **Palmar ligament** form the *palmar aspect* of the joint capsule .
  3. The palmar ligaments of medial 4 metacarpo-phalangeal joints are attached together by **deep transverse metacarpal ligaments** that hold the heads of metacarpal bones together .
- III. **Movements:**
  - A. Metacarpo-phalangeal joints *of the medial four fingers* allow:
    1. **Flexion:** By lumbricals, interossei, flexor digitorum superficialis and profundus.
    2. **Extension:** By extensor digitorum, extensor indices and digiti minimi.
    3. **Adduction:** Palmar interossei.
    4. **Abduction:** Dorsal interossei.

B. Metacarpo-phalangeal joint of the **thumb**: A hinge joint and allows:

- 1. Flexion:** By flexor pollicis longus and brevis.
- 2. Extension:** By extensor pollicis longus and brevis.

## **INTERPHALANGEAL JOINTS**

**I. Type:** Synovial, uniaxial (**hinge**) joints.

**II.** Ligaments : medial & lateral collateral ligaments and palmar ligaments ( like metacarpophalangeal joints )

**III. Movements:** They allow flexion and extension only.

A. In the **medial four** fingers:

**1. Flexion:**

- Flexor digitorum profundus (acting on both proximal and distal interphalangeal joints but it acts mainly on the distal one).
- Flexor digitorum superficialis (acting only on proximal interphalangeal joint).

**2. Extension:**

- Lumbricals
- Interossei

B. In the **thumb**:

**1. Flexion:** Flexor pollicis longus

**2. Extension:** Extensor pollicis longus

## VOLAR VIEW

