Joints of the upper limb

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Objectives-

Describe the bones that form the joints.

Describe the supports of the joints

Describe muscles acting on the joint.

Describe the vascular and nerve supply to the Joints

Describe the clinical applications.

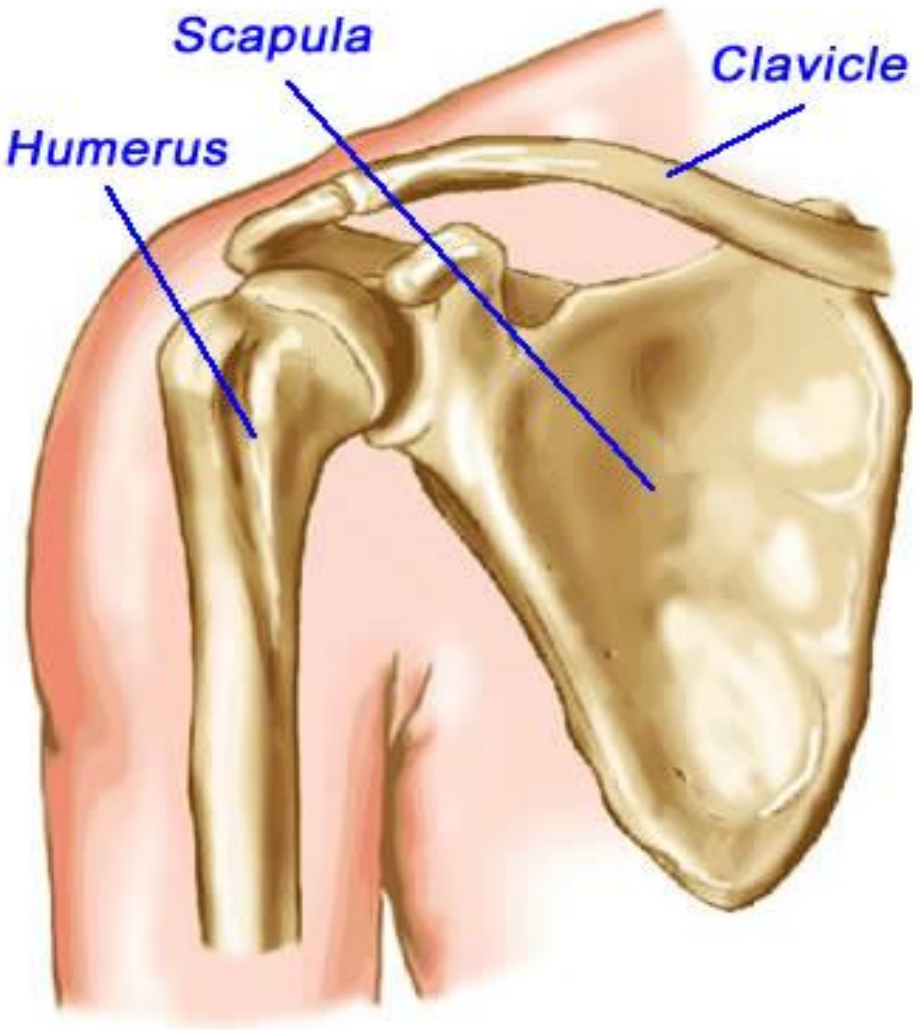
Shoulder joint

Ball and socket type

Between head of humerus and glenoid fossa

Wider mobility and less stability.

Gleno humeral, acromioclavicular and sterno clavicular, scapular thoracic forms the shoulder joint complex.



Shoulder joint complex X -ray

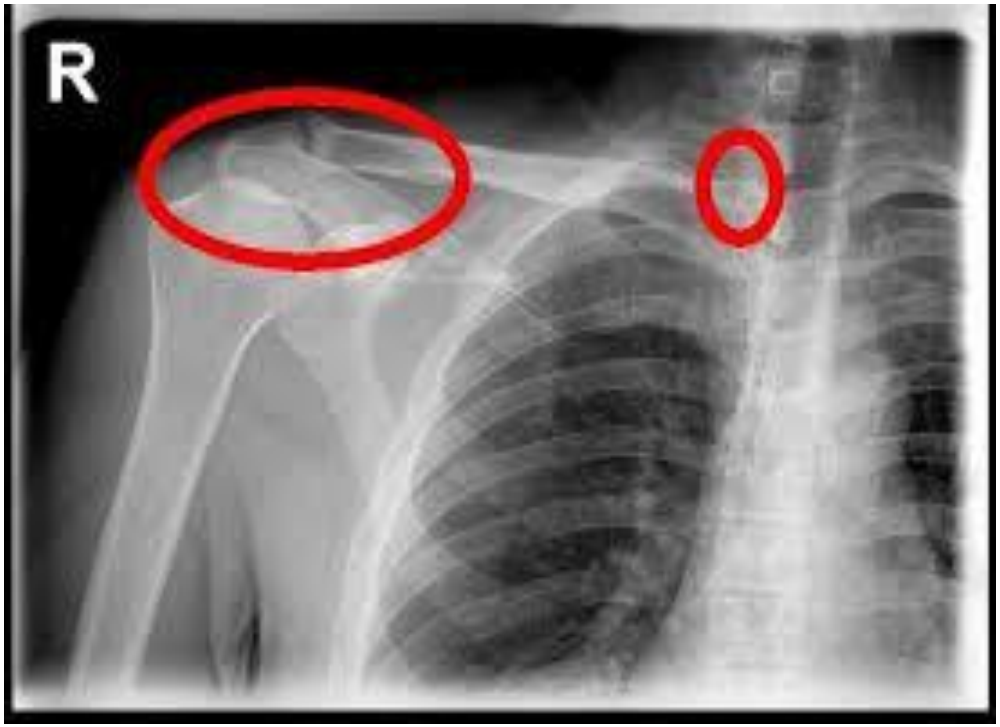
<u>Shoulder joint complex include-</u>

Gleno humeral joint

Acromioclavicular joint

Sterno clavicular joint

These three joints are biomechanically connected.



Shoulder joint supports

Labrum glenoidale deepens the articular surface

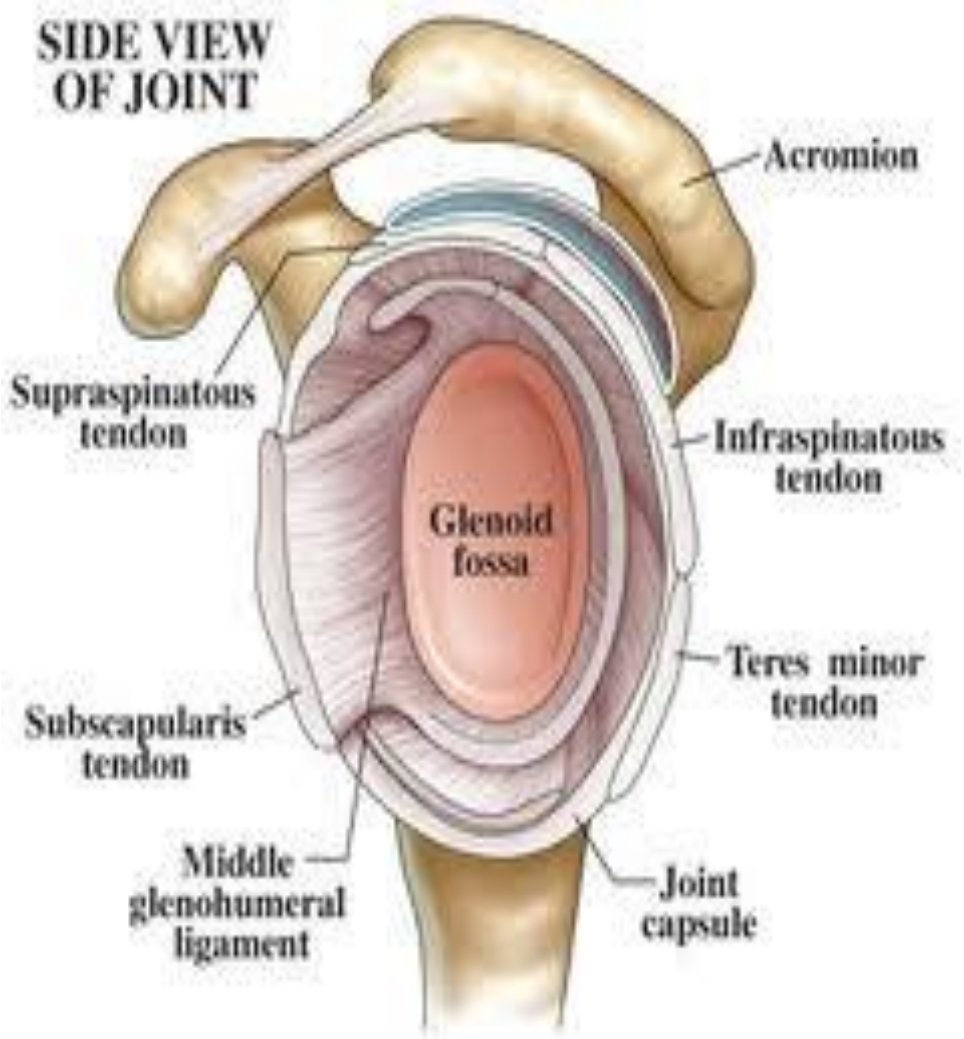
Capsule surrounds the joint

Supraspinatus, (S)

Infraspinatus (I), Teresminor (T)

and

Subscapularis (S) forms the rotator cuff muscles



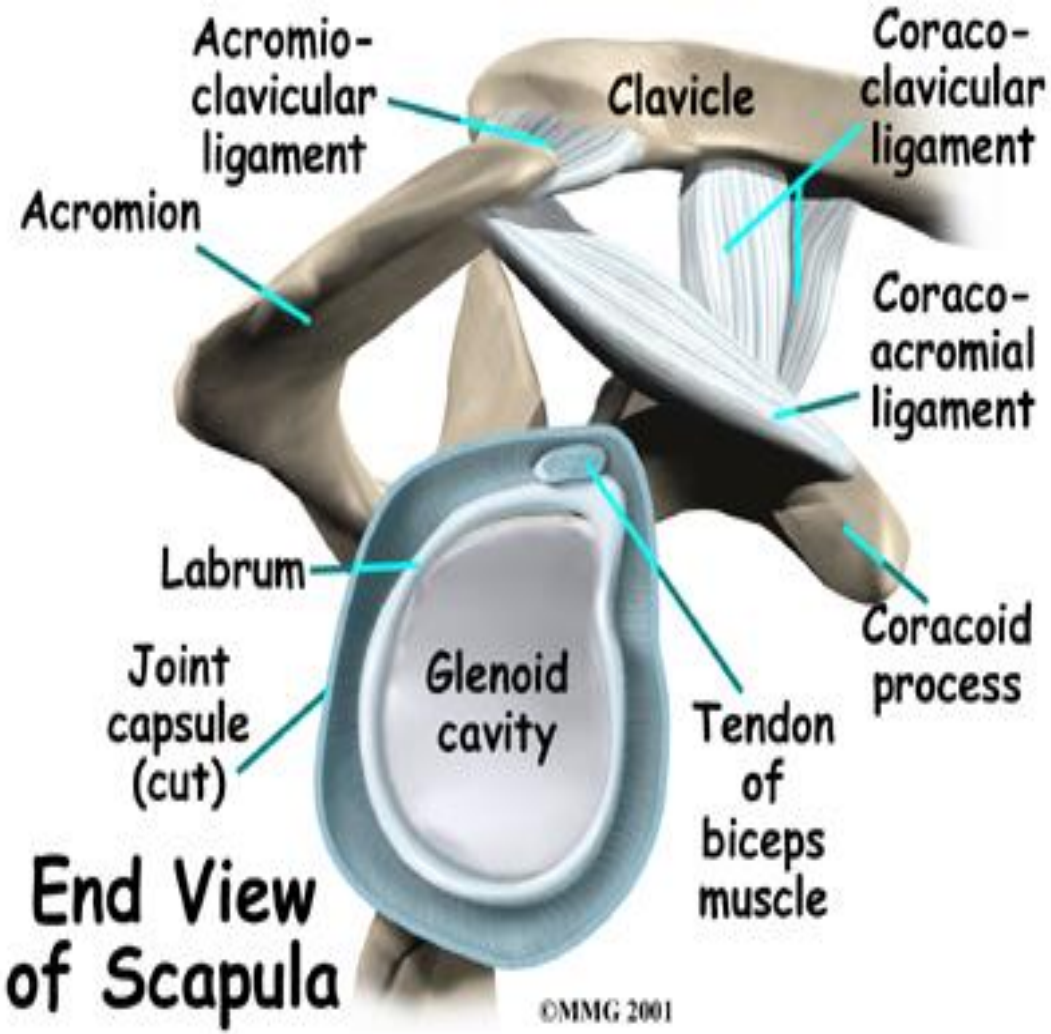
Ligaments

Coraco acromial

Coraco clavicular

Acromio clavicular

Gleno humeral ligaments – (superior, middle and inferior)



Movements

Flexion

Extension

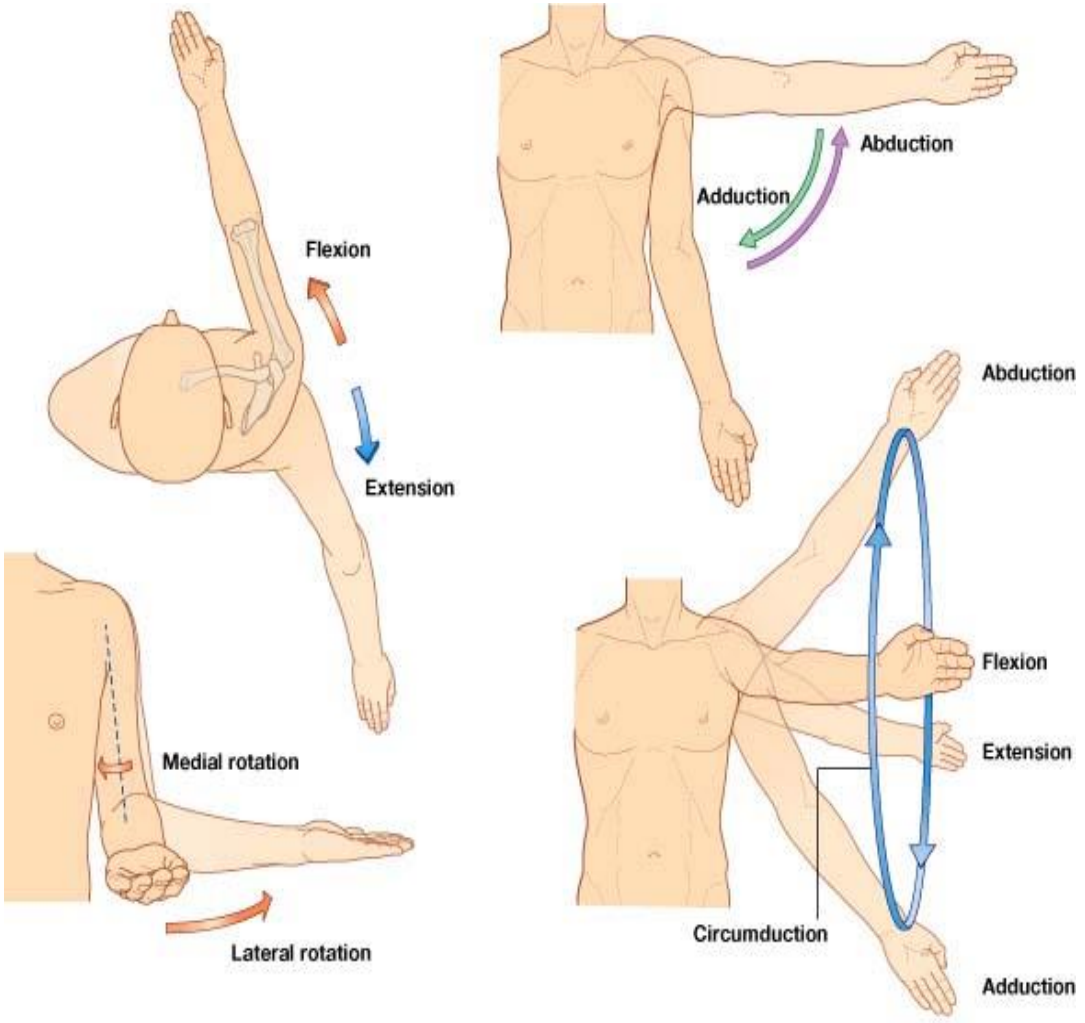
Abduction

Adduction

Lateral rotation

Medial rotation

Circumduction



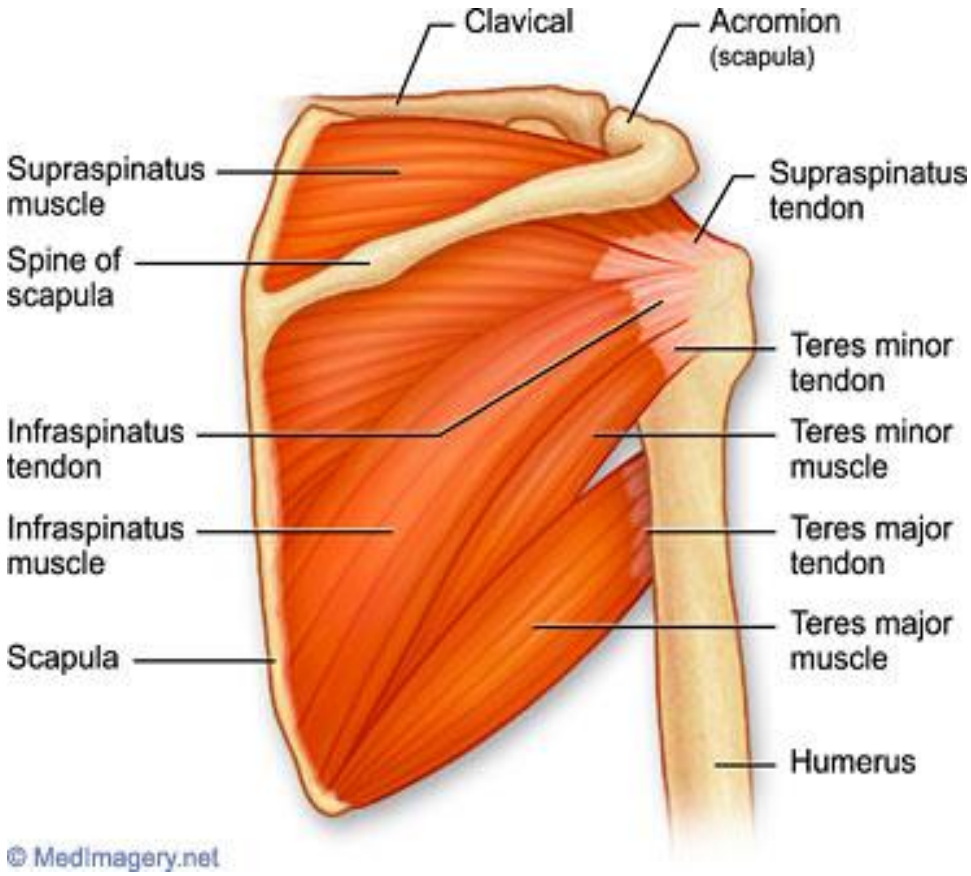
Posterior muscles

Supraspinatus – initiates abduction

Infraspinatus – lateral rotation

Teres minor - lateral rotation

Teres major - medial rotation, adduction, extension



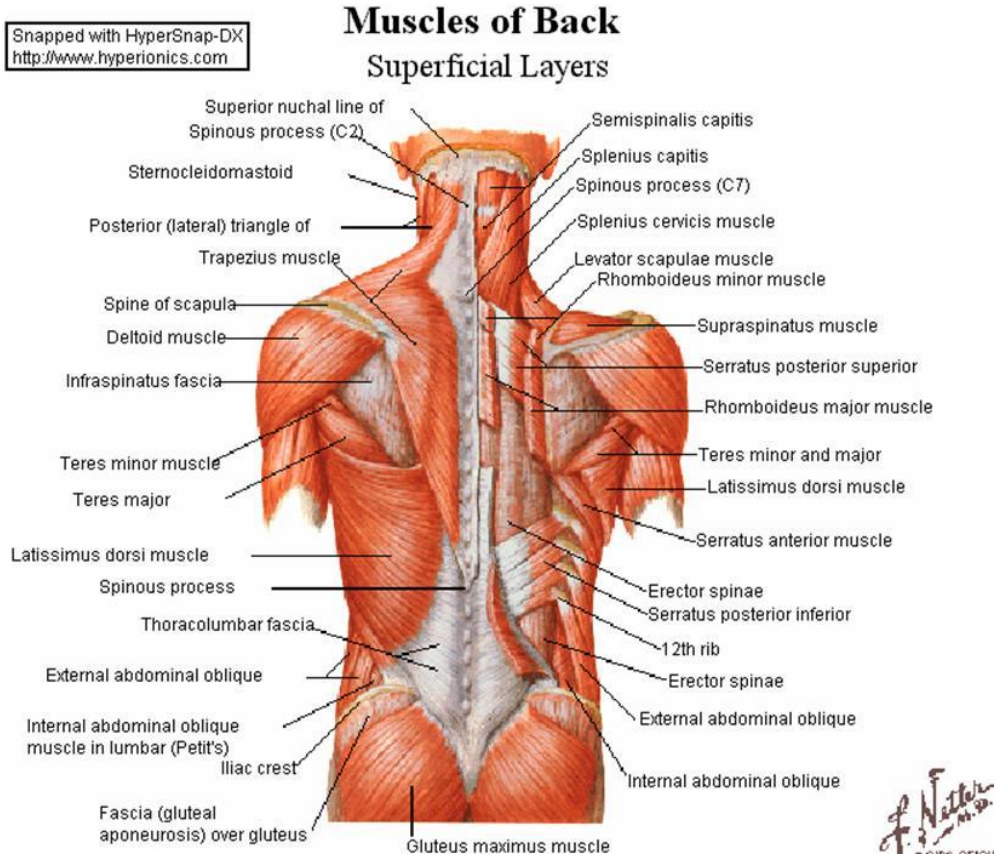
Posterior muscles

Deltoid – abduction from 15 – 90 degrees, flexion and extension.

Trapezius – Scapula rotation and shoulder abduction from 90 -180 degrees, shoulder shrugging.

Rhombids major and minor – retraction of scapula

Serratus anterior – helps in rotating the scapula during shoulder abduction and holding the medial border of the scapula attached to the thoracic wall.

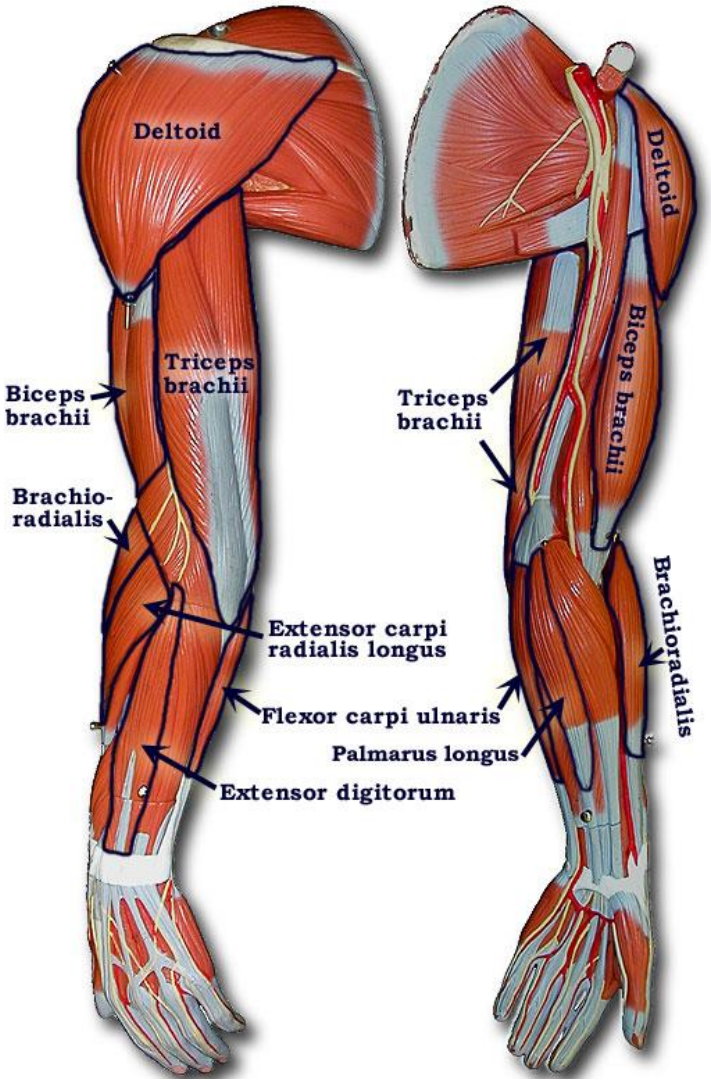


Anterior and posterior muscles

Susbscapularis – adduction and medial rotation

Triceps – Long head provide support to the shoulder. Causes extension at the elbow.

Biceps- Long head provides support to the shoulder. Biceps causes flexion at the elbow and also supination.

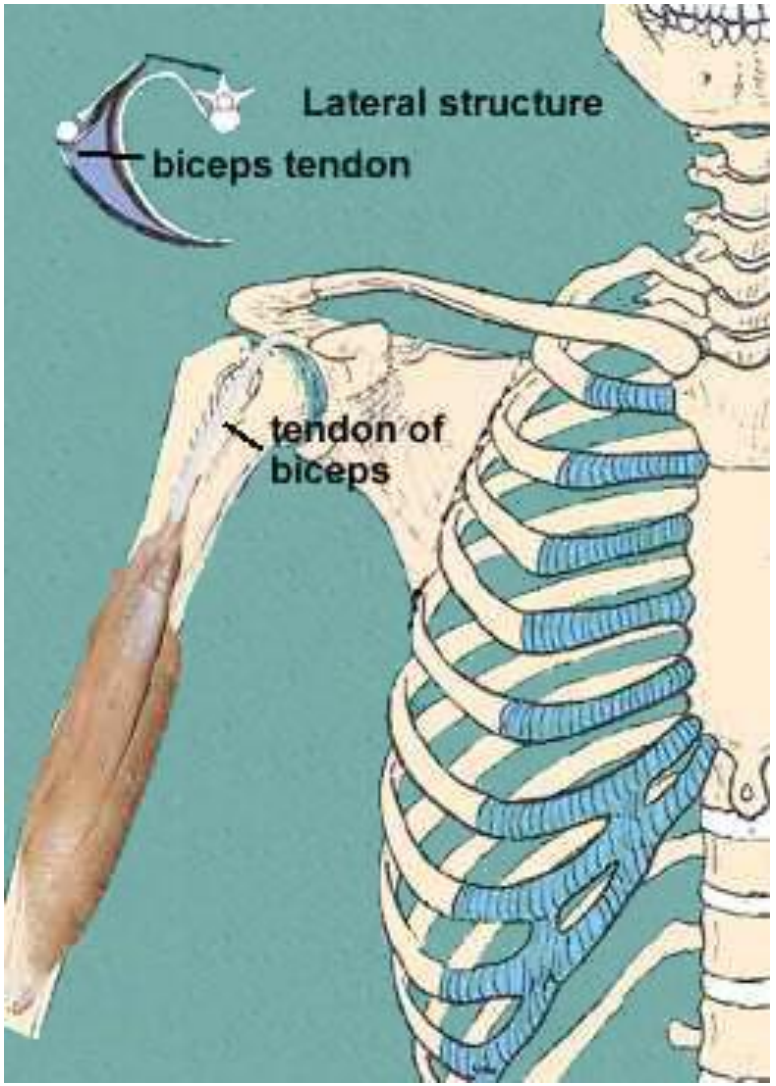


Biceps muscle

Has a long and a short head.

Causes flexion and supination at the elbow joint.

Supplied by musculocutaneous nerve.

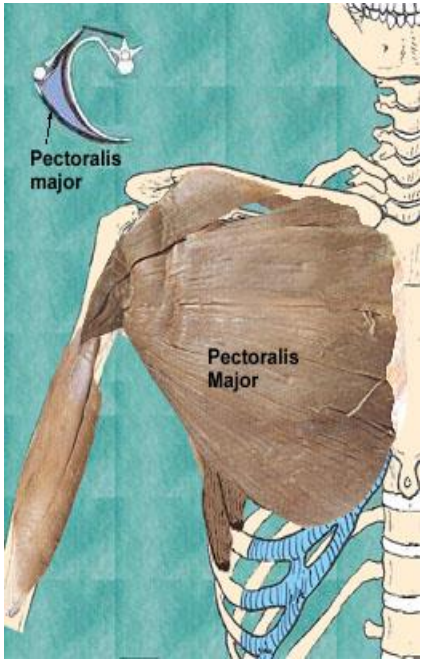


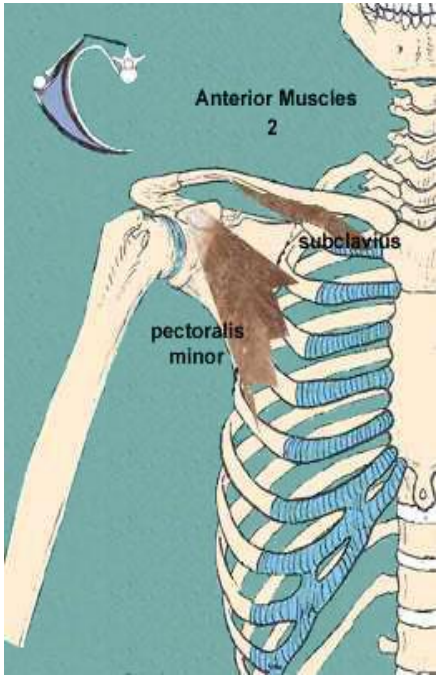
Pectoral region muscles

Anterior wall of axilla is made up of pectoralis major and minor muscles.

Pectoralis major helps in adduction, flexion, medial rotation of shoulder and help to elevate the ribs.

Pectoralis minor helps in protraction of scapula and elevation of ribs.



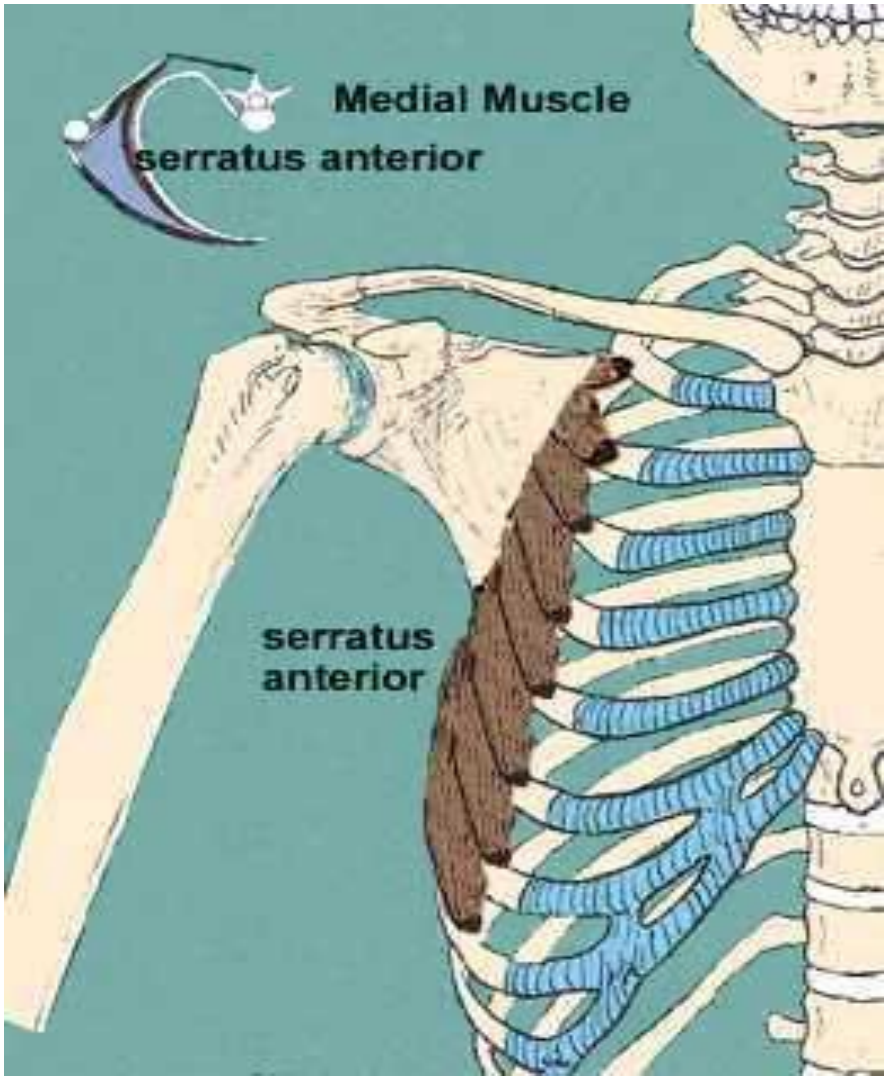


Serratus anterior muscle

Origin from upper 8 ribs. Inserts to the medial border of scapula.

Supplied by long thoracic nerve.

Helps in shoulder abduction beyond 90 degrees by rotating the scapula. Helps to pull the scapula medial border towards the chest wall.



Bursa related to the shoulder joint

Subacromial and sub deltoid bursa

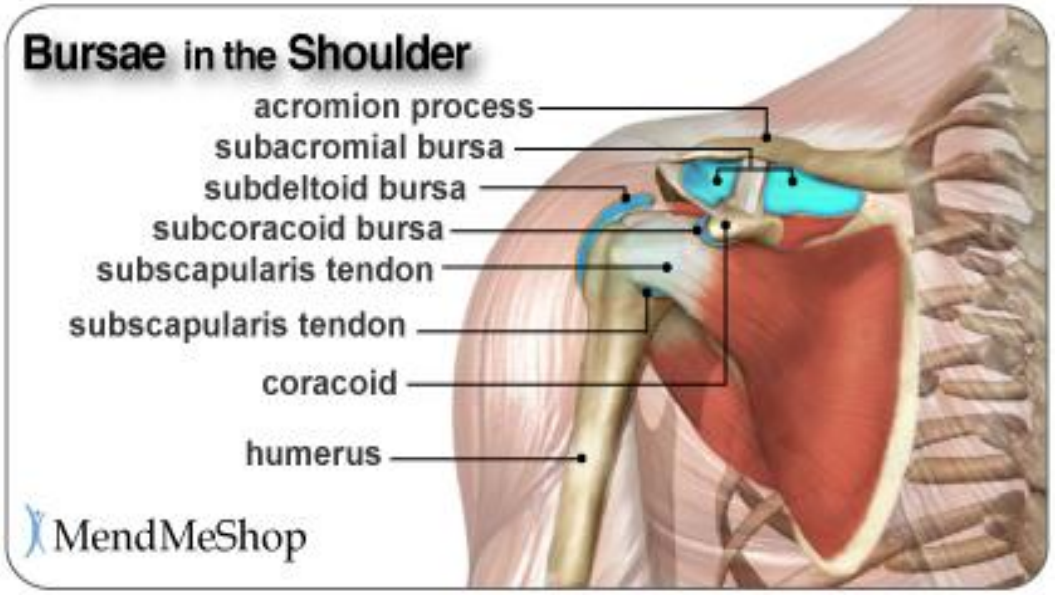
Subscapular bursa

Subcoracoid bursa

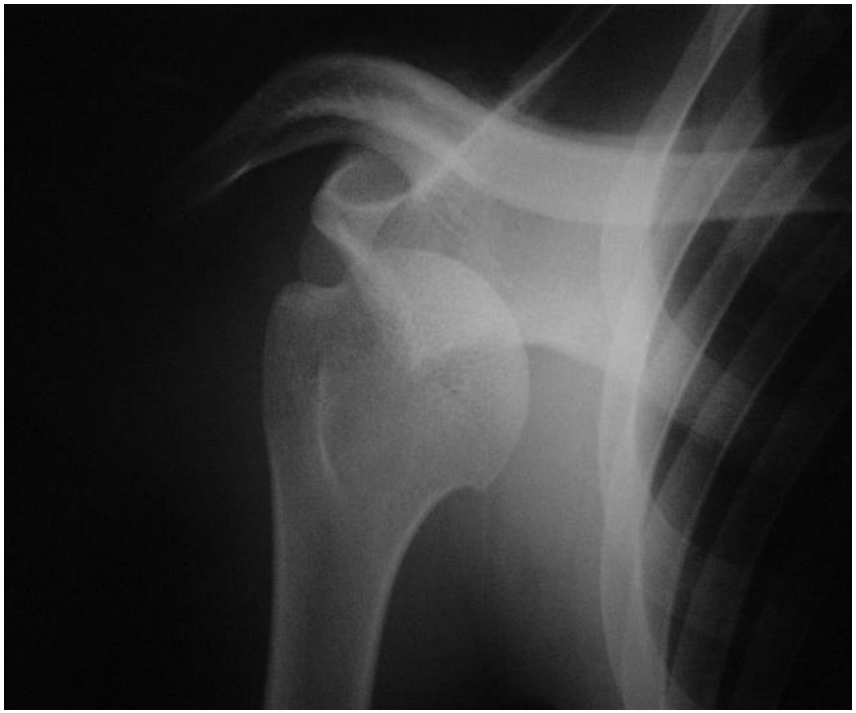
Coraco clavicular

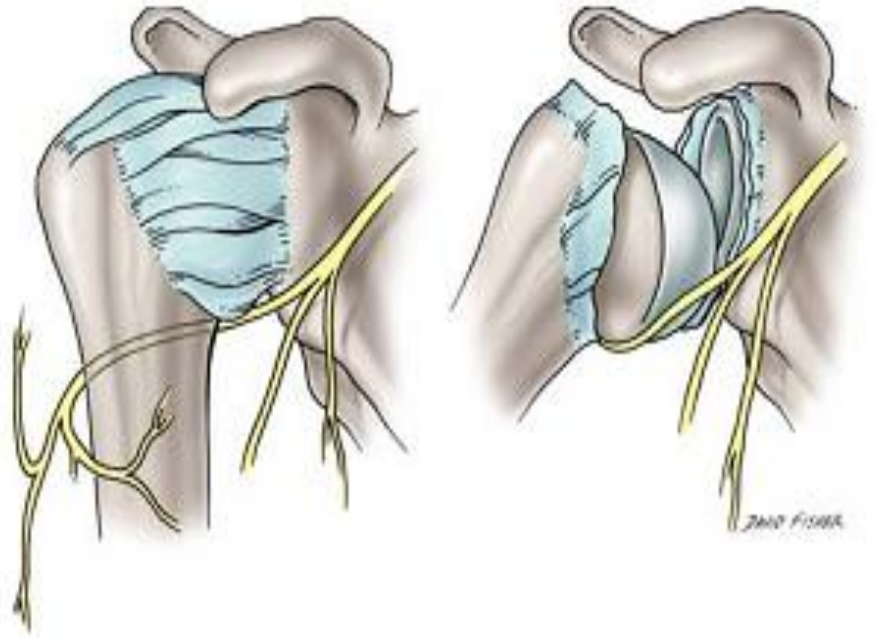
Supra acromial

Medial extension of sub deltoid bursa

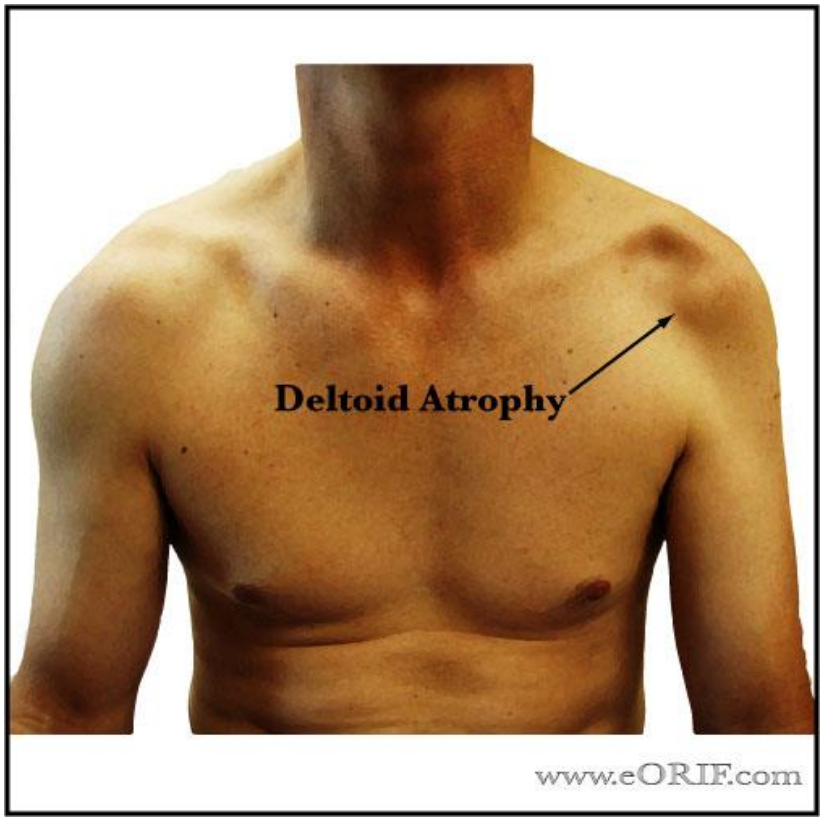


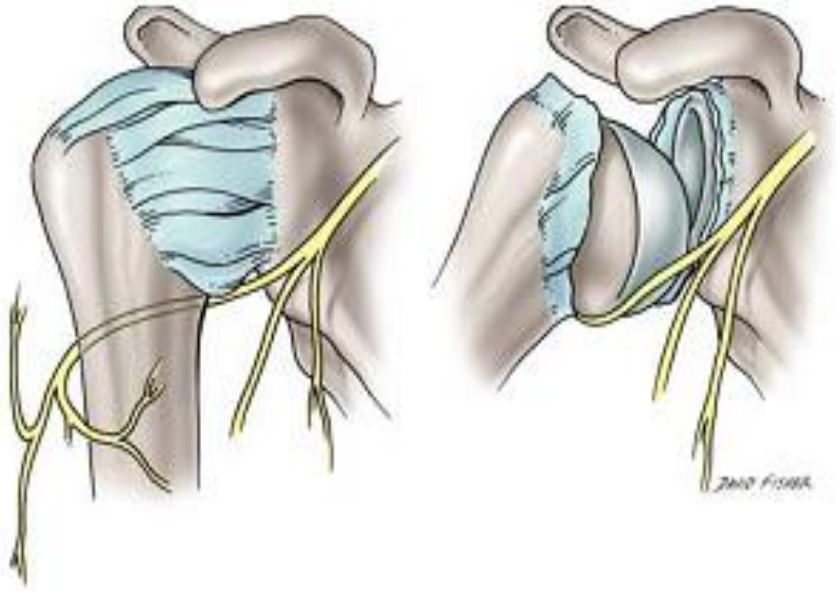
Shoulder joint dislocation and complications





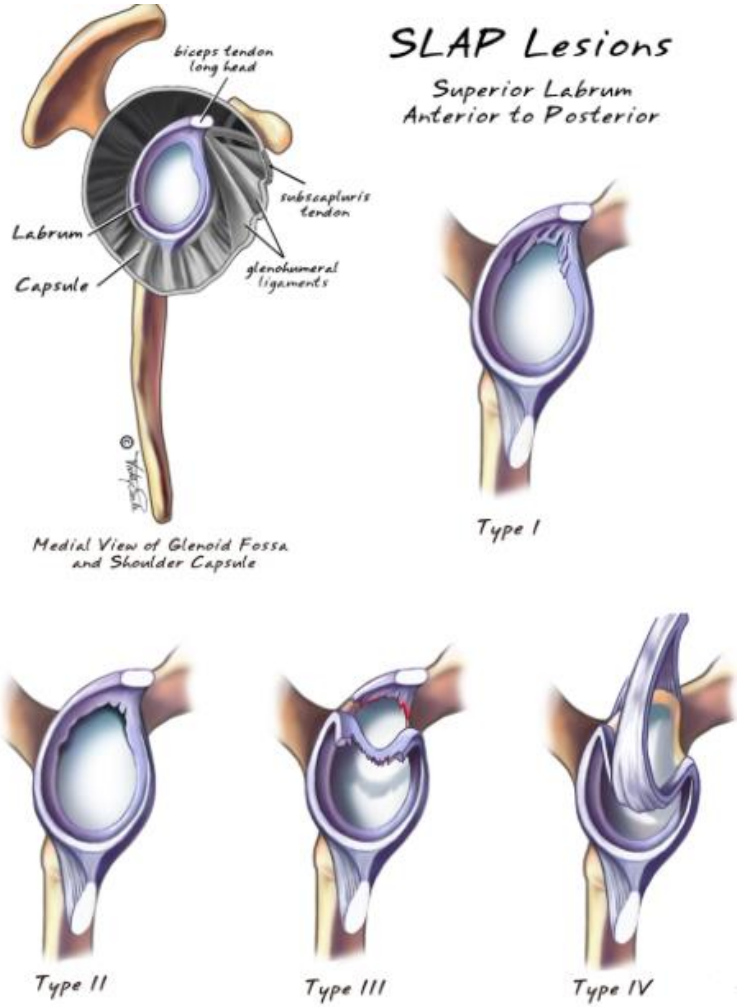
Complications of axillary nerve damage



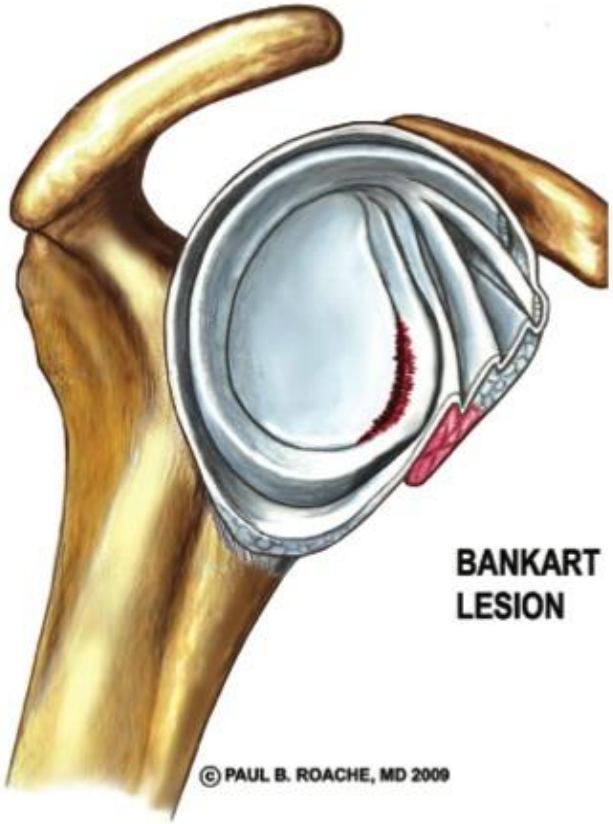


Common Causes

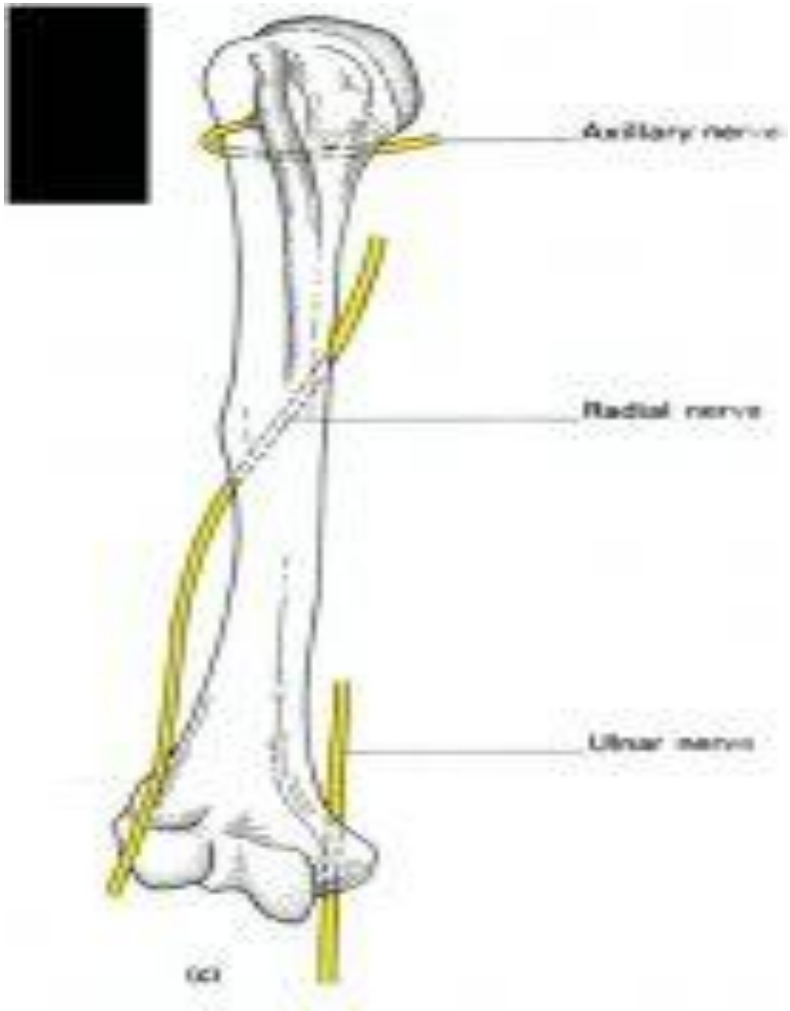
SLAP Lesions



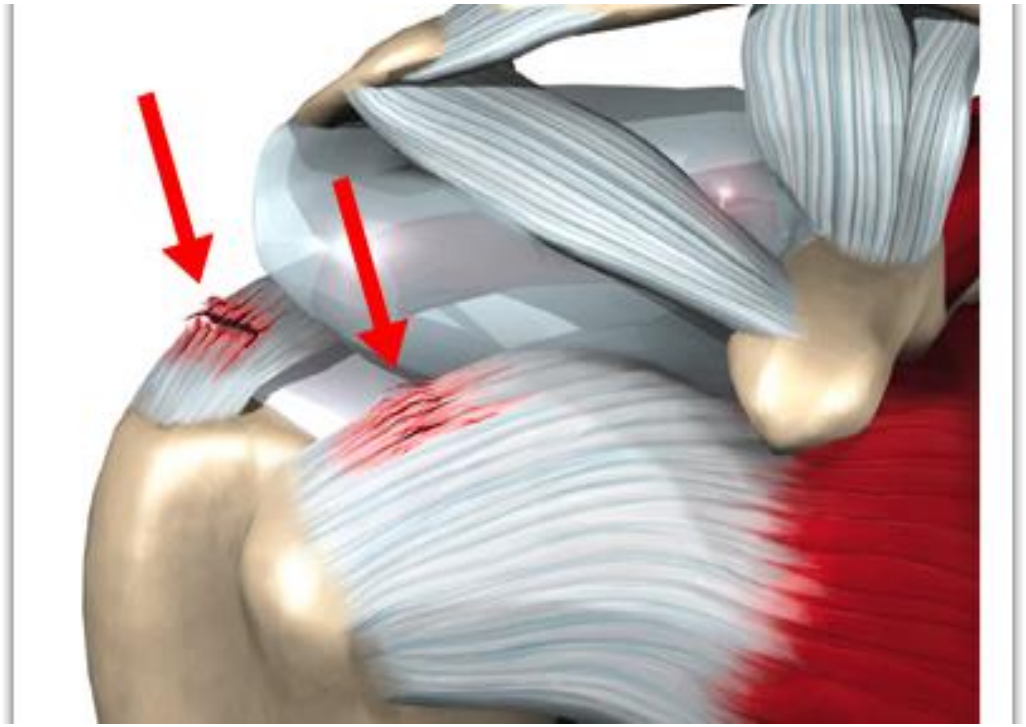
Bankart Lesion

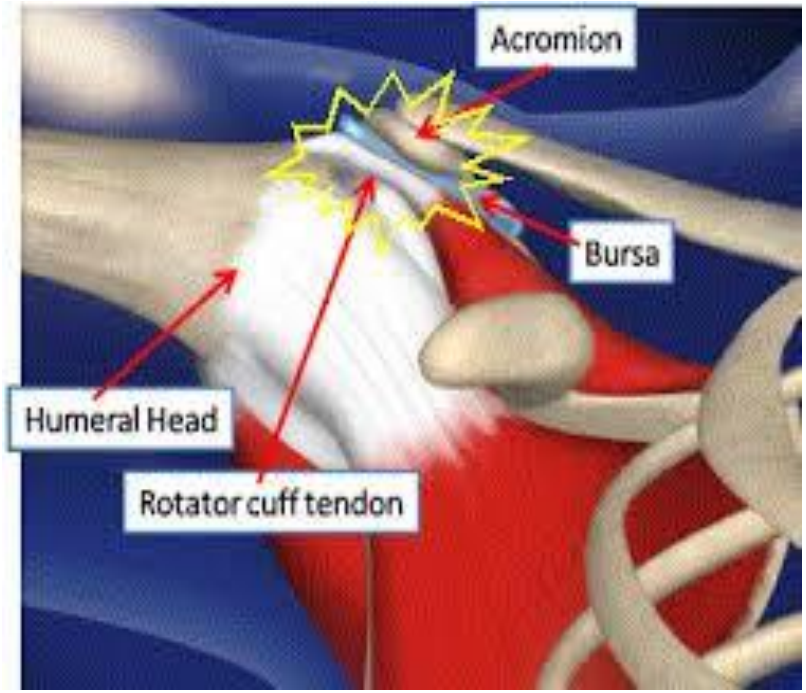


Fracture surgical neck of humerus



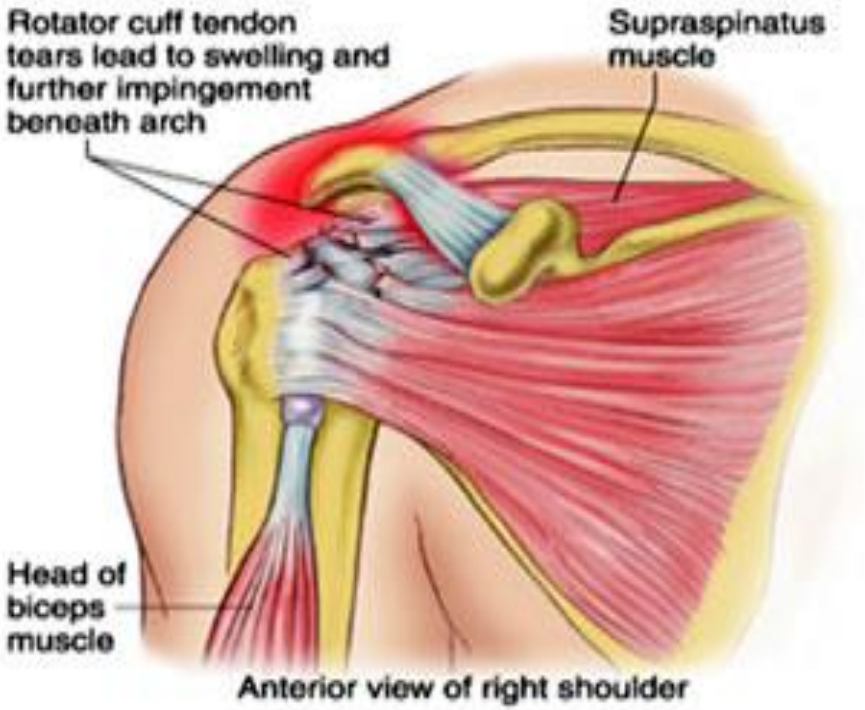
Rotator cuff tears and shoulder joint impingement



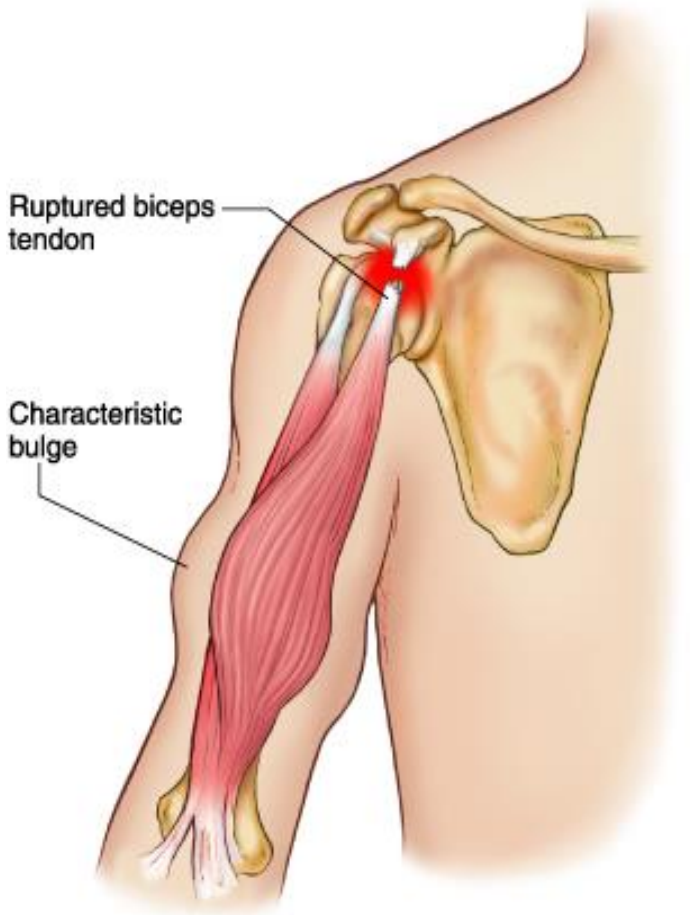


Common Causes

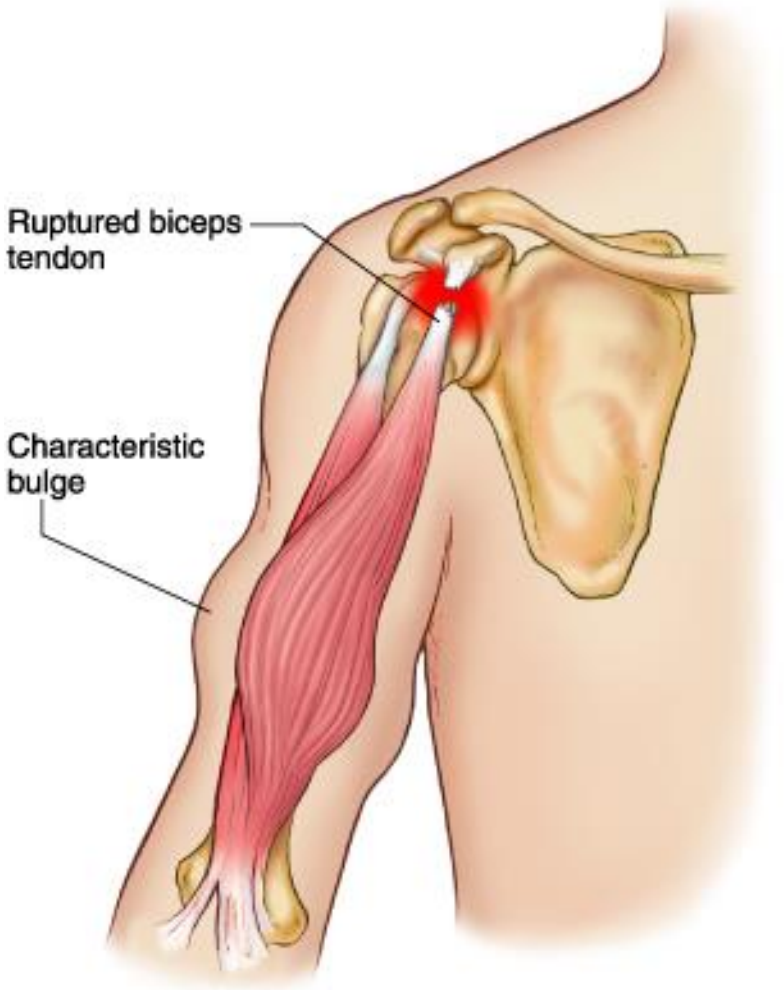
Rotator Cuff Strain



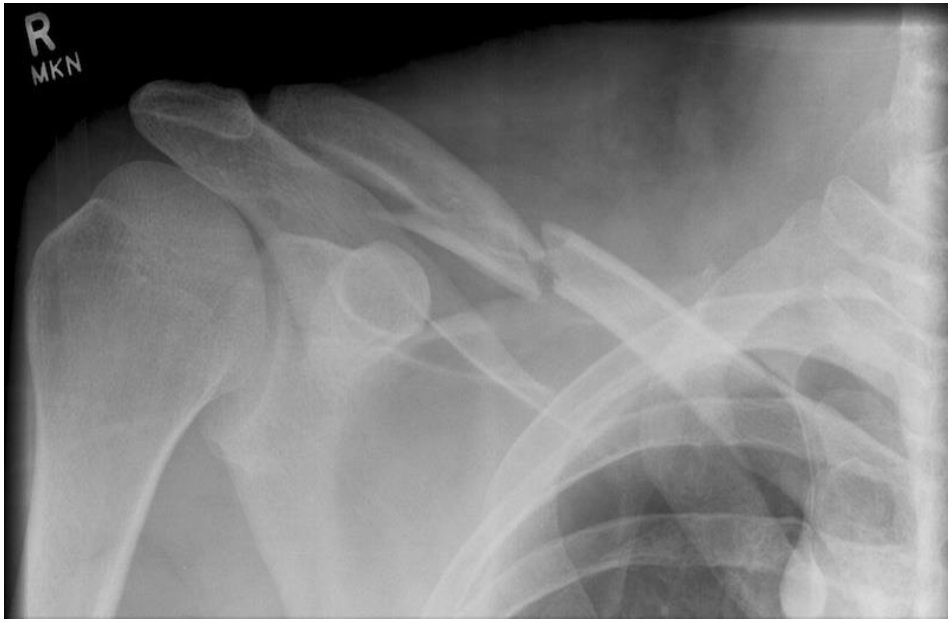
Long Head of Biceps tears

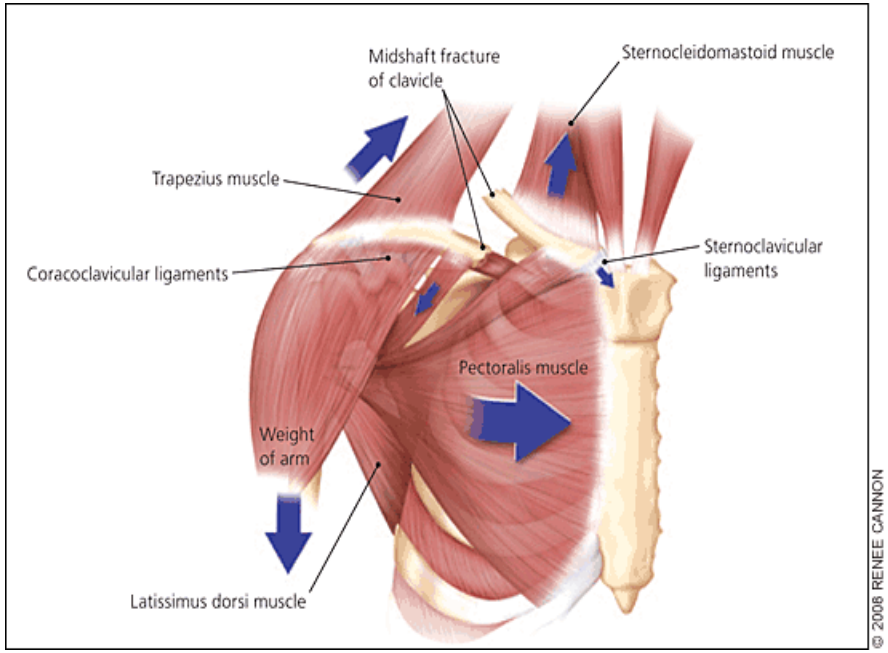


Damage to biceps muscle



Clavicle fracture





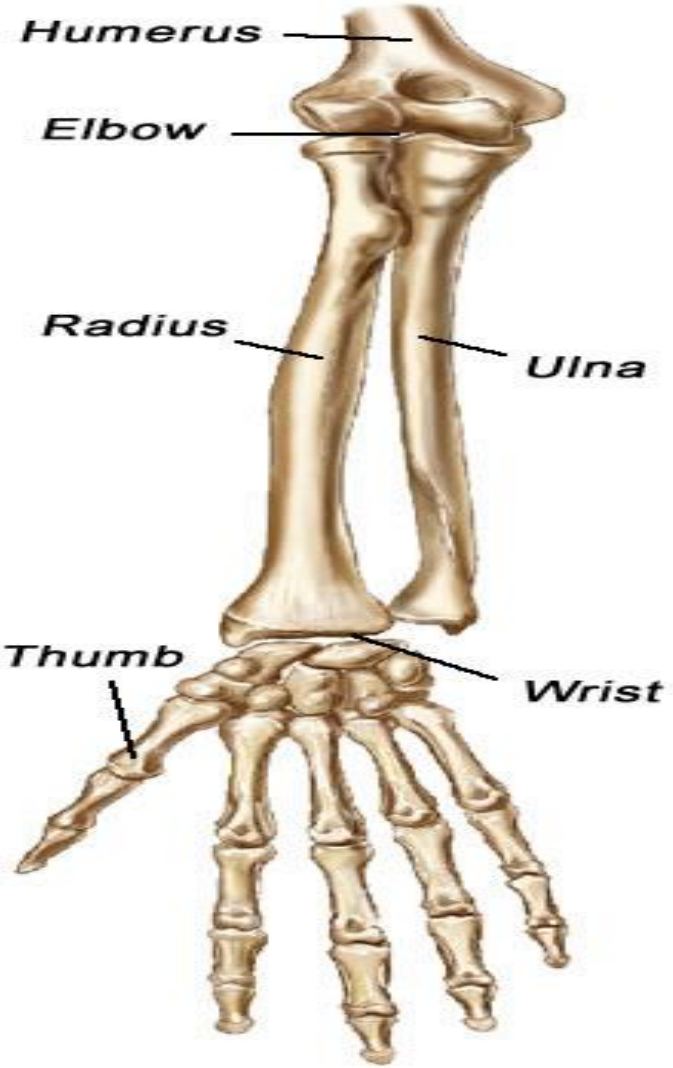
Bones of forearm and Hand

Ulnar and radius

Carpel bones

Metacarpals

Phalanges



Elbow Joint

Joint between radius, ulnar and humerus.

Synovial Hinge type

Flexion – biceps, brachialis

Extension – Triceps

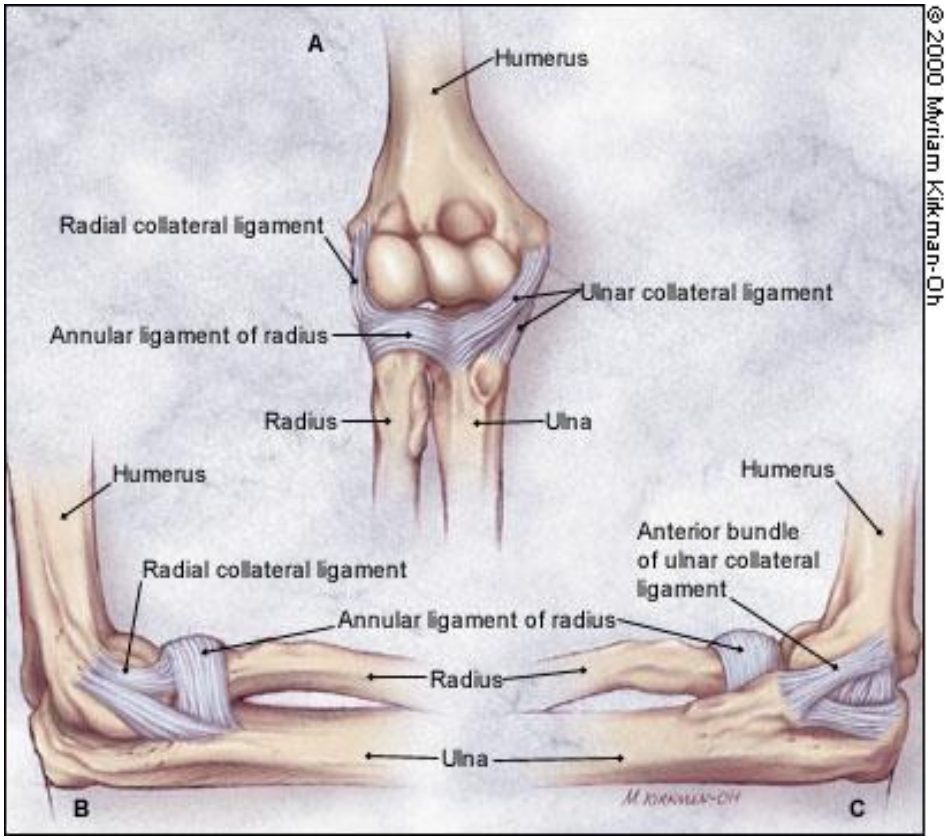
Long flexor and extensor muscles of forearm can contribute to flexion and extension

Pronation and supination occurs at proximal radio ulnar joint which is a pivot joint

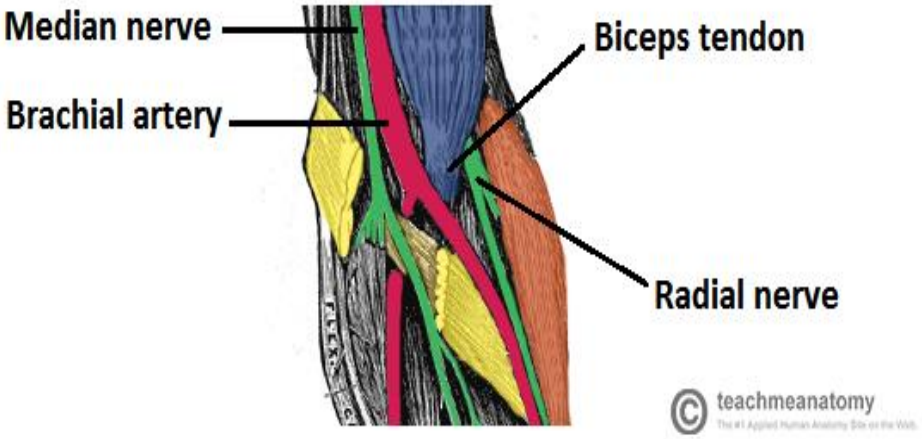
Pronation – pronator teres, pronator quadratus

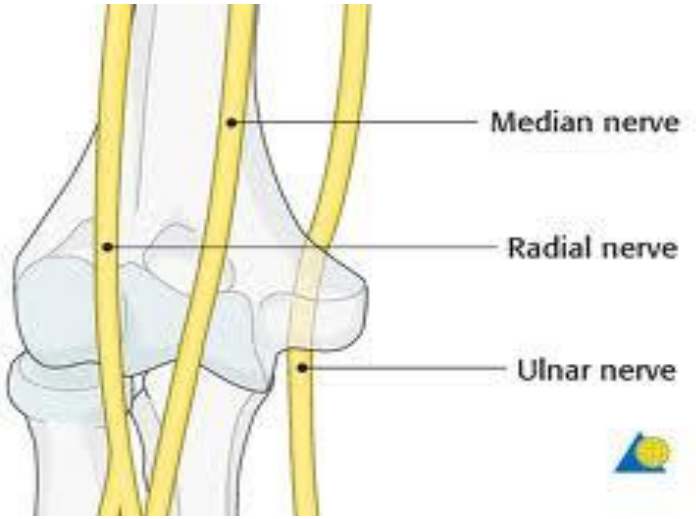
Supination – biceps and supinator

Supports – medial and lateral collateral ligaments, capsule, annular ligament



Important structures close to elbow





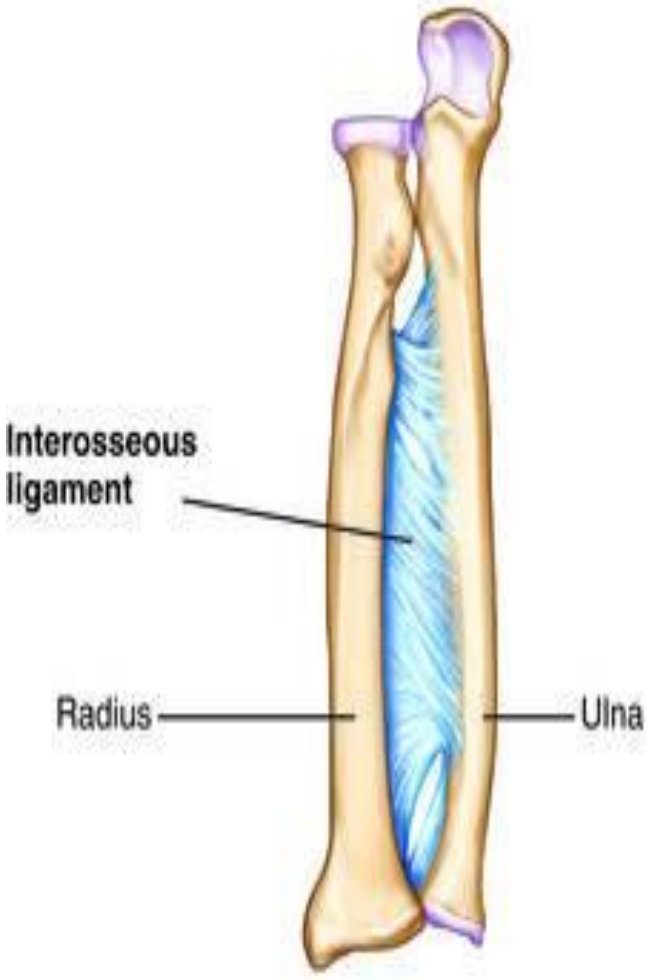
Deep Fascia

Forms the

<u>Interosseous membrane</u> – this membrane divides forearm into an anterior flexor compartment and a posterior extensor compartment.

<u>Extensor retinaculum &Flexor retinaculum</u>

Provide protection to tendons, blood vessels and nerves



Extensor Muscles of the forearm-

Extensor carpi ulnaris

Extensor digiti minimi

Extensor digitorum

Extensor Indicis

Extensor carpi radialis brevis

Extensor carpi radialis longus

Brachioradialis

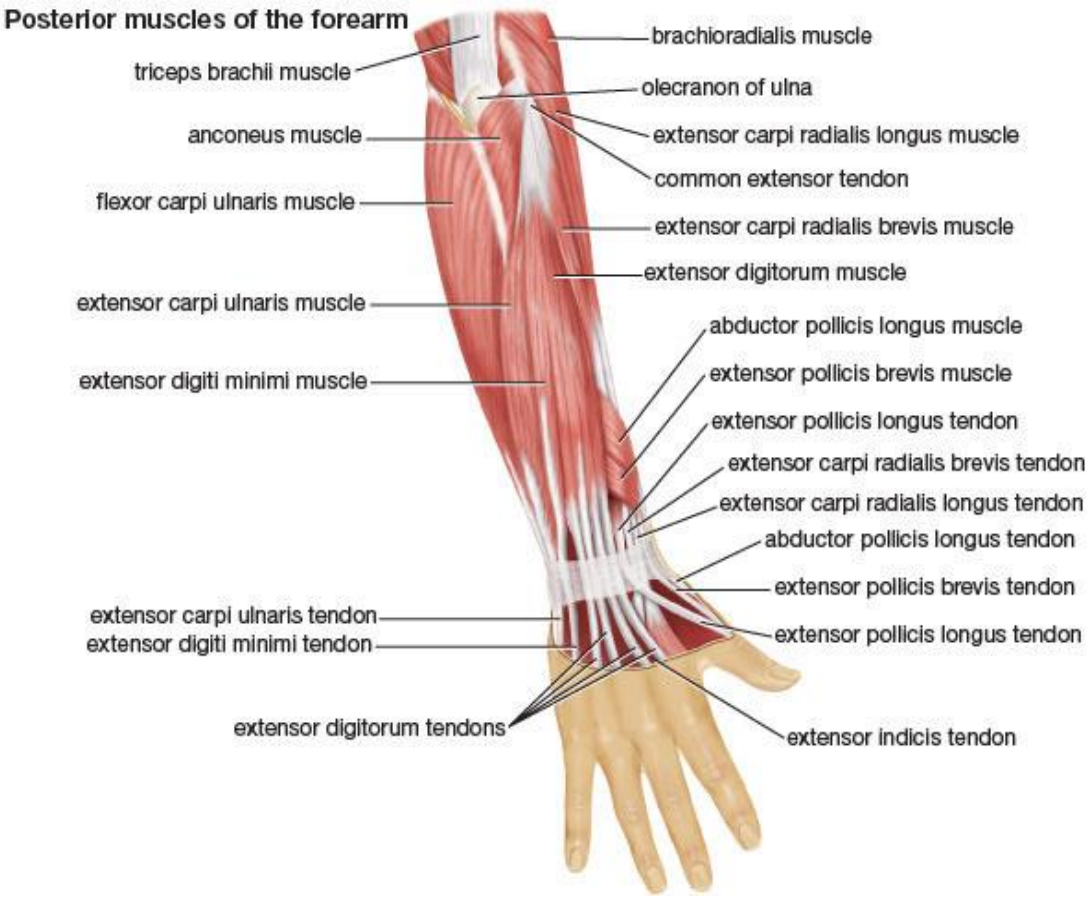
Deep Muscles

Extensor pollicis longus

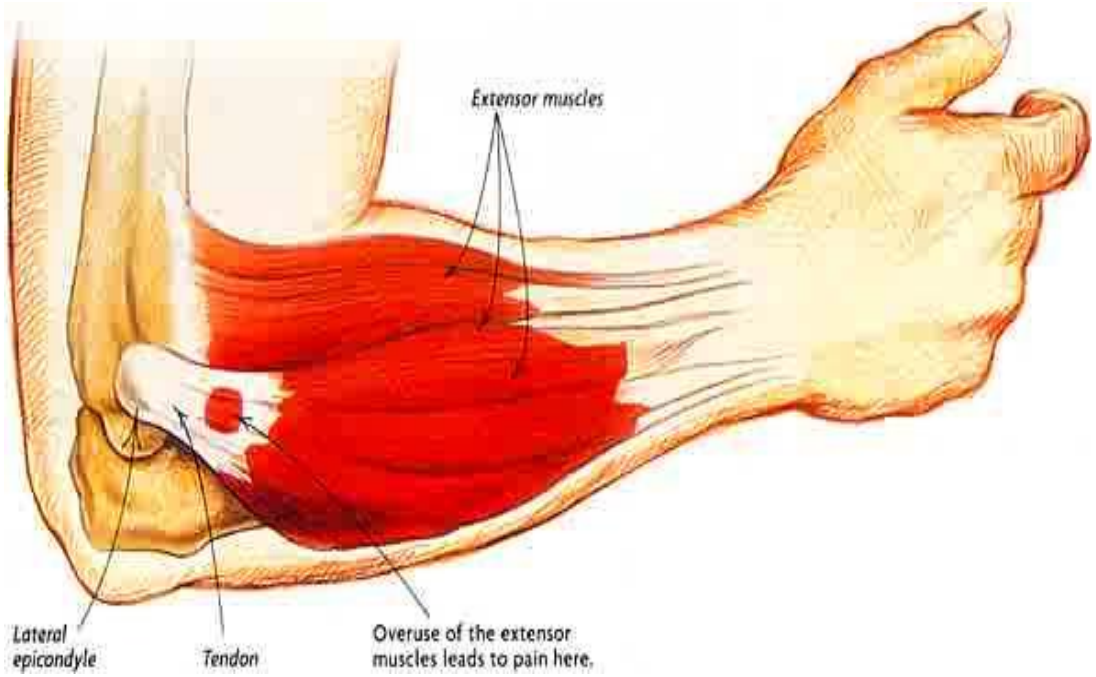
Extensor pollicis brevis

Abductor pollicis longus

Supplied by radial nerve and its posterior interosseous branch



Lateral Epicondylitis



Superficial flexor muscles of the forearm

Pronator teres

Flexor carpi radialis

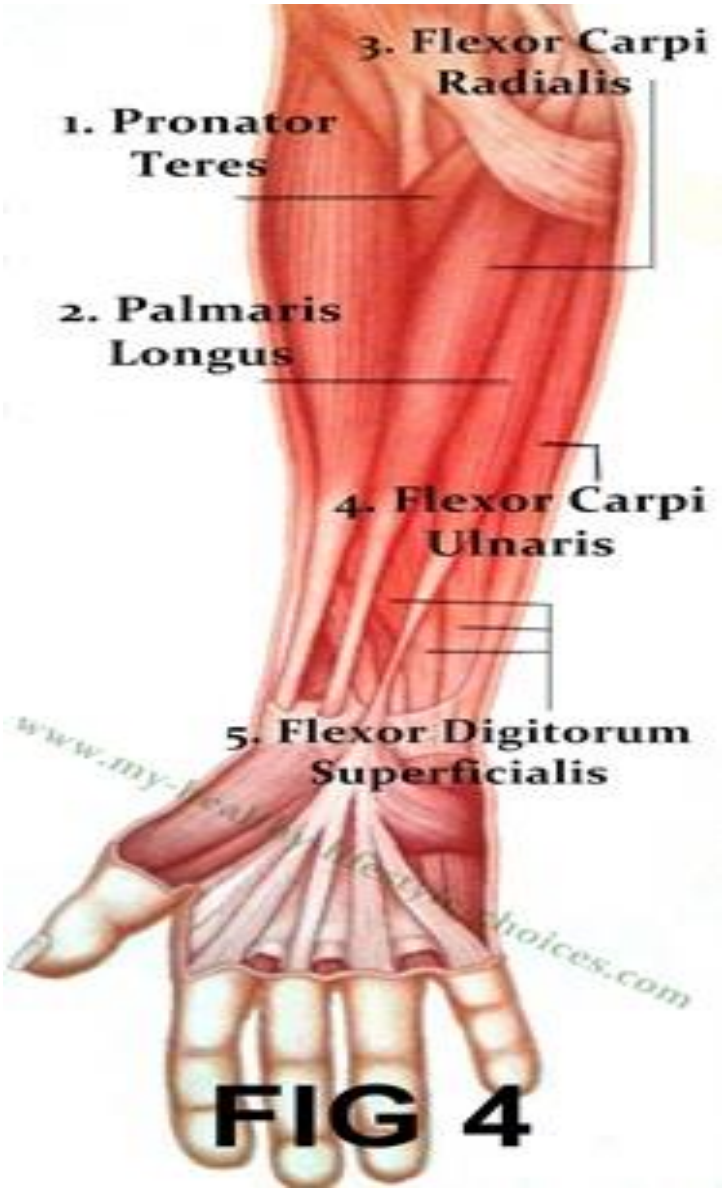
Palmaris longus

Flexor digitorum superficialis

(Supplied by median nerve)

Flexor carpi ulnaris

(Supplied by ulnar nerve)



Deep flexor muscles of the forearm

Flexor pollicis longus

Pronator quadratus

(supplied by median nerve)

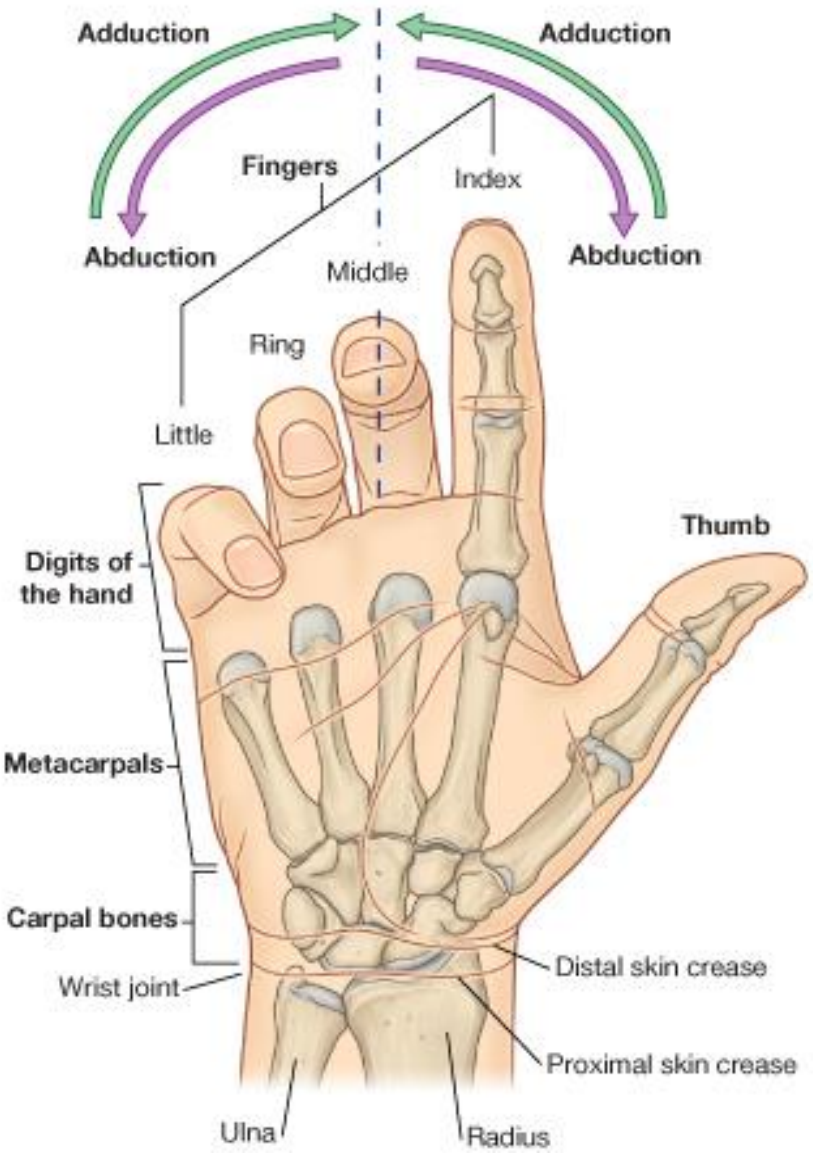
Flexor digitorum profundus

(Supplied by median and ulnar nerve)

Medial Epicondylitis

Hand Functions-

- Grip and manipulate objects.
- Modify the actions of forearm muscles inserted onto the bones of the hand.
- The hand is a good sensory organ.



Bones of the wrist (8)-

Scaphoid, lunate, triquetrum, pisiform (4 in Proximal row)

Trapezium, trapezoid, capitate, hamate (4 in Distal row)

Forms the carpal tunnel with flexor retinaculum

Bones of the Hand

5 Metacarpals

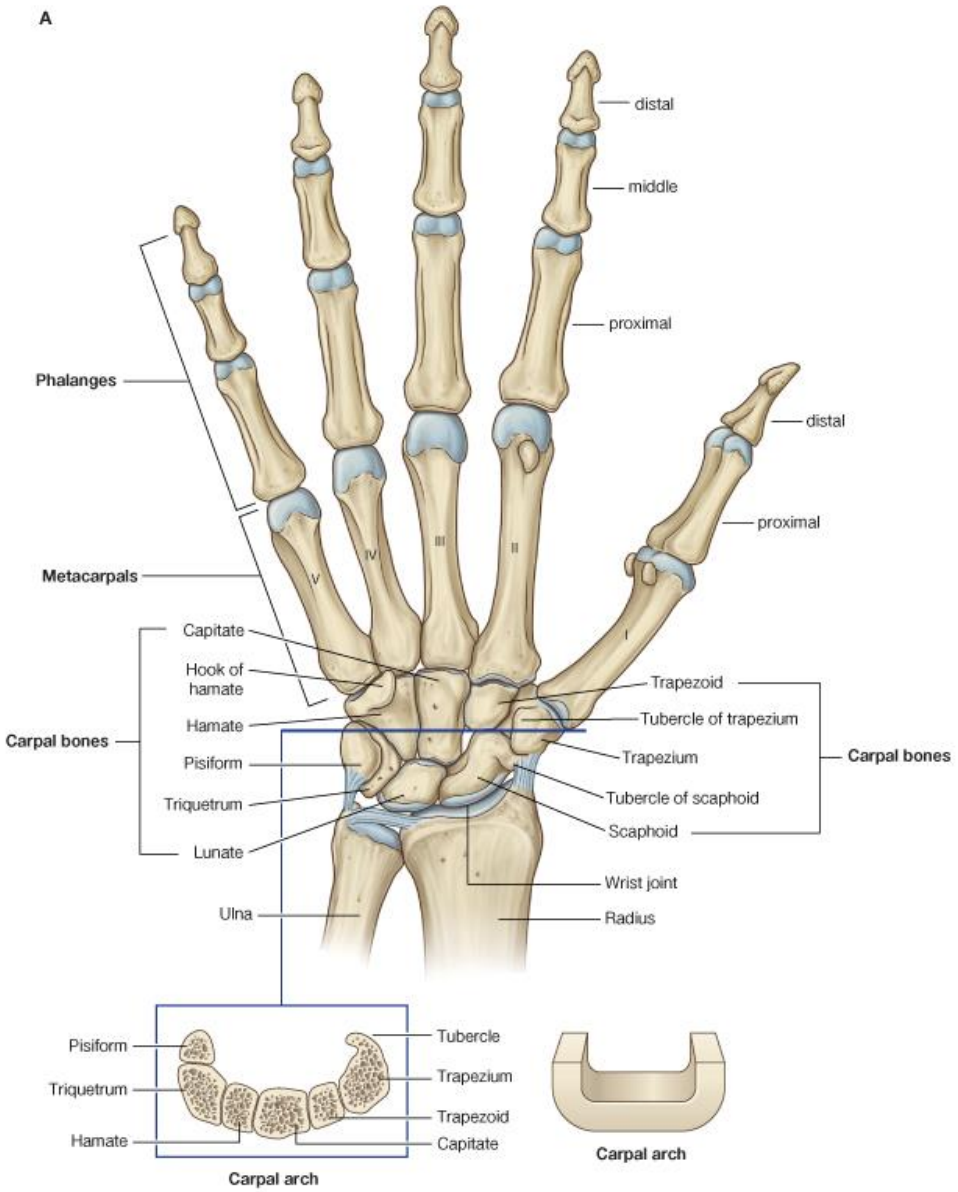
Thumb – 2 phalanges

Other fingers – 3 phalanges

Joints –

Radiocarpal,

Intercarpal, carpo metacarpal, metacarpo phalangeal, interphalangeal



B

Flexor retinaculum-

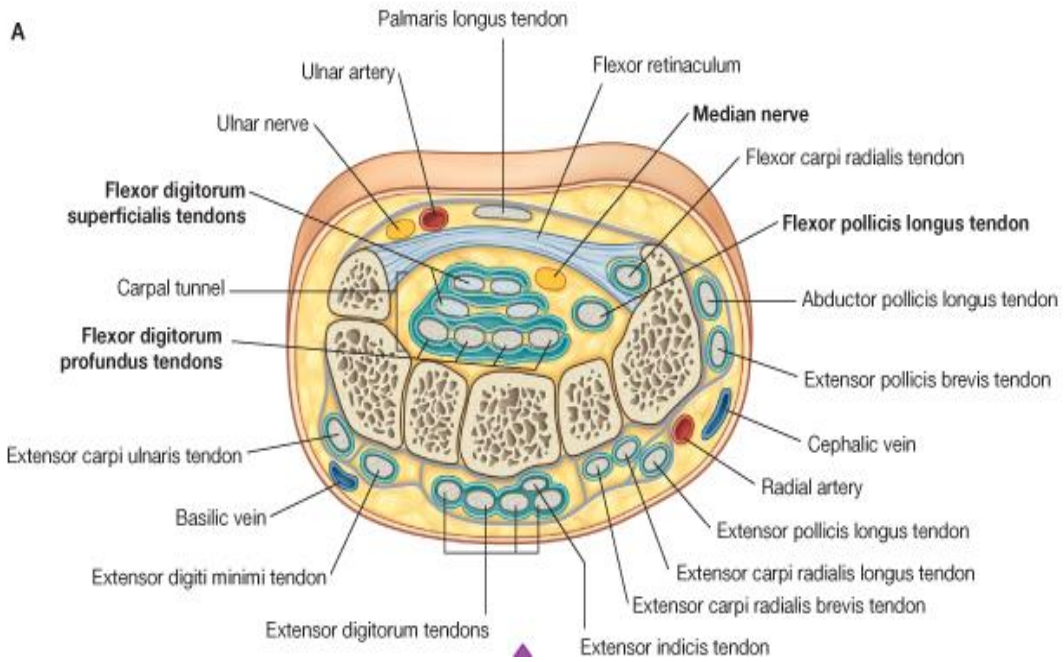
Formed by deep fascia.

Attached to scaphoid, trapezium, pisiform and hamate.

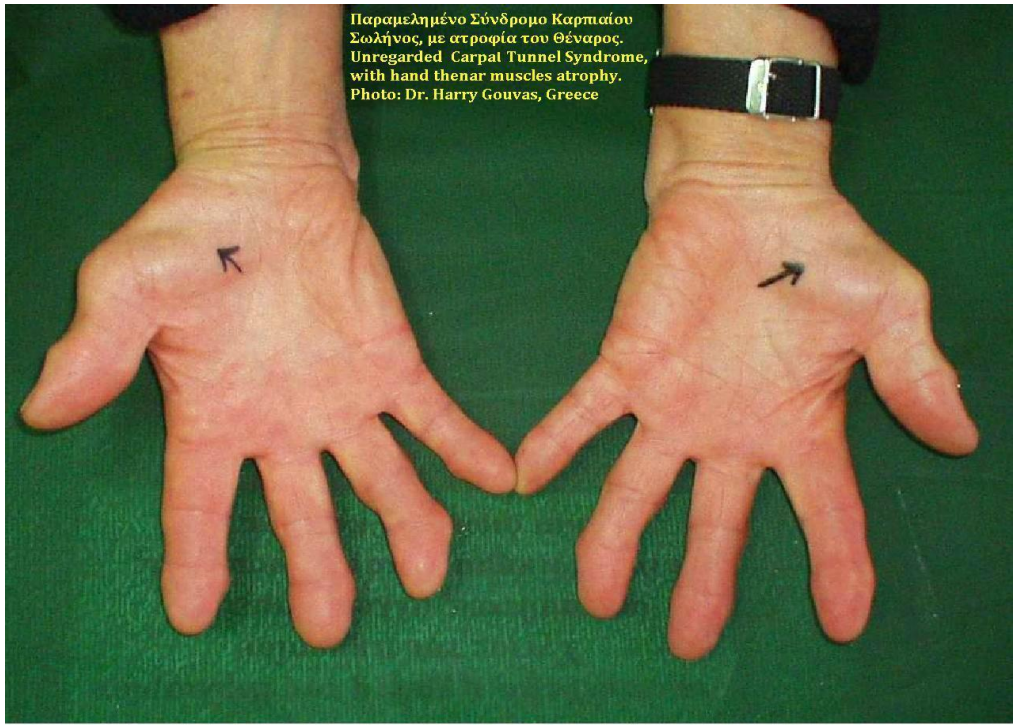
Ulnar nerve, ulnar artery and palmaris longus tendon passes superficially

Long flexor tendons, ulnar and radial bursae and median nerve passes deep to it.

Contributes to carpal tunnel syndrome



The picture shows a person suffering from bilateral carpel tunnel syndrome. The arrows indicates thena eminence wasting



Palmar aponeurosis

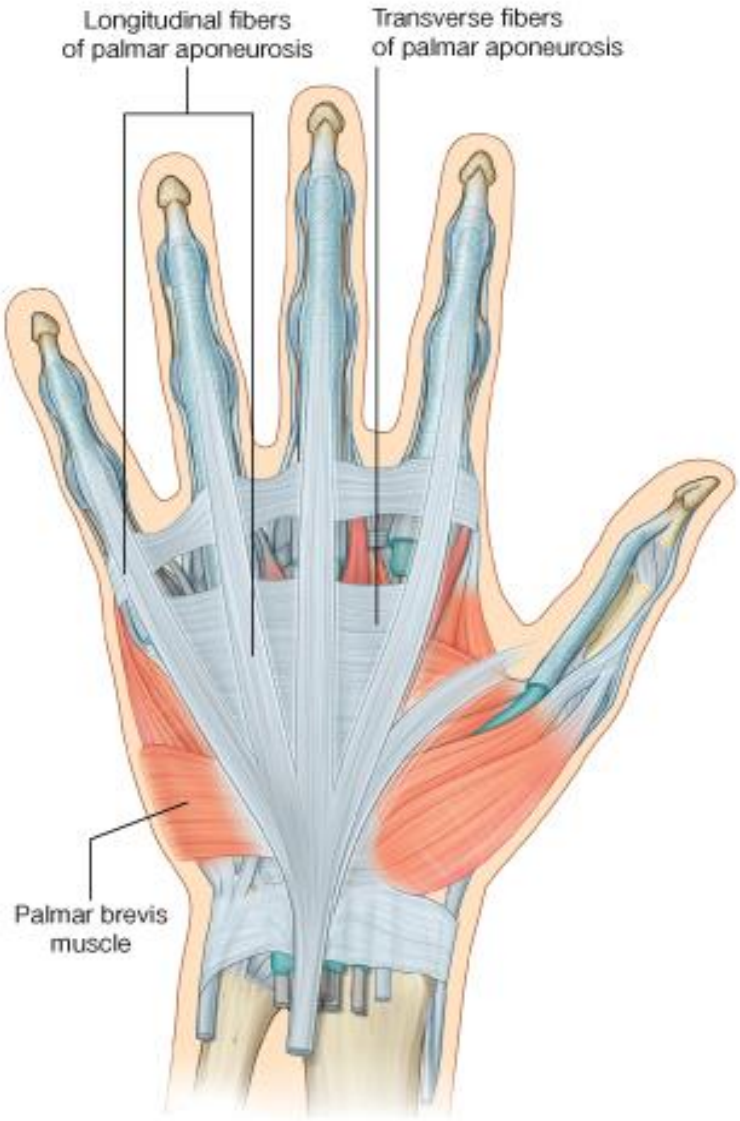
Condensation of deep fascia.

Triangular shape.

The apex of the triangle is connected with palmaris longus tendon and flexor retinaculum. Longitudinal fibres extend to the digits.

Transverse fibres connect longitudinal fibres.

Vessels, nerves and long flexor tendons lie deep to it.



Fibrous flexor sheaths

Formed by deep fascia

Finger tendons and they are synovial sheaths pass through it.

Inflammation of synovial sheaths can give rise to trigger finger.

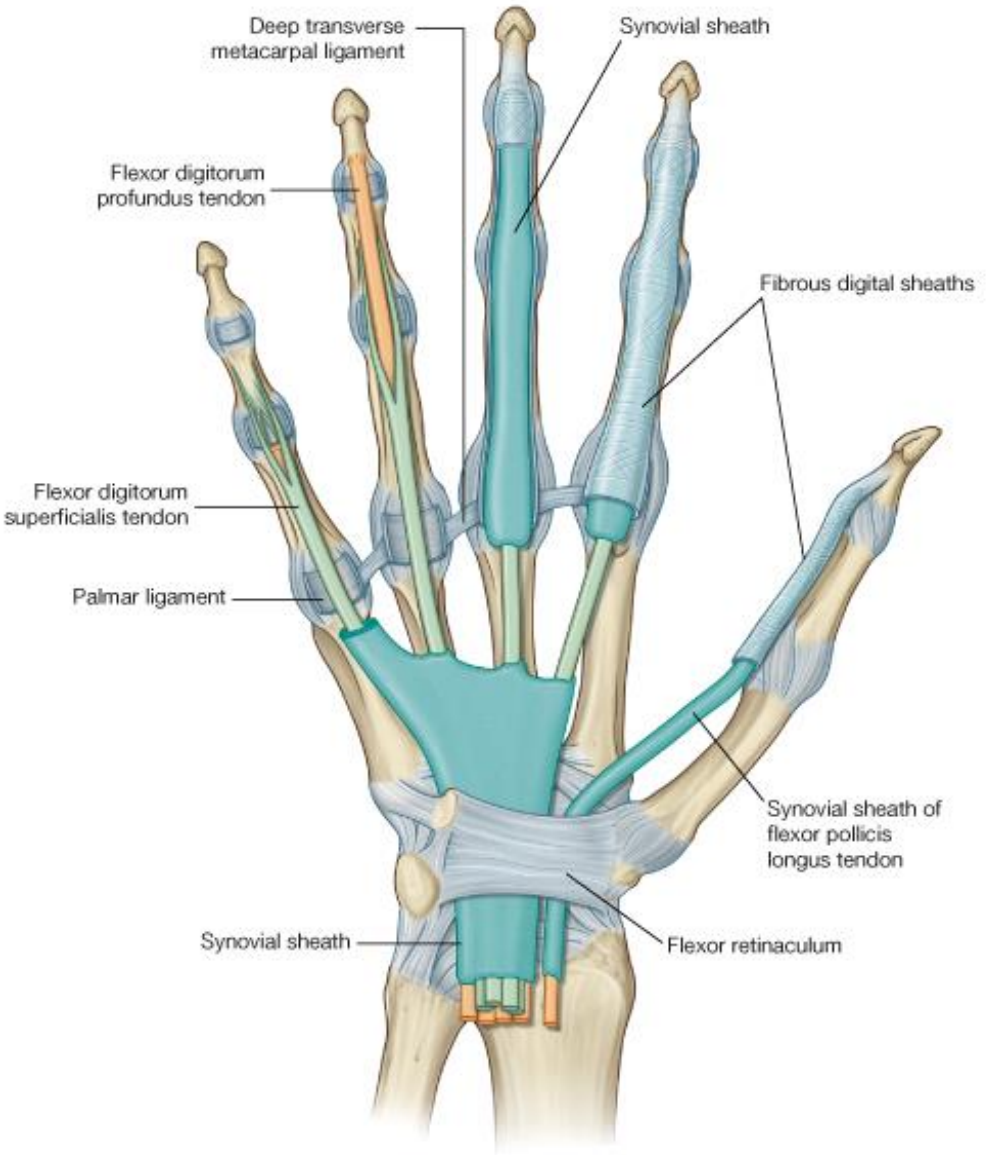
Ulnar bursa and radial bursa

They enclose flexor tendons.

Ulnar bursa is broader. Communicates with synovial sheath of little finger.

Radial bursa is narrower

These bursa can get infected.



Thenar space

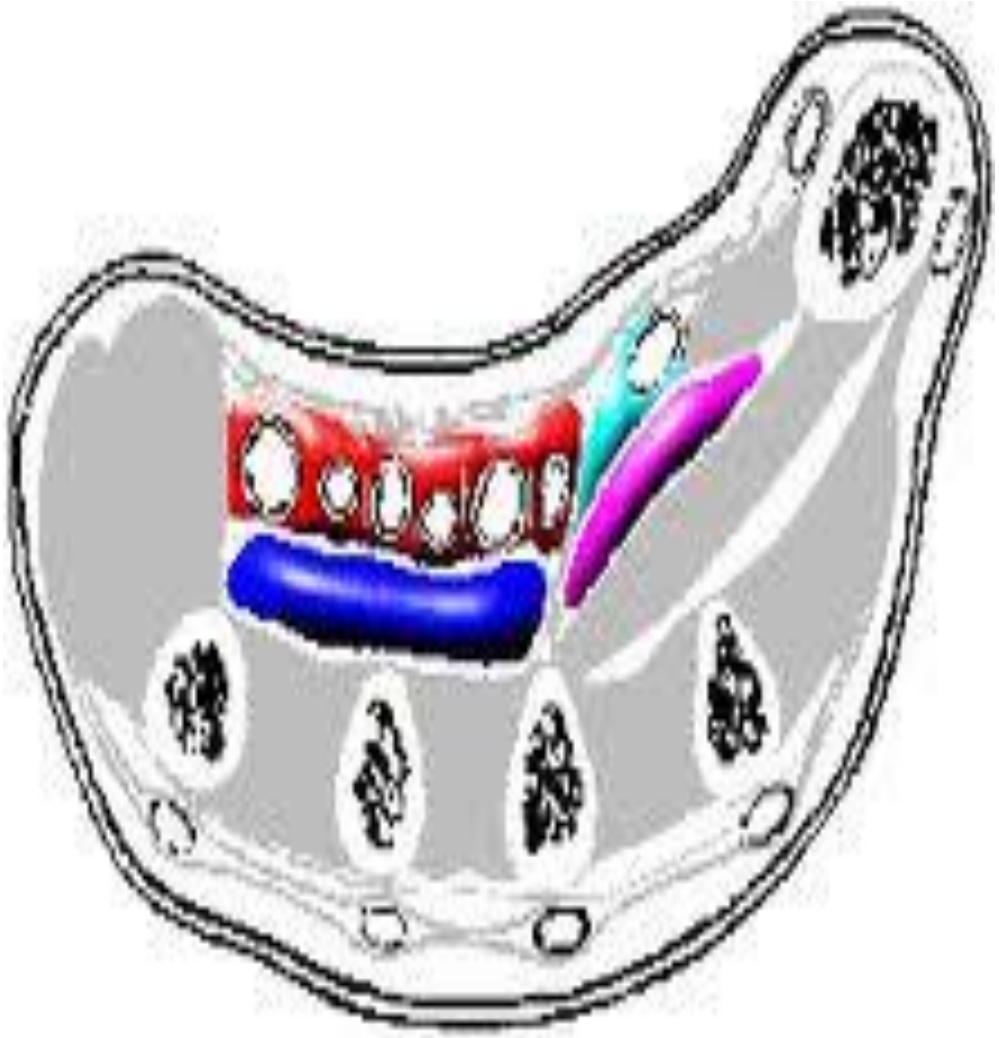
Lies deep to flexor tendons on metacarpal bones.

Lies on radial side

Mid palmar space

Lies deep to flexor tendons on metacarpal bones.

Lies on medial side

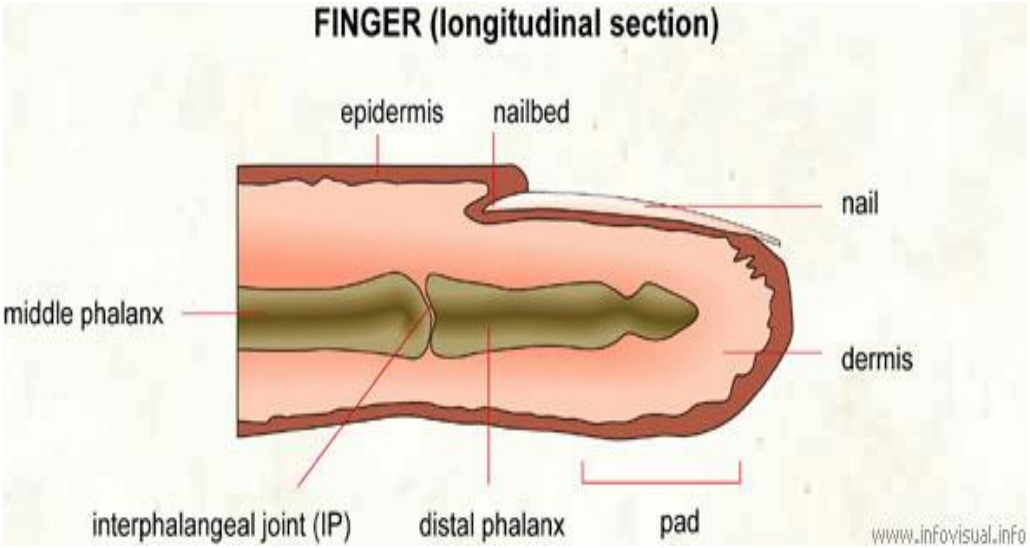


Pulp space of fingers-

Lies at distal end of fingers and thumb.

Tight compartments bounded by fibrous tissue that extend from skin to bone. Compartments are filled with fat.

Infections (whitlow) can cause avascular necrosis of bones.



Dorsal Interossei –

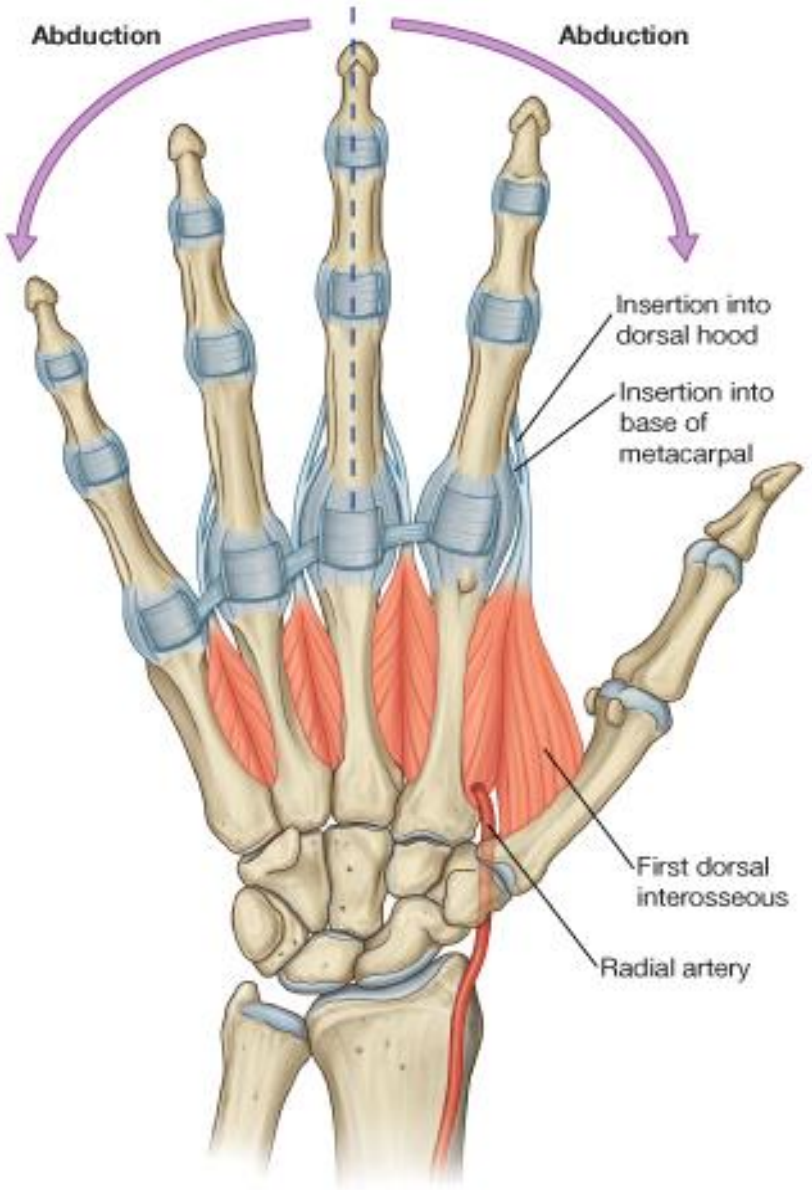
4 in number

Causes

abduction of fingers (DAB).

Extension at interphalangeal joints.

Supplied by ulnar nerve



Palmar Interossei –

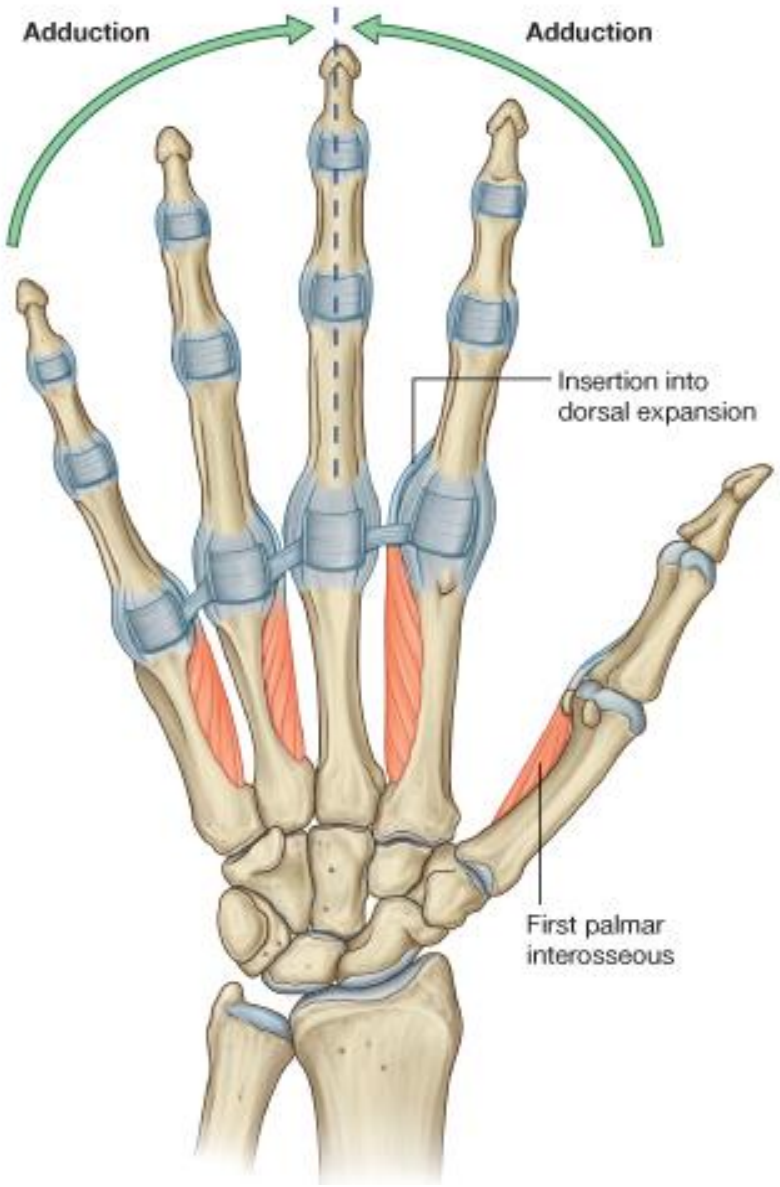
4 in number

Causes

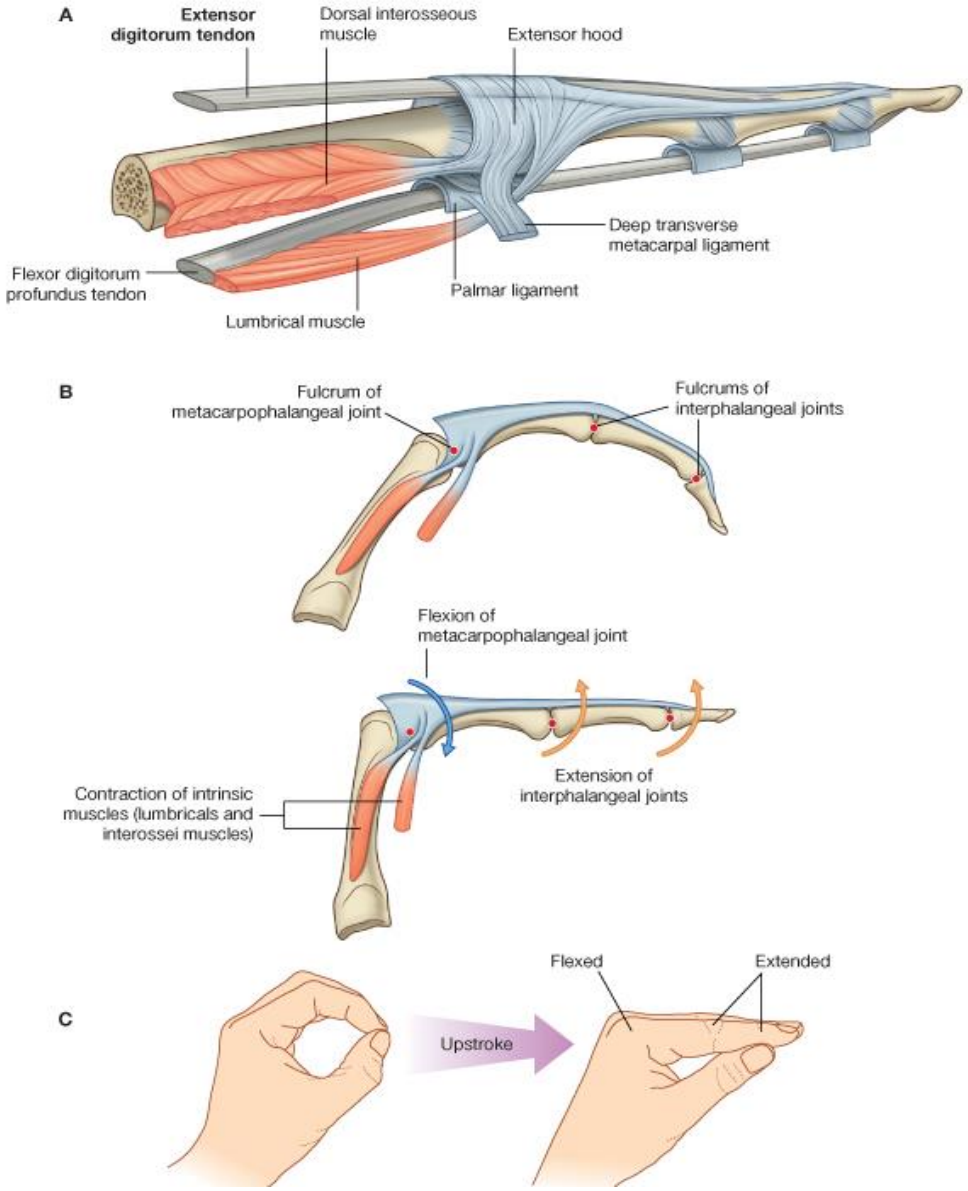
adduction of fingers (PAD).

Flexion at Metacarpo phalangeal and Extension at interphalangeal joints.

Supplied by ulnar nerve



Lumbricals and interossei are connected with dorsal digital expansion. Therefore they can cause flexion at metacarpo phalangeal and extension at interphalangeal joints.

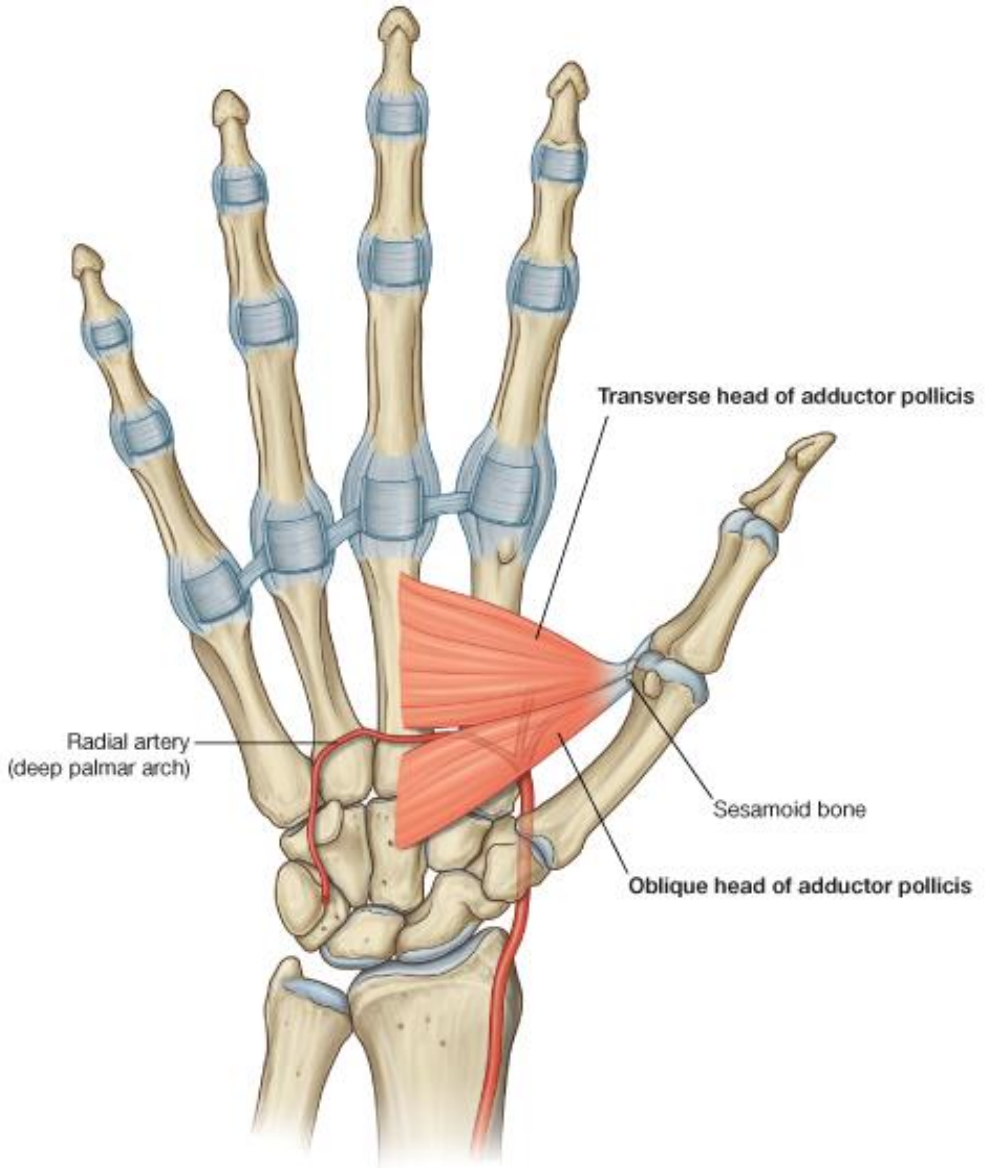


Adductor pollicis

Has an oblique and a transverse head.

Adduction of the thumb

Supplied by ulnar nerve



Thenar muscles-

Flexor pollicis brevis

Abductor pollicis brevis

Opponens pollicis

Supplied by median nerve

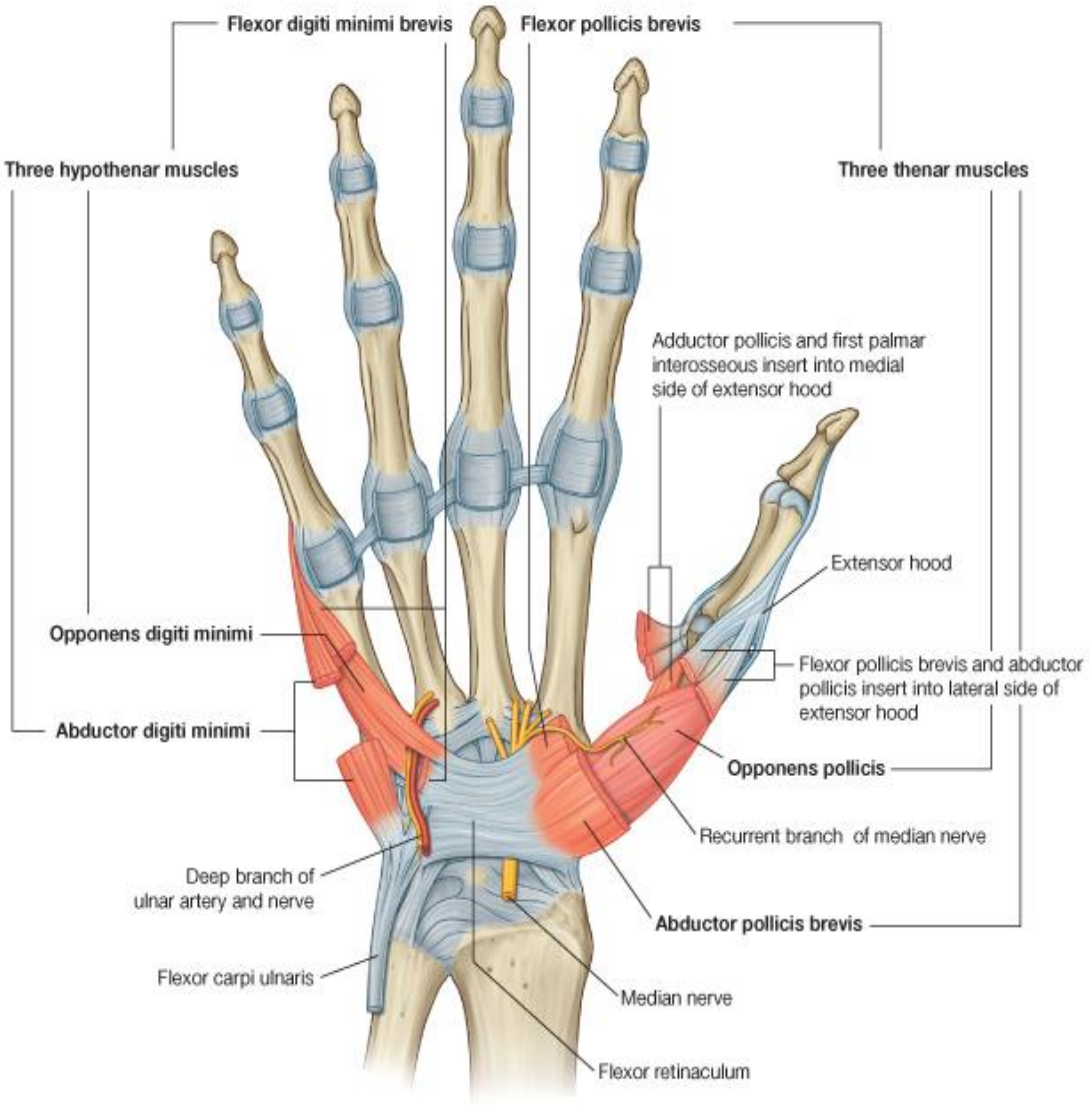
Hypothenar muscles-

Flexor digiti minimi brevis

Abductor digiti minimi brevis

Opponens digiti minimi

Supplied by ulnar nerve

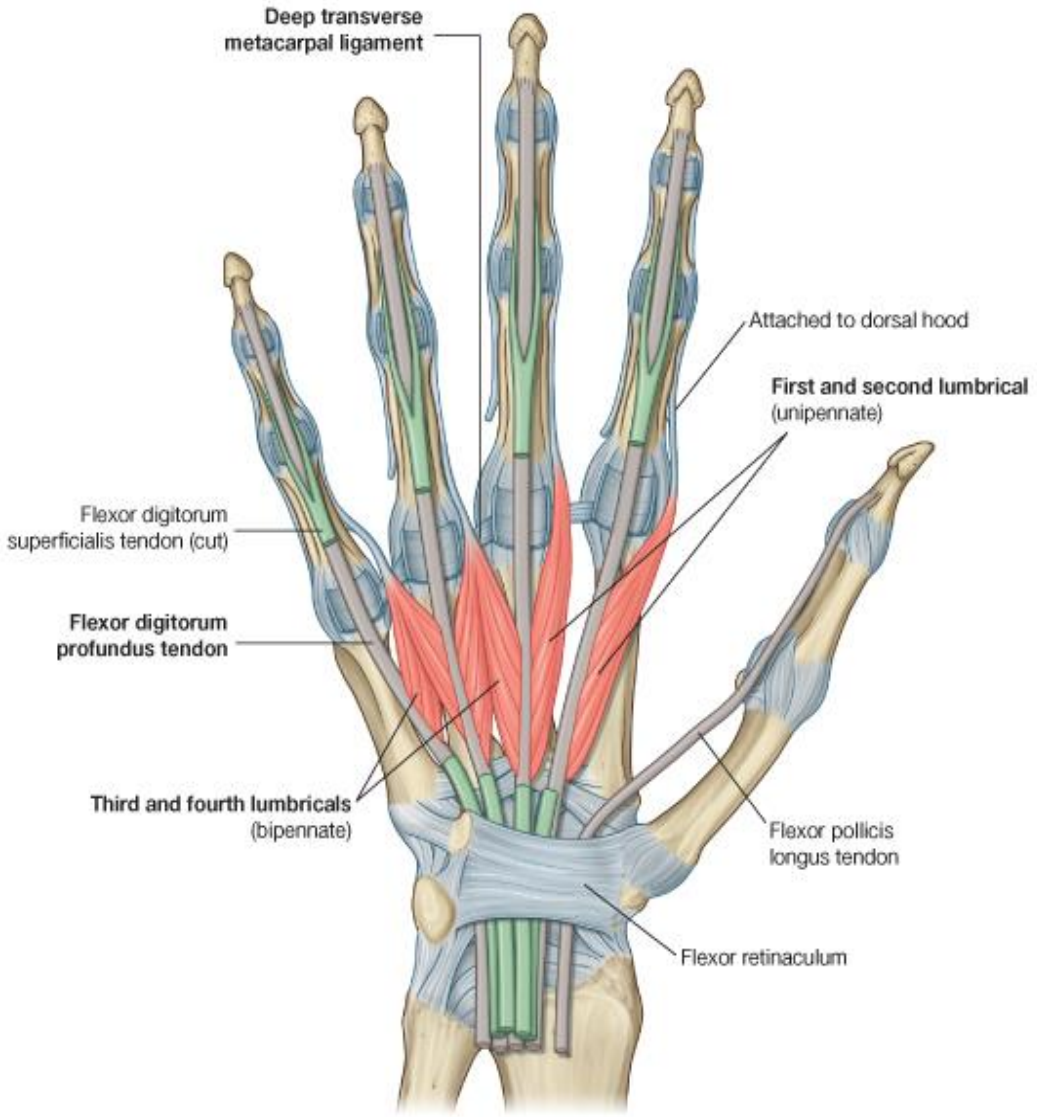


Lumbricals

2 radial and 2 medial

Causes flexion at metacarpo phalangeal joints and extension at interphalangeal joints

Radial 2 are supplied by median and medial 2 are supplied by ulnar



Anatomical snuff box-

Bounded by extensor pollicis longus, extensor pollicis brevis and abductor pollicis longus tendon.

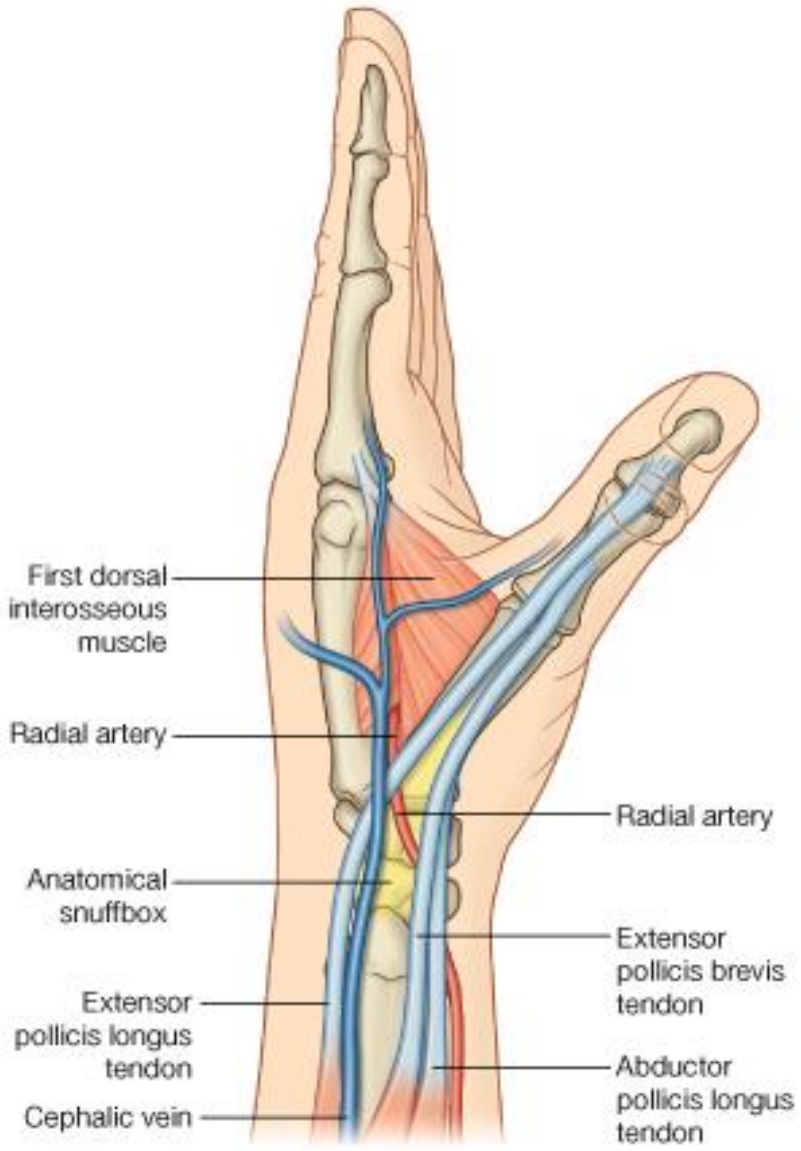
Floor is formed by scaphoid and trapezium bones.

Can detect a fracture of scaphoid.

Radial artery passes through it.

Cephalic vein lies on its roof

C.F – Tenosynovitis and scaphoid fracture



Arteries of upper limb

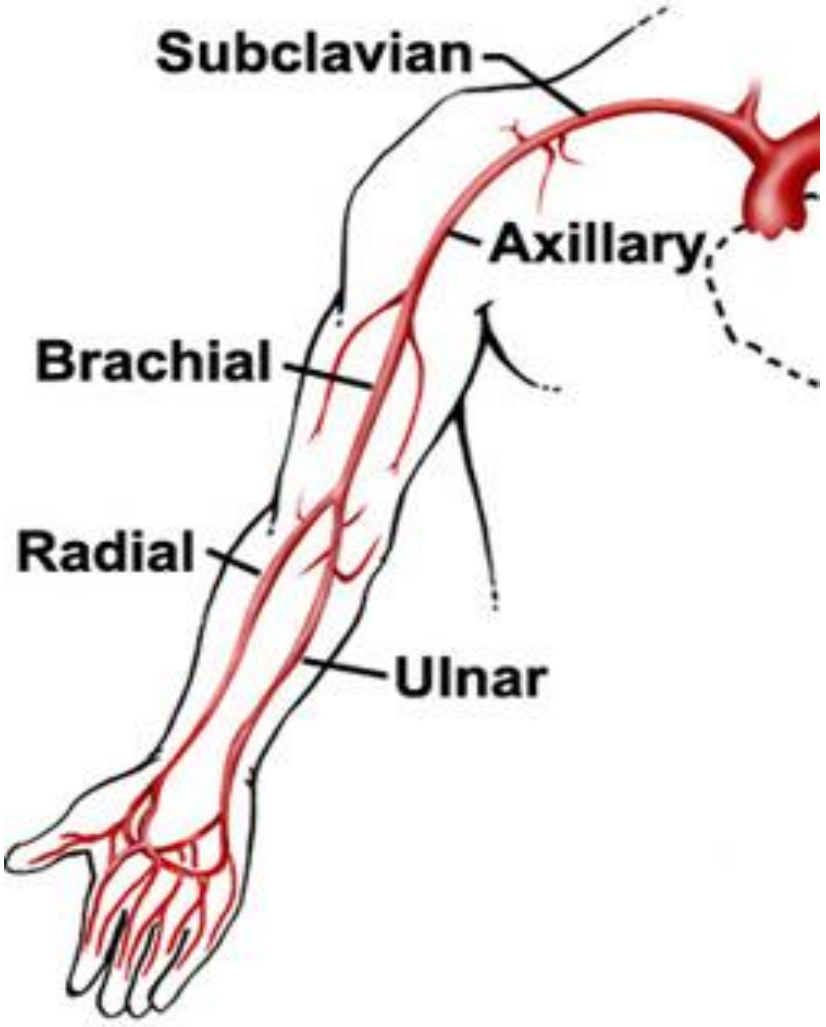
Subclavian

Axillary

Brachial

Ulnar

radial



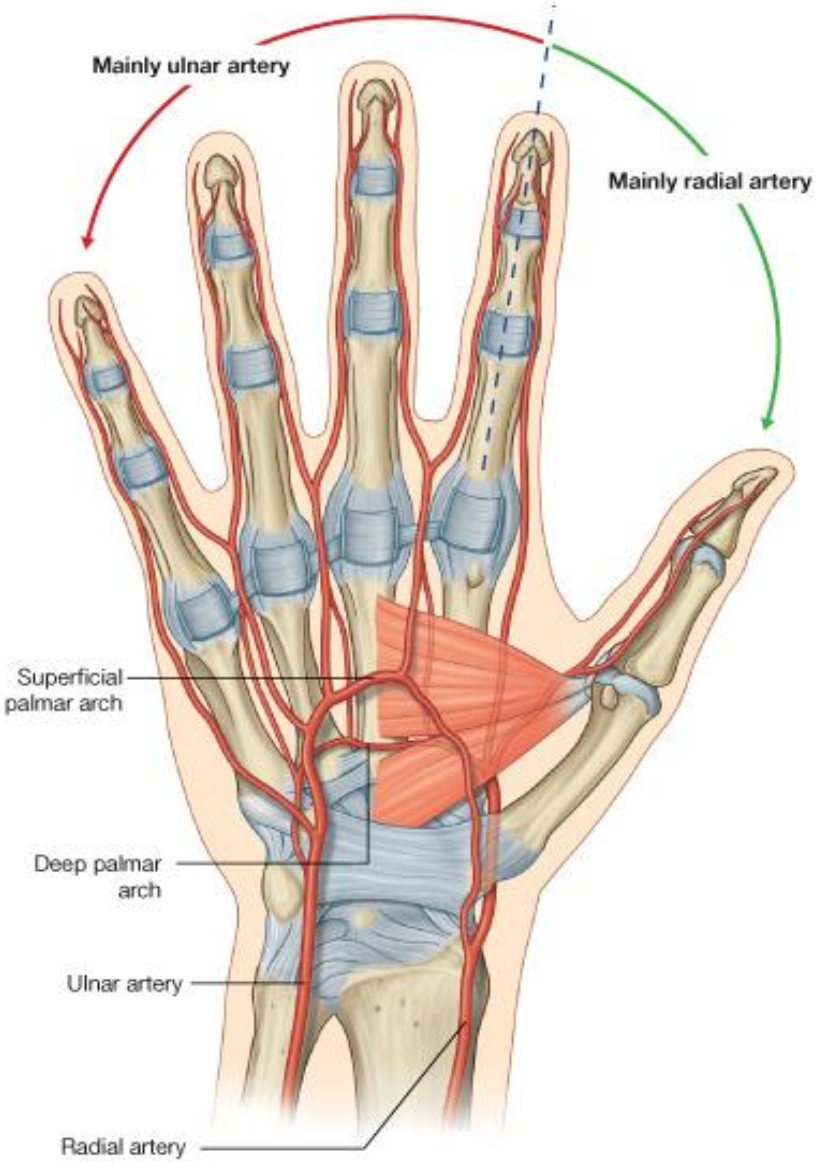
Arterial supply-

Supplied by ulnar and radial artery.

Superficial palmar arch major part is formed by ulnar artery.

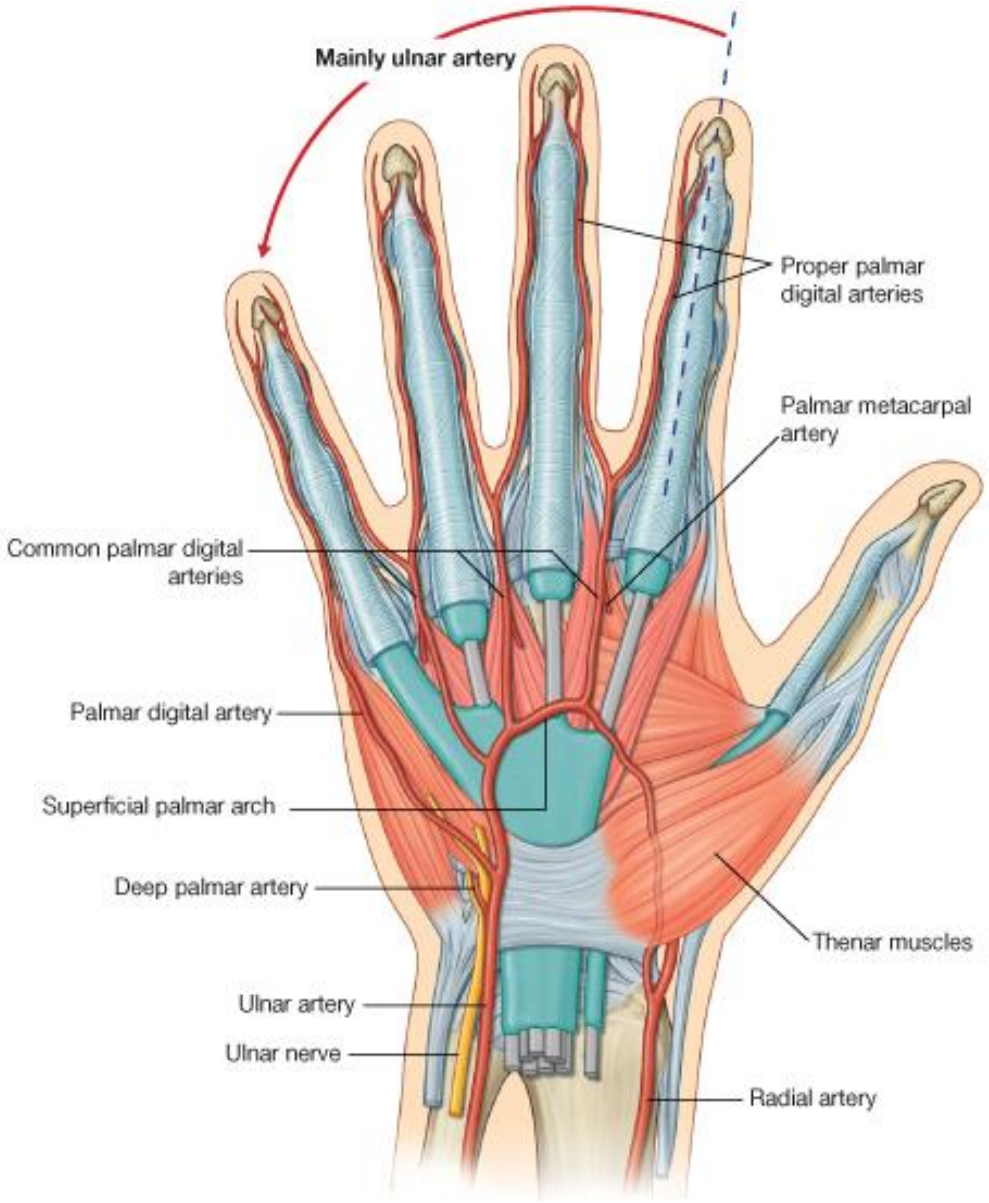
Deep arch major part is formed by radial artery.

Thumb and lateral half of index finger is supplied by radial artery.



They give rise to metacarpal and digital arteries.

Medial 3 and a half fingers are supplied by ulnar artery



Veins of upper limb

<u>Deep veins –</u>

Subclavian

Axillary

Brachial

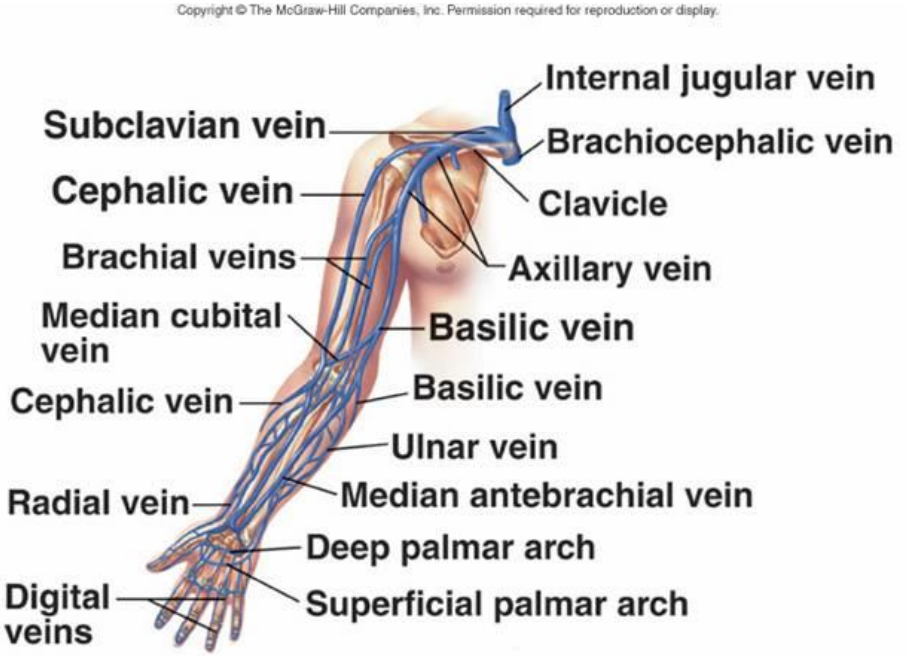
Radial and ulnar

<u>Superficial –</u>

Cephalic

Basilic

They both drain to axillary vein



Nerve supply of the hand-

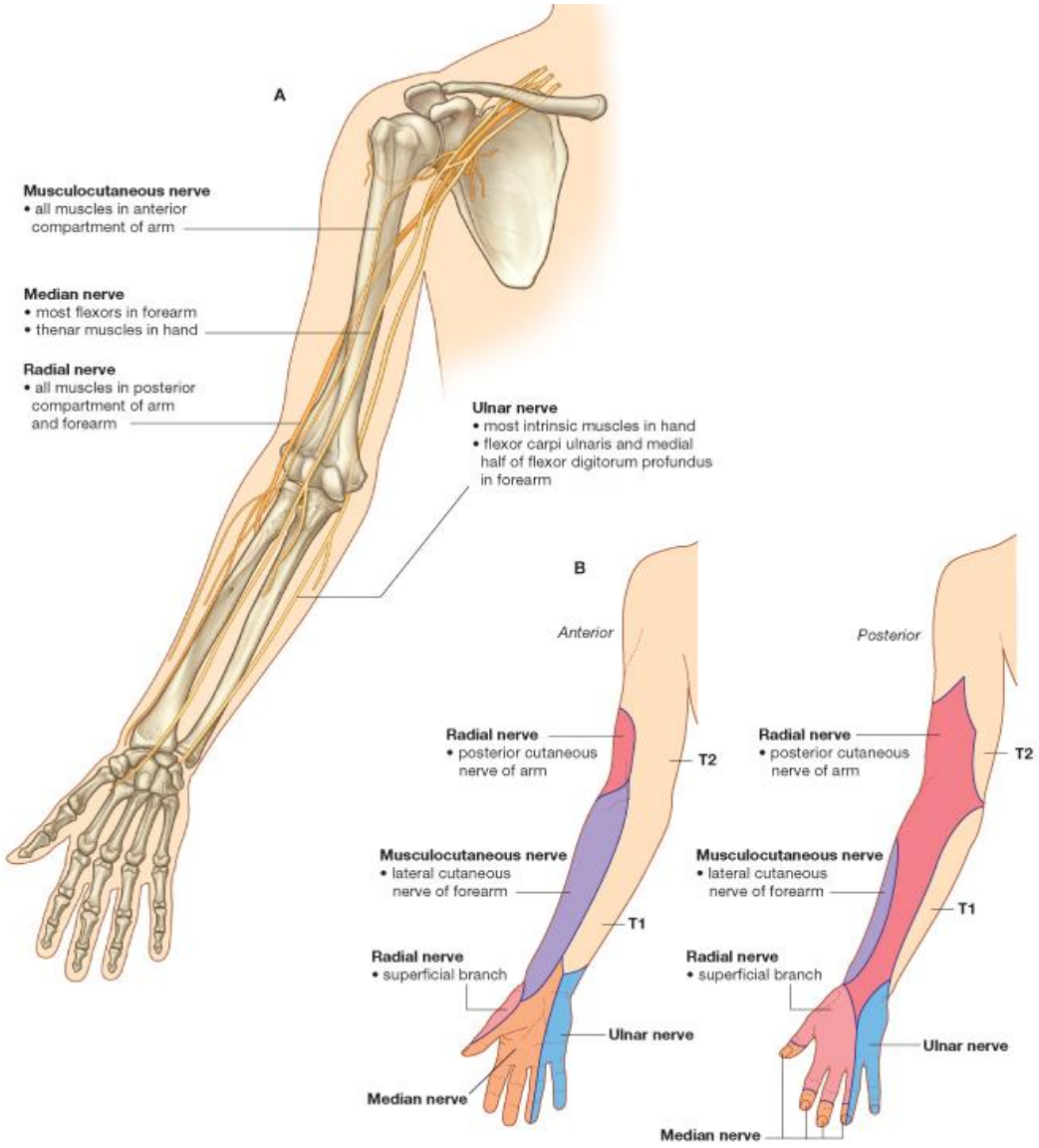
All the small muscles of the hand are supplied by ulnar nerve except the radial two lumbricals and thenar muscles.

Radial two lumbricals and thena muscles are supplied by median nerve.

Wrist and finger extensors are supplied by radial nerve.

Sensory –

Palmar aspect mainly by median and dorsal aspect mainly by radial. Ulnar supplies medial 1.5 fingers dorsal and ventral side.



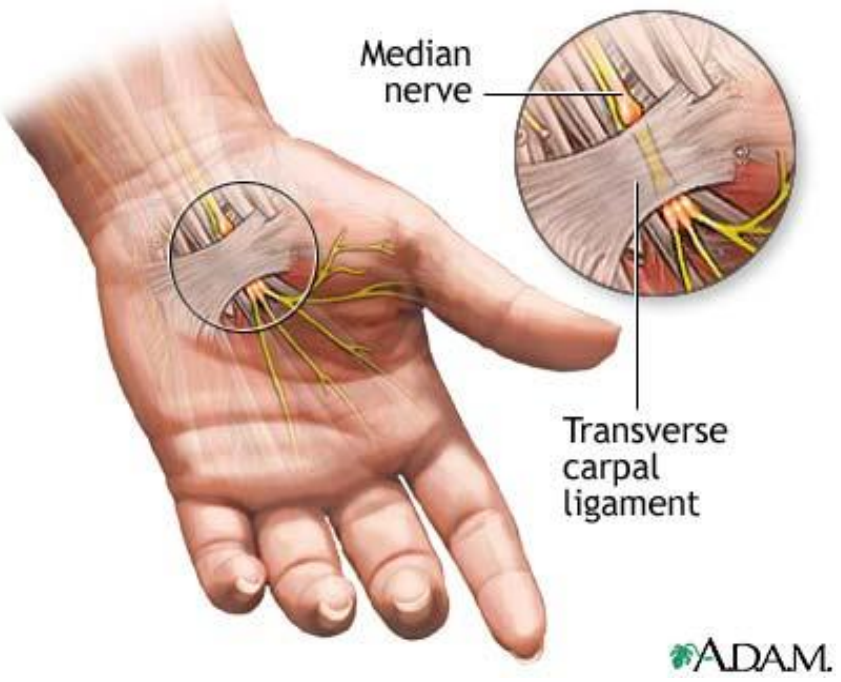
Wrist drop

The picture shows a ulnar claw hand of a person.

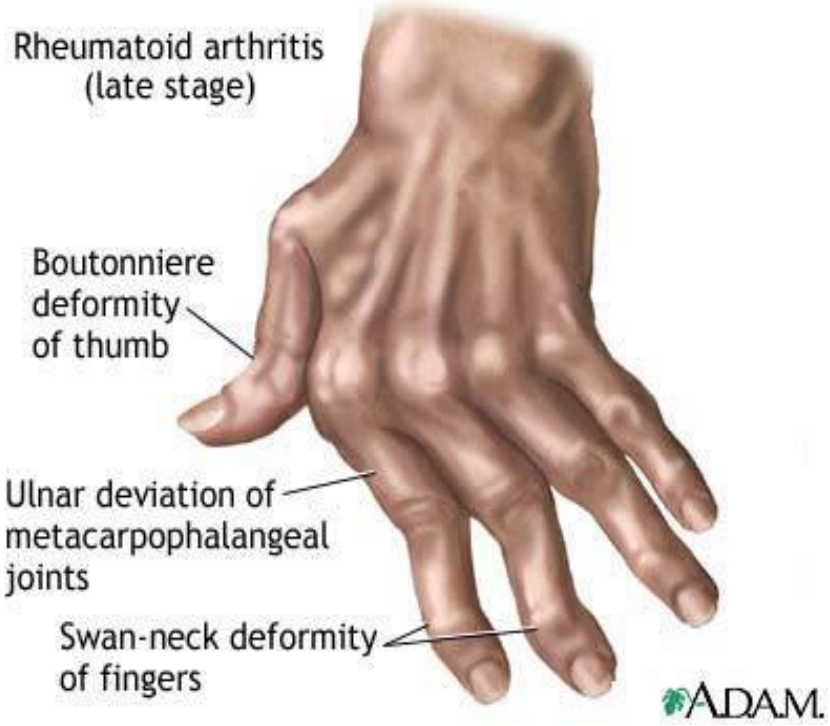
Median nerve obstruction beneath the flexor retinaculum.

There is wasting of thenar muscles.

Paresthesia over thenar eminence.

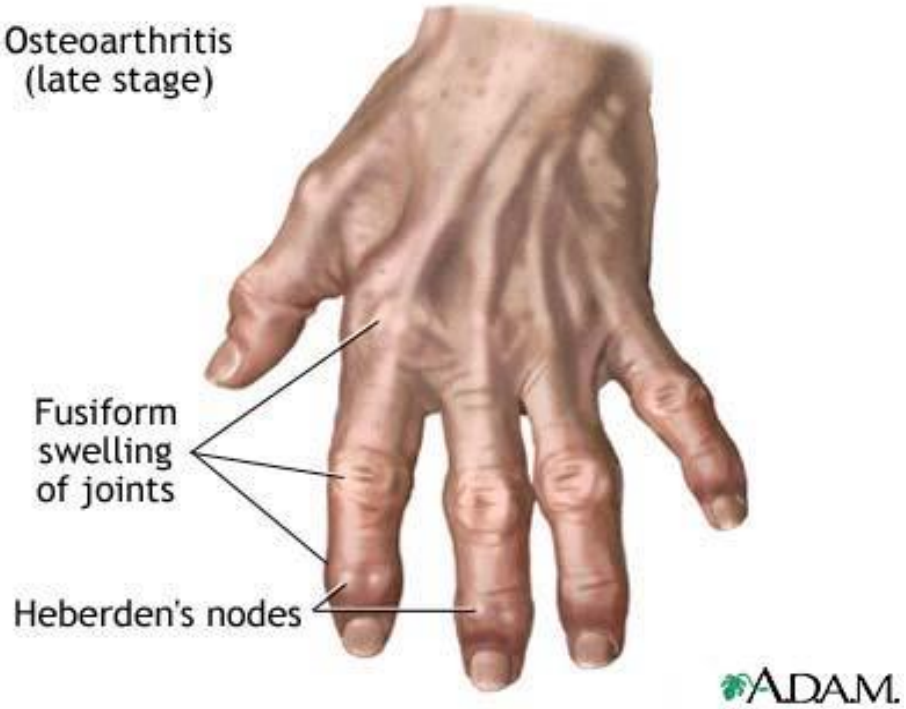


Rheumatoid Arthritis Hand




Rheumatoid arthritis
(late stage)
Boutonniere
deformity
of thumb
Ulnar deviation of
metacarpophalangeal
joints
Swan-neck deformity
of fingers
A.D.A.M.


Healthy
With RA


Osteoarthritis
(late stage)
Fusiform
swelling
of joints
Heberden's nodes
A.D.A.M.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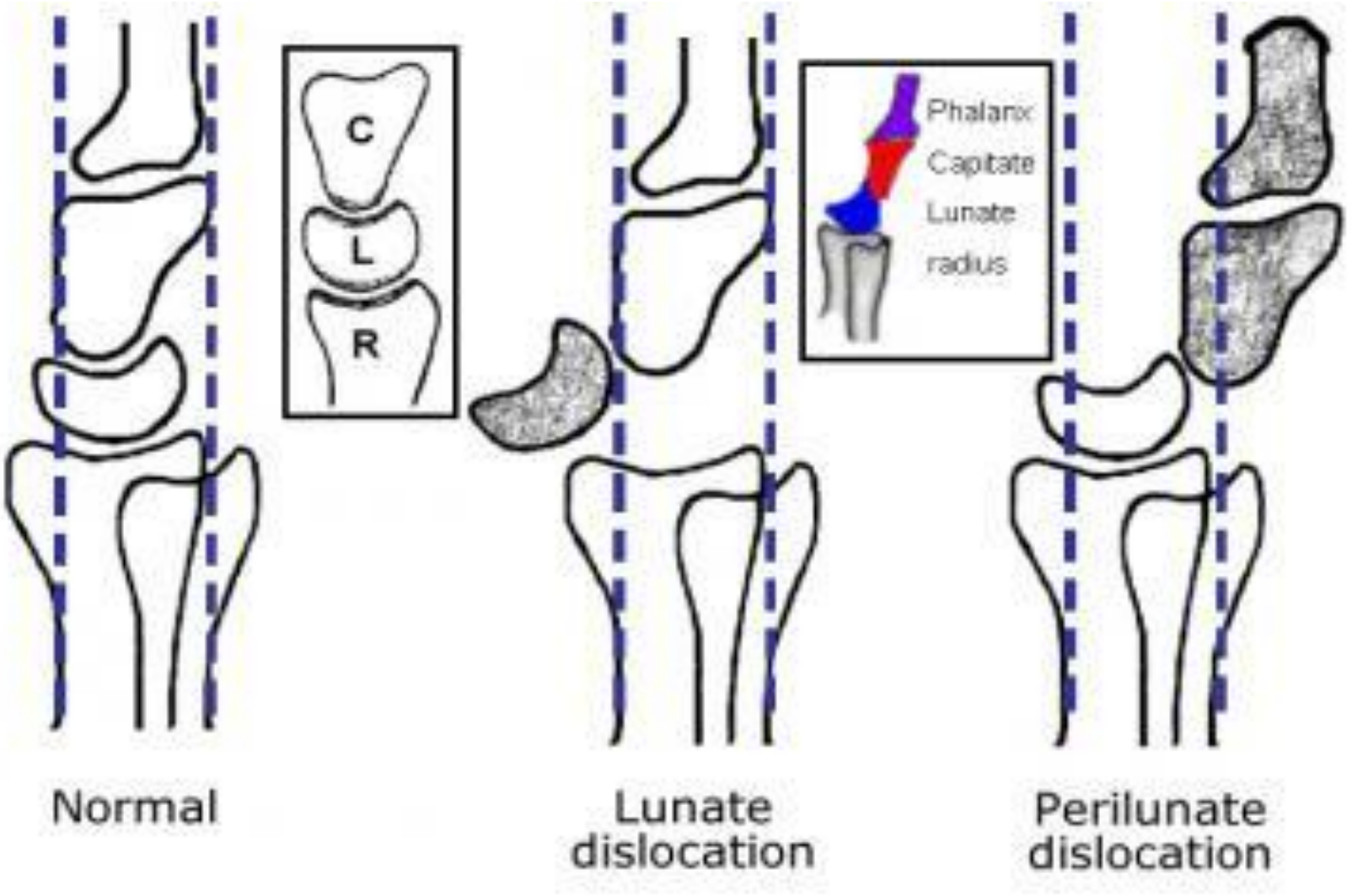
Scaphoid Fracture

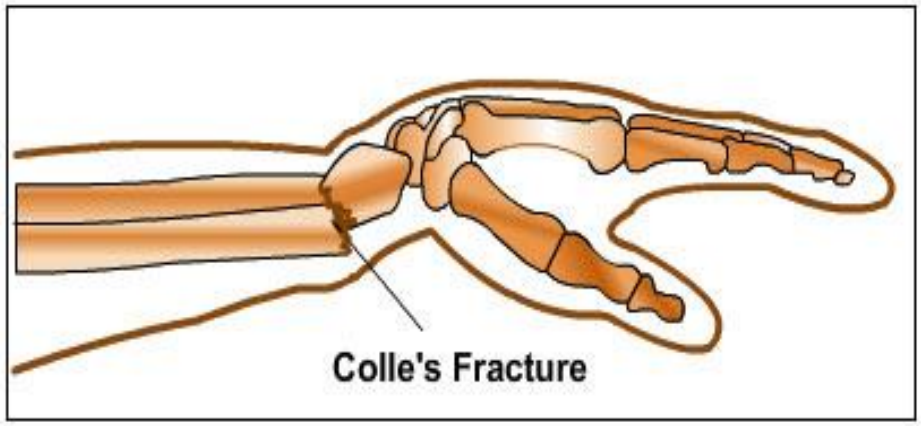
Dislocations related to the Lunate



Metacarpal Fracture

Fracture Phalanges

Colle’s Fracture



Galeazzi fracture

Radial shaft is fractured close to the wrist and

ulnar is dislocated

Montegia fracture

Ulnar shaft is fractured close to elbow

and

radius is dislocated