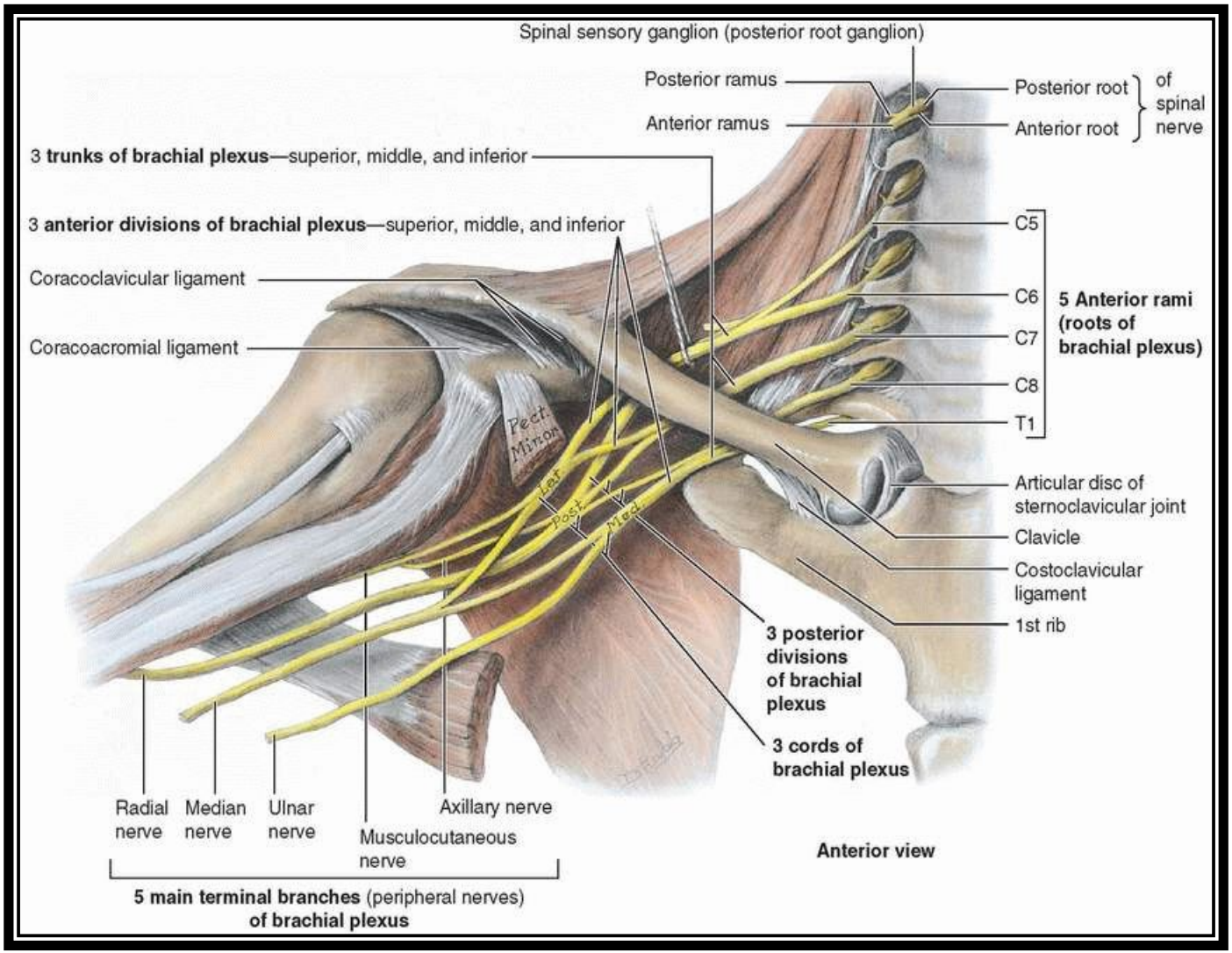
Pectoral (Shoulder) Girdle
Upper limb
Elbow, Wrist and Hand
Anatomy 2

Bony landmark review (handouts)

- Scapula
- Humerus
- Clavicle
- Sternum

Nerve supply to the upper limb



The Brachial Plexus

Supply:

- network of nerve fibres that supplies the skin & **musculature of the upper limb**

Location:

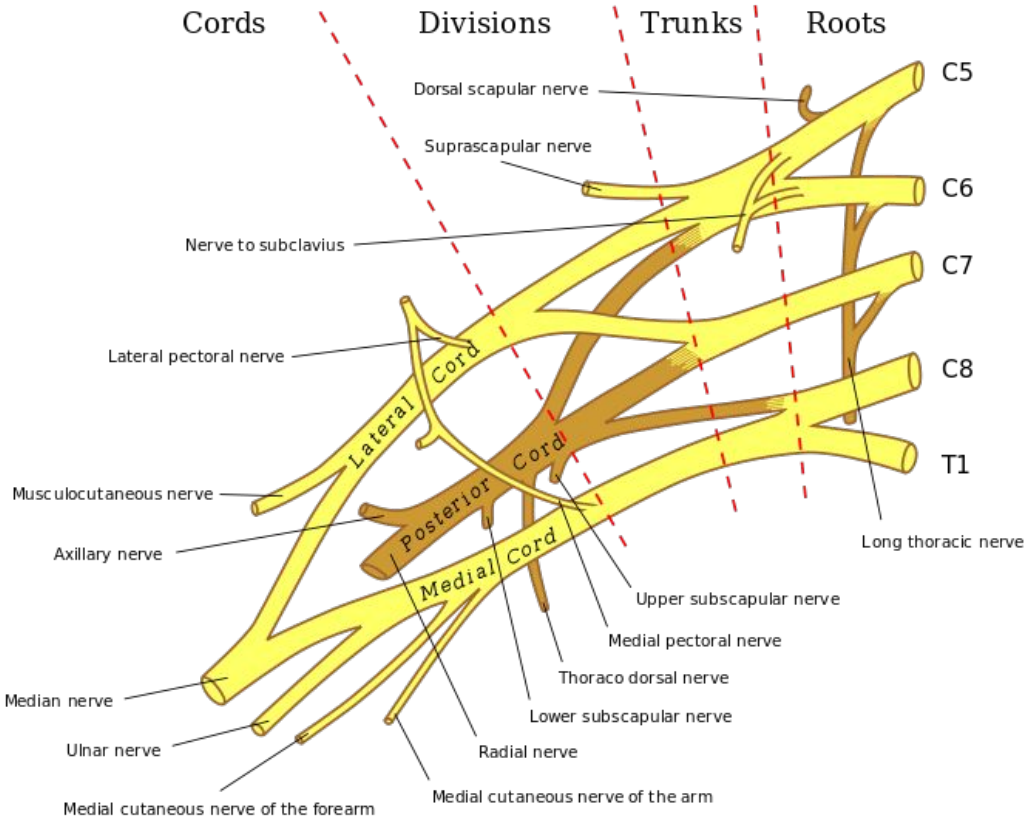
- **begins in the root of the neck, passes through the axilla & runs through the entire upper extremity**

Make up:

- **Anterior rami (divisions) of spinal nerves C5 - C8, & T1**

Parts of the brachial plexus

- Divided into 5 parts:
  - roots, trunks, divisions, cords, branches
  - mnemonic: Reach, To, Drink, Cold, Beer



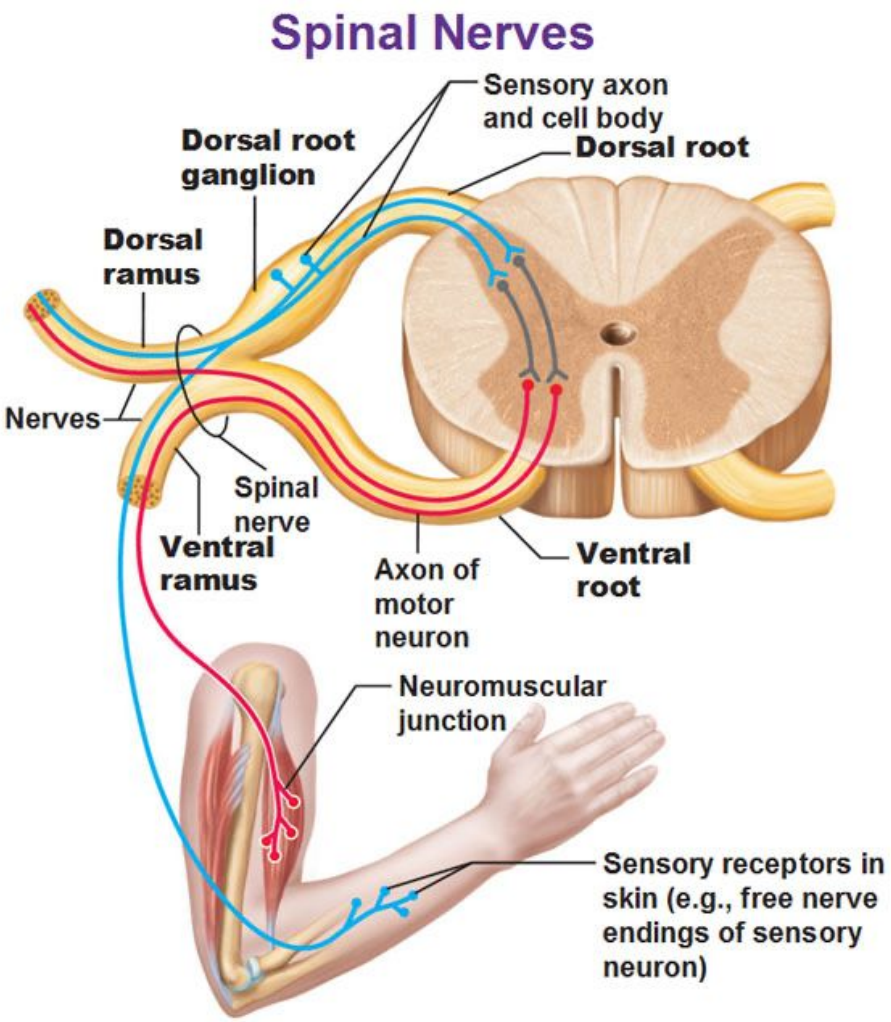
Roots

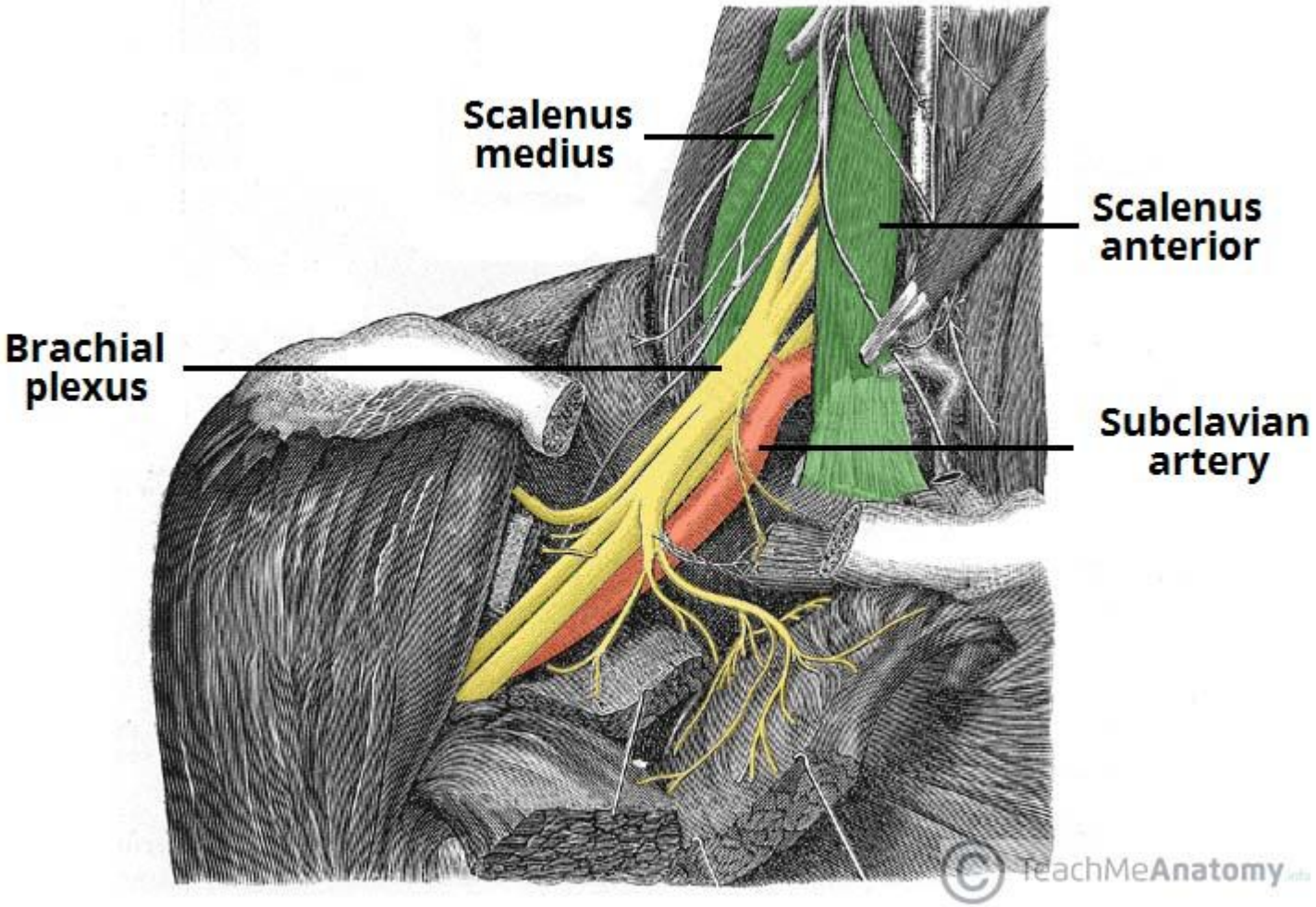
- “roots” are created by spinal nerves
- Spinal nerves leave the spinal cord via _____ & divide into anterior & posterior rami
- roots of the brachial plexus are formed by anterior rami of C5-T1 to innervate muscles & skin of the upper arm

Location of roots:

- pass between the anterior and middle scalene muscles to enter the base of the neck

Spinal Nerve




Scalenus medius
Scalenus anterior
Brachial plexus
Subclavian artery
TeachMeAnatomy

Trunks

- at the base of the neck, roots converge into three trunks:

Superior Trunk
- A combination of C5 & C6 nerve roots

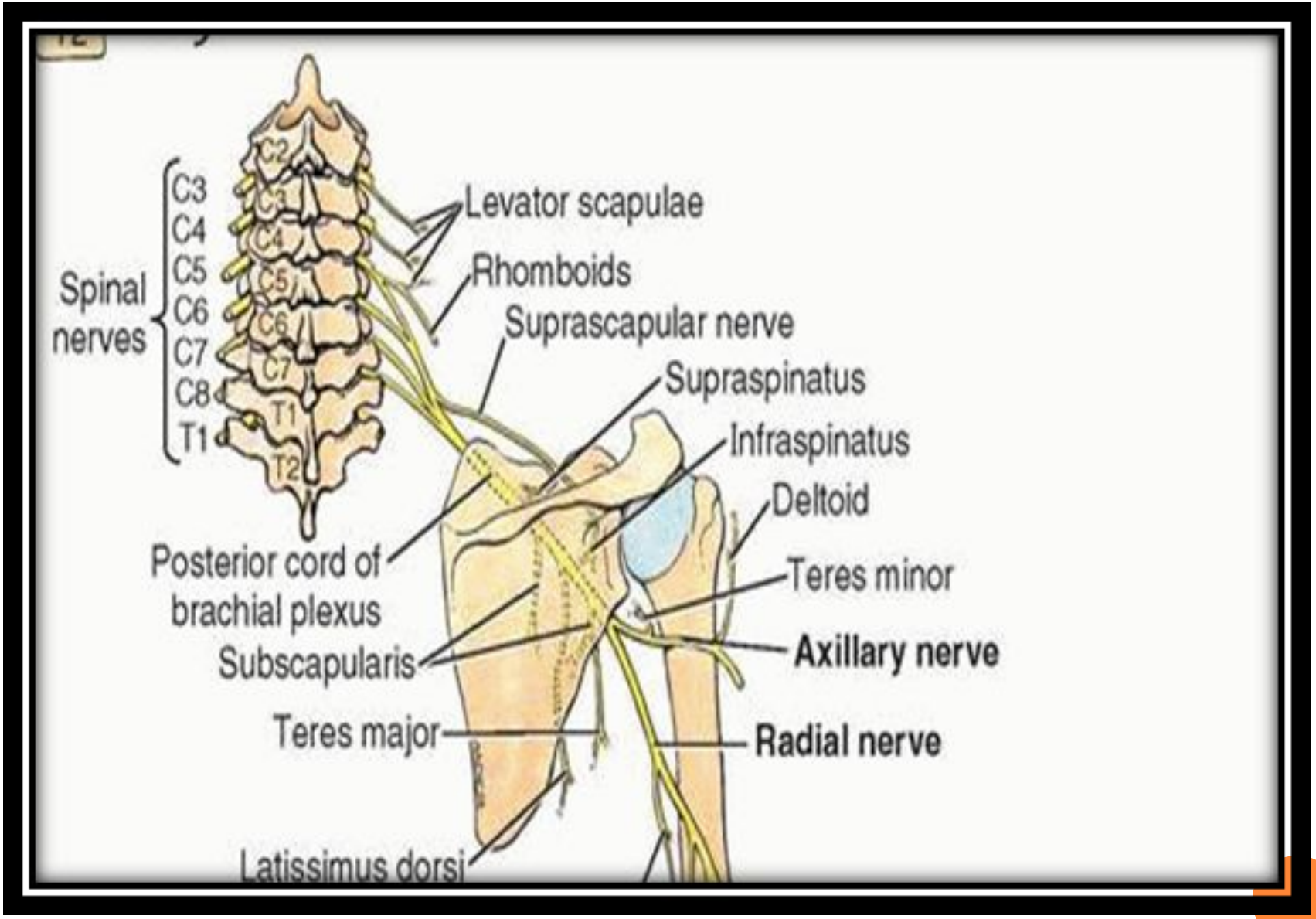
Middle Trunk
- Continuation of C7

Inferior Trunk
- Combination of C8 & T1

Location:
- travel laterally & cross through the posterior triangle of the neck

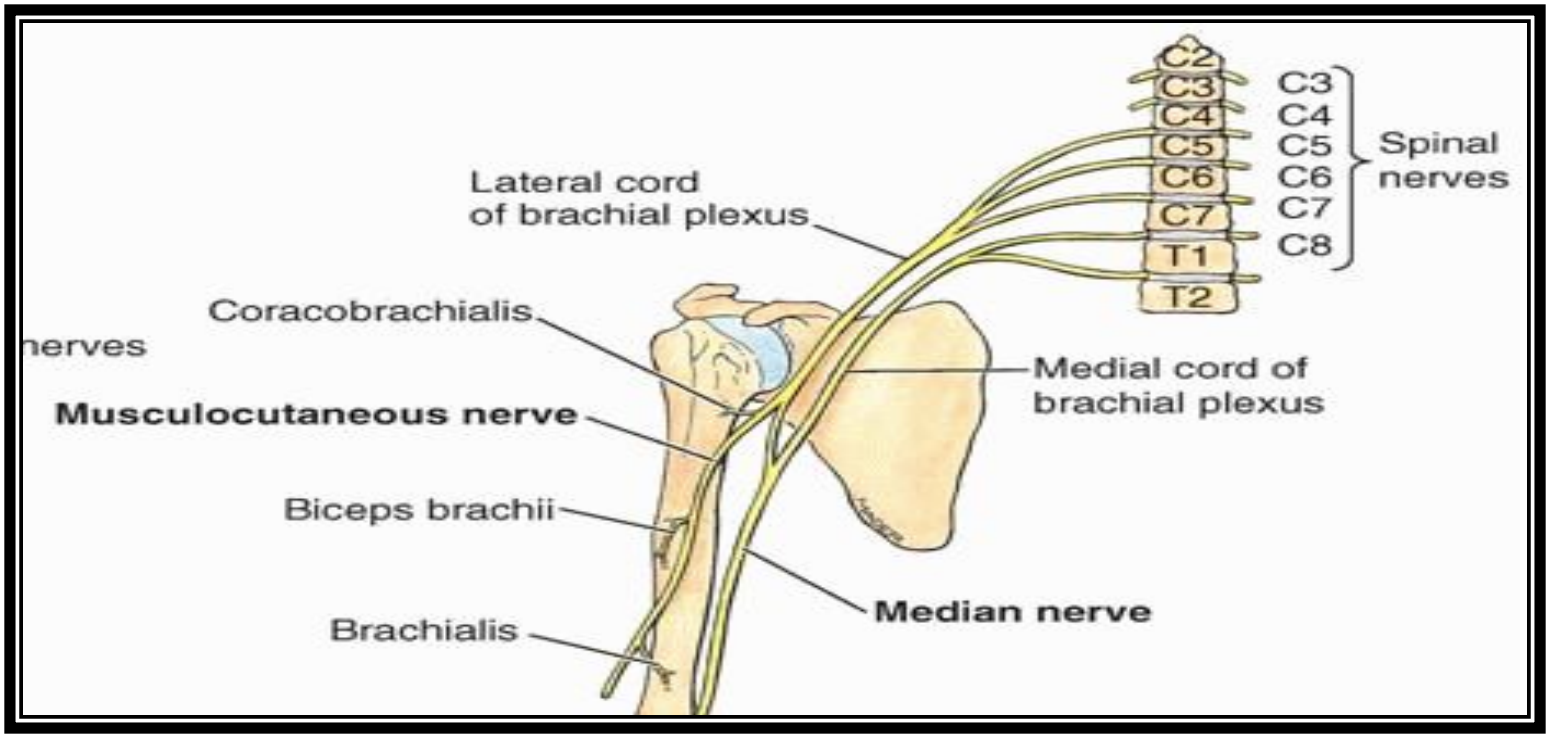
AXILLARY NERVE C5-C6

- Originates from the posterior cord.
- Wraps posteriorly around the surgical neck of the humerus.
- Passes through the quadrangular space (Superior -inferior border sub scap (Teres Minor from posterior) lateral - surgical neck of the humerus, Medial – long head of triceps muscle, Inferior – Teres major muscle)
- Gives rise to the superior lateral brachial cutaneous nerve (C5, C6) to supply skin over the area of the deltoid
- https://youtu.be/Ifd4nNqB_Ws


C2
C3
C4
C5
C6
C7
C8
T1
T2
Spinal nerves
Levator scapulae
Rhomboids
Suprascapular nerve
Supraspinatus
Infraspinatus
Deltoid
Teres minor
Axillary nerve
Radial nerve
Posterior cord of brachial plexus
Subscapularis
Teres major
Latissimus dorsi

MUSCULOCUTANEOUS – IN THE ARM (BETWEEN SHOULDER & ELBOW) C5-C7

- Originates from the lateral cord
- Pierces Coracobrachialis muscle
- Descends between Biceps Brachii and Brachialis

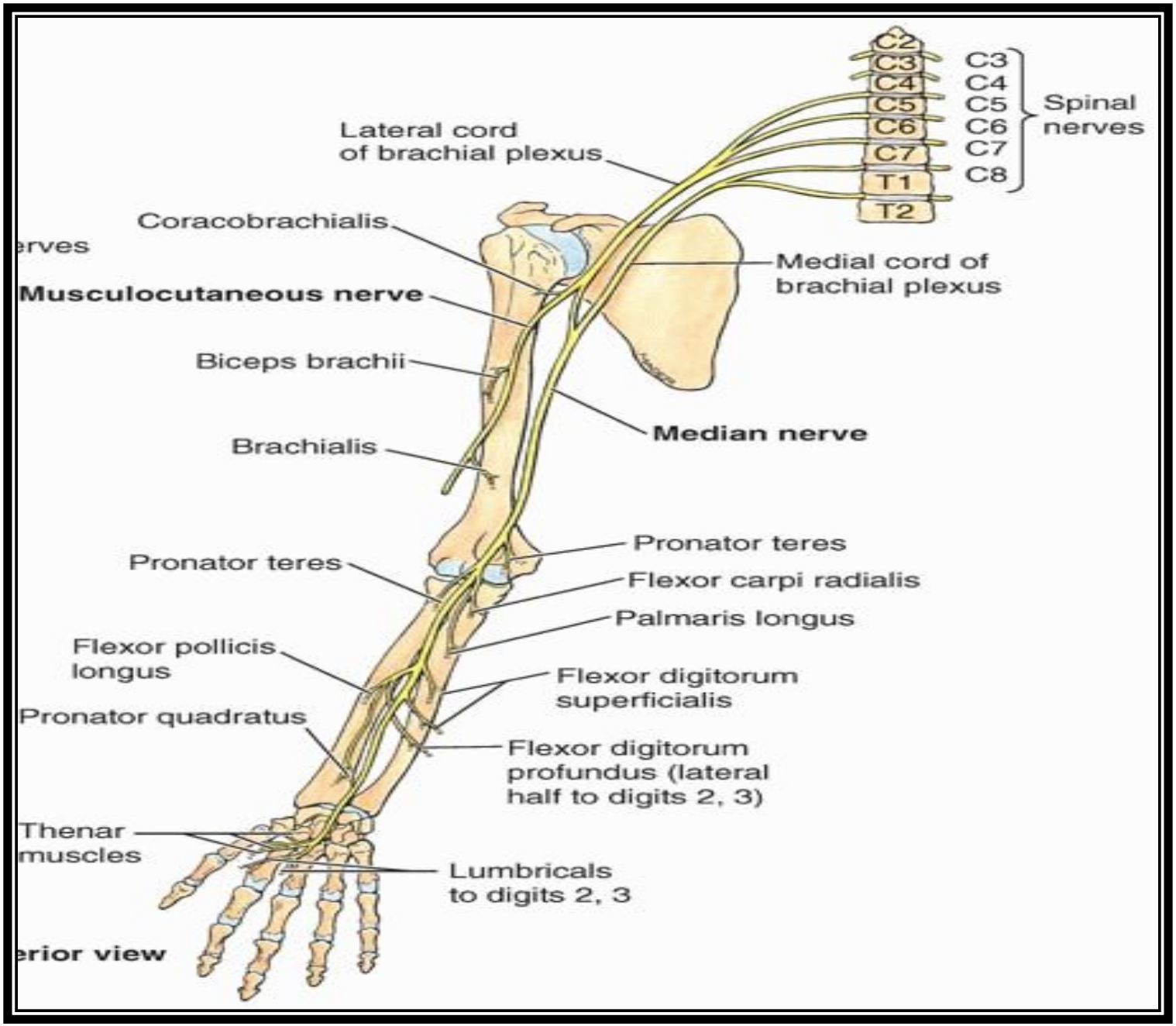


MUSCULOCUTANEOUS – IN THE FOREARM

- Around the elbow the musculocutaneous nerve continues as the **lateral antebrachial cutaneous nerve**
- Descends along lateral border of forearm to the wrist
- Runs fairly superficial near to the cephalic vein
- https://youtu.be/Wru7UCHlbFU

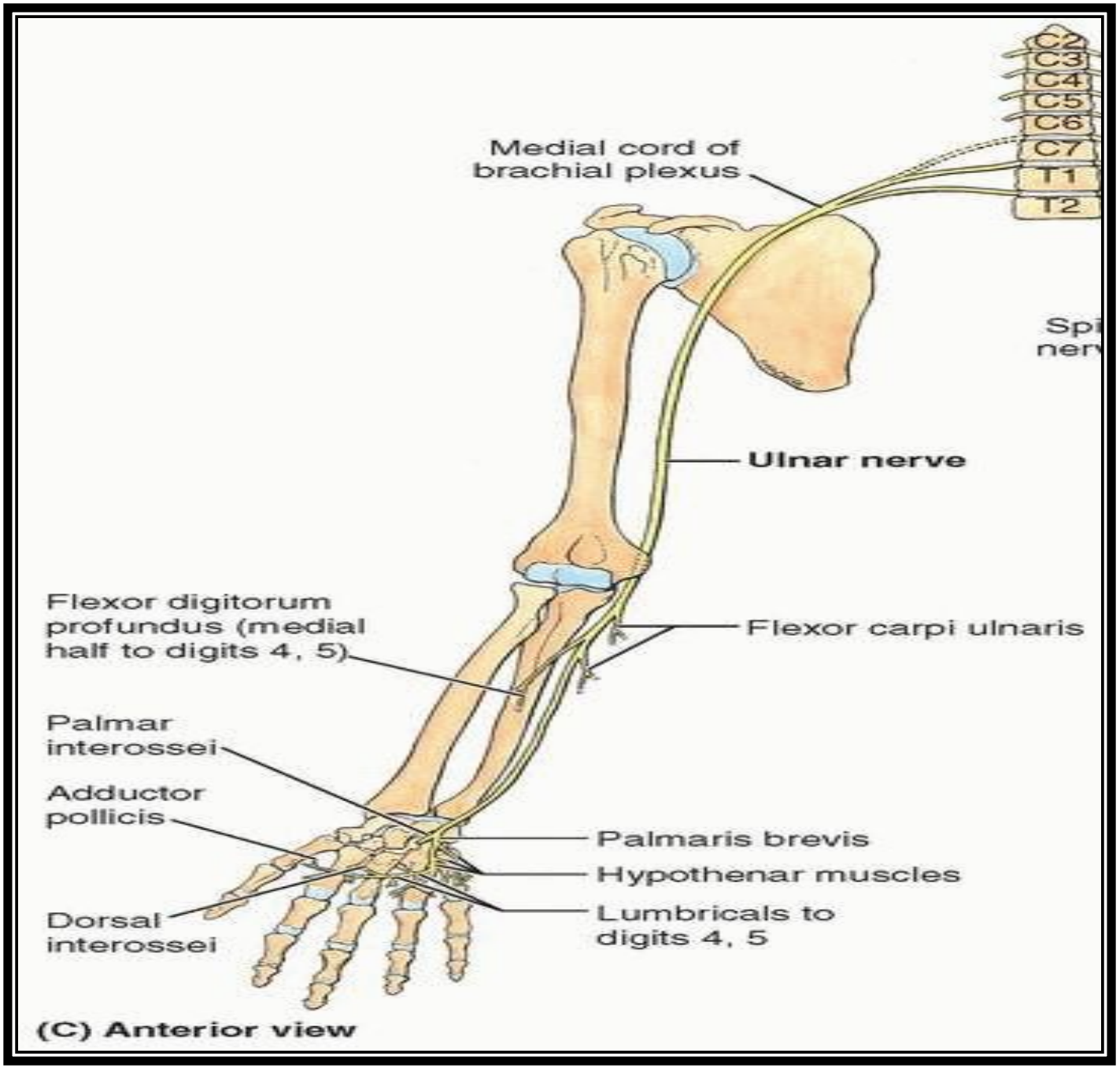
MEDIAN NERVE – IN THE FOREARM /HAND C5-T1

- Travels along medial to the Bicipital groove.
- Passes anterior to the medial condyle of the humerus
- Passes between the 2 heads of pronator Teres (deep to humeral, superficial to ulnar)
- Descends between Flexor Digitorum Profundus and Flexor Digitorum Superficialis
- Passes deep to the flexor retinaculum
- Passes through the **carpal tunnel**
- https://youtu.be/LSls4MWv3MQ


C2
C3
C4
C5
C6
C7
T1
T2
C3
C4
C5
C6
C7
C8
Spinal nerves
Lateral cord of brachial plexus
Coracobrachialis
erves
Musculocutaneous nerve
Biceps brachii
Brachialis
Medial cord of brachial plexus
Median nerve
Pronator teres
Pronator teres
Flexor carpi radialis
Palmaris longus
Flexor pollicis longus
Flexor digitorum superficialis
Pronator quadratus
Flexor digitorum profundus (lateral half to digits 2, 3)
Thenar muscles
Lumbricals to digits 2, 3
erior view

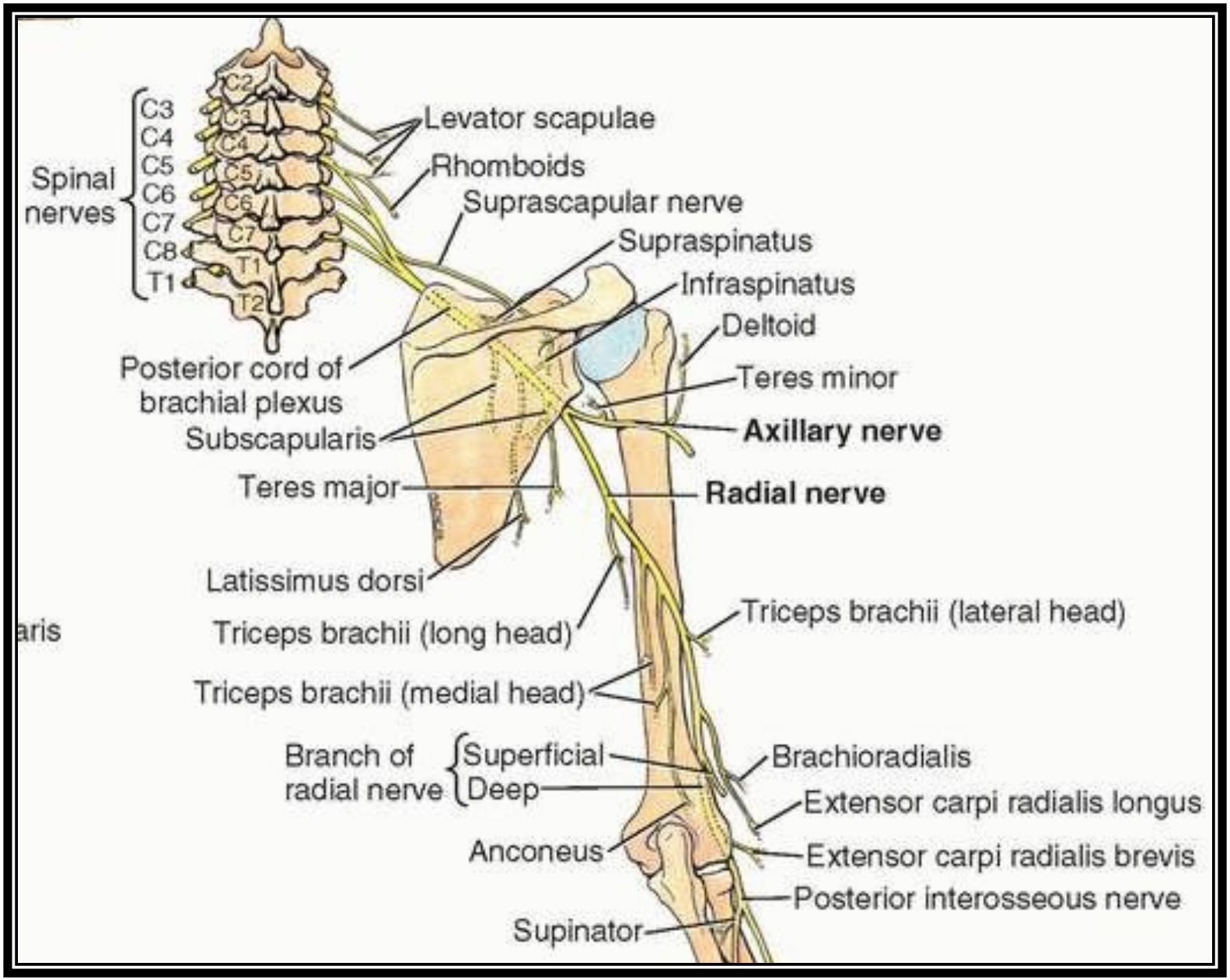
ULNAR NERVE IN THE ARM C7-T1

- Originates from the medial cord
- Descends down medial arm, medial to the bicipital groove
- Passes posterior to the medial epicondyle via the groove for ulnar nerve
- Passes between the heads of flexor carpi ulnaris
- Descends between flexor carpi ulnaris & flexor digitorum profundus
- Travels through the tunnel of Guyon (between the pisiform and hook of hamate)
- https://youtu.be/EoTfDy8T5vM


C2
C3
C4
C5
C6
C7
T1
T2
Medial cord of brachial plexus
Ulnar nerve
Flexor digitorum profundus (medial half to digits 4, 5)
Flexor carpi ulnaris
Palmar interossei
Adductor pollicis
Palmaris brevis
Hypothenar muscles
Lumbricals to digits 4, 5
Dorsal interossei
(C) Anterior view

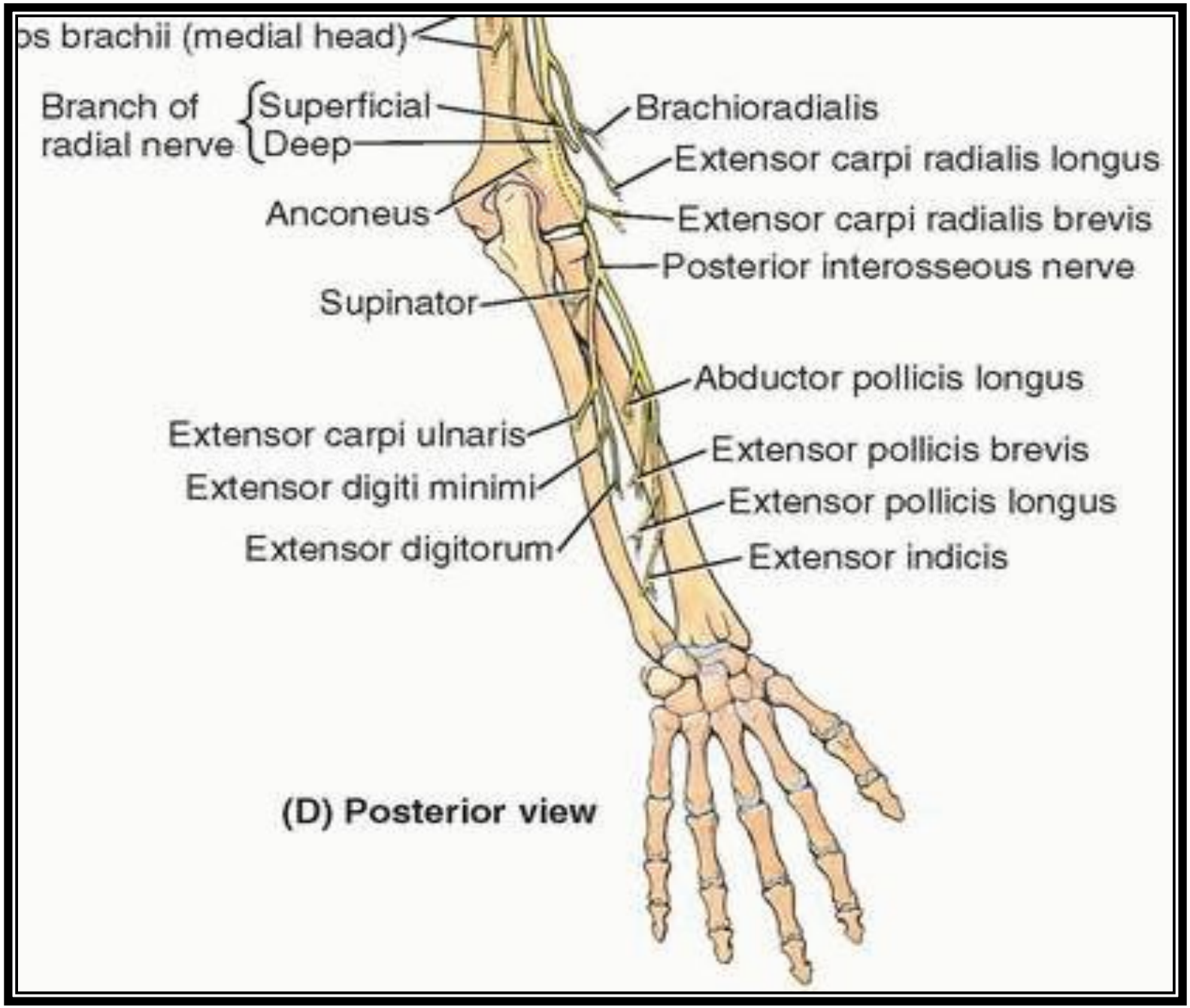
RADIAL NERVE – IN THE ARM C5-T1

- Passes posterior to the humerus in the radial/spiral groove with the deep brachial artery
- Travels between lateral and medial heads of triceps and pierces the intermuscular septum to enter the cubital fossa
- Here it divides into superficial (cutaneous) & deep (motor) branches.


Spinal nerves
C2
C3
C4
C5
C6
C7
C8
T1
T2
Levator scapulae
Rhomboids
Suprascapular nerve
Supraspinatus
Infraspinatus
Deltoid
Teres minor
Axillary nerve
Radial nerve
Posterior cord of brachial plexus
Subscapularis
Teres major
Latissimus dorsi
Triceps brachii (long head)
Triceps brachii (lateral head)
Triceps brachii (medial head)
Branch of radial nerve
Superficial
Deep
Brachioradialis
Extensor carpi radialis longus
Extensor carpi radialis brevis
Posterior interosseous nerve
Anconeus
Supinator

RADIAL NERVE IN THE FOREARM

- From the cubital fossa, divides into superficial and deep branches
- The deep branches winds around the neck of the radius and becomes the posterior interosseus nerve as it runs along the interosseus membrane
- The superficial branch courses deep to brachioradialis and then travels into the hand
- https://youtu.be/3M6dzH1i-GI


ps brachii (medial head)
Branch of radial nerve
Superficial
Deep
Anconeus
Supinator
Extensor carpi ulnaris
Extensor digiti minimi
Extensor digitorum
Brachioradialis
Extensor carpi radialis longus
Extensor carpi radialis brevis
Posterior interosseous nerve
Abductor pollicis longus
Extensor pollicis brevis
Extensor pollicis longus
Extensor indicis
(D) Posterior view

Main nerves from the brachial plexus

- Axillary - Origin C5 – C6 Nerve root – innerevates
- 453
- Muscles 328

Joint Review

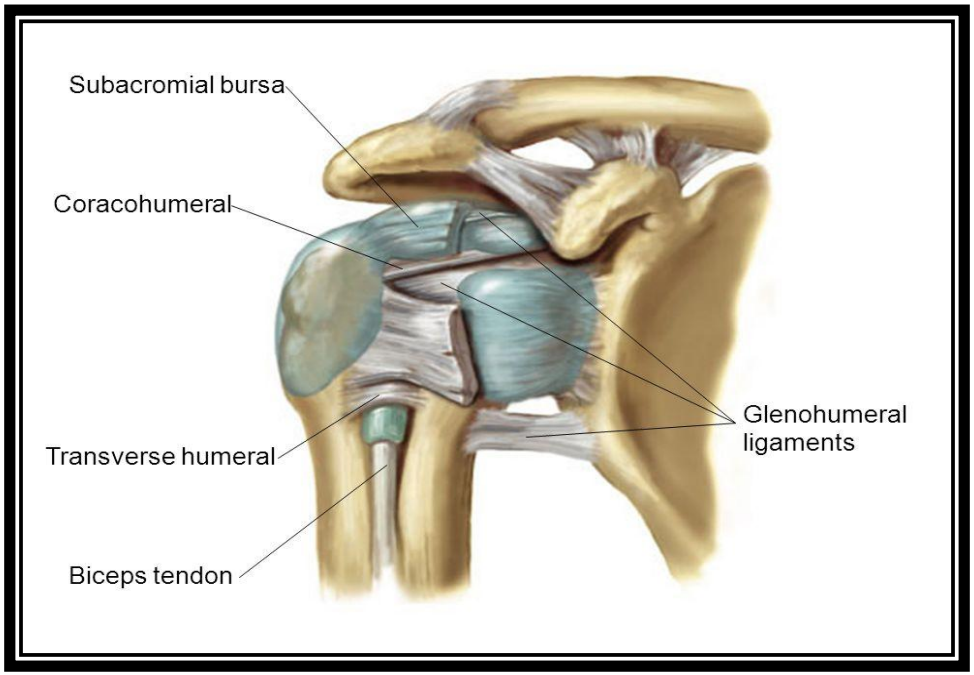
Glenohumeral Joint

- Ball and socket joint, synovial Joint
- Diarthrotic, multiaxial

The GH joint is made up of the following components

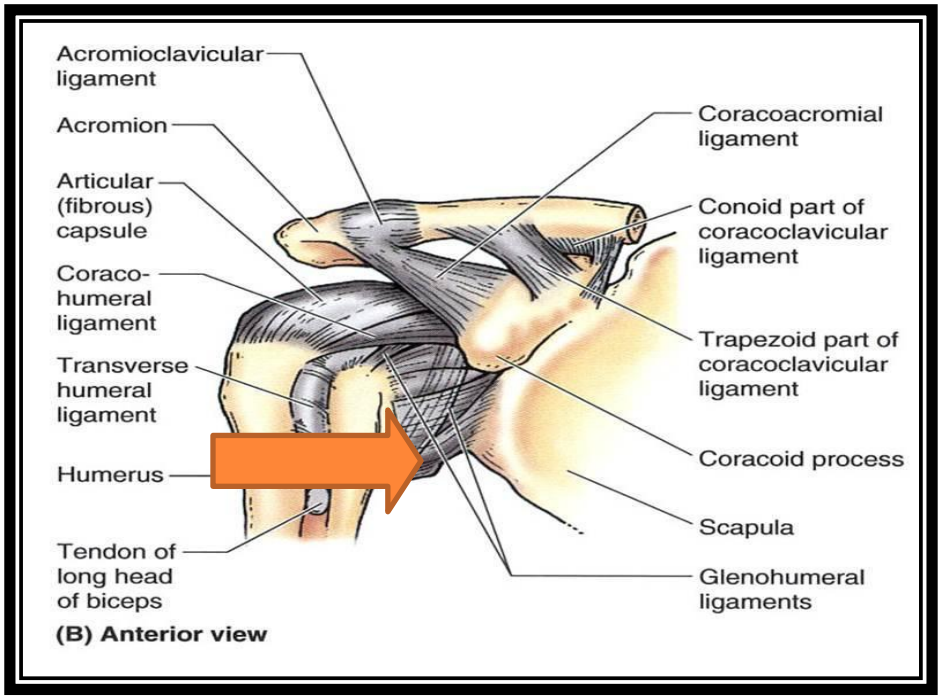
- Articular Capsule – Loose sac that envelops entire joint from glenoid cavity to anatomical neck of humerus. Weakest at the anterior/ inferior portion of the capsule
- Glenoid Labrum – Narrow rim of fibrocartilage around the edge of the glenoid cavity that deepens and enlarges the glenoid cavity. The Biceps Tendon attaches here as well
- Bursae – There are four associated with GH
  - Subscapular bursa, subdeltoid bursa, subacromial bursa,and subcoracoid bursa

- Ligaments
  - Coracohumeral Ligament
    - Strong broad ligament that strengthens superior part of the articular capsule. Extends from the coracoid process of the scapula to the greater tubercle of the humerus. Its purpose is to strengthen the superior part of articular capsule and reinforces the anterior aspect of the articular capsule. It also resists external rotation



Glenohumeral Ligaments

- Three thickenings over the anterior surface of the joint that extends from the Glenoid cavity to the lesser tubercle and anatomical neck of the Humerus. They are not always present and provide only minimal strength. They provide joint stability and help to resist excessive external rotation of the humerus. Individually named Inferior, middle and superior GH Ligaments.



GH Ligaments

Movement Continued

- The shoulder joint has the most movement of any joint in the body due to:
  - The looseness of the articular capsule
  - Shallowness of the glenoid cavity in relation to the size of the humeral head

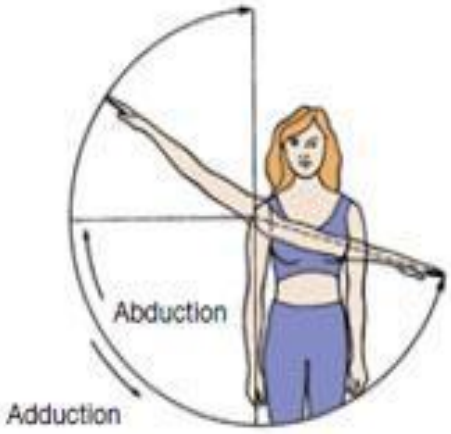
Most of the strength of the GH is not provided by the Ligaments but by the strength of the muscles surrounding it especially the rotator cuff muscles

- Supraspinatus
- Infraspinatus
- Teres Minor
- Subscapularis

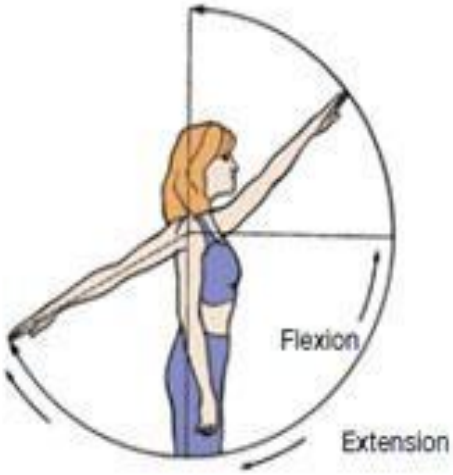
Referred to also as SITS muscles. They anchor the Humerus to the Scapula. Tendons of these muscles surround the joint with exception of the inferior portion

Movements at the GH

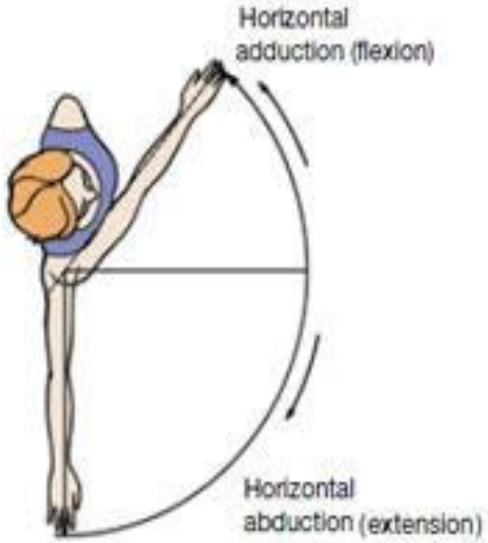
- Flexion
- Extension
- ABduction
- ADduction
- Medial rotation
- Lateral rotation
- Horizontal ABduction
- Horizontal ADduction
- Circumduction



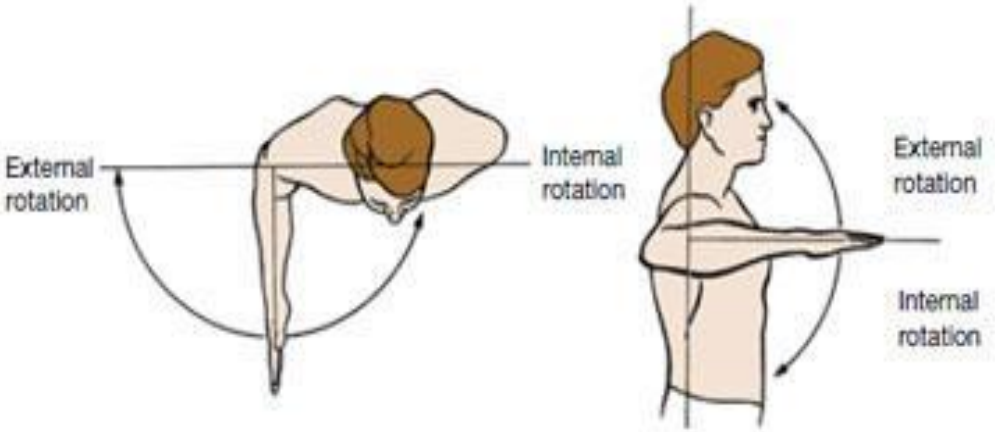
Abduction & Adduction



Flexion & Extension



Horizontal Abduction & Adduction



Internal & External Rotation

Muscles of the Glenohumeral Joint

Deltoid = (Delta (triangle) Oid (resemblance) 119

Origin

Lateral Clavicle, Acromion Process, Spine of Scapula

Insertion

Deltoid Tuberosity

Action

Anterior Head – Flexion and Medial Rotation, horizontal adduction

Whole – Abduction of Humerus

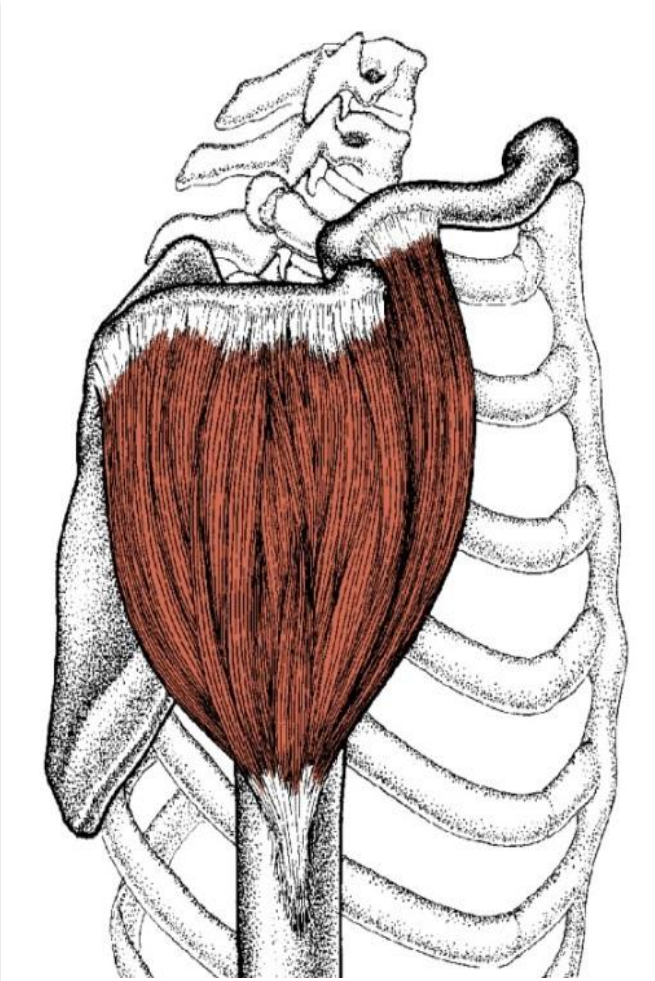
Posterior Head – Extension and Lateral Rotation, horizontal abduction

Nerve

Axillary nerve (C5, C6)

Blood

Posterior & Anterior humeral circumflex artery, pectoral & deltoid branch of thoracoacromial artery



Fun Facts

- Anterior deltoid considered prime mover of GH flexion
- Middle Deltoid considered prime mover of GH Abduction (Ant and Post fibres act as stabilizers) Strongest between 30 and 120 degrees
- Posterior deltoid is a strong extensor
- Fracture of surgical neck of humerus or shoulder dislocations can cause damage to axillary nerve and weaken the deltoid muscle
- ADL reaching above the head, lifting above head, waving good bye

Coracobrachialis = Coraco – referring to coracoid process, Brachialis – refers to arm

Origin

Coracoid process of scapula

Insertion

Medial Shaft of Humerus (middle 1/3)

Action

Flexion of GH

Adduction of GH

Horizontal Adduction of GH

Nerve

Musculocutaneous Nerve (C5, C6 & C7)

Blood

Muscular branches of brachial artery & anterior circumflex humeral artery

Fun Facts

- Musculocutaneous nerve pierces coracobrachialis
- Proximal attachment blends with proximal attachment of the short head of the biceps brachii
- Strong horizontal Adductor of the forearm
- Smallest anterior arm muscle
- Entrapment of the musculocutaneous nerve in this muscle can cause weakness in supination, elbow flexion, shoulder flexion and paresthesia (burning, tingling, numbness or itchy sensations). Entrapment is usually secondary to hypertrophy – more common in body builders or high level athletes
- ADL – hugging, covering your mouth to cough

Pectoralis Major

Origin

Sternal Portion – Anterior sternum and costal cartilage (Ribs 1-7)

Clavicular Portion –

Medial ½ of clavicle

Insertion

Lateral lip of Bicipital groove

The clavicular portion inserts below the Sternal portion

Action

Adduction and medial rotation of GH

Horizontal Adduction

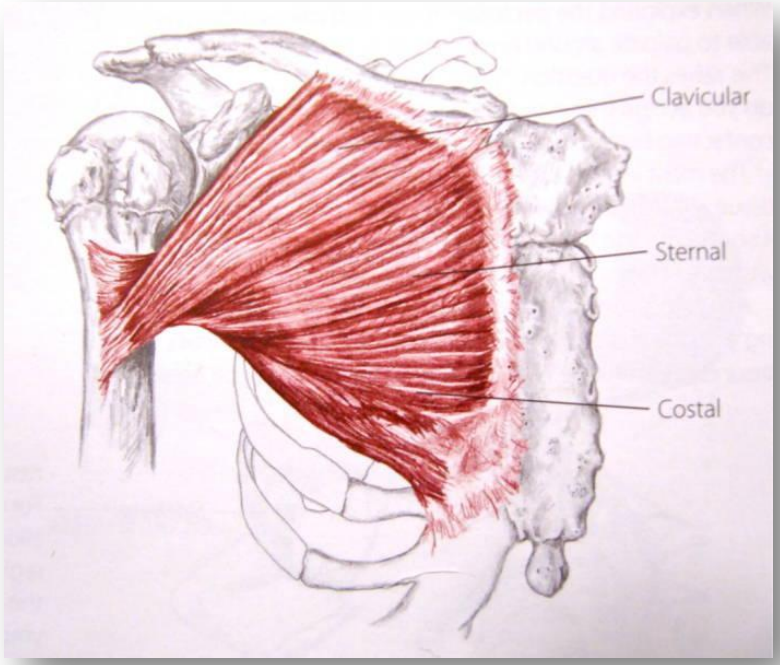
Flexion of Arm (clavicular portion)

Nerve

Medial and Lateral Pectoral Nerve

Blood Supply

Thoracoacromial trunk



Fun Facts

- Pectoralis – refers to the chest, Major = larger
- Towards the humeral attachment, the clavicular fibres are most superficial, the sternal fibres in the middle and the costal portion are the deepest (most posterior)
- Clavicular fibres at more distal on the humerus and the sternocostal more proximal on the humerus, causes a twist in the fibres; at 180 degrees twist disappears
- Makes up the most of the anterior axillary fold
- Over development or contracted pec majors can lead to “rounded shoulders”
- ADL – Hugging, applying deodorant, pushing, chin up

LATISSIMUSS DORSI LAT = WIDE, DORSI = OF THE BACK

Origin

SP's T7-L5, Ribs 9-12 via Thoracolumbar fascia, Posterior Iliac crest, Posterior sacrum

Insertion

Medial Lip of Bicipital groove

Action

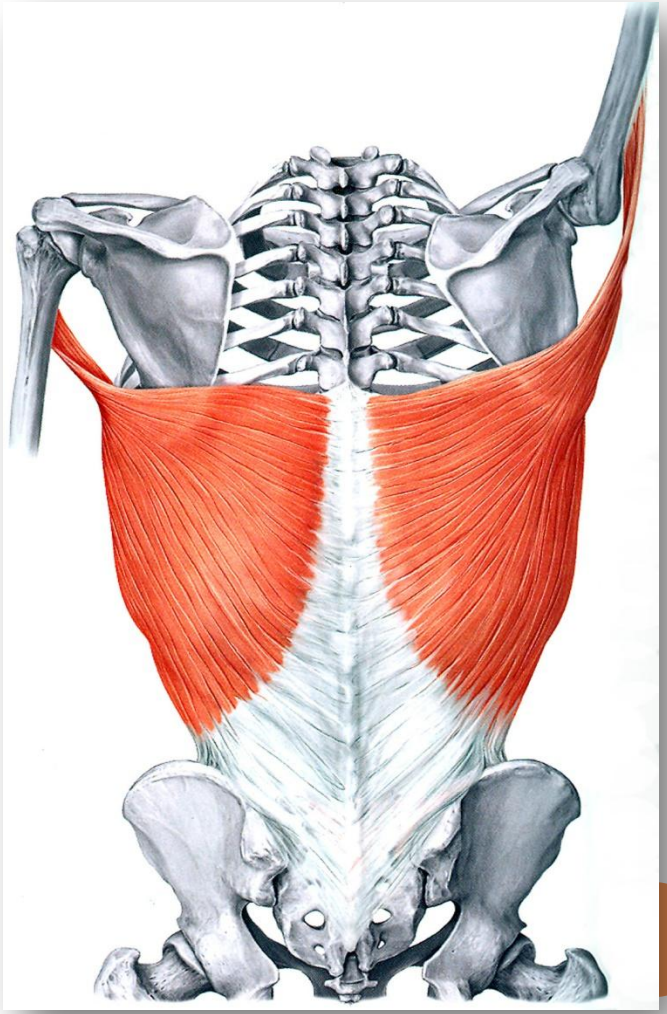
Extension, medial rotation and adduction of Humerus

Nerve

Thoracodorsal nerve (C6,7 & 8)

Blood

Thoracodorsal artery, intercostal arteries



Teres Major = Teres – Round, Major - Bigger

Origin

Inferior angle and lateral border of the scapula

Insertion

Medial lip of the bicipital groove of the humerus

Action

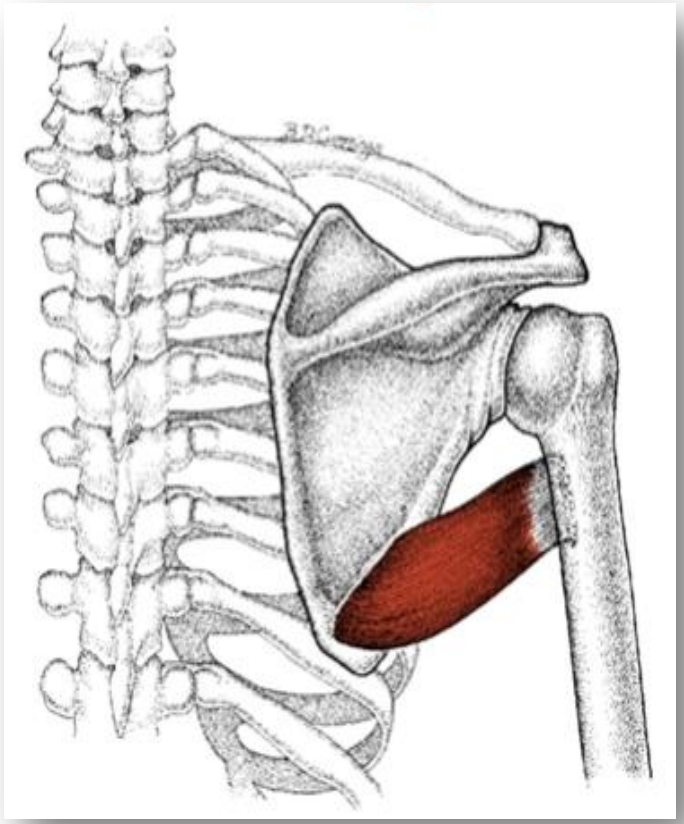
Medial rotation of GH,
Adduction of GH
Extension of GH

Nerve

Lower subscapular nerve (C5, C6 & C7)

Blood

Circumflex scapular artery,
Thoracodorsal artery



Fun Facts

- Wraps the humerus opposite to teres minor and creates opposite rotational motion
- With the Lats creates posterior axillary fold
- Known as the little Latissimus as they create the same motion
- Most active during adduction behind the back
- ADL – reaching behind back, rowing, cross country skiing, throwing

Rotator Cuff Muscles

Page 133

SUPRASPINATUS (ABOVE THE SPINE)

Origin

Supraspinous Fossa

Insertion

Greater Tubercle of the Humerus

Action

Abduction of shoulder

"Scaption"

Nerve

Suprascapular nerve (C5, C6)

Blood

Suprascapular artery

Fun Facts

- Creates the most abduction at the start and end of the action. Some texts say all the way through.
- Stabilizes the humeral head at the GH joint
- One of the rotator cuff muscles
- One of the three muscles that have attachment on the greater tubercle (Superior) (Infraspinatus, teres minor)
- Only one of the rotator cuff muscles that doesn't create rotation
- The distal (insertion) tendon mostly commonly injured due to its location between the acromion process and the greater tubercle. Can also be the location of impingement
- ADL reaching and lifting above the head
- Subacromial bursa protects supraspinatus

Infraspinatus = Below the spine of Scapula

Origin

Infraspinous Fossa

Insertion

Greater tubercle of the humerus (middle)

Action

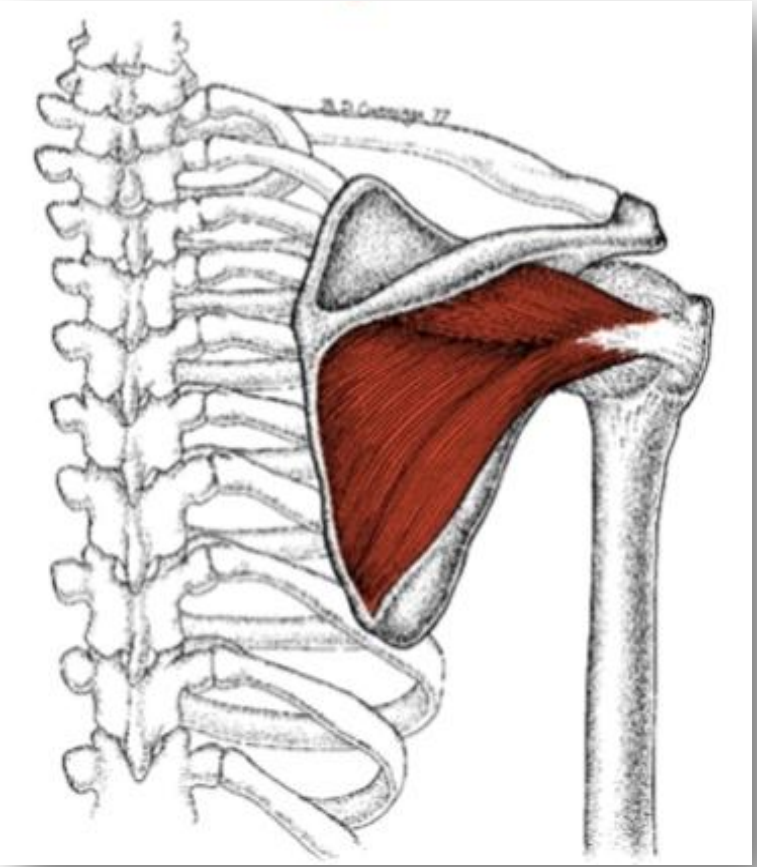
Lateral Rotation of Humerus

Nerve

Suprascapular nerve (C5, C6)

Blood

Suprascapular artery, Circumflex scapular artery



Fun Facts

- One of the Rotator cuff muscles
- Usually a layer of fascia over the infraspinatus muscle
- One of the three muscles to attach to the Greater Tubercle
- Distal tendon attaches to GH joint capsule
- May be weakened or paralyzed in upper brachial plexus injury
- Fibres often blend with teres minor
- ADL – Brushing hair back, back hand racket sports

Teres minor = Teres – Round, Minor - Smaller

Origin

Superior lateral border of the scapula

Insertion

Greater Tubercle of the humerus

Action

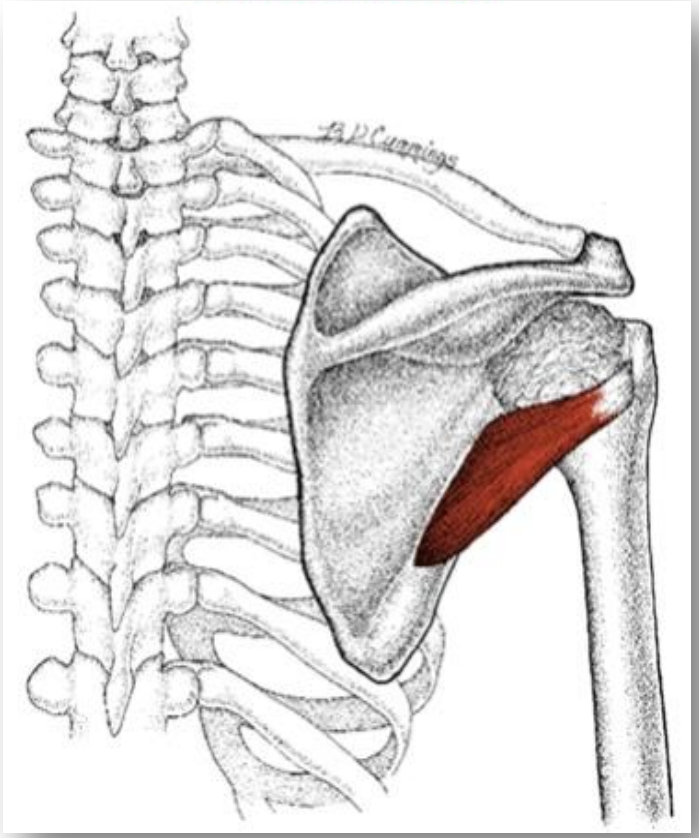
Lateral Rotation of Humerus

Nerve

Axillary nerve (C5, C6)

Blood

Scapular Circumflex artery, posterior humeral circumflex artery



Fun Facts

- One of the rotator cuff muscles
- One of three muscles that attaches to the greater tubercle
- Fibres can run with infraspinatus
- Teres minor and major wrap the humerus in opposite directions so create opposite actions
- Distal tendon adheres to the GH joint capsule
- ADL Brushing hair, back hand racket sports

Subscapularis – refers to subscapularis fossa

Origin

Subscapular Fossa

Insertion

Lesser Tubercle of the Humerus

Action

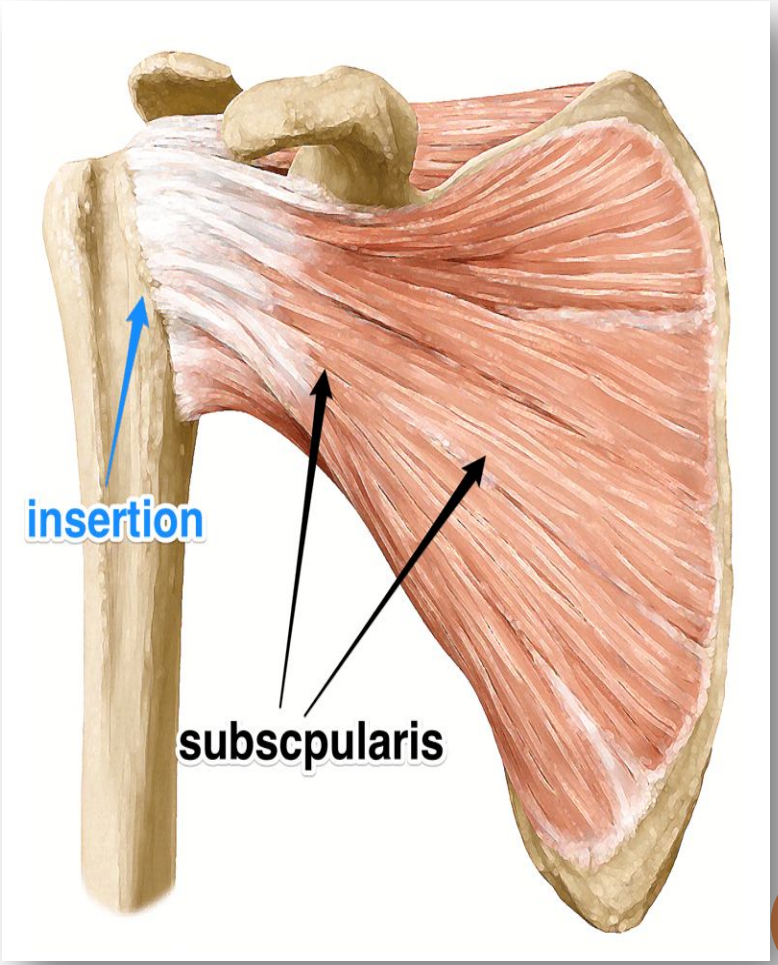
Medial Rotation at GH

Nerve

Upper and Lower subscapular nerves (C5, C6)

Blood

Circumflex scapular artery, Dorsal scapular artery, lateral thoracic artery



Fun Facts

- The Subscapularis muscle is one of the 4 Rotator Cuff muscles
- Together they are known as the known as the SITS muscles
  - Supraspinatus
  - Infraspinatus
  - Teres Minor
  - Subscapularis
- The subscapularis, Latissimus Dorsi and Teres Major create the posterior lateral fold of the axilla
- Subscapular bursa located between scapula and Subscapularis
- Tendon of the subscapularis attaches to GH joint capsule
- ADL reaching behind the back, throwing

Assignment

- Muscle actions worksheet
- Chapter 5 review questions
- Colouring sheets

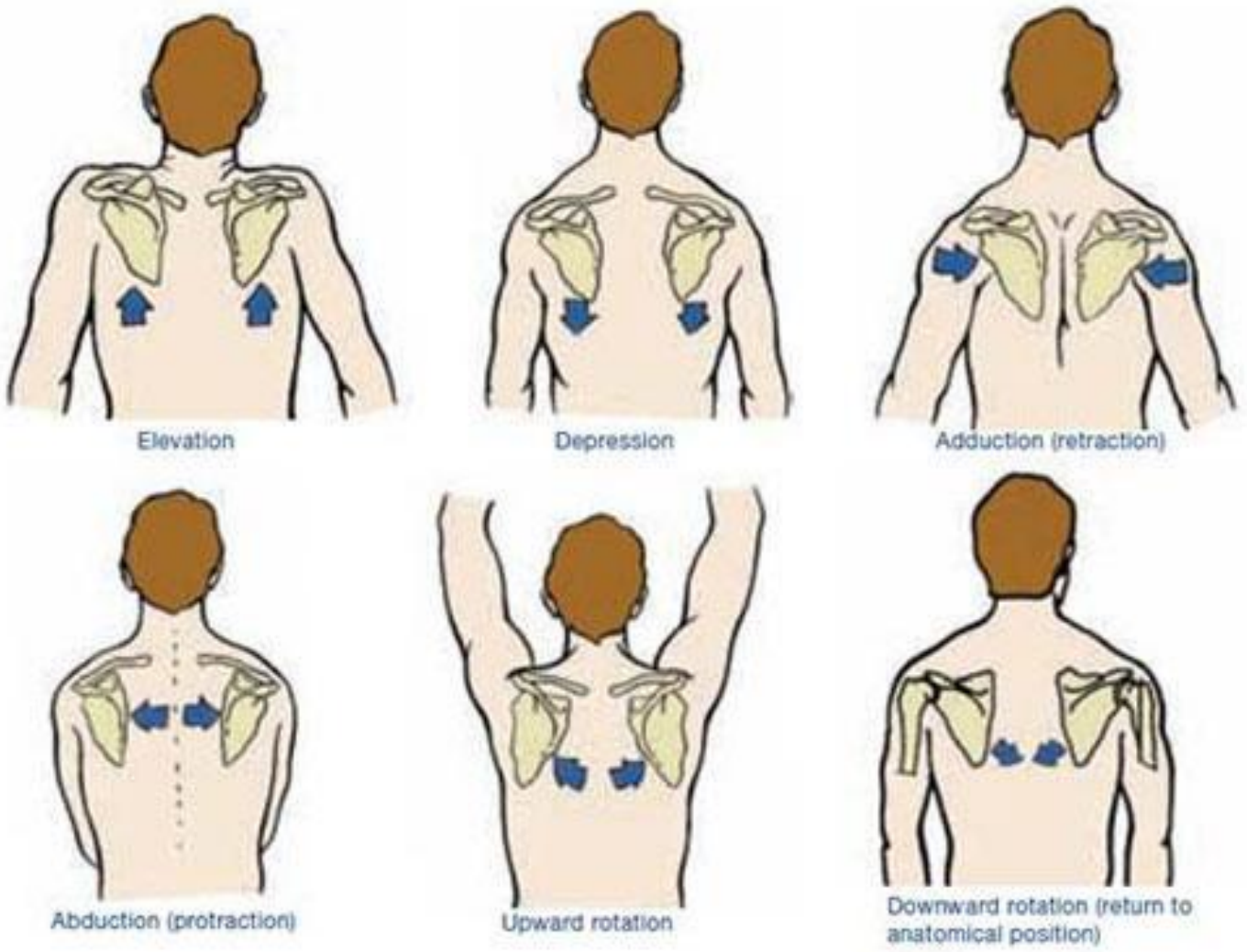
Muscles of the Shoulder Girdle Joints

Scapular movements

- Elevation – Superior movement of the scapula, such as shrugging or lifting a weight over the head
- Depression- Opposite of Elevation, Inferior movement of the scapula, as in pulling down on a rope attached to a pully
- Abduction (Protraction) – Movement of the scapula laterally and anteriorly as in doing a push up or punching
- Adduction (Retraction) – Movement of the scapula medially and posteriorly as in pulling the oars of a row boat
- Upward Rotation – movement of the inferior angle of the scapula laterally so the glenoid cavity is moved upward. This movement is required to move the humerus past the horizontal, as in doing a jumping jack
- Downward Rotation – movement of the inferior angle of the scapula medially so the glenoid cavity downward. This movement is seen with a gymnast on parallel bars supporting their weight on the hands

Scapular motions

Figure 3-34
Scapular movements



Trapezius (Trapezoid shape)

Origin

Upper – External Occipital Protuberance, Superior Nuchal line and Nuchal ligament and SP of C7

Middle – SP's T1 – T5

Lower – SP's of T6 –T12

Insertion

Lateral 1/3 of clavicle, acromion, Spine of scapula

Action

Upper – Elevation, Retraction & Upward Rotation of scapula,

Middle – Retraction of scapula

Lower – Depression of scapula

Reverse Muscle Action

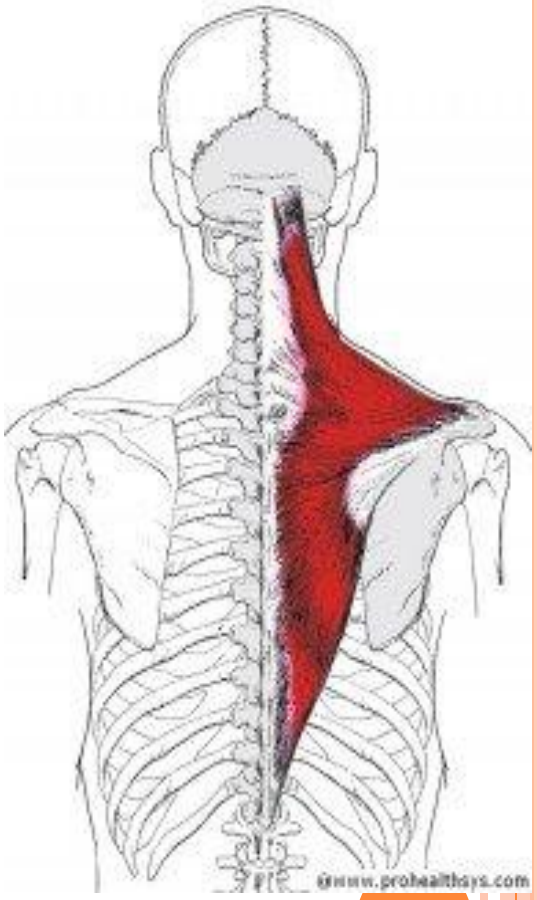
Lateral Flexion, extension, contralateral rotation of head at The neck

Nerve

Spinal Accessory nerve(CN XI), C3, C4

Blood

Transverse cervical Artery & Dorsal scapular Artery



Other info

- 3 parts upper, middle and lower
- Insertion same as Deltoid origin
- Head forward posture changes centre of gravity causing the upper traps to be in a constant isometric contraction which is why peoples uppers traps are often found to be tight
- Carrying a bag on a shoulder causes the shoulder to elevate causing scapular elevators to be tight (upper trapezius)
- Holding a phone between shoulder and neck causes tightness to the upper trap
- Rounded shoulder can be contributed to by weak middle traps
- A tension headache can be caused by the greater occipital nerve being compressed as it passes through the upper trap

Rhomboid Major – rhombos – Geometric shape, Oid - resemblence

Origin

SP's T2 – T5

Insertion

Medial border of the Scapula (Scapular spine to inferior angle)

Action

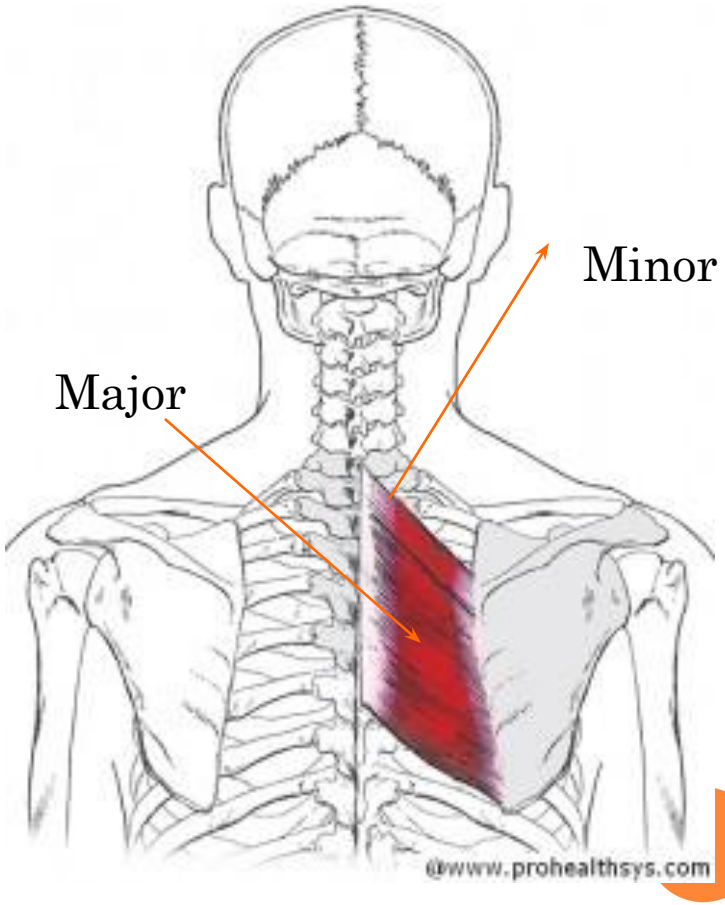
Retraction, elevation & downward rotation of scapula

Nerve

Dorsal Scapular Nerve (C4-C5)

Blood

Dorsal scapular artery



Rhomboid Minor

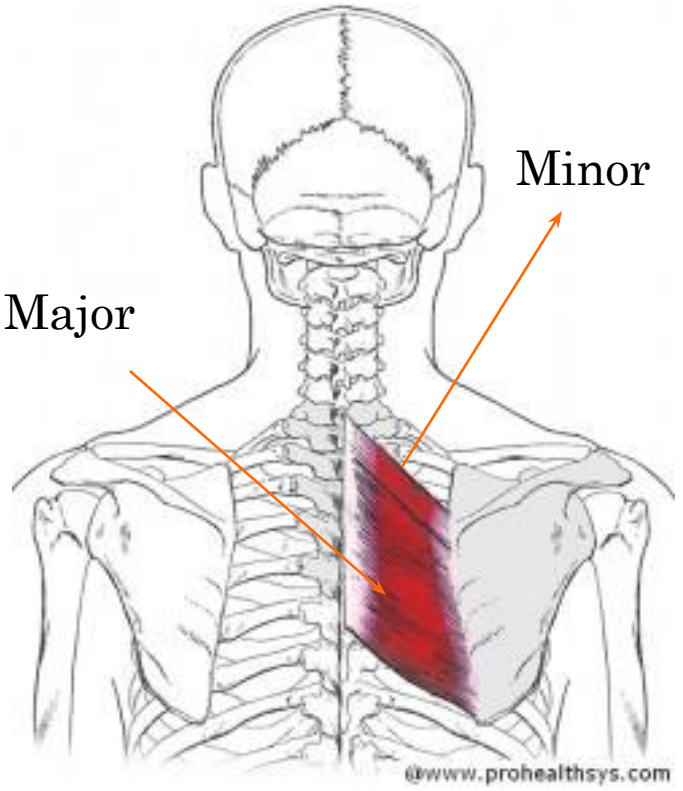
Origin
- SP's C7 and T1

Insertion
- Medial border of scapula (root of spine),

Action Retraction, Elevation and Downward Rotation of scapula

Nerve
- Dorsal Scapular Nerve (C4-C5)

Blood
- Dorsal scapular artery



Other Information

- Separate muscles but often grouped together because of their similar attachments and line of pull
- The two muscles often blend together on occasion there is a space between them
- The inferior border easier to palpate than superior
- Weak rhomboids can lead to rounded shoulder
- Christmas tree muscle based on shape
- Stabilizes the scapula for arm movements
- ADL – Rowing, pulling or lifting objects toward the body, opening a door towards yourself

Levator Scapulae – levator = Lifter

Origin
- TP's of C1 – C4

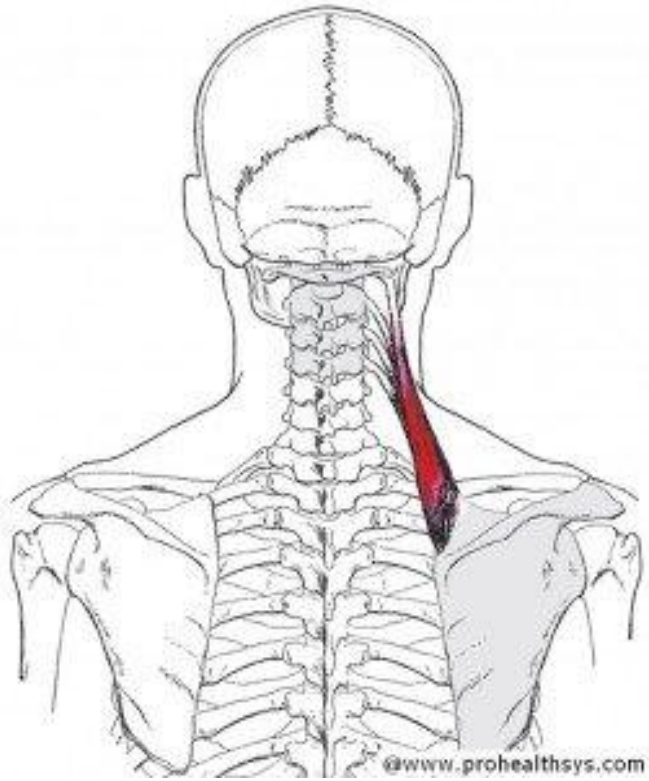
Insertion
- Medial Border of Scapula (root of spine to superior angle)

Action
- Elevation of Scapula

RMA
- Extension (Bilateral), Lateral flexion of the neck

Nerve
- Dorsal Scapular Nerve

Blood
- The Dorsal Scapular Artery



Other Information

- At mid point the muscle twists – can be mistaken for a trigger point
- The transverse process on C1 can be palpated posterior to the posterior ramus of the mandible, directly inferior to the ear anterior to the mastoid process
- Spastic Contracture of this muscle can lead to paresthesia in dermatomes of the cervical plexus
- ADL – lifting objects, cradling a phone on one shoulder
- Common area for people to 'hold' stress

Serratus anterior – Serratus – a notching,

Origin

Ribs 1 - 9 Anterolateral surface

Insertion

Anterior medial border of scapula

Action

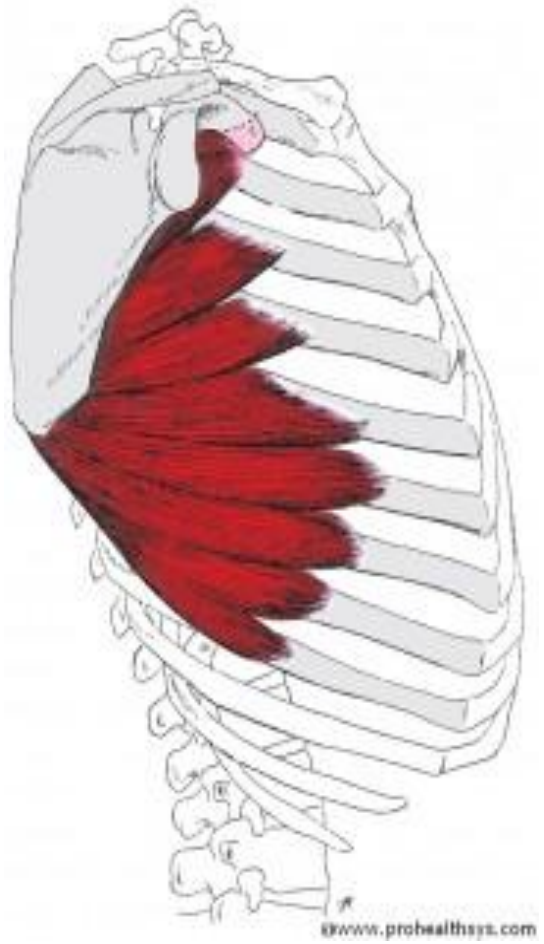
Protraction, upward rotation of the scapula

Nerve

Long Thoracic Nerve (C5, C6, C7)

Blood

Lateral thoracic artery, Superior Thoracic artery, dorsal scapular artery



Other Information

- May attach to ribs 1 – 8 or 2 – 9
- Upward rotation of the scapula is required for abduction and flexion of the humerus (Scapulohumeral Rhythm – 2 to 1 degrees of motion between humerus and scapula)
- Winging of the scapula can occur with damage to the long thoracic nerve or weakness of the serratus
- When the serratus is functioning correctly it will stabilize the scapula so the GH can function
- ADL – pushing away an object, push up, punching

Pectoralis Minor – Pectoralis – refers to the chest, Minor - Smaller

Origin

Ribs 3 – 5

Insertion

Coracoid Process medial aspect

Action

depression, downward rotation, & protraction of scapula

RMA

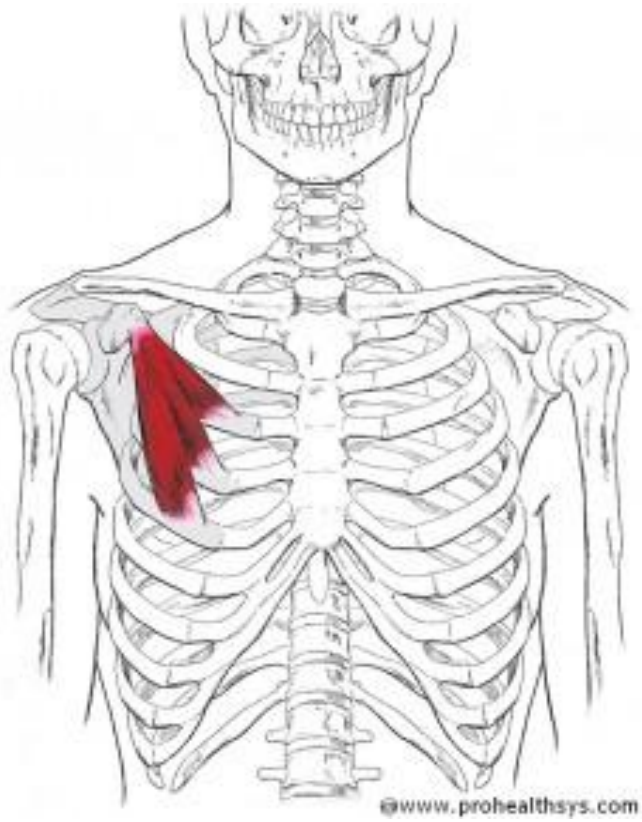
elevates ribs 3-5

Nerve

Medial and Lateral Pectoral nerve (C7, C8)

Blood Supply

Thoracoacromial Trunk



Other Info

- Contracted Pec Minor can cause thoracic outlet syndrome – most specifically (pectoralis minor syndrome)
- May contribute to rounded shoulder posture
- Considered an accessory muscle of respiration most specifically during forced inhalation

Subclavius, Sub = under, Clavius = Key

Origin

1st Rib (Junction of costocartilage)

Insertion

Middle 1/3 of clavicle (inferior surface)

Action

Depression of clavicle

RMA

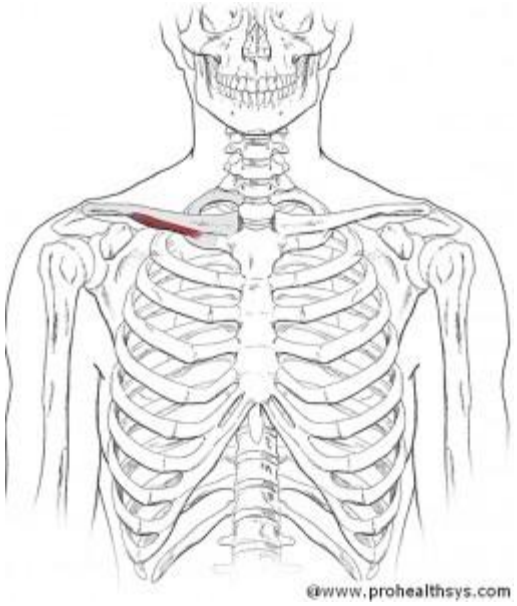
Elevation of first rib

Nerve

Nerve to subclavius

Blood Supply

clavicular branch of thoracoacromial artery



Videos -

Blood Supply

https://youtu.be/2ufqUOpm8O0

Scapular muscle movement

https://youtu.be/8wMCUdu_4Tk

Shoulder muscle movement

https://youtu.be/iXadGuuBhJI

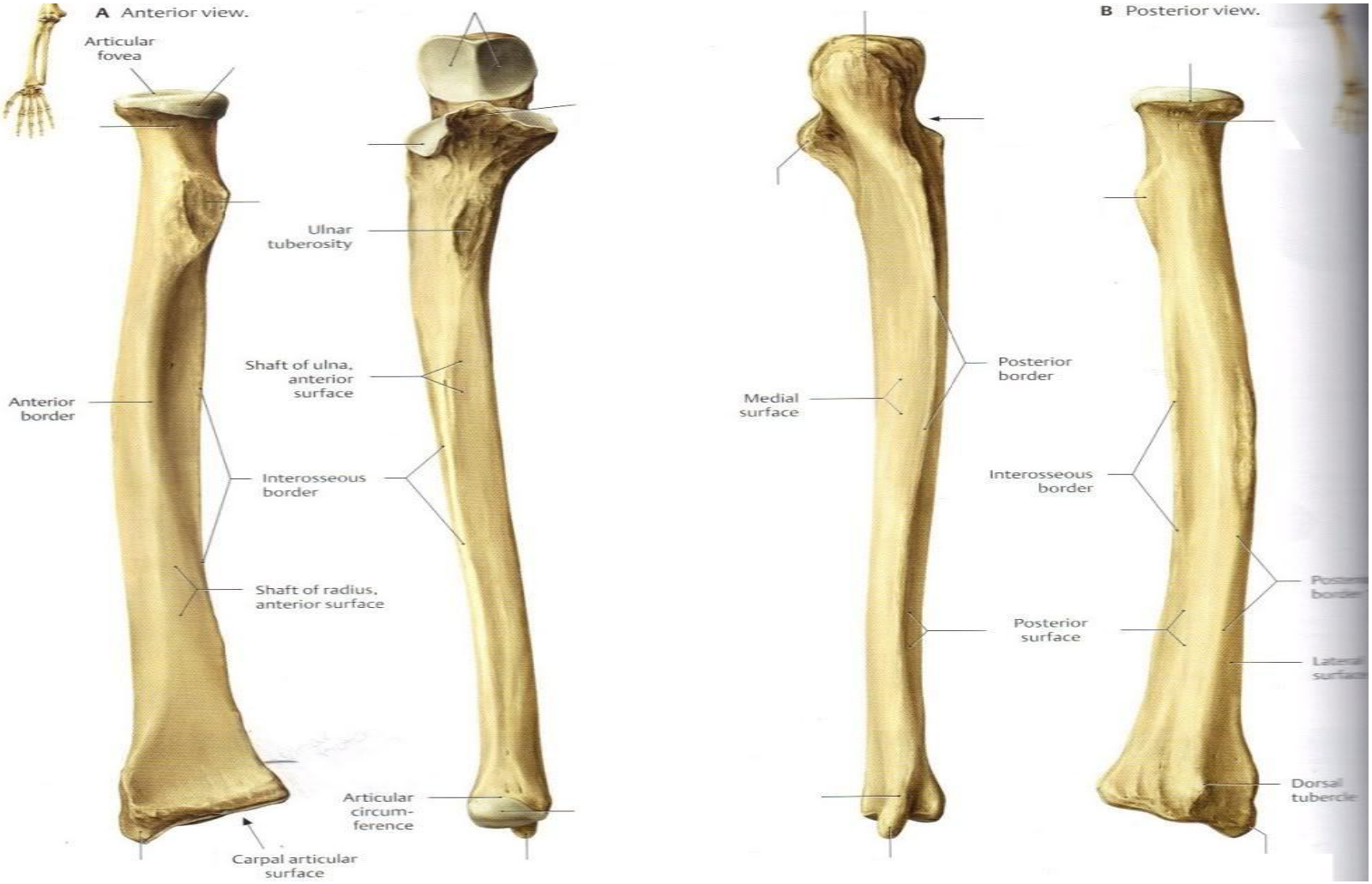
The Elbow – Bone Review

- The Ulna – In anatomical position the Ulna is the more medial of the two forearm bones. It is on the same side as your pinky to help remember
  - Bony Landmarks
    - Olecranon Process
    - Trochlear Notch
    - Coronoid Process
    - Ulnar Tuberosity
    - Radial Notch
    - Head of Ulna
    - Styloid Process

Bone Review - Radius

- In Anatomical position the Radius is the more lateral bone, the same side as your thumb
  - Bony Landmarks
    - Head
    - Neck
    - Radial Tuberosity
    - Articular surface
    - Styloid process

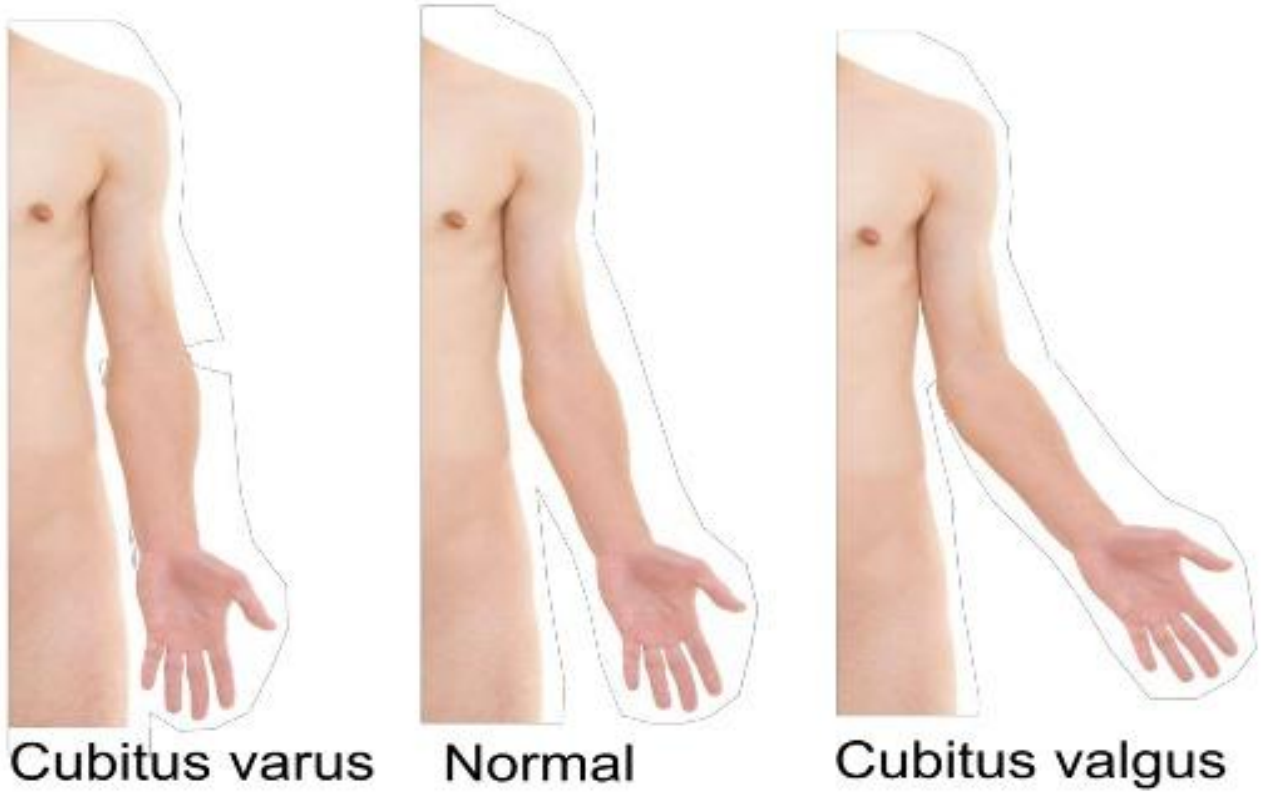
The Radius and Ulna



The carrying Angle

- Is a normal angle in the upper limb at the elbow joint which is approx 5 – 15 degrees. It permits the forearm to clear the hips in swinging motions during walking and is important in carrying objects
- If the angle is greater than 15 degrees the condition is know as cubital Valgum
- If the angle is less than 5 degrees the condintion is known as cubital Varus

Abnormality of carrying Angle



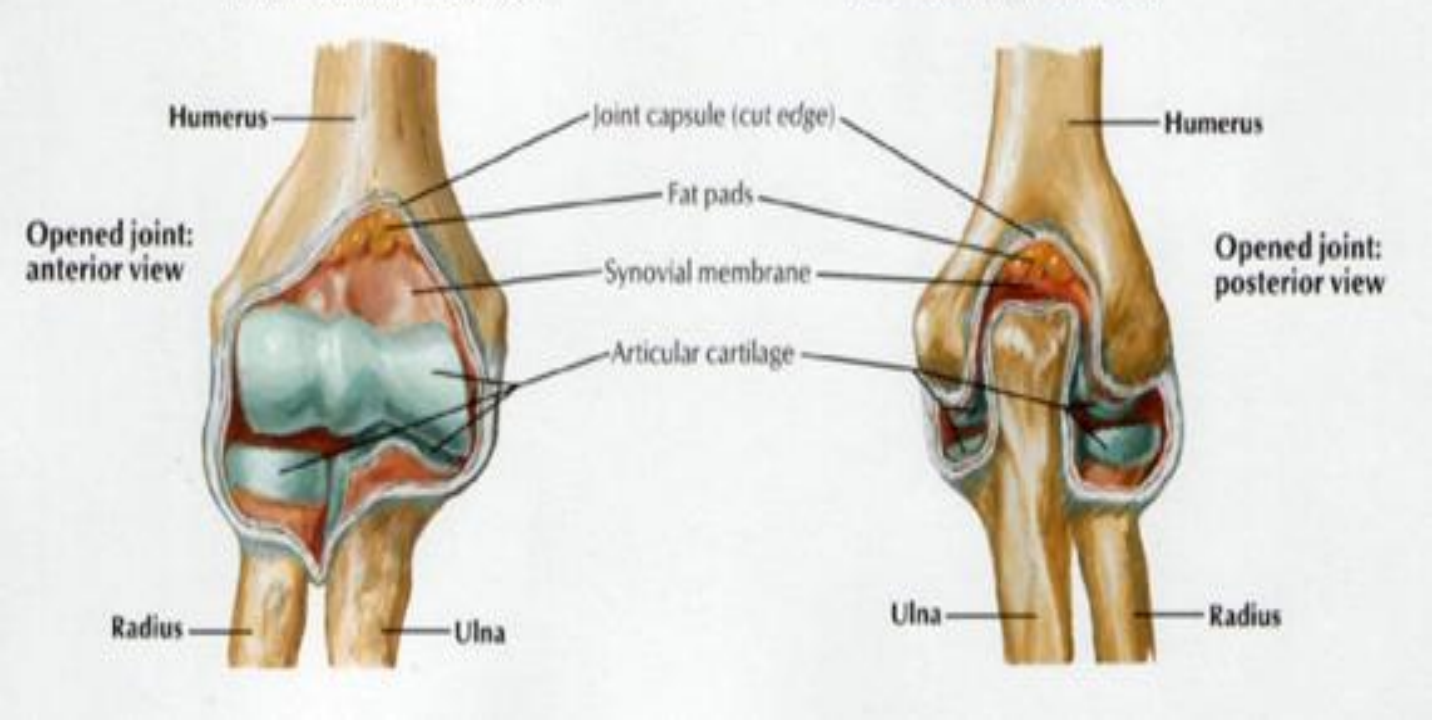
Any variation of the angle that is more than 15° is known as *cubitus valgus and* less than 5° are called *cubitus varus*.

The Elbow Joint

- Found at the distal humerus, and proximal Radius and Ulna
- The Elbow Joint is a Synovial Joint that contains three articulations
  - Humeroulnar
  - Humeroradial
  - Proximal Radioulnar
- Actions include flexion and extension, Supination and Pronation

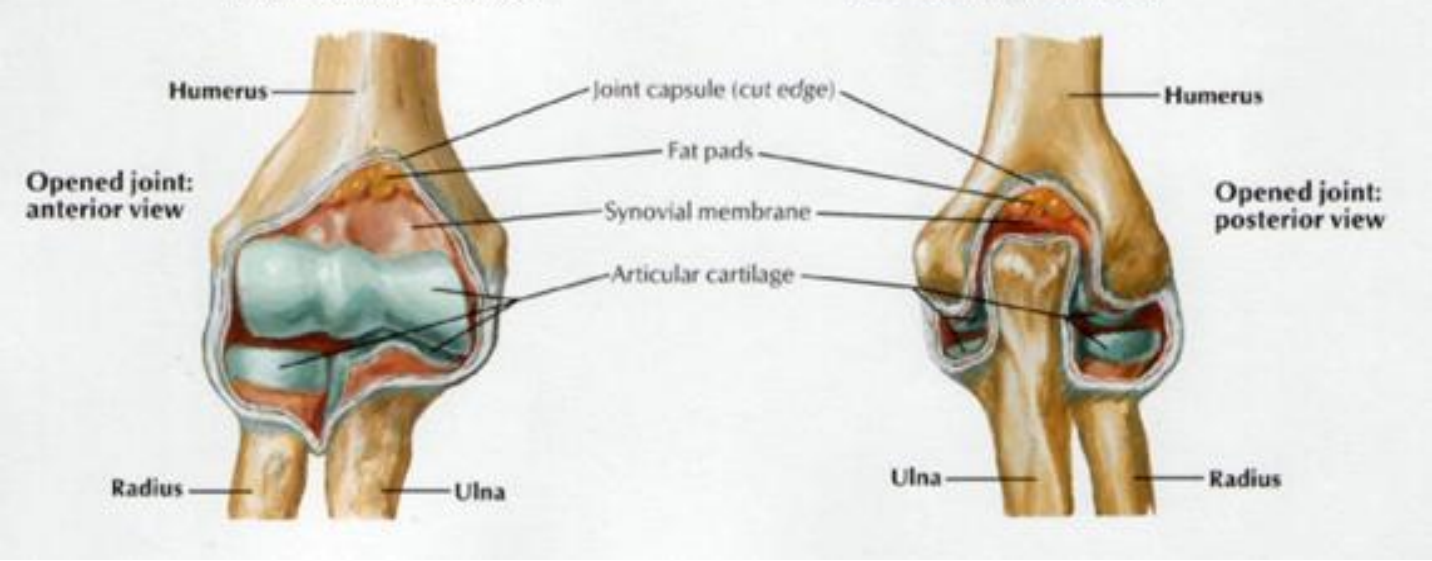
Humeroulnar

- Between olecranon and the trochlea of the humerus
- Primary location for flexion and extension



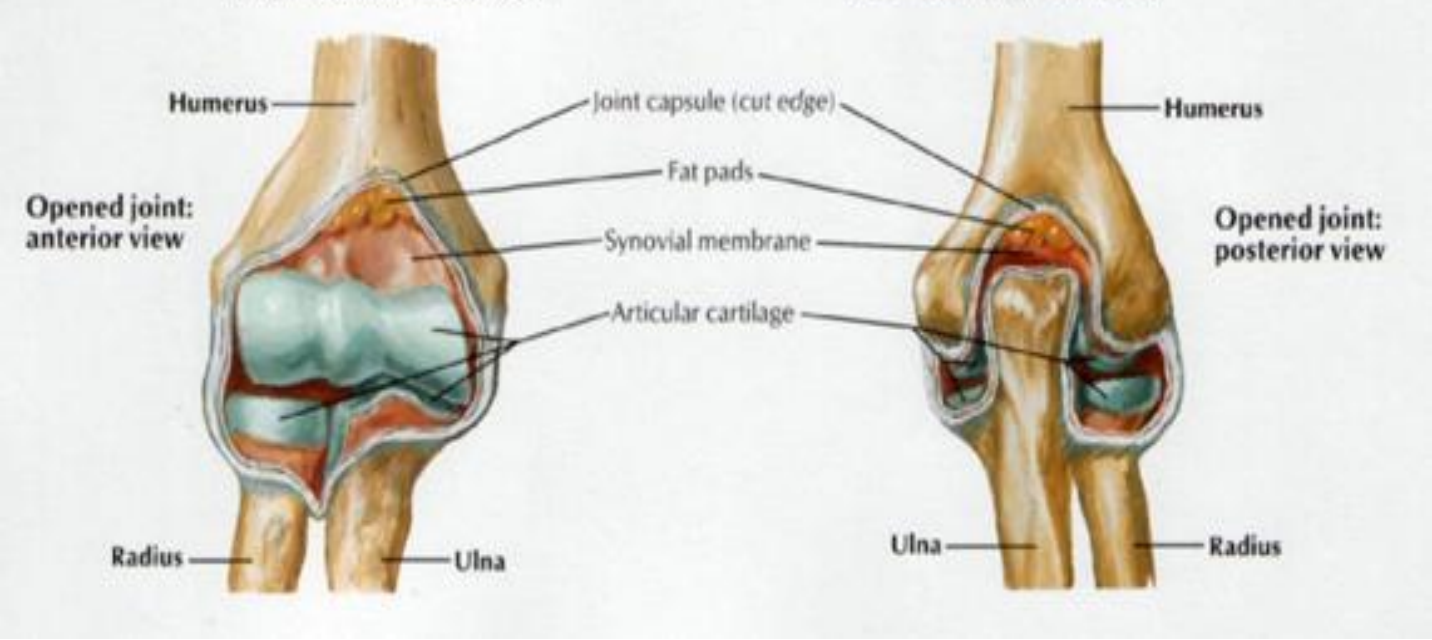
Humeroradial

- Articulation b/w head of the Radius and the capitulum of the humerus
- The Radius spins on the capitulum to allow for the motions of pronation and supination, not directly involved in flexion and extension



PROXIMAL RADIOULNAR

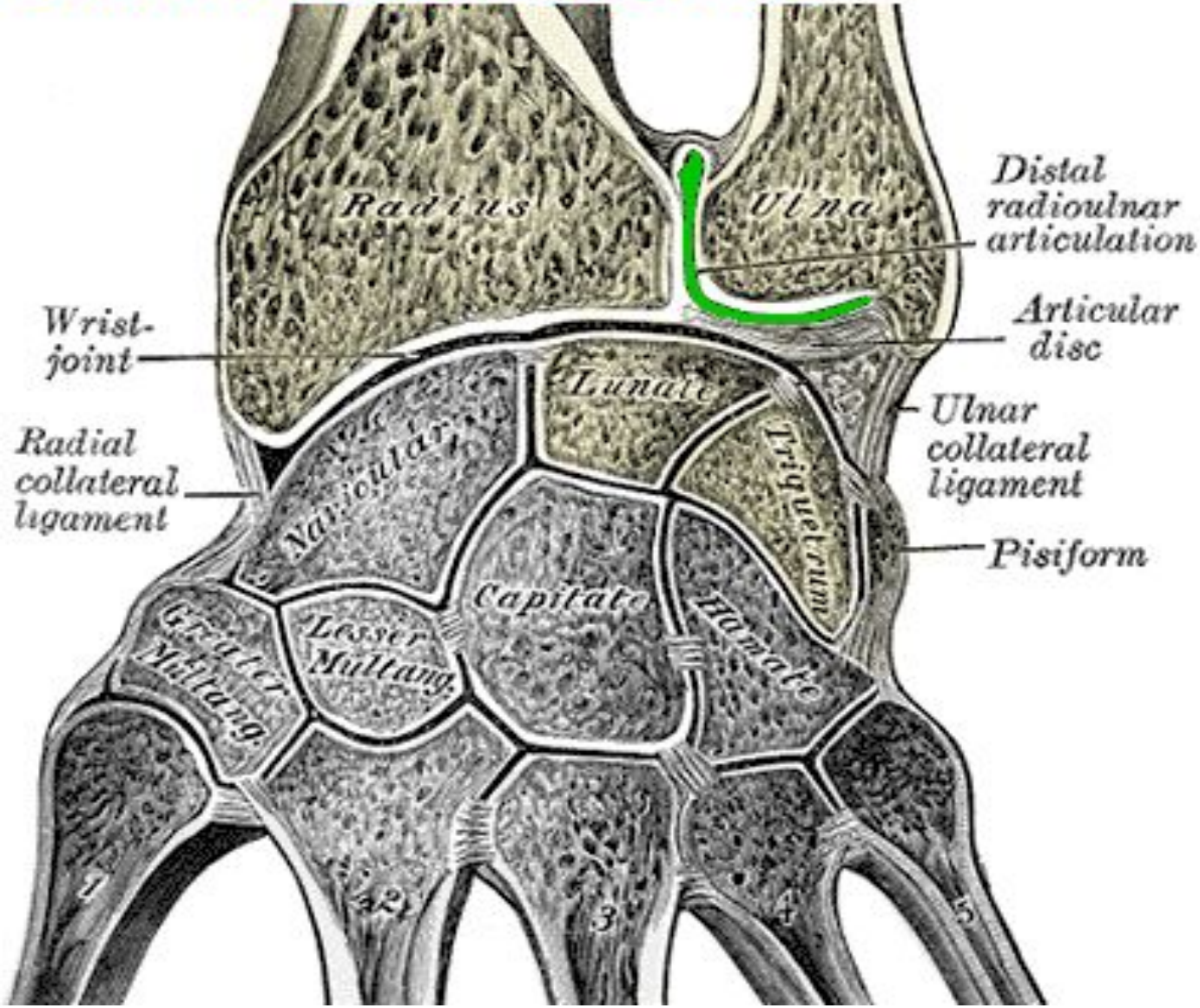
- Articulation of the Radial head into the Radial notch in the Ulna
- Accomodates the rotating portion – Pronation and supination



Distal Radioulnar Articulation

- Located at distal ends of the Radius and Ulna
- Accomodates rotational movement of radius over ulna
- Round head of the ulna fits into Ulna notch of the Radius
- synovial joint
- An articular disc connects the styloid process of the ulna to the radius

Distal Radioulnar Joint



Ligaments of the Elbow Joint

- Radial Collateral Ligament
  - Strong triangular ligament
  - Lateral epicondyle of the humerus to the annular ligament of the radius and the radial notch of the ulna
- Ulnar Collateral Ligament
  - Thick triangular ligament
  - extends from Medial epicondyle of the Humerus to the coronoid process and the olecranon of the ulna.
- Collateral Ligaments limit side to side movement
- Annular Ligament
  - encircles the head of the radius holds the head of the radius in the radial notch of the Ulna
- Interosseous Membrane
  - Located the length of the shafts of the radius and Ulna
  - Keeps the bones together
  - attachment point for some muscles of the forearm

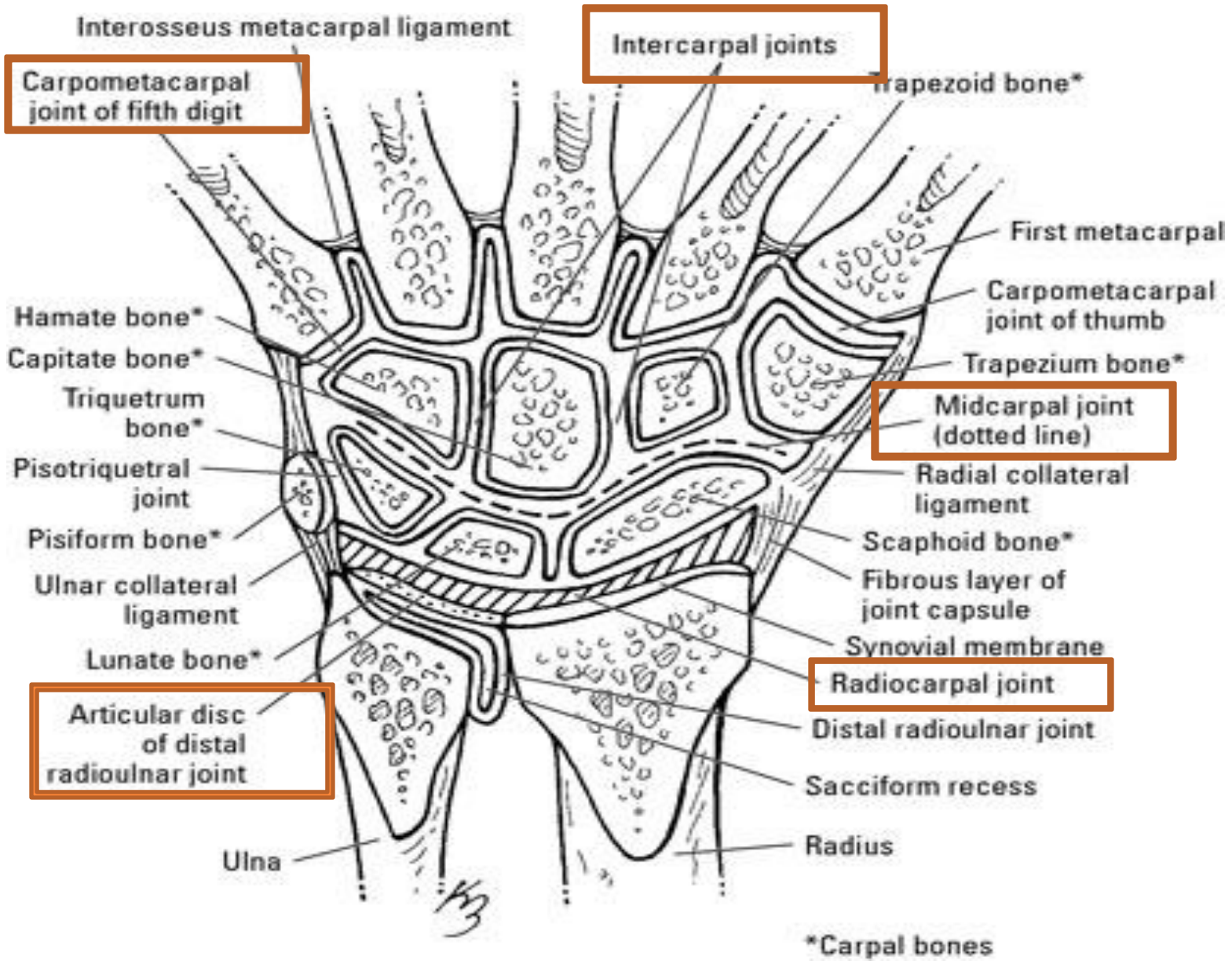
The Wrist – Carpal Bones

- Organized into two rows, lateral to medial the proximal row is named as follows
  - Scaphoid, Lunate, Triquetral (Triquetrum), Pisiform
- The more distal row, Lateral to medial
  - Trapezium, Trapezoid, capitate, hamate

"Susan likes to Party, Just try to call her"

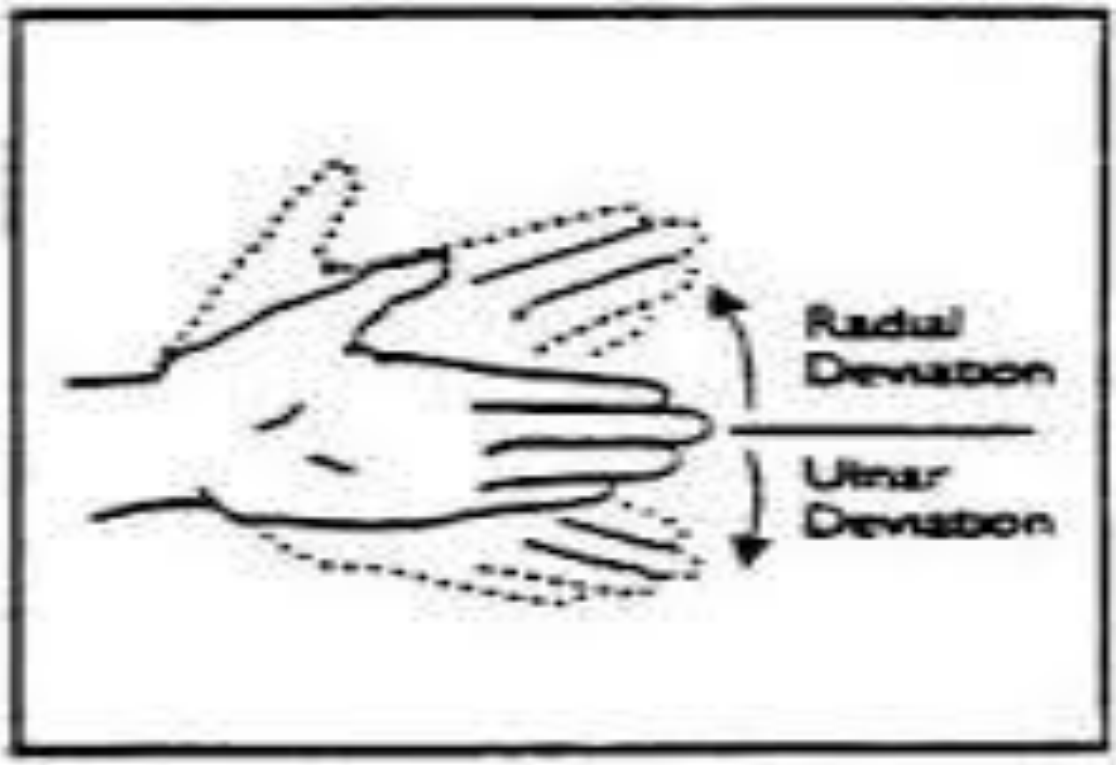
The wrist - Joints

- The wrist is made up of three main Joints
  - Radiocarpal joint
  - Carpometacarpal joints
  - Intercarpal Joints
- These Joints create the motions of the wrist


Interosseus metacarpal ligament
Carpometacarpal joint of fifth digit
Intercarpal joints
Trapezoid bone*
First metacarpal
Carpometacarpal joint of thumb
Trapezium bone*
Midcarpal joint (dotted line)
Radial collateral ligament
Scaphoid bone*
Fibrous layer of joint capsule
Synovial membrane
Radiocarpal joint
Distal radioulnar joint
Sacciform recess
Radius
Hamate bone*
Capitate bone*
Triquetrum bone*
Pisotriquetral joint
Pisiform bone*
Ulnar collateral ligament
Lunate bone*
Articular disc of distal radioulnar joint
Ulna
*Carpal bones

Radiocarpal Joint

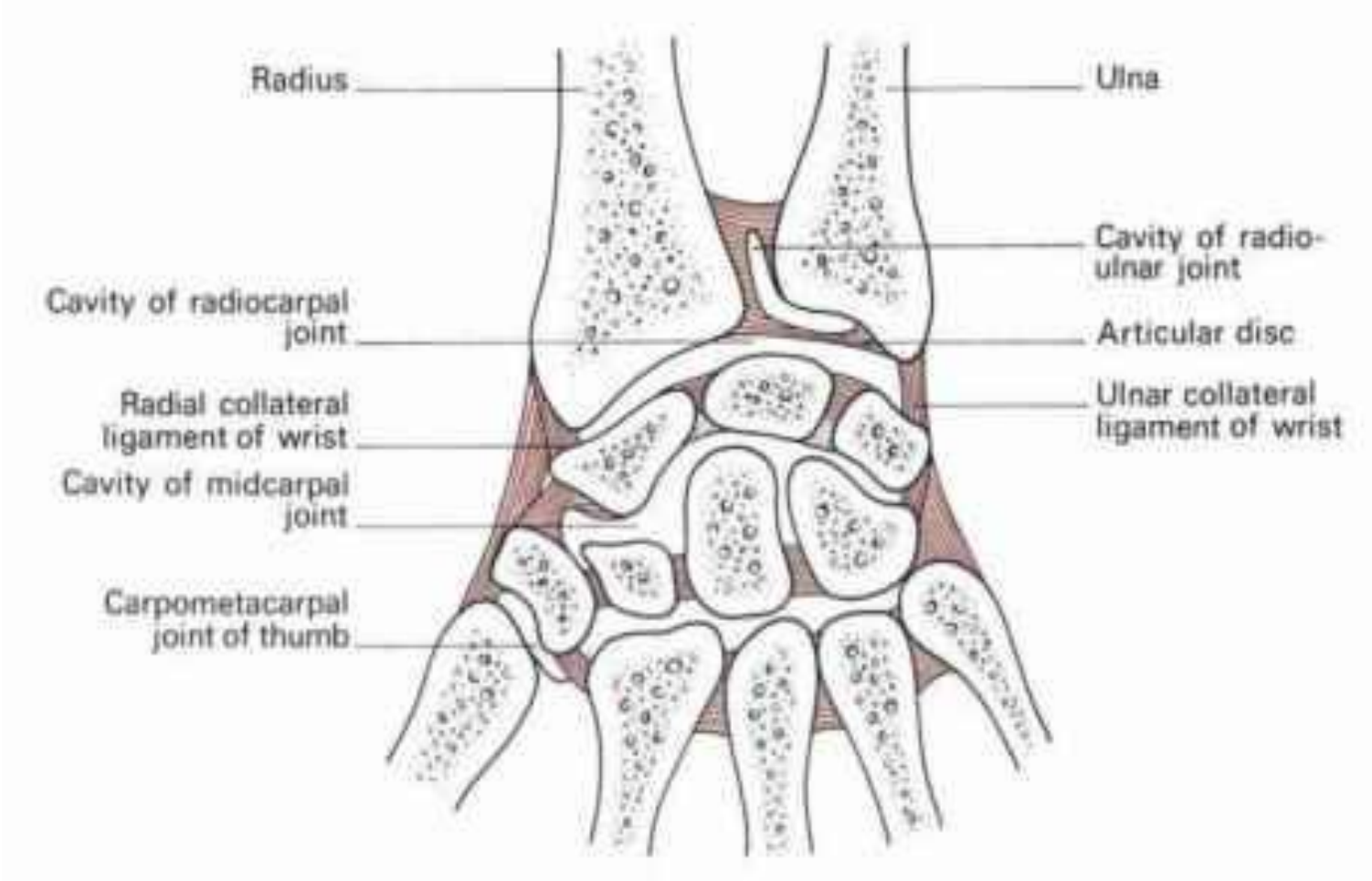
- Joint between the Radius and the Proximal row of carpals
- Primary motions are Radial and Ulnar Deviation



Intercarpal Articulations

- Every individual carpal bone has an articulation with those around it together they are called the intercarpal articulations:
  - Carpal bones are enclosed in a synovial joint capsule
  - Numerous ligaments the connect carpals to each other, radial and ulnar collateral ligaments arise from the joint capsule
- Midcarpal joint
  - located between the proximal and distal row of carpal bones
  - Primarily responsible for wrist flexion and extension

Intercarpal Joint



Carpometacarpal joints

- These joints are found between the distal row of the carpal bones and the proximal row of metacarpals (at their bases)
- Carpometacarpals 2-5 are gliding joints and allow minimal motion
- Carpometacarpal 1 is a specialized joint called a saddle joint
- As a group the metacarpals are positioned in a bit of a curve which allows metacarpal 5 to interact more easily with metacarpal 1
- Carpometacarpal is an articulation between Trapezium and Metacarpal 1. The saddle shape allows movement in multiple planes similarily to a ball and socket joint

Metacarpal Joints

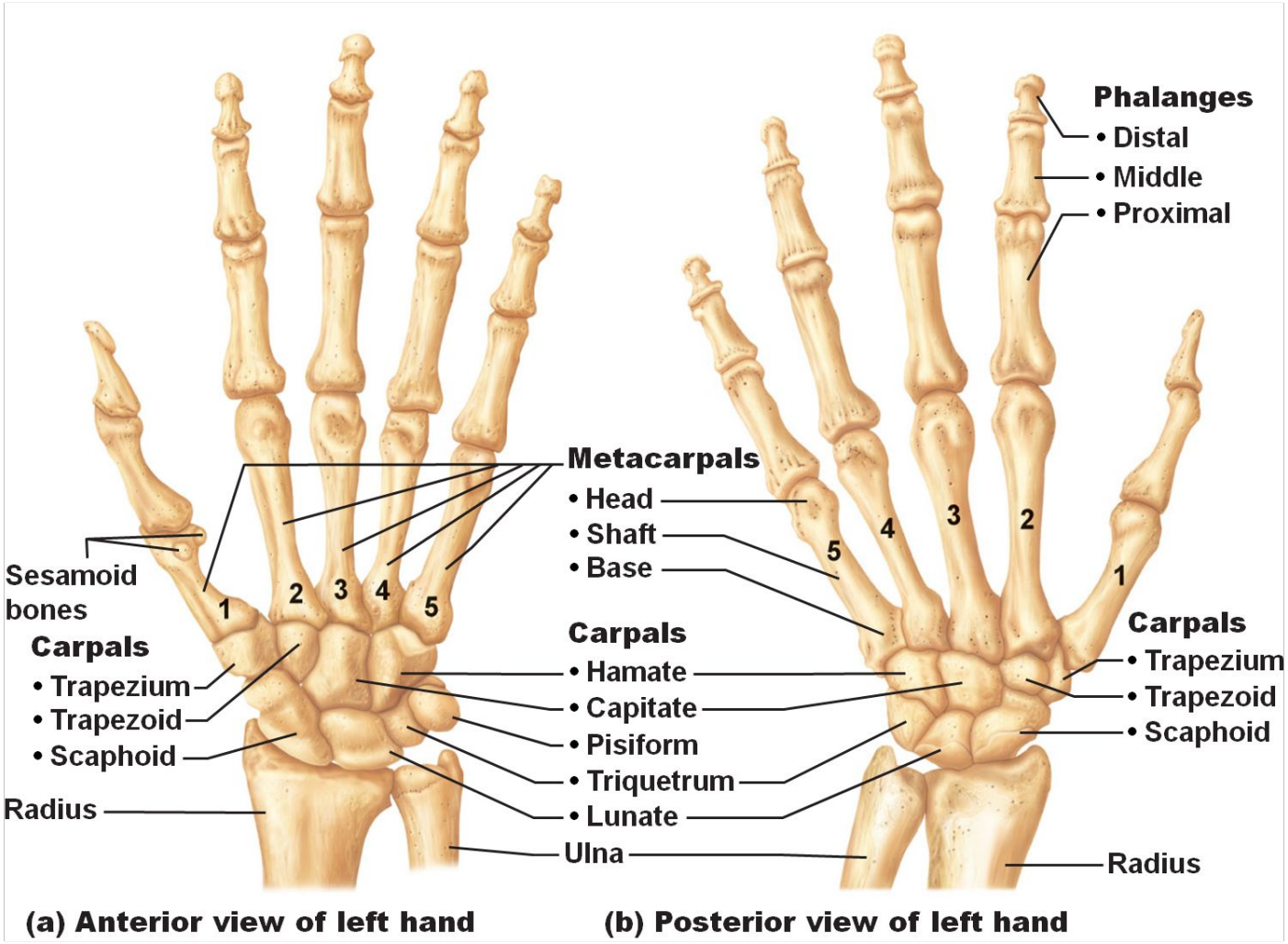
The hand

- Five digits on every hand
  - Digit 1 = Thumb
  - Digit 2 = Index Finger
  - Digit 3 = Middle Finger
  - Digit 4 = Ring Finger
  - Digit 5 = Baby Finger
- Five metacarpal bones of the hand articulate with the digits
- Digits are made up of phalanges
  - Digits 2 – 5 have three phalanges
  - Digit 1 has two phalanges

Hand Continued ..

- Phalanges have a
  - Head
  - Shaft
  - Base
- Phalanges are name for their location
  - Proximal
  - Middle
  - Distal

The HAND


Phalanges
• Distal
• Middle
• Proximal
Metacarpals
• Head
• Shaft
• Base
Sesamoid bones
1
2
3
4
5
Carpals
• Trapezium
• Trapezoid
• Scaphoid
Radius
Carpals
• Hamate
• Capitate
• Pisiform
• Triquetrum
• Lunate
Ulna
Carpals
• Trapezium
• Trapezoid
• Scaphoid
Radius
(a) Anterior view of left hand
(b) Posterior view of left hand

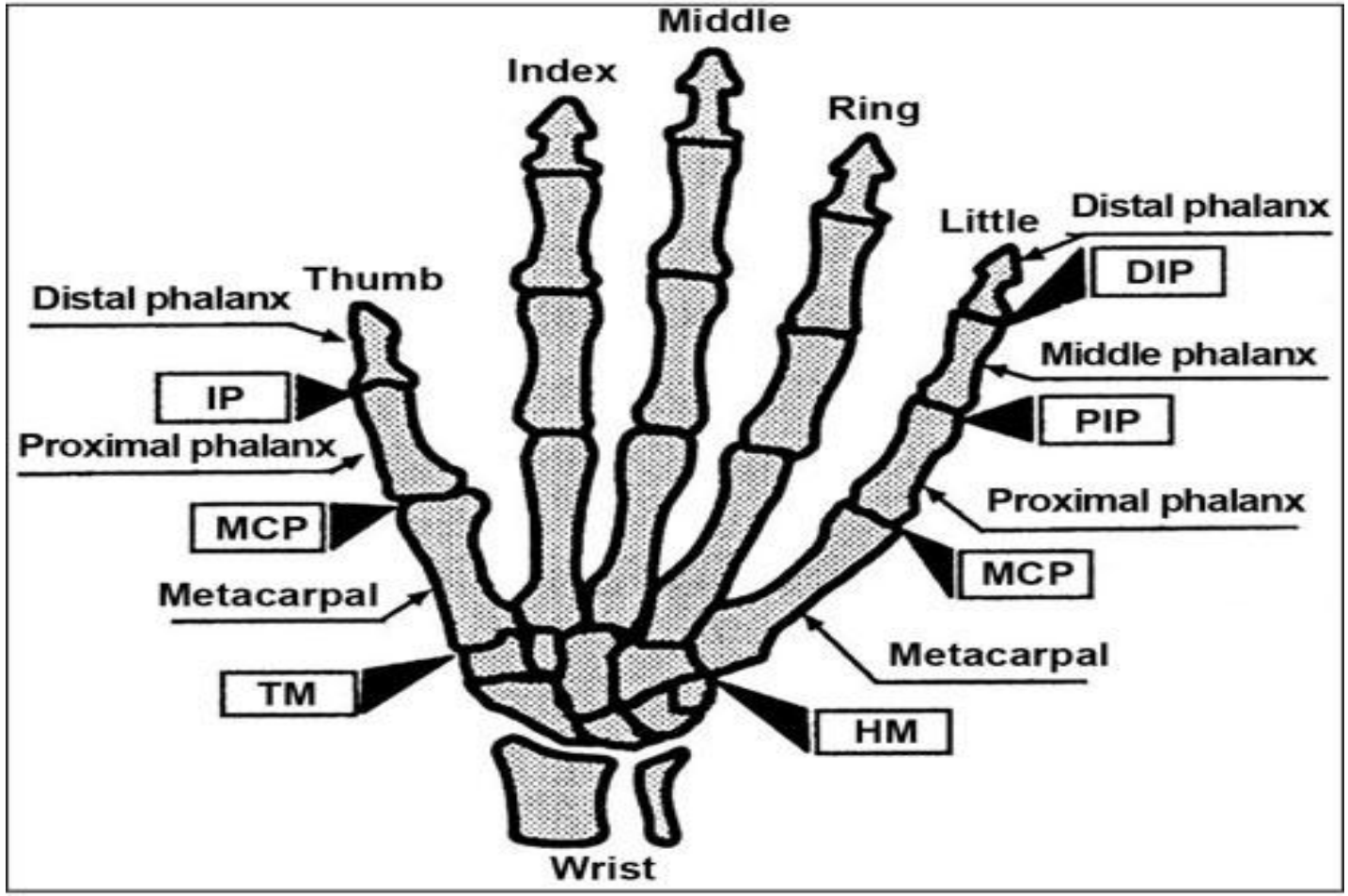
Metacarpals

- 5 Metacarpals
  - 1 – 5
  - Metacarpal 1 makes up the first part of the thumb
- Metacarpals also have a
  - Base
  - Shaft
  - Head
- The bases of the metacarpals articulate with carpals
- The head articulates with proximal Phalanges of each digit
- Form the palmer surface of the hand

Interphalangeal Joints

- Proximal Interphalangeal Joint (PIP)
  - Articulation between Head of proximal Phalange and base of middle Phalange
- Distal Interphalangeal Joint (DIP)
  - Articulation Between the head of the middle phalange and the base of the Distal Phalange

Interphalangeal Joints



Muscles of the Elbow and the Radioulnar joints

Biceps Brachii (2 heads, over the arm)

Origin – Long head – Supraglenoid Tubercle of scapula

Short Head – Coracoid Process

Insertion – Radial Tuberosity

Action – Flexion & Supination of Elbow, Flexion of GH

Nerve – Musculocutaneous Nerve

Blood

Muscular Branches of Brachial artery, Anterior circumflex humeral Artery

Brachialis – (refers to the arm)

Origin – Distal ½ of the anterior shaft of the humerus

Insertion – Ulnar tuberosity & coronoid process of the ulna

Action – Flexes forearm at the Elbow

Nerve – Musculocutaneous

Blood –

Muscular branches of the Brachial Artery

Brachioradialis (attaches to arm and to radius)

Origin – Lateral supracondylar ridge of humerus

Insertion – Styloid process of radius (lateral side)

Action – Flexion of elbow, pronation of forearm when supinated and supination of forearm when pronated

Nerve – Radial Nerve

Blood – Brachial artery, radial artery

Triceps (Three Heads) Brachii (of the arm)

Origin – Long head – Infraglenoid Tubercle of the Scapula

Lateral Head – Posterior shaft of humerus proximal 1/3

Medial Head – posterior shaft of humerus distal 2/3

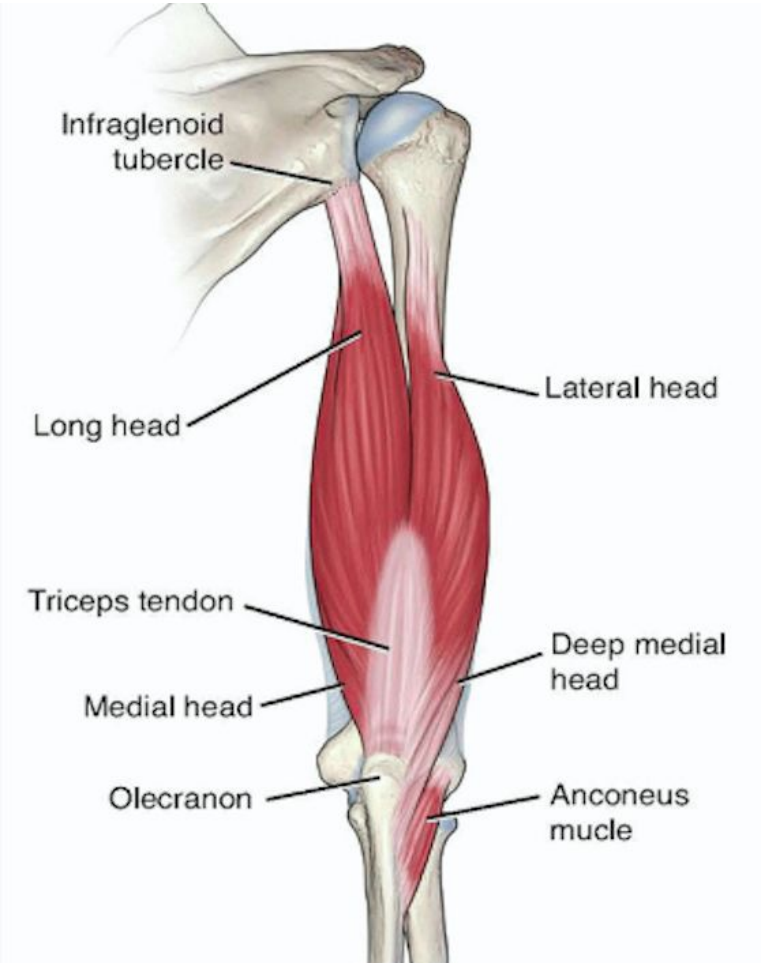
Insertion – Olecranon Process

Action – Extends the Forearm at the elbow joint

Extends the arm at GH Joint (long Head)

Nerve – Radial Nerve

Blood – Deep Brachial Artery, Circumflex scapular artery



Anconeus (Greek for Elbow)

Origin – Lateral Epicondyle of the humerus

Insertion - Posterior proximal Ulna

Action – Extension of Elbow joint

Nerve – Radial Nerve

Blood – Deep Brachial Artery

Pronator (Muscle That Pronates) Teres (Round)

Origin – Humeral Head - Medial Epicondyle of humerus (Common Flexor Tendon)

Ulnar Head – Coronoid process of the Ulna

Insertion – Lateral radius middle 1/3

Action – Pronation & Flexion of elbow

Nerve – Median Nerve

Artery – Ulnar & Radial Arteries

Pronator Quadratus (squared)

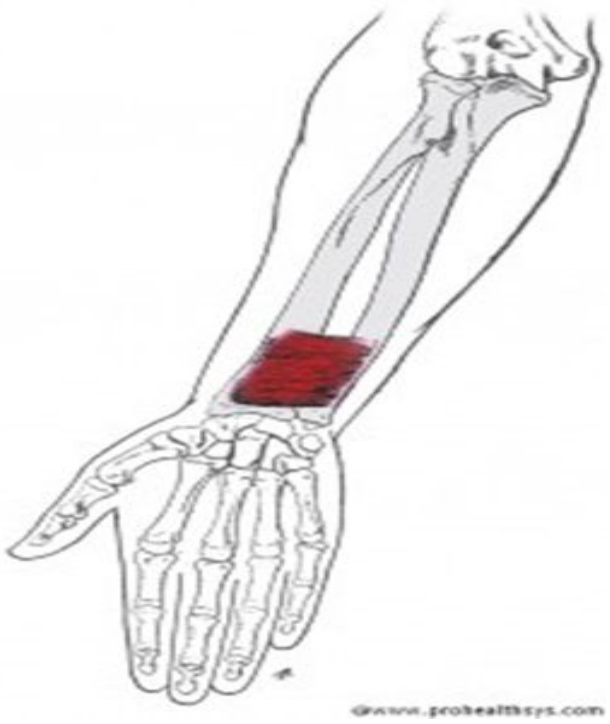
Origin – Anterior distal ¼ of the Ulna

Insertion – Anterior distal ¼ of the Radius

Action – Pronates the forearm

Nerve – Median Nerve

Blood – Anterior interosseous Artery



Supinator

Origin – Lateral epicondyle of the humerus and proximal ulna

Insertion – Proximal radius (posterior, lateral and anterior)

Action – Supination of the forearm

Nerve – Radial Nerve

Blood – Radial artery, Interosseus recurrent and posterior interosseus arteries

Videos

- Muscles

Elbow joint. Muscles and nerves

Muscles of the arm - Origin, Insertion & Innervation - Human Anatomy | Kenhub

Muscles of the wrist joint

Flexor Carpi Radialis, Carpi – Wrist, Radialis – Radial side of the wrist

Origin – Medial Epicondyle (via common flexor tendon

Insertion – Base of 2nd and 3rd Metacarpals (Anterior side)

Action – Flexion of wrist, Radial Deviation of wrist, Flexion and pronation of forearm (weak)

Nerve – median nerve

Blood – Ulnar and Radial Arteries

Palmaris Longus, Palmaris = refers to palm

Origin - Medial Epicondyle (via common flexor tendon)

Insertion – Palmar aponeurosis & flexor retinaculum

Action – Flexion of the wrist

Nerve – Median Nerve (C7, C8)

Blood – Ulnar Artery

Flexor Carpi Ulnaris

Origin –

Humeral head- Medial epicondyle (common flexor tendon)

Ulnar Head – Medial aspect of olecranon & proximal 2/3 of medial ulna

Insertion – Pisiform & Hamate, base of 5th metacarpal

Action – Flexion of wrist, Ulnar deviation, elbow flexion (weak)

Nerve – Ulnar nerve (C7, C8)

Blood- Ulnar Artery

Extensor Carpi Radialis Longus

Origin – Lower Lateral supracondylar ridge (below brachioradialis)

Insertion – Base of the 2nd Metacarpal

Action – Extension of wrist, Radial deviation, flexion and supination of Elbow (Weak Action)

Nerve – Radial Nerve

Blood – Radial recurrent & brachial arteries

Extensor Carpi Radialis Brevis

Origin – Lateral Epicondyle of the humerus (Common extensor tendon)

Insertion – Base of 3rd Metacarpal

Action – Extension of Wrist, Radial deviation of wrist, flexion of elbow joint (Weak)

Nerve – Radial (C7, C8)

Blood – Radial recurrent artery

Extensor Carpi Ulnaris

Origin – Lateral Epicondyle (via common extensor tendon)

Insertion – Base of 5th metacarpal (posterior side)

Action – Ulnar deviation, extension of wrist, extension of elbow

Nerve – Radial (C6, C7, C8)

Blood – Posterior Interosseous artery

Extrinsic Muscles of the Finger Joints

Flexor Digitorum Superficialis

Origin –

Humero-ulnar head – Medial epicondyle via common flexor tendon, coronoid process of ulna, & ulnar collateral ligament

Radial Head – Oblique line of radius along upper anterior border.

Insertion – Base of middle Phalanges of fingers 2-5, (tendons split at insertion)

Action - flexion of fingers 2-5 (pip, mcp), flex wrist and hand, flexion of elbow (weak action)

Nerve - Median nerve

Blood – Ulnar and Radial Arteries

Flexor Digitorum Profundus

Origin – Anterior & medial surface of the Ulna (proximal ½) & Interosseous Membrane

Insertion – Base of distal phalanges of fingers 2 – 5

Action – Flexion of Fingers (at DIP, PIP, MCP joints) Flexion of wrist

Nerve – Median nerve (c8, T1) radial half of muscle

Ulnar nerve – (C8,T1) ulnar half of muscle

Blood – Ulnar and radial arteries, anterior interosseous artery

Flexor Pollicis longus – Pollicis = Thumb, Longus = Long

Origin – Radius (middle anterior surface) & interosseous membrane

Insertion – Base of distal phalanx of the thumb (anterior aspect)

Action – Flexion of thumb (CMC, MCP and IP Joints), flexion of wrist

Nerve – Median Nerve

Blood – Radial artery and anterior interosseous artery

Extensor Digitorum

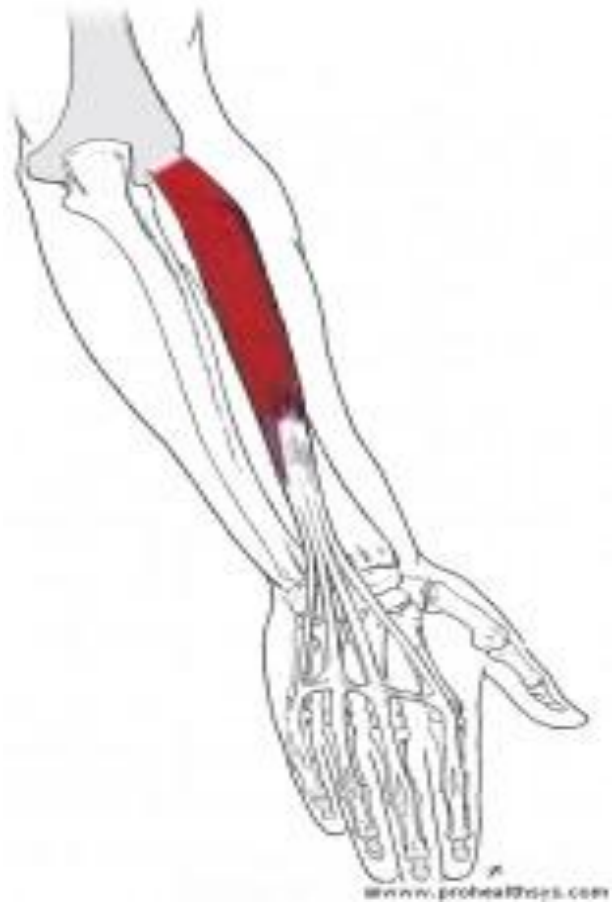
Origin – Lateral Epicondyle of humerus (via common Extensor tendon)

Insertion – Phalanges 2 – 5

Action – extension of digits 2-5 (MCP, PIP & DIP), Extension of wrist, extension of elbow (weak action)

Nerve – Radial Nerve (C7, C8)

Blood – Ulnar artery



Extensor Digiti Minimi

Origin – Lateral epicondyle of humerus (via common extensor tendon)

Insertion – Middle & Distal phalanges of 5th digit

Action – Extension of little finger (5th digit), extension of wrist (lesser action)

Nerve – Radial (C6,C7, C8)

Blood – Posterior Interosseous Artery

Deep Distal group of 4

Thumb Motions

https://www.youtube.com/watch?v=P4WPk5mUr8I

Abductor Pollicis Longus

Origin – Posterior surface of the ulna, radius & interosseous membrane

Insertion - Base of first metacarpal lateral side

Action – Abduction & extension of thumb at cmc

Nerve – Radial nerve (C7, C8)

Blood – Posterior Interosseous Artery

Extensor Pollicis Brevis

Origin – Posterior distal 1/3 surfaces of radius & interosseous membrane

Insertion – Base of proximal phalanx of thumb

Action – Extension of thumb at CMC & MCP, Abduction of thumb at CMC

Nerve – Radial

Blood – Posterior interosseous artery

Extensor Indicis

Origin – Posterior distal 1/3 of Ulna & Interosseous membrane

Insertion – Base of middle and distal phalanx of index finger (via extensor expansion & extensor digitorum muscle tendon)

Action – Extension of index finger (MCP, DIP & PIP), extension of wrist (weak), adduction of index finger (weak)

Nerve – Radial nerve

Blood – Posterior Interosseous

Extensor Pollicis Longus

Origin – Posterior middle 1/3 of Ulna & Interosseous membrane

Insertion – Distal phalanx of thumb

Action - Extension of thumb (CMC, MCP, IP Joints)

Nerve – Radial nerve

Blood – Posterior Interosseous artery

Videos

Animated forearm Forearm Muscles Anatomy - Anterior Compartment (Flexors) Part 1

Animated Posterior Forearm Muscles Anatomy - Posterior Compartment (Extensors) Part 1

Gross anatomy anterior The Anterior compartment of the Forearm

Gross anatomy posterior Human cadaver extensor muscles (arm)

The Hand https://youtu.be/zyl6eoU-3Rg

Muscles of the Hand

Thenar Muscles

Abductor Pollicis Brevis

Origin - Tubercles of Scaphoid & Trapezium and flexor Retinaculum

Insertion – Base of proximal Phalanx of the thumb (lateral side)

Action – Abduction of the thumb

Nerve – Median Nerve

Blood – Branches of the Radial Artery

Flexor Pollicis Brevis

Origin – Trapezium and Flexor Retinaculum

Insertion – Base of proximal phalanx of the thumb (lateral side)

Action – Flexion of thumb

Nerve – Median nerve

Blood – Branches of the Radial Artery

Opponens Pollicis

Origin – Trapezium & Flexor Retinaculum

Insertion – Metacarpal of the thumb (anterolateral side)

Action – Opposition of thumb

Nerve – Median Nerve

Blood – Branches of the Radial Artery

Hypothenar muscles

Abductor Digiti Minimi

Origin – Pisiform & tendon of Flexor Carpi Ulnaris

Insertion – Base of proximal phalanx of the little finger (ulnar side)

Action – Abduction of the little finger

Nerve- Ulnar nerve

Blood – Ulnar Artery

Flexor Digiti Minimi

Origin – Flexor Retinaculum & hook of hamate

Insertion – Base of proximal phalanx of little finger (ulnar side)

Action – Flexion of little finger

Nerve – Ulnar nerve

Blood – Ulnar Artery

Opponens digiti Minimi

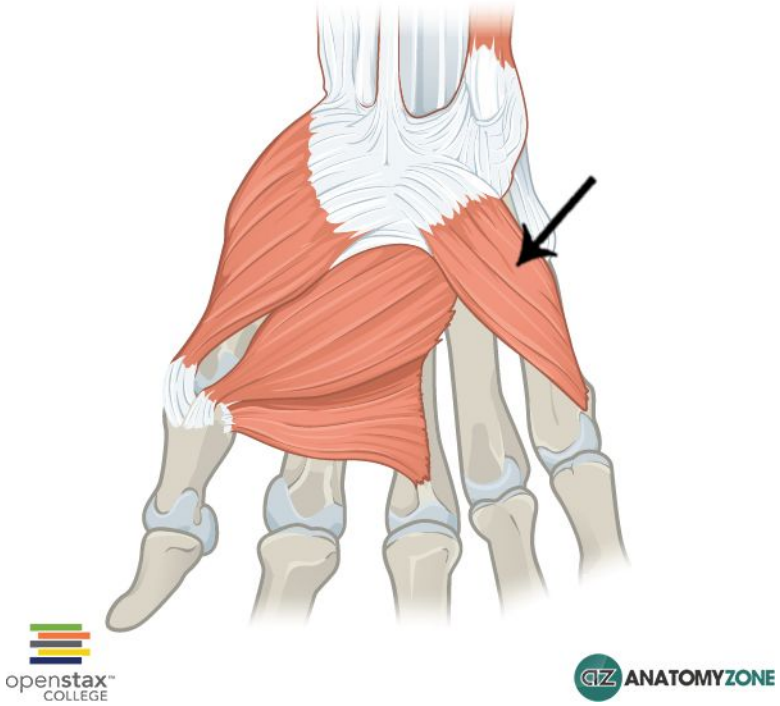
Origin – Flexor Retinaculum and hook of hamate

Insertion – 5th metacarpal (anterior medial surface)

Action – opposition of little finger

Nerve – Ulnar Nerve

Blood – Ulnar Artery



Central Hand Muscles

Palmaris Brevis

Origin – Palmar aponeurosis (medial side)

Insertion – Skin on medial side of the hand

Action – Tenses skin on medial side of hand

Nerve – Ulnar Nerve

Blood – branches of the radial and ulnar arteries

Adductor Pollicis

Origin – Oblique head- capitate and bases of 2nd and 3rd metacarpals.

Transverse head – Palmer side of third metacarpal

Insertion – Base of proximal phalanx of the thumb (medial side)

Action – Adduction of the thumb

Nerve – Ulnar Nerve

Blood – Branches of the radial artery

Lumbrical Manus x 4 (not on thumb) lumbrical (earthworm) manus (hand)

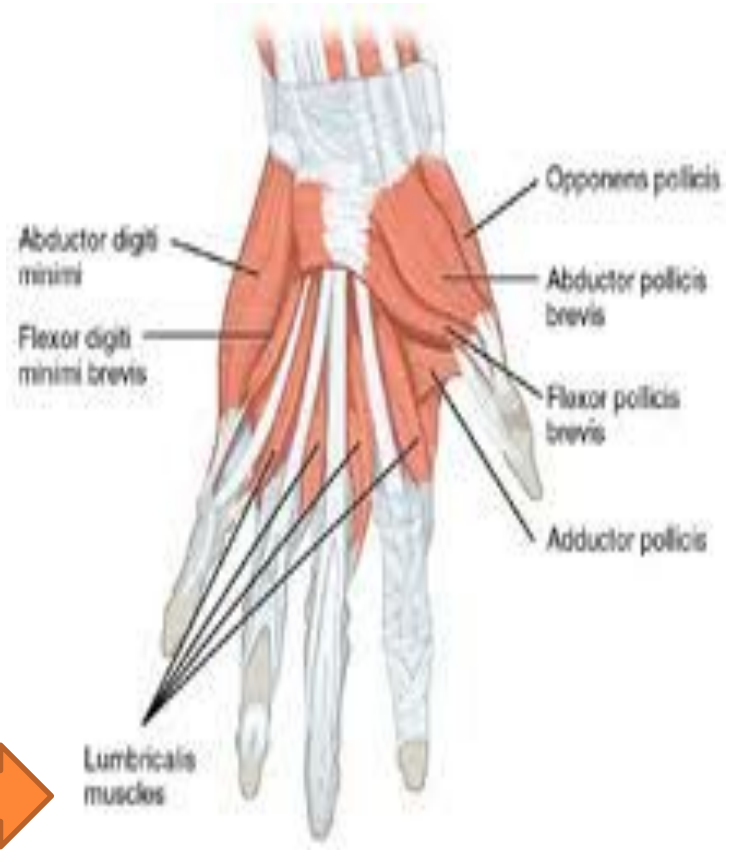
Origin – Tendons of Flexor Digitorum Profundus (lateral side)

Insertion – Extensor expansion (lateral side)

Action – Flexion of MCP joints and EXTENSION OF IP JOINTS

Nerve – Median and ulnar nerve

Blood – Branches of radial and ulnar arteries



Palmer interossei x 3 (not on middle finger/thumb)

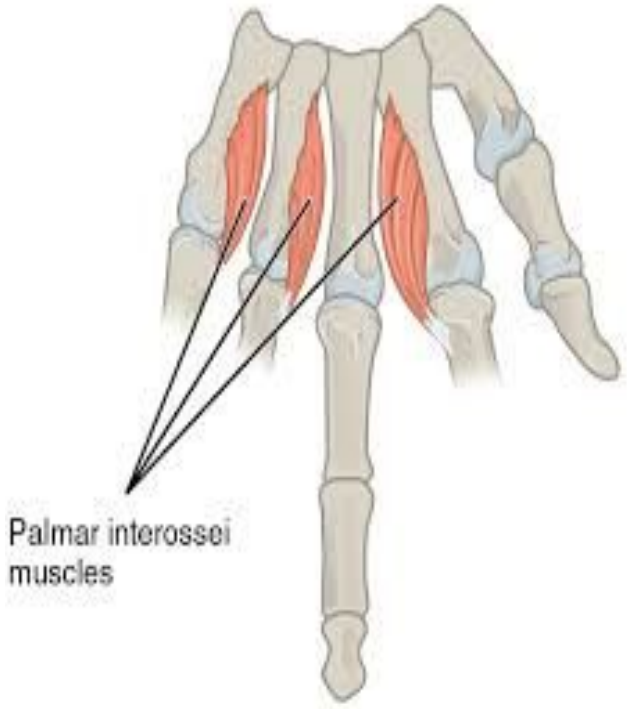
Origin – Metacarpals 2,4 & 5

Insertion – Base of proximal phalanx of digit 2,4 & 5 & extensor hood of same digits

Action- Adduction of fingers, Flexion of fingers at MCP while IP joints are extended

Nerve – ulnar nerve

Blood – Branches of Radial and Ulnar Arteries



Lumbricals and palmar interossei

Dorsal Interossei x 4

Origin – Between each Metacarpal

Insertion – Base of proximal Phalanx of fingers 2-4 & extensor hood of same digits

Action – Abduction of fingers (hint DAB, lolol)

Nerve – Ulnar nerve

Blood – Branches of radial and ulnar arteries