Flexor compartment of forearm

Deep fascia (antebrachial fascia)

Contents:

- Muscles :

superficial group of muscles : - pronator teres

- flexor carpi radialis
- palmaris longus
- flexor carpi ulnaris
- flexor digitorum superficialis (Intermediate muscle)

Muscles :

- Deep group of muscles :
  - flexor digitorum profundus
  - flexor pollicis longus
  - pronator quadratus

Vessels :

- Arteries : radial artery
  ulnar artery

- Nerves : median & ulnar nerve

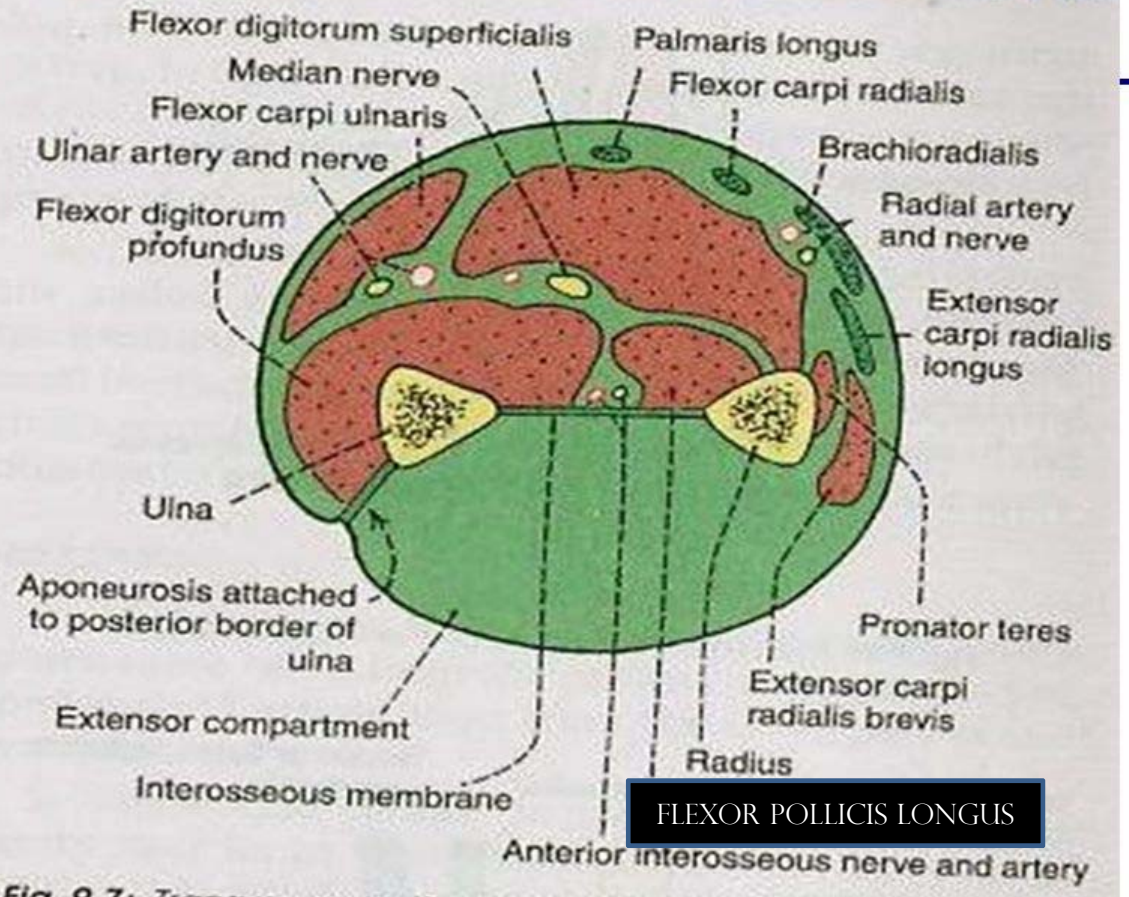


Fig. 9.7: Transverse section passing through the middle of the forearm showing arrangement of structures in the flexor (anterior) compartment.

medial

lateral

muscles

- Superficial layer
- Intermediate layer
- Deep layer

Superficial layer

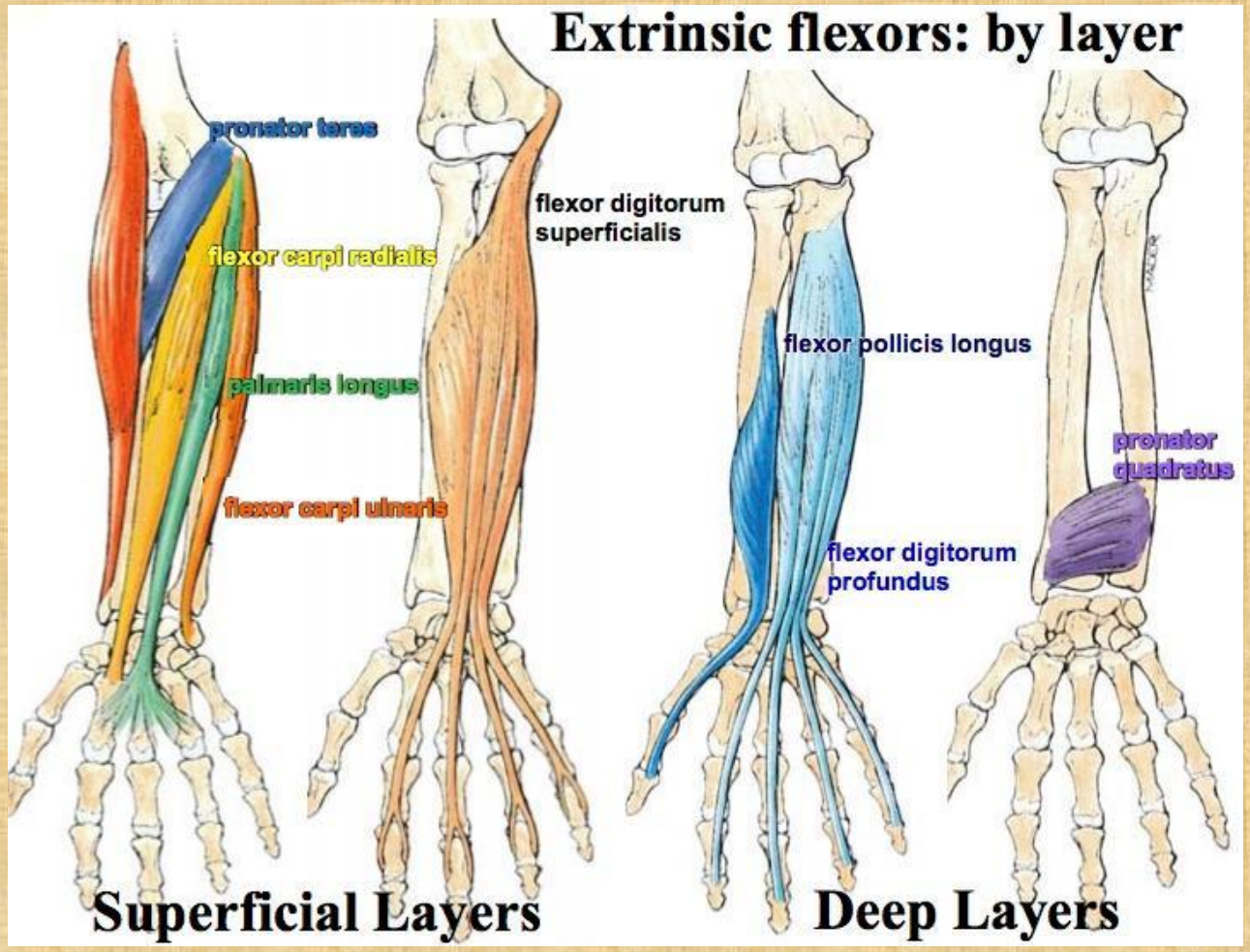
- Pronator teres
- Flexor carpi radialis
- Palmaris longus
- Flexor carpi ulnaris

Intermediate layer

- Flexor digitorum superficialis

Deep layer

- Flexor digitorum profundus
- Flexor pollicis longus
- Pronator quadratus


Extrinsic flexors: by layer
pronator teres
flexor carpi radialis
palmaris longus
flexor carpi ulnaris
flexor digitorum superficialis
flexor pollicis longus
pronator quadratus
flexor digitorum profundus
Superficial Layers
Deep Layers

Pronator teres : median nerve lies between the two heads

- Origin : humeral head : common flexor origin : medial epicondyle

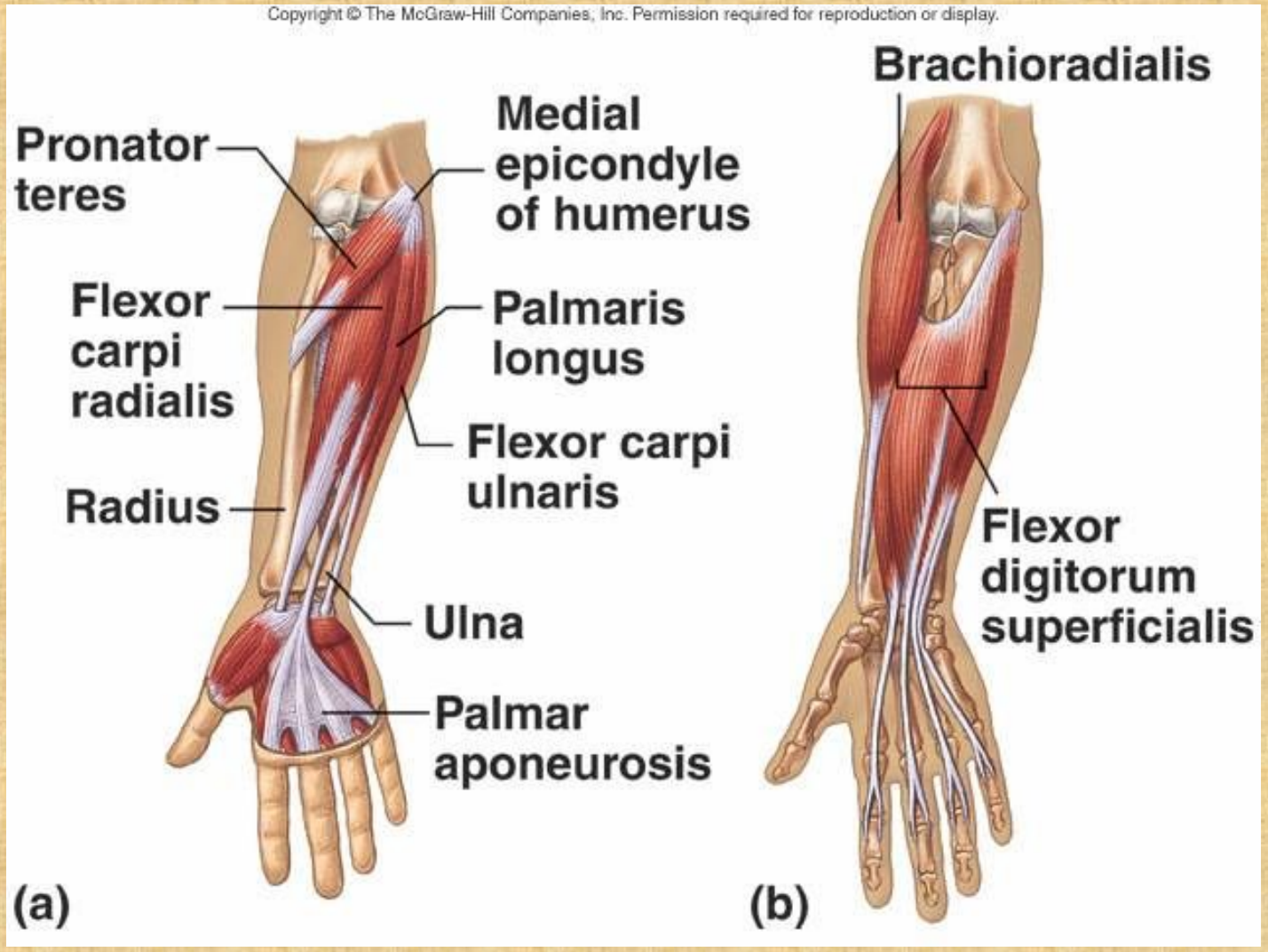
  medial supracondylar ridge

  ulnar head : medial border of coronoid process of ulna

Insertion : middle of the lateral surface of shaft of radius

Nerve supply : median nerve

Action : weak flexor of elbow joint, pronation of forearm



Flexor carpi radialis

- Origin : Medial epicondyle, antebrachial fascia , adjacent fascial septa
- Insertion : bases of 2nd & 3rd metacarpal bones
- Laterally related to tendon of brachioradialis and radial artery
- Perforates the flexor retinaculum
- Flexor of wrist joint
- Along with extensor carpi radialis longus & brevis : ABDUCTION OF WRIST

Palmaris longus : degenerated distal part represents palmar aponeurosis

- Common origin – medial epicondyle
- Passes in front of retinaculum
- Regressive muscle
- Slender long tendon
- Nerve supply : median nerve
- Action : Weak flexor of wrist

Flexor carpi ulnaris

- Humeral head : common flexor origin
- Ulnar head : medial margin of olecranon process and posterior border of ulna
- **Tendinous arch** connects the two heads : deep to it ulnar nerve , posterior ulnar recurrent artery
- Insertion : pisiform bone , hook of hamate , base of 5^{th} metacarpal
- Nerve supply : ulnar nerve
- Action : flexion of the elbow joint, flexion of wrist , adduction of the wrist with extensor carpi ulnaris
- Ulnar nerve & artery lateral to the tendon

Flexor digitorum superficialis

- Origin : humero-ulnar head :
  radial head :

Median nerve and ulnar artery are plastered by an arch

Tendon : divides into two strata : - superficial stratum : for middle and ring fingers

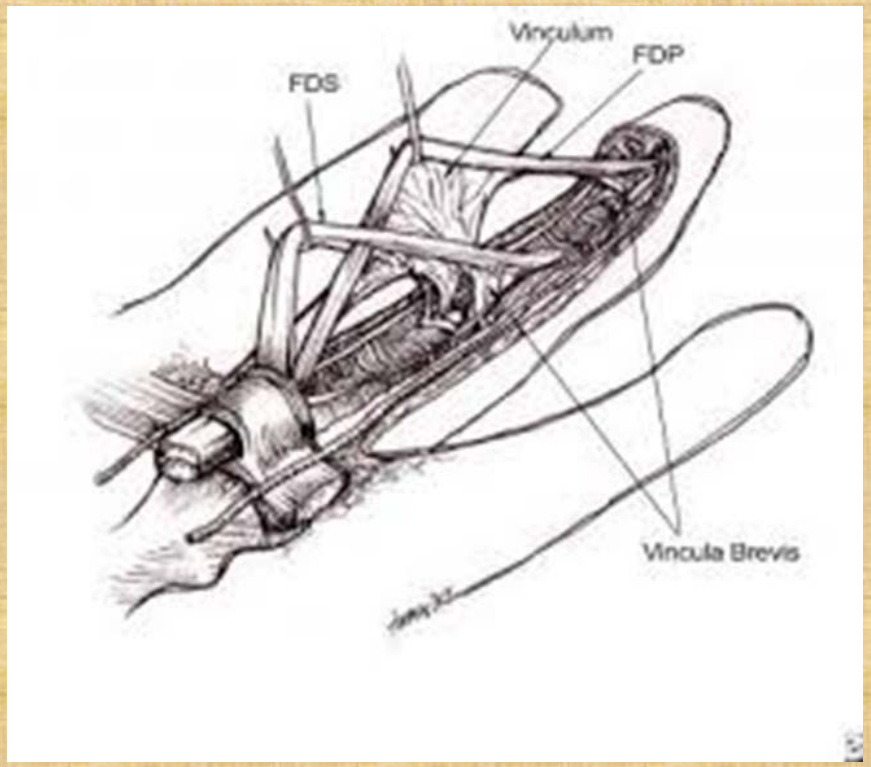
- deep stratum : for index and little finger

Insertion : shaft of the middle phalanx

Nerve supply : median nerve

Action : Flexion of middle phalanx

Insertion of FDS



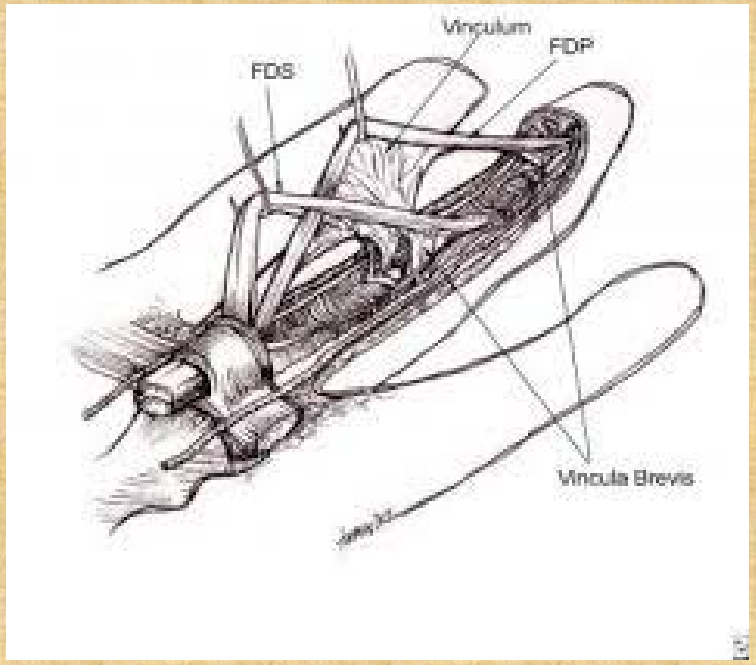
Flexor digitorum profundus

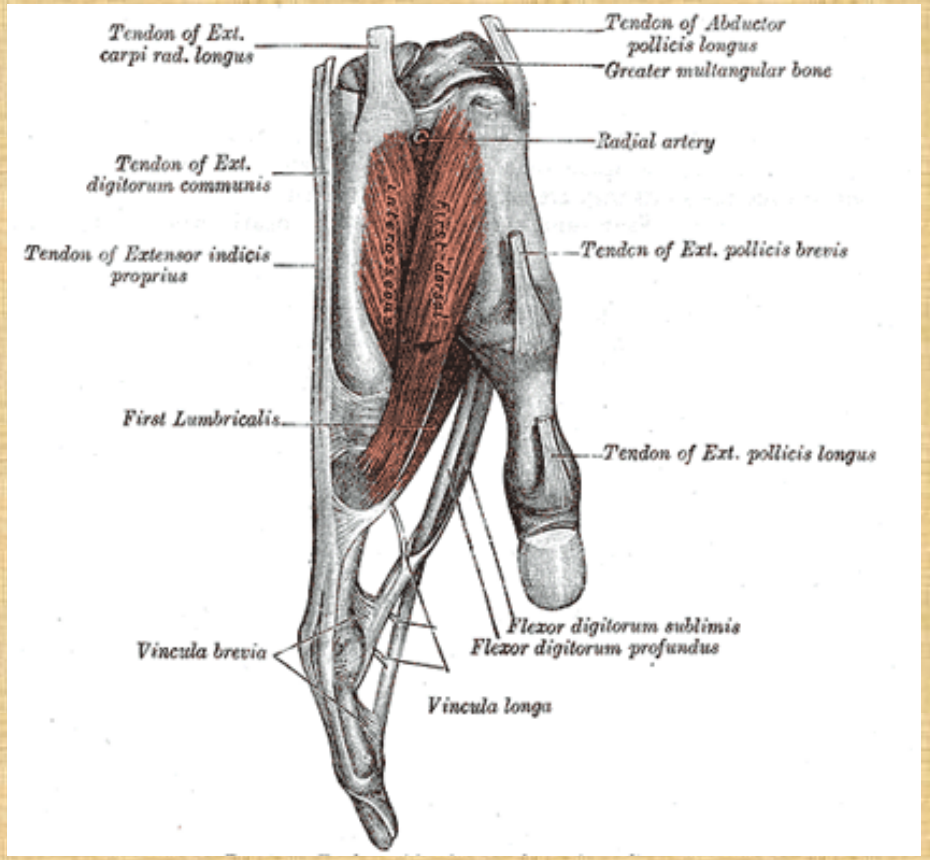
- Bulkiest muscle of the forearm
- Origin : Anterior & medial surfaces of upper ¾ of ulna
  Medial borders of coronoid process and olecranon process
  Adjacent interosseous membrane and upper ¾ of posterior border of ulna

Insertion : splits into four tendons for medial 4 fingers
each has fibrous flexor sheath
inserted on the base of the terminal phalanx
gives origin to 4 lumbricals

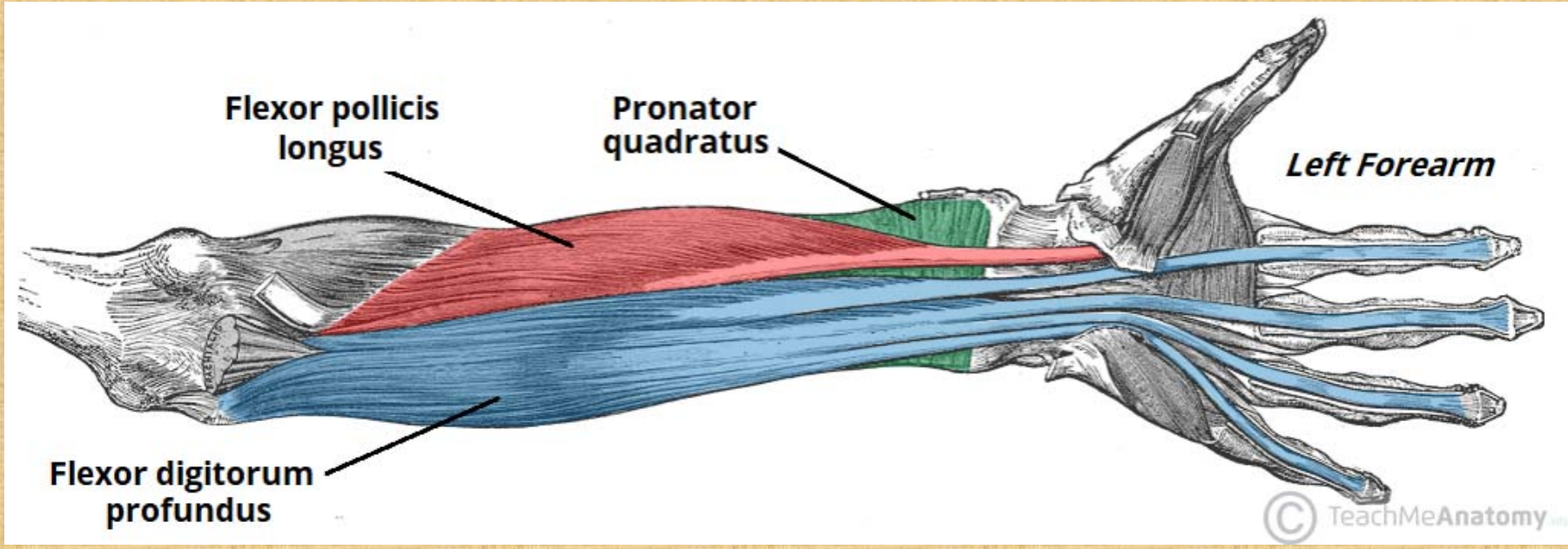
Nerve supply : median nerve (anterior interosseous branch) & ulnar nerve

- Action : flexion of the distal phalanges after the FDS flexes the middle phalanx


Vinculum
FDP
FDS
Vincula Brevis


Tendon of Ext. carpi rad. longus
Tendon of Abductor pollicis longus
Greater multangular bone
Radial artery
Tendon of Ext. digitorum communis
Tendon of Extensor indicis proprius
Tendon of Ext. pollicis brevis
First Lumbricalis
Tendon of Ext. pollicis longus
Vincula brevia
Flexor digitorum sublimis
Flexor digitorum profundus
Vincula longa

FLEXOR POLLICIS LONGUS & PRONATOR QUADRATUS



Flexor pollicis longus

- Origin : upper ¾ of anterior surface of shaft of radius & adjoining interosseous membrane

Insertion : passes deep to the flexor retinaculum palmar surface of distal phalanx of thumb

Nerve supply : median nerve (anterior interosseous branch)

Action ; flexes the distal phalanx of the thumb

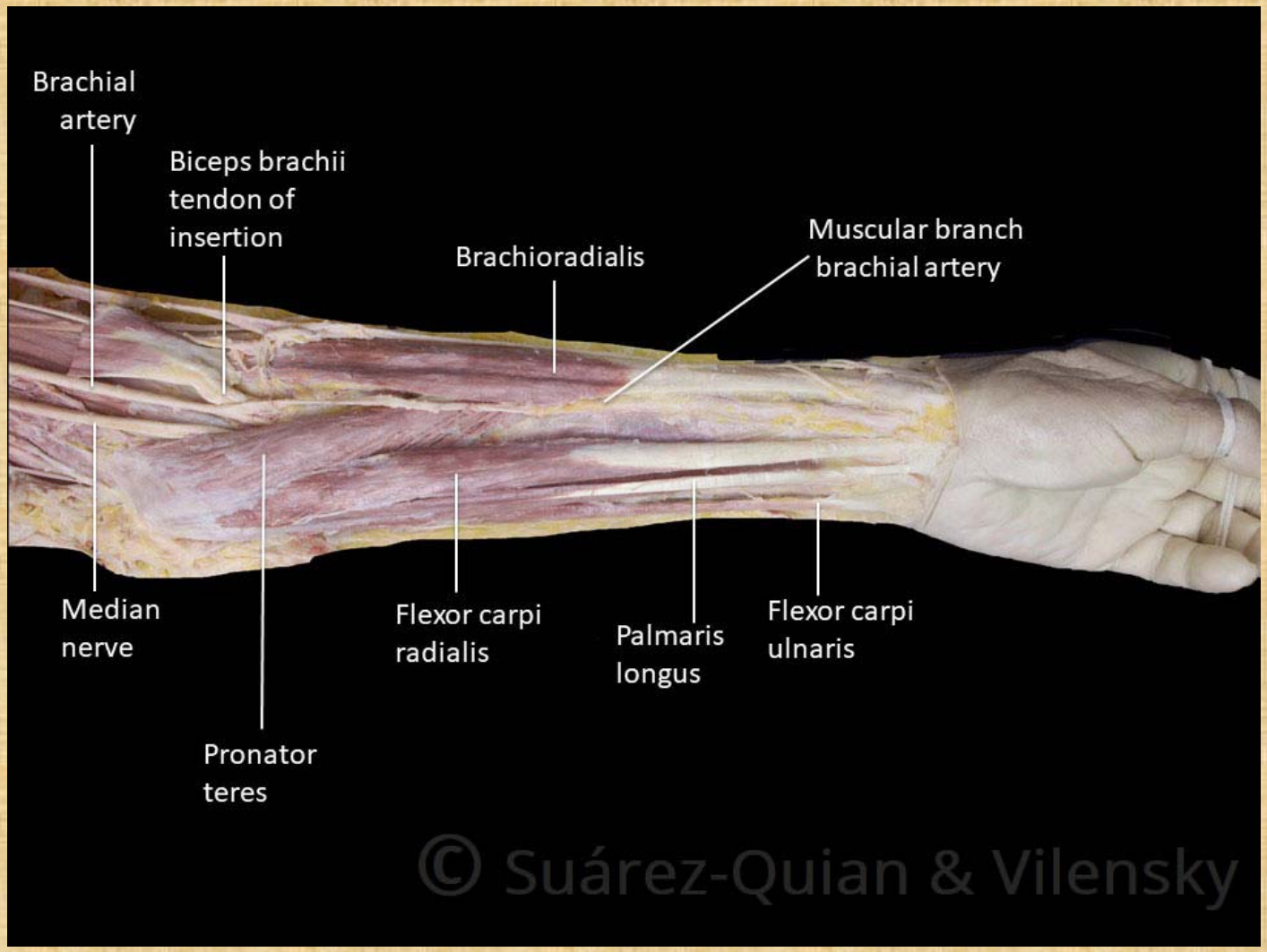
Flexor pollicis longus and pronator quadratus

- Oblique cord

Degenerated primitive origin of FPL

- sacciform recess :

A synovial pouch intervenes between deep surface of PQ and interosseous membrane


Brachial artery
Biceps brachii tendon of insertion
Brachioradialis
Muscular branch brachial artery
Median nerve
Pronator teres
Flexor carpi radialis
Palmaris longus
Flexor carpi ulnaris
© Suárez-Quian & Vilensky

Vessels and nerves

- Radial and ulnar artery

  ↓

  Common interosseous branch

  ↓

  Anterior interosseous & posterior interosseous branch to supply deep structures of the flexor compartment of forearm

- Median and ulnar nerves

Vessels and nerves

- Radial and ulnar artery

⇓

Common interosseous branch

⇓

Anterior interosseous & posterior interosseous branch

supply

deep structures of the flexor compartment of forearm

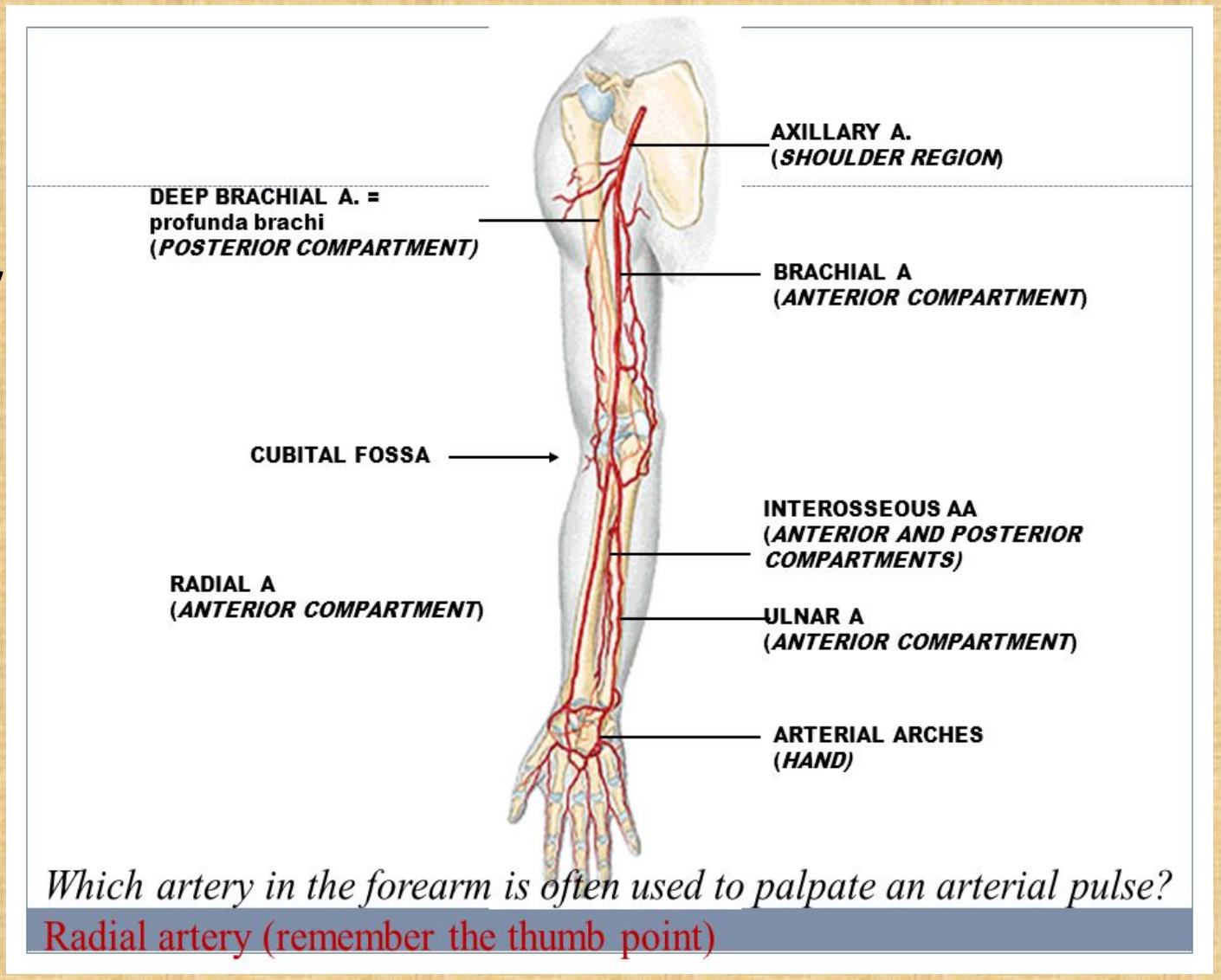
Superficial & Deep palmar arch
radial nerve

competencies

- Arteries of the palm
- Course of the Radial artery in the palm
- Course of the Ulnar artery in the palm
- Formation of Superficial and Deep palmar arch
- applied anatomy

- RADIAL NERVE :
  FORMATION OF THE RADIAL NERVE
  COURSE & RELATIONS OF THE RADIAL NERVE IN – 1) ARM 2)FOREARM AND 3) PALM
- APPLIED ANATOMY

- Radial artery
- Ulnar artery



Superficial & Deep palmar arch

- Terminal parts of radial & ulnar arteries
- Anastomose to form superficial & Deep PALMAR ARCHES

Diagram :

Ulnar artery

- Deep branch
- Larger terminal branch
- Oblique course in upper ¼ part
- Vertical course in lower ¾ part
- In upper part covered by all superficial muscles
- Lies superficial to FDP & BRACHIALIS
- BRANCHES : anterior & posterior ulnar recurrent artery
  common interosseous artery
  muscular branches
  Palmar carpal branches
  dorsal carpal branches
- Continuation of ulnar artery forms superficial palmar arch

Radial artery

- Smaller Superficial terminal branch
- Lateral convexity
- Overlapped by brachio-radialis in the upper part

Branches :

1) radial recurrent
2) Muscular branches
3) 1ST Dorsal metacarpal artery
3) Palmar carpal branches
4) Dorsal carpal branches
5) Superficial palmar branch
6) Arteria princeps pollicis
7) Arteria indices

- Continuation of superficial branch of radial artery forms deep palmar arch

Superficial palmar arch

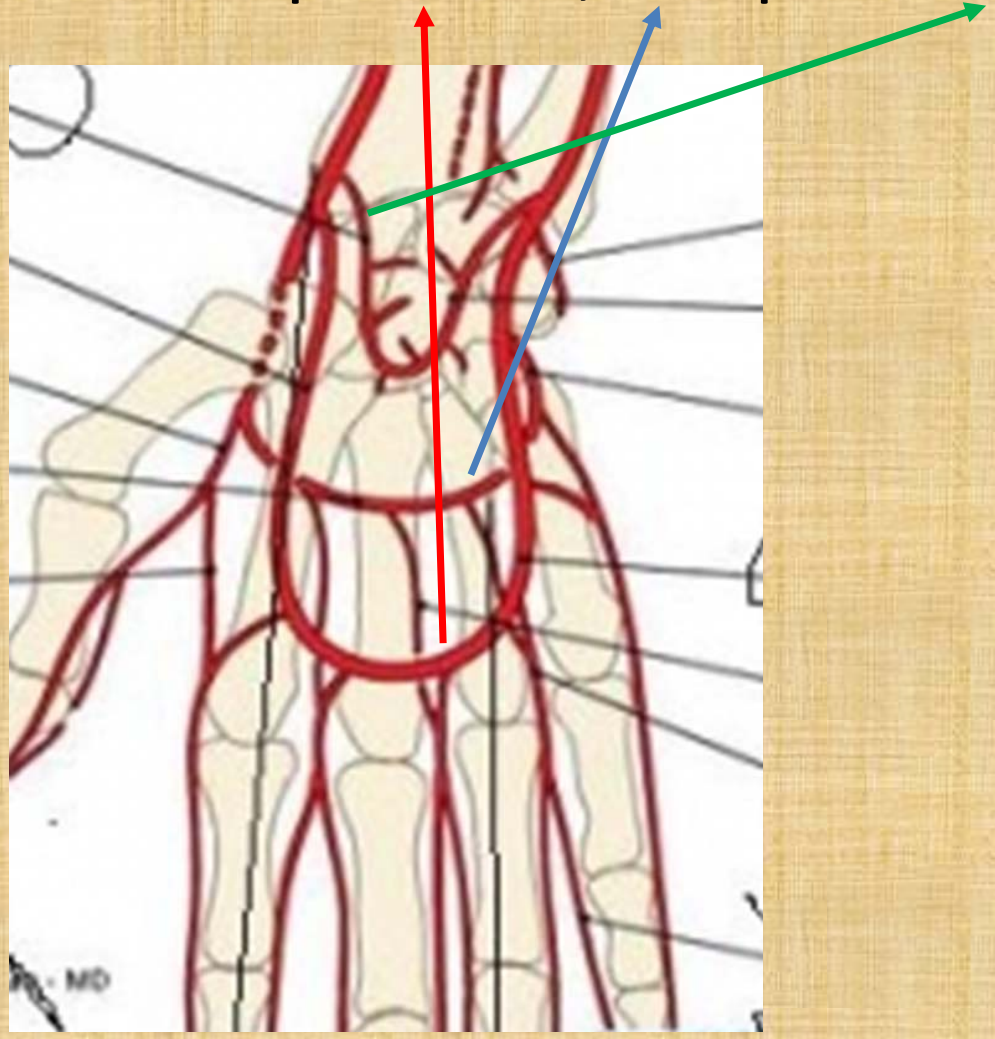
Relations :

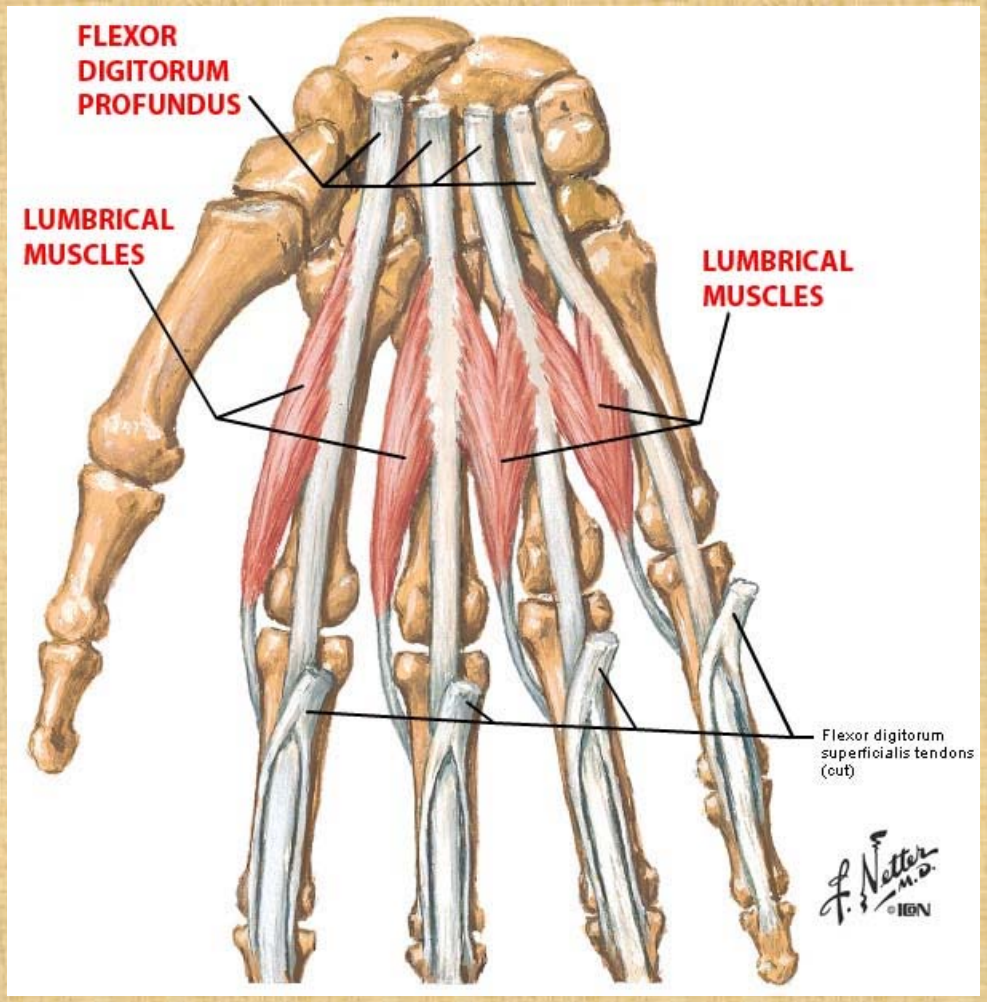
- Superficially : Palmaris brevis , palmar aponeurosis

- Deep : long flexor tendons , lumbrical muscles ,& palmar digital branches of median nerve.

- Course of the ulnar artery in the palm :
  - accompanied by ulnar nerve on its medial side
  - enters the palm superficial to the Flexor Retinaculum
  - forms main contribution in the formation of superficial palmar arch

Diagram shows Superficial , Deep & Carpal arches




FLEXOR
DIGITORUM
PROFUNDUS
LUMBRICAL
MUSCLES
LUMBRICAL
MUSCLES
Flexor digitorum
superficialis tendons
(cut)
F. Netter M.D.
©IGN

Superficial palmar arch

- ARTERIAL ARCADE
- Continuation of ulnar artery
- Lies beneath the palmar aponeurosis
- Lies at the same level of distal border of fully extended thumb
- Completed on lateral side by one of the following arteries :

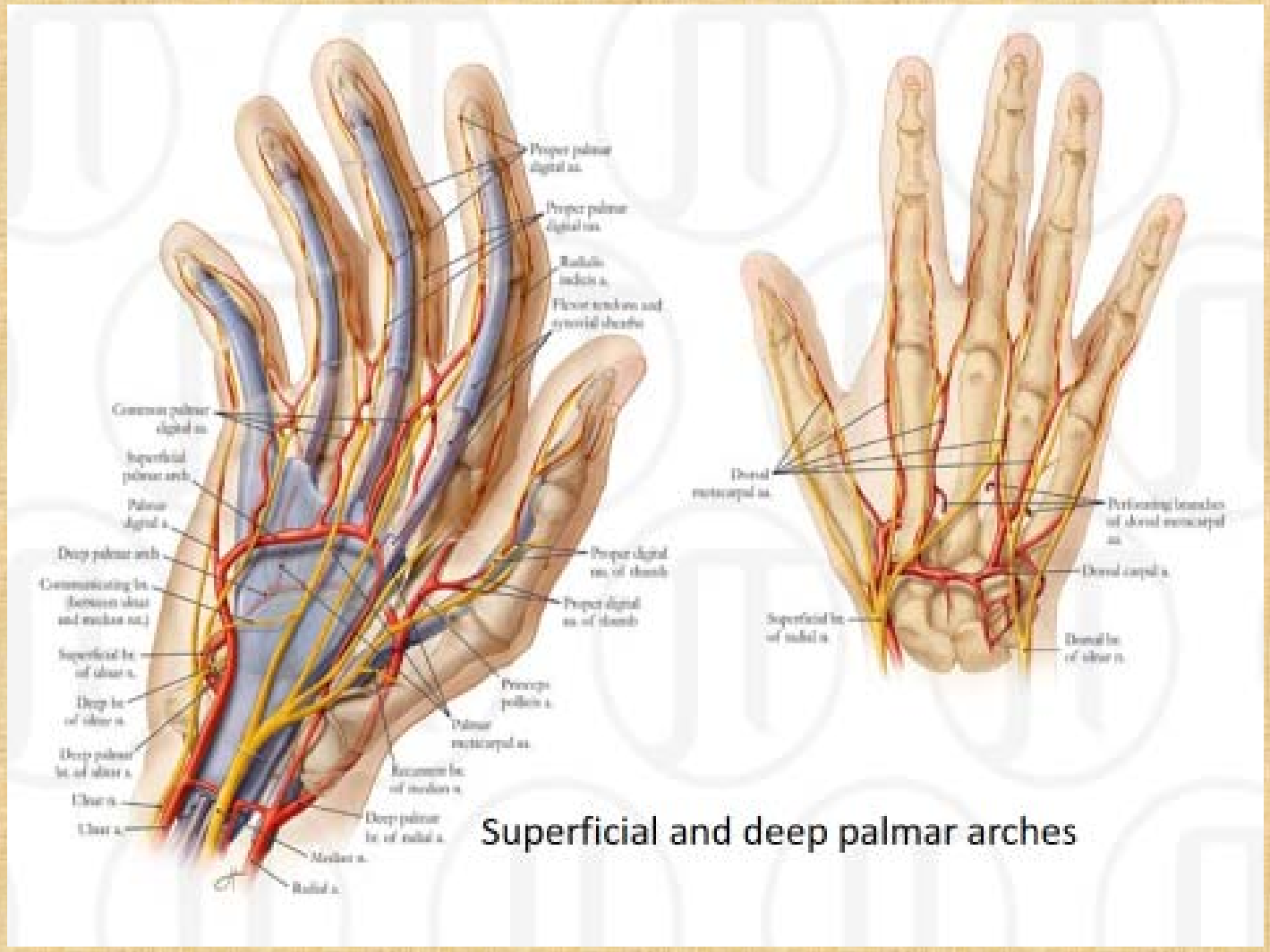
1. **Superficial palmar branch of radial artery**
2. Arteria princeps policis
3. Arteria radialis indicis
4. Arteria nervi mediana

BRANCHES OF THE SUPERFICIAL PALMAR ARCH : does not supply radial side of index finger & both sides of thumb

3 COMMON DIGITAL ARTERIES + 1 PROPER DIGITAL ARTERY

PALMAR DIGITAL ARTERIES

PROPER PALMAR DIGITAL ARTERIES

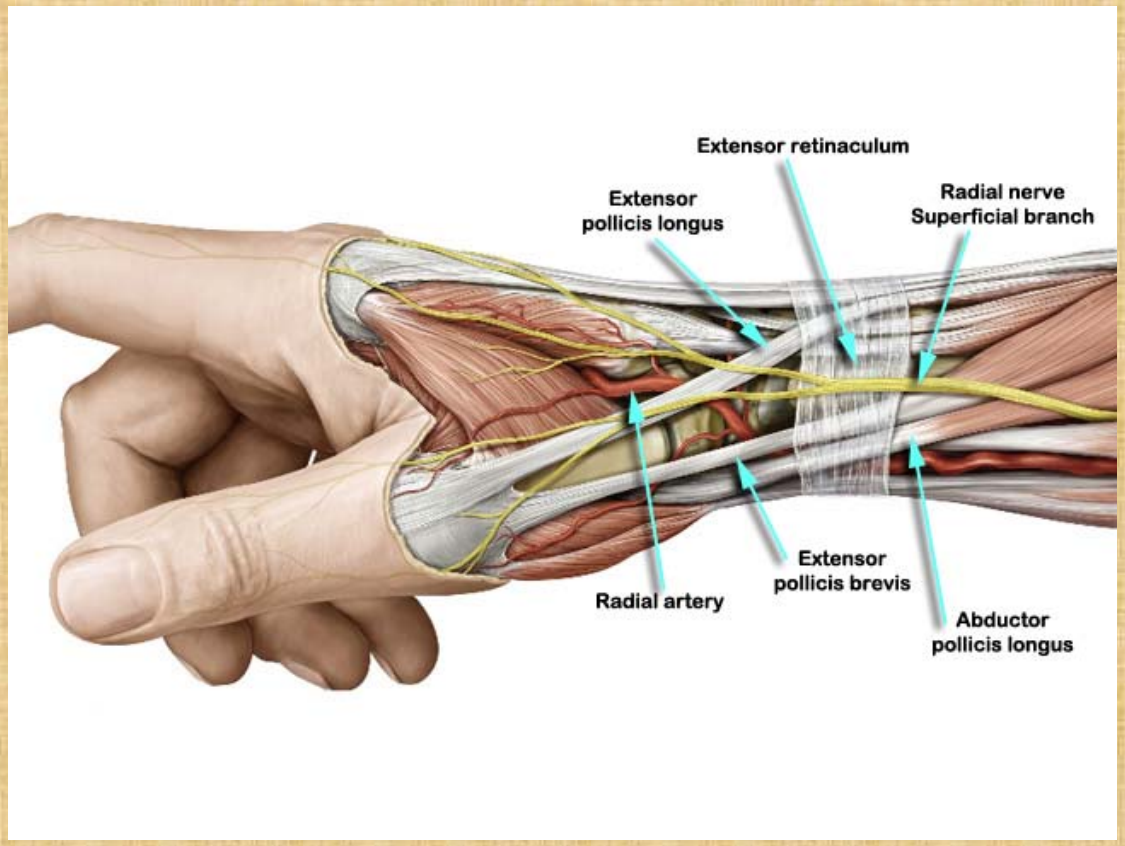


Superficial and deep palmar arches

Deep palmar arch

- Arterial arcade
- Formed by anastomosis between terminal end of radial artery and deep branch of ulnar artery across the bases of metacarpals.
- 1 cm. proximal to the superficial palmar arch
- Continuation of radial artery
- Enters the palm between the two heads of 1st dorsal interosseous muscle AFTER PASSING THROUGH THE ANATOMICAL SNUFF BOX
- Appears in the palm between two heads (oblique & transverse) of adductor pollicis

Anatomical snuff box



BRANCHES OF THE DEEP PALMAR ARCH

- 3 PALMAR METACARPAL ARTERIES – terminate by joining the common digital branches of superficial palmar arch
- 3 PERFORATING DIGITAL ARTERIES – anastomose with dorsal metacarpal arteries
- RECURRENT BRANCH – extends proximally to end in palmar carpal arch by anastomosing with the anterior carpal arch

Radial nerve :

- Formation
- Course & relations of the radial nerve in

  ---- arm

  ---- forearm

  ---- hand

Applied anatomy

Course of radial nerve in arm and forearm

-formation : C5,6,7,8,T1

-LARGEST BRANCH OF BRACHIAL PLEXUS

-Begins as the continuation of posterior cord

-conveys fibers from dorsal branches of ventral rami

-lower triangular space: accompanied by profunda brachii artery

-spiral groove

-pierces lateral inter-muscular septum

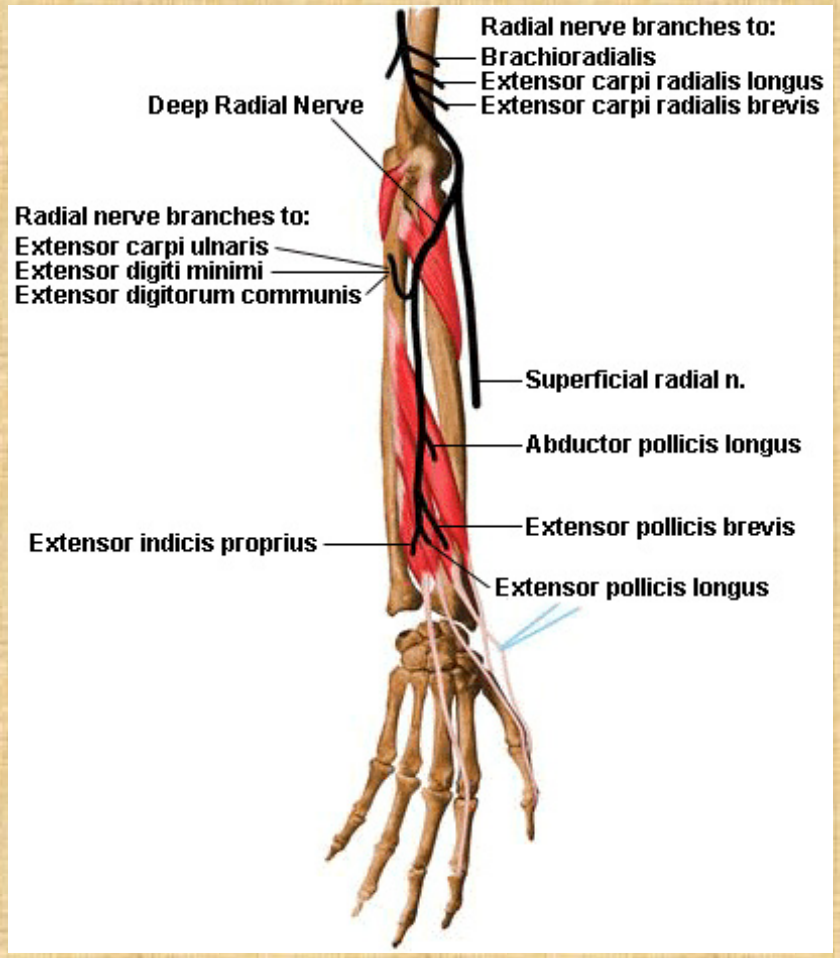
Course of the Radial nerve in the forearm

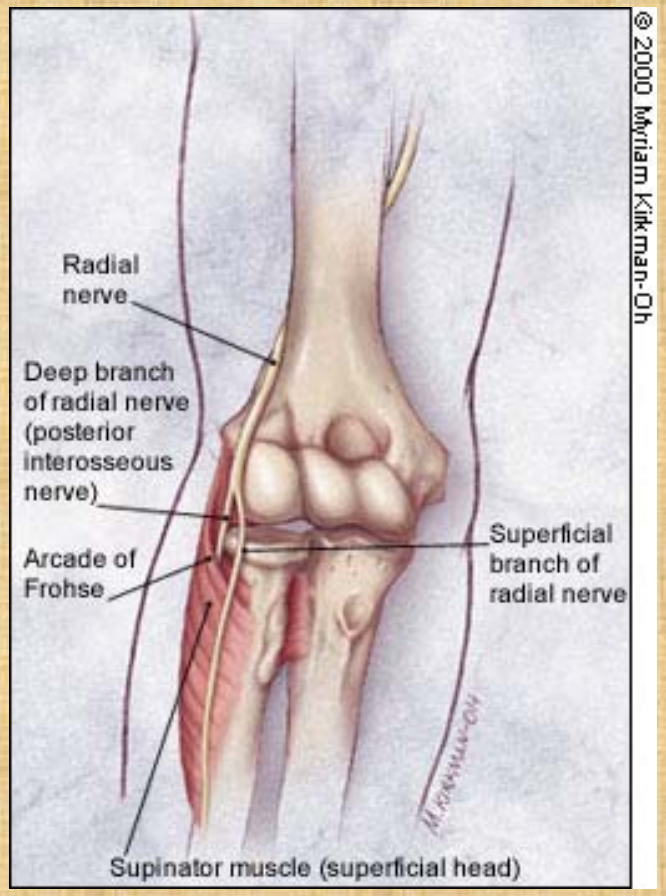
- On reaching the lateral epicondyle

- **S**uperficial & deep terminal branches

- Essentially **s**ensory mixed(essentially motor)

In the forearm





Course of the radial nerve in the hand

- Superficial terminal branch

-runs downwards along the lateral aspect of forearm

-relations :

- Superficial : brachioradialis

- Deep : supinator, pronator teres , flexor digitorum superficialis, flexor pollicis longus

- deep terminal branch(posterior interosseous nerve)

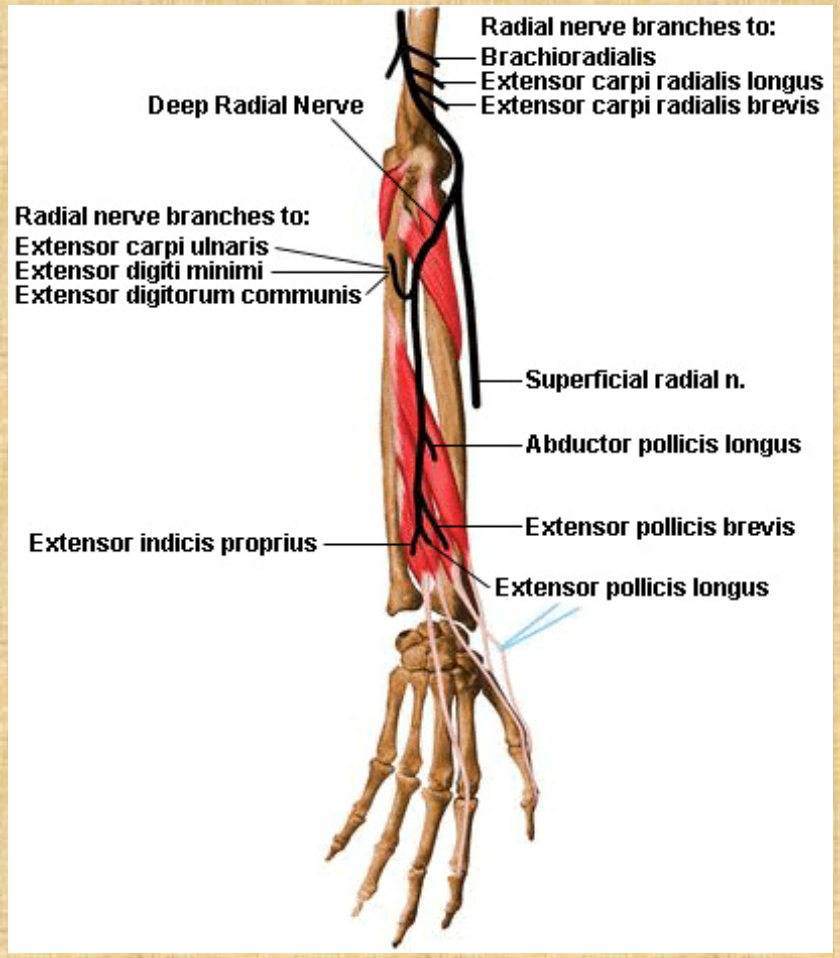
- Winds round lateral side of radius
- Passes between two strata of supinator muscle
- Enters into the extensor compartment
- Ends into pseudo-ganglion supplying surrounding joints in the hand

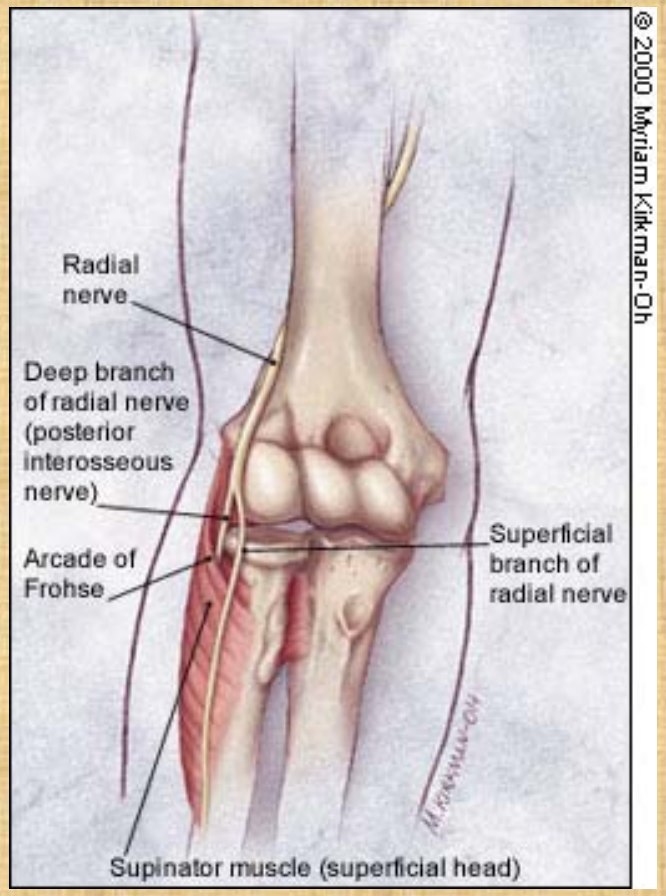
Branches in the hand (diagram)

- Cutaneous : skin over the anatomical snuff box, lateral 3&1/2 fingers Except distal phalanges , 2/3 area of the dorsum of the hand (diagram)
- Articular : wrist and 1st carpo-metacarpal joint, metacarpo-phalangeal joint,inter-phalangeal joint
- Vascular : radial artery

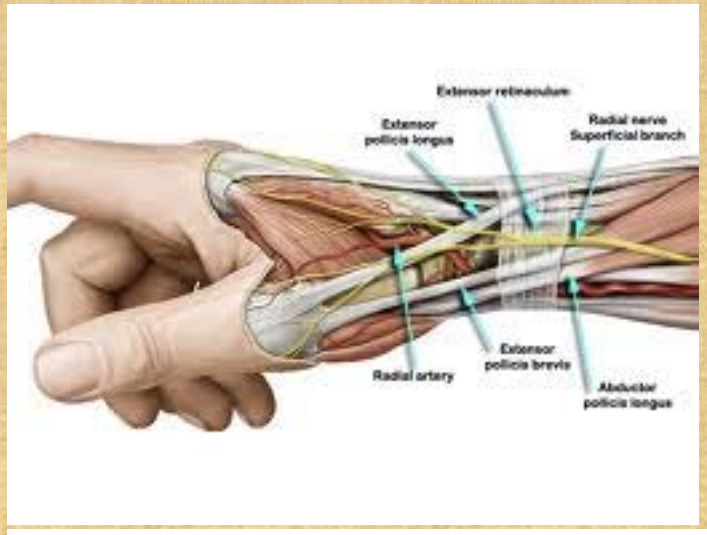
- Muscular : all extensor muscles through its lateral & medial divisions
- Cutaneous : ------
- Articular : inferior radio-ulnar joint , wrist, inter-carpal joints
- Vascular : posterior interosseous artery

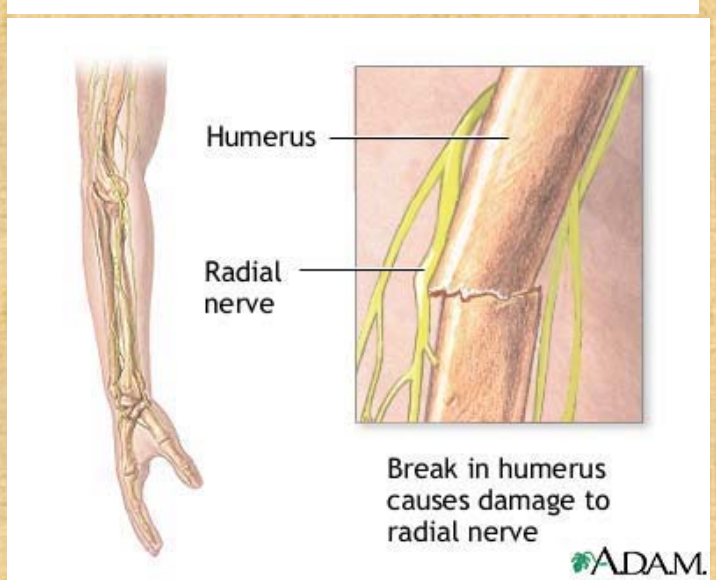
In the forearm





In the hand





-applied anatomy

Saturday night palsy : compression of nerve against the spiral groove may be associated with temporary radial nerve palsy

# of shaft of the humerus : radial nerve is often injured in the spiral groove

Wrist drop : when extensor muscles are paralyzed hand is flexed at wrist.

PRONATION & SUPINATION

- Bones : radius & ulna
- Joints : superior radio-ulnar joint
  middle radio-ulnar joint
  inferior radio-ulnar joint
- Axis :
- Muscles involved in movements:
- Applied anatomy:

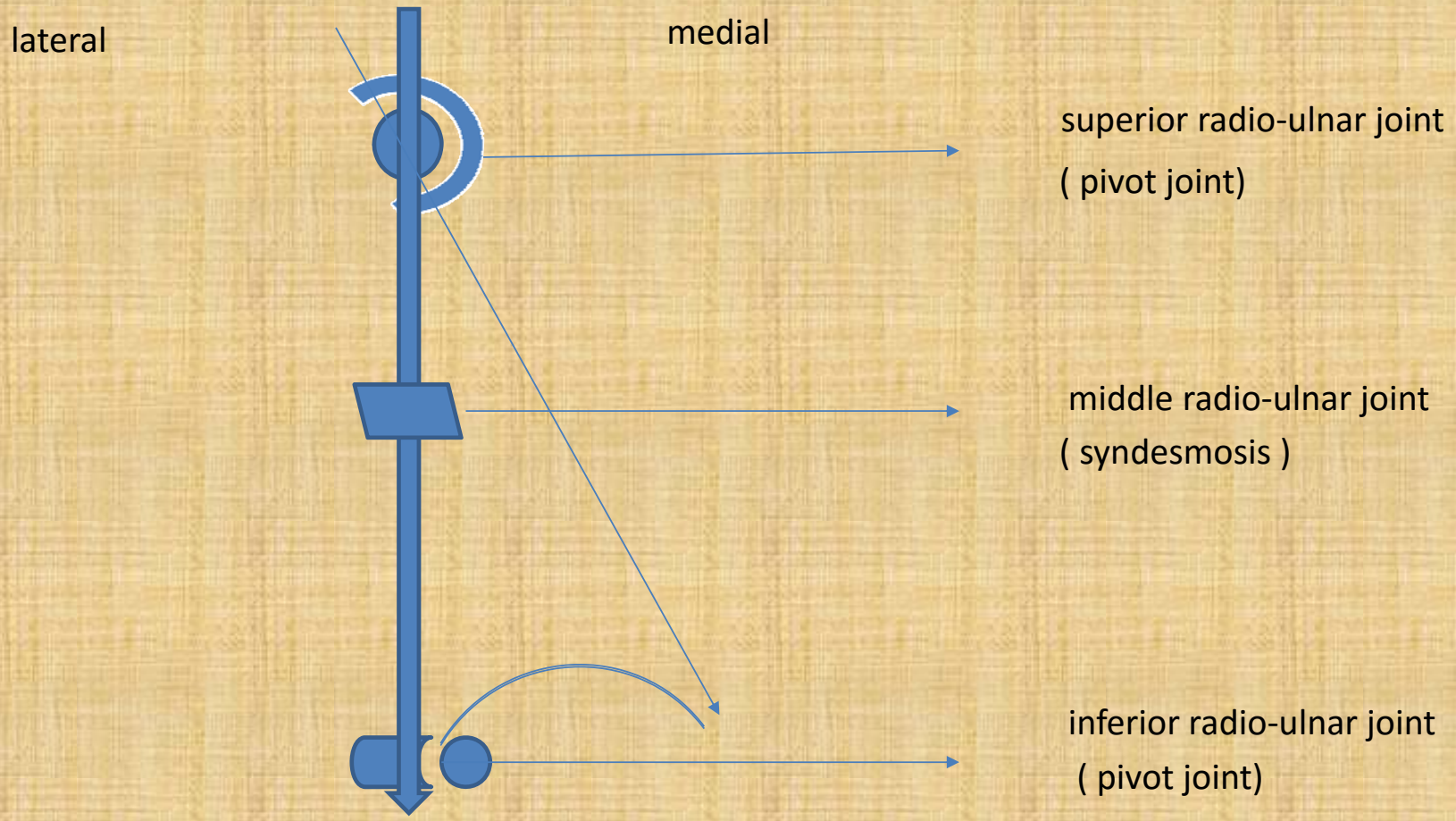
Bones

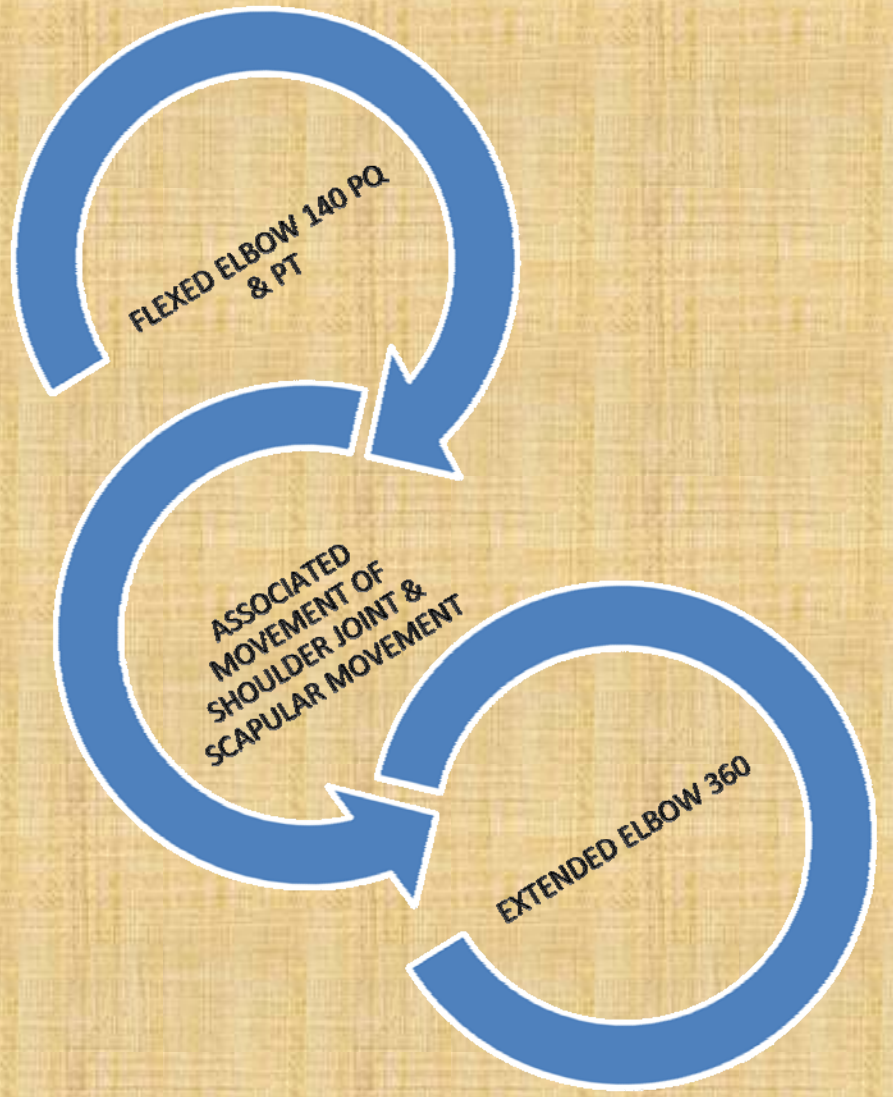
- Radius & ulna are connected : 1) superior & inferior radio-ulnar joint ⟶ pivot variety of synovial joint 2) interosseous membrane & oblique cord ⟶ syndesmosis type of fibrous joint

AXIS

- Axis : oblique: passing through the centre of the head of the radius and margin of attachment of articular disc on the ulna at inferior radio-ulnar joint
- Accessory movement : backward & forward translation of radial head in radial notch of ulna & ulnar head in ulnar notch of radius
- When axis is prolonged, it shifts from Index finger to Little finger

Axis and movements of radio-ulnar joints




FLEXED ELBOW 140 PQ & PT
ASSOCIATED MOVEMENT OF SHOULDER JOINT & SCAPULAR MOVEMENT
EXTENDED ELBOW 360

MUSCLES INVOLVED IN MOVEMENTS

- SUPINATION
- SUPINATOR : PRIME MOVER
- MORE POWERFUL THAN PRONATION BECAUSE ANTIGRAVITY MOVEMENT
- INTEROSSEOUS MEMBRANE IS DESPIRALIZED

- BICEPS BRACHII : SCREWING MOVEMENT IN FLEXED ELBOW

- PRONATION
- PRONATOR QUADRATUS
- PRONATOR TERES
- HEAD OF THE RADIUS SPINS IN ANNULAR LIGAMENT
- INTEROSSEOUS MEMBRANE IS SPIRALIZED

Applied anatomy

- Subluxation of head of the radius : common in children below 6 years . As diameters of head & neck are very similar, sudden traction on the wrist / hand causes subluxation of the head . The condition is known as **PULLED ELBOW**
- Dislocation of the head of the radius is not uncommon , most frequently in youth caused by fall on the outstretched hand . radial head is displaced forwards with rupture of the annular ligament

Radial nerve : FORMATION ,COURSE ,DISTRIBUTION OF BRANCHES , APPLIED ANATOMY

- FORMATION:
- it is the largest branch of the brachial plexus

formed by dorsal branches of ventral rami of C5,6,7,8,T1 (posterior cord) which is formed by all dorsal divisions of brachial plexus

COURSE OF THE RADIAL NERVE

- DESCENDS BEHIND THE 3RD PART OF AXILLARY ARTERY
- ACCOMPANIED BY THE PROFUNDA BRACHII ARTERY IN LOWER TRIANGULAR SCAPULAR SPACE
- ENTERS INTO THE SPIRAL GROOVE

- Branches : 1) articular branch : elbow joint
  2) Muscular branches :
  3) Cutaneous branches : posterior compartment of forearm
     dorsal aspect of lateral two and half fingers

Ulnar nerve (musician's nerve)

- Controls fine movement of fingers
- Palpable behind medial epicondyle
- Cubital tunnel syndrome

Cubital tunnel syndrome

- 3 common sites for compression of the ulnar nerve:

1) Behind medial epicondyle
2) Between pisiform & flexor retinaculum
3) Below hook of hamate

- Hand remains abducted while attempting flexion of the wrist joint
- Medial 4 fingers can not be abducted or adducted
- Claw hand
- Paralysis of adductor pollicis
- Wasting of hypothenar