Learning Objectives

1. Median nerve formation , root value and important relations

2. Motor and sensory supply

3. Important sites of injuries/entrapment of nerve

4. Effects of injury of median nerve

5. How to clinically test median nerve injury

Q 1.Regarding the median nerve, all are correct EXCEPT:

a. Arises from both the medial and lateral cords of the brachial plexus.
b. It crosses the brachial artery at the insertion of the coracobrachialis.
c. In the cubital fossa, it lies lateral to the brachial artery.
d. It enters the hand in the carpal tunnel.
e. Injury of the nerve causes ape-like hand.

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Answer c

Q 2. A 40 year tailor complains of pain numbness and weakness of right hand for last 3 months. On examination, there is hypoesthesia and atrophy of thenar eminence. Which of the following nerve is likely to be involved?

A Ulnar nerve
B Median nerve
C radial nerve
D Axillary nerve

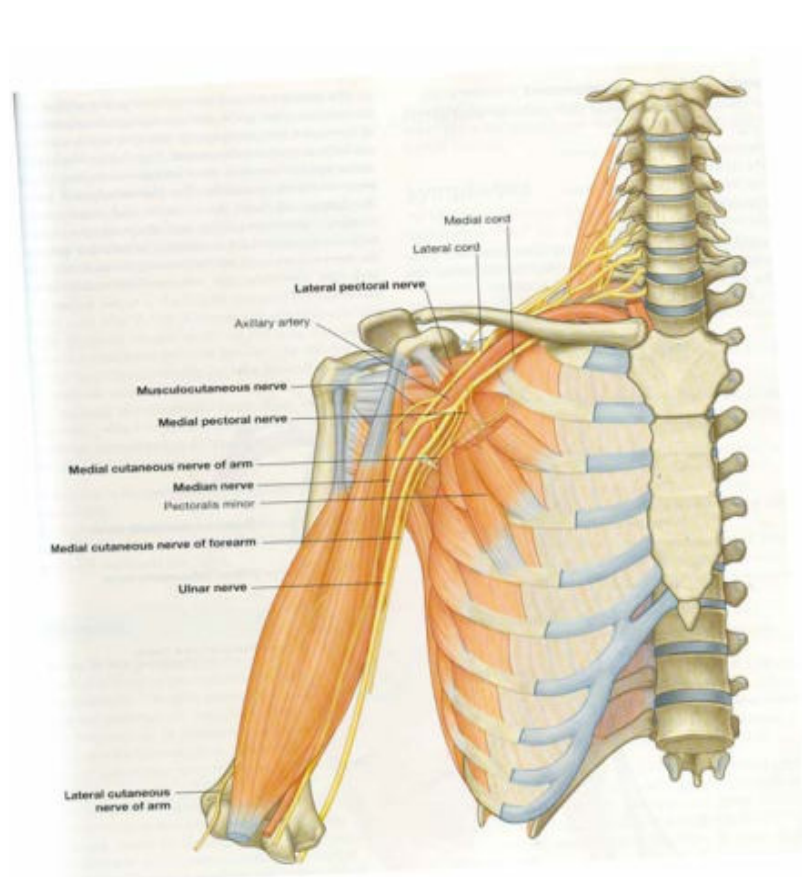
Q 3 Injury to the median nerve in the arm would affect all of the following movements except:
A. Pronation of the forearm
B. Flexion of the wrist
C. Flexion of the thumb
D. Supination of the forearm

Anatomy

- Mixed nerve (contain motor & sensory fibers).
- **Root value:** C5,6,7,8 & T1
- Runs in the median plane of the forearm , so its called median nerve

MEDIAN NERVE

- Formation:from two roots from lateral cord [C(5),6,7]&
  from medial cord(C8,T1) of brachial plexus
  Before leaving axilla, C7 fibres conveyed by median nerve are handed over to Ulnar nerve



- These two roots embrace the third part of axillary artery uniting anterior or lateral to it

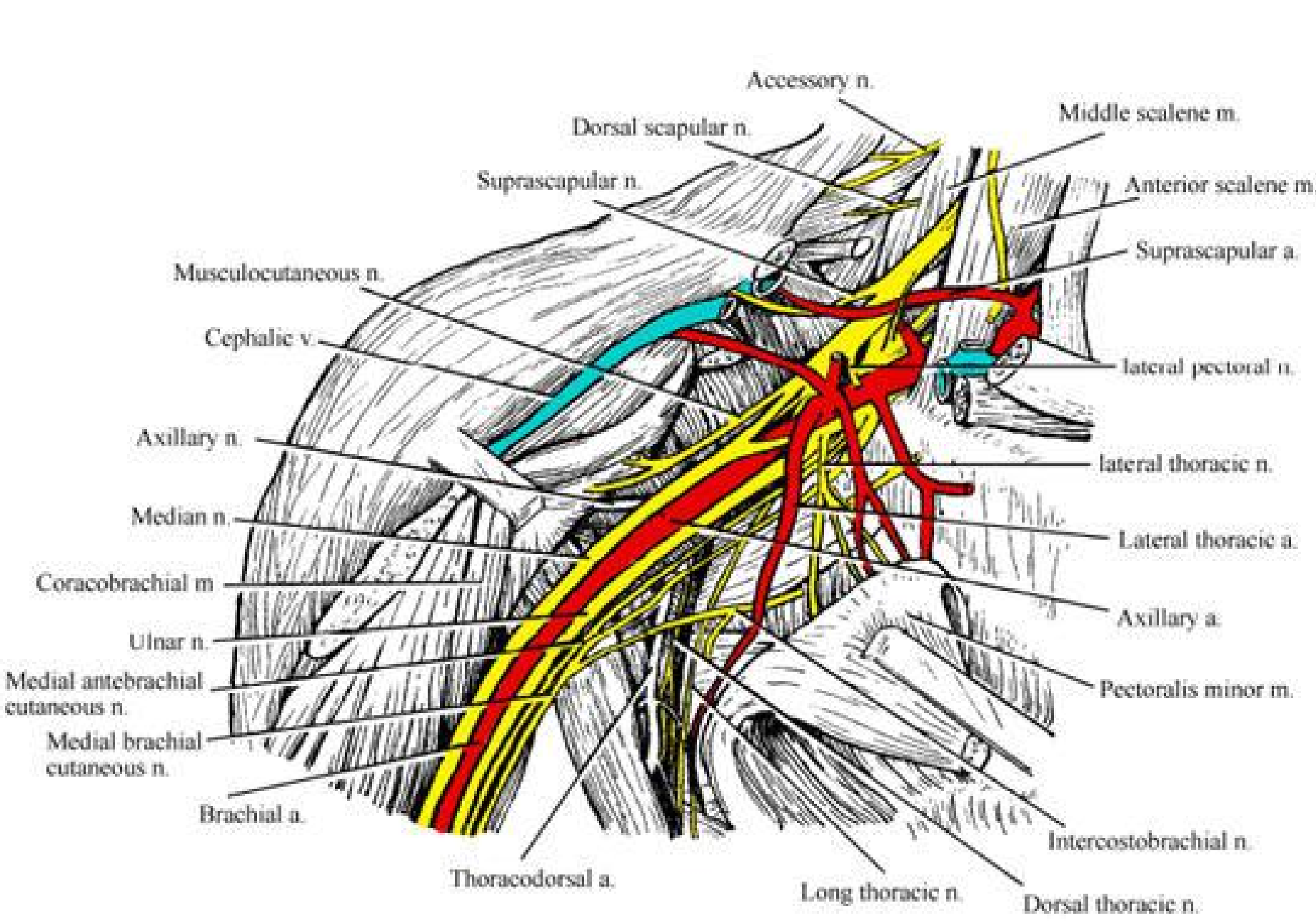
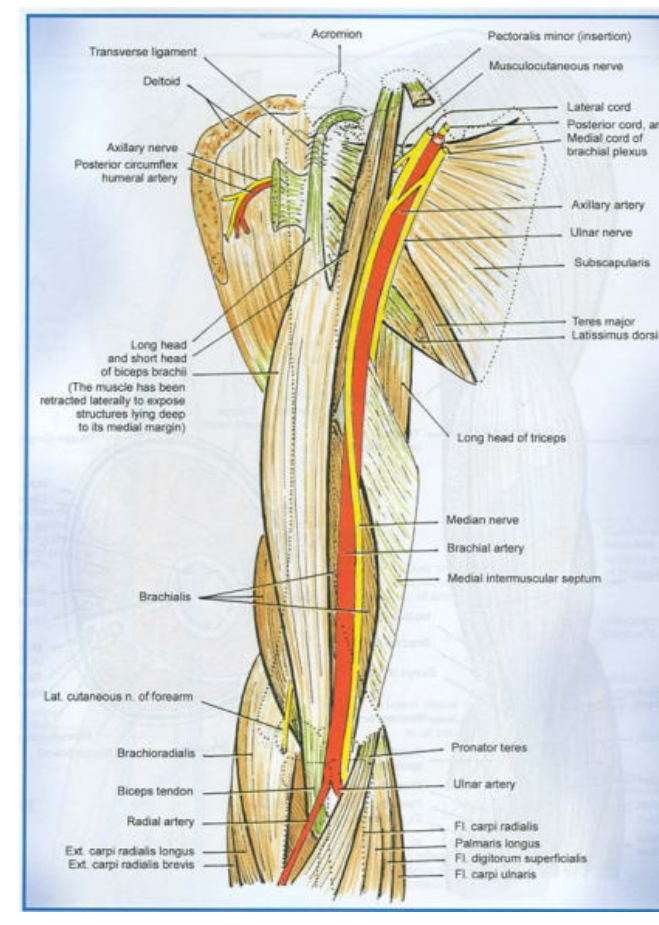
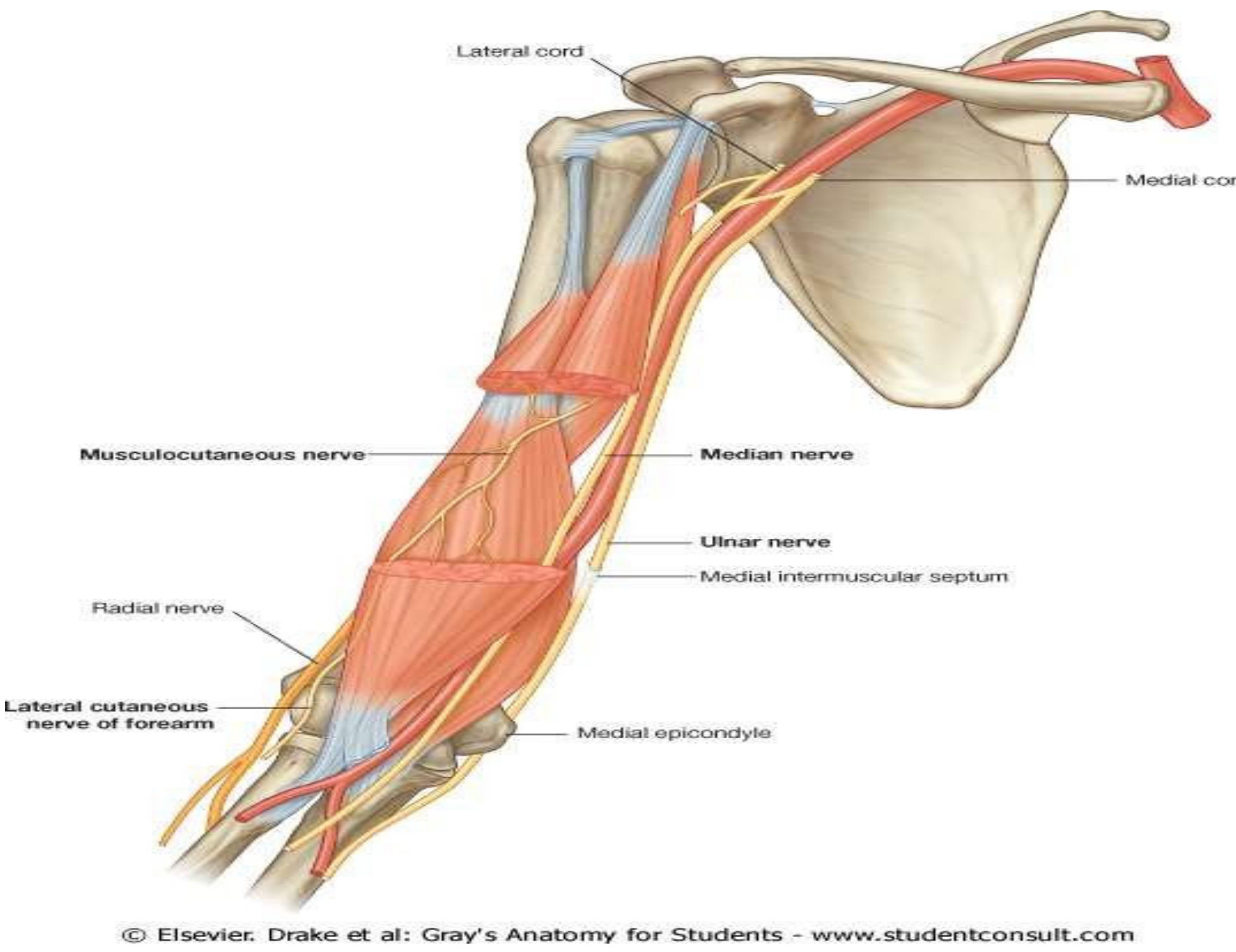


Fig. 3.1–5 Anatomy of brachial plexus

In the arm

- Closely related to the brachial artery through out the course in arm
- In the upper part it is lateral to artey
- In the middle part it crosses the artery from lateral to medial side
- Remains on the medial side up to elbow



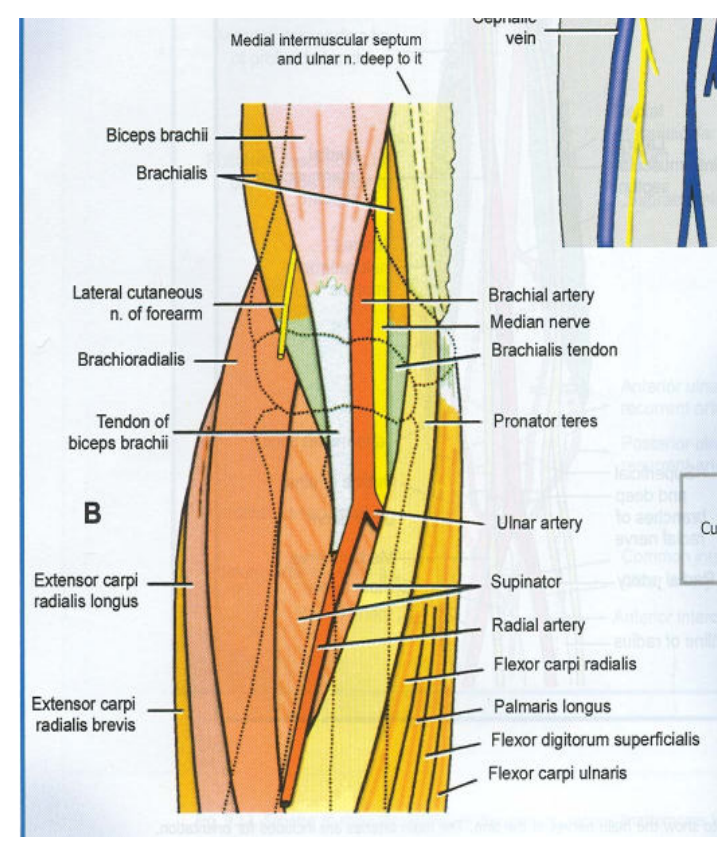


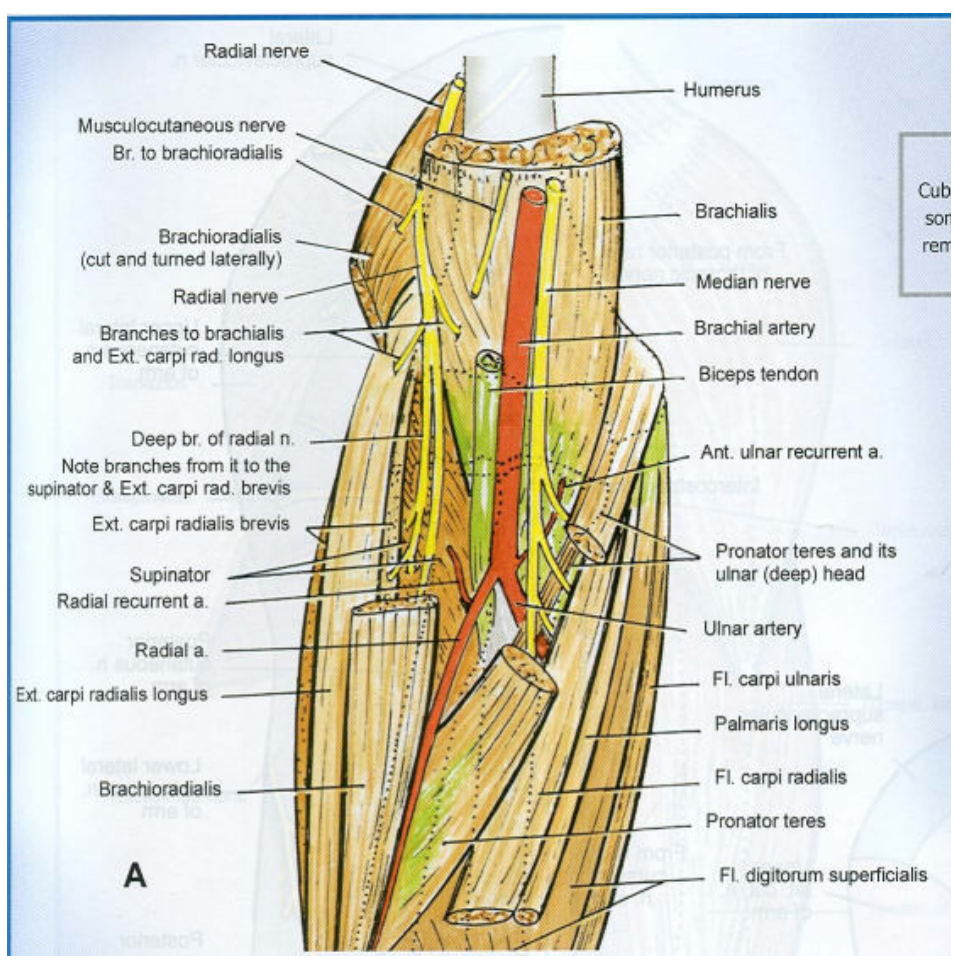
Branches in arm

- Branch to Pronator Teres just above elbow
- Branch to brachial artery
- Branch to elbow joint at or just below the elbow

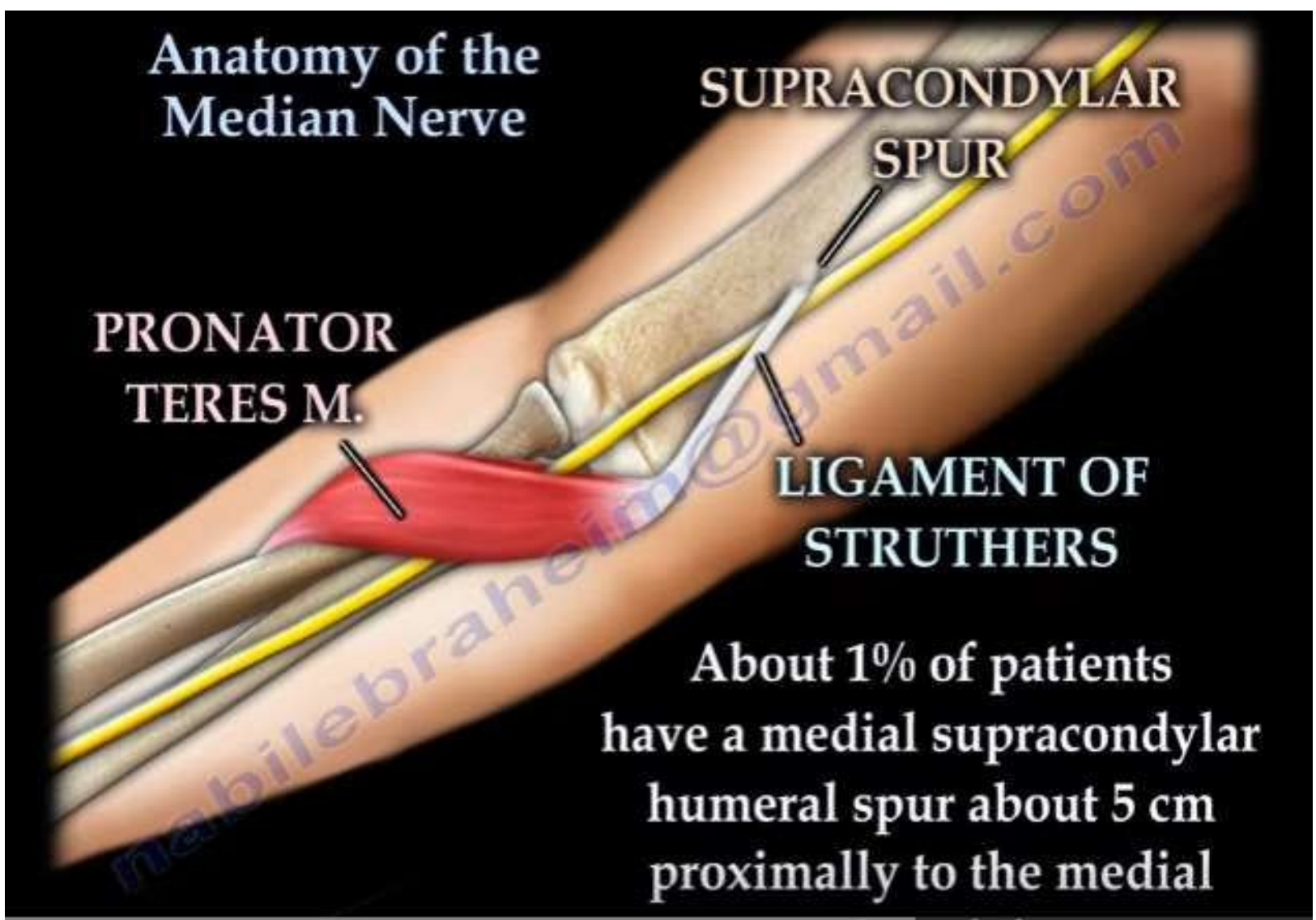
In the cubital fossa

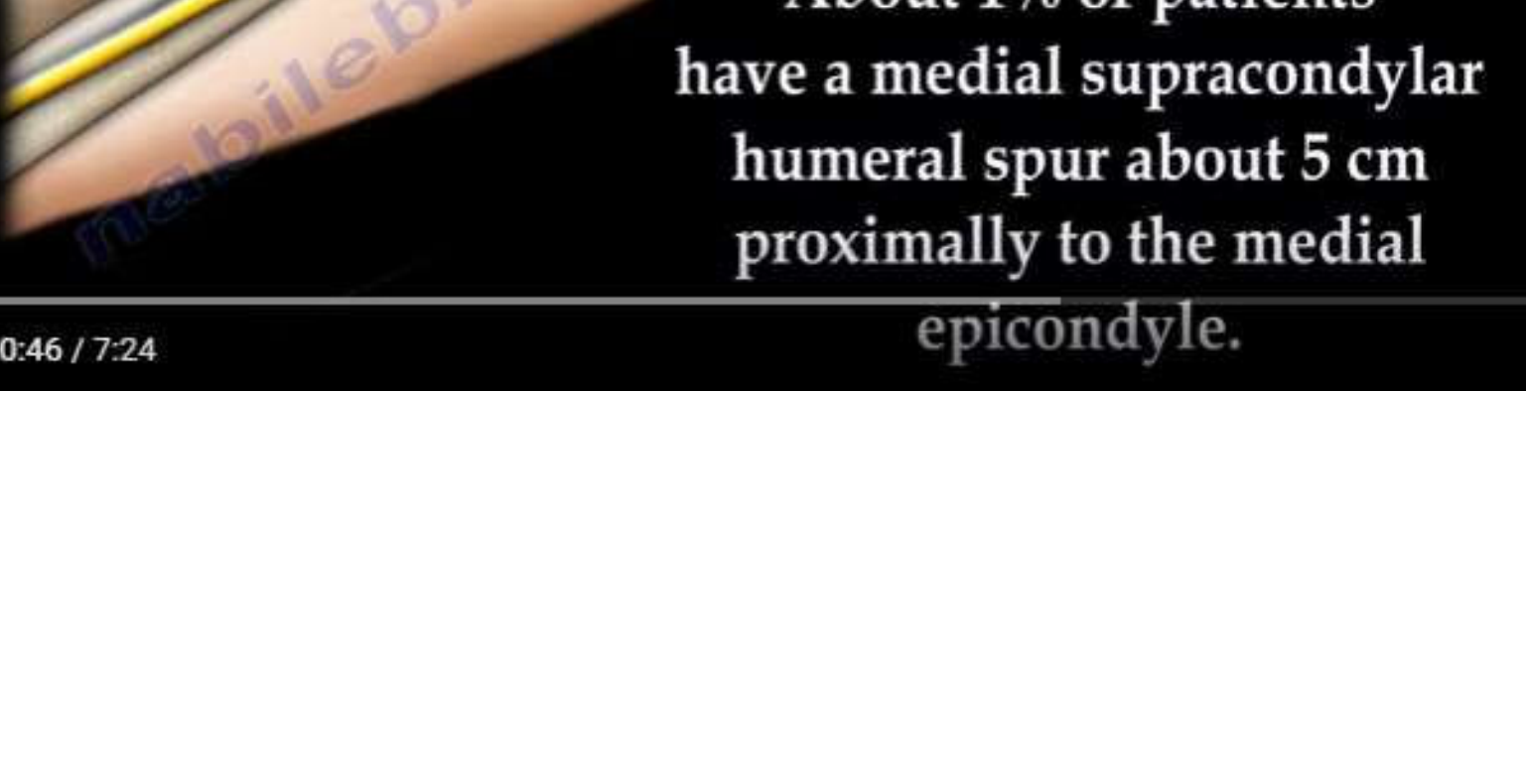
- Descends medial to brachial artery
- Posterior to bicipital aponeurosis
- Anterior to brachialis, seperated by the muscle from the elbow joint

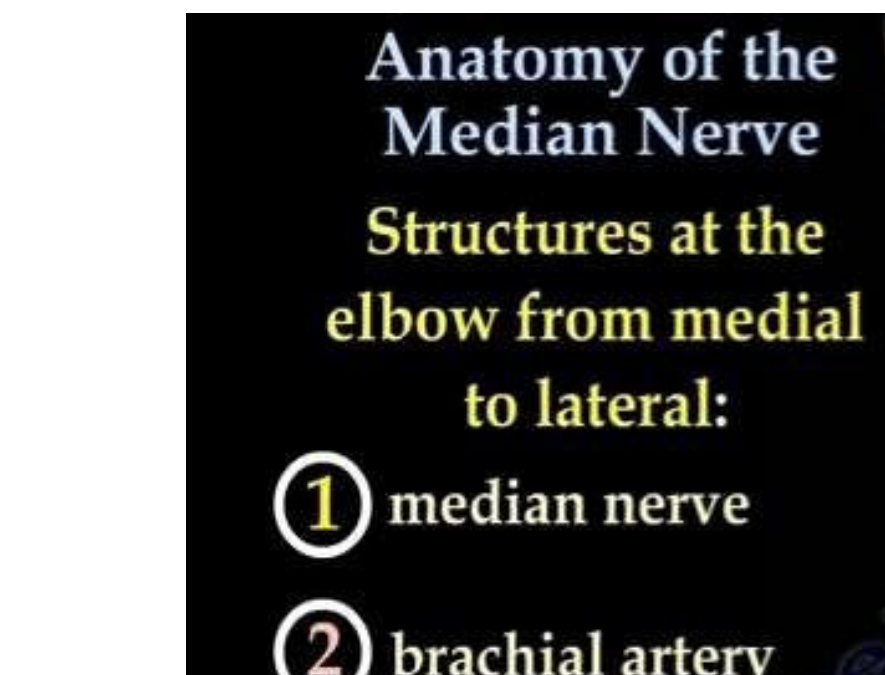


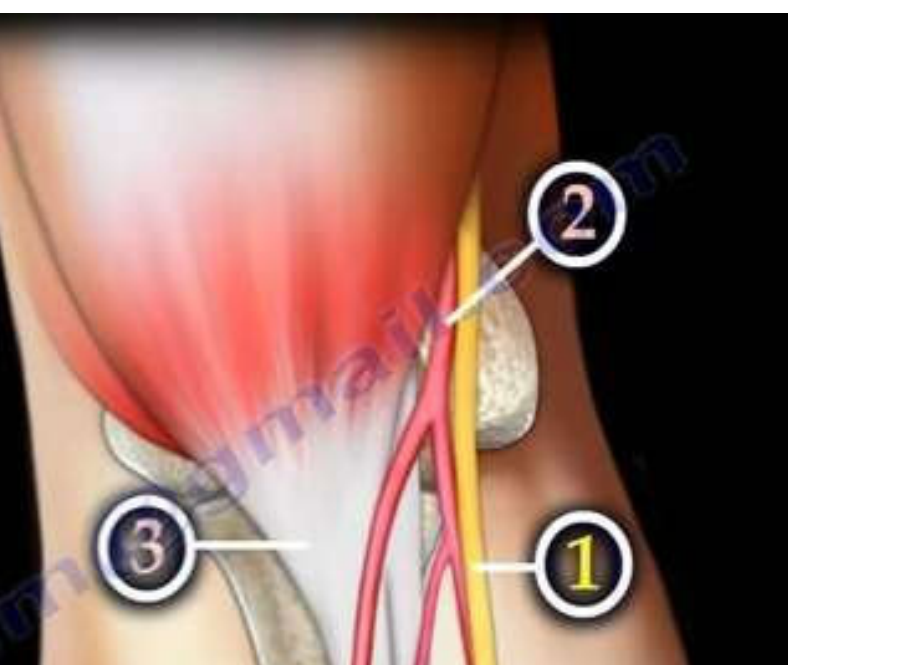


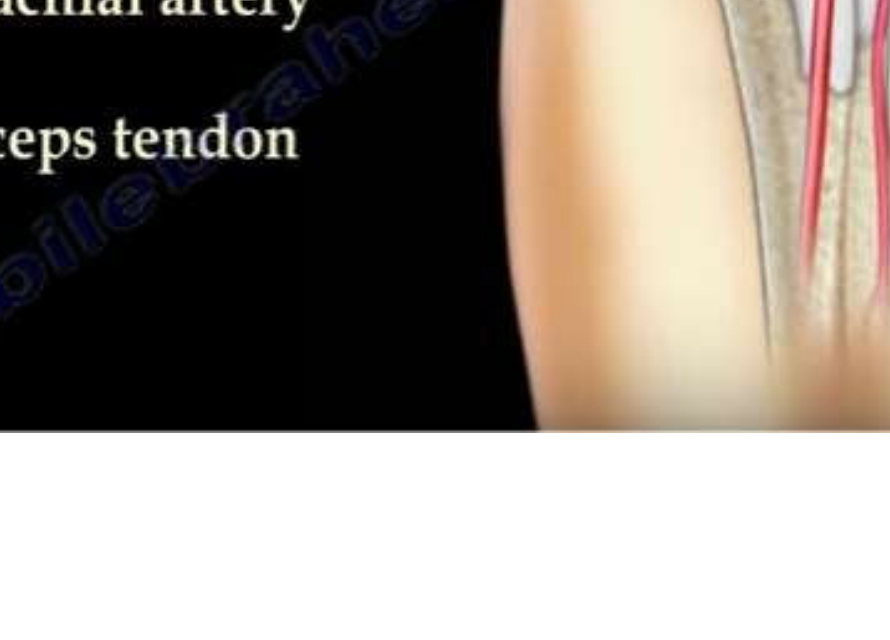
- Leaves the cubital fossa by passing between two heads of pronator teres











In the forearm

- Enters the forearm between the heads of pronator teres
- Crosses the lateral side of ulnar artery from which it is seperated by the deep head of pronator teres
- Gives branch to pronator teres while passing between the two heads

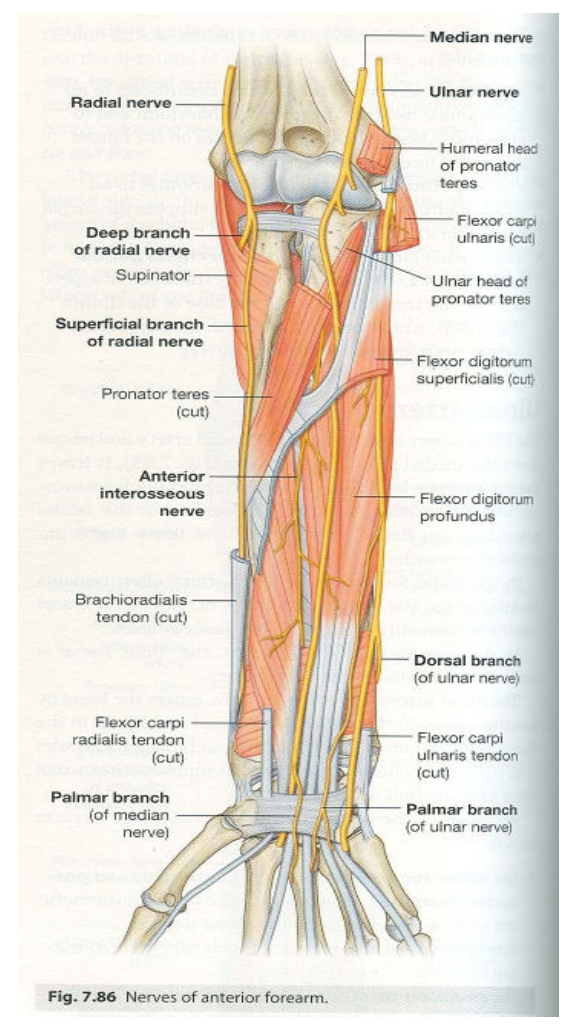


Fig. 7.86 Nerves of anterior forearm.

- Proceeds behind a tendinous ridge between the two heads of Flexor digitorum superficialis and anterior to Flexor digitorum profundus
- Here it is accompanied by median artery, a branch of anterior interosseous artery

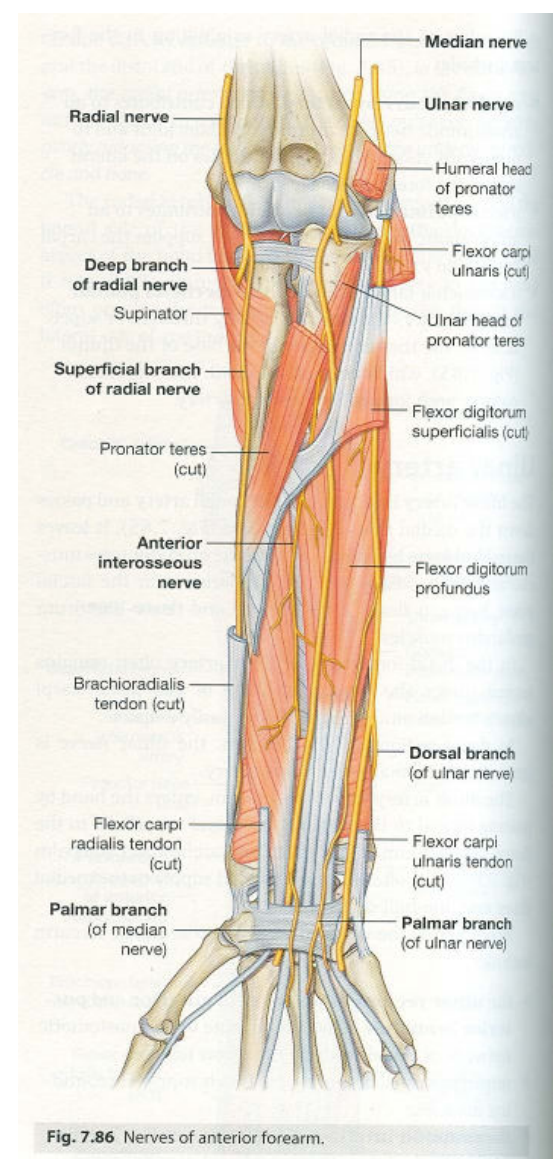
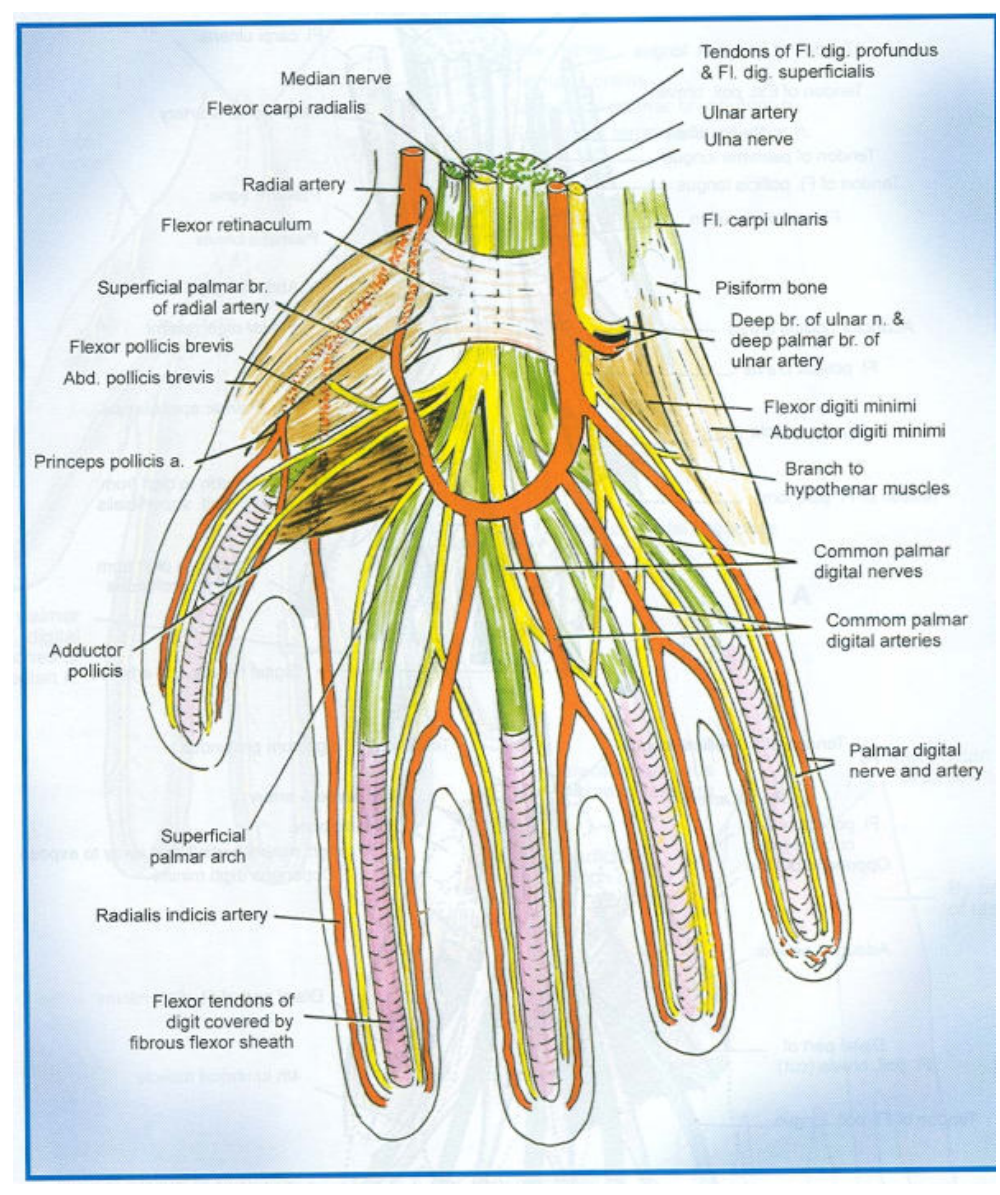
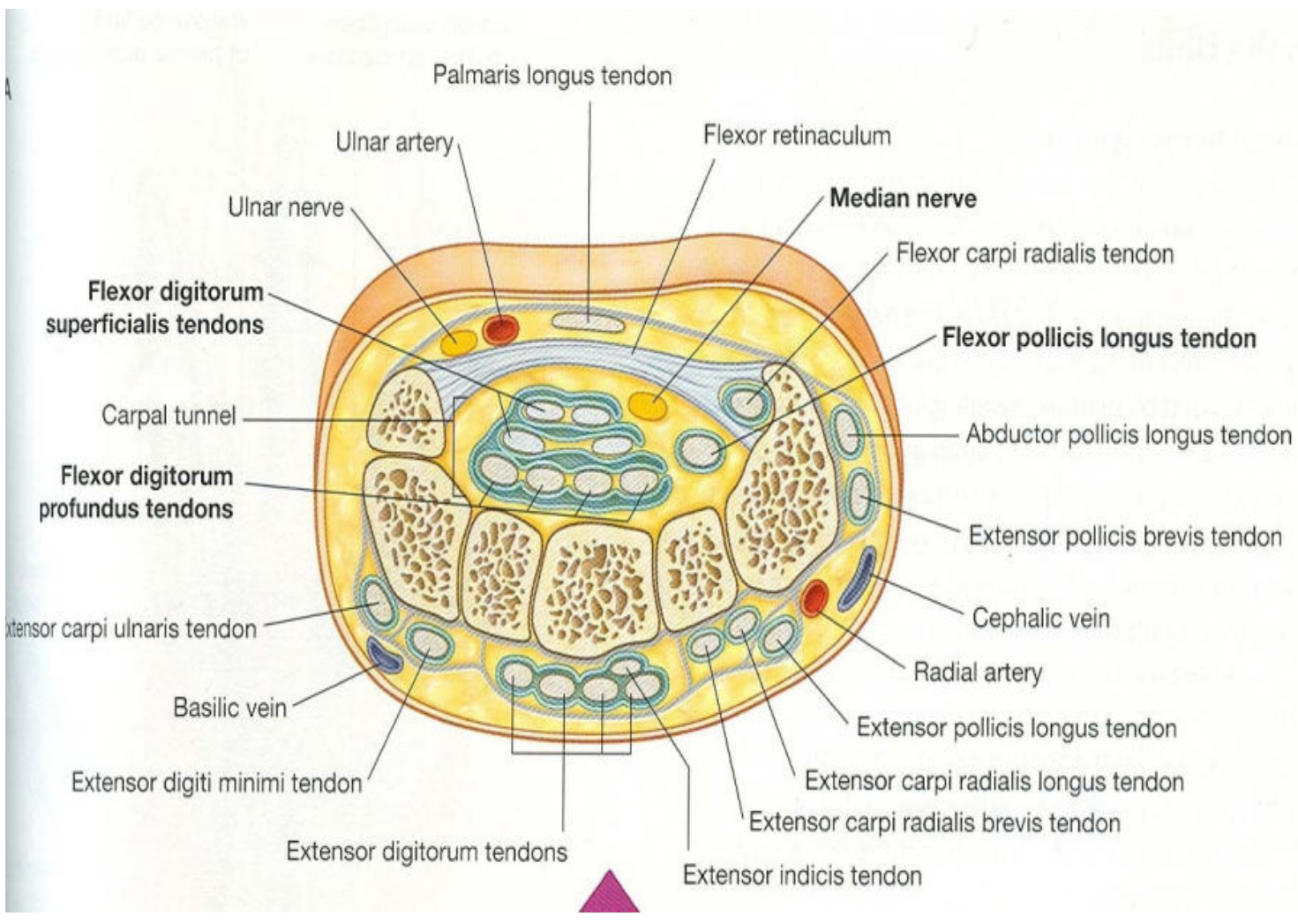


Fig. 7.86 Nerves of anterior forearm.

- About 5 cm proximal to flexor retinaculum it becomes superficial
- Here it lies between the tendon of palmaris longus and the flexor carpi radialis muscle





- Leaves the forearm and enters the palm of the hand by passing through the carpal tunnel deep to flexor retinaculum

Branches in the forearm

- **Muscular branches** to all the muscles in the superficial and intermediate layer of forearm except one (FCU) originate medially from nerve just distal to elbow joint

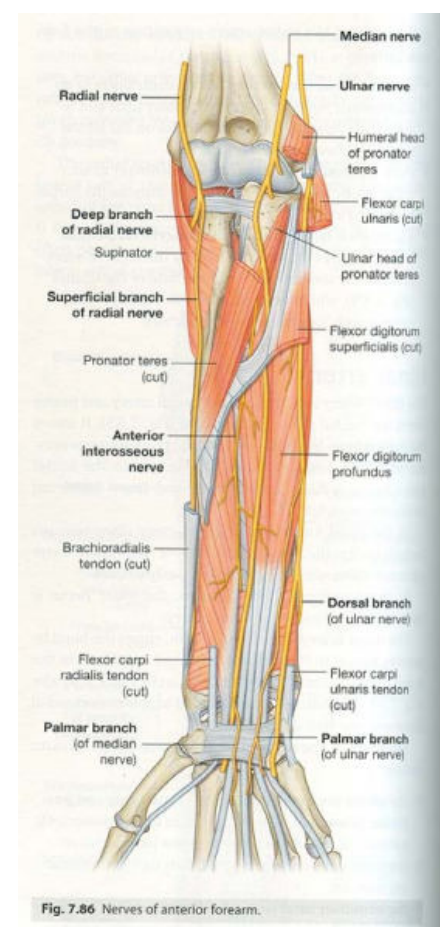


Fig. 7.86 Nerves of anterior forearm.

- ***Anterior interosseous nerve***: originate between two heads of pronator teres
- passes distally down the forearm with the anterior interosseous artery.
- Innervates the muscles of deep layer (FPL, lateral half of FDP (for index and middle finger) and pronator quadratus)

Articular Branches -supply elbow,superior and inferior radio-ulnar joint, interosseous membrane and wrist joint

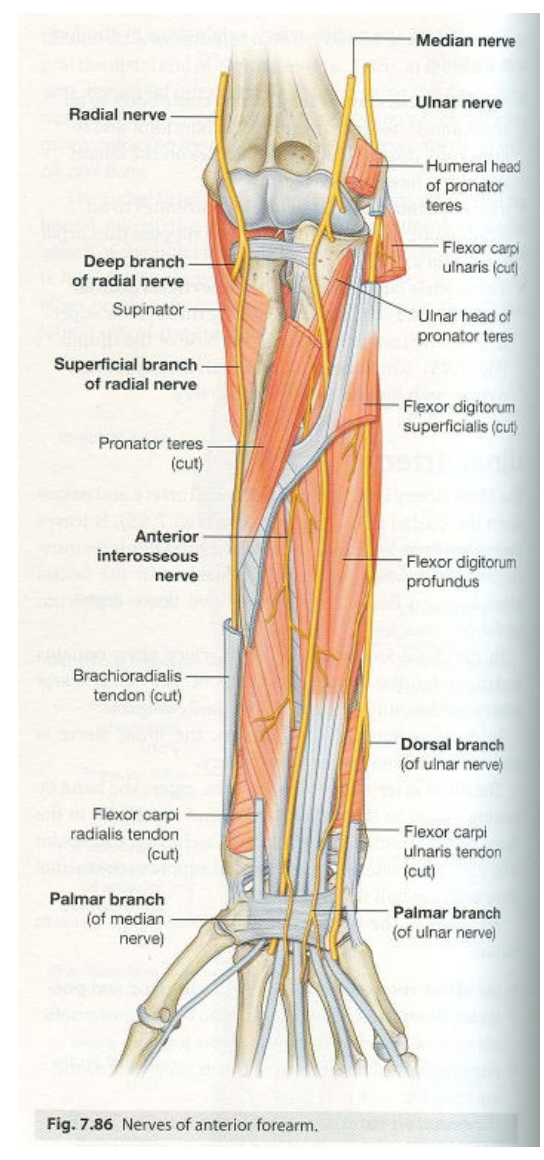
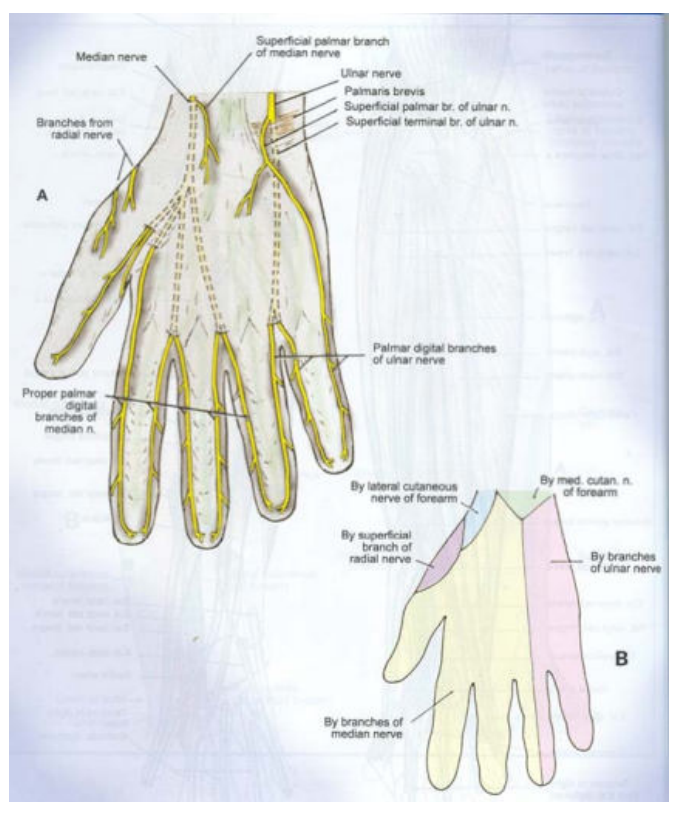
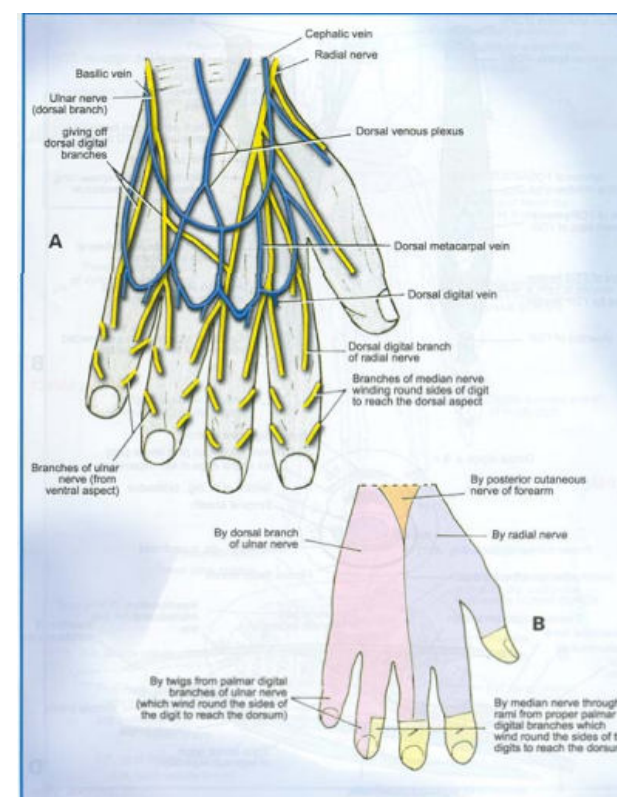


Fig. 7.86 Nerves of anterior forearm.





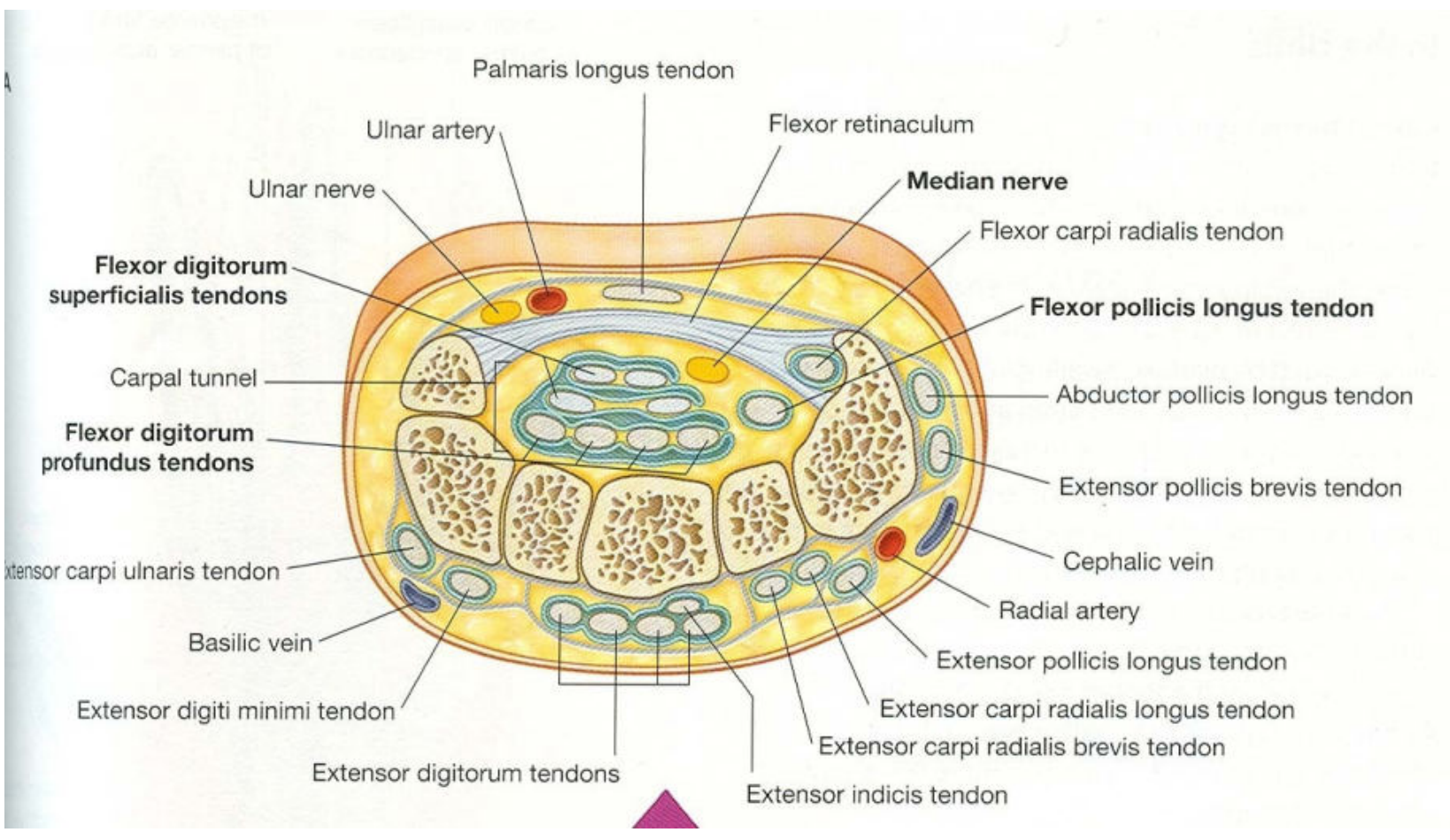
•***Palmar cutaneous branch:*** starts just proximal to flexor retinaculum

- •**Lateral branches** - thenar skin and connecting branch to the lateral cutaneous nerve of fore arm
- •***Medial branches -*** central palmer skin and connecting branch to the palmar cutaneous branch of the ulnar nerve

- ***Communicating branch***: multiple
  - –Arise in the proximal forearm
  - – Pass medialy between FDP & FDS and behind the ulnar artery to join the ulnar nerve

Median nerve in hand

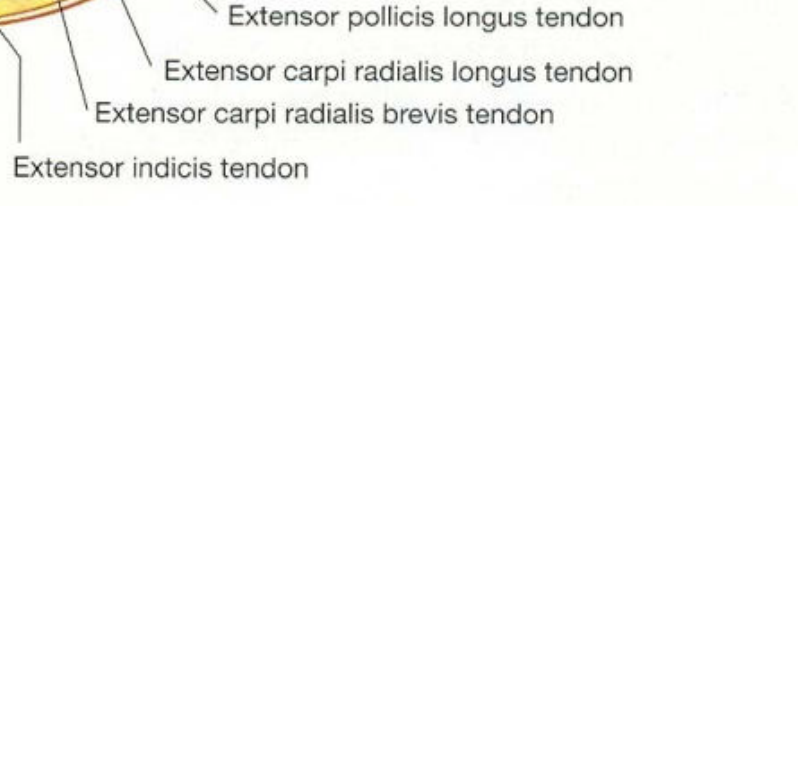
- Proximal to flexor retinaculum it lies between the tendons of FCR & FDS overlapped by palmaris longus
- Distally it lies between the retinaculum and the tendon in the retinaculum
- Site of compression
- Distal to retinaculum nerve enlarges and flattens
- devides in to five or six branches



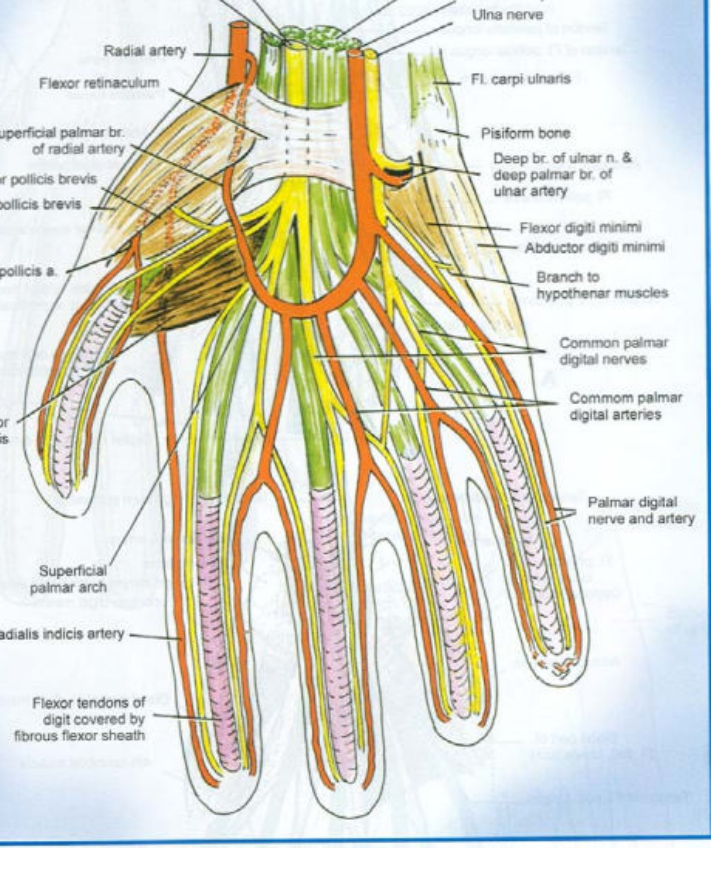
Branches in the hand

Lateral branch: gives

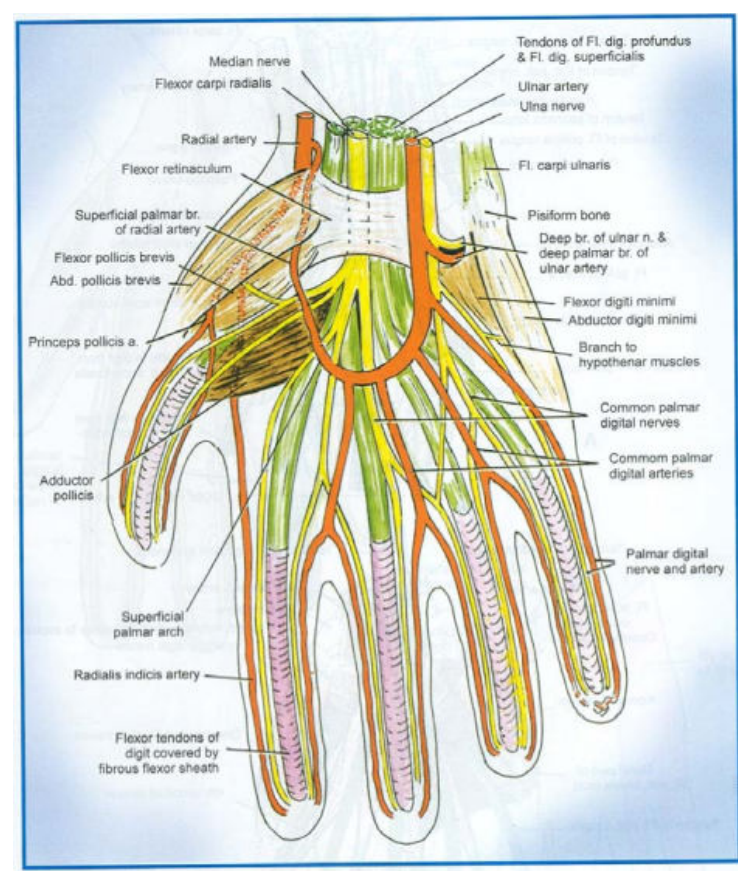
Recurrent muscular branch- short and stout, curls upwards over the distal border of flexor retinaculum and FPL to supply three thenar muscles APB, FPB &OP

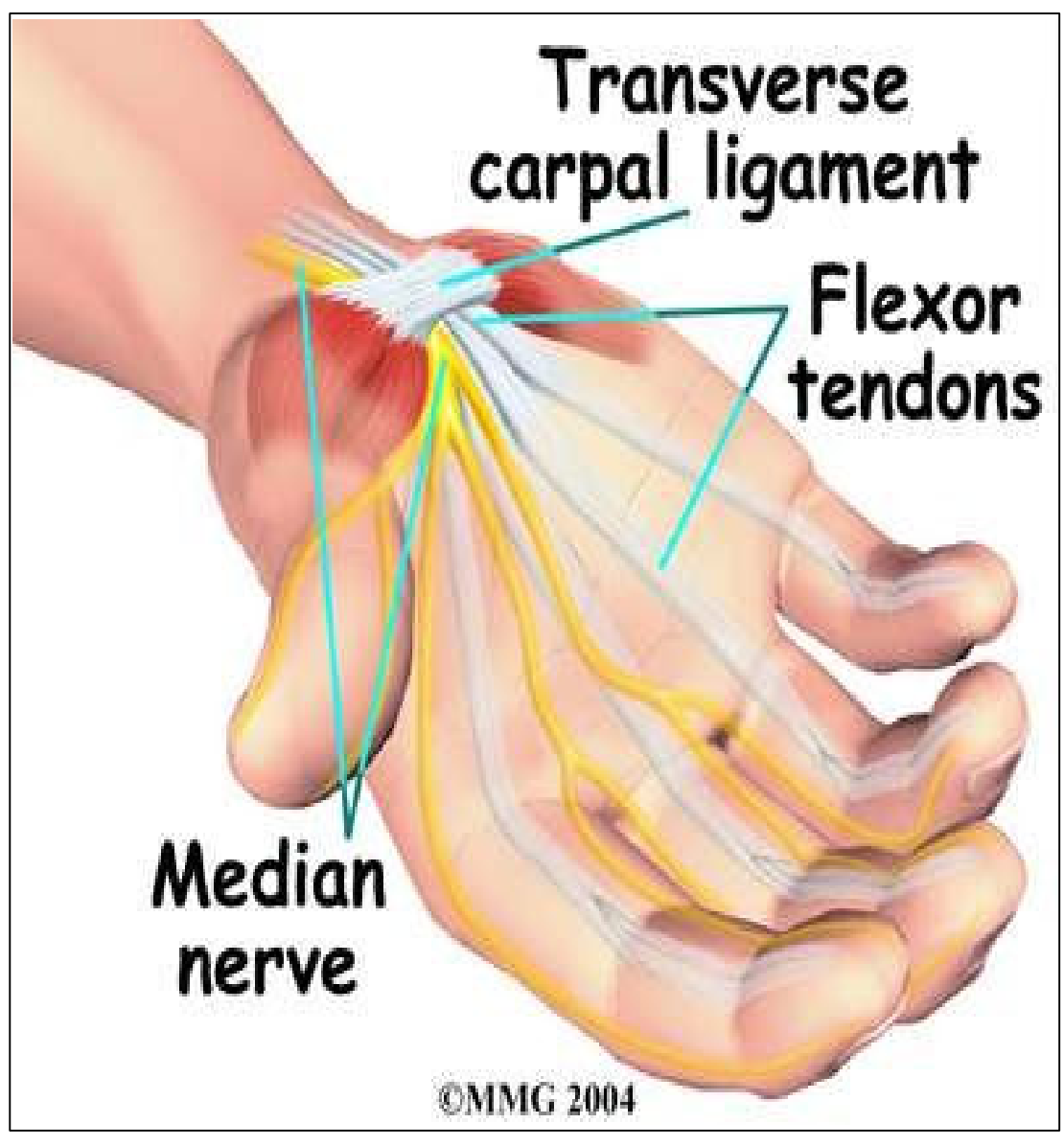


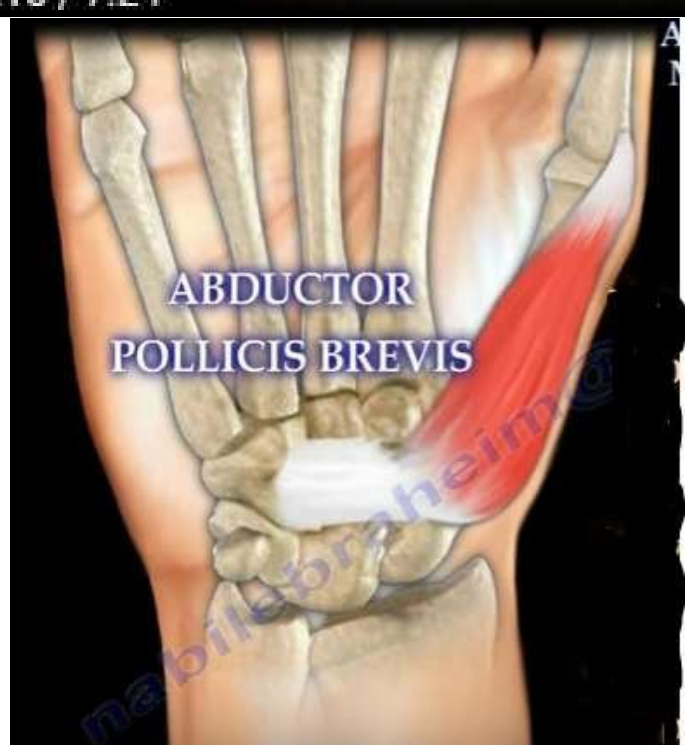
- ***Three palmer digital branches-*** First two supply the skin of the sides of the thumb ,its web and distal part of its dorsal surface.
- Third supplies the skin of the radial side of index finger and **the first lumbrical muscle** through its superficial surface

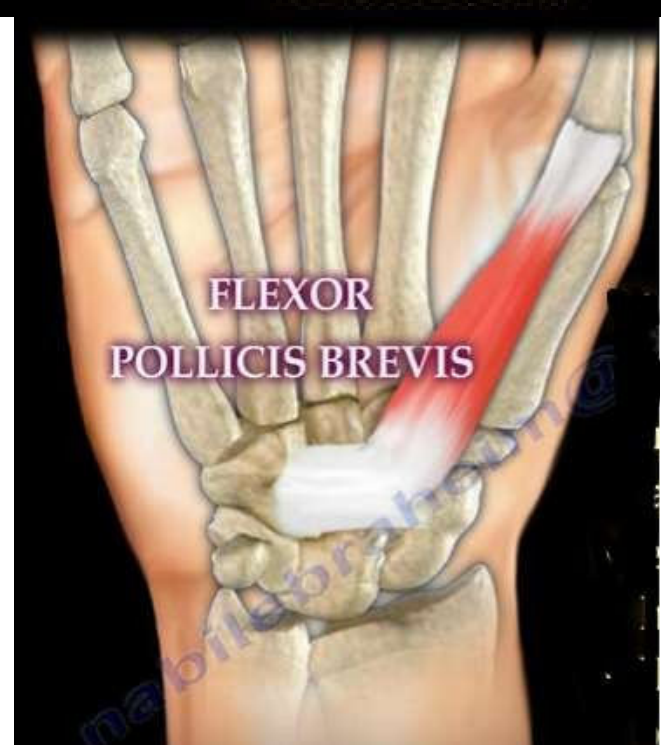


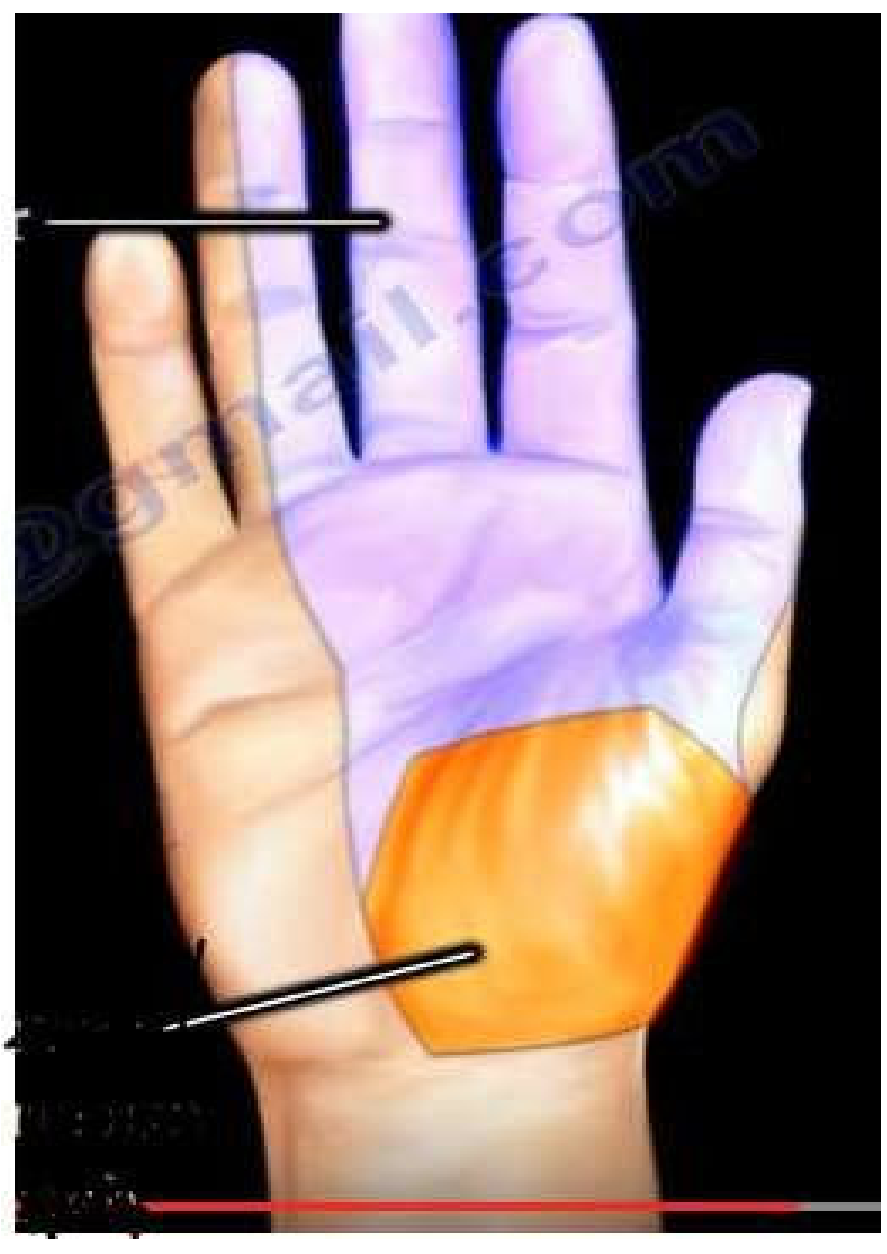
- Medial branch: gives
  - Two common palmar digital branches- lateral and medial which descend to the interdigital clefts between the index, middle and ring finger
  - Each nerve divides again into two to supply adjacent sides of the fingers
  - So in total it supplies skin of lateral three and half fingers including the skin on the dorsal aspect of terminal phalanges









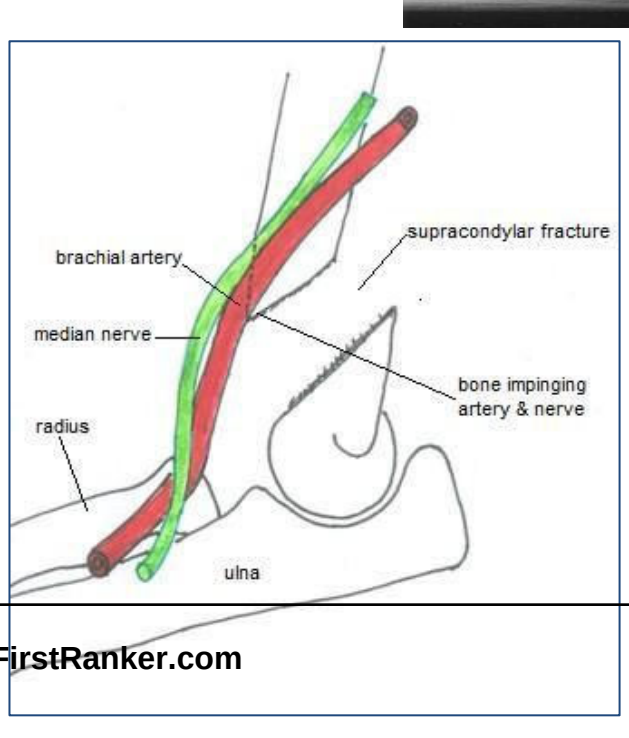


Injuries

- High
- Low

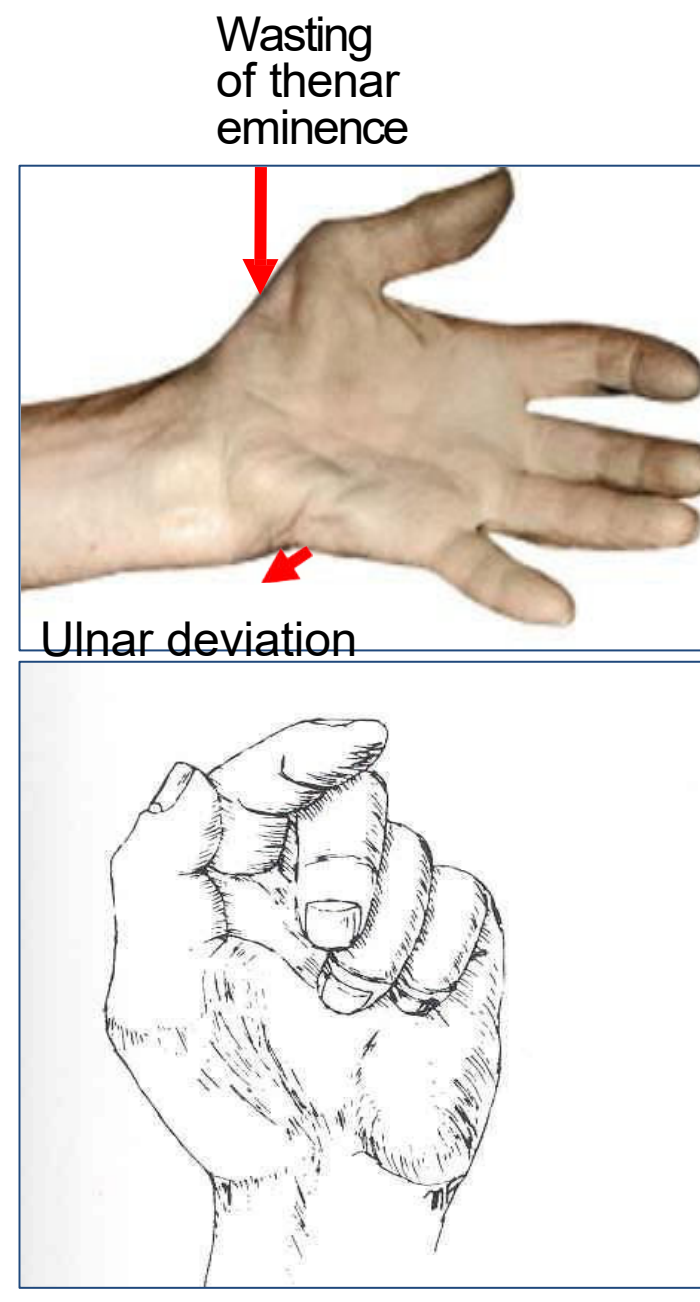
Median Nerve Lesion in Elbow Region – High Lesion

- Damaged in supracondylar fracture of humerus
- Muscles affected are:
- Pronator muscles of the forearm
- All long flexors of wrist and fingers except FCU and medial half of FDP



Motor Effects:

- Loss of **pronation**. Hand is kept in supine position
- Wrist shows weak flexion, and ulnar deviation
- Loss of **flexion** on interphalangeal joints of the index and middle fingers
- **Weak** flexion of ring and little finger
- **Thumb** is adducted and laterally rotated, with **loss of flexion** of terminal phalanx and loss of opposition
- **Wasting** of thenar eminence
- Hand looks flattened and ***"apelike",*** and presents an inability to flex three most radial digits when asked to make a fist.

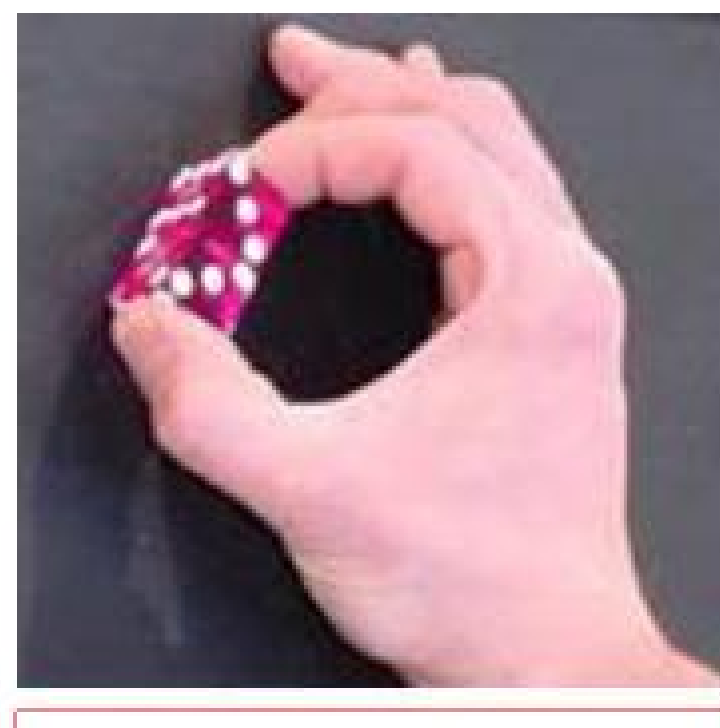


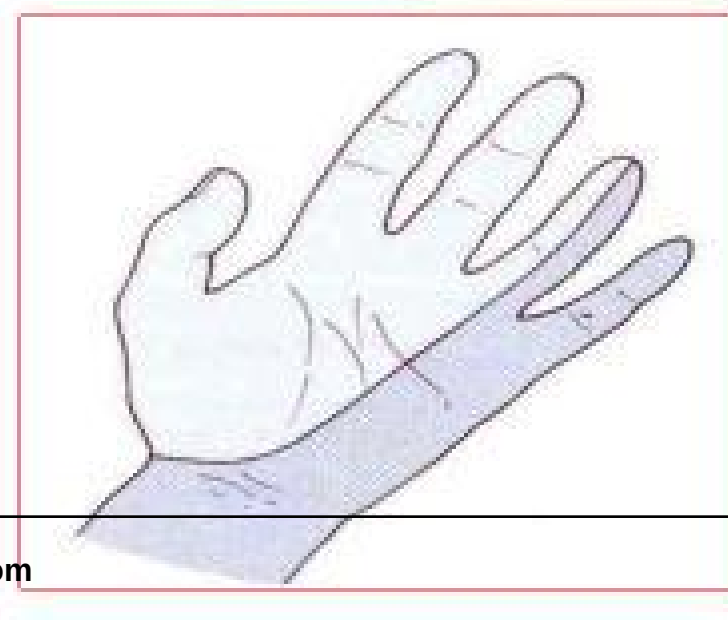
- Sensory Effects: Loss of sensation from:
  - The radial side of the palm
  - Palmar aspect of the lateral 3½ fingers
  - Distal part of the dorsal surface of the lateral 3½ fingers
- Trophic Changes:
  - Dry and scaly skin
  - Easily cracking nails
  - Atrophy of the pulp of fingers

Median Nerve Lesion at Wrist

- Often injured by **penetrating wounds** (stab wounds or broken glass) of the forearm.
- **Motor:**
- Thenar muscles are paralyzed and atrophy in time so **thenar eminence becomes flattened**
- **Opposition & abduction of thumb are lost**, and thumb and lateral two fingers are arrested in adduction & hyperextension position .
- "***Apelike hand***"
- **Sensory** & **trophic** changes are same as in elbow region injuries

- The most serious disability of median nerve injuries is:
- **Loss of opposition of the thumb**. The delicate pincer-like action is not possible
- **Loss of sensation** from thumb and lateral 3½ fingers & lateral ⅔ of the palm





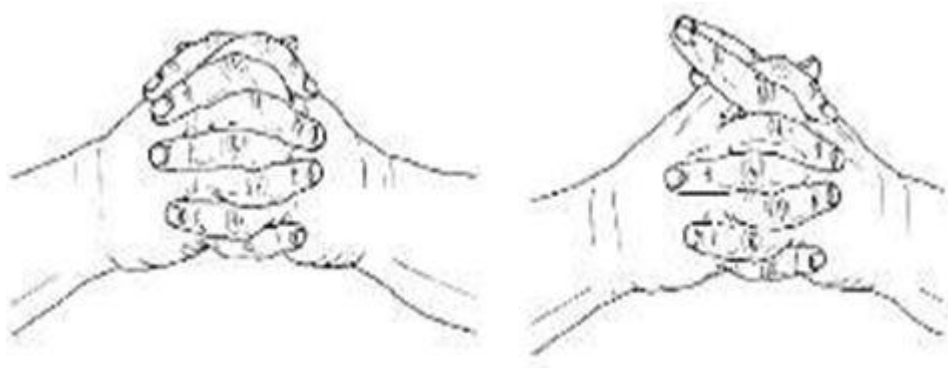
Examination

- Flexor pollicis longus : Tested by holding thumb at its base and patient asked to flex the terminal phalanx

Examination

- Flexor digitorum superficialis & profundus (Ochsner's clasping test)

  - Patient is asked to clasp the hands , the index finger of affected side fails to flex



Ochsner's Clasping Test

Examination

- Flexor Carpi radialis : Hand deviates to the ulnar side when flexed against resistance

Examination

- Muscles of Thenar eminance:

  -abductor pollicis brevis (Pen test)

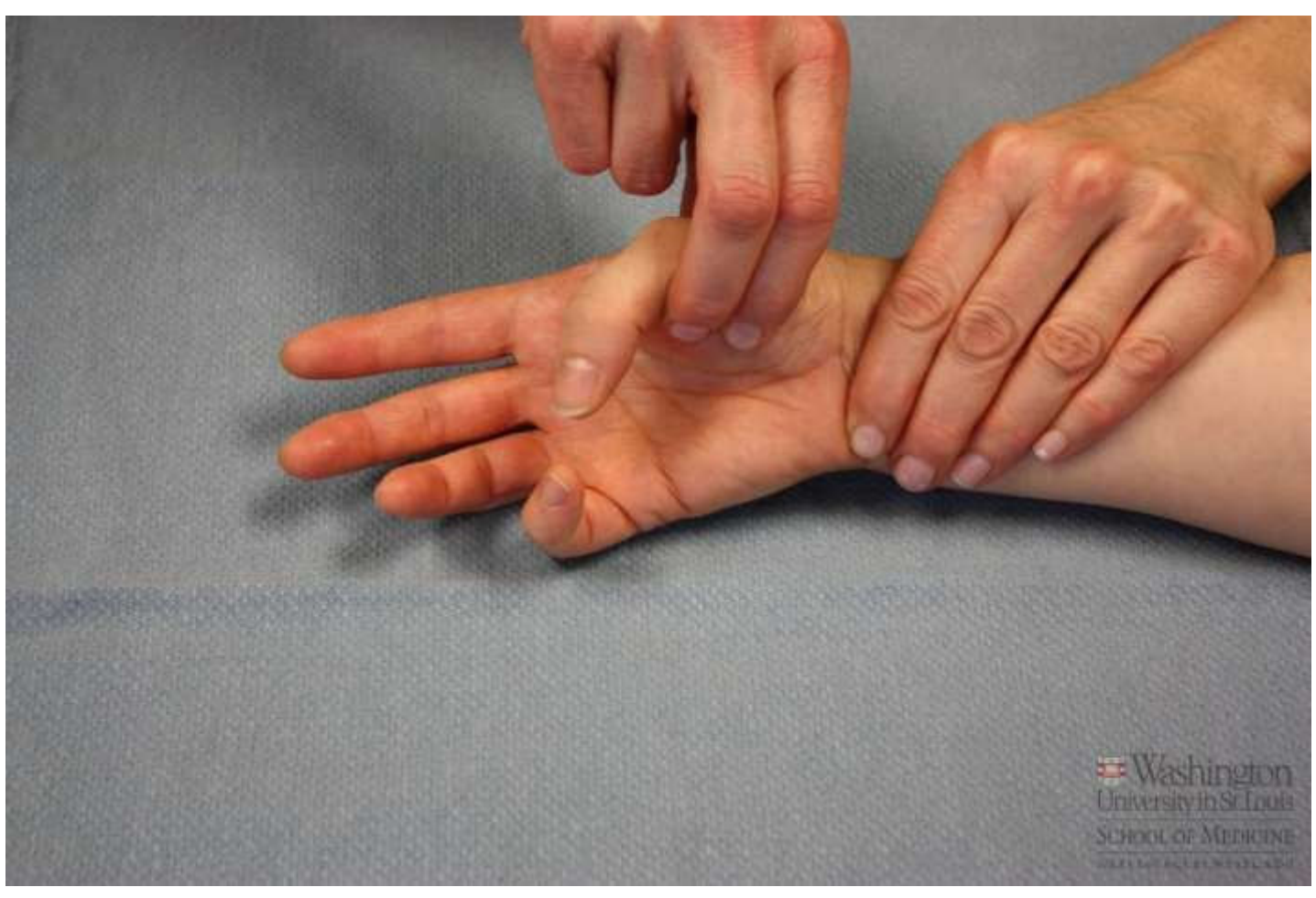
  - hand laid flat on the table

  -pen held above the palm and the patient is asked to touch the pen with his thumb

Examination

- opponens pollicis : brings the tip of the thumb towards the tips of other fingers

Opponens pollices

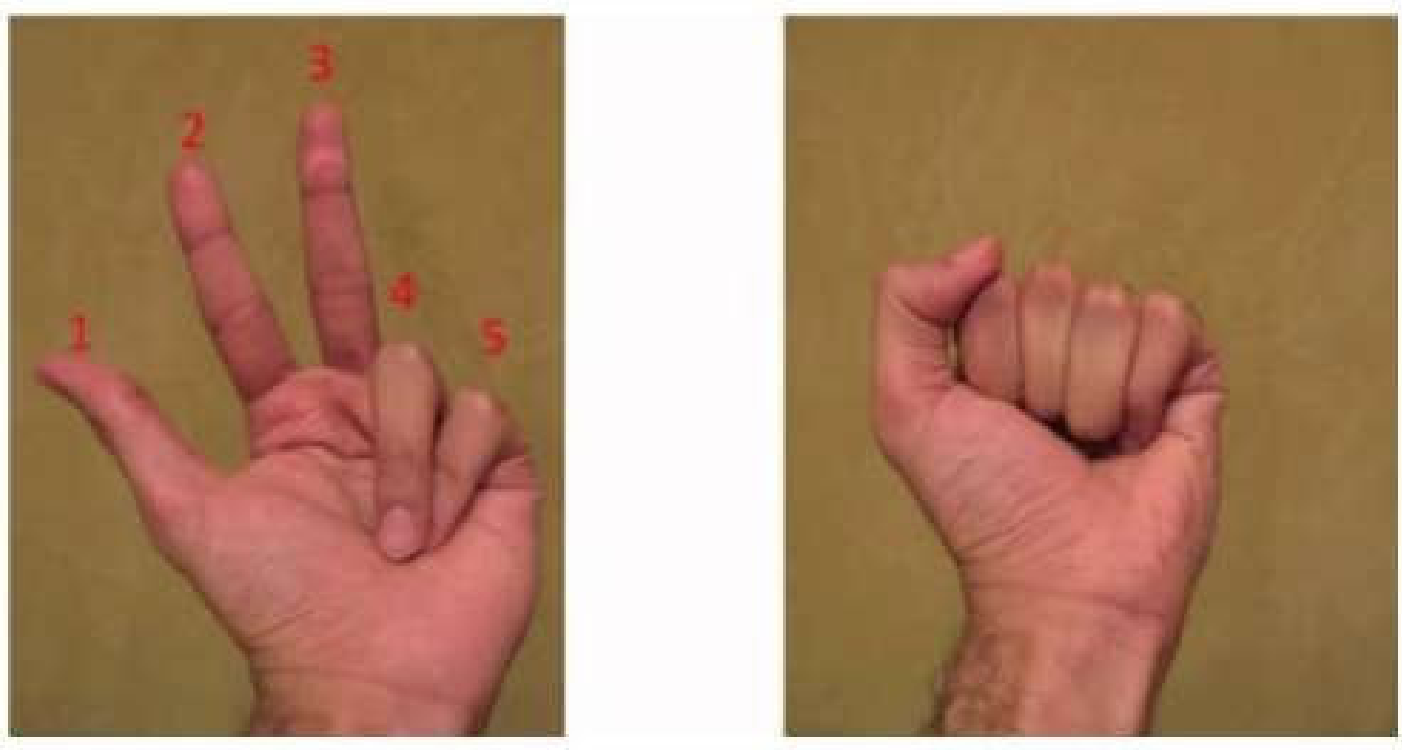


Benedict Sign

Lesion to upper arm area, just proximal to where motor branches of forearm flexors originate, is diagnosed if the patient is unable to make a fist.

More specifically, the patient's index and middle finger cannot flex at the MCP joint, while the thumb usually is unable to oppose. This is known as **hand of benediction** or **Pope's blessing hand**.

Benedict Sign



Benedict sign

Kiloh-Nevin syndrome and OKSign

The Anterior Interosseus Nerve (AIN) syndrome

Patients suffering from this syndrome have impaired distal interphalangeal joint, because of which they are unable to pinch anything or make and "OK" sign with their index finger and thumb. The syndrome can either happen from **pinched nerve, or even dislocation of the elbow**.

Kiloh-Nevin syndrome OKSign

OK SIGN

After history of stab wound on front of forearm , patient presents with impairment of the pincer movement and is having difficulty picking up a small item, such as a coin, from a flat surface. Which of the following statement is correct ?
A Injury to anterior interroseous nerve of median nerve
B injury to main median nerve as pincer movement involves FDS
C Injury to ulnar nerve
D. Injury to median nerve at level of wrist

Ape hand deformity

In "Ape hand deformity", the thenar muscles become paralyzed due to impingement and are subsequently flattened. it is seen only after the thenar muscles have atrophied. While the adductor pollicis remains intact, the flattening of the muscles causes the thumb to become adducted and laterally rotated. The opponens pollicis causes the thumb to flex and rotate medially, leaving the thumb unable to oppose.

Ape Thumb

Median nerve Compression Syndromes

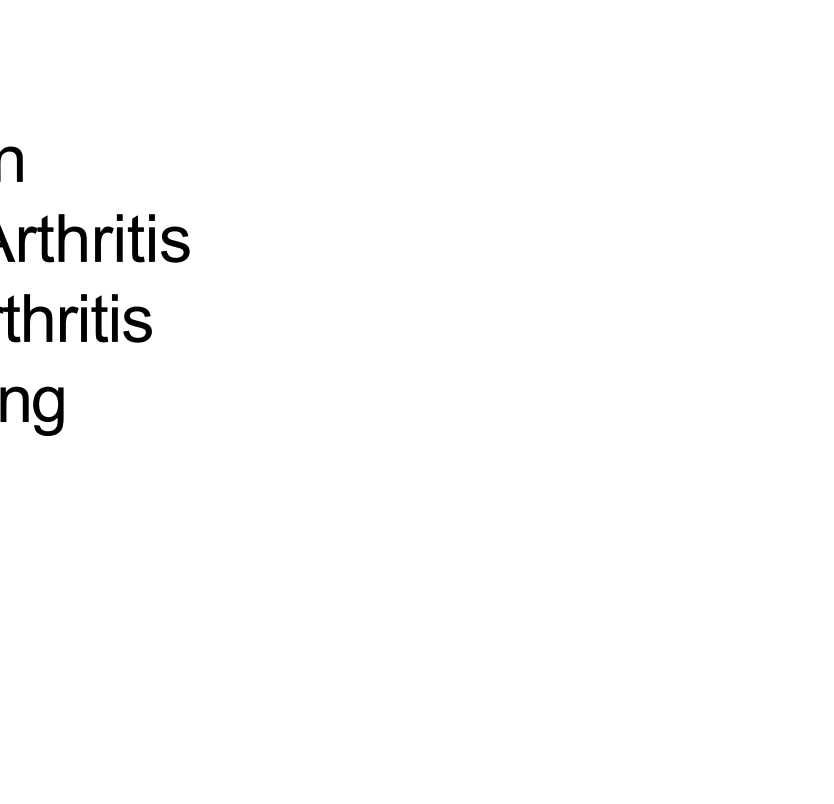
- Carpal Tunnel –nerve may be compressed due to inflammatory condition of ulnar bursa or anterior dislocation of lunate bone
- Pronator
- Interosseous

Carpal Tunnel Syndrome

- Compressive neuropathy as the nerve passes through the Carpal Tunnel
- Causes:
  - Idiopathic : Most common
  - Inflammatory : Rheumatoid Arthritis
    : Wrist osteoarthritis
  - Post traumatic : Bone thickening
  - Endocrine : Myxoedema
    : Acromegaly
  - Pregnancy
  - Gout
  - Repetitive wrist movts: Typists & Computer users

Carpal Tunnel Syndrome

- The commonest neurological problem associated with median nerve is compression beneath flexor retinaculum at wrist.
- Motor: Weak motor function of thumb, index & middle finger
- Sensory: **Burning pain** or 'pins and needles' along distribution of median nerve to lateral 3½ fingers



No sensory changes over palm as palmer cutaneous branch is given before median nerve enters carpal tunnel.

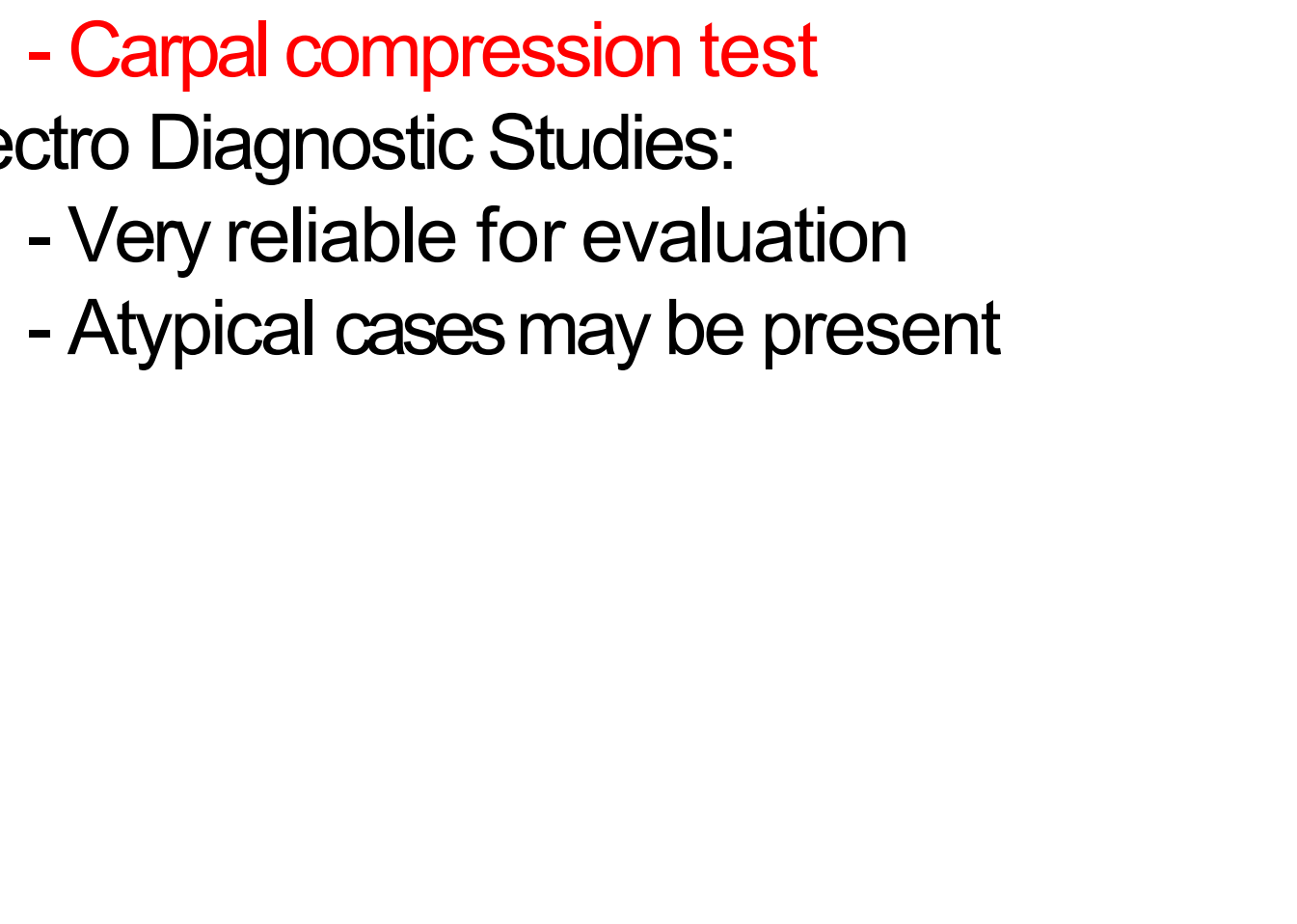
Symptoms

- Hand and wrist Pain
- Paraesthesia
- Hypoaesthsia
- Sparing of Palmar cutaneous branch supply
- Patient wakes at night with burning or aching pain and shakes the hand to obtain relief and restore sensation
- Aggravated by elevation of hand
- Thenar atrophy and weakness of thumb opposition and abduction may develop late

Diagnosis

- History
- Clinical examination:
  - Thenar wasting
  - Phalen's sign
  - Tinel's sign
  - Carpal compression test
- Electro Diagnostic Studies:
  - Very reliable for evaluation
  - Atypical cases may be present

Thenar atrophy



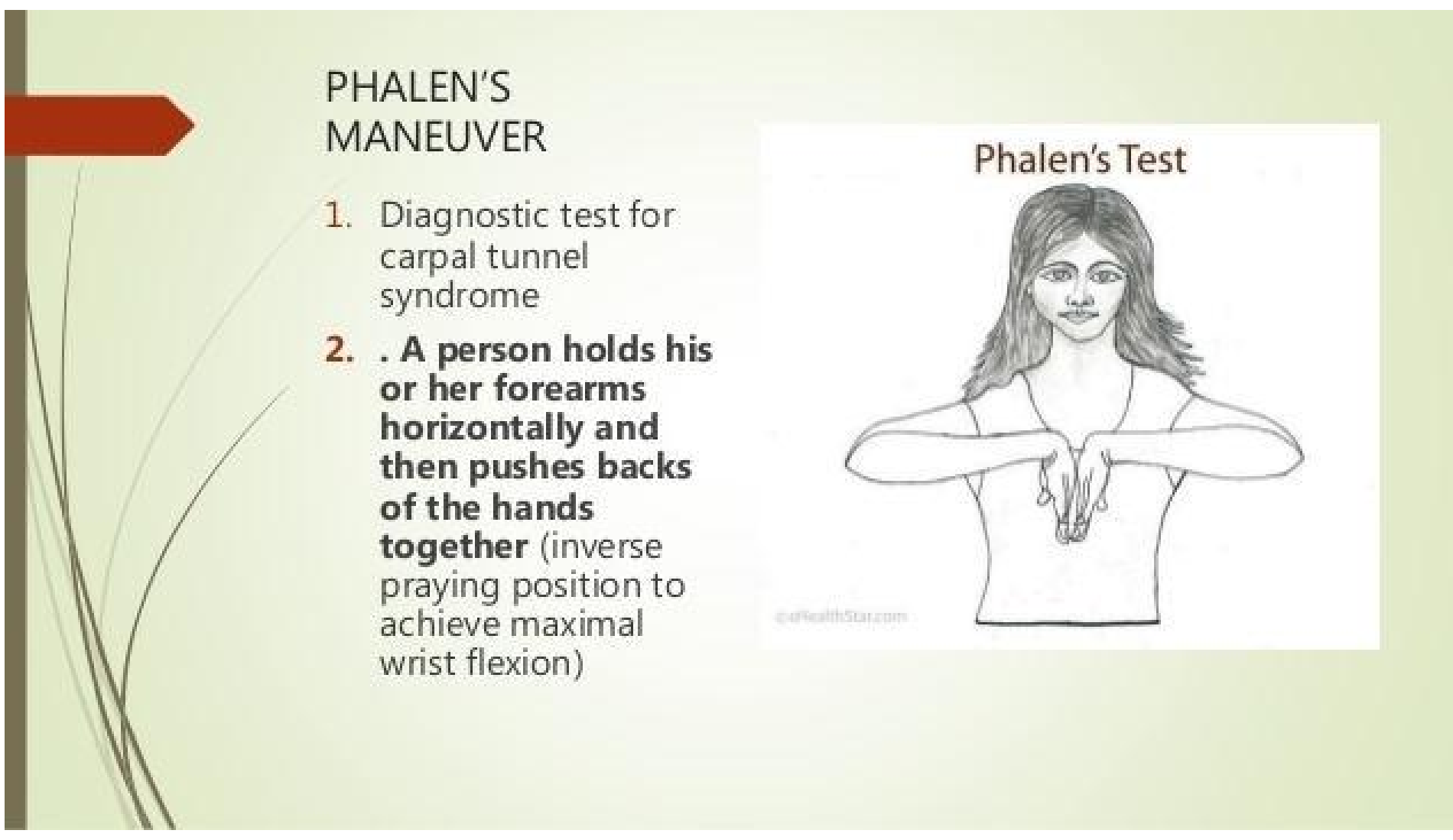
Phalen test

A positive Phalen test is highly suggestive of carpal tunnel syndrome.

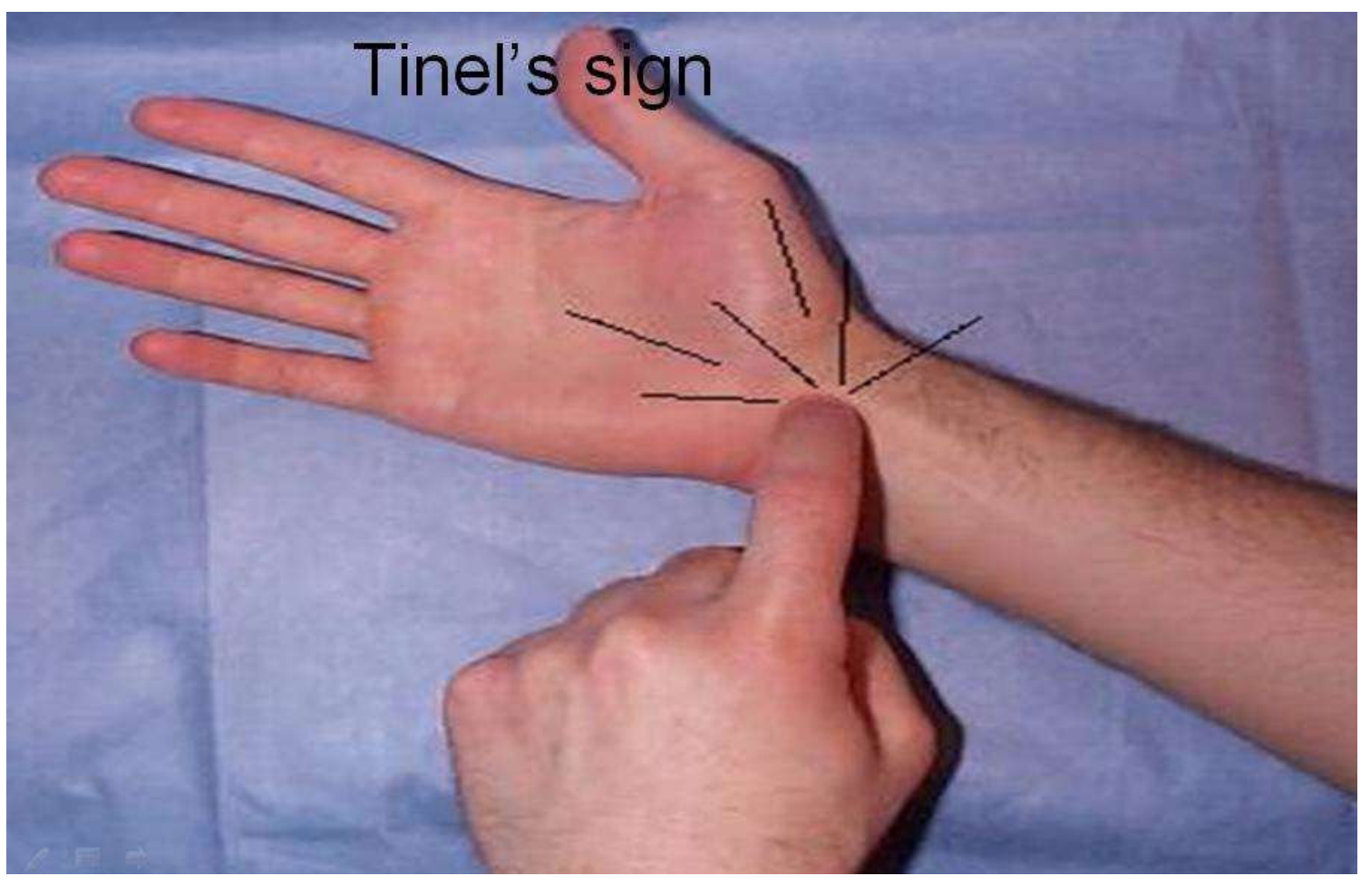
Phalen's test is performed by having patients place their wrists in complete unforced **flexion** for at least 30 seconds.

If the **median** nerve is **entrapped** at the wrist, this maneuver will reproduce the symptoms of carpal tunnel syndrome.

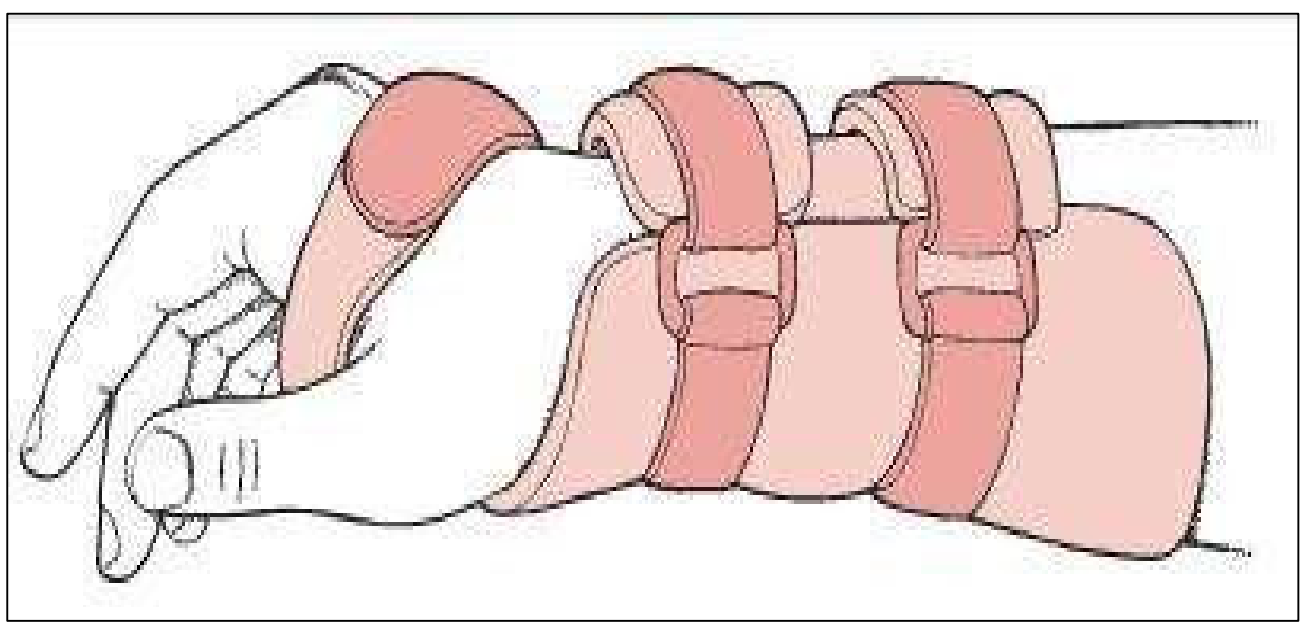
Phalen's maneuver

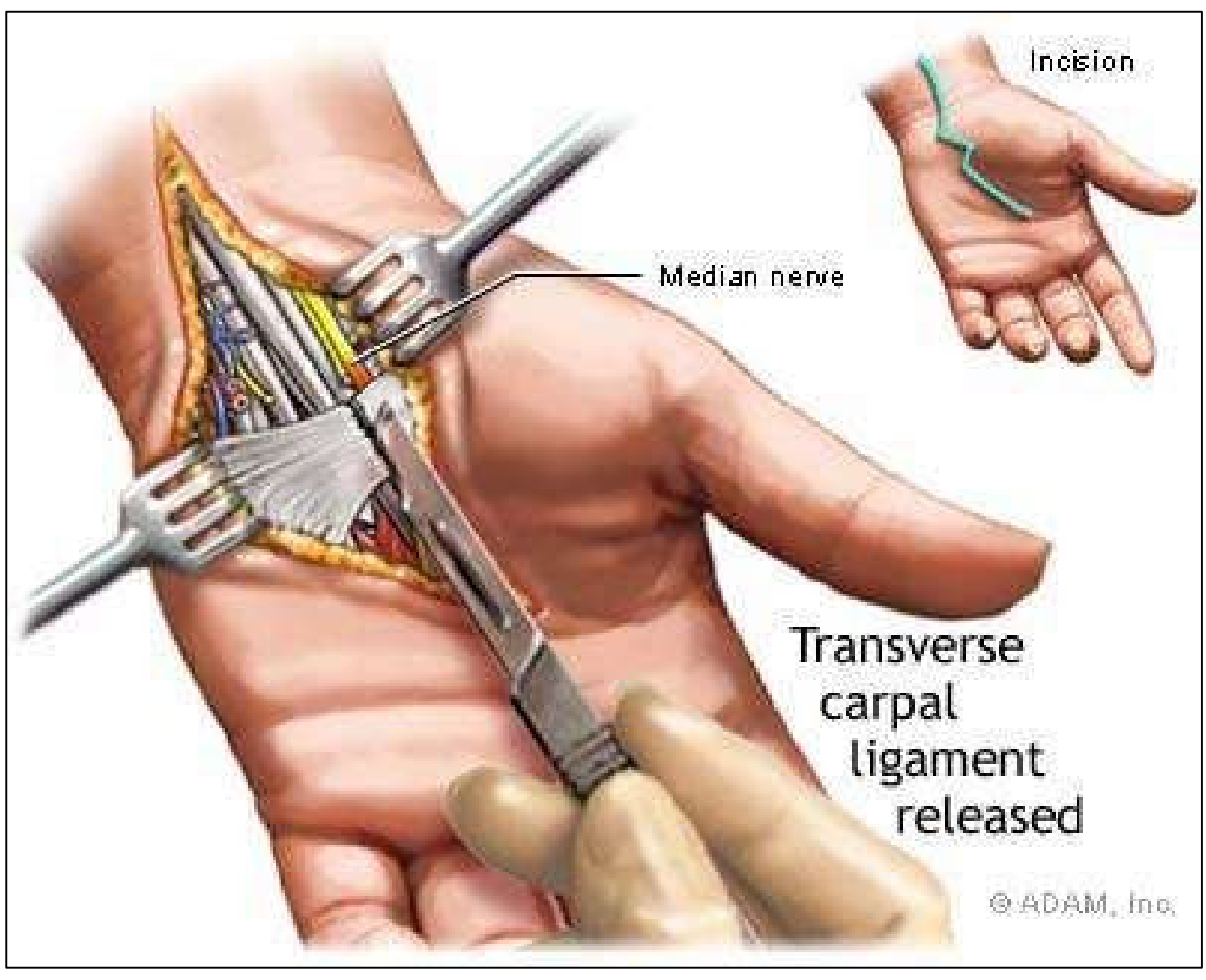


Tinel's Sign



Carpal Compression test/ Durkan's test





Pronator teres syndrome

- High Compression neuropathy
- It is rare compared to CTS and AIS

Pronator teres syndrome

The characteristic physical finding is tenderness over the proximal median nerve, which is aggravated by resisted pronation of the forearm.

The **flexor pollicis longus and FDP of the index finger** are weak, leading to impairment of the **pincer movement**. This reflects involvement of the anterior interosseous nerve.

Sensory changes may be found in the **first three fingers as well as in the palm**, indicating impairment of the median nerve proximal to the flexor retinaculum.

Symptoms & signs

- Symptoms are similar to those of carpal tunnel syndrome
- Sensory disturbances
  - Thumb & Index > Middle finger
- Night pain is unusual and forearm pain is more common
- Hand numbness on gripping
- Phalen's test negative
- Double crush phenomena

- Symptoms provoked by resisted elbow flexion with forearm supinated (tightening of bicipital aponeurosis)

- By resisted forearm pronation with the elbow extended (pronator tension)