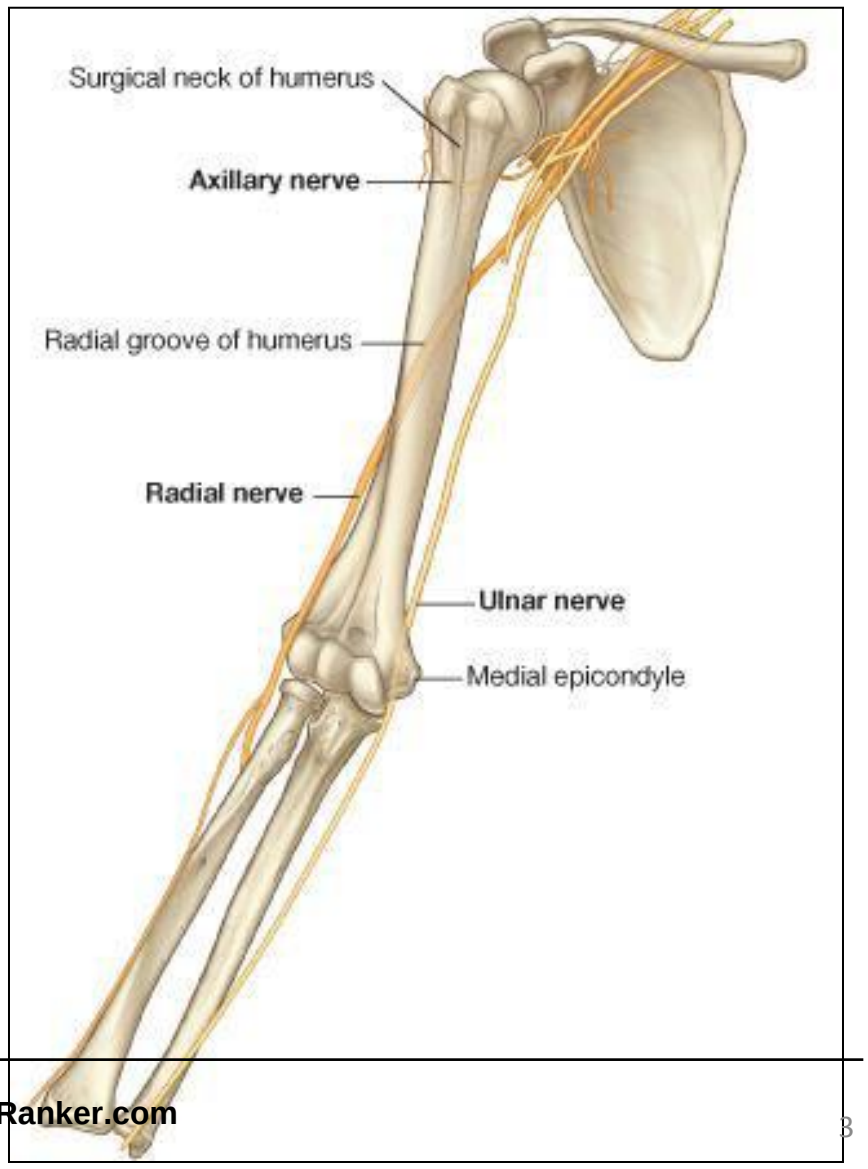
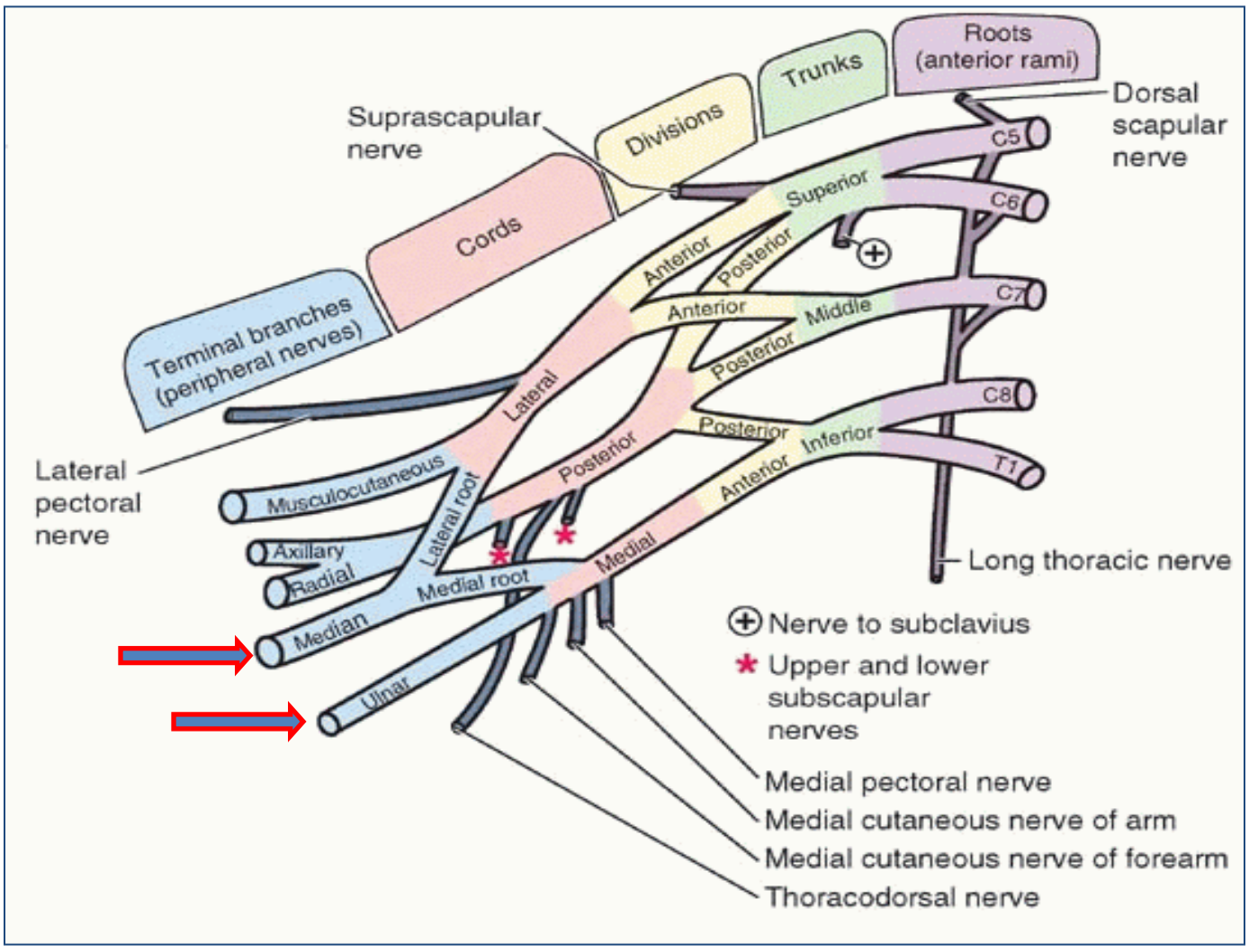
Objectives

- Origin, course & relation of median & ulnar nerves.
- Motor & sensory distribution
- Carpal tunnel syndrome
- Claw hand
- Motor & sensory effects in cases of lesion of median & ulnar nerves
- Clinical signs/tests

Median & Ulnar nerves



Ulnar & Median nerves - Brachial plexus



Median Nerve

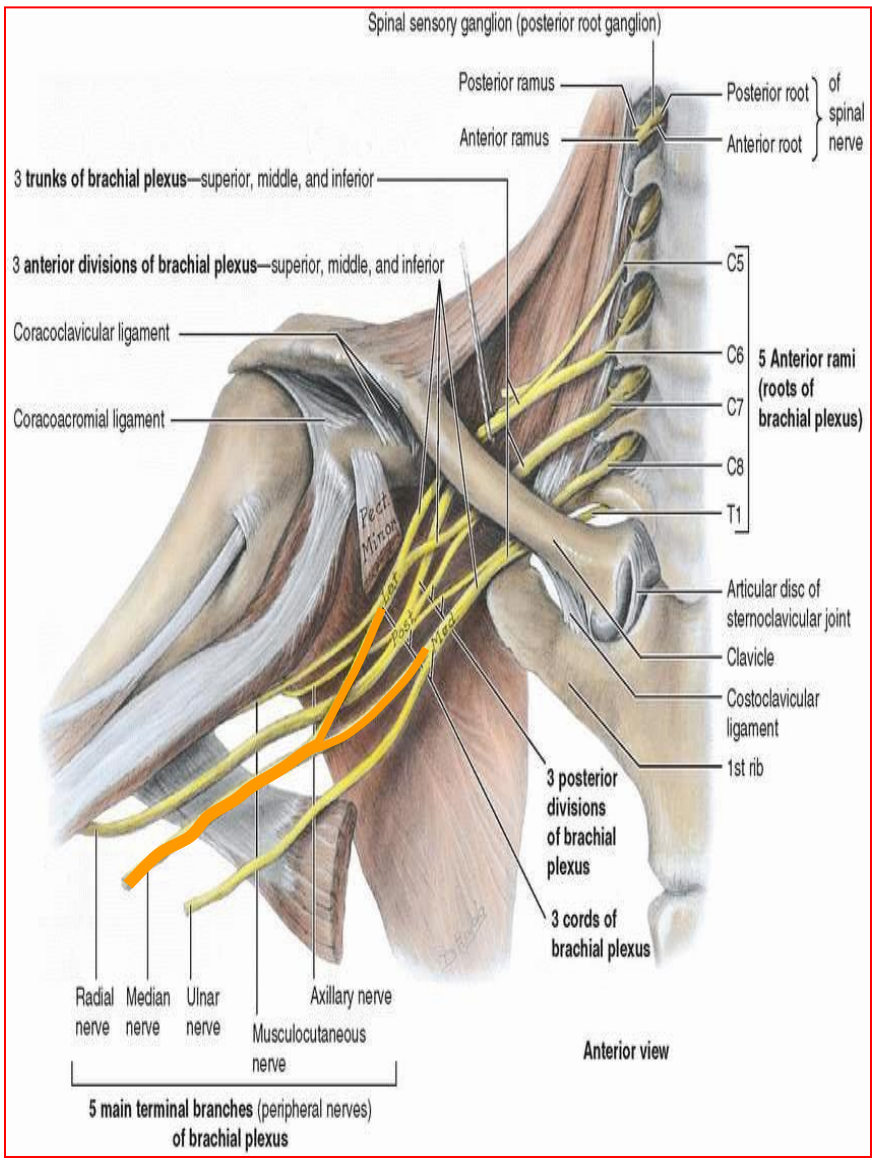
Origin : (C5,6,7, & 8, T1)

- median nerve is formed
- by union of **lateral and medial roots**
- originating from **lateral and medial cords** of brachial plexus.
- **anterior to third part of axillary artery**

Median Nerve

Origin : C5,C6,C7 & C8, T1

- median nerve is formed **anterior to third part of axillary artery** by union of **lateral and medial roots** originating from **lateral and medial cords** of brachial plexus.

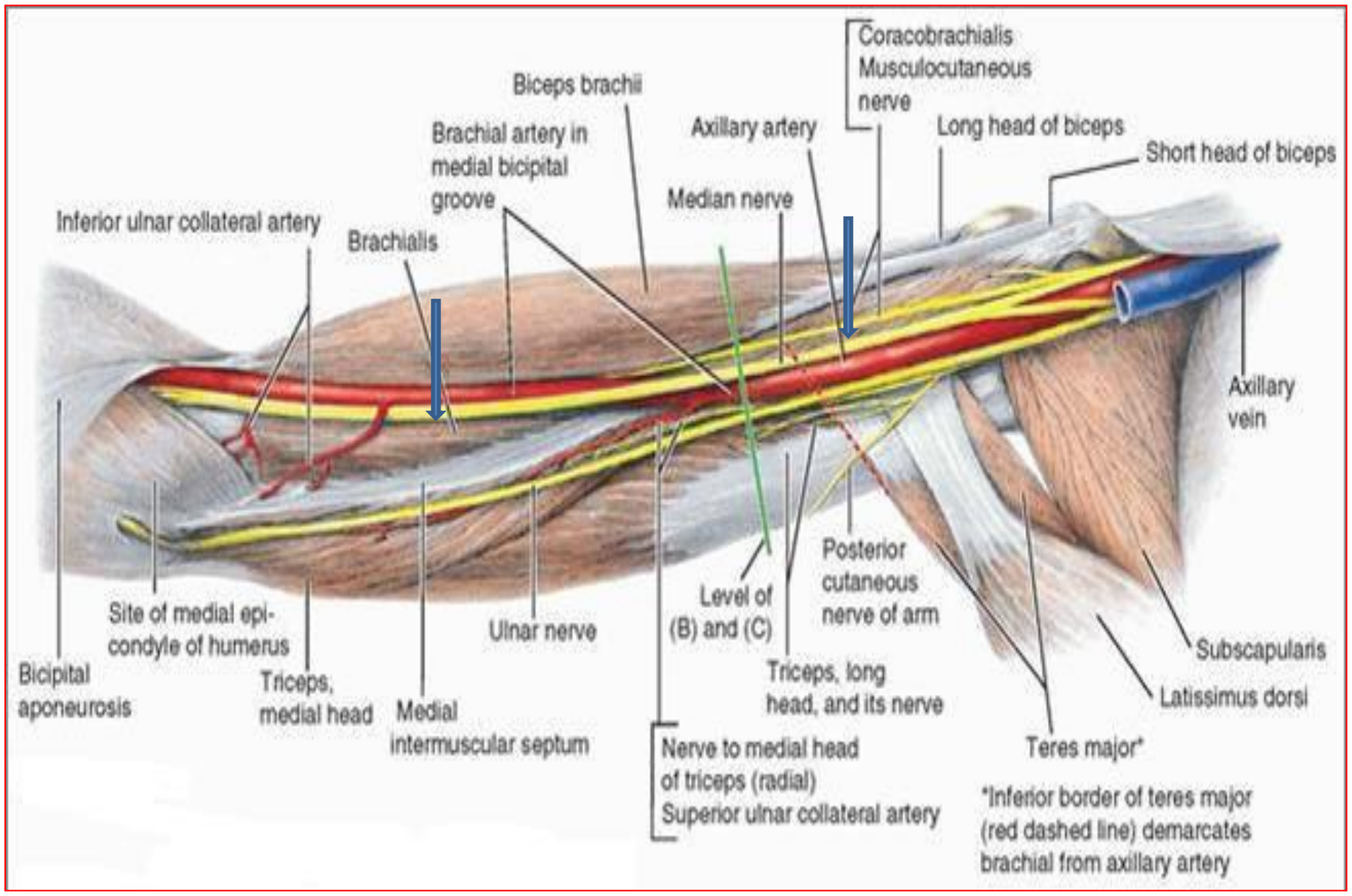


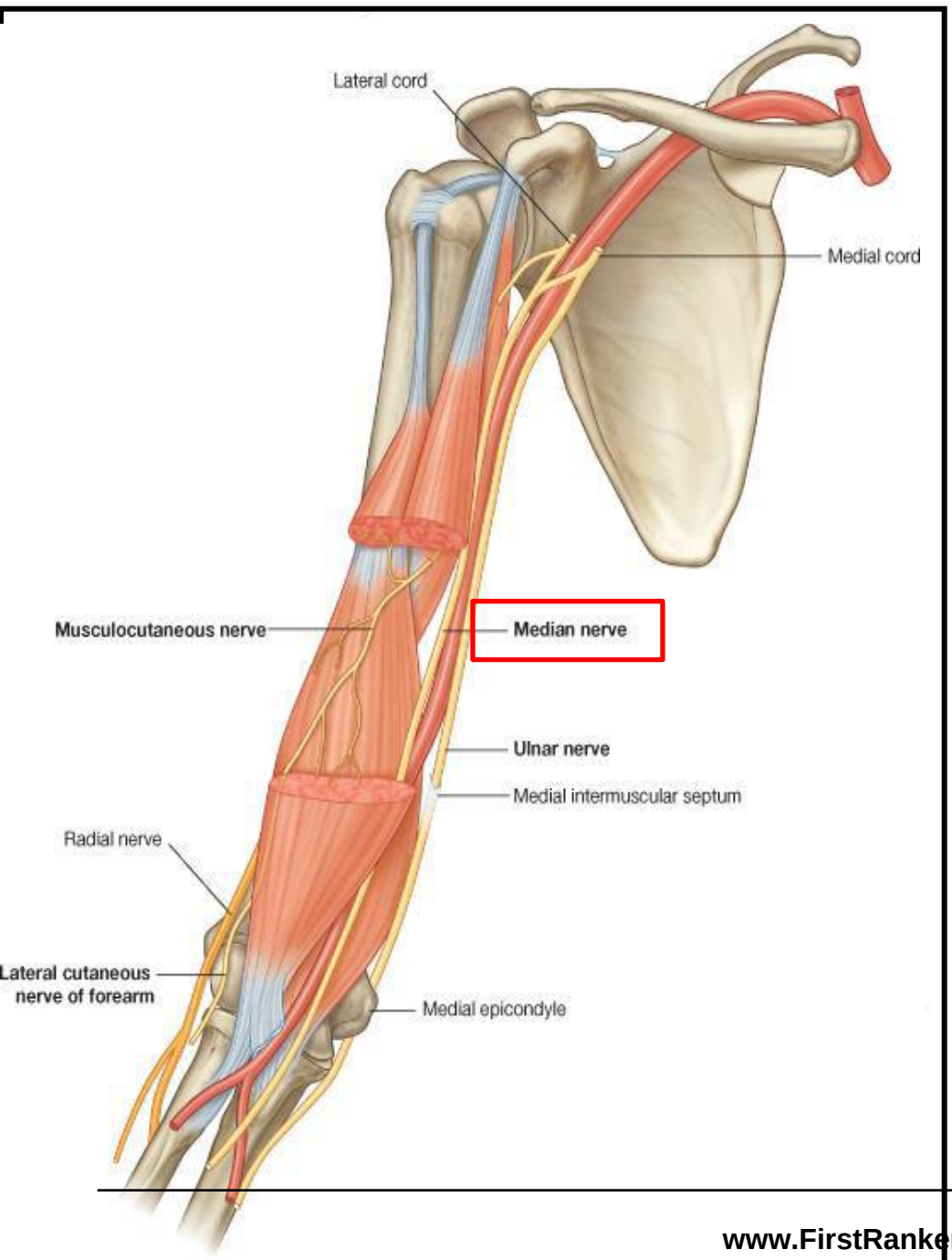
Median Nerve in Arm

- At inferior margin of teres major muscle.
- Passes vertically down on medial side of arm in anterior compartment and is related to brachial artery throughout its course:
  - proximal region → lateral to brachial artery;
  - distal region → at mid point it crosses to medial side of brachial artery and lies anterior to elbow joint.

Median nerve has NO major branches in arm, but a branch to one of muscles of the forearm, pronator teres muscle, may originate from it immediately proximal to elbow joint.

Median Nerve in Arm





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Median nerve - C5,C6,C7 + C8,T1

Origin: 2 roots - medial & lateral cords of brachial plexus.

medial root crosses 3rd part of axillary artery & join lateral root , **runs** down on *lateral side* of brachial artery.

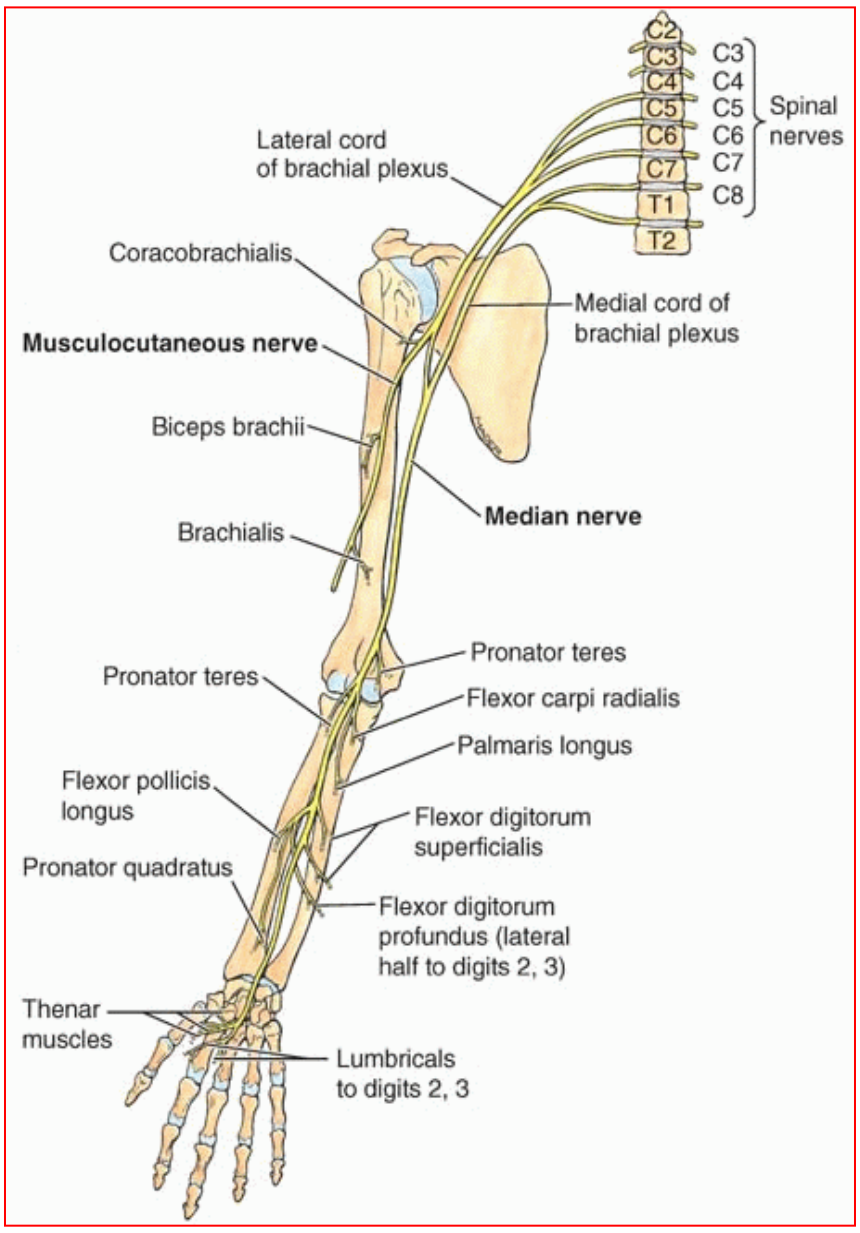
Mid of arm, *it crosses brachial artery* from lateral to medial and continues down on its *medial side.*

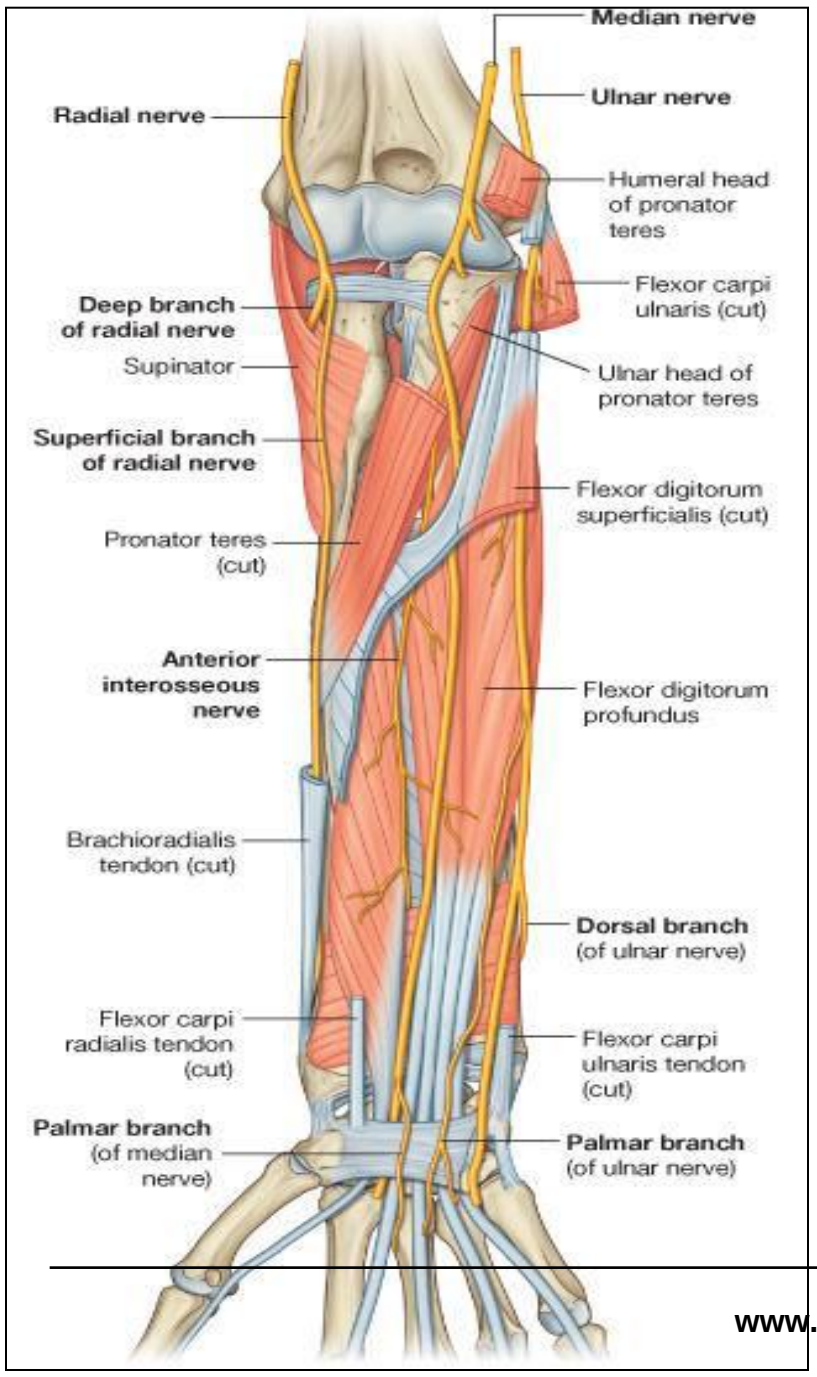
At elbow, *it lies medial to tendon of biceps & is crossed by bicipital aponeurosis.*

- **no branches** in arm.

Median Nerve in Forearm

- Median nerve passes into forearm anterior to elbow joint, where branches innervate most of muscles in anterior compartment of forearm (**except** for **flexor carpi ulnaris** muscle and **medial half of flexor digitorum profundus** → innervated by **ulnar nerve**).





Median nerve

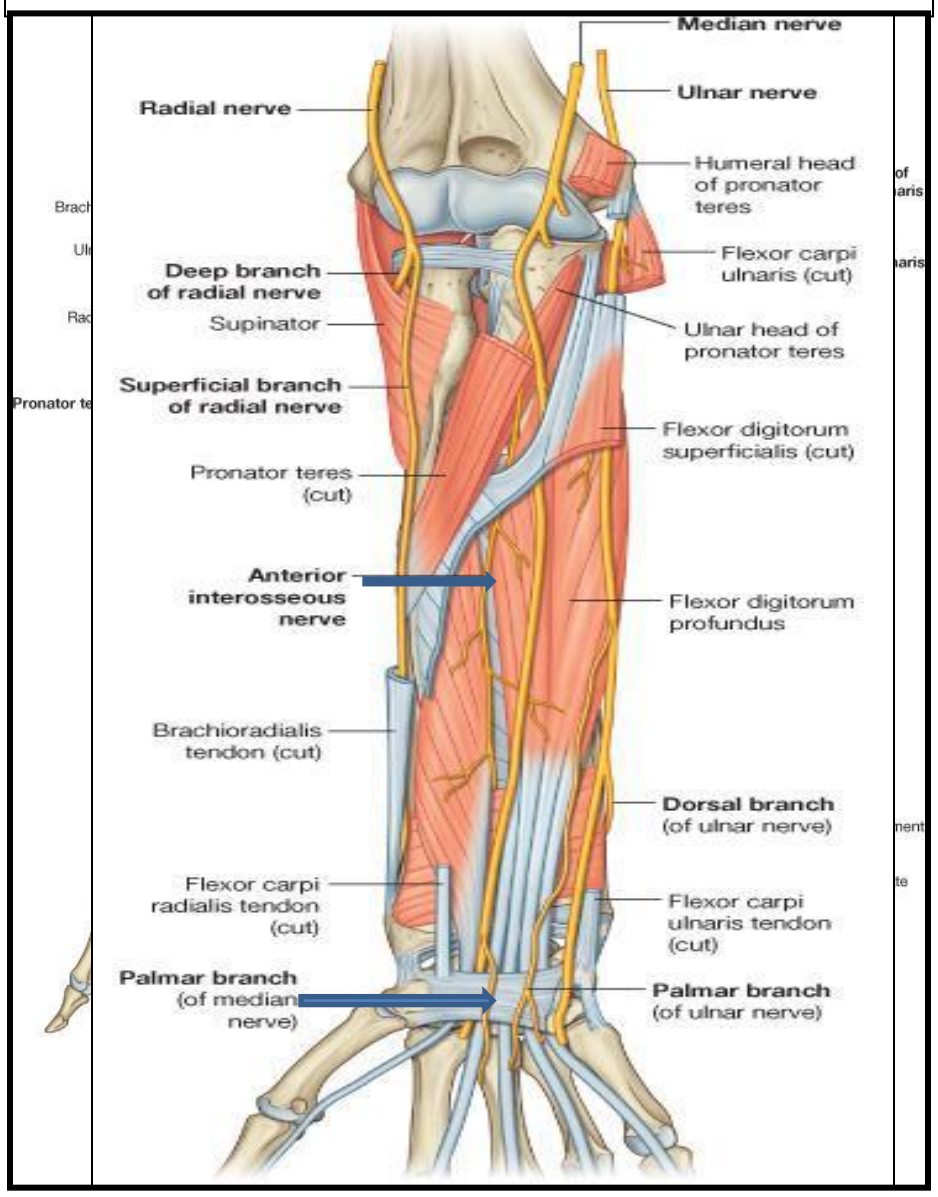
In cubital fossa - lies deep to bicipital aponeurosis.

Leaves cubital fossa & runs b/w two heads of pronator teres.

Descends b/w flexor digitorum superficialis & flexor digitorum profundus.

It reach palm **deep to flexor retinaculum** or **through** carpal tunnel **deep** to tendon of **palmaris longus** & **lateral** to tendon of **flexor digitorum superficialis**.

Median nerve in forearm



Muscular: Pronator teres, Flexor carpi radialis , Palmaris longus & Flexor digitorum superficialis.

Palmar cutaneous branch: at distal part of forearm & superficial to flexor retinaculum - skin of lateral 2/3 of palm.

Articular: elbow joint.

Anterior interosseous nerve: between FPL & FDP, anterior to interosseous membrane.

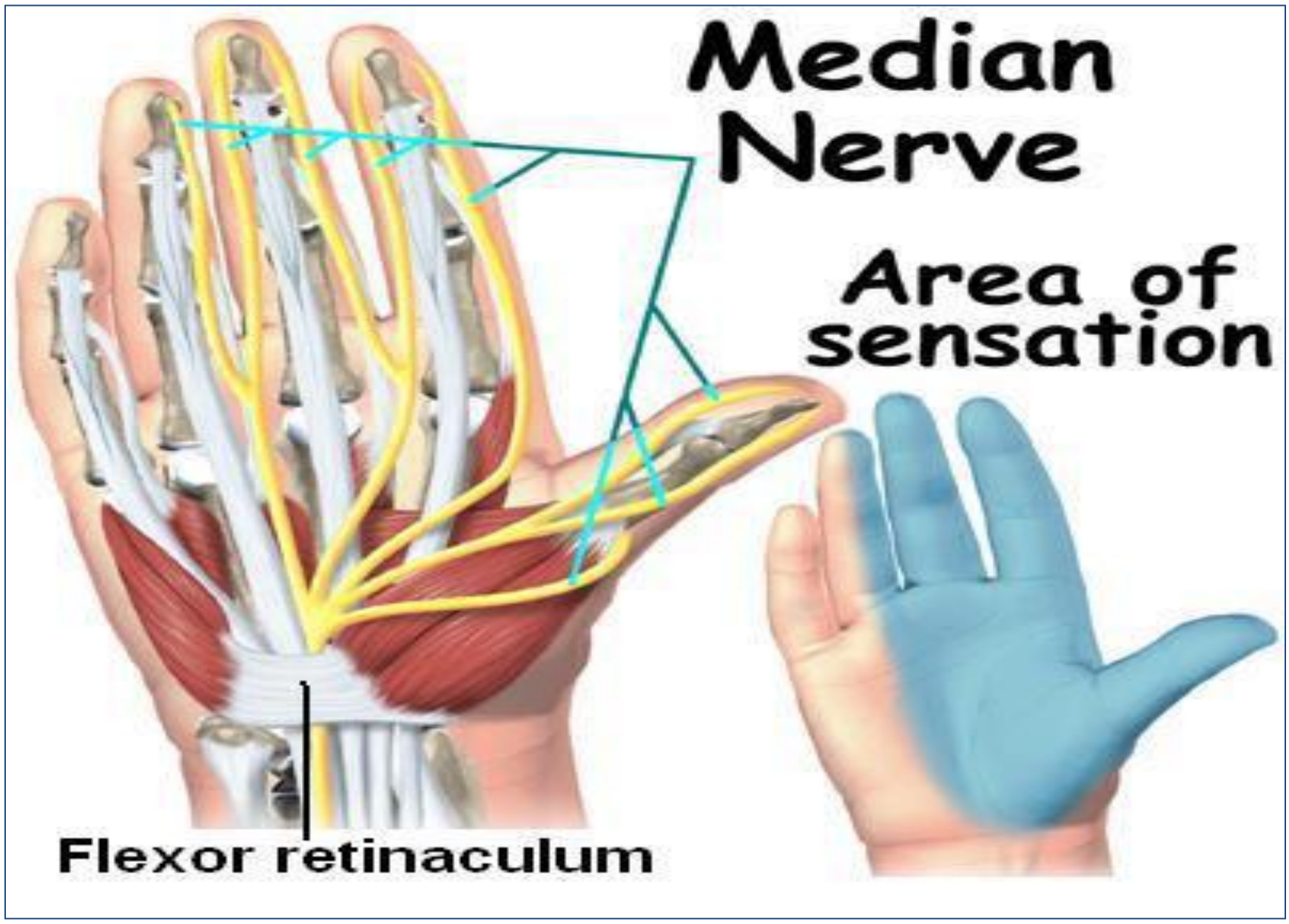
It supplies : FPL+PQ+ lateral half of FDP.

Articular branches: wrist & distal radioulnar joint.

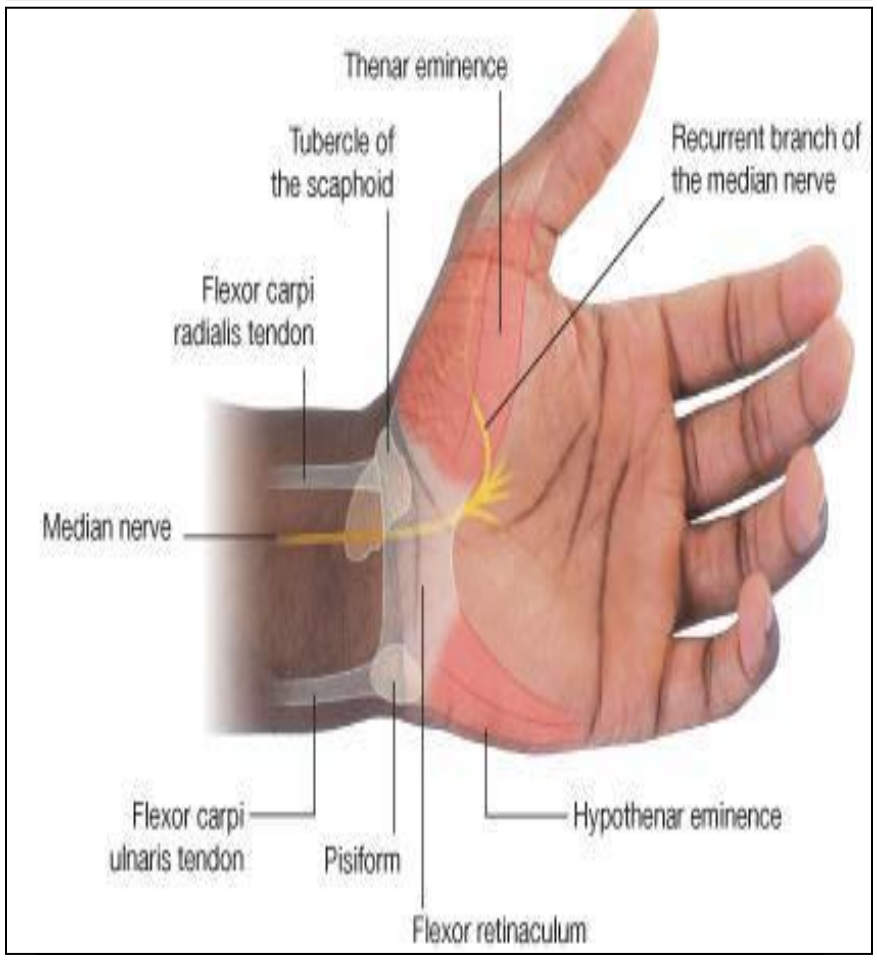
Median Nerve in Hand

- Median nerve continues into hand by passing deep to flexor retinaculum.
- It innervates: Three thenar muscles of thumb , Lateral 2 lumbrical muscles associated with movement of index and middle fingers;
- Skin over palmar surface of lateral three & half digits and over lateral side of palm and middle of wrist.

Median Nerve in Hand



Median n in hand



- Enters palm **through carpal tunnel, deep to flexor retinaculum** & divides → lateral & medial branches.
- Lies a fingerbreadth distal to tubercle of scaphoid.
- **Muscular:** Thenar – Muscles 5 .
- Abductor pollicis brevis.
- Flexor pollicis brevis.
- Opponens pollicis (deep to the above 2 ms.).

Thenar Eminenece Ms.

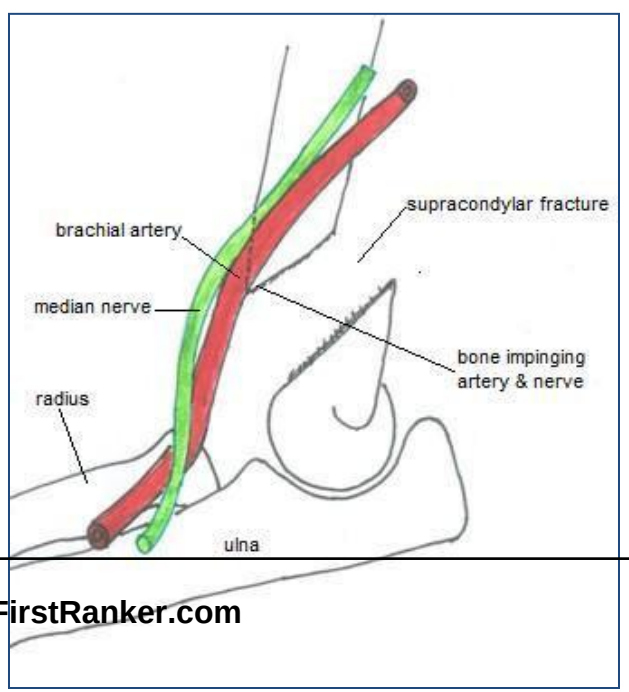
- Lateral 2 lumbricals (1st & 2nd).
- Digital cutaneous branches : to palmar aspect of lateral 3 ½ fingers

Median Nerve Lesion

- Injury of median nerve at different levels cause different syndromes.
- In arm and forearm the median nerve is usually not injured by trauma because of its relatively deep position.
- **Median nerve can be damaged**:
  - Elbow region
  - At wrist above flexor retinaculum
  - In carpal tunnel

Median Nerve Lesion in Elbow Region

- 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

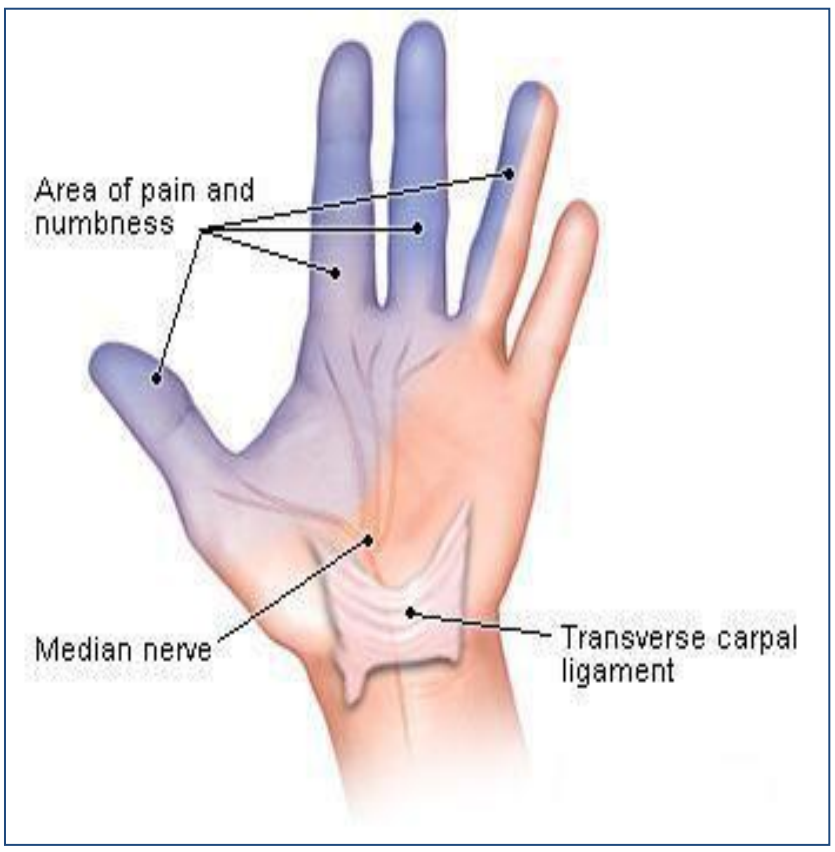


Median Nerve Lesion at Wrist

- 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

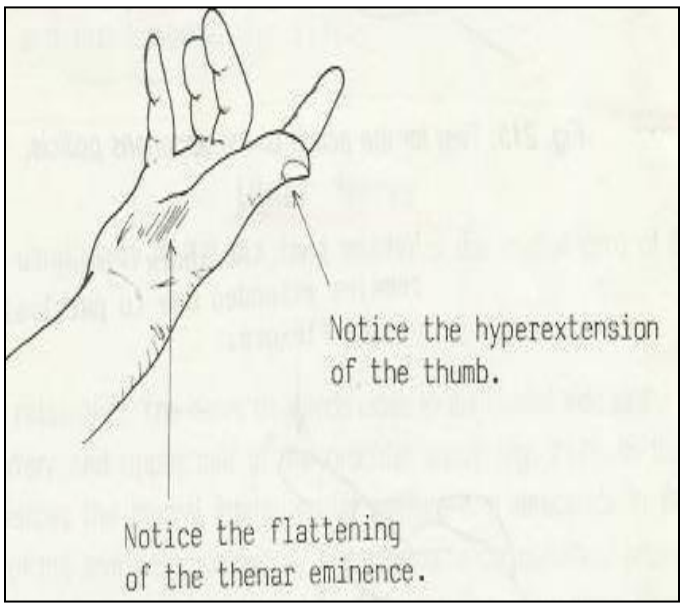
Carpal Tunnel Syndrome

- 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



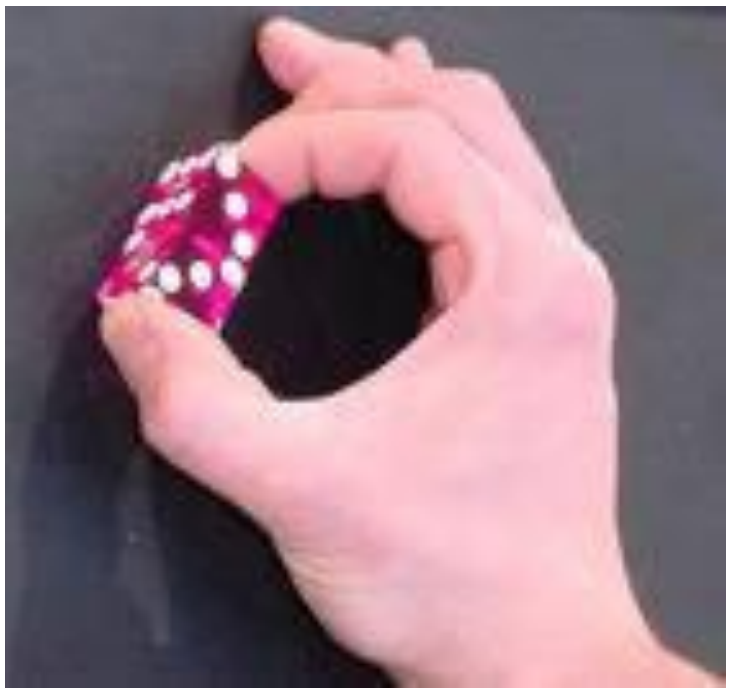
No sensory changes over palm as palmer cutaneous branch is given before median nerve enters carpal tunnel.

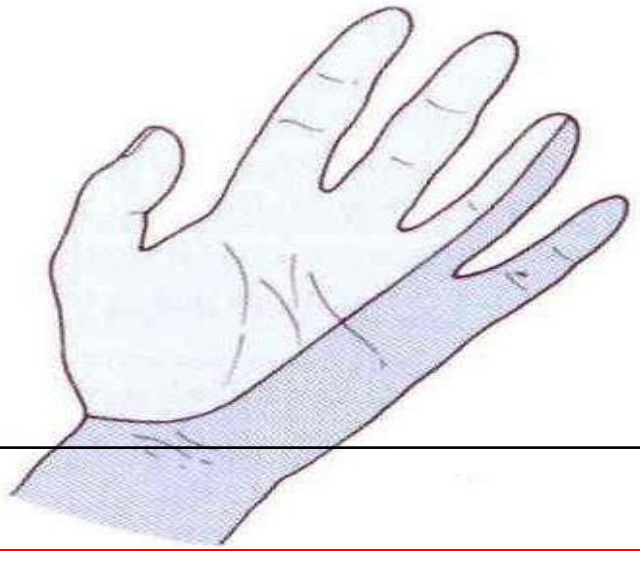
Lesion of median nerve - above elbow



- **Weakness** of **flexion** - **wrist** due to paralysis of FCR & PL.
- **Loss of pronation** - paralysis of pronator teres & quadratus.
- **Loss of flexion of middle phalanges** of medial 4 fingers - paralysis of FDS.
- **Loss of flexion of terminal phalanges of index & middle fingers** - paralysis of lateral ½ of – FDP.

- 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





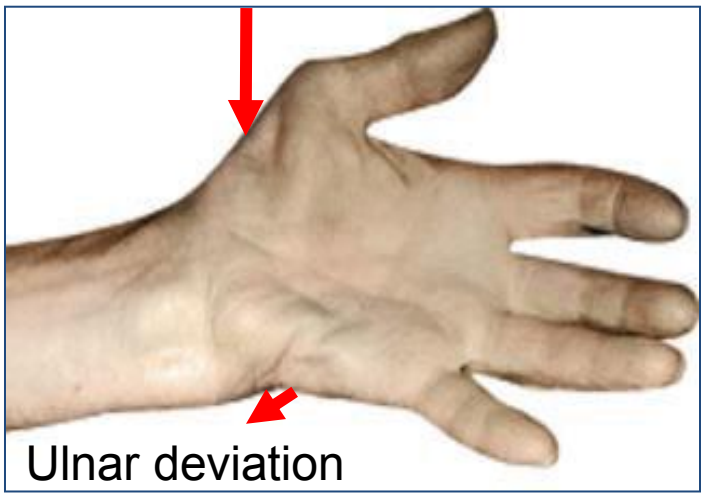
Median Nerve

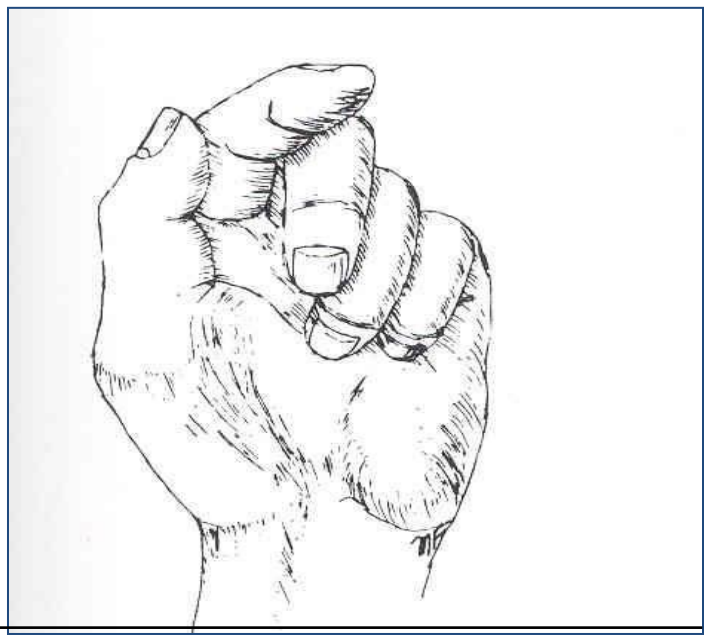
- Origin: Medial and lateral cords
  - Motor
    All muscles in anterior compartment of forearm (**except** flexor carpi ulnaris and medial half of flexor digitorum profundus), three thenar muscles of the thumb and two lateral lumbrical muscles
  - Sensory
    Skin over palmar surface of lateral three and one-half digits and over lateral side of the palm and middle of wrist

Motor Effects:

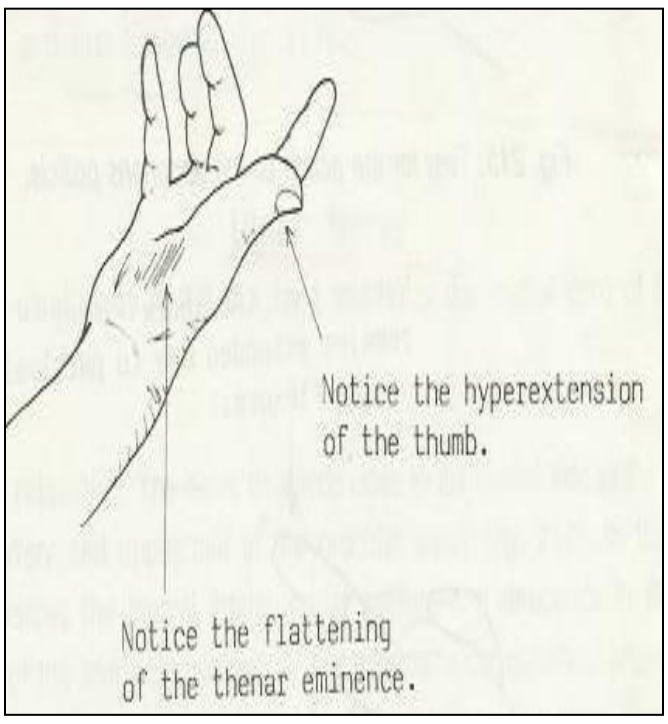
- Loss of **pronation**. Hand is kept in supine position
- Wrist shows weak flexion, and ulnar deviation
- Loss of **flexion** on interphalangeal joints of the index and middle fingers
- **Weak** flexion of ring and little finger
- **Thumb** is adducted and laterally rotated, with **loss of flexion** 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.

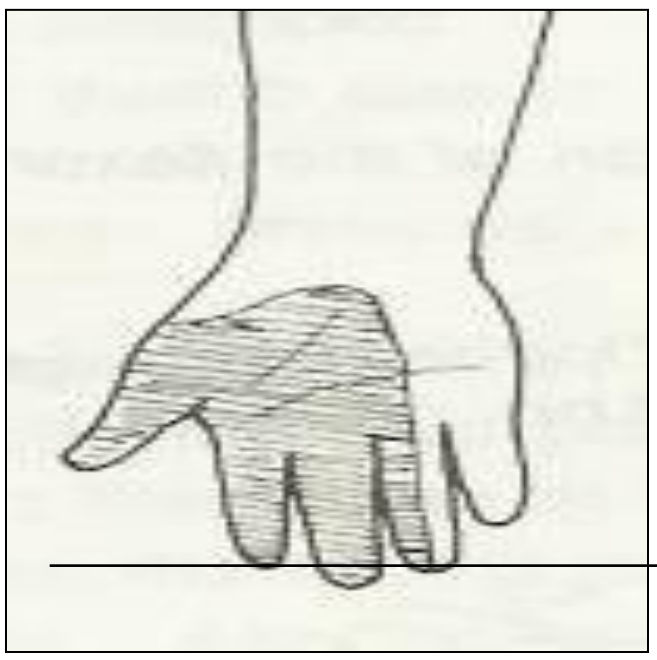
Wasting of thenar eminence





- 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





Lesion of median nerve -above elbow

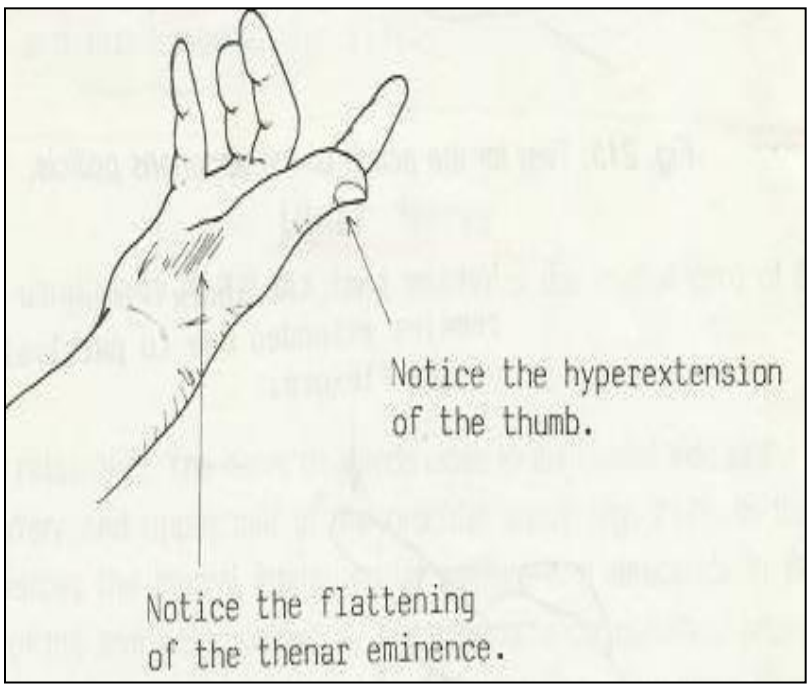
Loss of flexion of thumb - Flexor pollicis longus & brevis

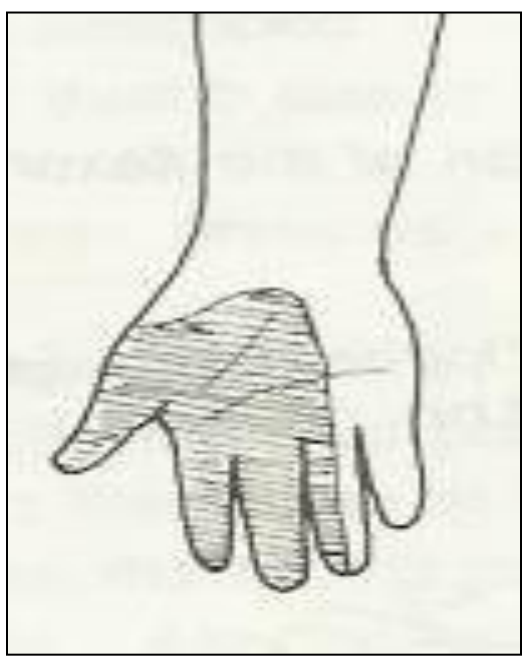
Loss of opposition of thumb - Opponens pollicis.

Flatting/Wasting of Thenar eminence - atrophy.

→ 'Ape hand' - Ape thumb deformity
Thenar eminence is flattened and thumb is adducted & hyperextended.

Loss of cutaneous sensations - hollow of palm + palmar surfaces of lateral 3 ½ fingers.





Lesion of median nerve - above wrist

Loss of opposition of thumb paralysis - opponens pollicis.

Flattening of thenar eminence - atrophy of thenar muscles.

‘ Ape hand ’ or Ape thumb Deformity.

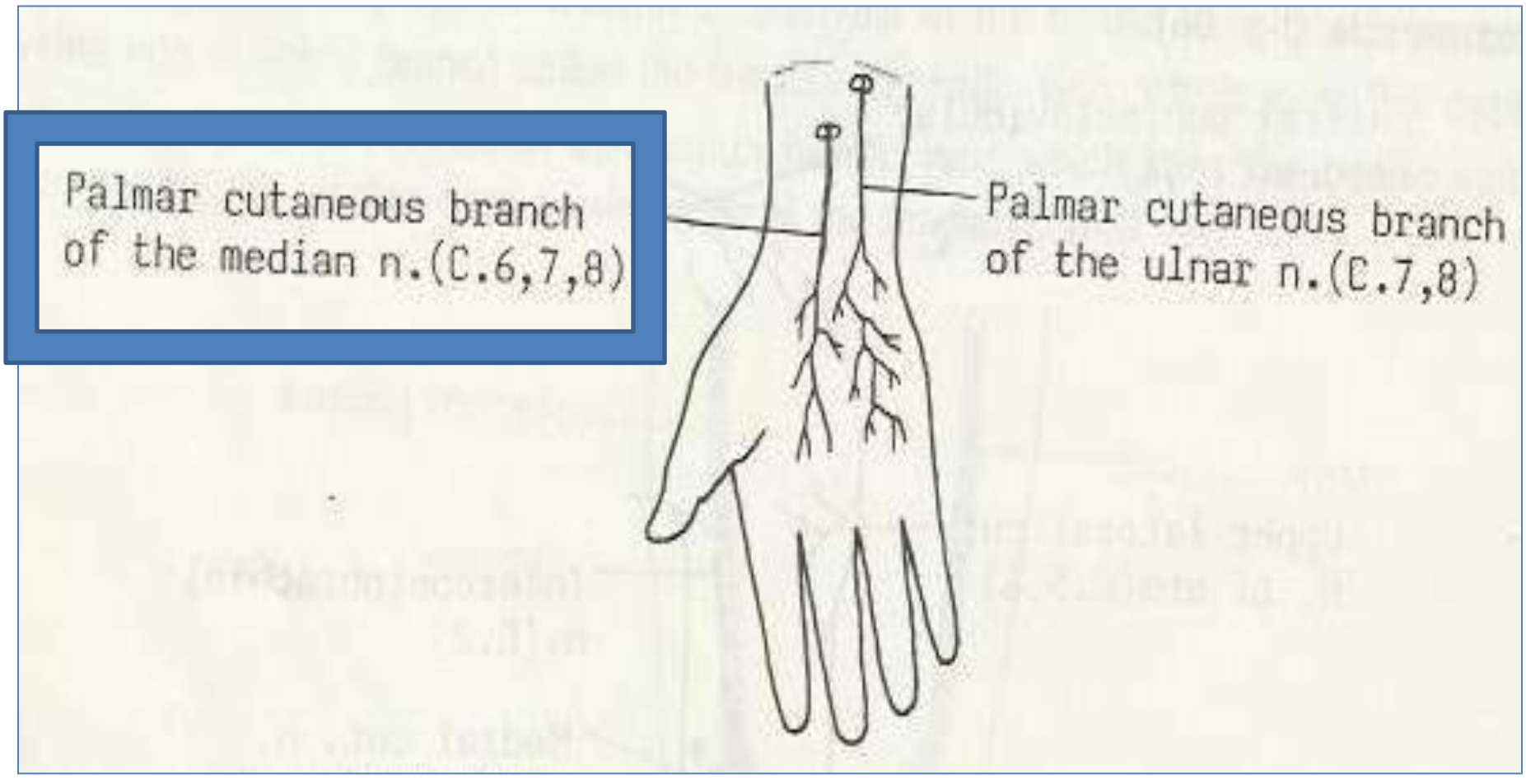
Loss of cutaneous sensations

- palmar surfaces of the lateral 3 ½ fingers.

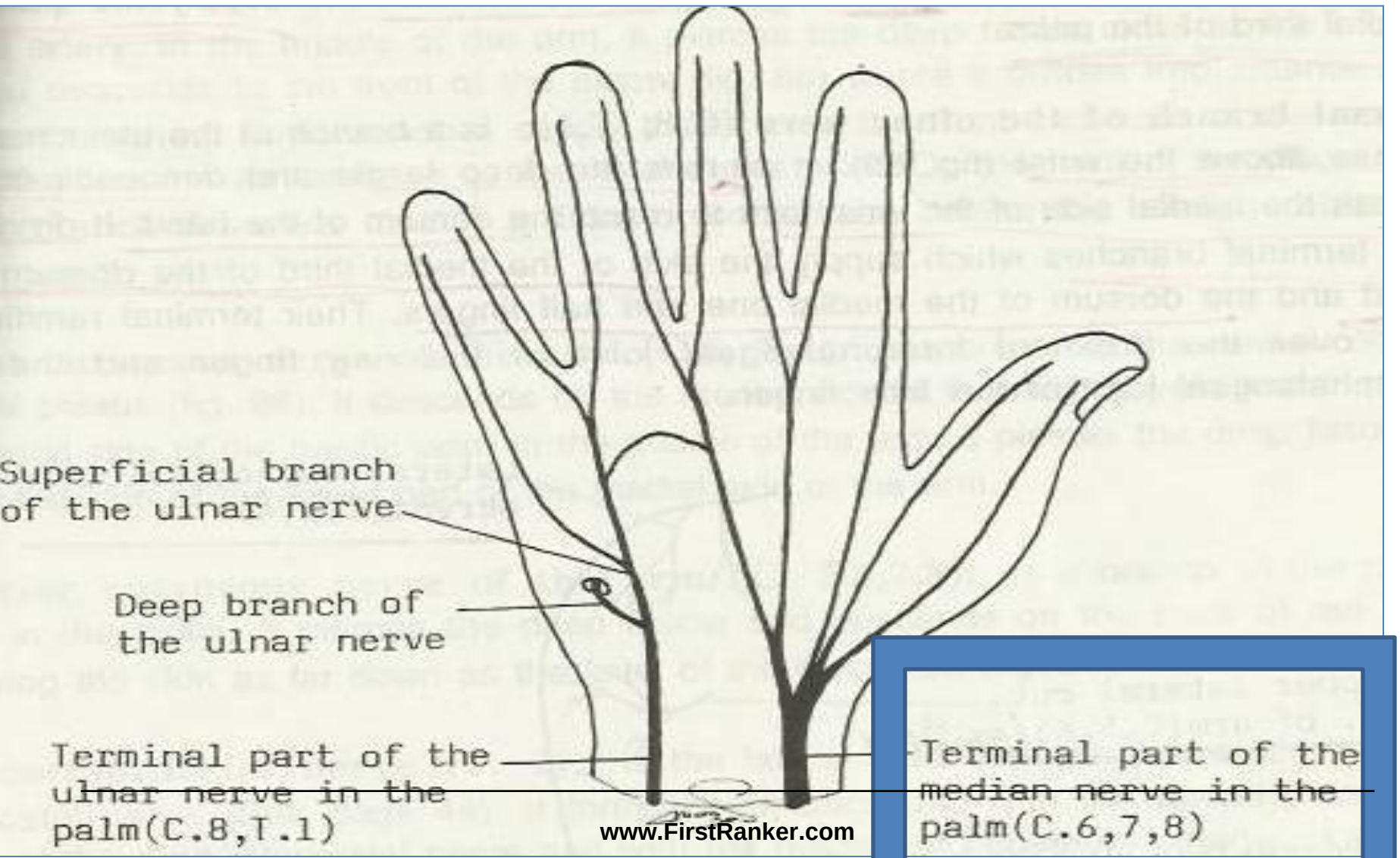
Carpal tunnel syndrome

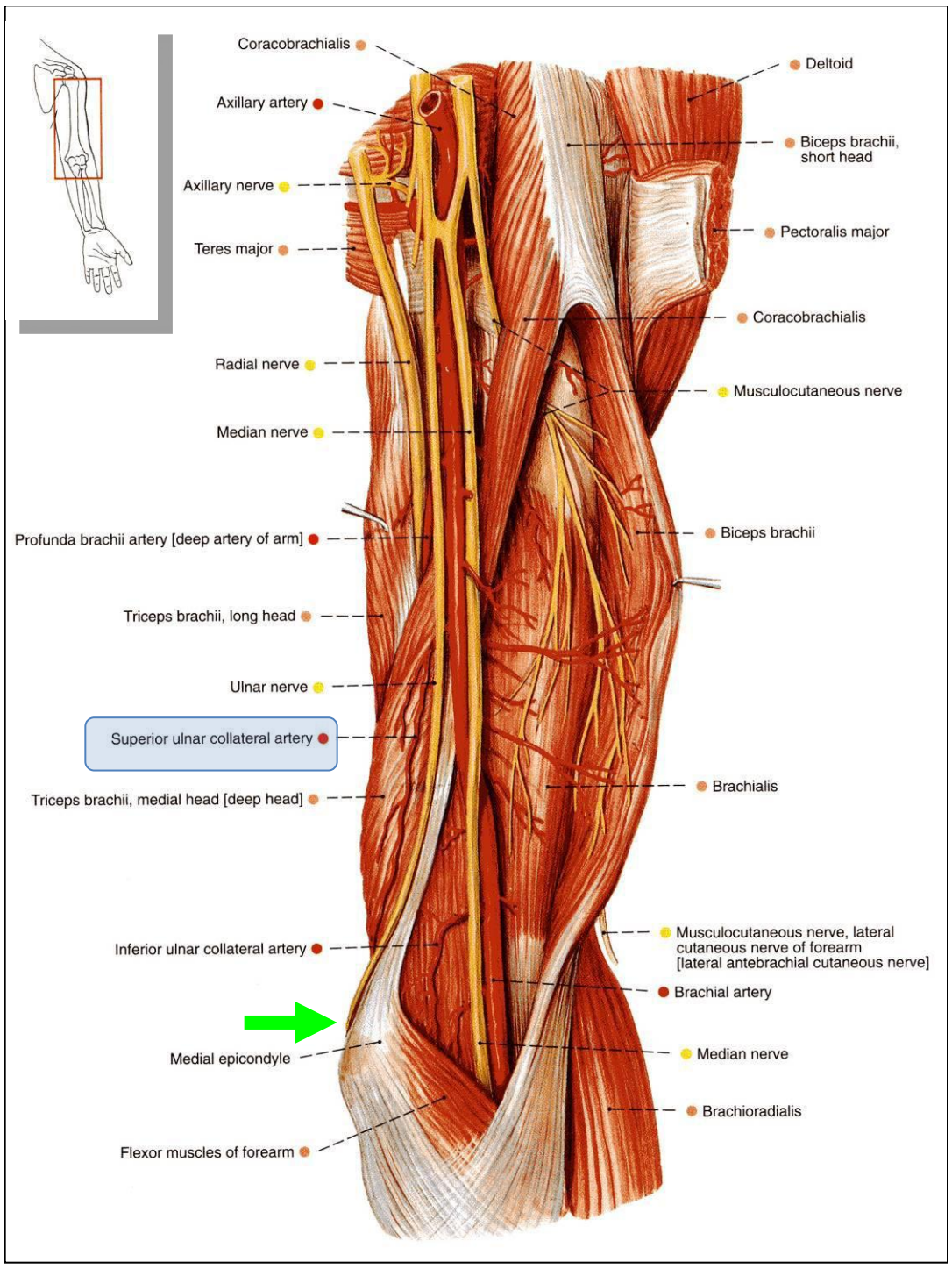
- Compression of median nerve - carpal tunnel.
- **Slight flattening of thenar eminence** due to wasting of thenar eminence muscles.
- Accompanied by burning pain or ‘pin & needles’ with diminished cutaneous sensations on palmar aspect of lateral 3 ½ fingers.
- No paresthesia occurs over the thenar eminence (because this area is supplied by palmar cutaneous branch of median N) , arises in distal part of forearm & descends superficial to flexor retinaculum.

Carpal tunnel syndrome



Carpal tunnel syndrome





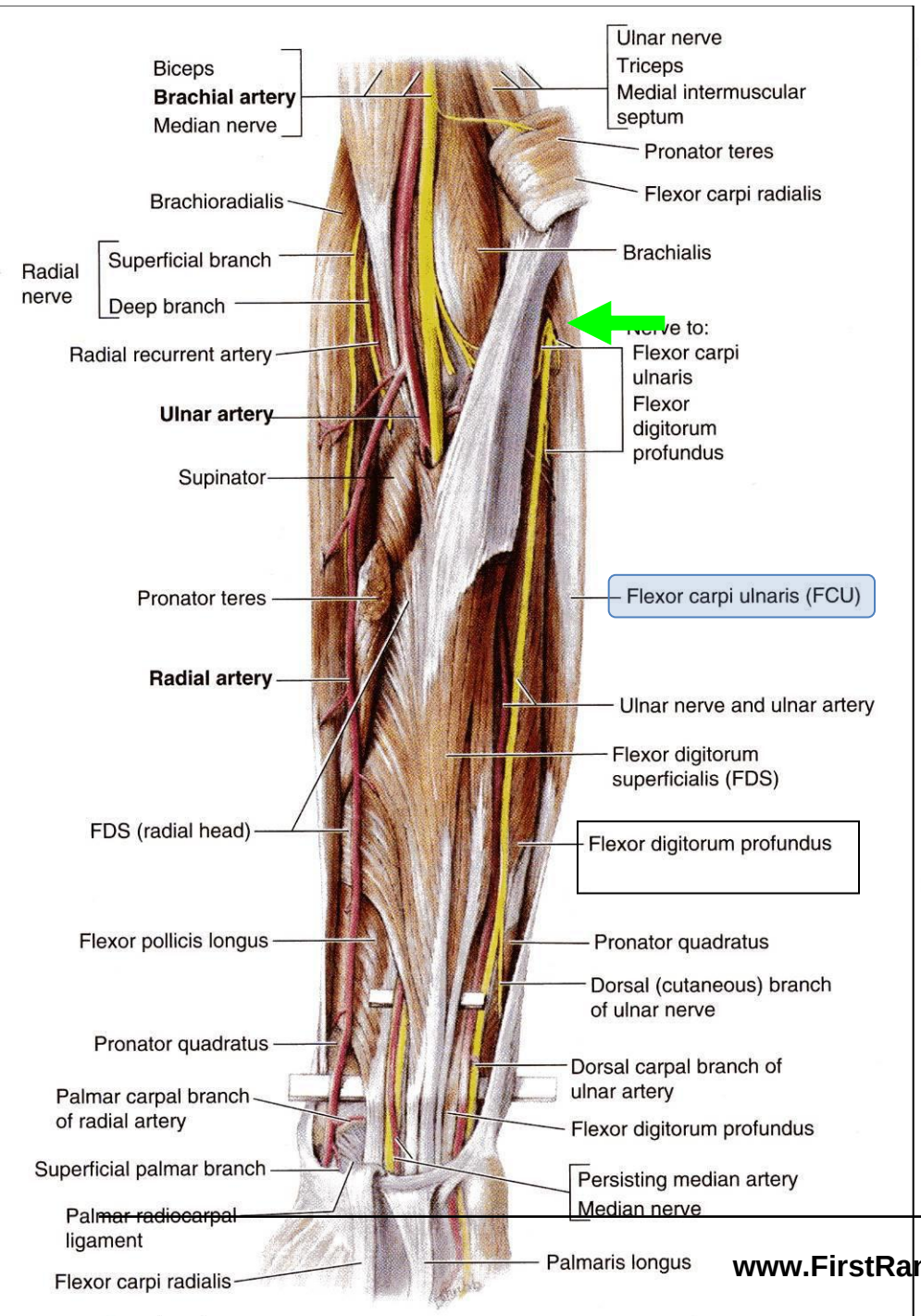
Ulnar nerve C8T1

Origin : medial cord of brachial plexus , runs *medial to brachial artery* - middle of arm.

At **coracobrachialis insertion**, - ***pierces medial intermuscular septum***, is accompanied by superior ulnar collateral artery – and *enter posterior compartment of arm.*

At elbow - *posterior to medial epicondyle.*

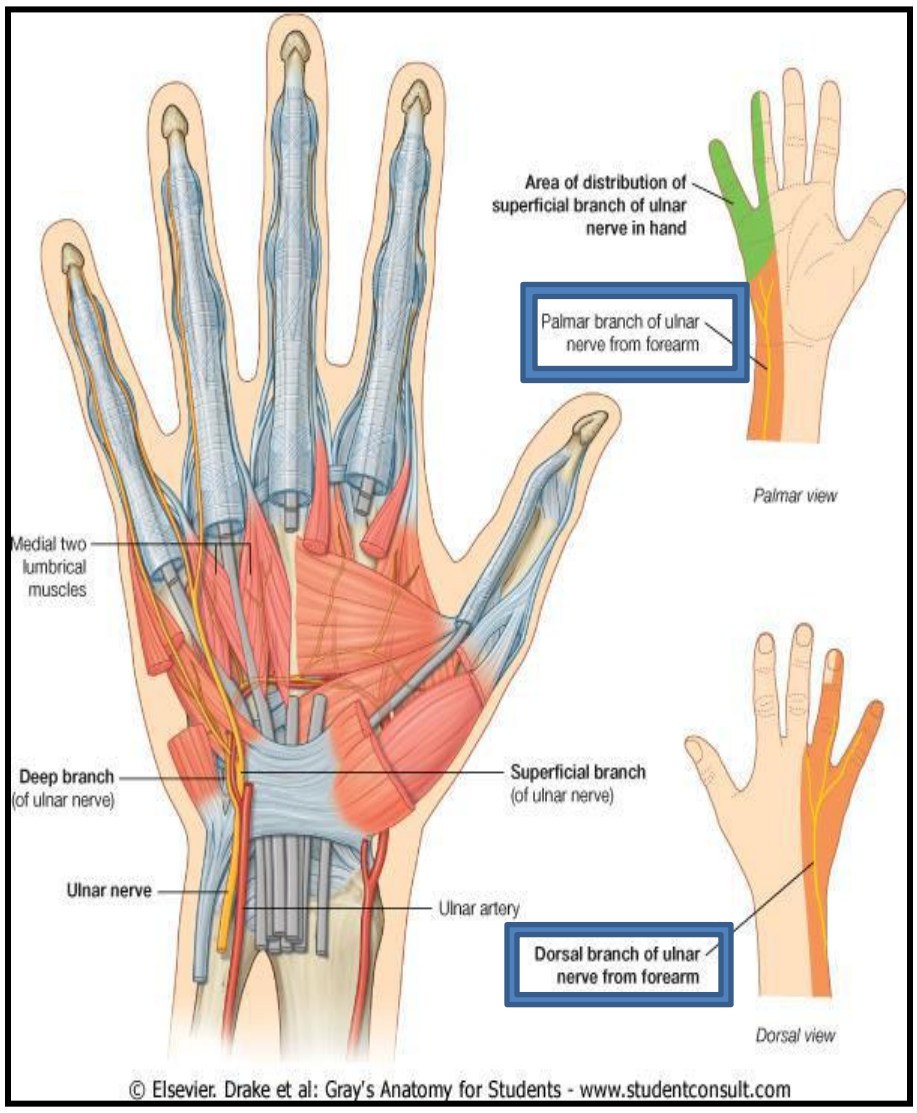
No *branches* in arm.



Ulnar nerve in forearm

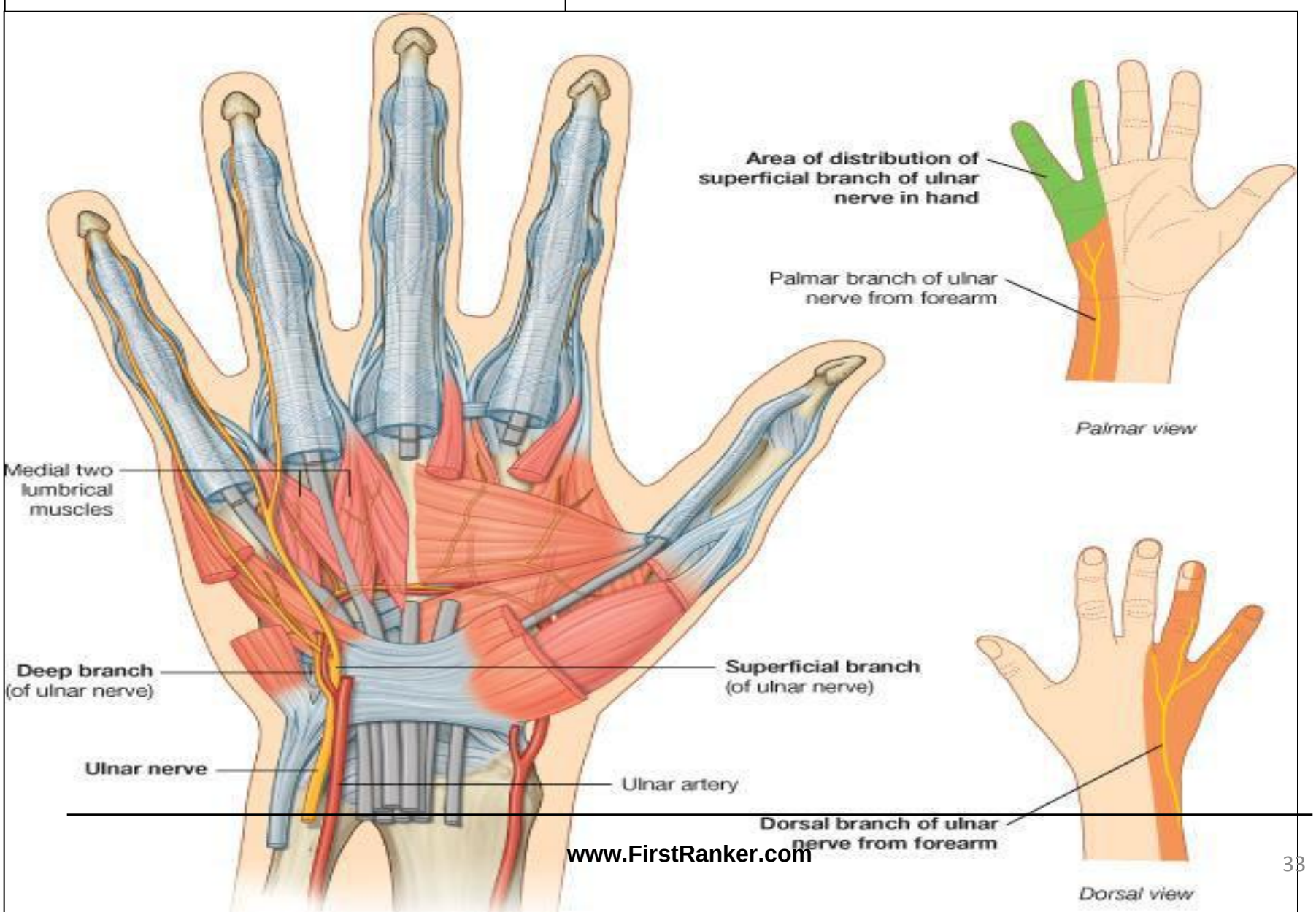
- It continues downward to enter in forearm
- *b/w two heads of* ***flexor carpi ulnaris.***
- It runs down forearm **between FCU and FDP.**
- In lower half of forearm it lies **medial to ulnar artery.**

Ulnar nerve in Forearm



- **Muscular: FCU & FDP**
- Flexor carpi ulnaris.
- Medial ½ of FDP
- **Articular:** elbow joint.
- **Dorsal or posterior cutaneous branch:**
- Dorsal surface - **medial 1/3rd of hand 1½ fingers.**
- **Palmar cutaneous branch :** to supply skin of palm of hand and medial **1½ fingers.**
- **FDP – lateral ½ Median N**
- **Medial ½ Ulnar N**

Ulnar nerve in Hand



Ulnar nerve in Hand

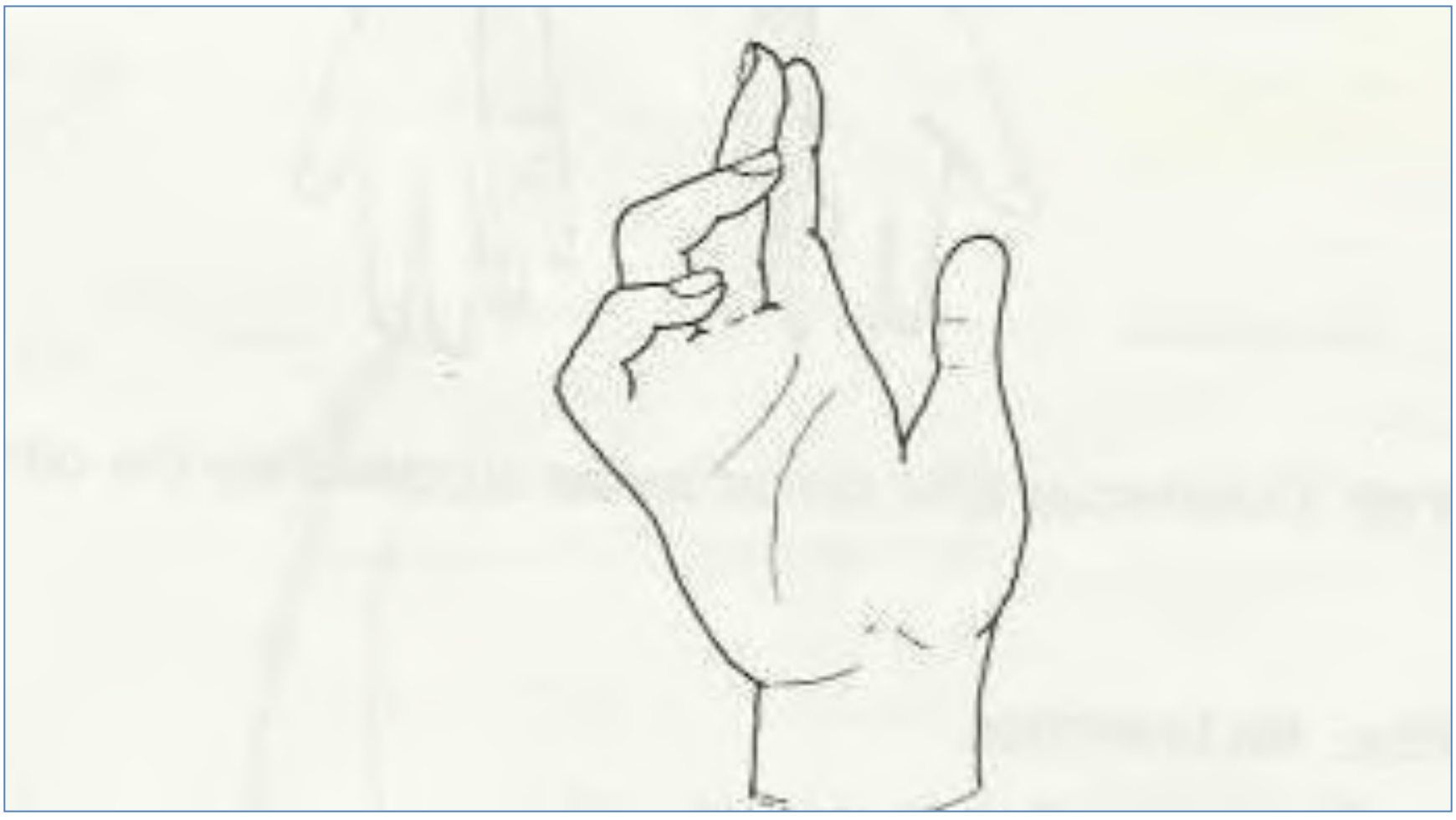
- Enters the palm superficial to flexor retinaculum,
- close to lateral border of pisiform bone.
- Then it divides into superficial & deep branches.
- **Superficial branch:**
- It supplies **palmaris brevis**
- palmar aspect of **medial 1½ fingers.**

Ulnar nerve in Hand

Deep branch:

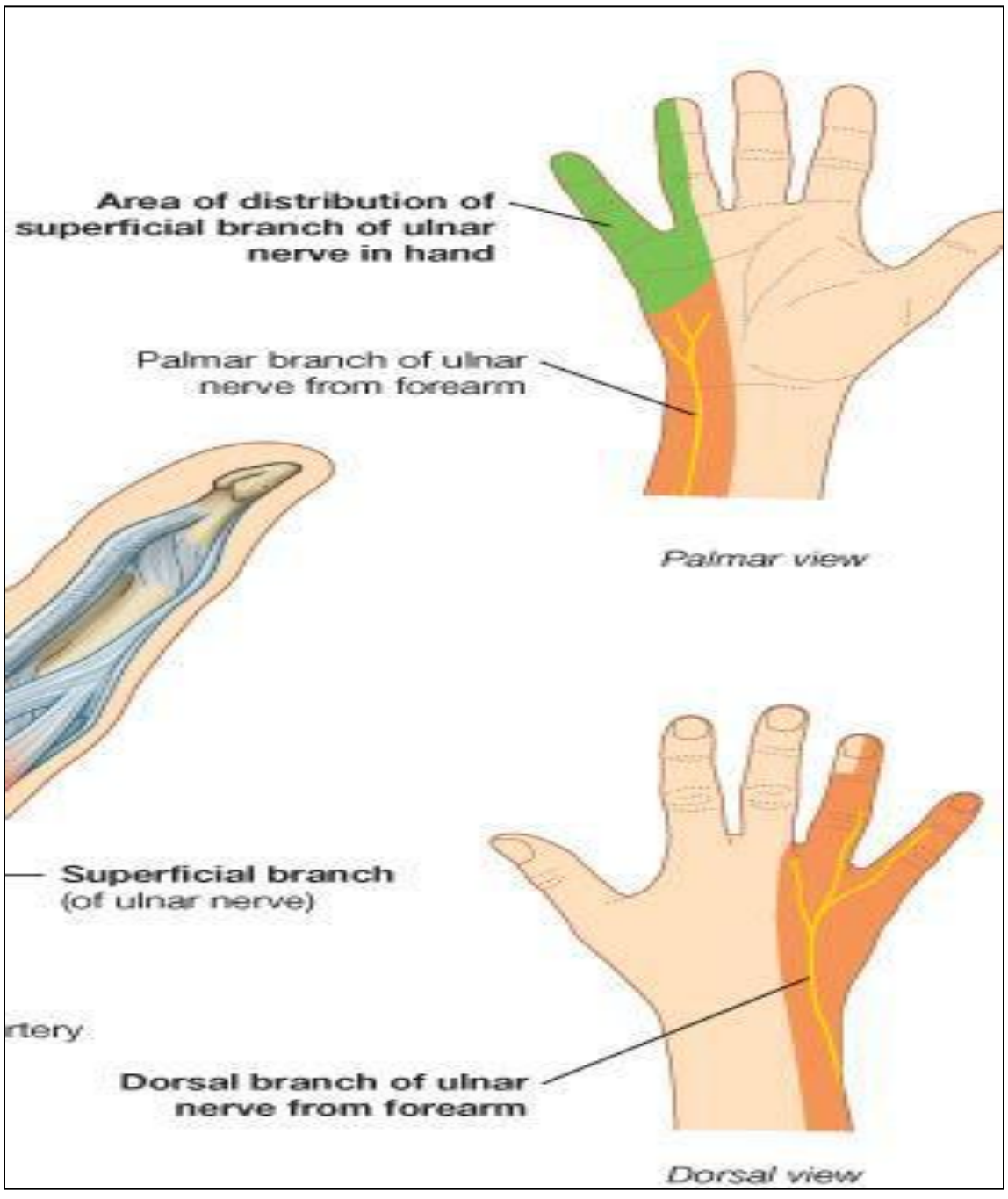
- Runs b/w abductor digiti minimi & flexor digiti minimi.
- pierces opponens digiti minimi.
- Then passes laterally within concavity of **deep palmar arch.**
- lies deep to flexor tendons.
- **It supplies 14 muscles :**
- **Three hypothenar muscles**.
- ***Adductor pollicis.***
- **All dorsal & palmar interossei.**
- **Medial 2 lumbricals.**

Lesion of ulnar nerve above elbow - atrophy of hypothenar muscles



Lesion of ulnar nerve above elbow

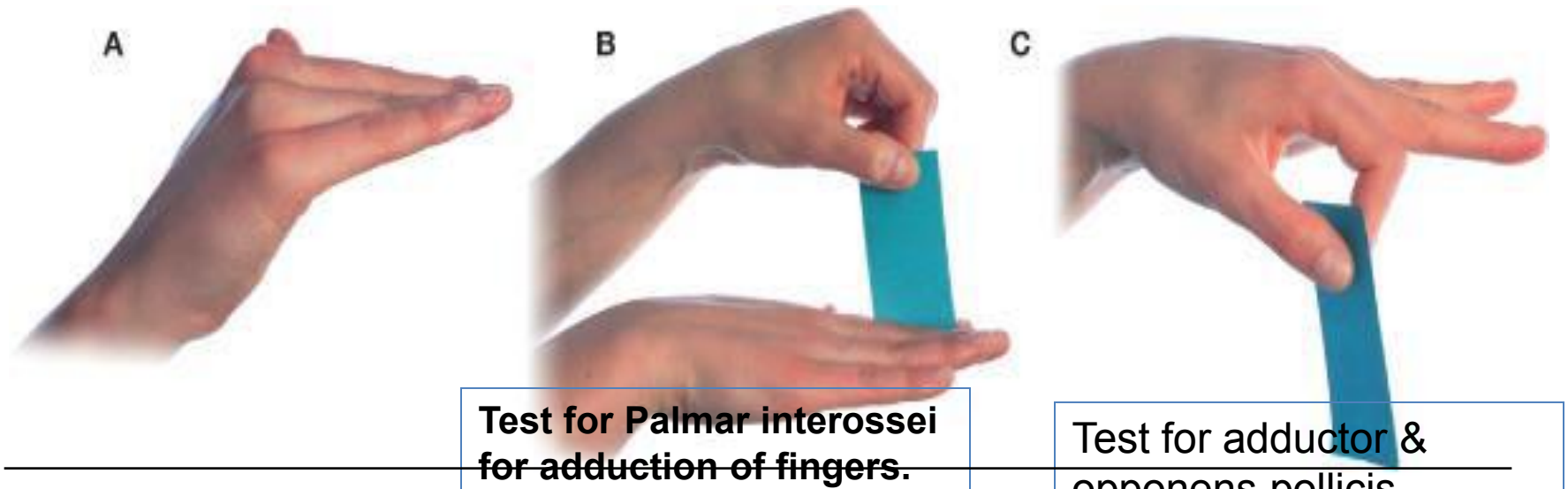
- Weakness of flexion at wrist → paralysis of FCU
- Loss of flexion of terminal phalanges of ring & little fingers → paralysis of medial ½ of FDP
- Paralysis of all interossei & medial 2 lumbricals (3rd & 4th).
- Characteristic deformity is - partial claw hand.
- Atrophy of hypothenar muscles.
- Fingers - hyperextended at metacarpophalangeal joints & flexed at interphalangeal joints - ring & little finger.
- Loss of adduction of hand & thumb due to paralysis of flexor carpi ulnaris & adductor pollicis.



Lesion of ulnar nerve above elbow - Loss of cutaneous sensations on front & dorsum of medial 1/3 of hand + medial 1 ½ fingers.

Lesion of ulnar nerve above wrist

- **It leads to paralysis of intrinsic muscles of hand as described above.**
- **deformity 'claw hand'**
- **Loss of cutaneous sensations of medial 1 ½ fingers.**

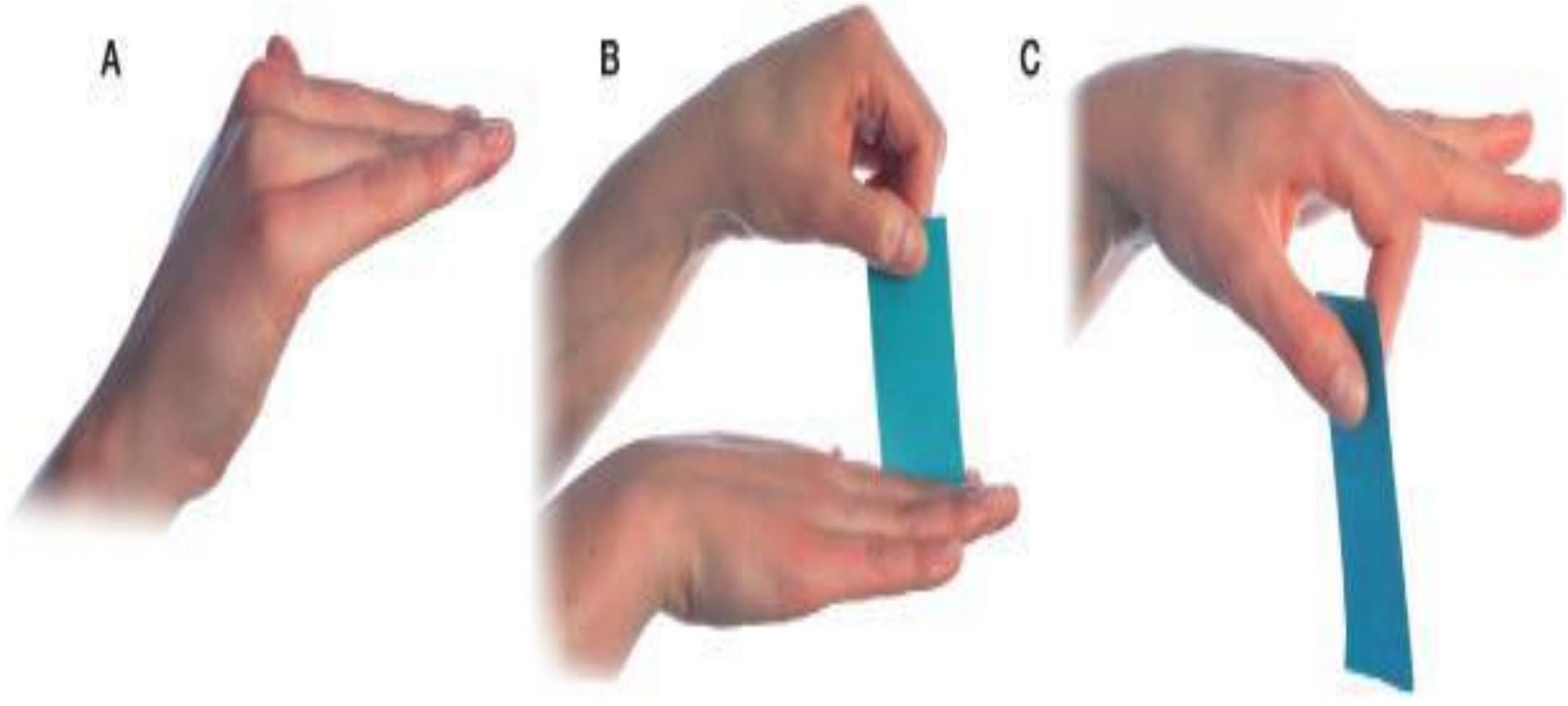


Test for Palmar interossei for adduction of fingers.

Test for adductor & opponens pollicis.

Test for Palmar interossei for adduction of fingers.

Test for adductor & opponens pollicis.



1. Which one of these nerves is concerning with the carpal tunnel syndrome ?
a.ulnar nerve.
b.radial nerve.
c.median nerve.
d.axillary nerve.

2. Which muscle has double nerve supply ?
A Biceps.
B Extensor digitorum superficialis.
C flexor digitorum profundus.
D Triceps.

3. Ape hand is the characteristic deformity due to lesion of :
A Radial nerve.
B Ulnar nerve.
C Median nerve.
D Axillary nerve.

Pattern of injury

Pattern of root contribution to plexus:

Upper trunk lesion: Sensory loss in C5 & C6

Middle trunk lesion: Sensory loss in C7

Lower trunk lesion: Sensory loss in the combined C8 & T1 dermatomes

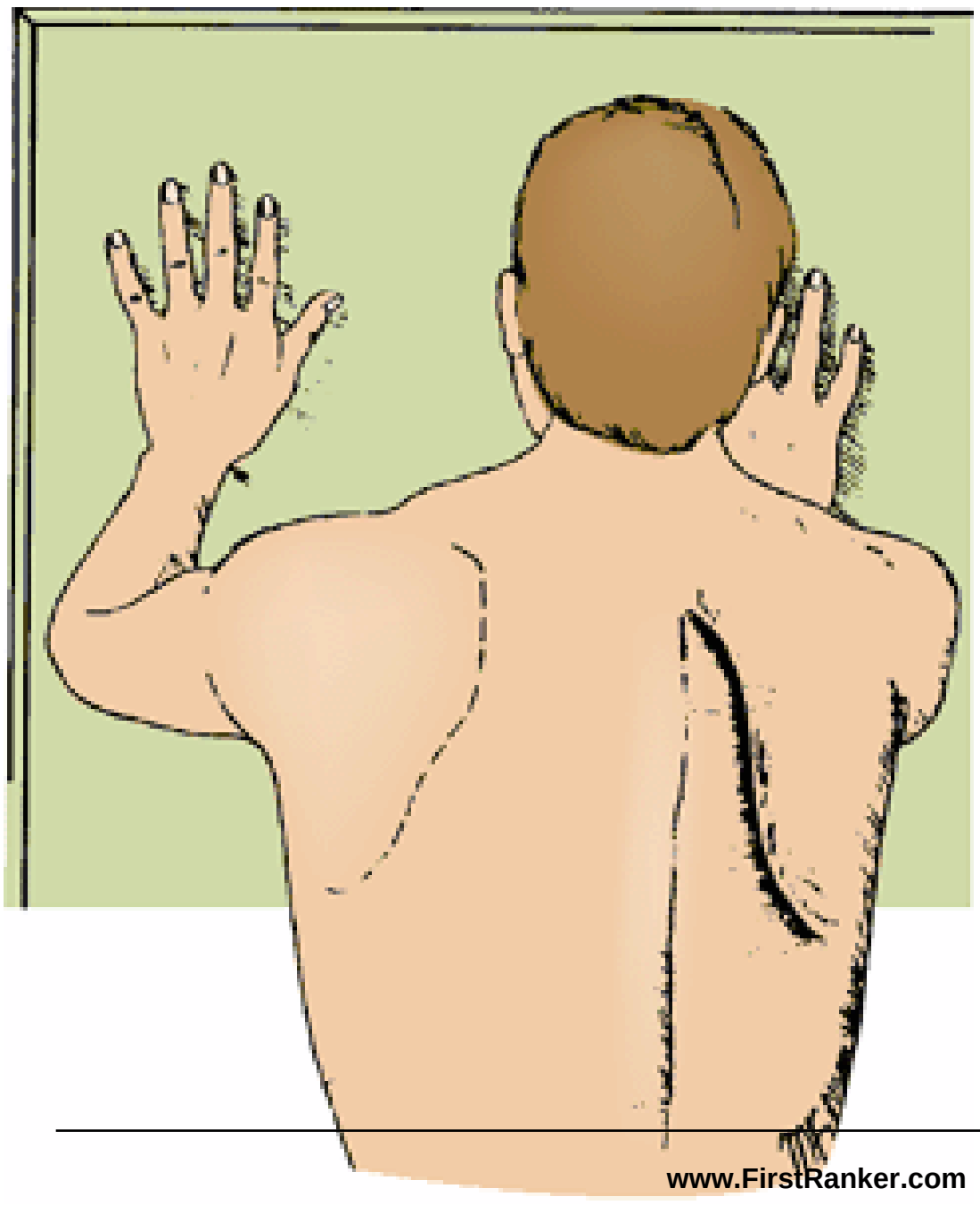
Principles of localization

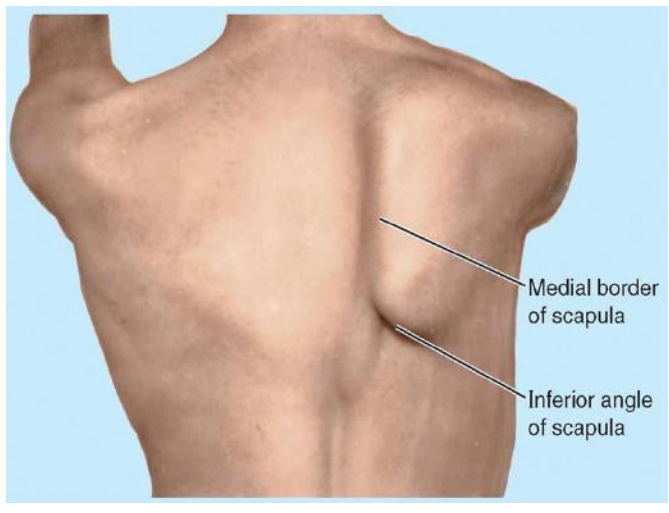
- **Certain sites**
- Ulnar nerve & median nerve at elbow
- Carpal tunnel – median nerve
- Single nerve - Elbow extension ~ Radial
- Multiple nerves - Elbow flexion ~ Musculo cutaneous, Median

Affection of:

1- Most of the small muscles of the hand (T1)

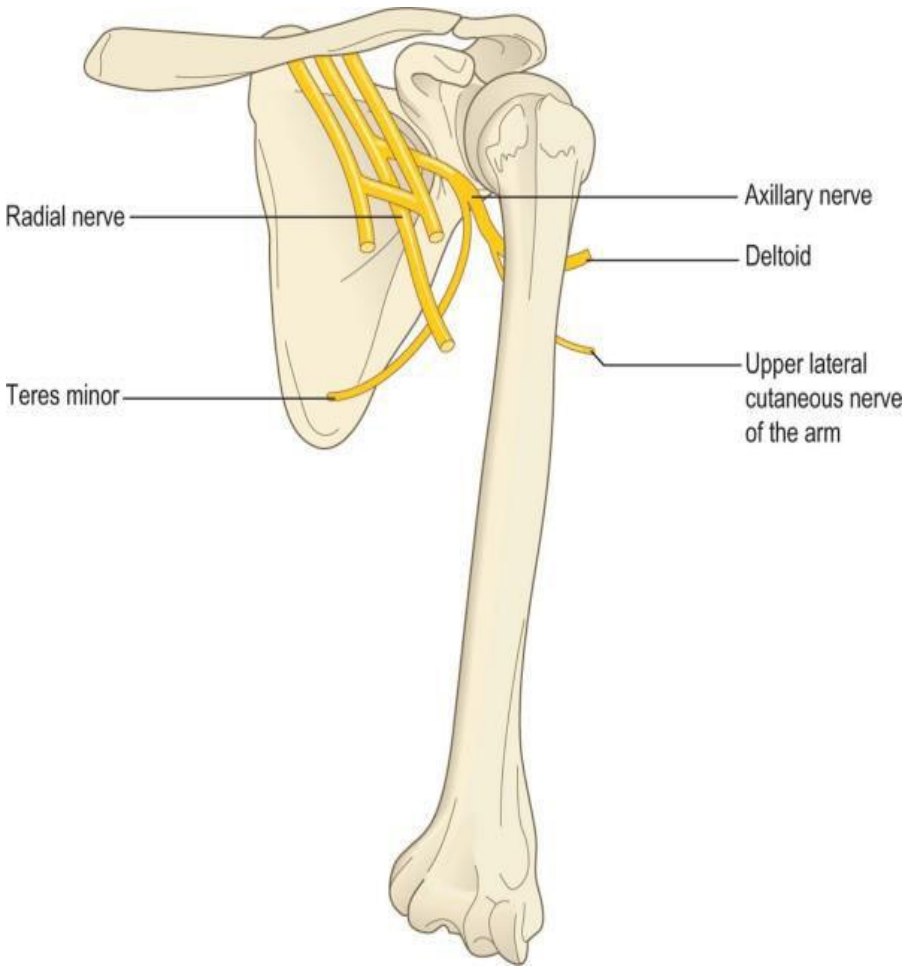
2- Ulnar flexors of the flexor compartment of forearm are partially affected (C8)





WINGING OF SCAPULA

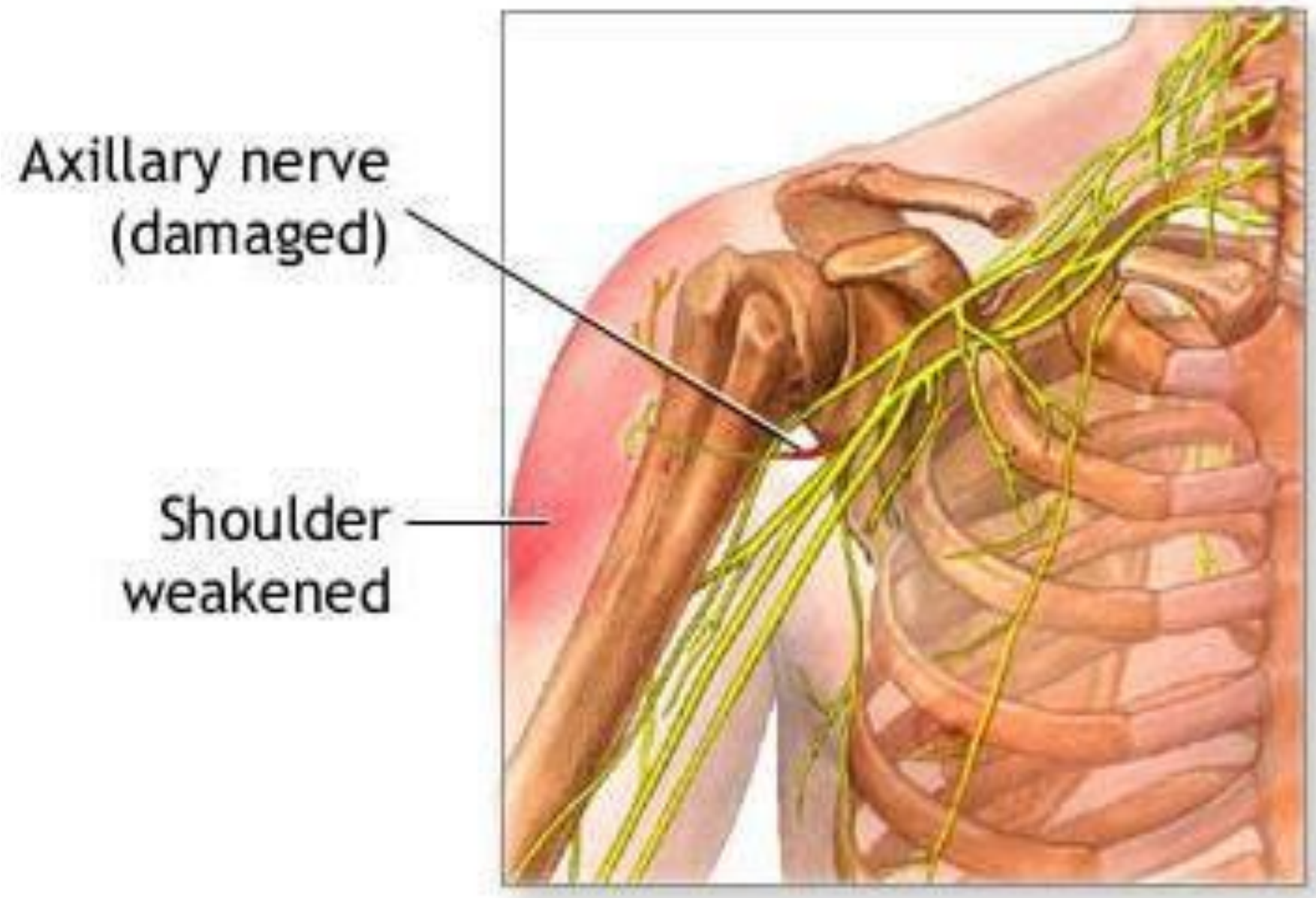
Injury to axillary nerve

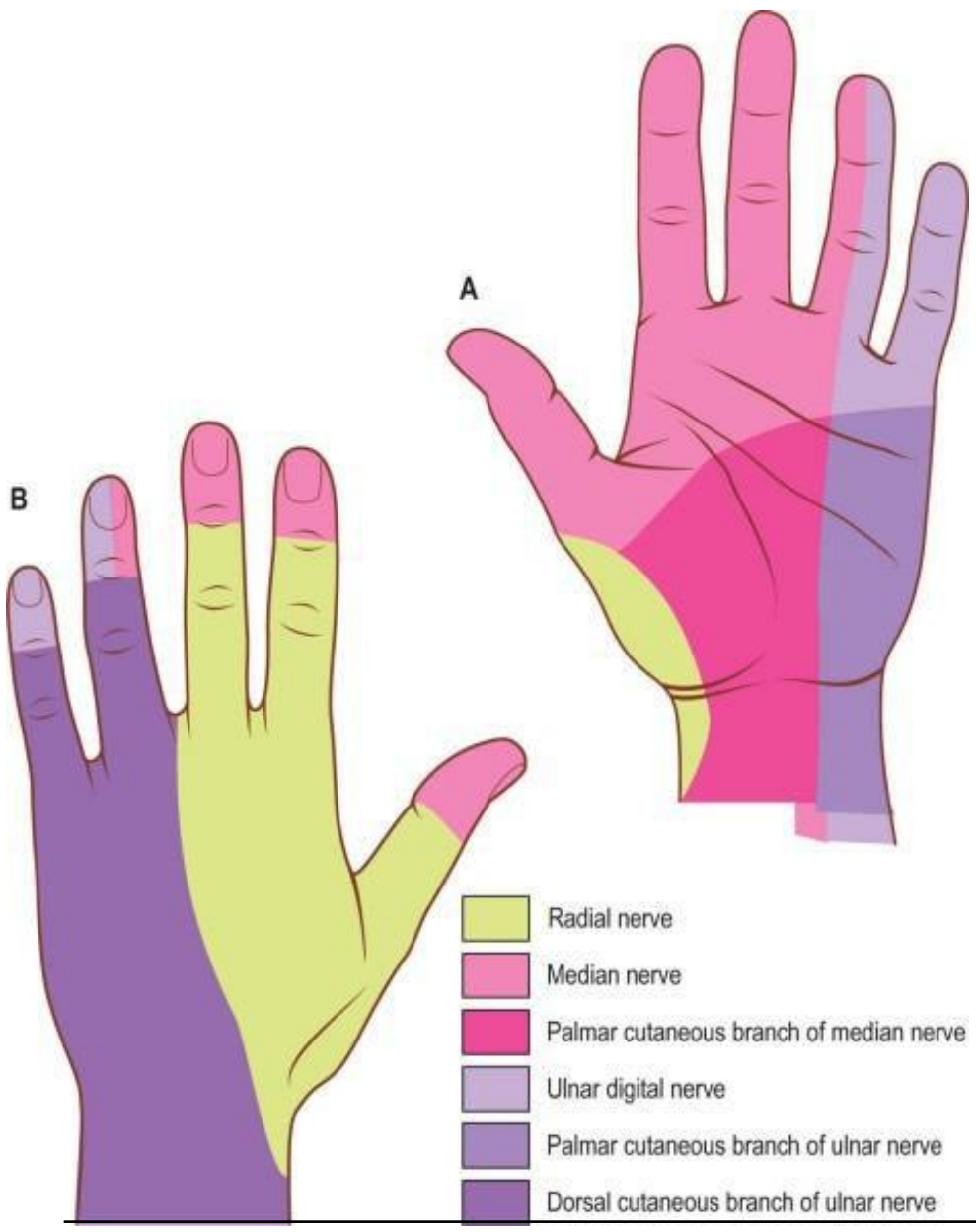


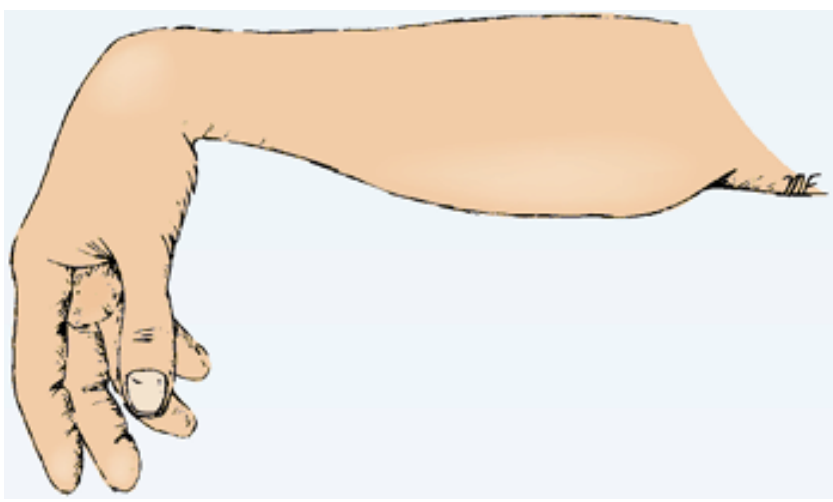
Anterior Shoulder Dislocation

Dislocated Head

Normal Head



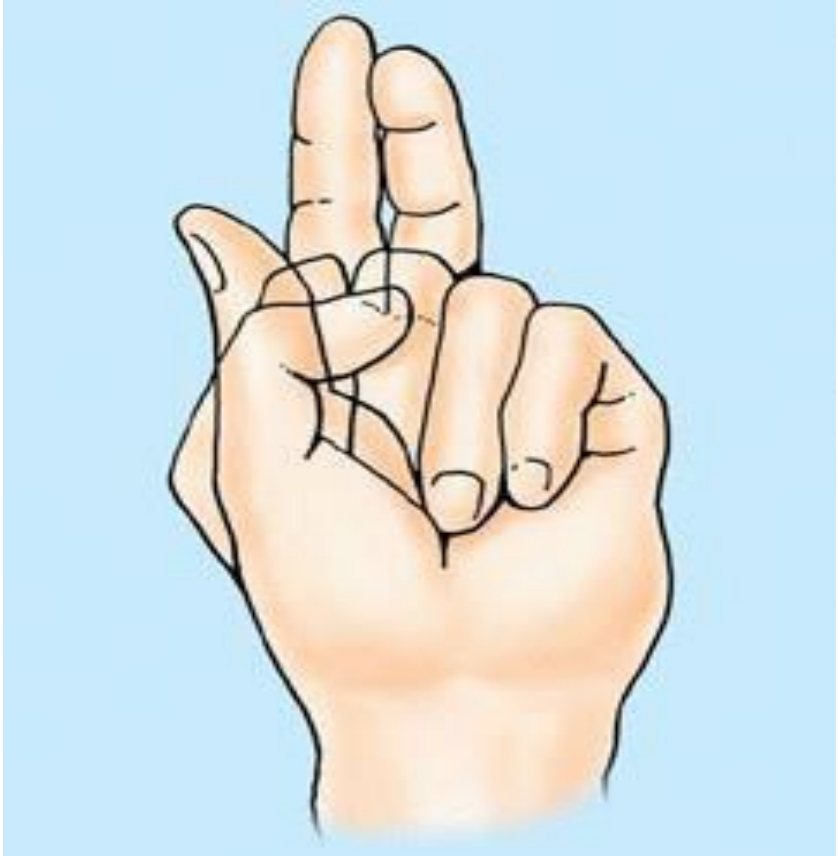




WRIST DROP

Median nerve injury at elbow (hand of benediction)

Inability to flex distal interphalangeal joint of index finger



Inability to flex digits two and three into a compact fist

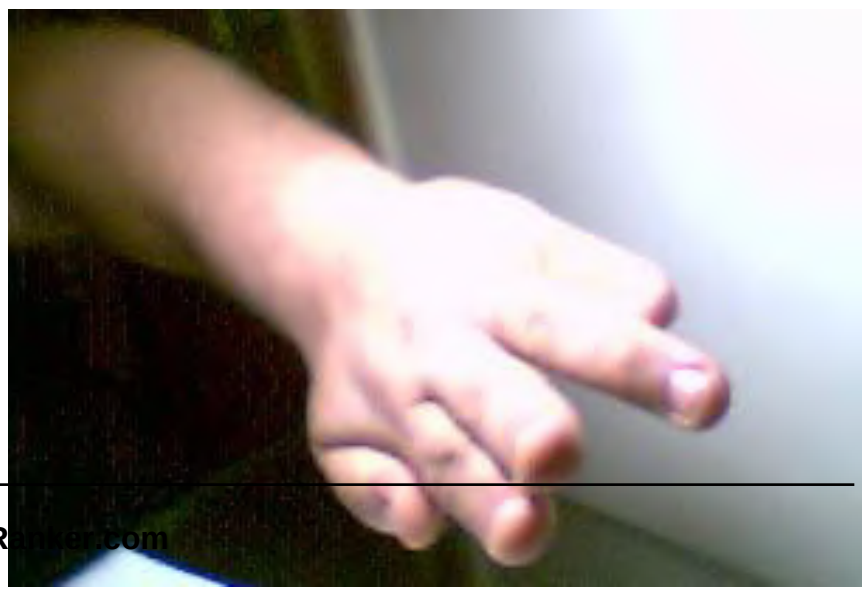
Median nerve injury

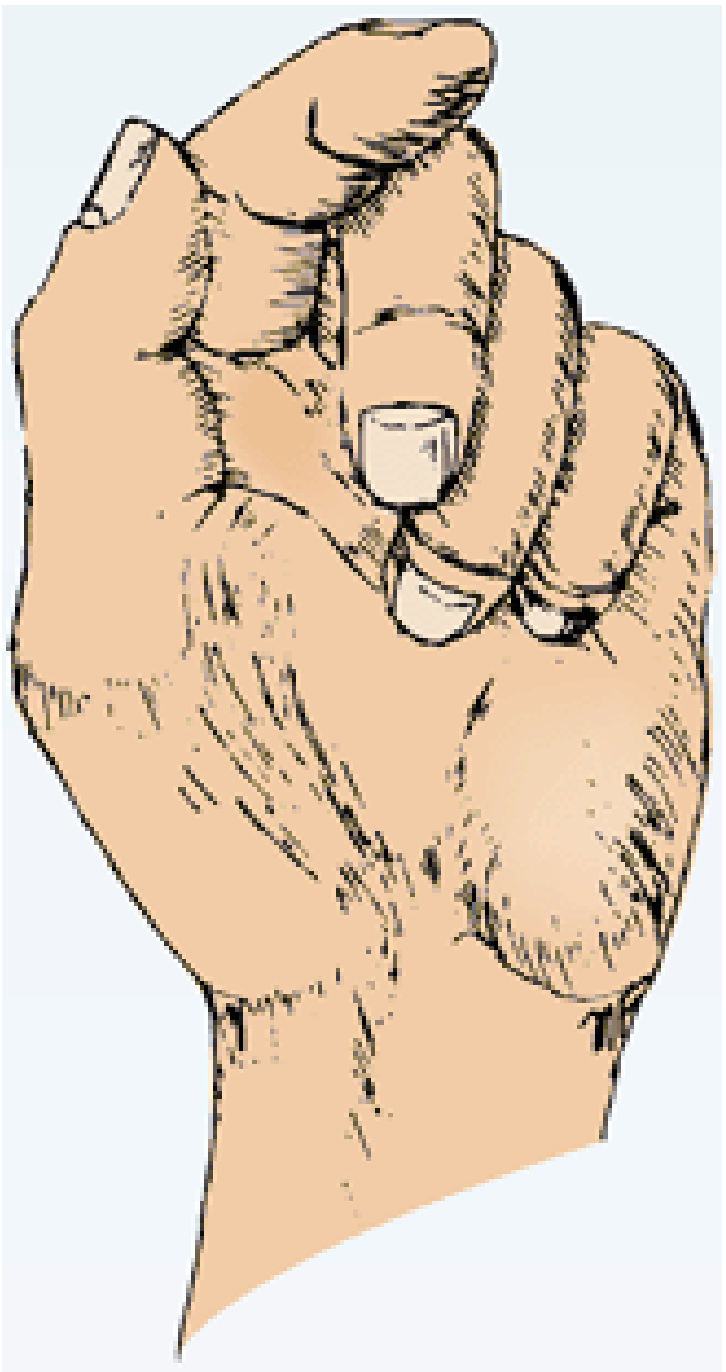
A- Above Elbow:

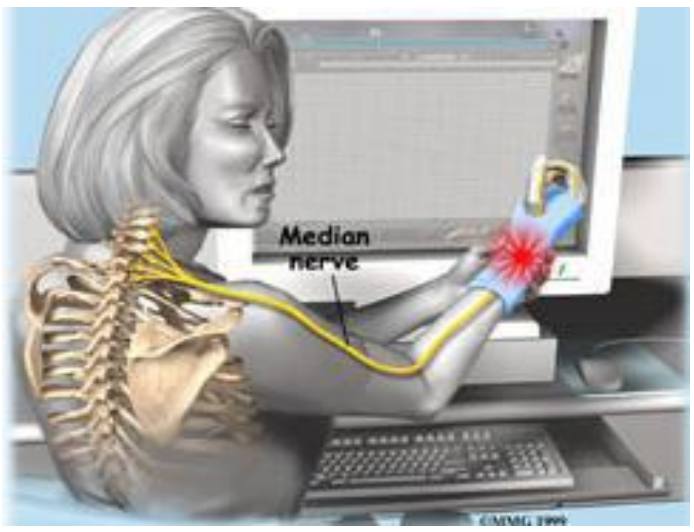
1- Loss of pronation
2- Week flexion
3- Ulnar deviation
4- Inability to flex thumb
5- Inability to oppose fingers
6- Inability to flex middle digits
7- Inability to flex Index middle fingers
- Sensory loss
- Ape hand deformity

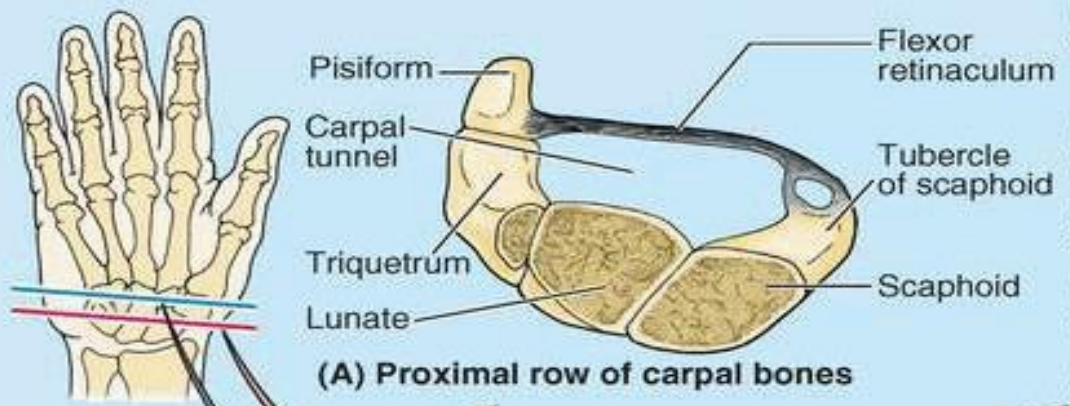
B- Above Wrist:

1- No Loss of pronation
2- No Week flexion
3- No Ulnar deviation
4- No Inability to flex thumb
5- Inability to oppose fingers
6- No Inability to flex middle digits
7- No Inability to flex index and middle fingers
-Sensory loss
-Ape hand deformity

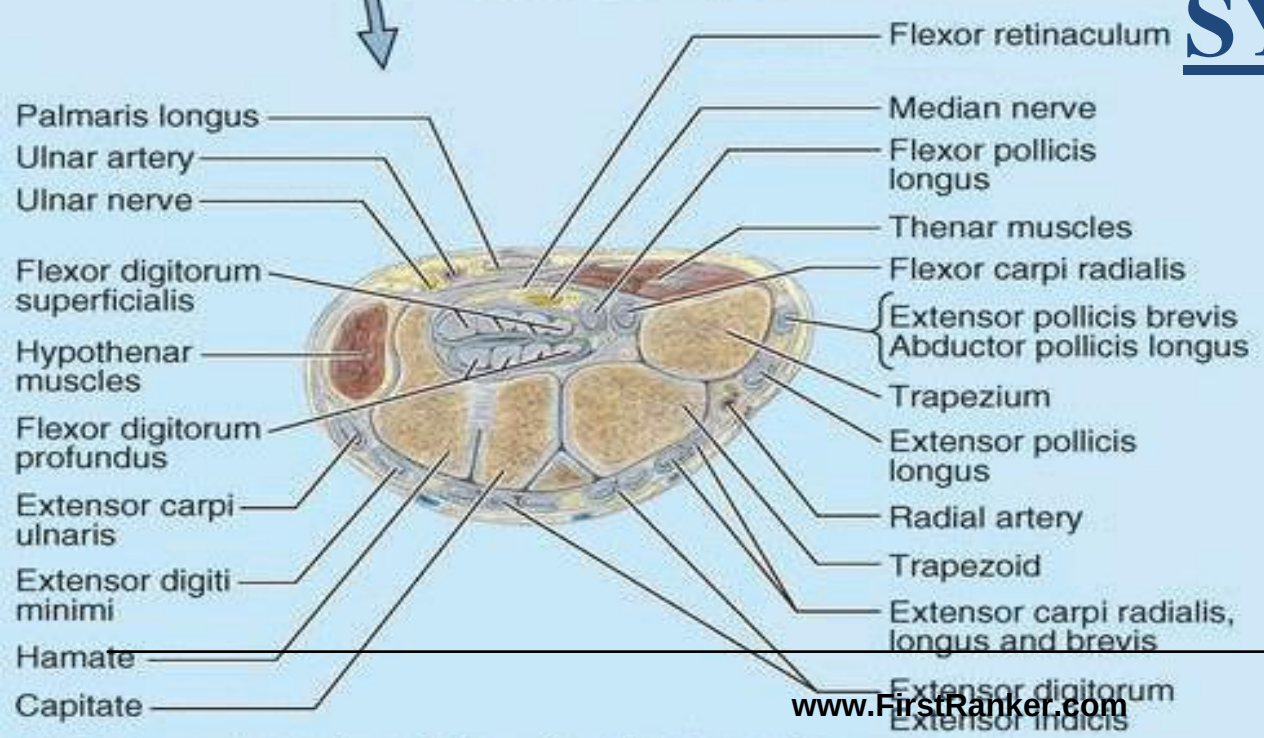


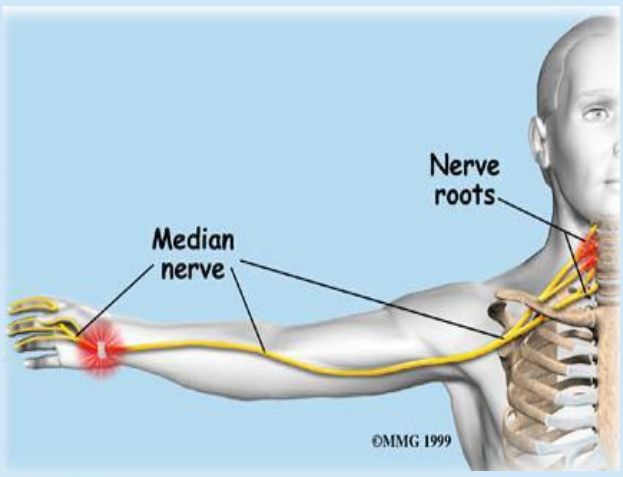






CARPAL TUNNEL SYNDROME

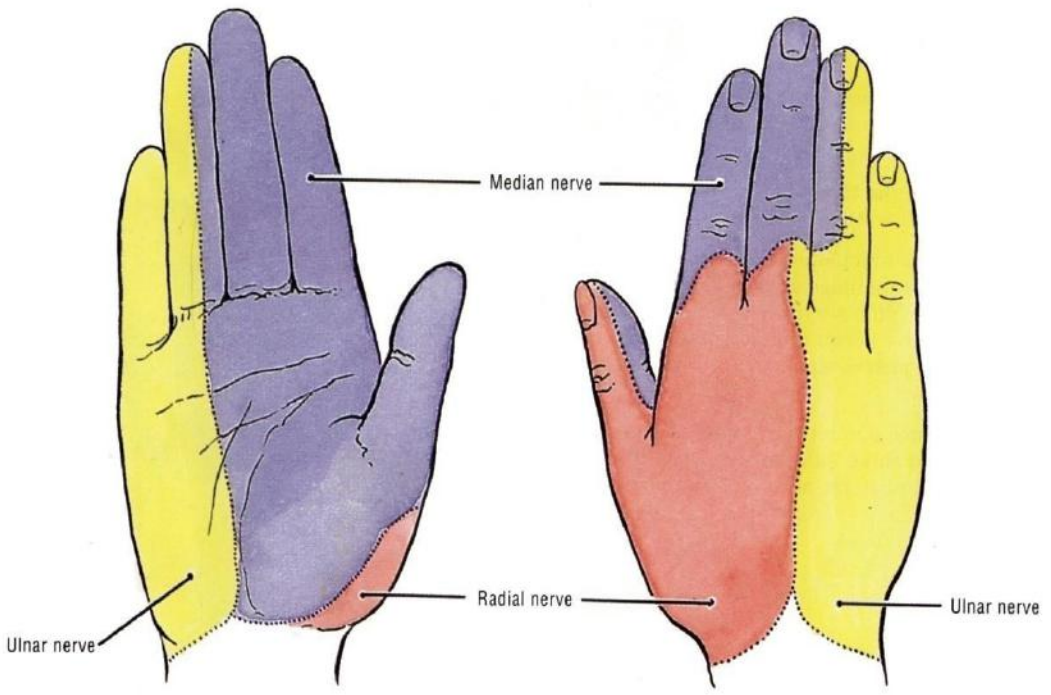


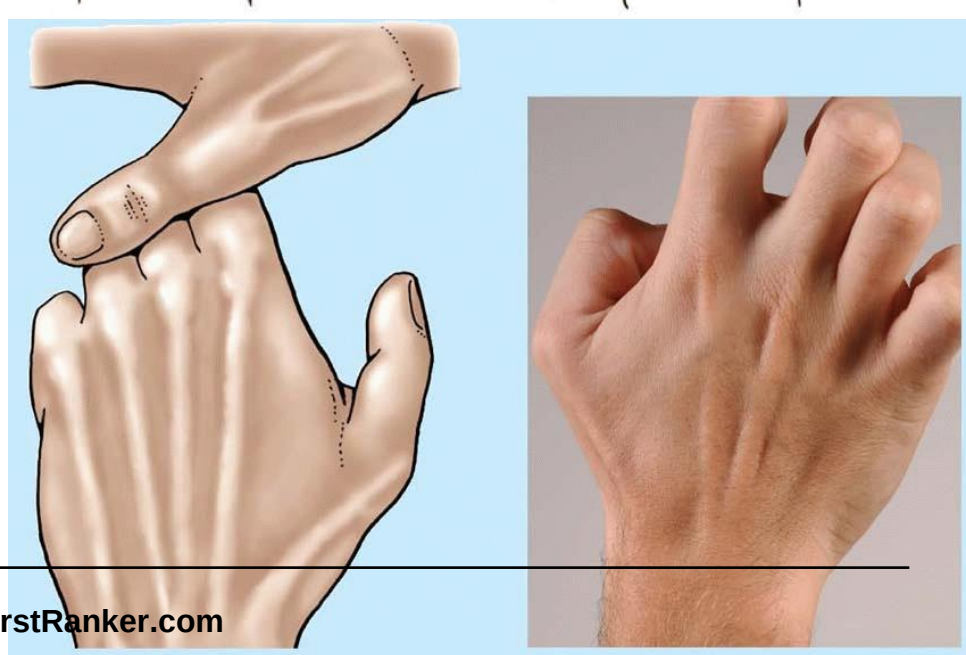


Emaciation of thenar eminence, thumb adducted and extended

(F) Simian hand

(E) Inability to oppose thumb (movement occurs at carpo-metacarpal joint)





Ulnar nerve injury

A - Above Elbow:

1- Week flexion

2- Loss of adduction

3- Inability to adduct thumb

4- Inability to put hand in writing position

- Sensory loss

- Partial claw hand deformity

B - Above Wrist:

1- No Week flexion

2- No Loss of adduction

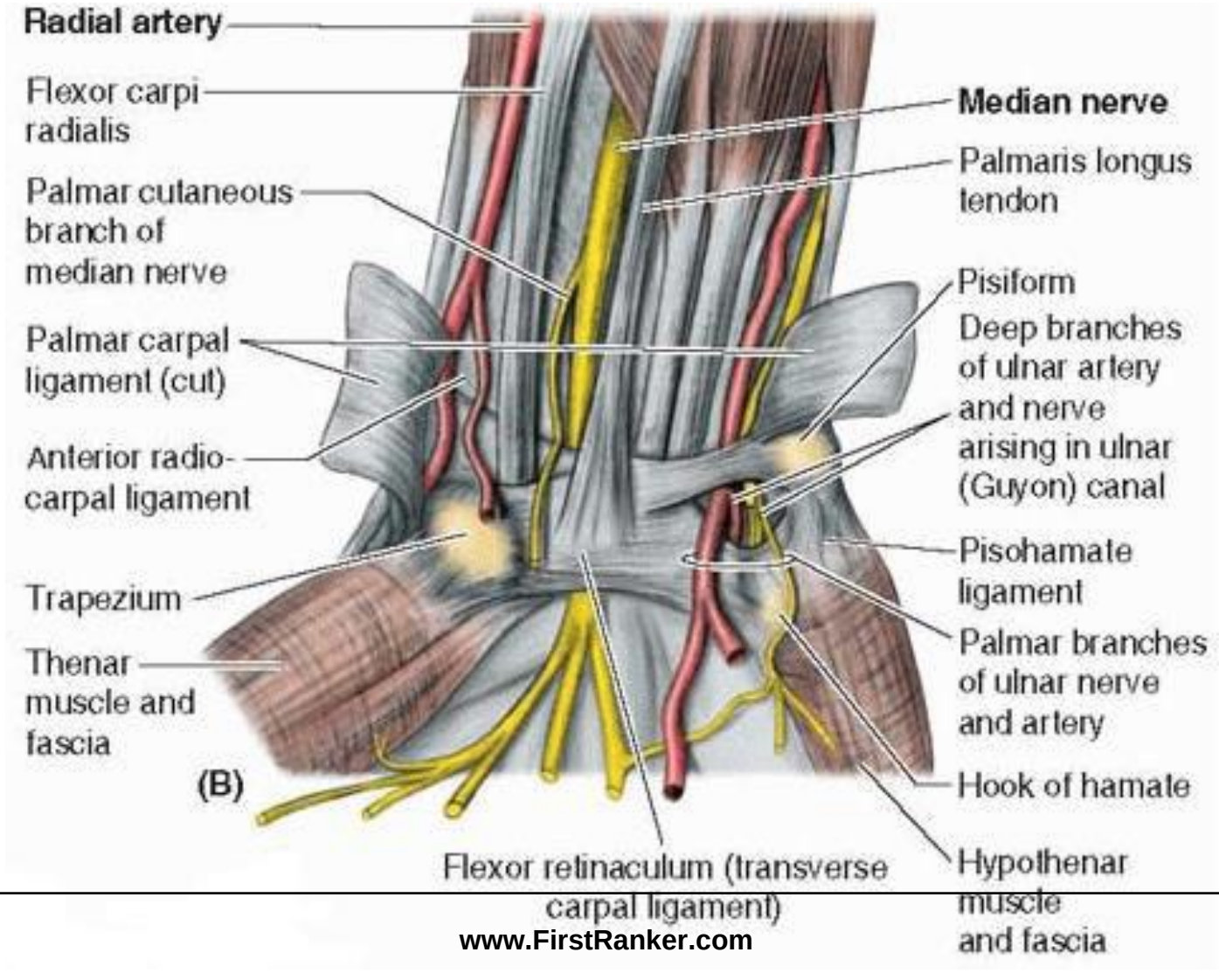
3- Inability to adduct thumb

4- Inability to put hand in writing position

- Sensory loss to fingers only

- Partial claw hand deformity is more prominent (Ulnar paradox)

Ulnar canal syndrome/Guyon tunnel syndrome



Handlebar neuropathy

- **Symptoms**
- Tingling
- Numbness
- Pain on the outside or middle of the forearm; this sensation of discomfort may run all the way to the little finger.
- **Treatment**
- Anti-inflammatory medications
- Wrist splints
- Therapeutic exercises

- **An inability to oppose the thumb to the little finger can result from damage to the _____ nerve.**

a) Axillary
b) Musculocutaneous
c) Radial
d) Ulnar
e) Median

- **Hyperextension of the proximal phalanges of the little and ring fingers can result from damage to the _____ nerve.**

a) Ulnar
b) Axillary
c) Radial
d) Median
e) Musculocutaneous

- **Wrist drop can result from damage to the _____ nerve.**

a) Median
b) Ulnar
c) Radial
d) Anterior interosseous
e) Axillary