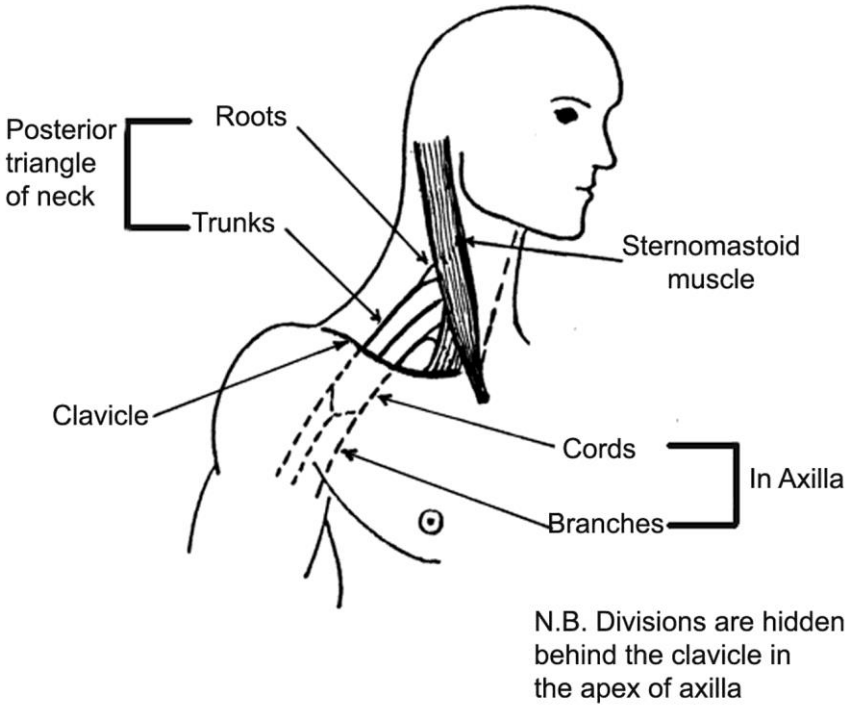
NERVES OF UPPER LIMB

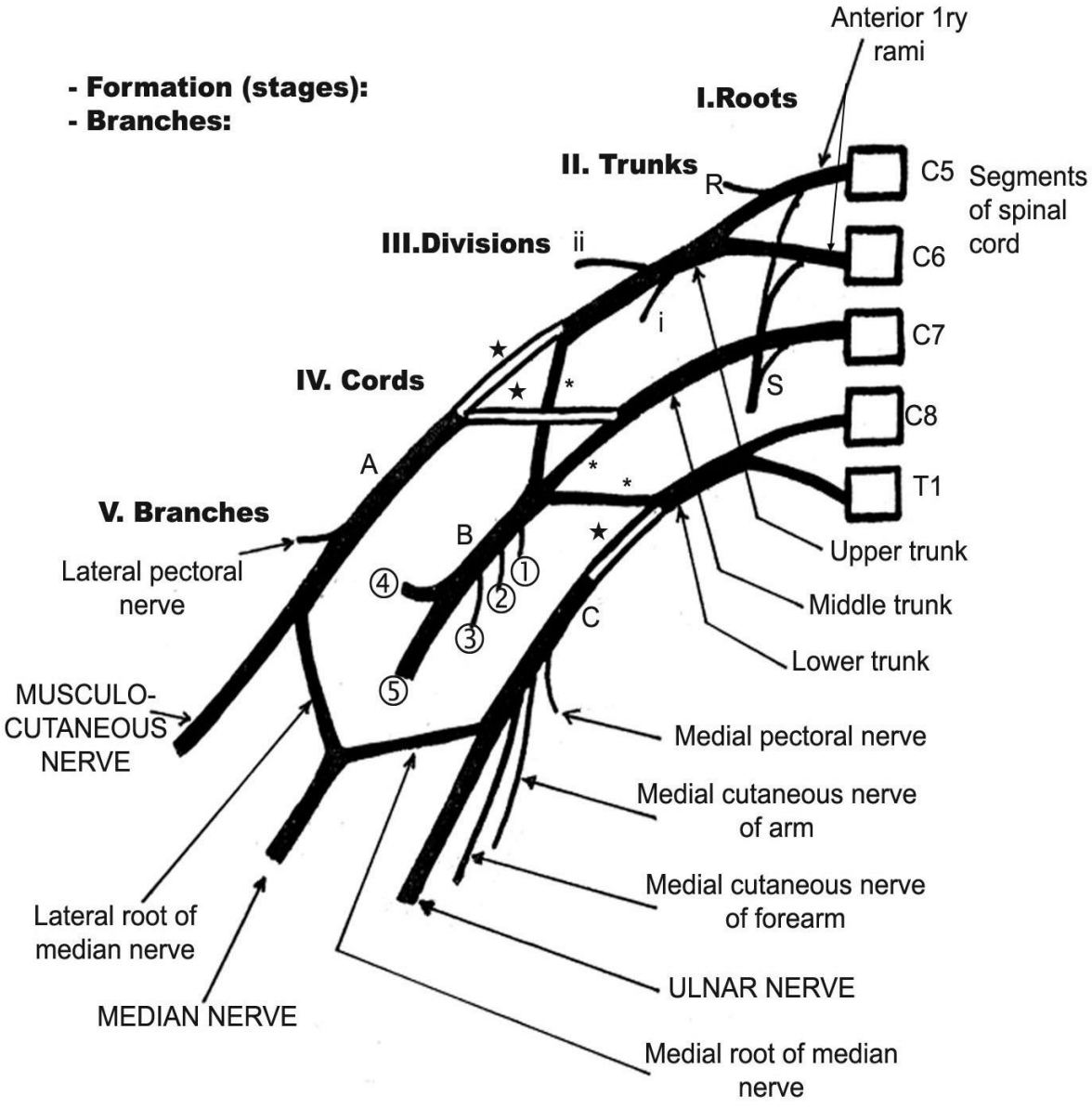
1. **BRACHIAL PLEXUS:** formed of roots, trunks, divisions and cords:
   * **The roots:** Formed of ant. rami of ***C5, 6, 7, 8 & T1***
   * **The trunks:** Upper trunk (C5,6), middle trunk(C7), lower trunk (C8, TI).
   * **The divisions:** Each trunk divides into ant. & post.,.divisions.
   * **The cords:** Lat. , med. & post. cords.
   * **Site.**
     - Roots & trunks lie in post triangle of neck.
     - Divisions lie in the apex of axilla behind the middle 1/3 of clavicle.
     - Cords lie in the axilla.
   * **Branches of brachial plexus:**
     1. **Roots :** N. to rhomboids and N. to serratus ant. (C5, 6, 7).
     2. **Trunks:**(2S) Suprascaplar n. & nerve to subclavius.
     3. **Cords:**
        - **Med. cord:** Med, pectoral, med. cut. n. of arm, med. cut. n. of forearm, ***ulnar and median root of median n.***
        - **Lat. cord:** Lat. pecteral, ***musculocutaneous & lat. root of median n.***
        - **Post. cord:** Upper subscapular, N. to latissimus dorsi, lower subscapular, ***axillary (circumflex) and radial nerve***.



Site of Brachial plexus

Anterior 1ry

BRACHIAL PLEXUS



A. Lateral cord
B. Posterior cord
C. Medial cord

★Anterior division
* Posterior division

i. Nerve to subclavius
ii. supra-scapular nerve

R. Nerve to rhomboids
S. Nerve to serratus anterior

① Upper subscapular nerve
② Nerve to latissimus dorsi
③ Lower subscapular nerve
④ AXILLARY NERVE
⑤ RADIAL NERVE

Brachial Plexus Injuries

* **Aetiology :**

1- Rarely open injuries as stab or gun shot .

2- Traction injuries which is usually birth injury .

3- Pressure injuries as fractures of clavicle or dislocation of shoulder .

* Clinical picture : 3 types

1- Whole plexus injury :

a-***Wasting , Paralysis , loss of active movements & motor power*** of whole muscles of upper limb

b- Complete sensory loss of upper limb except over upper ½ of deltoid (supplied by lateral supraclavicular nerve C3 & C 4) and medial side of arm (supplied by intercostobrachial nerve T2).

c- Horner's syndrome due to associated injury of sympathetic chain .

2-Erb-Duchenne paralysis : (injury of upper trunk C5 & C6)

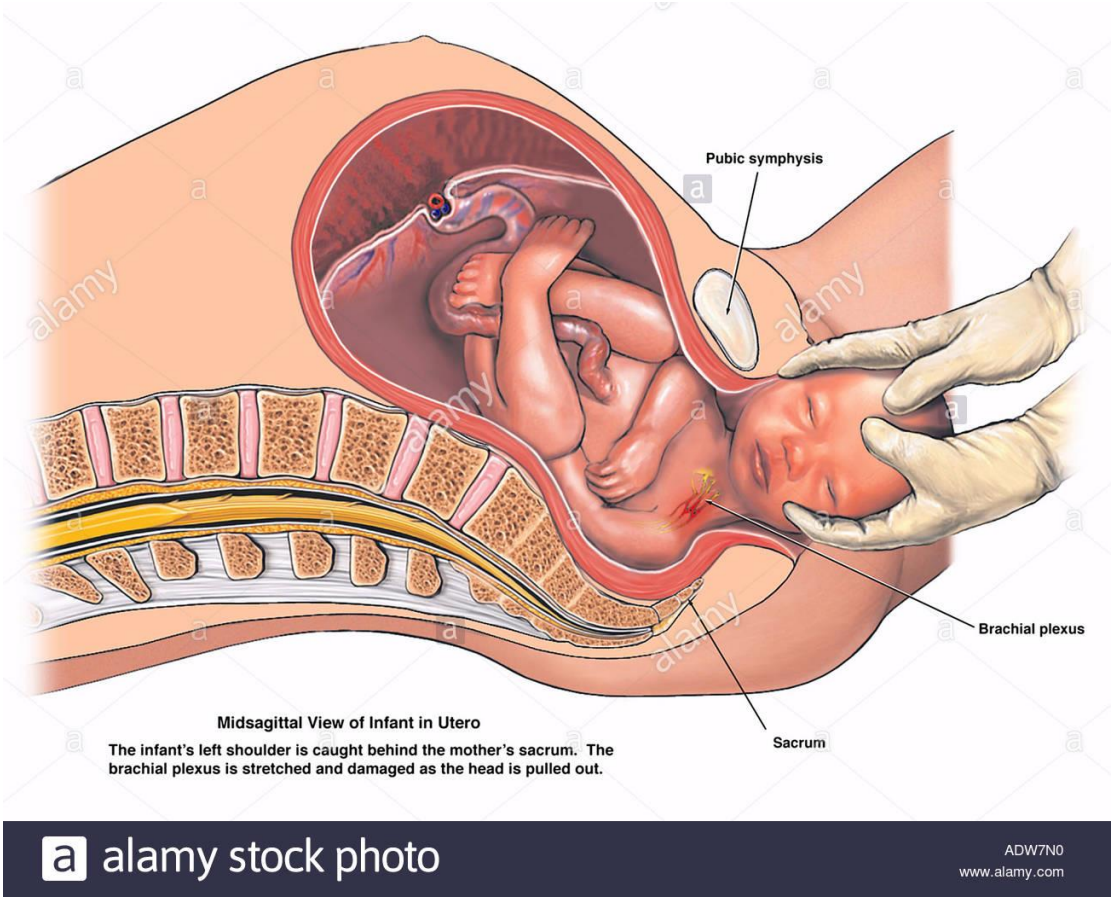
a- ***Wasting , Paralysis , loss of active movements & motor power*** of abductors & external rotators of shoulder , flexors of elbow and supinator leading to adduction & internal rotation of shoulder , extension of elbow and pronation of forearm ***(policeman tip deformity)*** .

b- Sensory loss on the lateral aspect of upper limb .

3- Klumpke's paralysis : (injury of lower trunk C8 & T1)

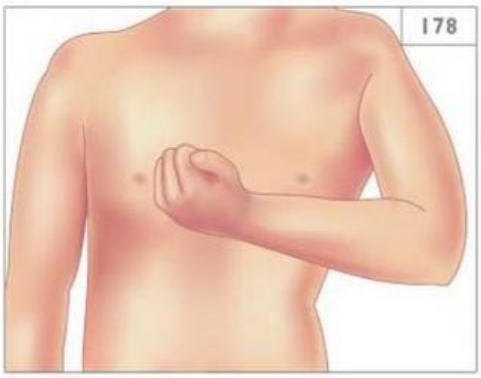
a- ***Wasting , Paralysis , loss of active movements & motor power*** of flexors of wrist & fingers (C8) and intrinsic muscles of hand (T1) leading to ***complete claw hand*** deformity (paralysis of lumbricle & interossie).

b- Sensory loss along the medial 3 1/2 fingers , medial 2/3 of palm of hand and medial aspect of forearm .



Whole plexus injury

177 Erb's palsy.



178 Klumpke palsy.

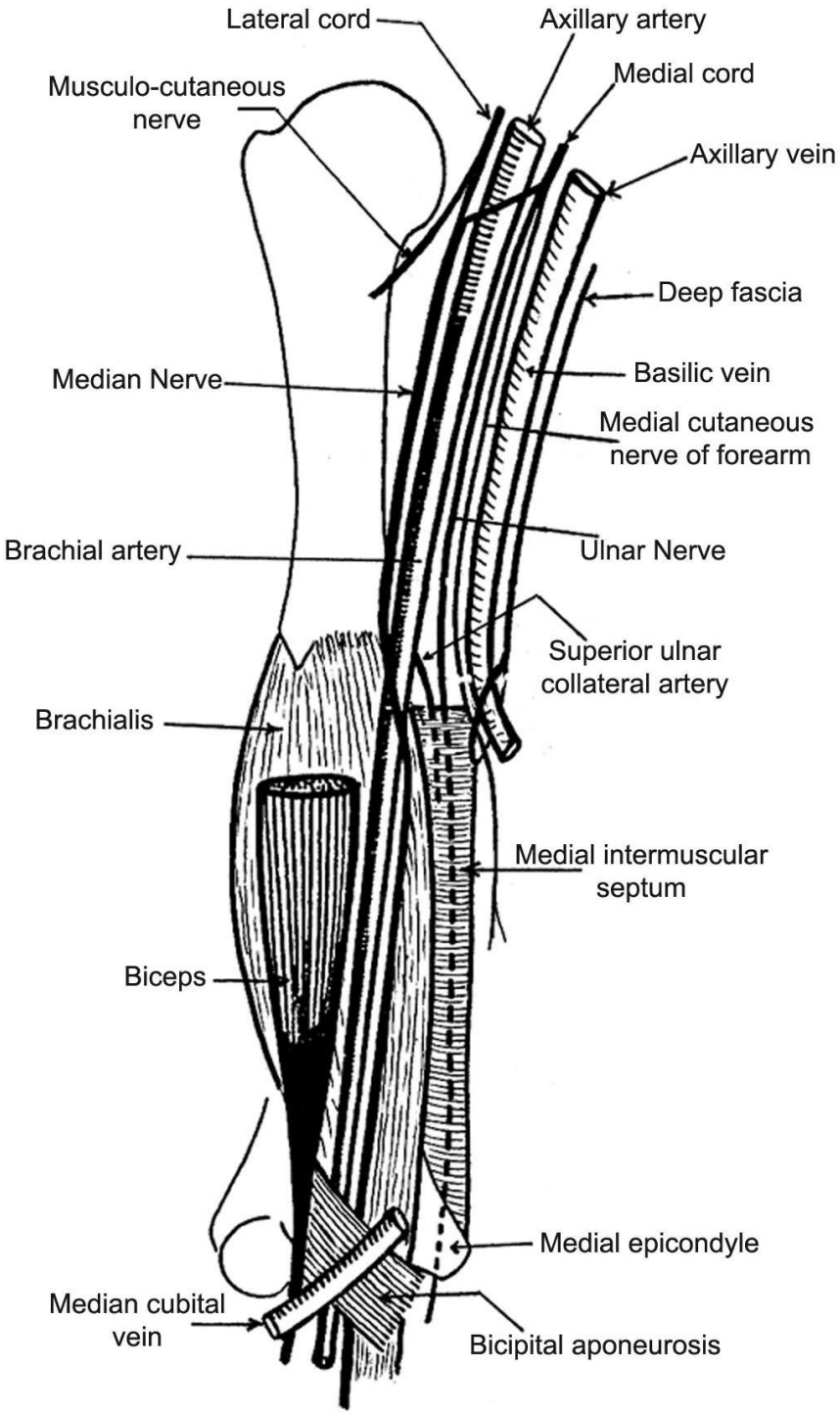
2. ULNAR NERVE: (C7, 8 & TI)

- It **descends on med. aspect** of arm .
- **It passes behind** the medial epicondyle of humerus .
- It enters the forearm by passing between the 2 heads of flexor carpi ulnaris.
- It **descends on med. aspect** of forearm .
- It enters the palm of hand & **ends** superficial to flexor retinaculum where it divides into a superficial cutaneous branch and a deep muscular branch .

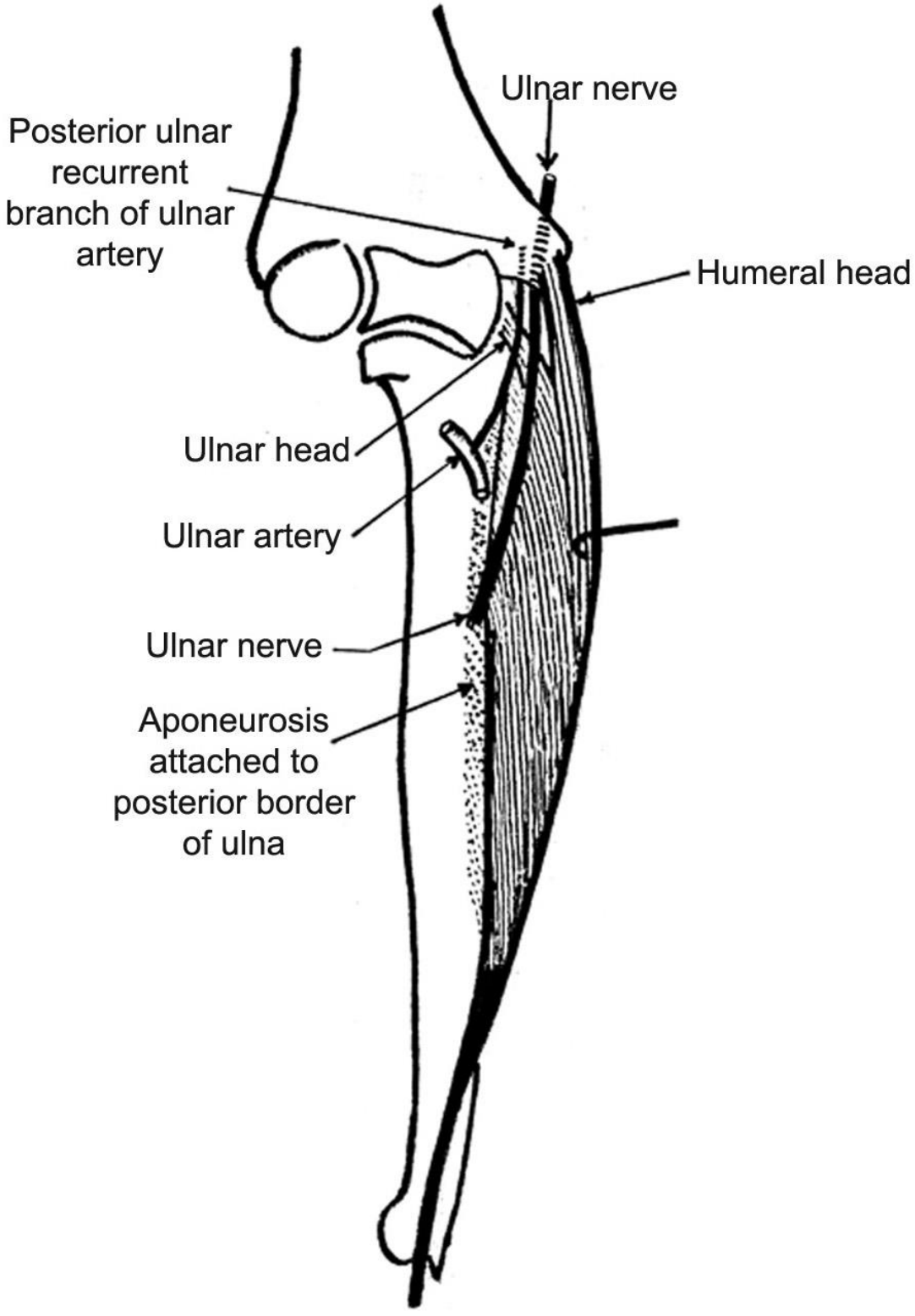
* **Branches:**

- **In axilla & arm**: No branches
- **In forearm**:
  - ***a) Muscular:*** Flexor carpi ulnais & medial 1/2 of flexor digitorum profundus.
  - ***b) Cutaneous*:**
    1. **Palmar cutaneous branch:** supply medial 1/3 of the palm.
    2. **Dorsal cutaneous branch:** Supply medial 1/3 of dorsum of hand and the dorsal aspect of medial 1 1/2 finger.
- **In hand**:

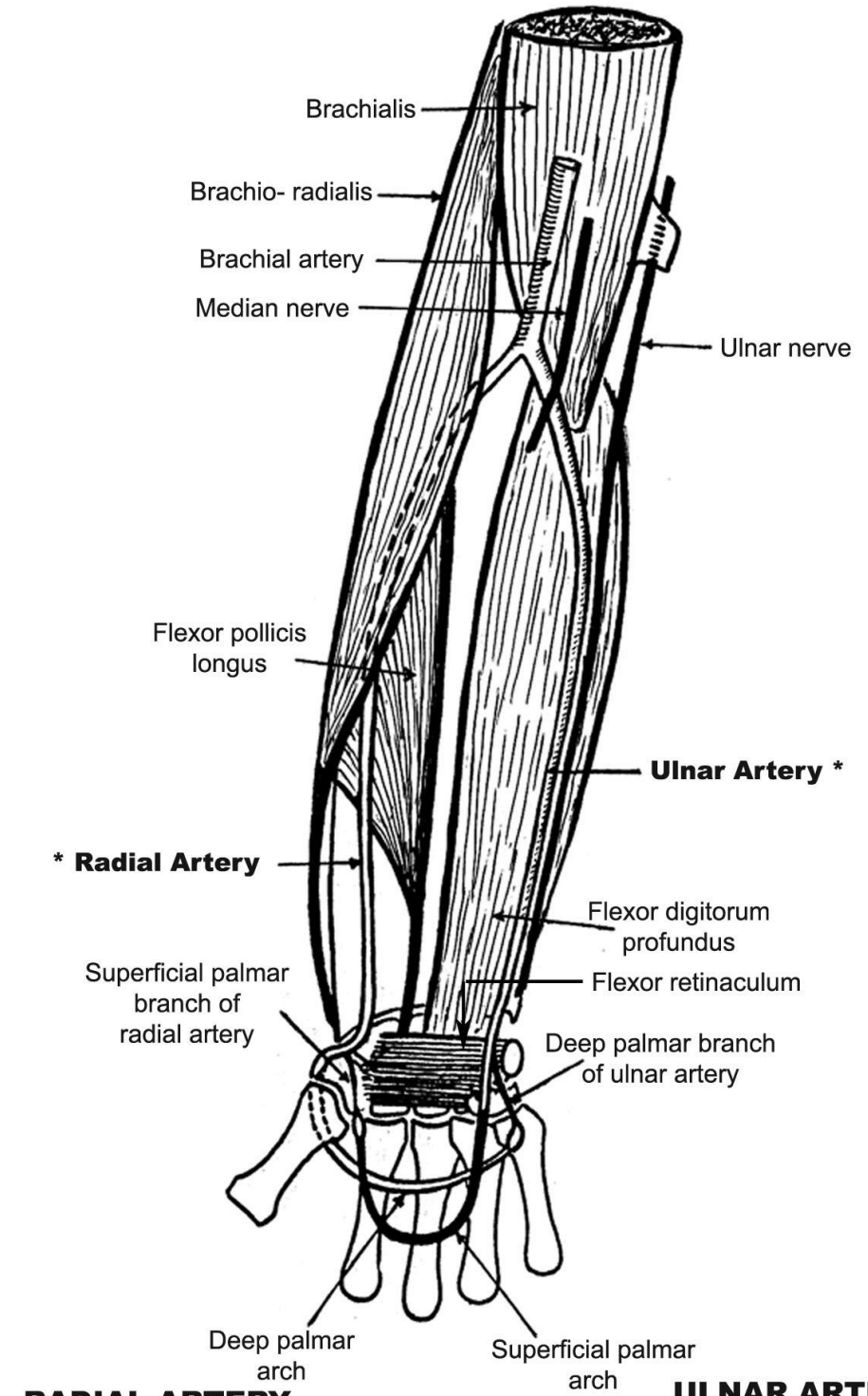
- ***Deep branch:*** Supply ms of hypothenar eminence, interossei, med. 2 lumbericals & adductor pollices.
- ***Superficial branch:*** Supply palmer aspect of medial 1 1/2 fingers.



ULNAR AND MEDIAN NERVES IN THE ARM
(Course and Relations)

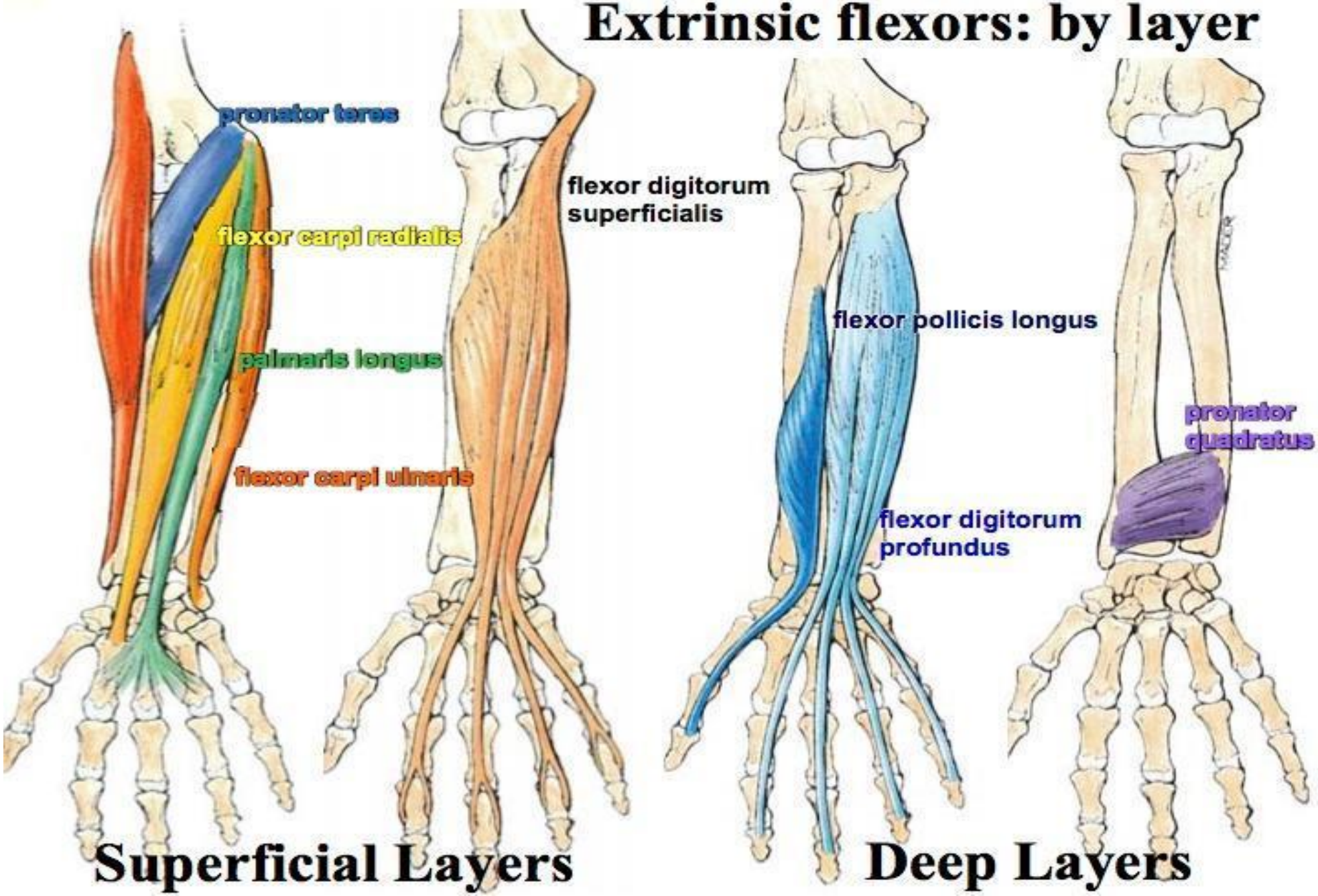


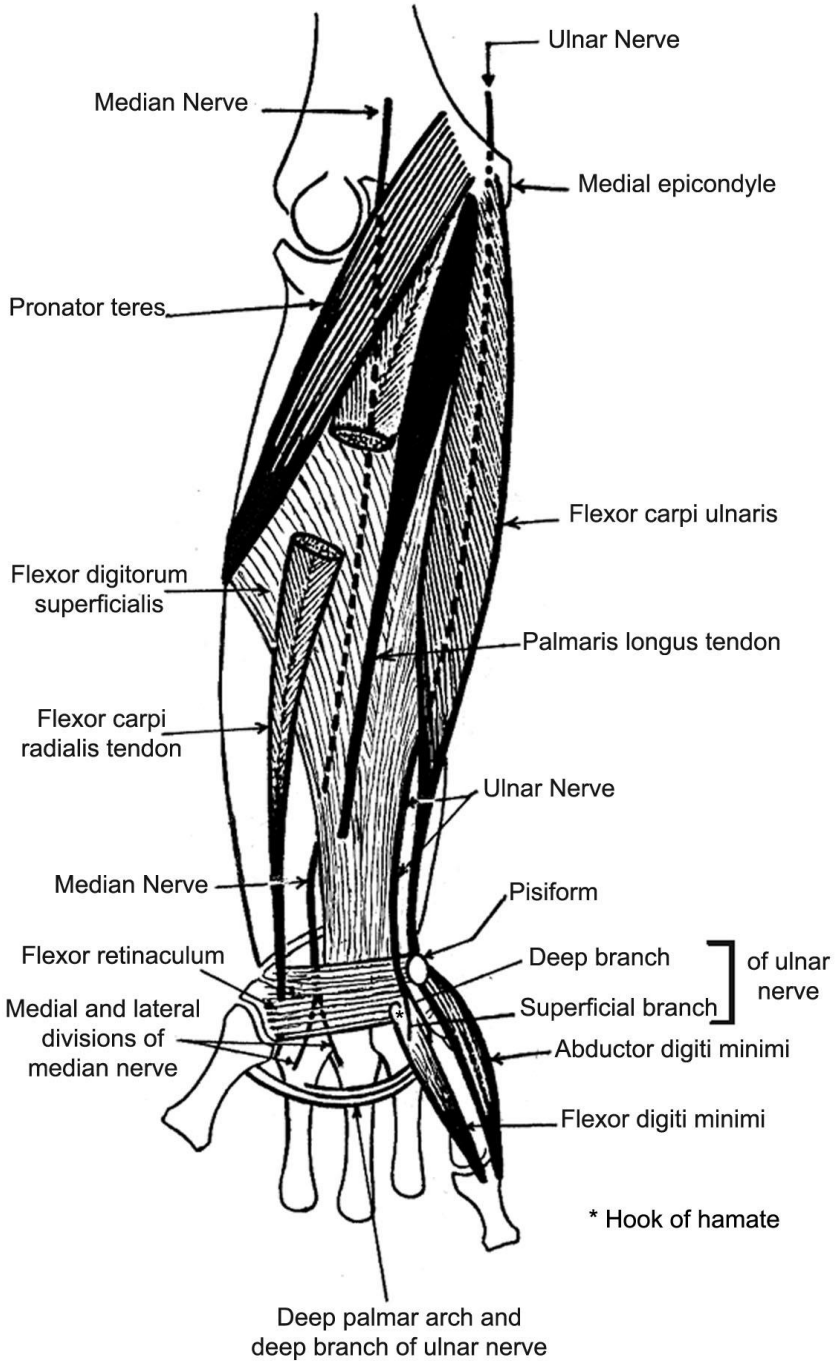
Flexor carpi ulnaris muscle and its relations



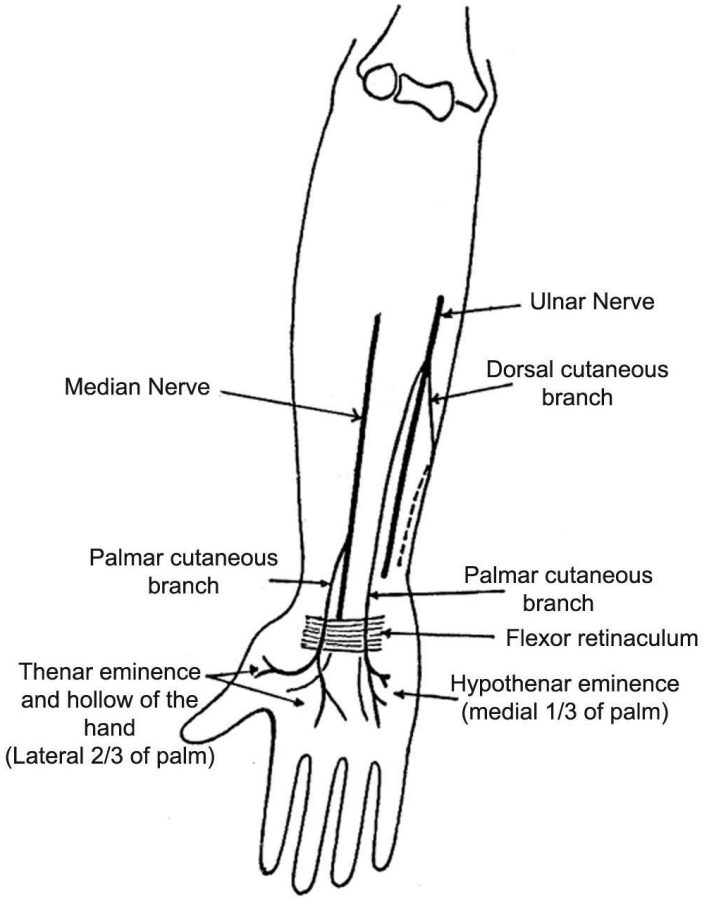
Front of Forearm

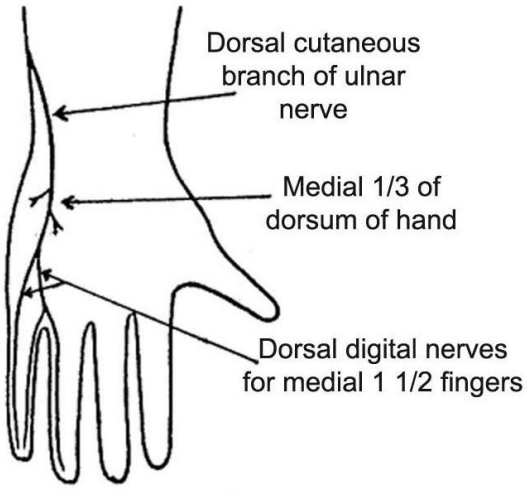
Extrinsic flexors: by layer



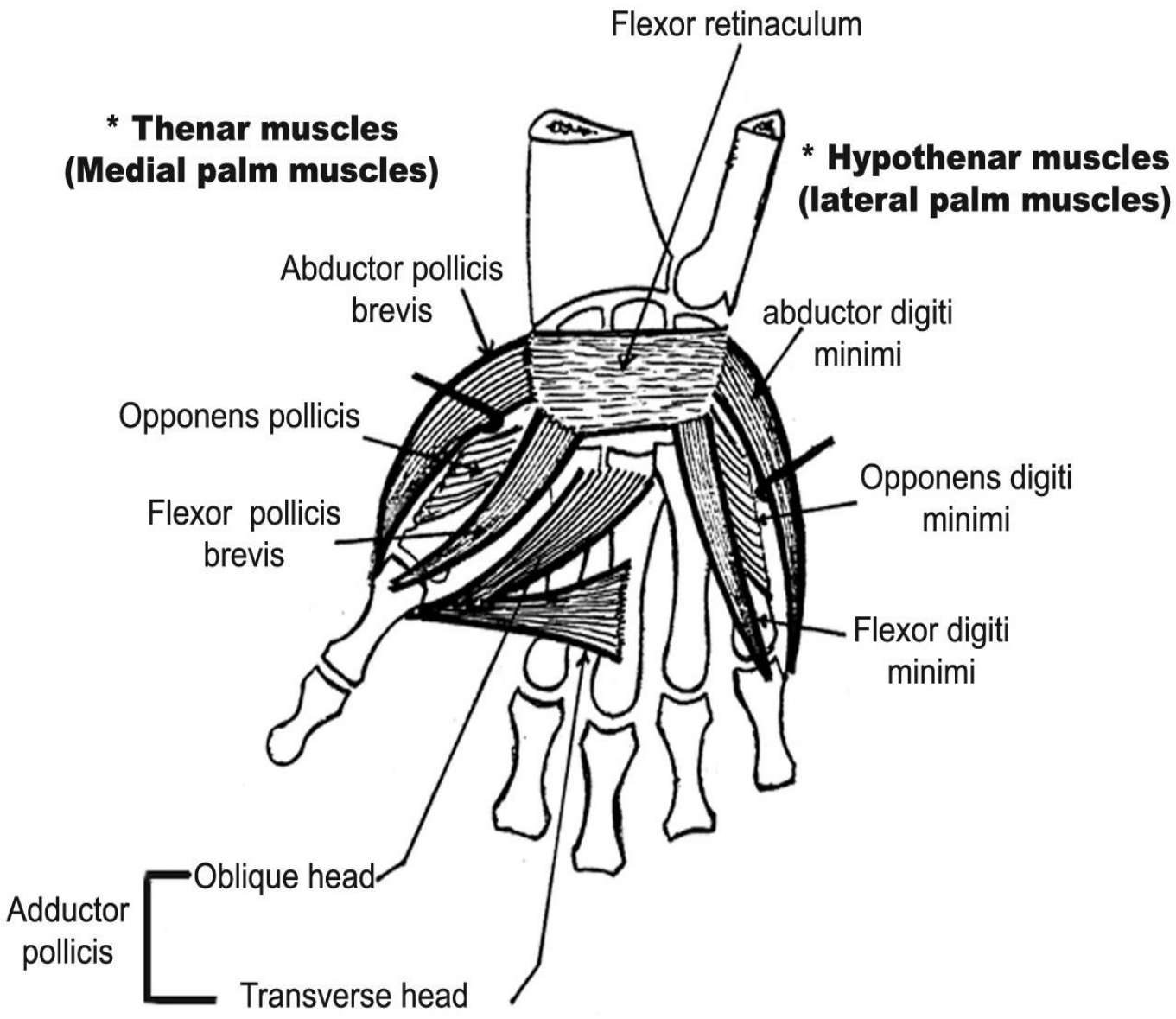


ULNAR AND MEDIAN NERVES IN THE FRONT OF FOREARM (Relations)

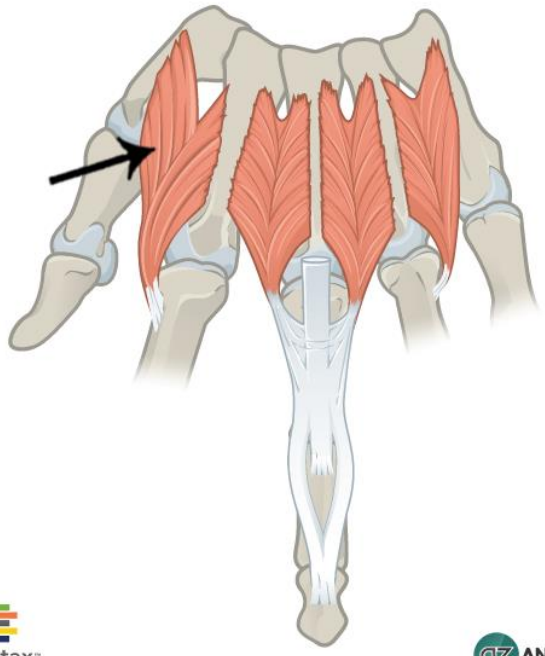


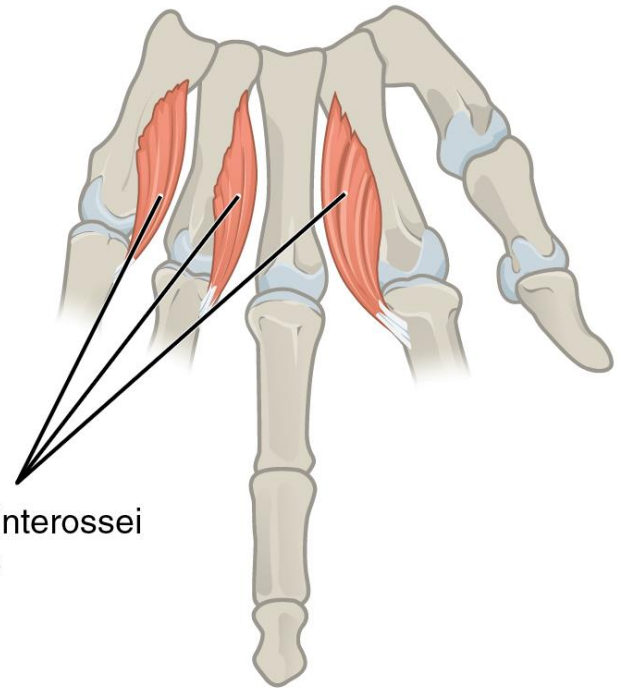


Ulnar Nerve
(Dorsal cutaneous branch)



MUSCLES OF THE HAND

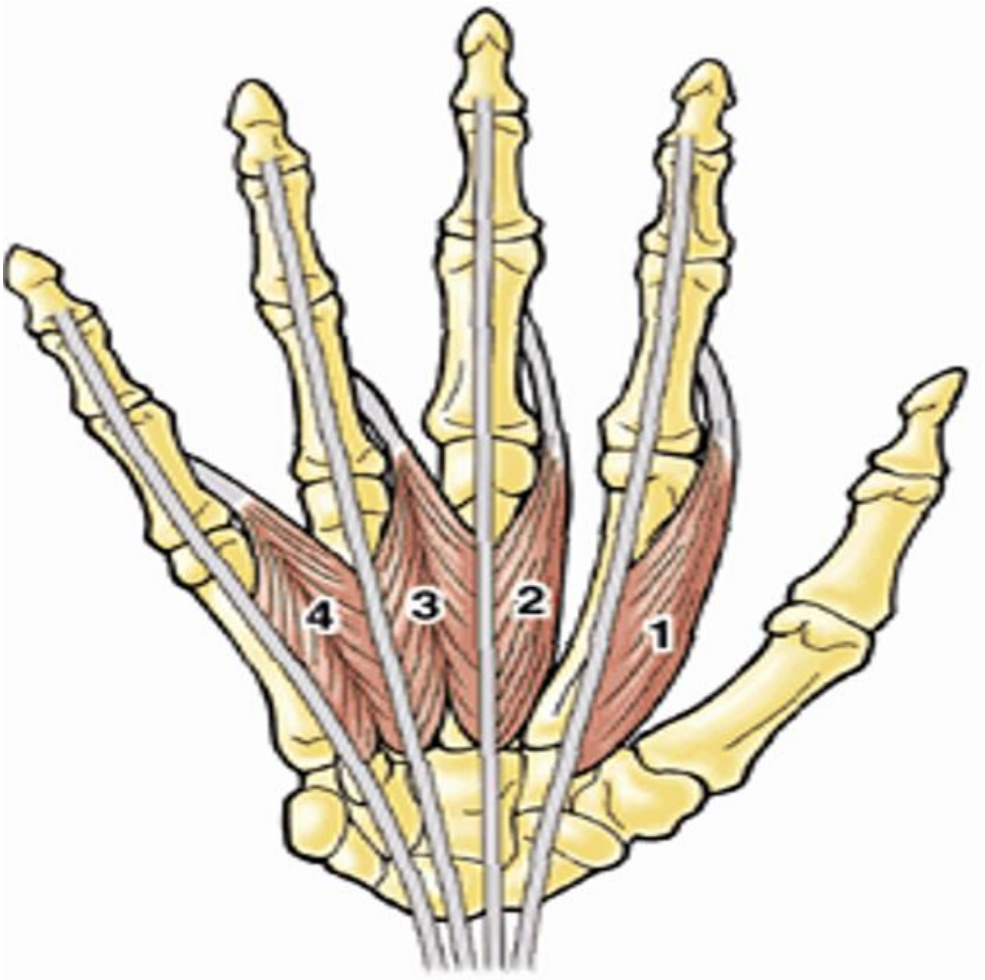




Palmar interossei muscles

openstax COLLEGE

ANATOMYZONE



Lumbricals (1–4)

* **Applied anatomy: ULNAR NERVE INJURY**

❖ **Cause:** Cut wrist , supracondylar fracture or Fracture medial epicondyle of humerus.

❖ **Clinical picture :**

1. Sensory loss: in the area supplied by ulnar nerve .

2. Motor loss: ***Wasting , Paralysis , loss of active movements & motor power*** of muscles supplied by ulnar nerve . The most important sequels are :

- Loss of adduction of medial 4 fingers due to paralysis of palmar interossei .

- Loss of abduction of middle 3 fingers due to paralysis of dorsal interossei .

- Loss of writing position of medial 2 fingers due to paralysis of interossei and medial 2 lumbericals .

- Loss of adduction of thumb due to paralysis of adductor polices .

3. Deformity: ***Partial claw hand*** (due to paralysis of interossei and medial 2 lumbericals of little & ring fingers). The deformity is more sever in case of injury at the level of the wrist (intact flexor digitorum profundus) than that at the level of elbow ***(ulnar paradox)***

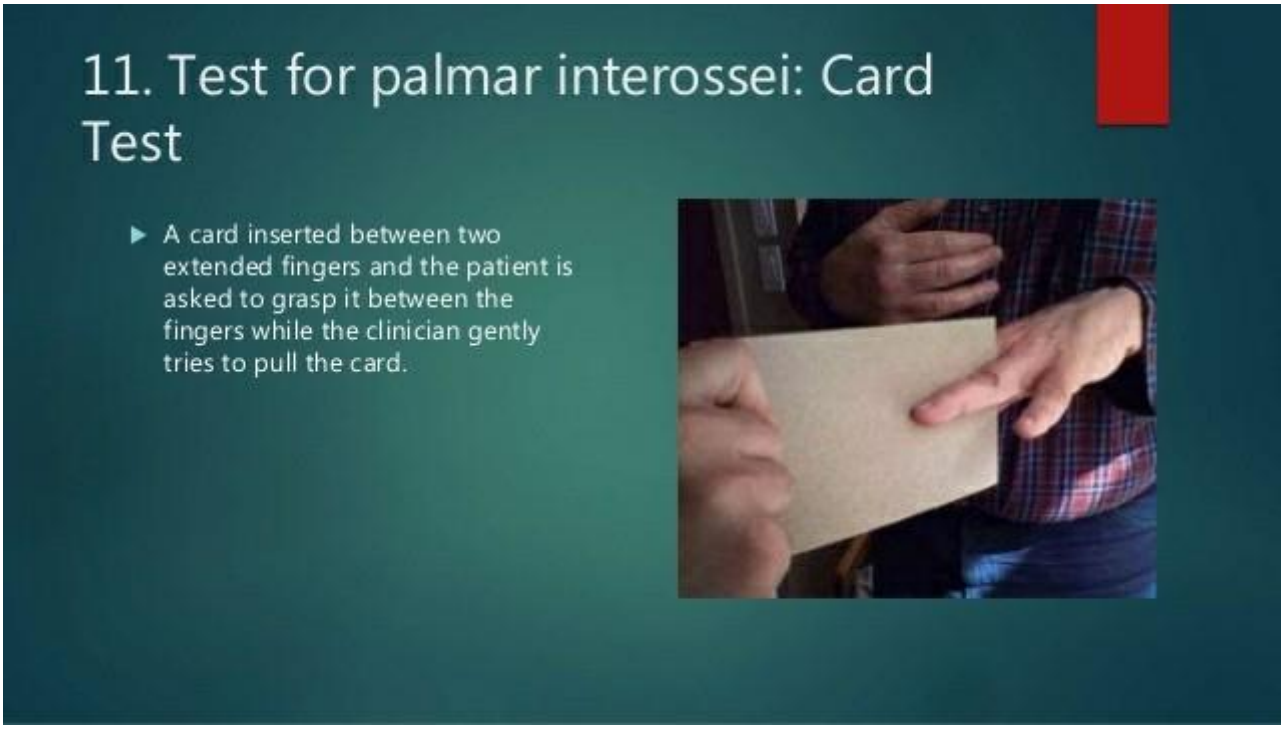
4. **Special tests:-**

A - Card test : The patient can not hold a piece of paper between extended fingers due to paralysis of adductors of fingers (palmar interossei) .

B -Froment's test : ask the patient to hold a piece of paper between the thumbs and the index fingers (due to paralysis of adductor polices the patient can do this only by flexion of thumb not by adduction .

Ulnar paradox

Ulnar nerve injury at the level of wrist



Card test

Froment's test

3. MEDIAN NERVE: (C5,6,7,8 & TI)

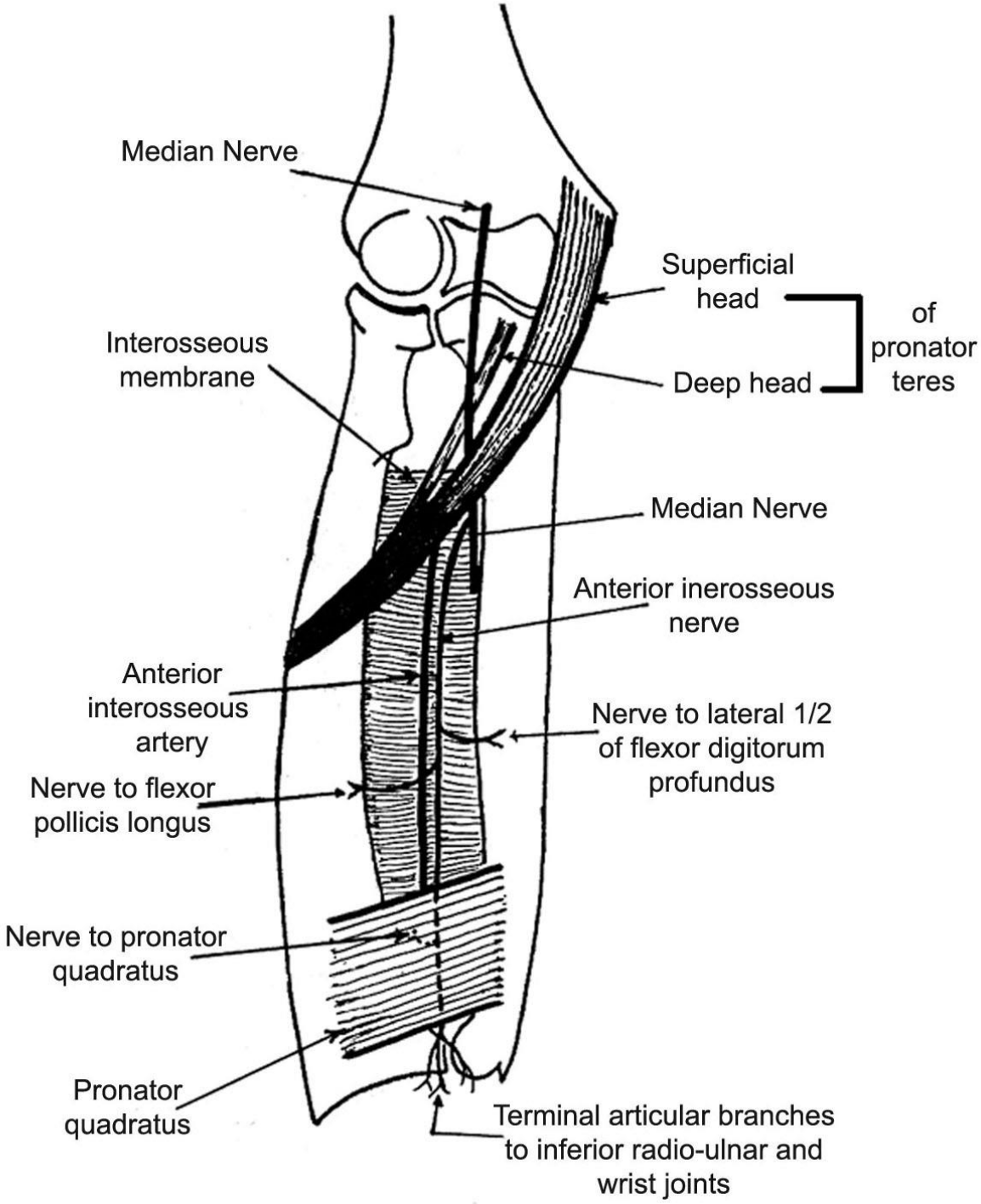
- It is formed by medial and lateral roots from the medial and lateral cords of brachial plexus .
- It descends lateral to axillary & upper part of brachial artery till the middle of arm it ***crosses anterior to the brachial artery*** from lateral to medial .
- It enters the forearm by passing between the 2 heads of pronator teres.
- It passes in the lateral part of forearm then deep to the flexor retinaculum (through carpal tunnel) to enter the hand where **it ends by** dividing into medial & lateral branches.

*** Branches:-**

- **In axilla & arm**: No branches.
- **In forearm**:
  - ***a) Muscular:*** superficial group of front of forearm except flexor carpi ulnaris.
  - ***b) Ant. interosseous nerve*** (supply the deep group of front of forearm except med. 1/2 of flexor digit. profundus .
  - ***c) Palmar cutaneous branch*** (pass in front of flexor retinaculum to supply lateral 2/3 of palm).
- **In hand:**
  - ***a) Muscular*** (lateral 2 lumbricals , muscles of thenar eminence except adductor pollices).
  - ***b) Cutaneous:*** palmar aspect of lateral 3 1/2 fingers & dorsal aspect of their distal & midlle phalanges.

*** Applied anatomy: MEDIAN NERVE INJURY**

A. Cause: Supra-condylar fracture of the humerus , Colle's fracture of radius , cut wound at the wrist or Carpal tunnel syndrome (median nerve compression in the carpal tunnel due to oedema, myxoedema , tumors, teno-synovitis… etc.).



Anterior Interosseous Nerve
(branch of Median Nerve)

B. Clinical picture :

1. **Deformity:** ***Ape or Monkey's hand*** (adduction of extended thumb with wasting of thenar eminence).

2. **Motor loss:** ***Wasting , Paralysis , loss of active movements & motor power*** of of all muscles supplied by median nerve . The most important sequels are :

a-Due paralysis of all flexors of index & middle fingers (FDP , FDS & lateral 2 lumbracils) leading to:

-Ask the patient to raise the hands leading to ***benediction attitude .***

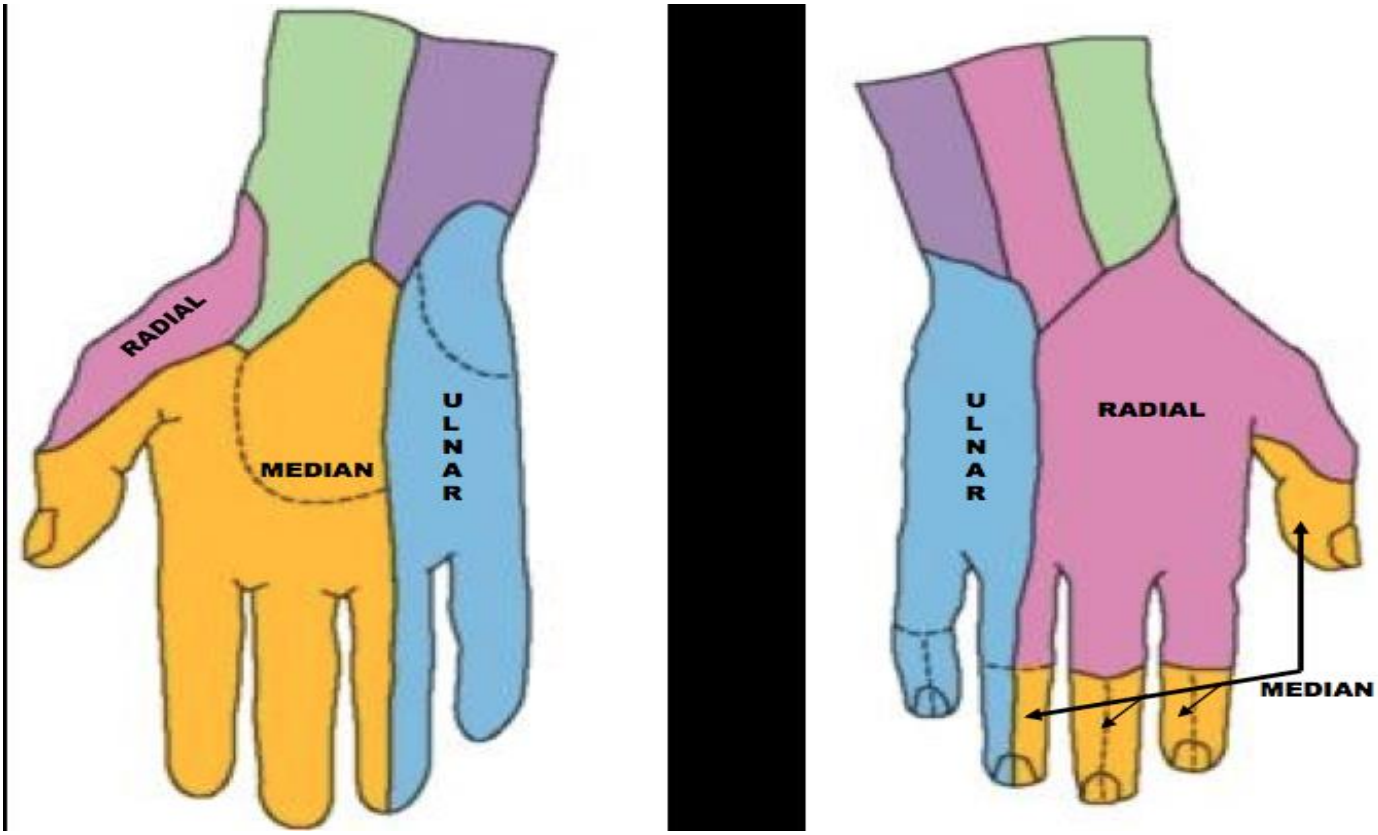
-***Clasping test*** :Ask the patient to clasp the 2 hands leading to pointing of index finger .

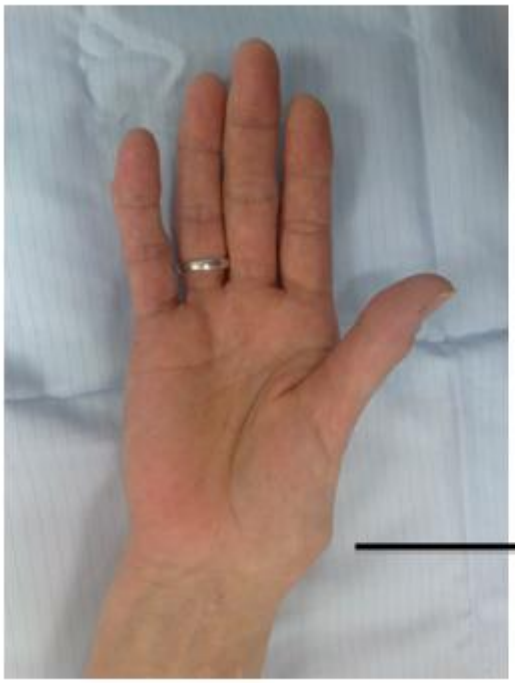
b- Loss of flexion of thumb (flexor polices longus & brevis)

c- Loss of opposition of the thumb (opponens polices)

d- ***Pen touching test :*** Ask the patient to touch a pen by side of extended thumb (test of **abductor polices brevis**) .

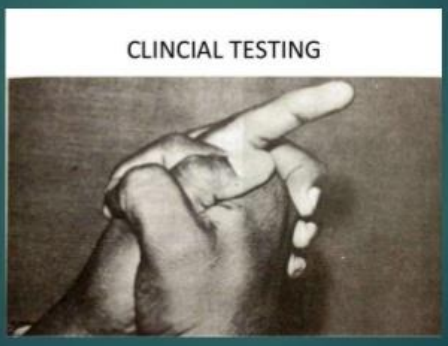
3. **Sensory loss:** in the skin supplied by median nerve





Prominence at the base of the thumb

Ochsner's clasping test: flexor digitorum superficialis and profundus(lateral half)

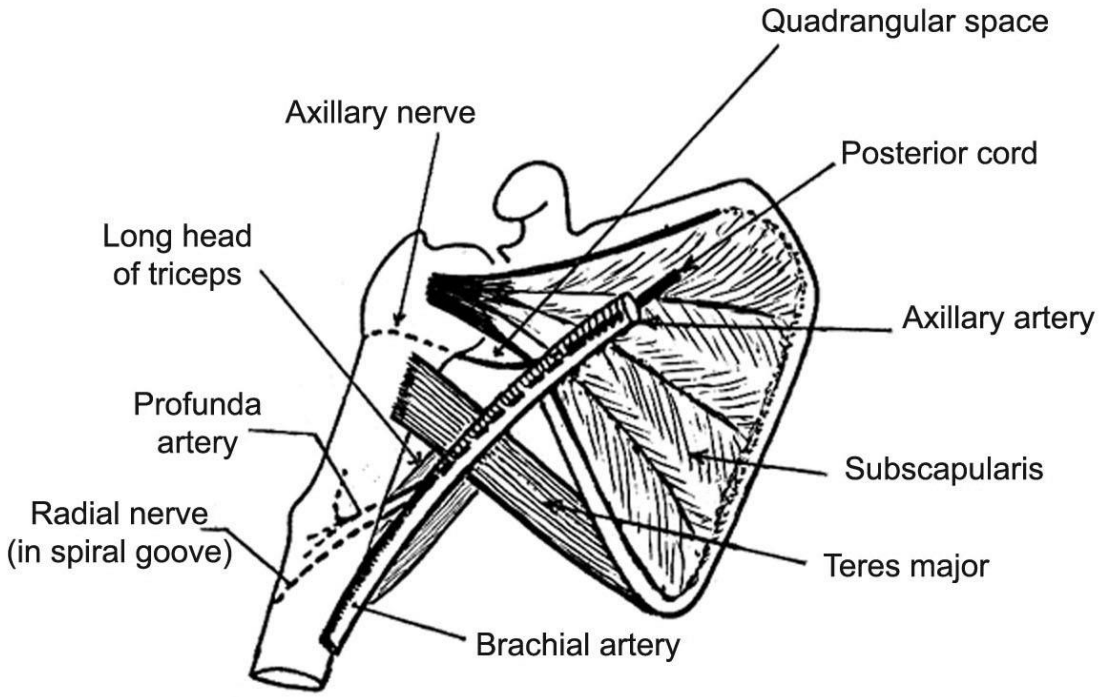


3. RADLAL NERVE: (C5,6,7,8 &TI)

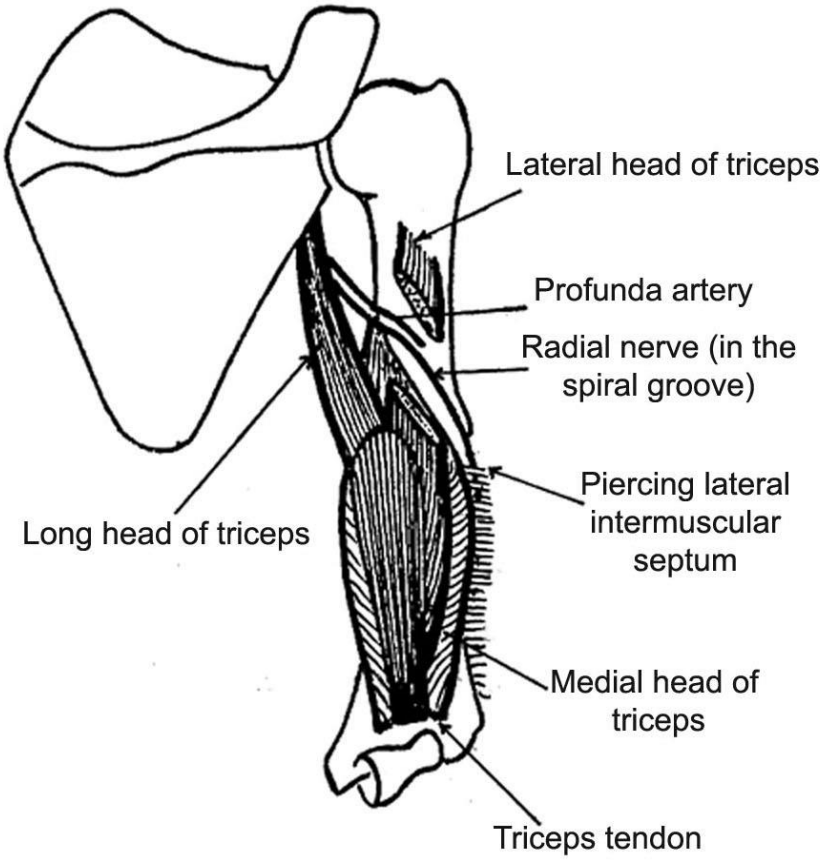
- It descends behind the axillary artery and upper most part of brachial artery . It passes between long & medial heads of triceps then passes in the spiral groove.
- **In the lower 1/3 of arm** it pierces the lateral intermuscular septum to reach the front of arm between brachialis & brachioradialis .
- It **ends** at level of lateral epicondyIe by dividing into superficial radial nerve and posterior interosseous nerve

* **Branches:**

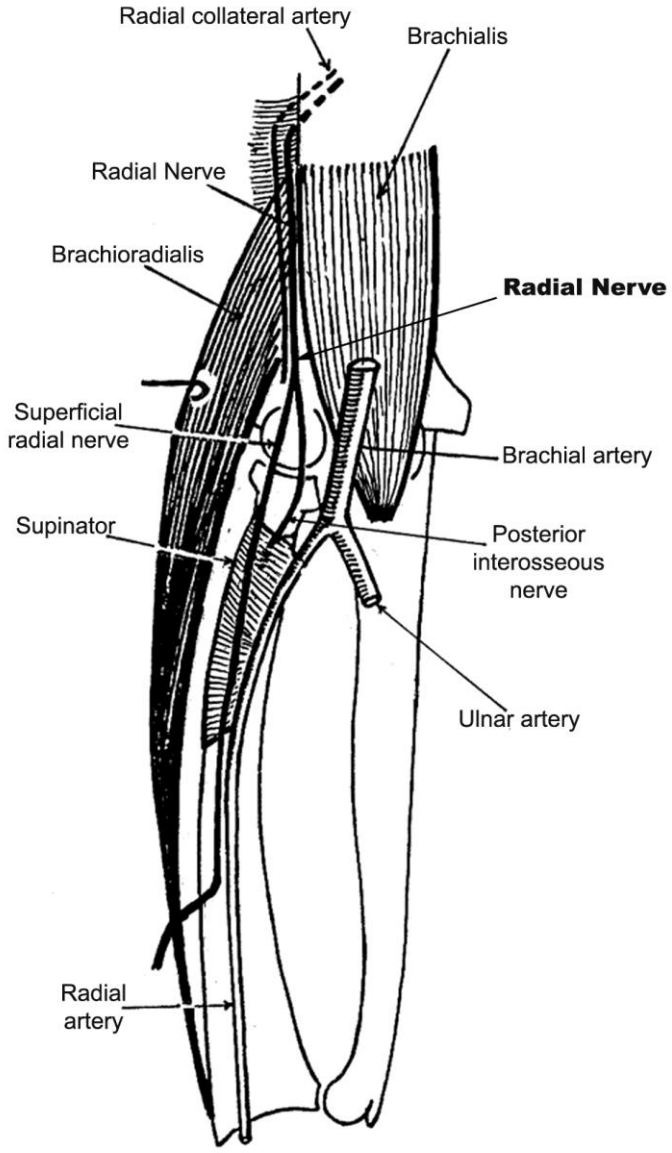
- **In axilla**: ***Muscular*** (long head of triceps), ***cutaneous*** (posterior cutaneous nerve of arm).
- **In spiral groove**: ***Muscular*** (medial & lateral head of triceps anconeus), ***cutaneous*** (lower lateral cutaneous nerve of arm & posterior cutaneous nerve of forearm).
- In groove **between brachialis & brachioradialis**: Lateral 1/2 of brachialis , brachioradialis & extensor carpi radials longus.
- **Post. interosseous nerve**: (***pure motor***) to all muscles of back of forearm except brachioradialis & extensor carpi radials longus.
- **Superficial radial nerve** : (***cutaneous***) supply the lateral 2/3 of dorsum of hand and dorsal aspect of proximal phalanx of lateral 3 1/2 of fingers.



RADIAL NERVE
(in the axilla)



RADIAL NERVE
(in the spiral groove)



RADIAL NERVE
(in lower 1/3 of arm)

* **Applied anatomy: RADIAL NERVE INJURY**

A) Causes: Crutch palsy **,** Saturday night paralysis , fracture shaft or supracondylar fracture of humerus

B) Clinical picture :

1-Deformity: there is flexion of the elbow , pronation of forearm and fingers & wrist drop .

2-Motor loss: paralysis of muscules supplied by radial nerve i.e. muscles of back of arm & forearm .

3-Sensory loss: due to overlapping by surrounding nerves , sensory loss is limited to a triangular area of skin on the 1st. dorsal interosseus space & anatomical snuff box .

5. MUSCULO-CUTANEOUS NERVE: (C 5,6,&7)

* It pierces the coracobrachialis then runs between brachialis & biceps.

*** Branches:**

- **Muscular** (coracobrachialis , biceps & medial 1/2 of brachialis).
- **Cutaneous:** it continues as lateral cutaneous nerve of forearm .

*** Applied anatomy: MUSCULOCUTANEOUS NERVE INJURY**

I. Cause: Musculo-cutaneous nerve injury is rare as it is protected by muscles along its whole course.

II. Clinical picture :

A. Sensory Loss: Loss of sensation from the area of skin supplied by lateral cutaneous nerve of forearm (loss of sensation from the skin covering lateral aspect of forearm both anteriorly and posteriorly in addition to the proximal part of the thenar eminence).

B. Motor Loss: Paralysis of muscules of front of arm .

6. AXILLARY (CIRCUMFLEX)NERVE: (C5&6)

* Passes backwards in the quadrangular space & ends by becoming the upper lateral cutaneous nerve of arm.

*** Branches:**

- **Muscular** (deltoid, teres minor),
- **Cutaneous**(upper lateral cutaneous nerve of arm).

*** Applied anatomy: AXILLARY NERVE INJURY**

I. Cause: Axillary nerve injury is frequent in:

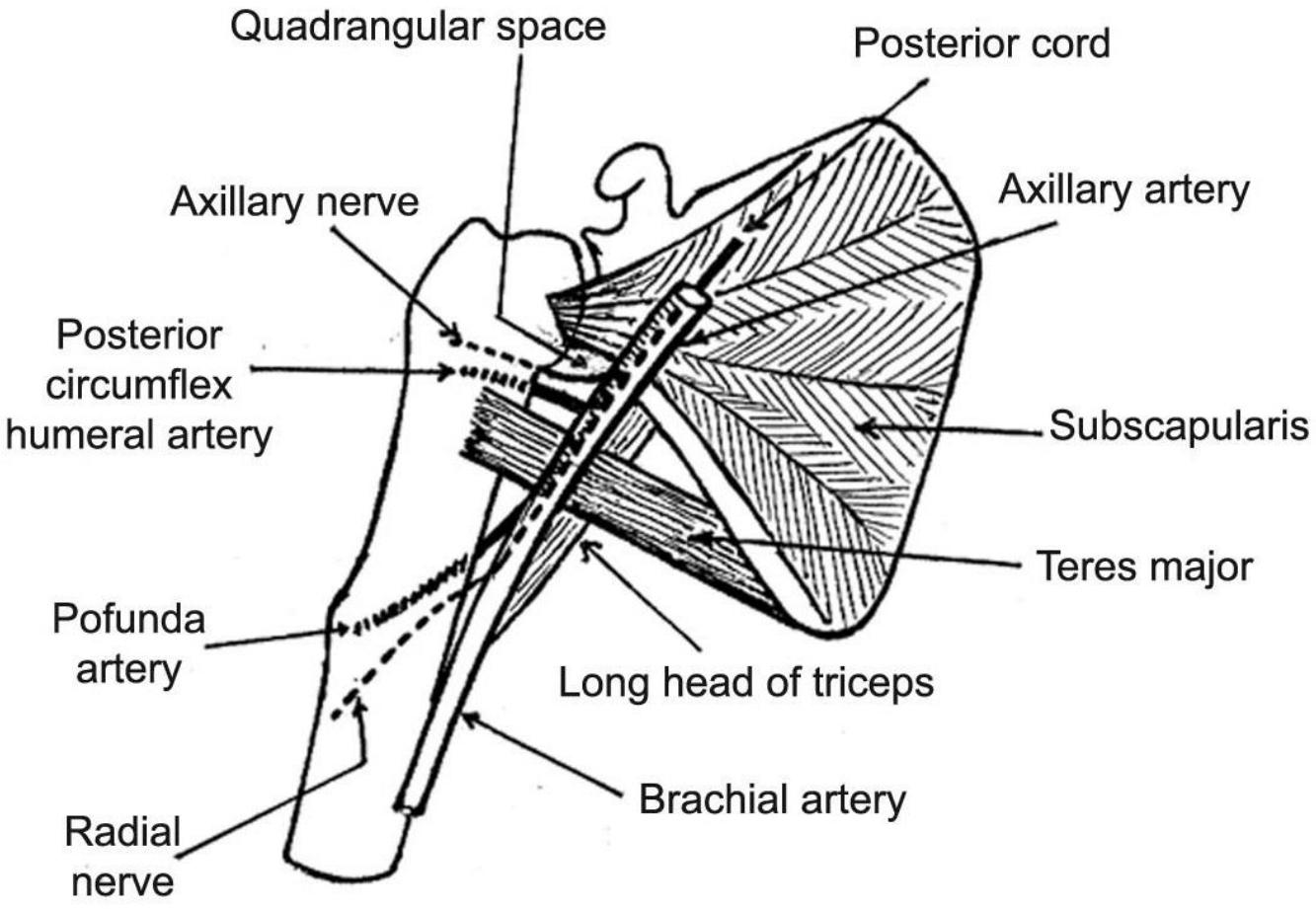
A. Dislocation of the shoulder joint.

B. Fracture surgical neck of humerus.

II. Clinical picture :

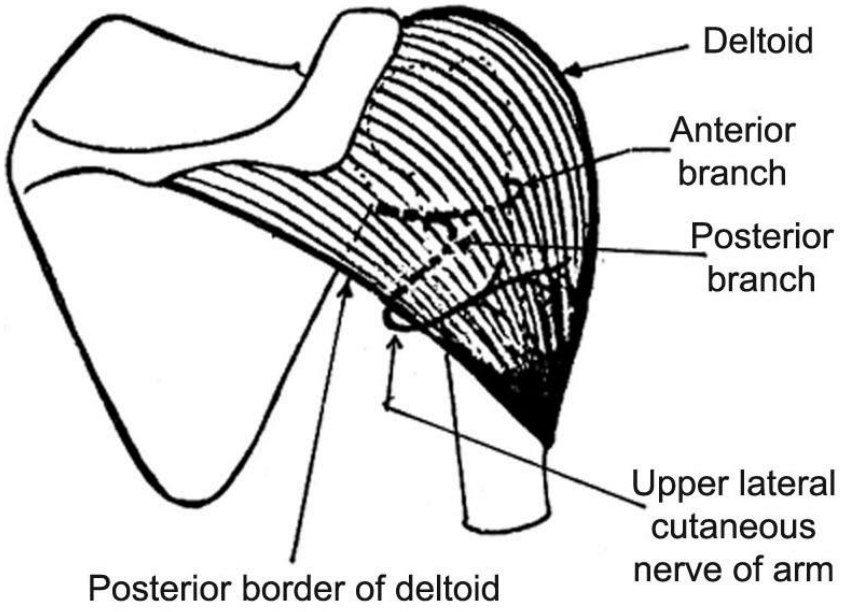
A. Sensory loss: From the skin covering the lower half of deltoid .

B. Motor loss: paralysis of deltoid & teres minor→ loss of abduction of shoulder joint from 15 up to 90 degrees & ***flat shoulder***

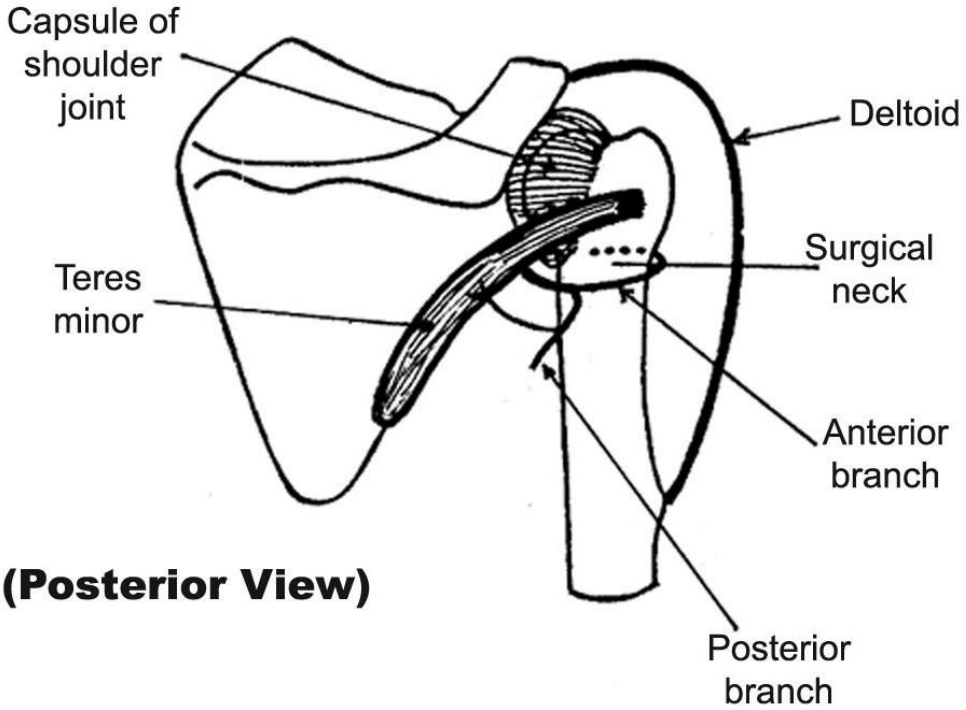


(Anterior View)

AXILLARY (CIRCUMFLEX) NERVE
(beginning, course and relations)



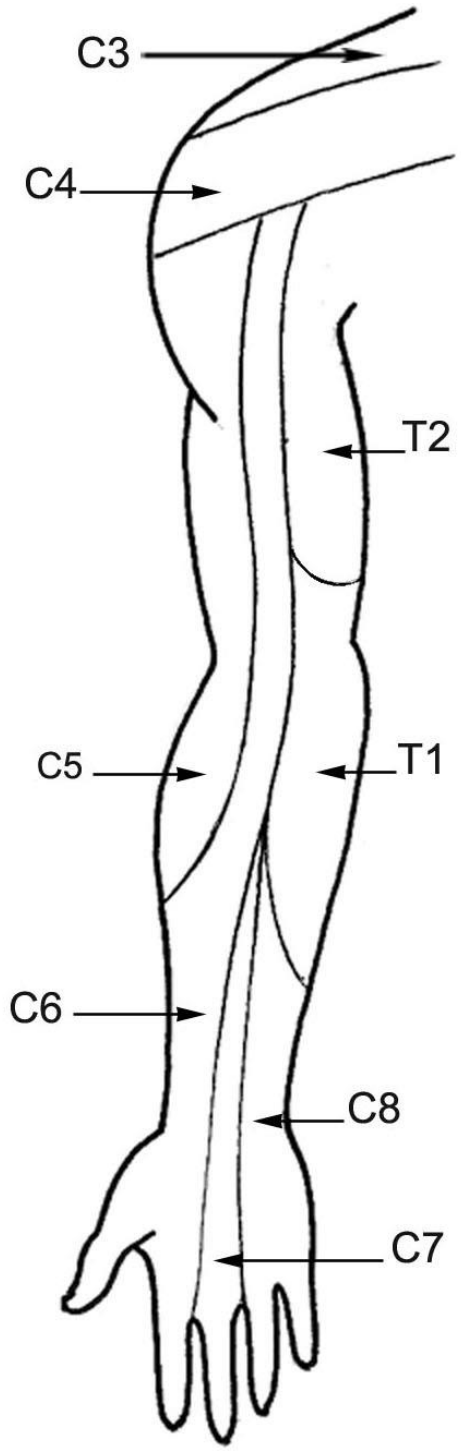
(Posterior view)



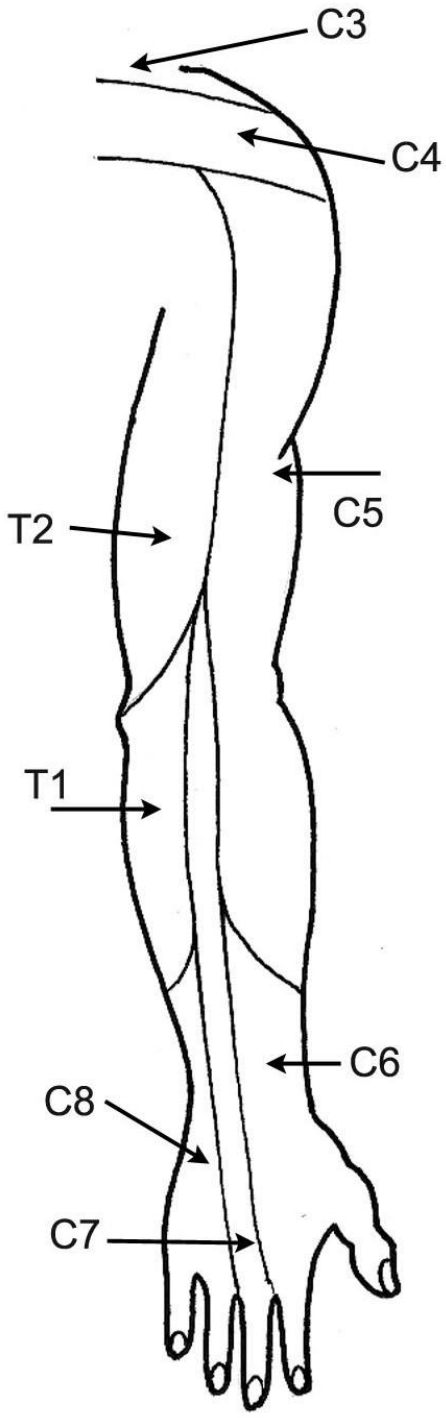
(Posterior View)

AXILLARY (CIRCUMFLEX) NERVE
(end)

SEGMENTAL NERVE SUPPLY OF UPPER LIMB



Segmental Nerve Supply of the Skin of the Upper Limb (Anterior view)



Segmental Nerve Supply of the skin of the Upper Limb (Posterior view)