MEDIAN NERVE
(LABOURER'S NERVE)

- Dr.PRIYANKA SHARMA

Reconstructive and Plastic Surgeon

ANATOMY

- The median nerve arises
- Lateral cord : C5 C6 C7
- Medial cord : C8 T1

ARM :

It lies in relation to the **brachial artery.**

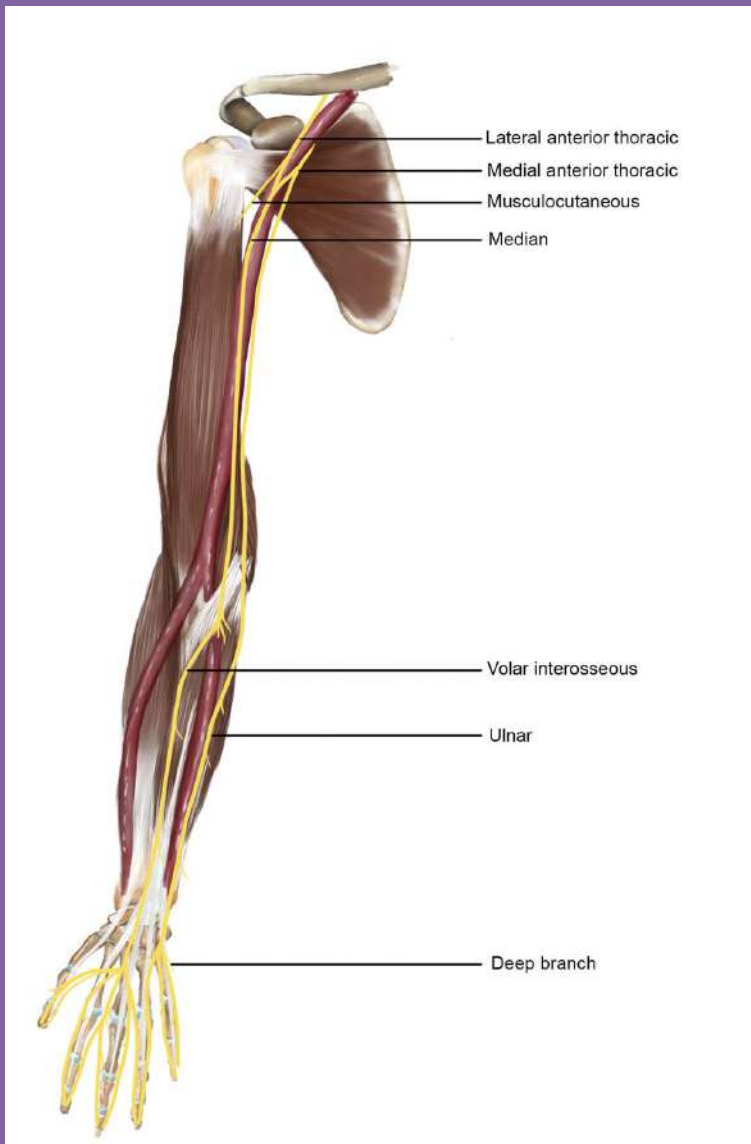
Crosses lateral to medial,

in front of the artery.

CUBITAL FOSSA : medial to the artery,

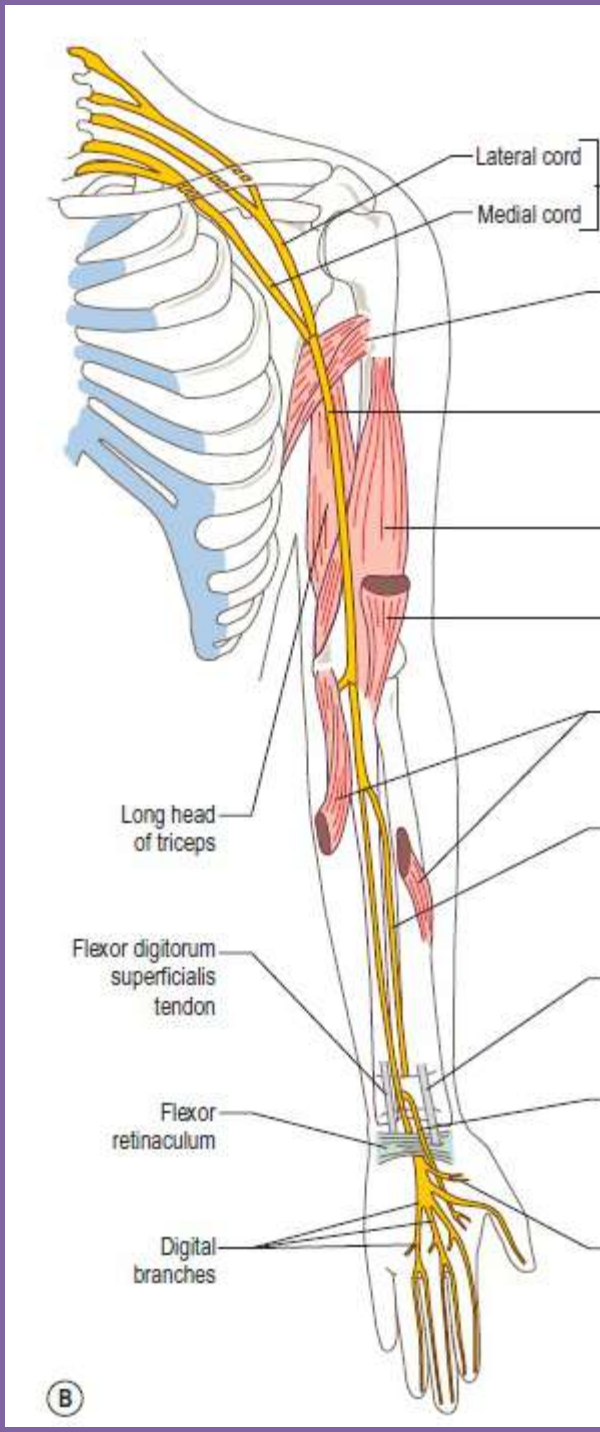
deep to bicipital aponeurosis &

in front of the brachialis.



FOREARM :

- Humeral and ulnar heads of pronator teres.
- Below fibrous arch of FDS
- Runs on the surface of FDP
- 5 cm above flexor retinaculum - becomes superficial
- Between FCR and palmaris longus.



- BRANCHES :

- At cubital fossa : superficial flexors : PT, FCR, FDS

- ANTERIOR INTEROSSEOUS (AIN) : 4cm below elbow,
  : deep muscles:FPL, radial FDP and PQ

- PALMAR CUTANEOUS BRANCH : just above flexor retinaculum
  does not go through carpal tunnel
  Sensation to thenar, mid palm

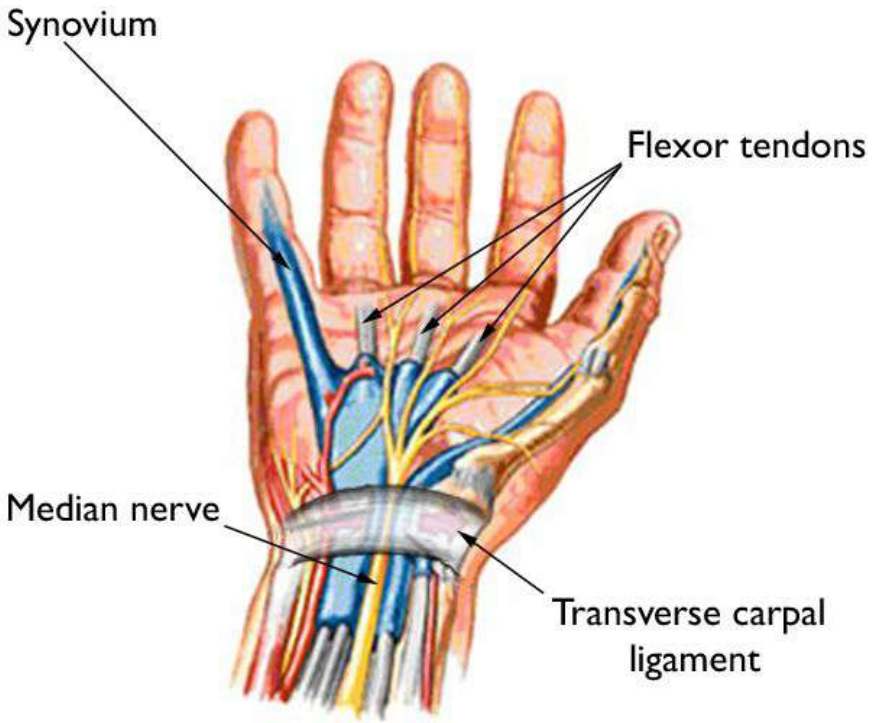
- Articular branches.

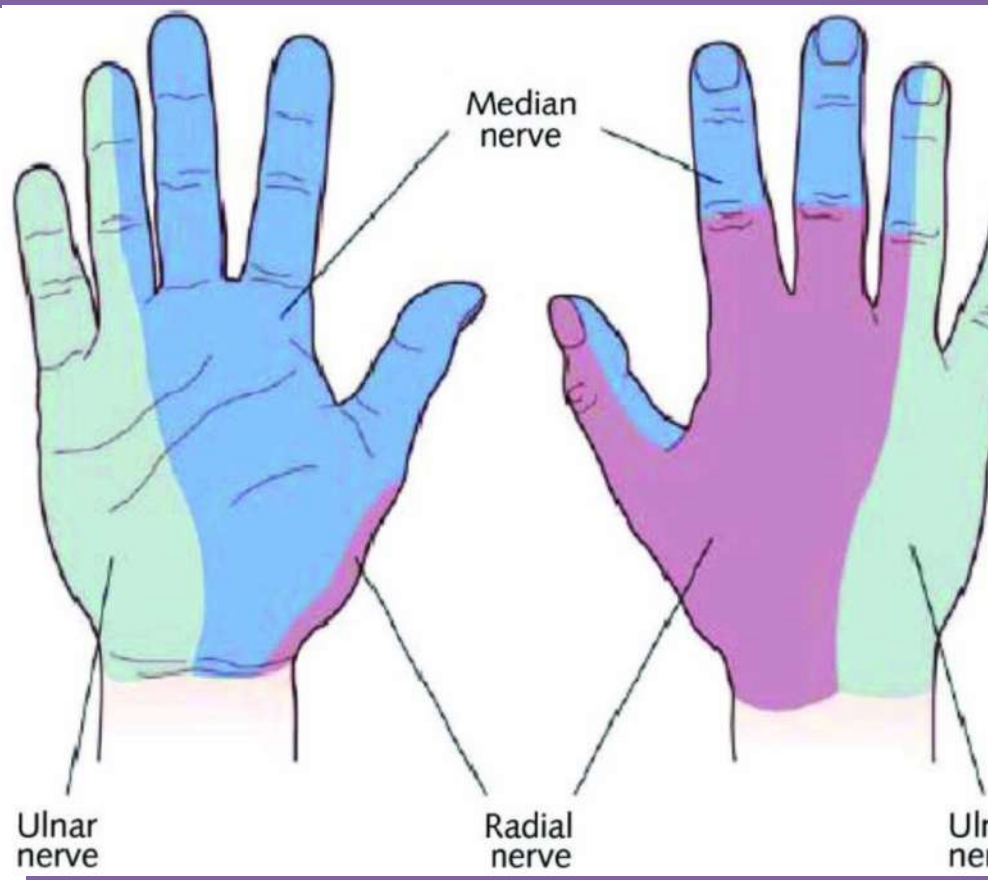
HAND:

- Deep to the flexor retinaculum
- Through carpal tunnel into the palm

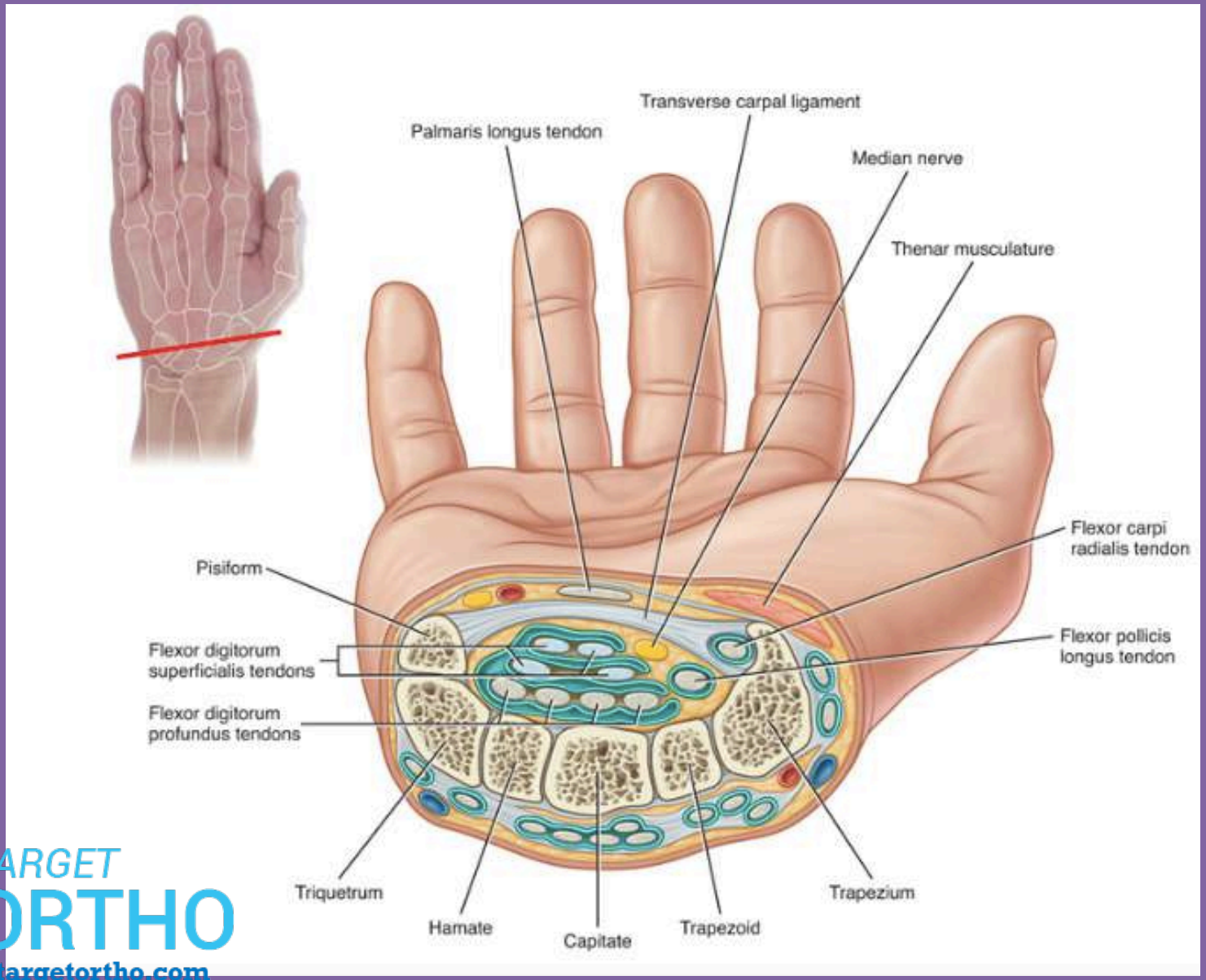
- BRANCHES :
- The recurrent branch to the thenar muscles
- Branches to first 2 lumbricals

- Sensation to the radial palm
- (mid palmar sensation is by palmar cutaneous branch)
- Radial 3 ½ fingers on the volar aspect
- TPx to MPx region on the dorsum of the same





CARPAL TUNNEL : 9 flexors + 1 nerve



KAPLAN'S CARDINAL LINE:

Palmar arches

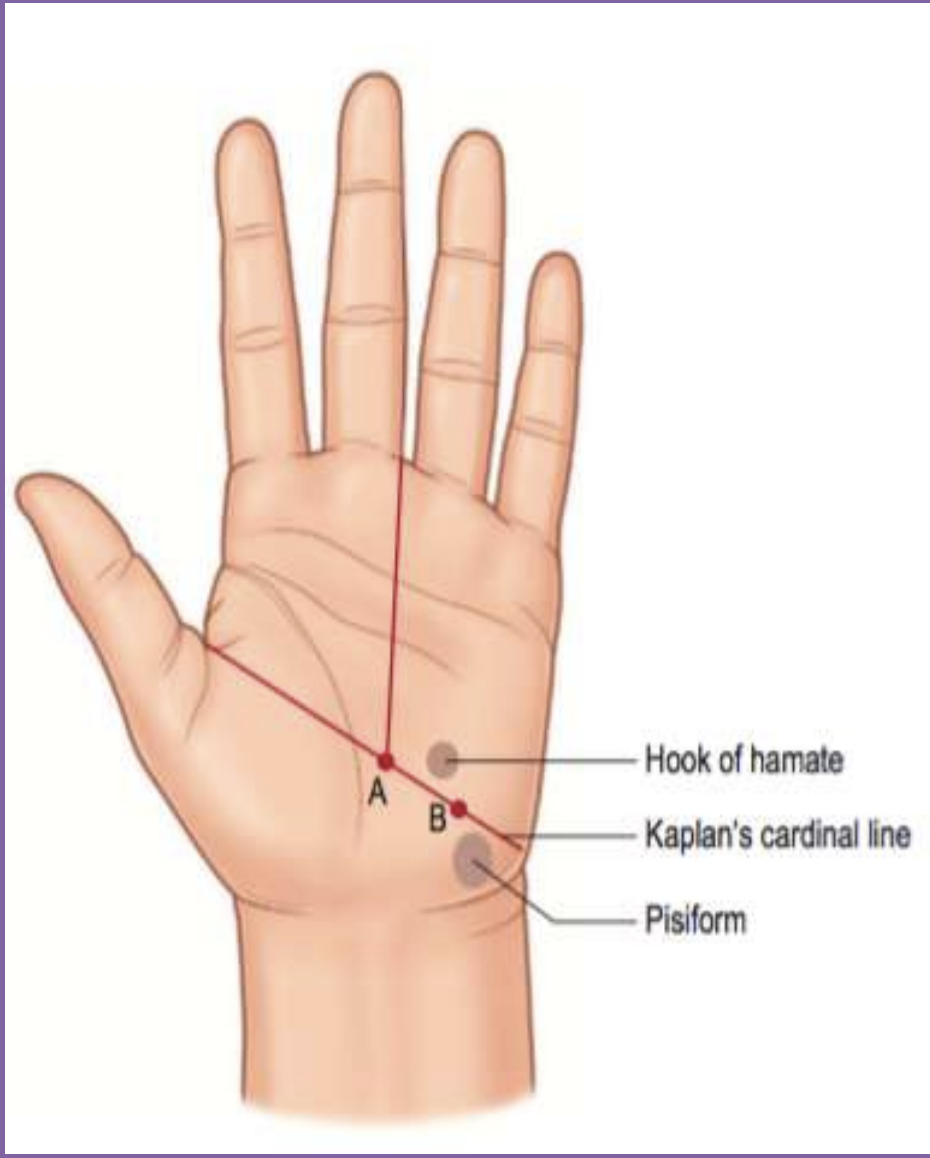
Motor branch of median nerve

Palmar cutaneous branch of median nerve

Ulnar nerve and artery

Carpal tunnel release

Endoscopic release



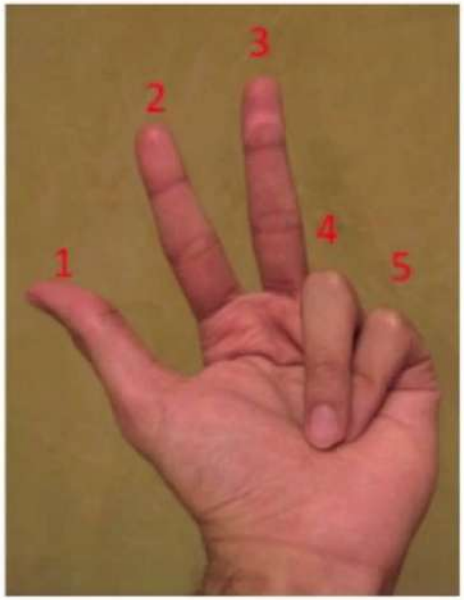
- MUSCLE TESTING :(proximal to distal)

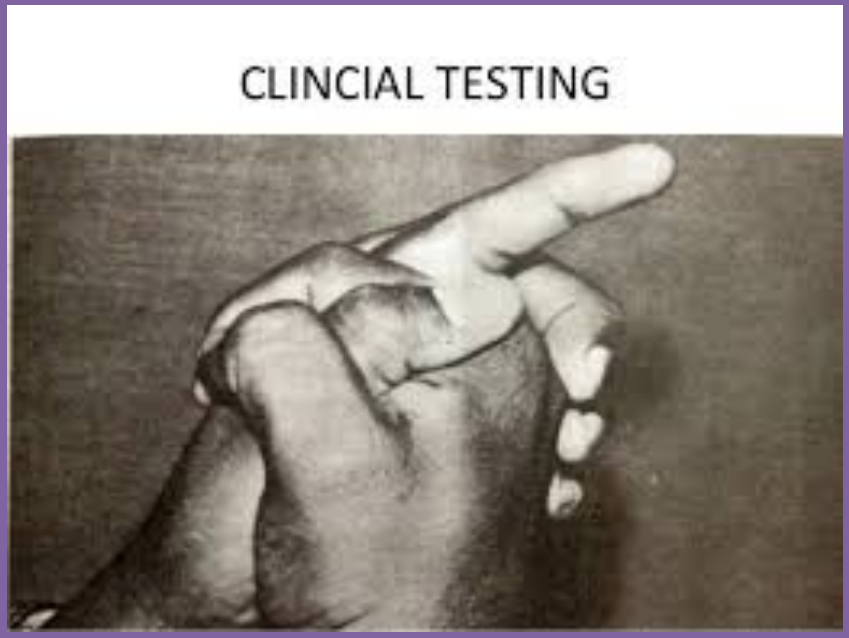
- PRONATOR TERES
- FLEXOR CARPI RADIALIS
- PALMARIS LONGUS
- FLEXOR DIGITORUM SUPERFICIALIS
- PRONATOR QUADRATUS
- FLEXOR POLLICIS LONGUS
- FLEXOR DIGITORUM PROFUNDUS INDEX AND MID
- ABDUCTOR POLLICIS BREVIS (APB)
- FLEXOR POLLICIS BREVIS ** (Superficial)
- OPPONENS POLLICIS

- SIGNS:

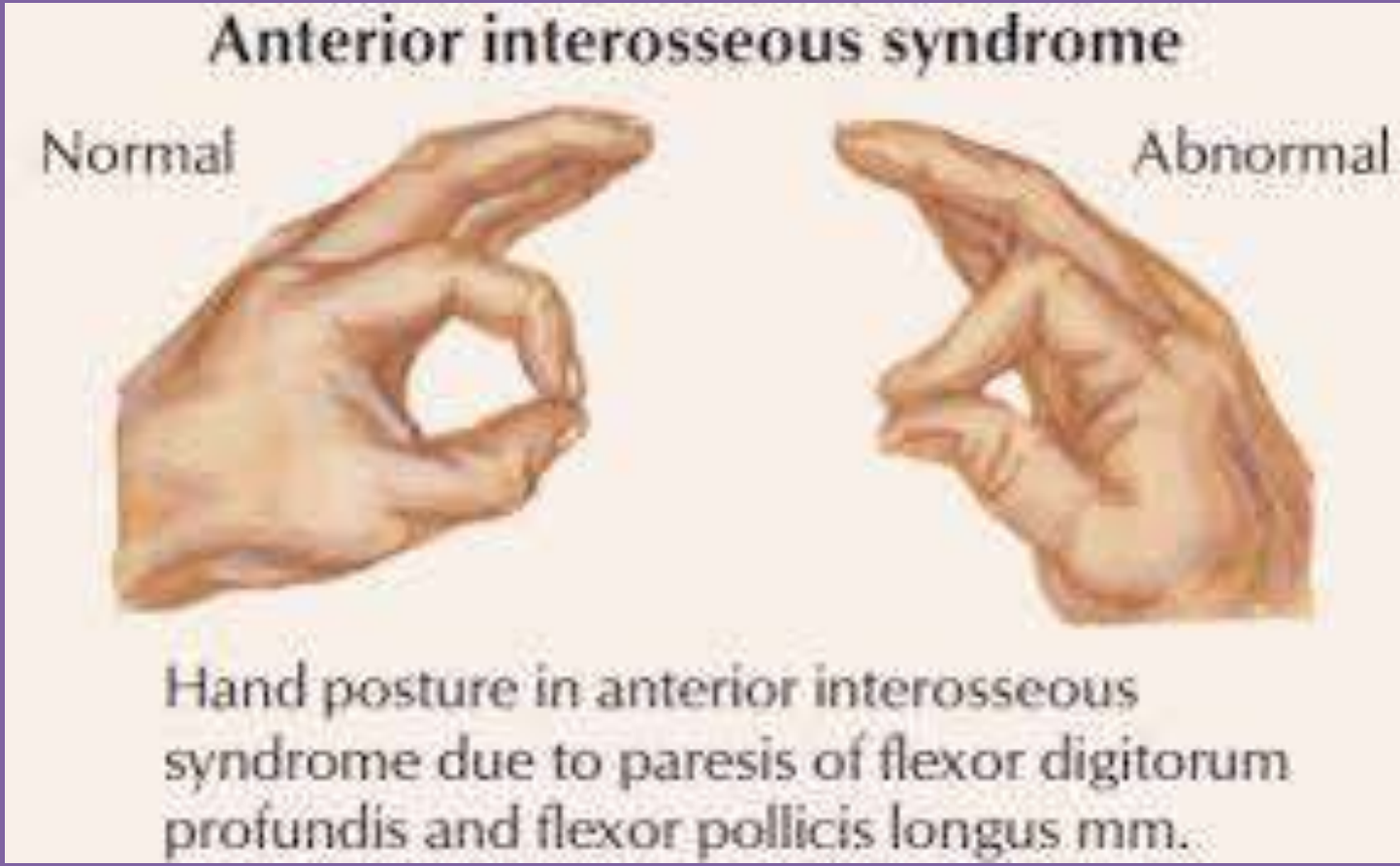
- BENEDICTS HAND/ Pointing index
- Sensory loss over radial 3.5 fingers and dorsum
- Wasting of thenar muscles
- Dry, cool skin with atrophic changes.

Typical Characteristic of Median nerve Injury is Hand of Benediction





O SIGN :



APE THUMB deformity :

The thumb is adducted, laterally rotated and extended at IP joint

The first metacarpal lies in the same plane as the remaining

Thenar eminence flattening

PEN TEST :

TO CHECK ABDUCTOR POLLICIS BREVIS

- SNAP test

PHALEN'S TEST :

MEDIAN NERVE COMPRESSION AT CARPAL TUNNEL

SITES OF COMPRESSION :

- **CARPAL TUNNEL** (most common) :-

  Numbness in thumb and index, early morning

  APB testing : pen test or snap fingers

  Phalens and reverse Phalens

- **PRONATOR SYNDROME** :-
- Pronator teres
- Laceratus fibrosus
- Arch of FDS

  * Differentiated from carpal tunnel : No morning symptom

    No Tinels at wrist

    Parasthesia at palmar triangle

    Pain ove muscle / pronator test

- **ANTERIOR INTEROSSEOUS SYNDROME** :

Compressed by pronator teres, FDS, aberrant structures

Pain in the forearm

Weakness of fine pinch

- For all the compression neuropthies, 6 – 8 weeks of observation
- Occupational changes
- Splints
- Decompression

NERVE REPAIR

- **Non operative:**
  - **observation with sequential EMG/NCS/advancing TINELS**
    - indications
      - neuropraxia (1st degree)
      - axonotmesis (2nd degree)
- **Operative:**

Primary repair : at the time of injury

: within 1 week

Delayed primary : 2weeks – 1month

Secondary : >1 month

- **surgical repair :**
  - indications
    - neurotomesis (3rd degree)

- **nerve grafting :**
  - indications
    - defects > 2.5 cm

- **Surgical Techniques : Direct muscular neurotization**
  - insert proximal nerve stump into affected muscle belly
  - results in less than normal function

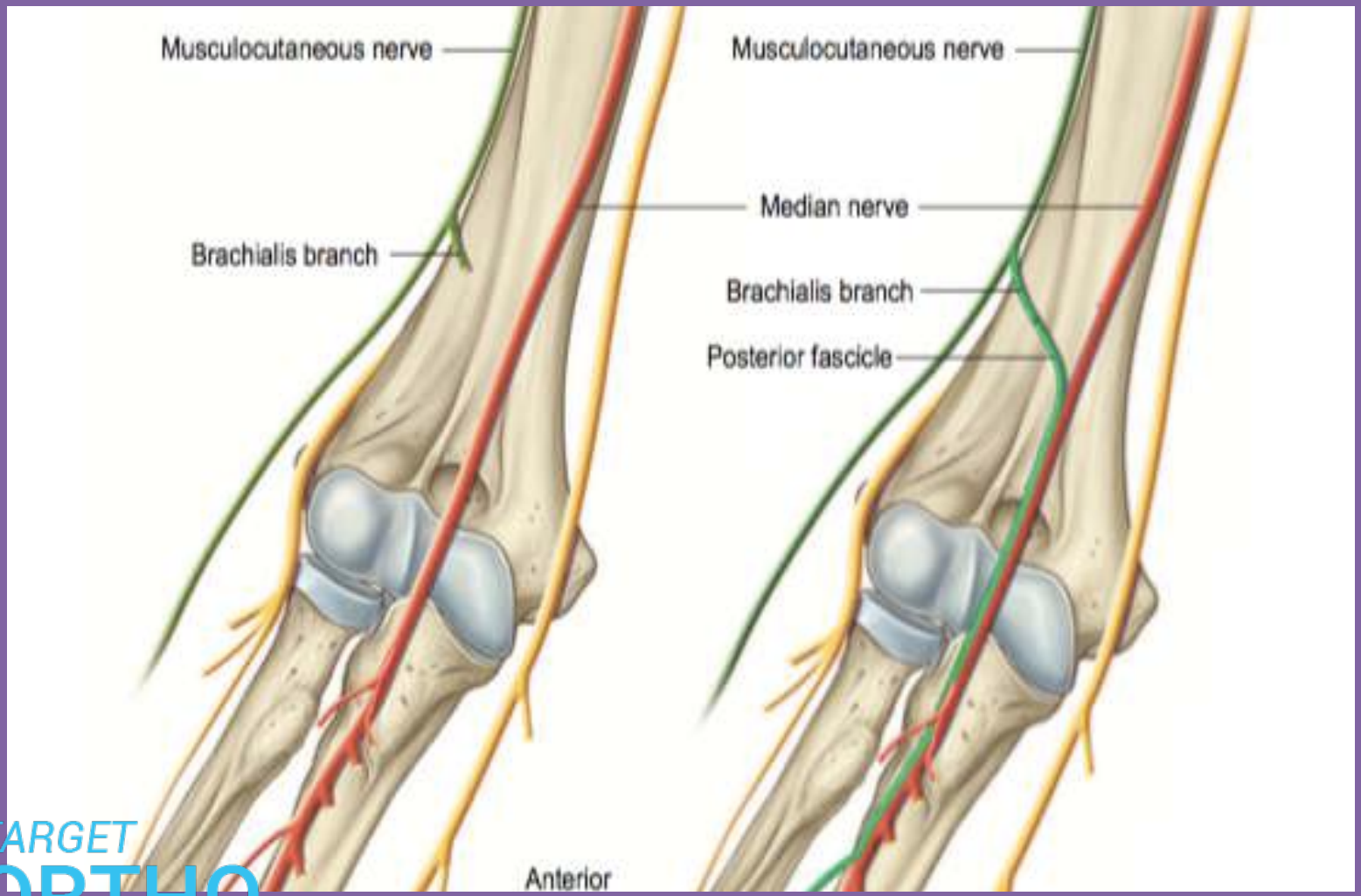
- **Epineural Repair**
  - primary repair of the epineurium in a tension free fashion
  - first resect proximal neuroma and distal glioma
  - it is critical to properly align nerve ends during repair to maximize potential of recovery

- **Fasicular repair**
  - **indications**
    - three indications exist for grouped fascicular repair
      - median nerve in distal third of forearm
      - ulnar nerve in distal third of forearm
      - sciatic nerve in thigh
  - **technique**
    - similar to epineural repair, but in addition repair the perineural sheaths (individual fascicles are approximated under a microscope)
  - **outcomes**
    - no improved results have been demonstrated over epineural repair

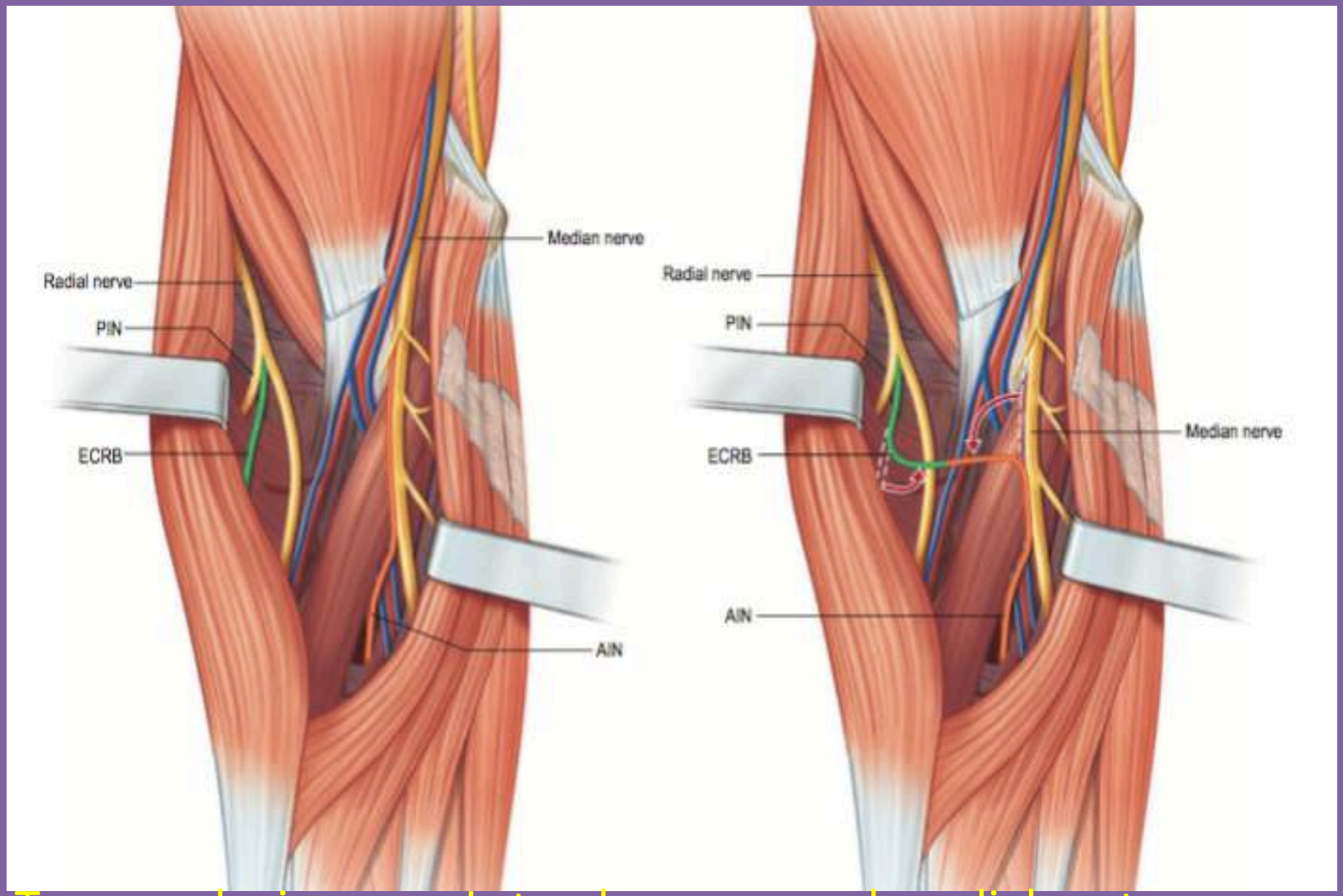
- **Nerve grafting**
  - **Reversed autologous graft** (sural, saphenous, lateral antebrachial)
    - remains the gold standard of repair for segmental defects >2.5cm is autologous nerve grafting
  - **Allograft/ conduits**
    - the only synthetic graft which shows equal results to autologous nerve grafting is a collagen conduit
    - collagen conduits allow for nutrient exchange and accessibility of neurotrophic factors to the axonal growth zone during regeneration

MOTOR NERVE TRANSFERS

Brachialis br. to Median nerve



ECRB Br. to AIN



Topography in arm – Lateral sensory and medial motor.

SENSORY NERVE TRANSFERS

- To restore sensation over the palmar and digital distributions of median nerve
- Fascicles from dorsal ulnar nerve
- Autografts to reconstruct the donor nerve

- MEDIAN NERVE PALSY :
- **HIGH** : At the level of elbow and forearm

PT, FCR, PL, FDS

FPL, FDP index and mid, PQ

Thenar muscles

- **LOW** : At the level of wrist and hand

APB, FPB, OP

Radial 2 lumbricals

- Parasthesia along median nerve distribution

- MANAGEMENT BY TENDON TRANSFERS:

INDICATIONS :

- Leprosy
- Nerve not amenable to repair
- Old age of patient
- Co-morbidities

PRINCIPLES :

- Good skin cover
- Good sensation
- Full PROM of joints
- Expendable donor tendon
- Synergistic tendons
- Grade at least 4/5 of donor
- Straight line of pull
- One pulley
- Single function

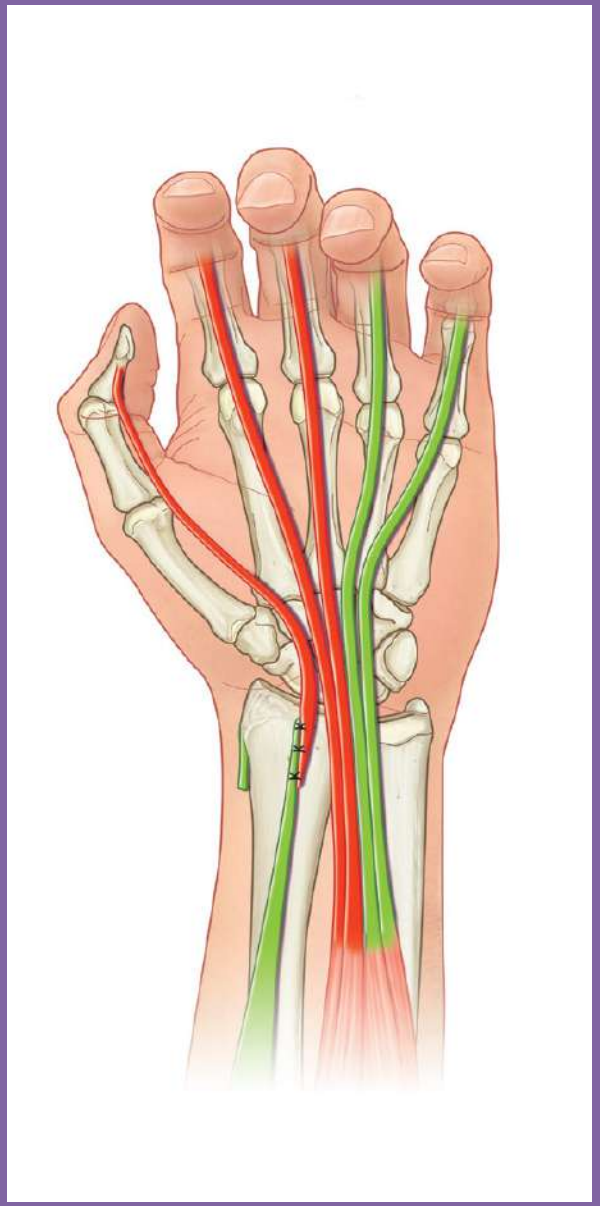
HIGH MEDIAN NERVE PALSY :

- Requirement : Thumb IP flexion
  Flexion PIP and DIP index and mid
  Thumb opposition

THUMB IP FLEXION:

Brachioradialis to FPL

- The BRACHIORADIALIS is divided at the radial styloid process
- It must be freed upto the proximal portion
- Distally fibres insert into the deep fascia
- **30mm** tendon excursion is then attained
- Transfer is end – end (Pulver taft)
- Tension is adjusted by keeping elbow in 45 flexion
- All 3 joints of thumb must be in full extension when wrist flexed to 30 (tenodesis effect)



For index and mid IP flexion:

- Side to side TAGGING of FDP at the forearm level

- Gives range of flexion, but not much strength.

For power flexion , ECRL transfer :

- The ECRL tendon is divided at the base of 2nd metacarpal
- Subcutaneously through radial distal border forearm
- End to end tendons are woven to FDP index, mid in forearm
- **TENSION ADJUSMENT BY TENODESIS**
- **ECRL excursion : 30mm**
- **FDP excursion : 70 mm**
- Wrist in 30 flexion, IP straight and with wrist in 30 extension, tips of fingers should touch palm
- Too much tension : flexion contractures of IP

LOW MEDIAN NERVE PALSY
(OPPONENSPLASTY)

- The ideal motor transfer should have a tension fraction and length almost equal to that of APB
- Tendon grafts should be avoided
- Pulley should be used for line of pull

- **Tension adjustment** should be so that :

  Wrist in neutral

  Thumb in opposition

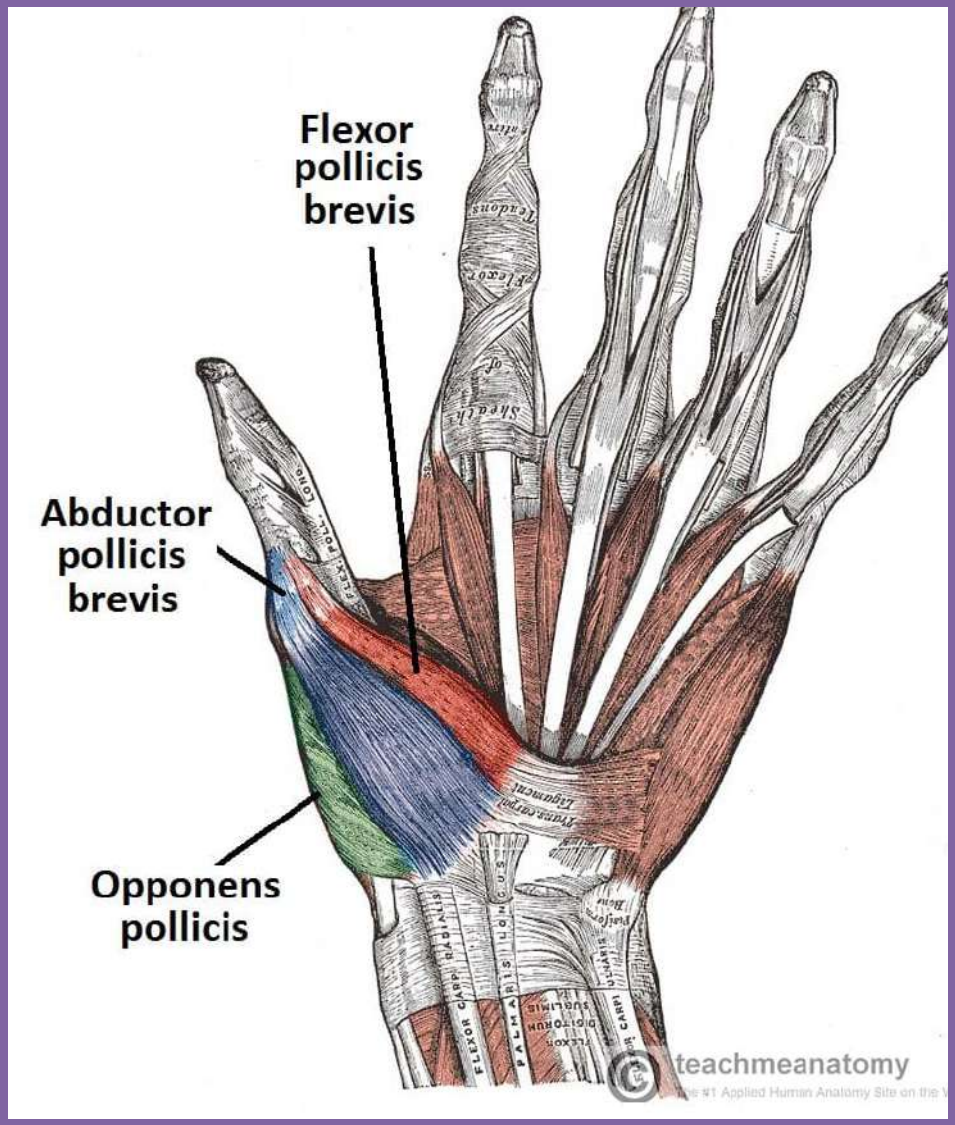
  Tenodesis effect : thumb abduction with wrist extension

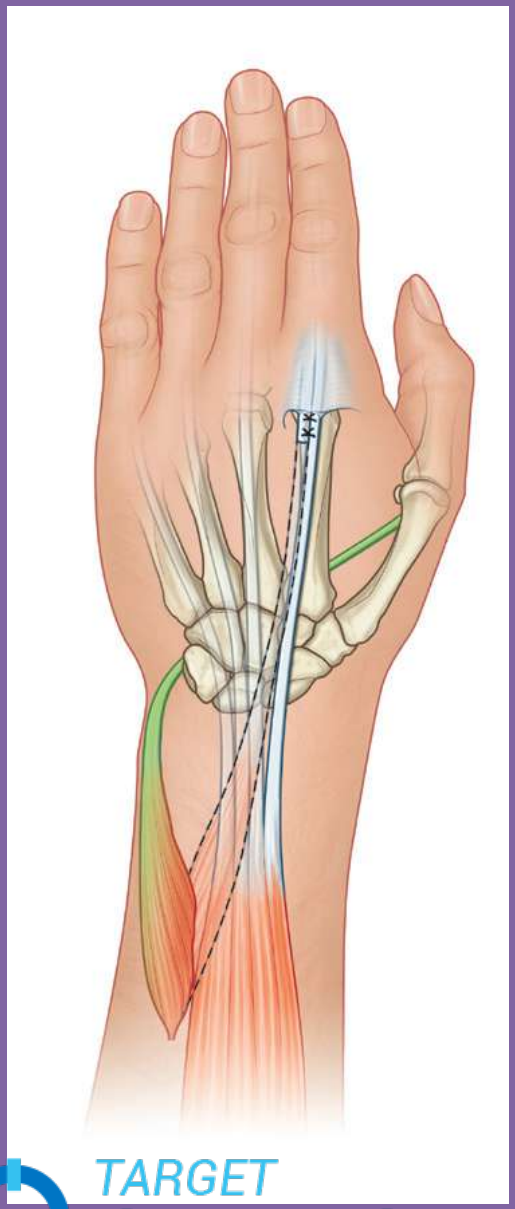
Abductor pollicis brevis

Origin :

Insertion:

Function:





Burkhalter : EIP transfer

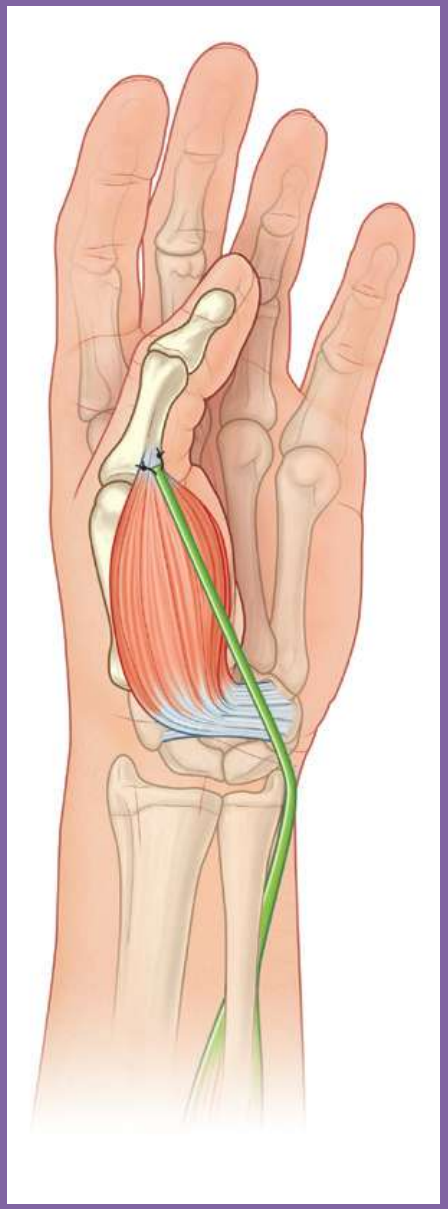
ORIGIN : Posterior surface lower 1/3rd of ulna and interosseous membrane

INSERTION : Extensor expansion on dorsum of PPx

NERVE SUPPLY : PIN

- EIP is divided at insertion
- Important to repair extensor retinaculum to avoid extensor lag

- EIP tendon passed along the ulnar border
- Subcutaneous tunnel
- APB, EPL, MP capsule
- Thumb kept in opposition 4 weeks with POP
- Active movments initiated
- Protective splint 3-4 weeks

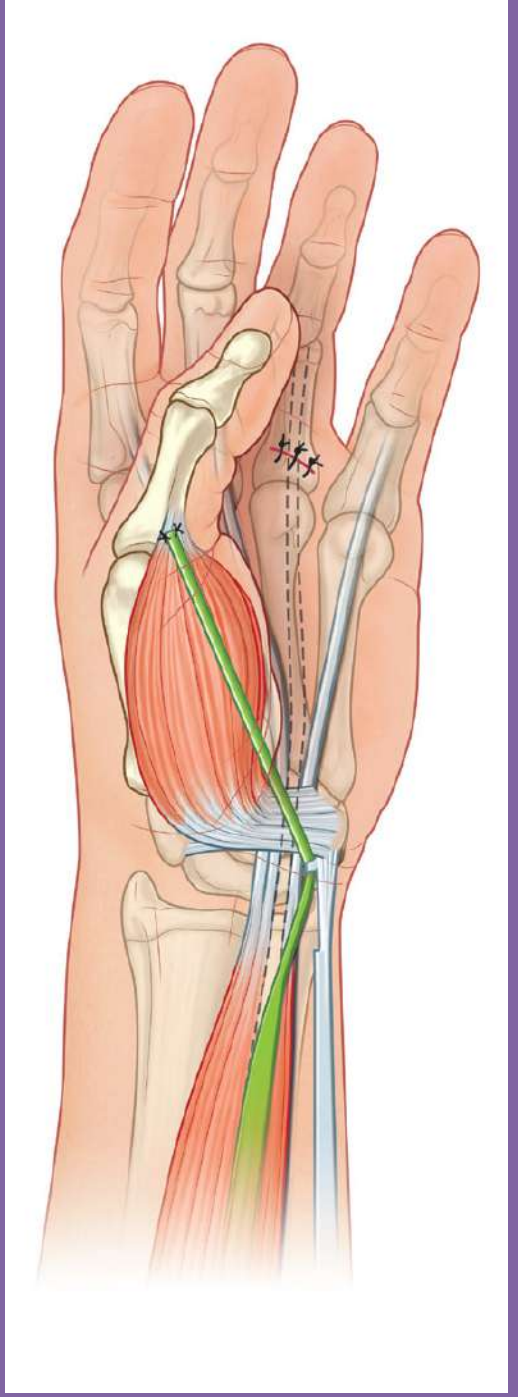


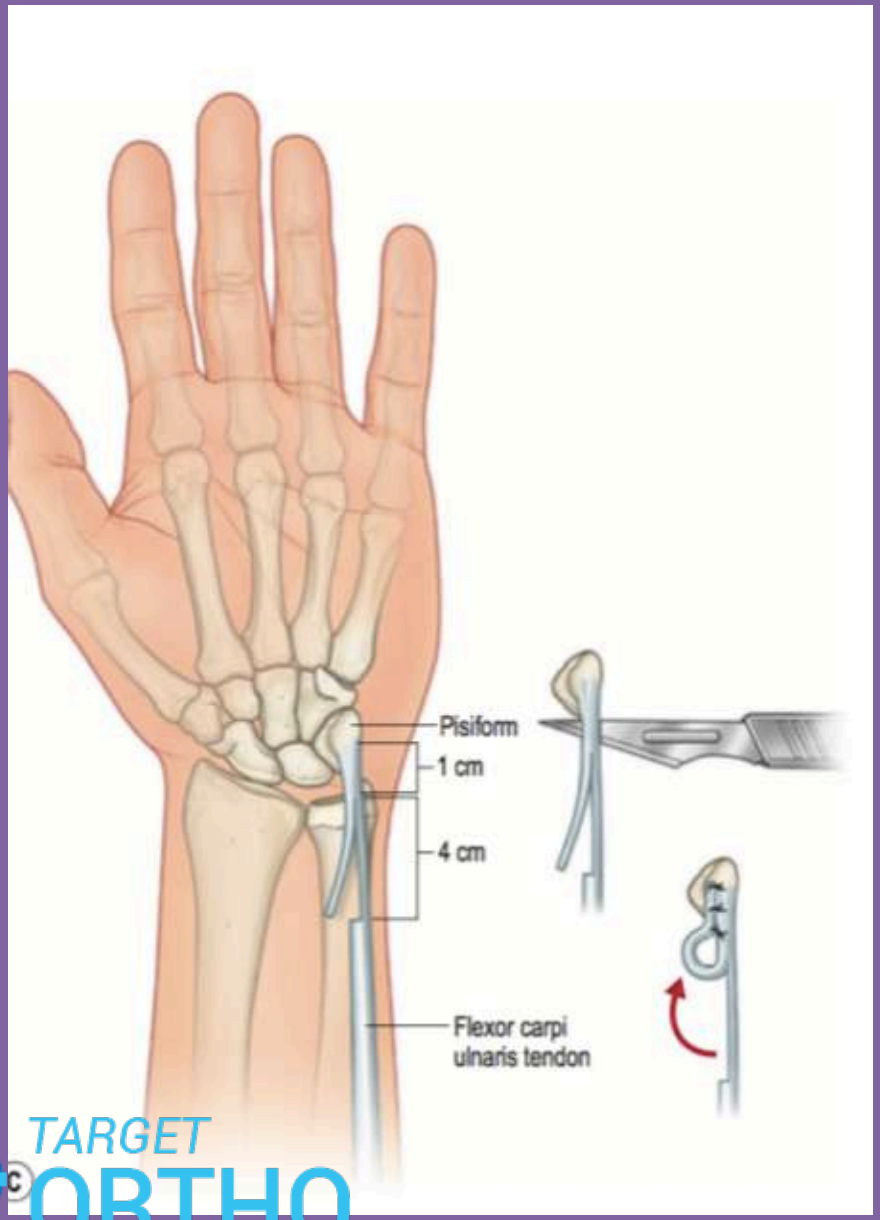
BUNNELL'S FDS TRANSFER:

- FDS RING: between A1 and A2 pulley
- Delivered in distal forearm
- **FCU pulley**
- Subcutaneous tunnel to APB insertion
- ADVANTAGE : **strongest** transfer
- DISADVANTAGE:

  Cannot be used in ulnar nerve palsy

  Swan neck deformity of ring





METHOD OF MAKING FCU PULLEY:

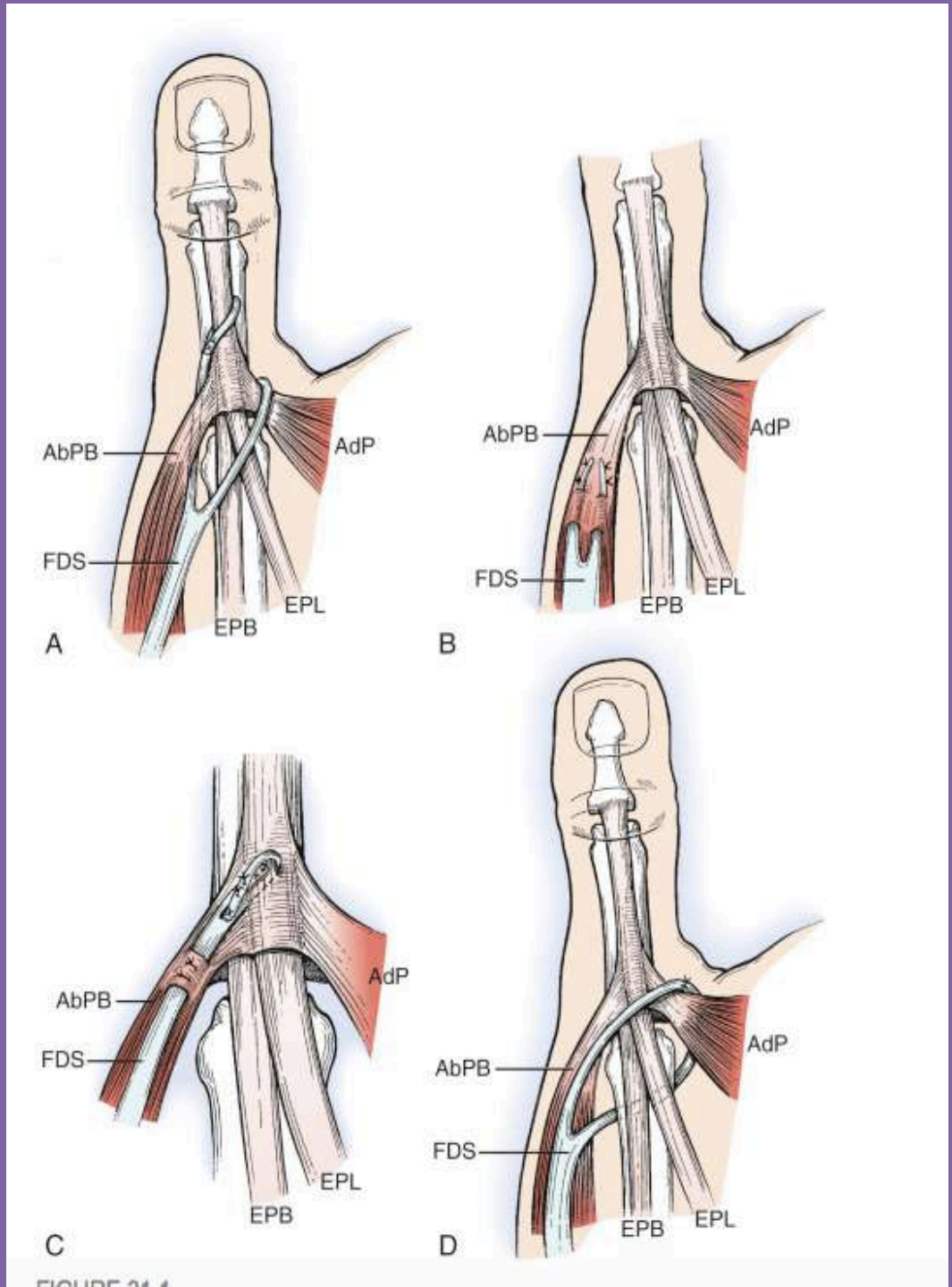
Essential as only simple looping of FDS around FCU will cause only flexion rather than opposition

Other pulleys : Guyons canal, transverse carpal ligament

ROYLE THOMPSON : Ulnar border of palmar aponeurosis
Less chance of ulnar nerve compression

Techniques of insertion:

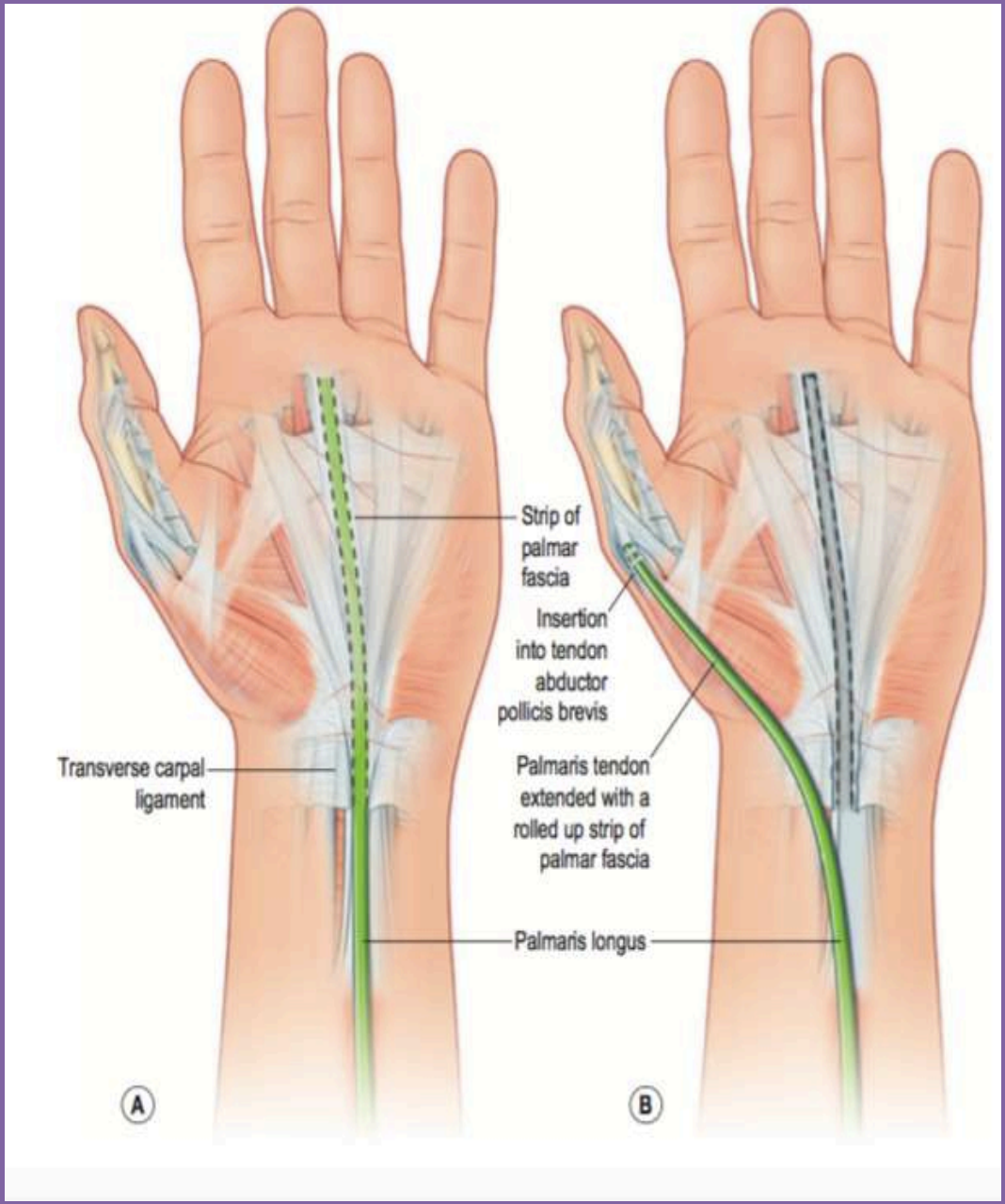
Brand
Littler
Riordan
Royle-Thompson



CAMITZ :

- Palmaris longus taken with extension of palmar fascia
- Transferred subcutaneously to APB

- Preferred in old age, carpal tunnel compressions.



MILLER'S PROCEDURE:

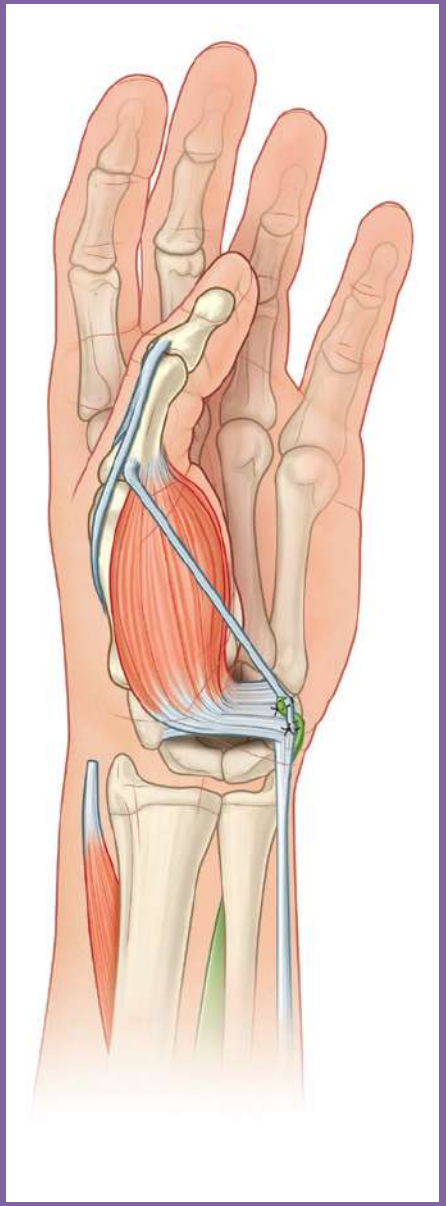
- The ECU divided at insertion
- Delivered into the distal forearm
- Rerouted around the ulnar border of forearm

- The APB is divided at origin at distal end of radius and interosseous membrane

- Kept as distally based tendon at insertion on PPx thumb

- Passed subcutaneously through the palm to the ulnar border

- Sutured to ECU.



- **HUBER'S OPPONENSPLASTY:**
- Preferred in pediatric age group
- Adds bulk to the thenar region.

- The ABDUCTOR DIGITI MINIMI is divided at the insertion on base of PPx little finger
- Can be released at pisiform
- Islanded on NV bundle at proximal radial border of ADM
- Avoids compression to ulnar nerve
- Dissected upto origin at pisiform and flexor rentinaculum

- Turned 180 * superficial to the FCU (turning page of a book)
- Passed subcutaneously to the MP joint of thumb
- Insertion at APB and MCP joint capsule

Common Questions!

- Incisions
- Pulley
- Tension
- Splintage
- Mobilisation/ hand physiotherapy
- Combined median and ulnar nerve palsy

THANK YOU!

Linkedin - Dr.Priyanka Sharma

Instagram – drps_plastics

Youtube – DrPS