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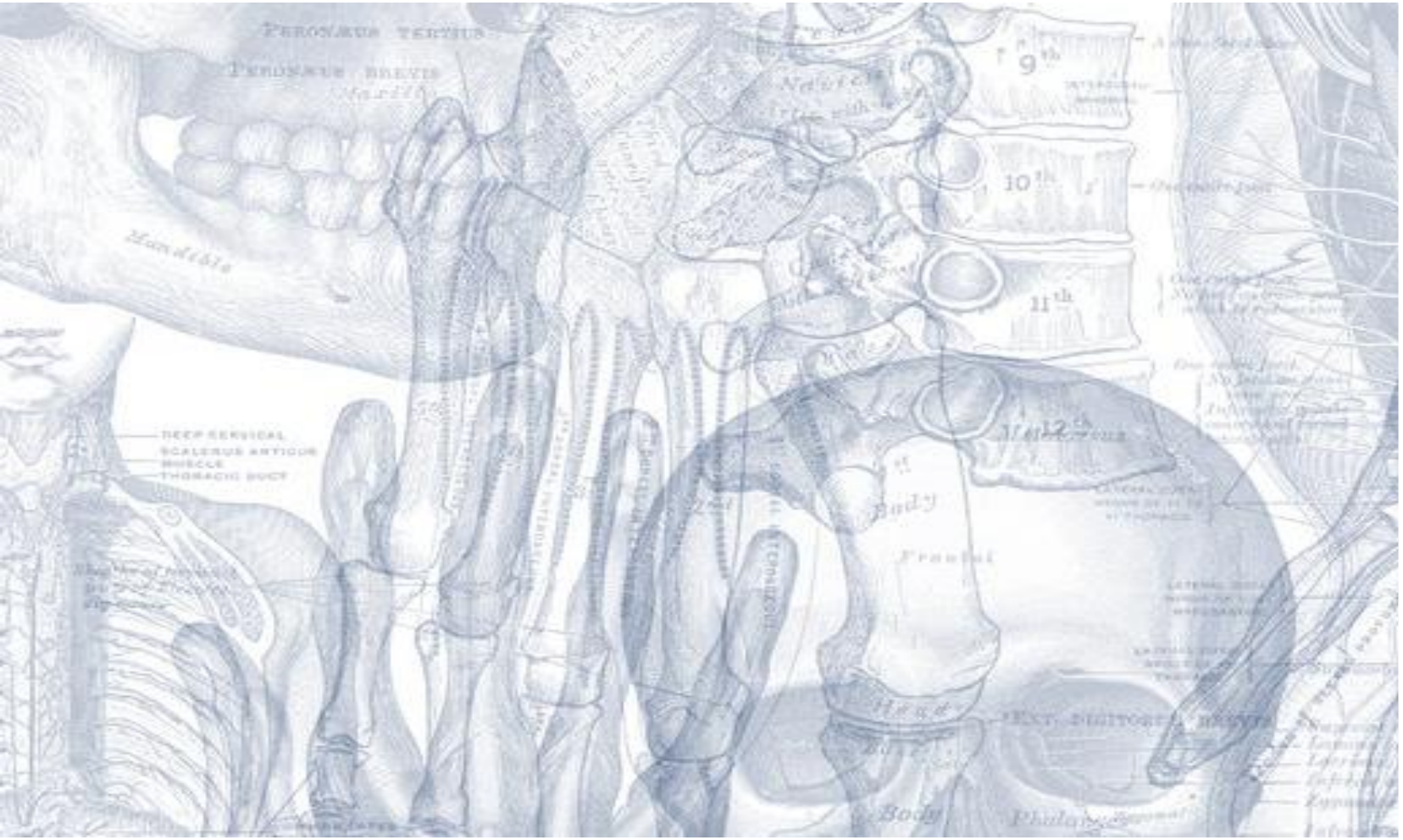


ANATOMY
TEAM 436

436
MEDICINE
KING SAUD UNIVERSITY

Revised by
شوق الأحمري & طراد الوكيل

Hand and Wrist

Editing file

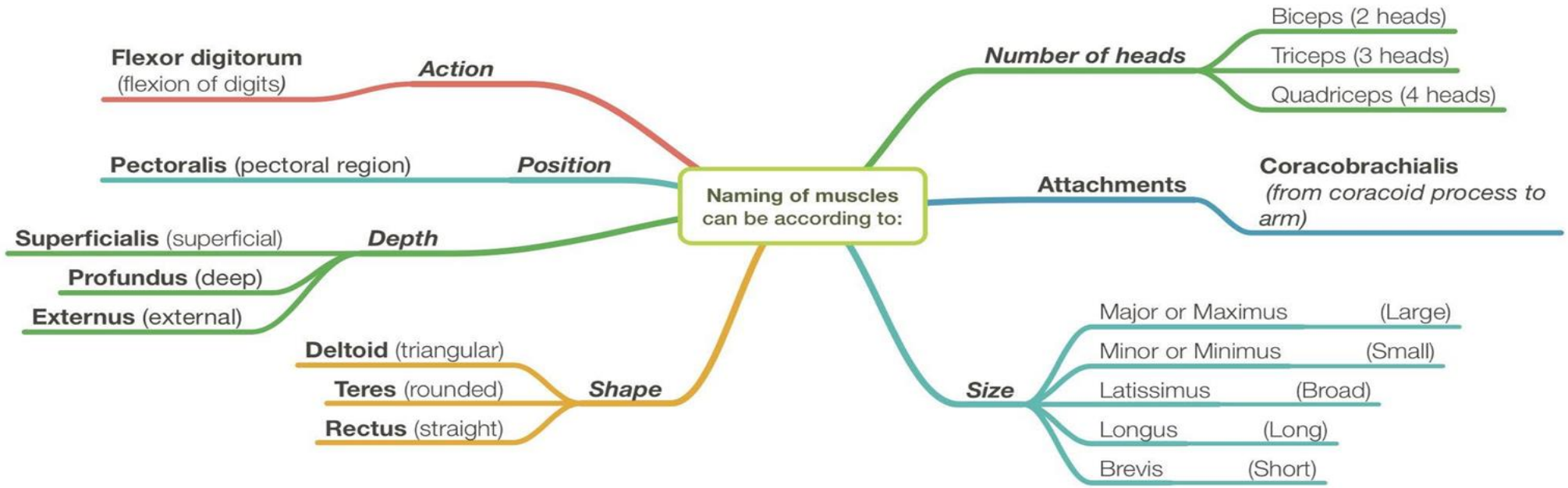
Color Code

- **Important**
- **Doctors Notes**
- **Notes/Extra explanation**

Objectives

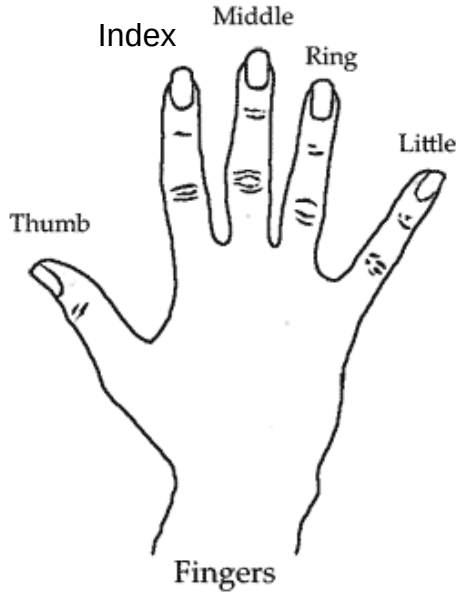
- ✓Describe the anatomy of the deep fascia of the wrist & hand (flexor & extensor retinacula & palmar aponeurosis).
- ✓List the structures passing superficial & deep to flexor retinaculum.
- ✓Describe the anatomy of the insertion of long flexor & extensor tendons.
- ✓Describe the anatomy of the small muscles of the hand (origin, insertion, action & nerve supply)

Recall what we took in foundation:



The following pairs always come together (they counter each other so if one is present so is the other)

Flexor & Extensor	(flexor carpi ulnaris & extensor carpi ulnaris)
Longus & Brevis	(extensor carpi radialis longus & extensor carpi radialis brevis)
Superficialis & Profundus	(flexor digitorum superficialis & flexor digitorum profundus)
Major & Minor	(pectoralis major & pectoralis minor)



<u>The fingers:</u>

Digitorum = has 4 tendons each attached to a finger
Pollicis = the thumb
Indices = index finger السبابه
Digiti minimi = pinkie

Retinacula

Flexor & Extensor Retinacula:

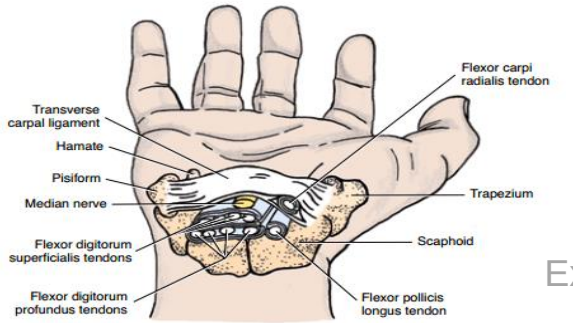
Bands of Deep Fascia at the Wrist

Function:

Hold the long flexor and extensor tendons at the wrist in position.

Attachments:

	Medially	**Laterally**
Flexor retinaculum	Pisiform & Hook of hamate	Tubercle of scaphoid & Trapezium
Extensor retinaculum	Pisiform & Hook of hamate	Distal end of radius



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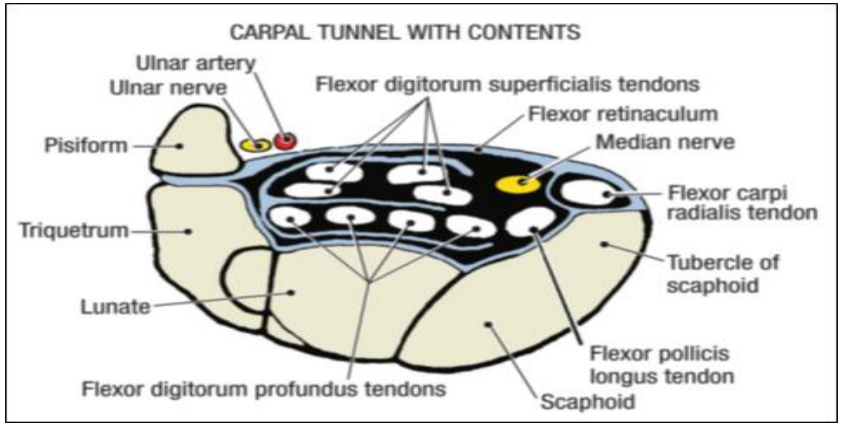
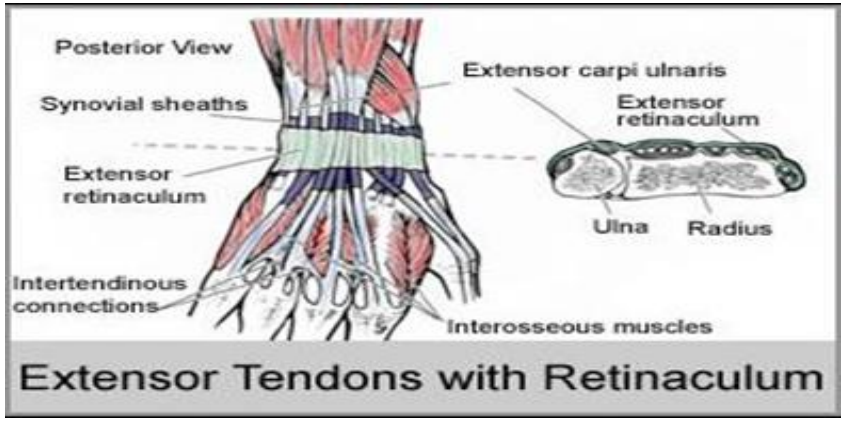
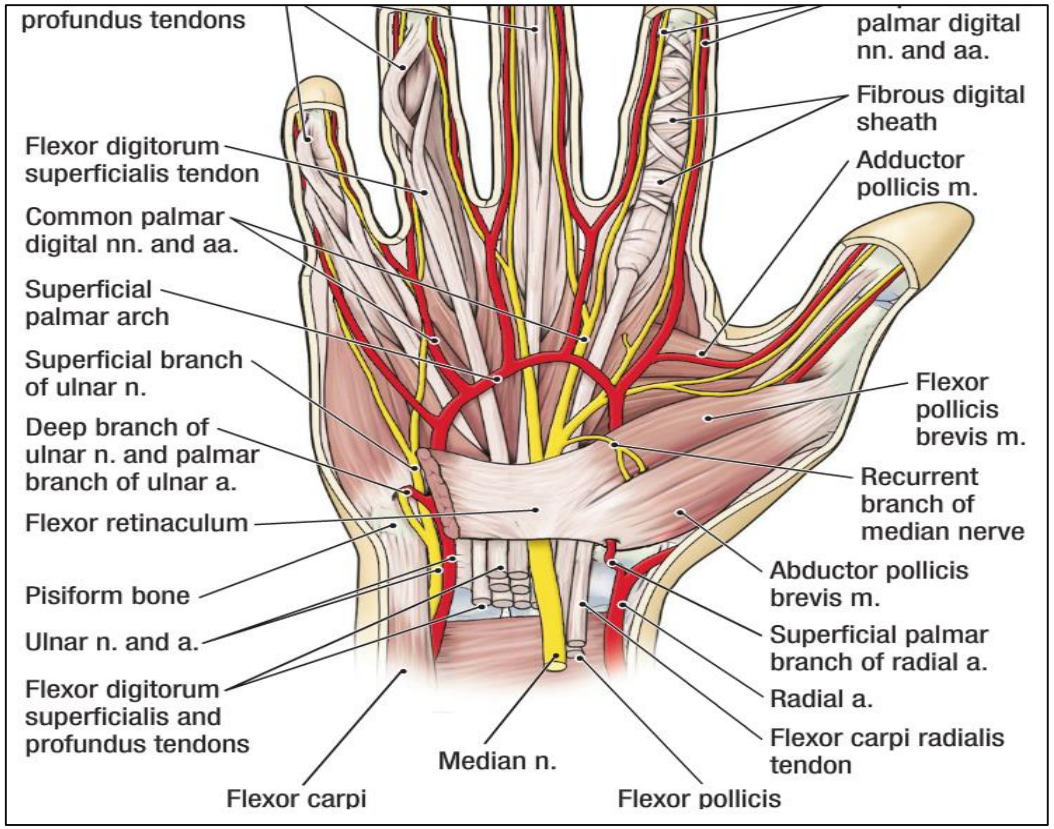


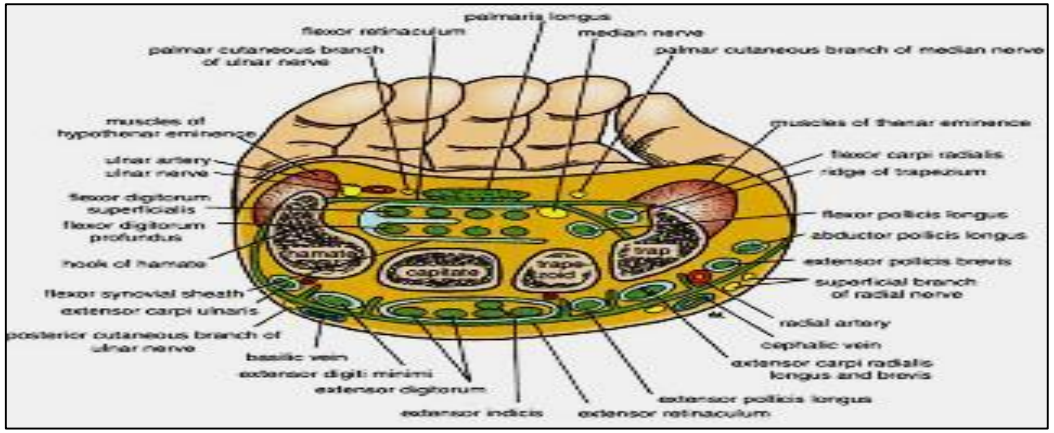


Structures Superficial to Flexor Retinaculum

From Medial to Lateral

1. Tendon of **Flexor carpi ulnaris**.
2. Ulnar **nerve**.
3. Ulnar **artery**.
4. Palmar cutaneous branch of **ulnar nerve**.
5. Palmaris longus **tendon**.
6. Palmar cutaneous branch of **median nerve**.





Carpal Tunnel

Formed from

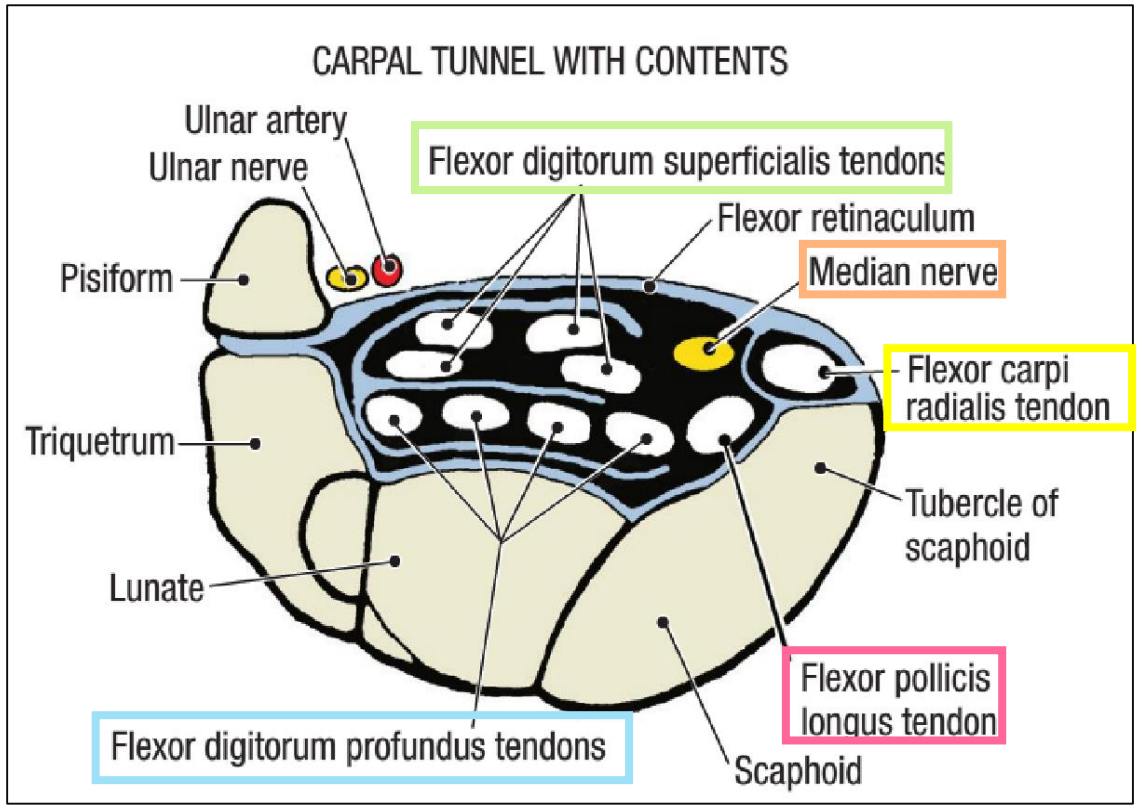
Concave anterior surface of the **Carpus** (carpal bones) covered by **Flexor Retinaculum.**

Contents

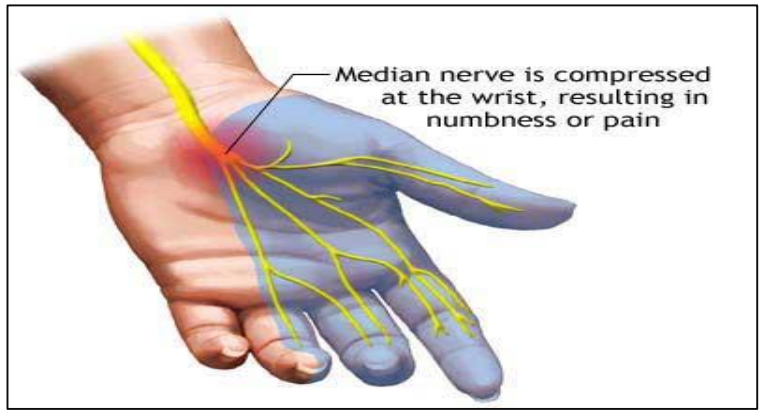
From Medial to Lateral

- Tendons of **flexor digitorum superficialis & profundus**
- Median **nerve**
- **Flexor Pollicis Longus**
- **(Flexor carpi radialis)**

* Note the flexor carpi radialis is in between brackets because it has a special compartment in the fascia

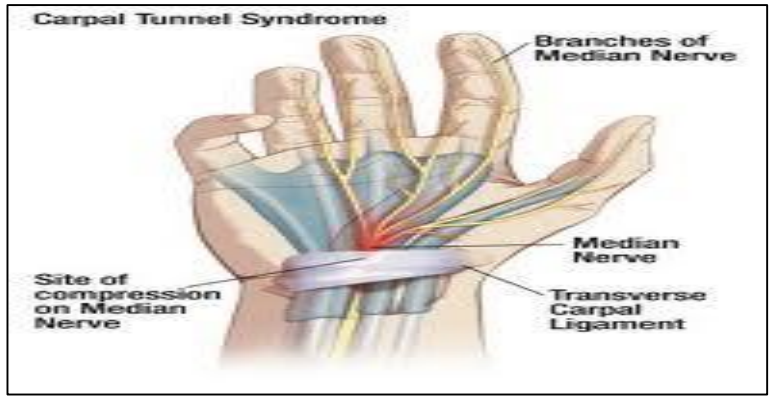


Carpal Tunnel Syndrome



Causes :

- **Compression** of the median nerve within the carpal tunnel.



Manifestations:

1.Burning pain (pins and needles) in *the lateral three and half fingers.*

No paresthesia* over the **thenar eminence** (because it is supplied by the plamer cutaenous branch of the median which is superficial to the flexor retinaculum)

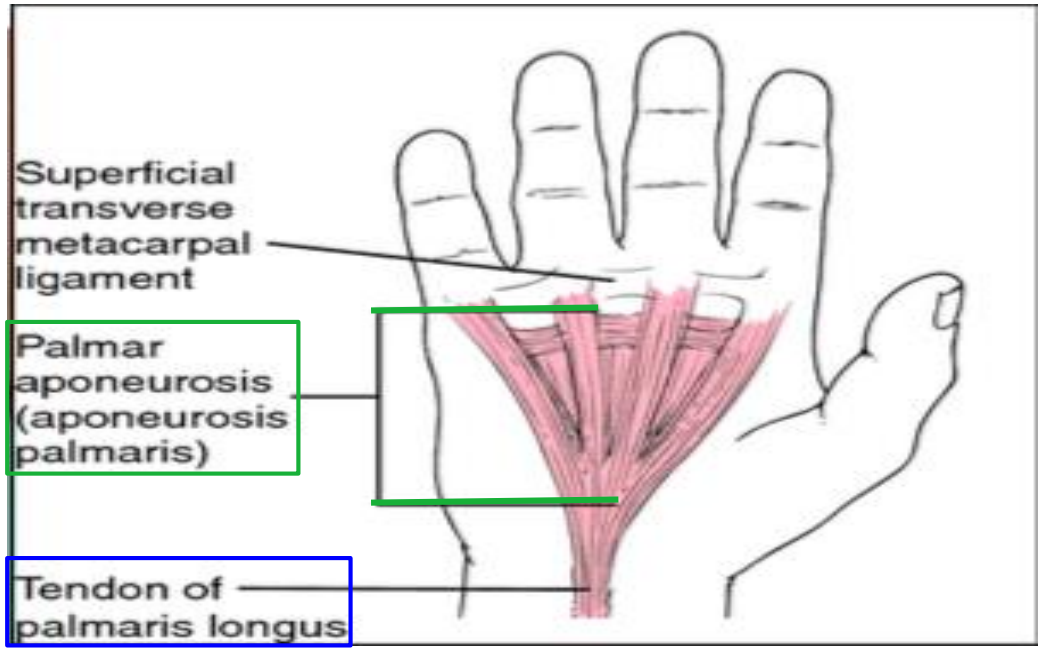
2. Weakness or atrophy of the thenar muscles **(Ape Hand).**

3. Inability to ***Oppose*** the thumb.

*Paresthesia: a sensation of pricking, tingling, or creeping on the skin usually associated with injury or irritation of a sensory nerve or nerve root

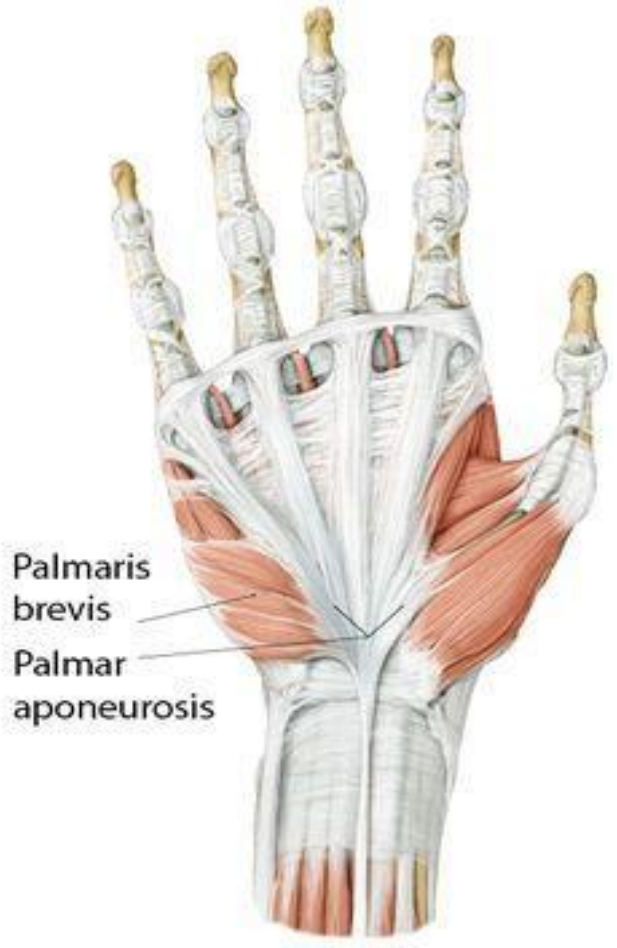
Palmar Aponeurosis:

- The thickened deep fascia of the palm.
- It is triangular in shape, occupies the central area of the palm.
- It has:
  - **Apex:** attached to the distal border of flexor retinaculum and receives the **insertion** of palmaris longus tendon.
  - **Base:** divides at the bases of the fingers into four slips that pass into the fingers.
- Function:
  1. Firmly attached to the overlying skin and improves the grip (it's deeply concave and not superficial in order to hold stuff easily)
  2. Protects the underlying tendons, vessels & nerves.
  3. Gives origin to **palmaris brevis muscle**.



Palmaris Brevis:

Origin	Insertion	Nerve supply	Action
Flexor retinaculum (FR) & Palmar aponeurosis (PA)	Skin of the palm	Ulnar nerve (superficial branch)	Corrugation* of skin to improve grip.



(the contractions appear on the skin since it's a superficial muscle)

corrugation*:shaped into alternate ridges and groove

Short Muscles of Thumb & Little Finger: (explained in the next slide)

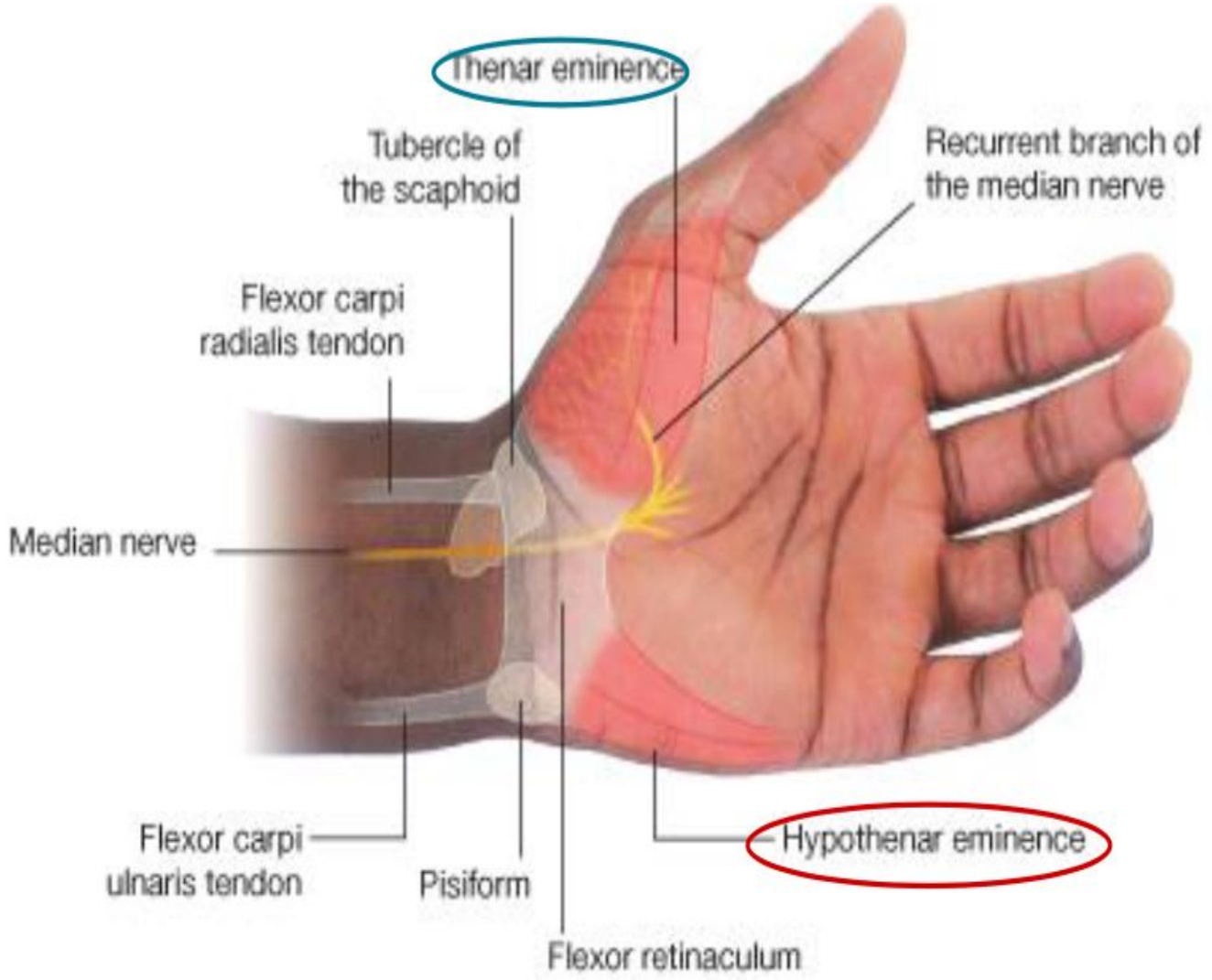
It includes the Thenar eminence and Hypothenar eminence. Each one is further divided into 3 types of muscles.
Can be remembered using the mnemonic,
"A OF A OF A" for:

(thenar muscles)

- **A**bductor pollicis brevis
- **O**pponens pollicis
- **F**lexor pollicis brevis
- **A**dductor pollicis

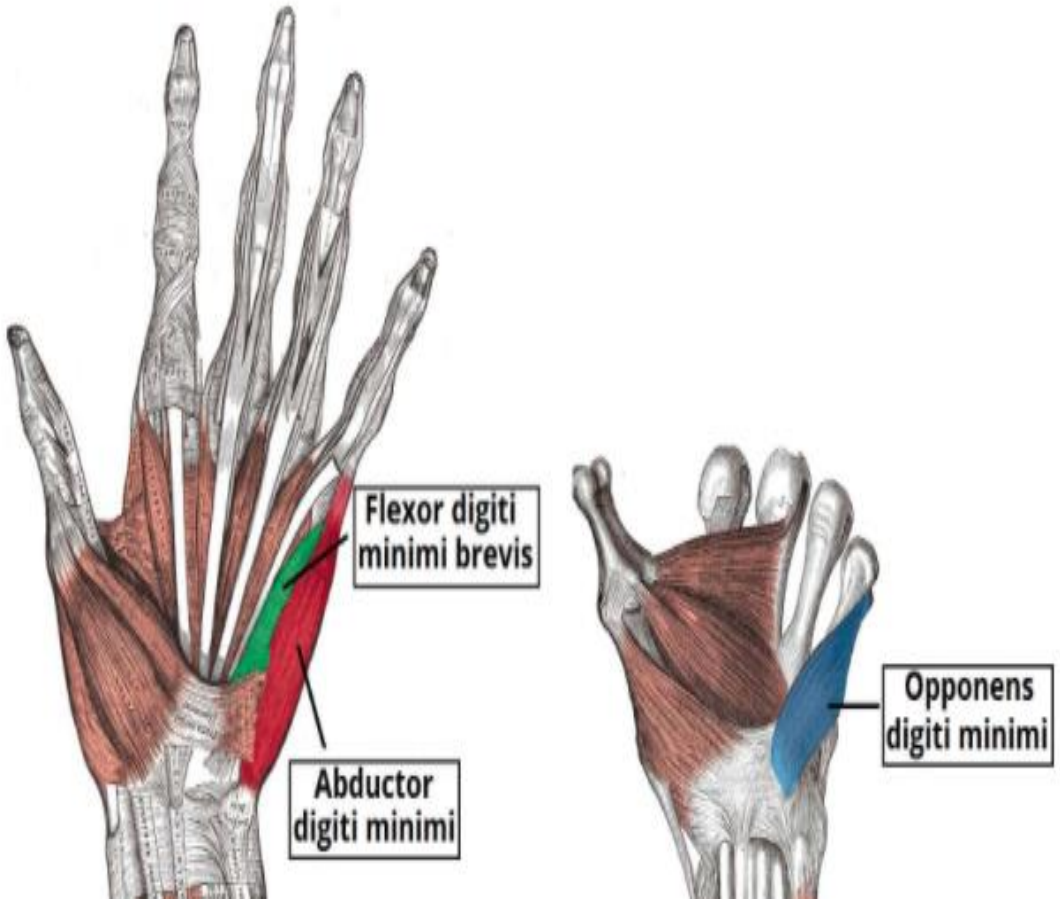
(Hypothenar muscles)

- **O**pponens digiti minimi
- **F**lexor digiti minimi
- **A**bductor digiti minimi



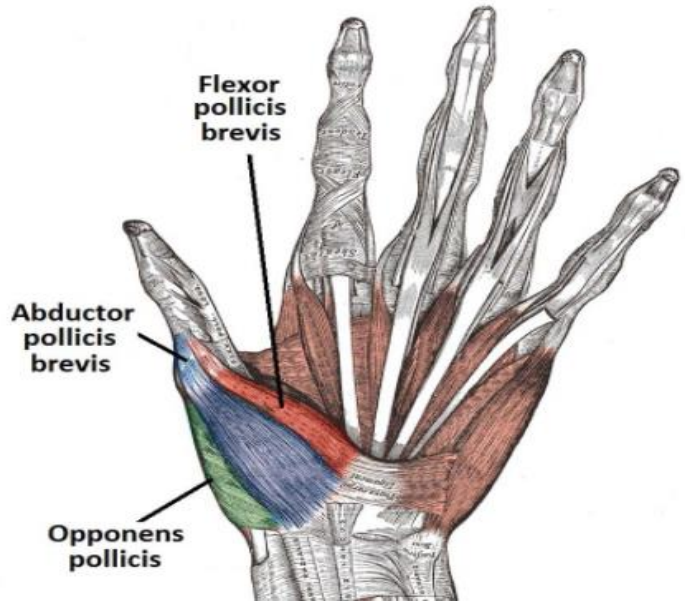
Short Muscles of Thumb & Little Finger:

Hypothenar Eminence				
Muscle	**Origin**	**Insertion**	**Nerve supply**	**Action**
Abductor digiti minimi	Pisiform	Base of proximal phalanx	All by deep branch of ulnar nerve	Abduction
Flexor digiti minimi	Flexor retinaculum			Flexion
Opponens digiti minimi	Flexor retinaculum	Palmer surface of 5th meta-carpal		Pulls the 5th metacarpal forward

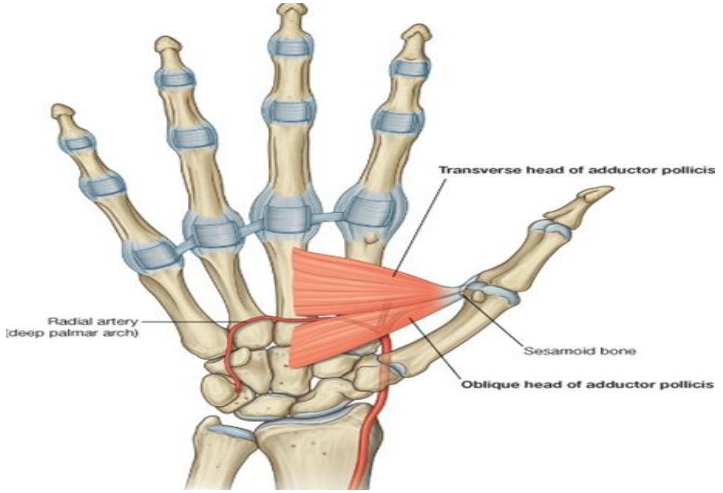


Short Muscles of Thumb & Little Finger:

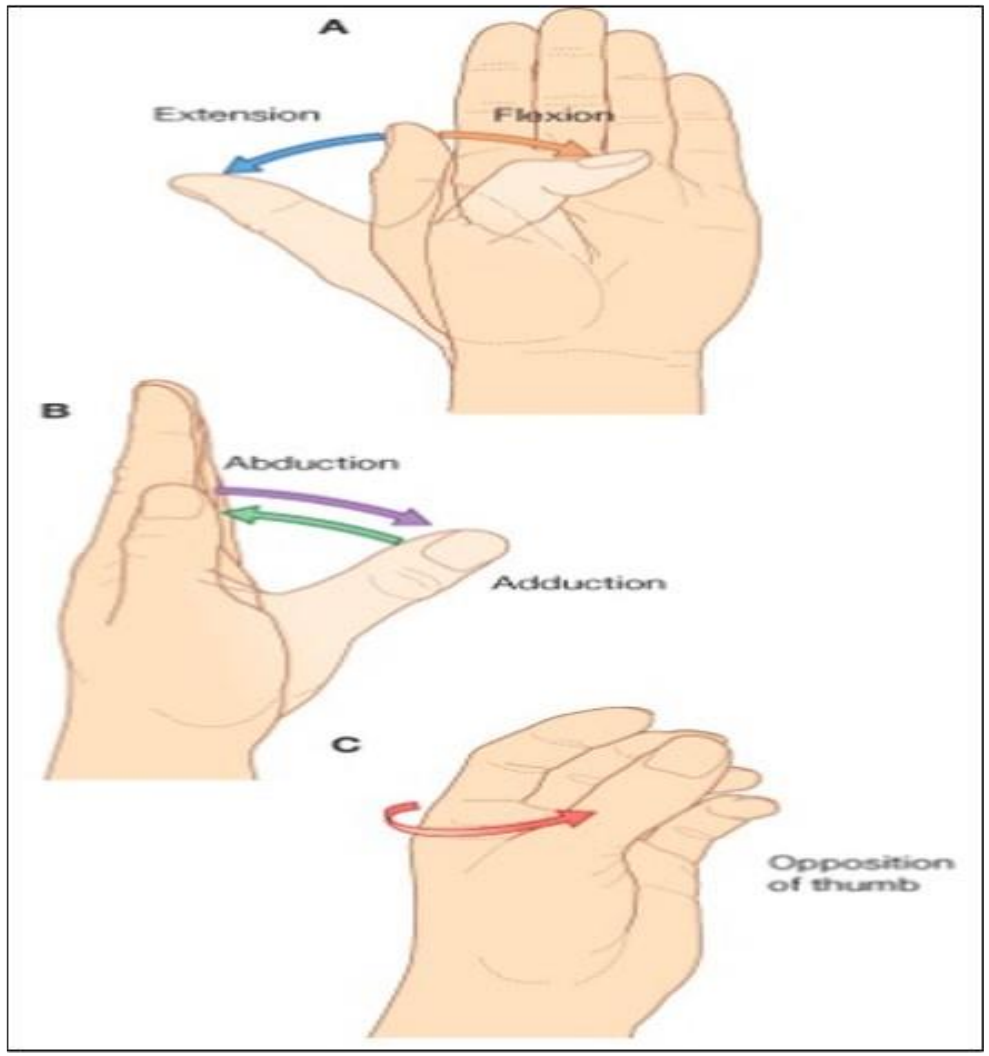
Thenar Eminence				
Muscle	**Origin**	**Insertion**	**Nerve supply**	**Action**
Abductor pollicis brevis	Flexor retinaculum, Scaphoid and trapezium	Base of proximal phalanx	All supplied by median nerve	Abduction
Flexor pollicis brevis	Flexor retinaculum			Flexion
Opponens pollicis	Flexor retinaculum	Lateral part of 1st metacarpal		Opposition



Adductor Pollicis (also on the thumb but not part of the thenar)	Origin	Insertion	Nerve supply	Action
	Oblique head: Anterior bases of **2**nd &**3**rd metacarpal. Transverse head : **3**rd metacarpal.	Medial side of base of proximal phalanx of thumb.	Deep branch of Ulnar nerve.	Adduction .



Movements of the Thumb



Insertion of

Flexor Digitorum Superficialis & Profundus

Flexor Digitorum **Superficialis**

1- Each tendon **Divides** into <u>two halves</u> & pass around the Profundus Tendon.

2- The two halves **<u>Meet</u>** on the <u>posterior</u> aspect of Profundus tendon (partial decussation of fibres).

3- **<u>Reunion</u>** (اتحاد من جديد) of the two halves.

4- **<u>Further Division into two slips</u>** attached to the <u>Borders</u> of Middle Phalanx.

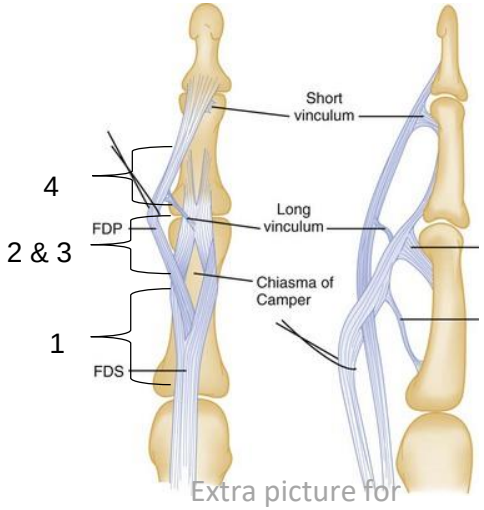
Flexor digitorum **Profundus :**

Inserted into the <u>Base</u> of the Distal Phalanx.

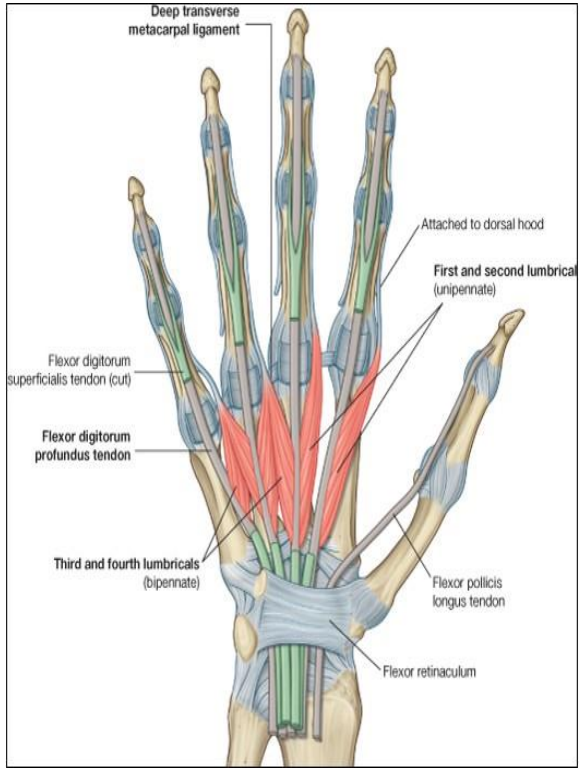
Extra

Flexor digitorum superficialis:

Flexor digitorum profundus:



Extra picture for understanding



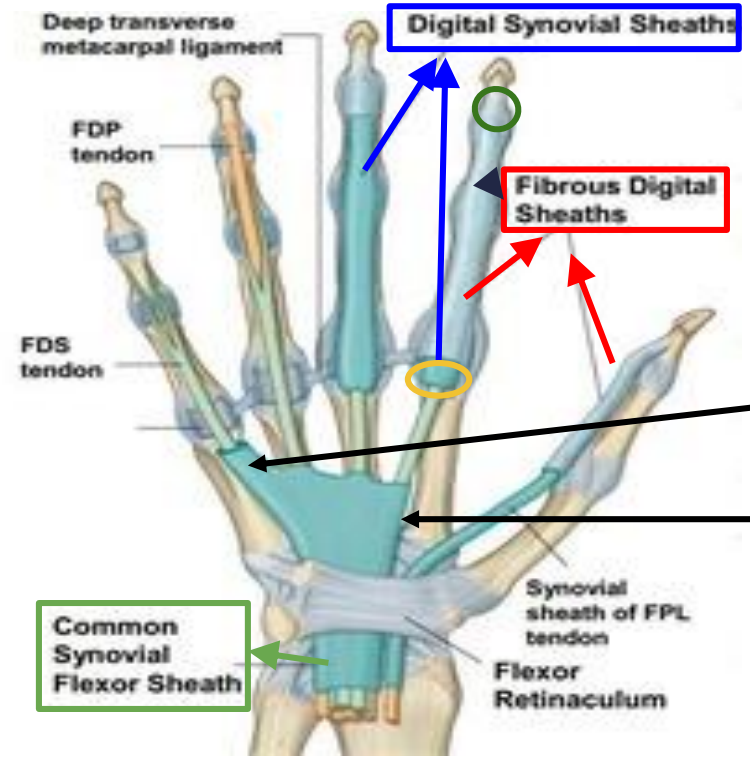
Fibrous Flexor (Digital) & Synovial Flexor Sheaths:

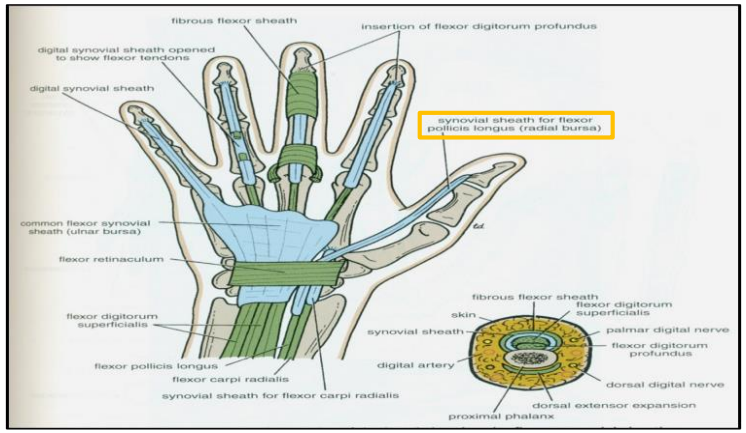
Fibrous flexor sheaths:

- Fibrous flexor is a **strong fibrous sheath** which covers [1] the anterior surface of the fingers and attached to the sides of the phalanges.
- Its proximal end is **opened**.
- Its distal end is **closed**.
- The sheath with the anterior surface of the phalanges & the interphalangeal joints form an **osteofibrous blind tunnel** [2] for the long flexor tendons of fingers.

[1] Both kinds of sheath covers the tendon to protect it.

[2] like a cave (opened from one side and closed from another)





Synovial flexor sheaths:

A - Common synovial sheath (ulnar bursa).

- Cover tendons of flexor digitorum superficialis and profundus.
- The <u>medial</u> part of it **extends distally** (without intteruption) on tendons of the little finger. (covers the whole finger)
- The lateral part **stops** on the middle of the palm. (doesn't cover the 3 middle fingers)
- The distal ends of the long flexor tendons to **(index, middle and ring)** fingers is <u>digital synovial sheaths.</u> (not the ulnar bursa).

B - Flexor pollicis longus tendon of the thumb has its own synovial sheath (radial bursa).

<u>Function of synovial sheaths:</u>

They allow the long tendons to move smoothly with a **minimum of friction** beneath the flexor retinaculum and the fibrous flexor sheaths.

Each finger has a tendon covered by (fibrous flexor sheath) to protect it and betweer the tendon and the fibrous sheath there are synovial sheaths to reduce friction.

Muscles of the hand

Lumbricals (4 muscles)

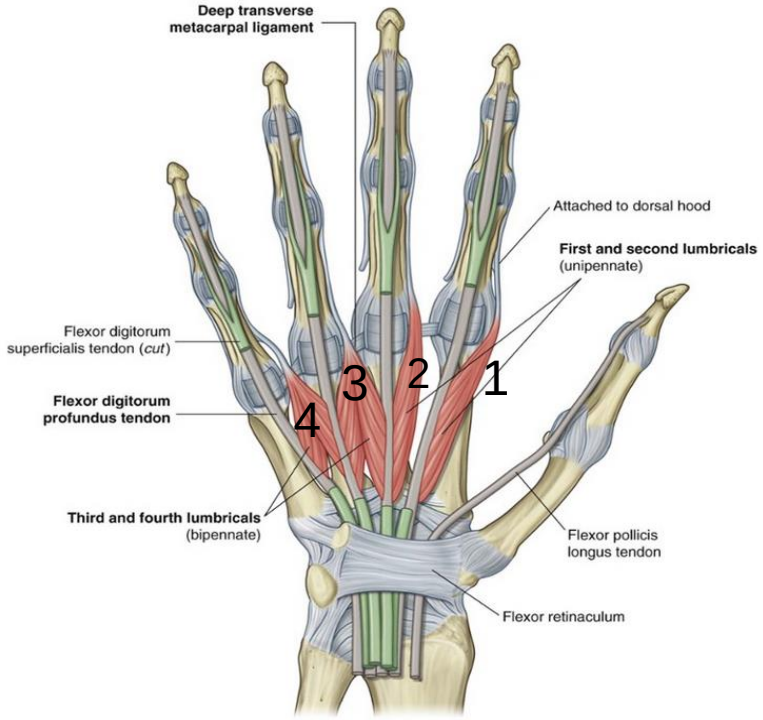


FIG. 7.104 Lumbrical muscles.

Palmar interossei (4 muscles)

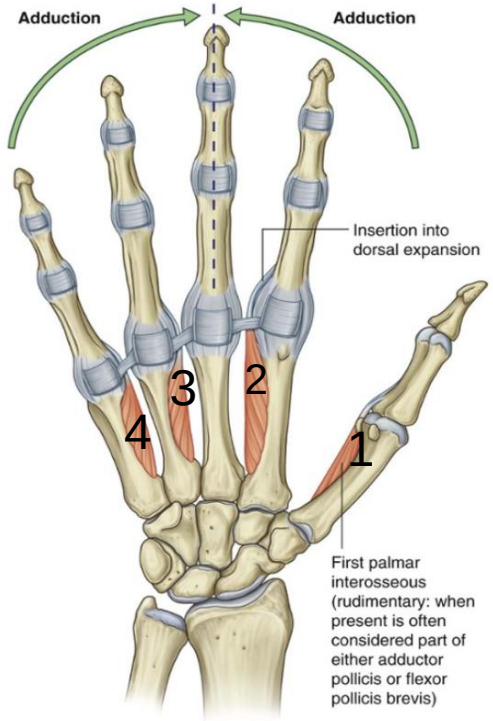


FIG. 7.101 Palmar interossei (palmar view).

Dorsal interossei (4 muscles)

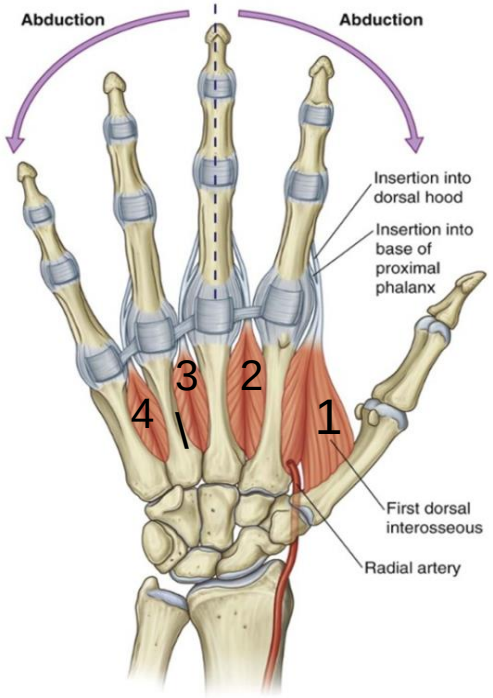
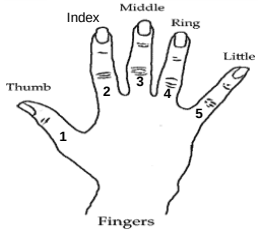
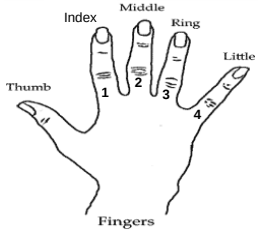


FIG. 7.100 Dorsal interossei (palmar view).

Note: you have to differentiate between numbering according to the metacarpals and numbering the digits



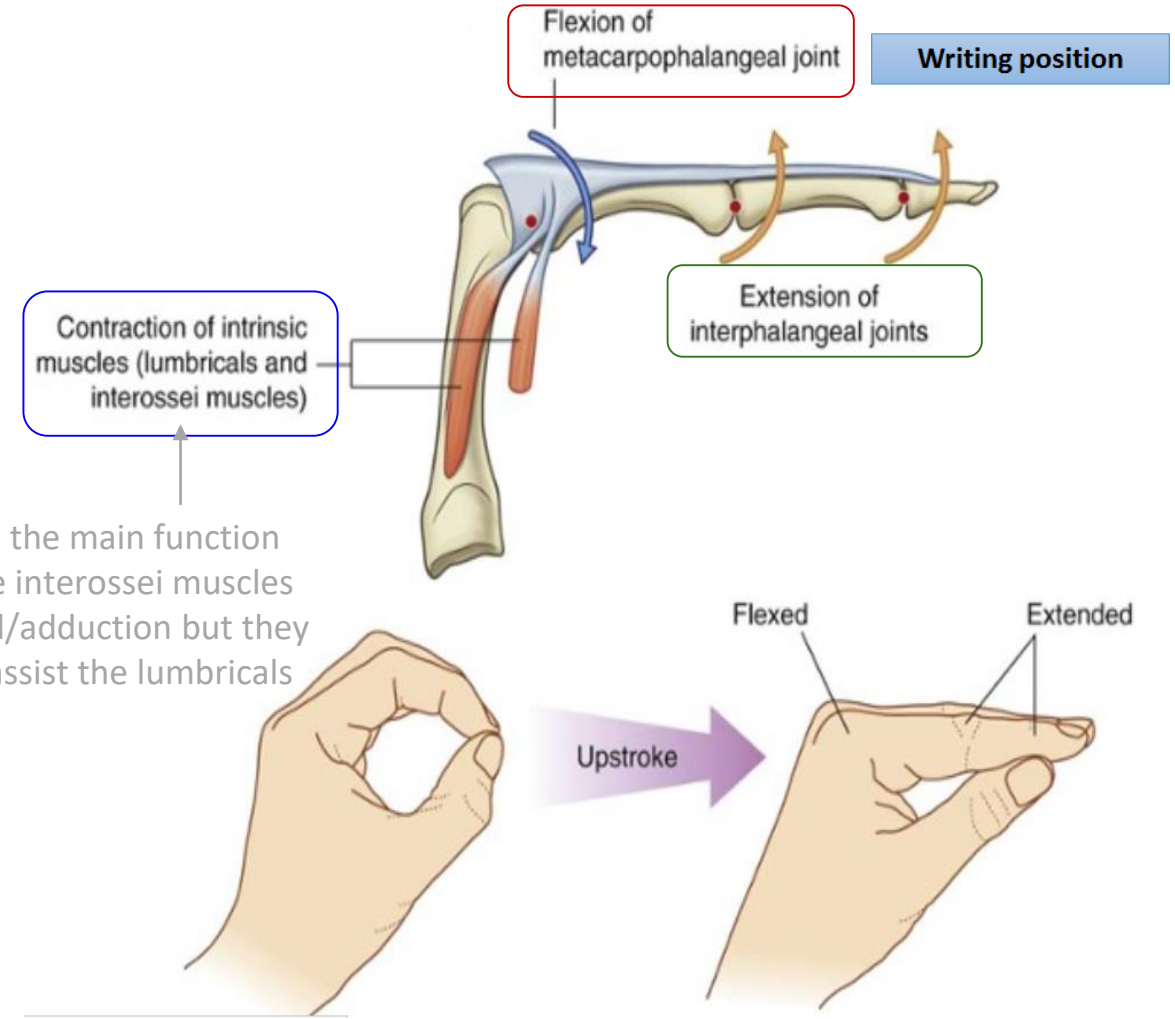


Muscles of the hand

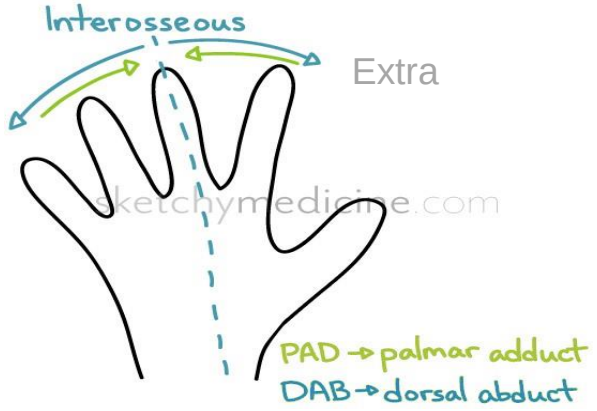
Muscle	Origin	Insertion	Nerve supply	Action
Lumbricals (4 muscles)	Tendons of flexor digitorum profundus	Extensor expansion of medial four fingers.	Lateral two **1st & 2nd** by recurrent/digital branch of the **median nerve** Medial two **3rd &4th** by the deep branch of the **ulnar nerve**.	Flex metacarpophalangeal joints and extend interphalangeal joints of fingers **Except thumb**
Palmar interossei (4 muscles)	1st : Base of 1st metacarpal. Other three: Ant. Surface of Shafts of 2nd, 4rd & 5th metacarpals.*	Proximal phalanges of thumb ,index, ring, & little fingers and Extensor expansion	Deep branch of **ulnar nerve**	Adduction of fingers toward center of the 3rd one.
Dorsal interossei (4 muscles)	Contiguous sides of shafts of Metacarpals Contiguous: adjacent, sharing a common border	Proximal Phalanges of index, ring ,middle finger & Extensors	Deep branch of **ulnar nerve**	Abduction of fingers away from the 3rd one.

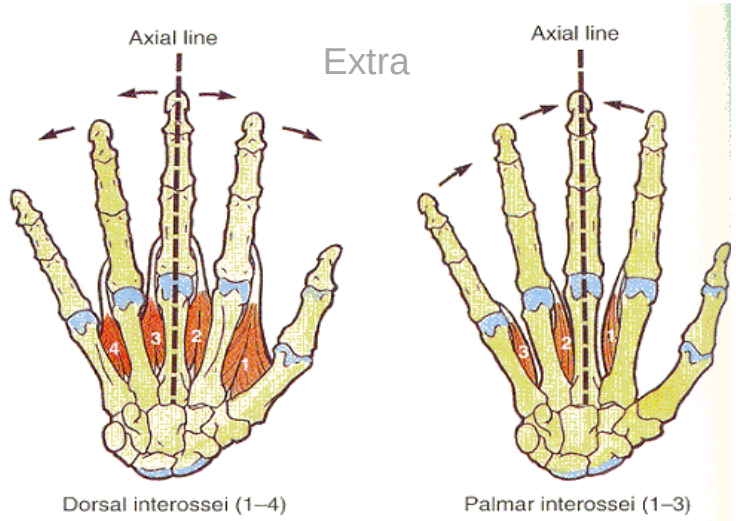
* The 3rd metacarpal doesn't have palmer interossei because it is the axis (does not adduct)

Action of Lumbricals & Interossei



Note: the main function of the interossei muscles is abd/adduction but they also assist the lumbricals





Note: Reverse the writing position and you get the claw hand (extension of metacarpophalangeal & flexion of interphalangeal)

Extensor Expansion

Formed from the expansion of the tendon of the extensor digitorum at the PIJ (proximal interphalangeal joint).

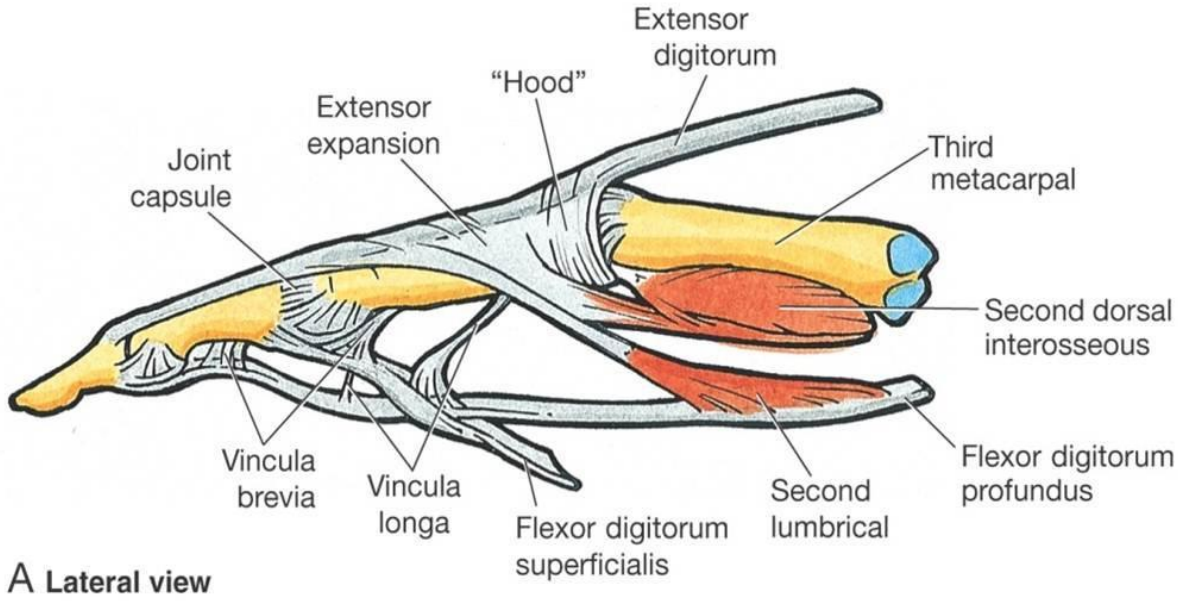
The tendon split into three parts**:**

- <u>One Central</u>: inserted into the base of ***Middle phalanx***.

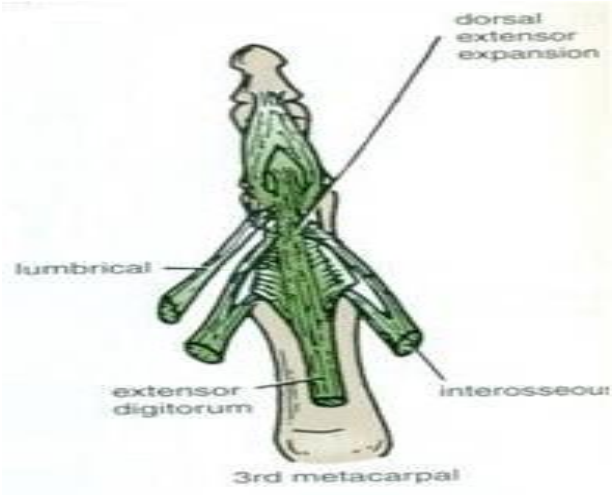
- <u>Two laterals</u>: inserted into the base of the ***Distal phalanx***.

The Expansion Receives the <u>insertions</u> of:

1. Corresponding ***Interosseous muscle*** (on each side)**.**
2. **Lumbrical muscle** (on the lateral side).



A **Lateral view**



Summary

Hand and wrist

	Name	Origin	Insertion	Nerve supply	Action
Hypothenar eminence.	Abductor Digiti Minimi.	Pisiform.	Base of proximal phalanx.	Deep branch of ulnar nerve.	Abduction.
	Flexor Digiti Minimi.	Flexor retinacula.	Base of proximal phalanx.	Deep branch of ulnar nerve.	Flexion.
	Opponens Digiti minimi	Flexor retinaculum	Palmer surface of 5th metacarpal	Deep branch of ulnar nerve.	Pulls the 5th metacarpal forward (Cup the palm).
Thenar Eminence	Abductor Pollicis Brevis.	FR + Scaphoid and trapezium.	Base of proximal phalanx of 1st digit.	Median nerve.	Abduction.
	Flexor Pollicis Brevis.	Flexor Retinaculum.	Base of proximal phalanx of 1st digit.	Median nerve.	Flexion.
	Opponens Pollicis.	Flexor retinaculum (+Trapezium)	Lateral part of 1ST metacarpal.	Median nerve.	Opposition.
	Palmaris Brevis.	FR + Palmaris aponeurosis.	Skin of palm.	Ulnar nerve (superficial branch).	Corrugation of skin to improve grip.
	Adductor Pollicis oblique.	Anterior base of 2nd and 3rd metacarpal.	Medial base of proximal phalanx of thumb.	Deep branch of ulnar.	Adduction.
	Adductor Pollicis transverse.	3rd metacarpal.	Medial base of proximal phalanx of thumb.	Deep branch of ulnar nerve.	Adduction.
	Lumbrical muscles	Tendons of flexor digitorum profundus.	Extensor expansion of medial four fingers.	1st and 2nd (median) 3rd and 4th (deep ulnar branch).	-Flexion of metacarpophalangeal joins -Extension of interphalangeal joints.
	Palmar interossei	1st: Base of 1st metacarpal. Other three: Anterior surface of shafts of 2nd, 4th & 5th metacarpals.	Proximal phalanges of thumb, index, ring, & little fingers and Extensor expansion	Deep branch of ulnar nerve.	Adduction of fingers toward center of the 3rd one.
	Dorsal interossei	Contiguous sides of shafts of Metacarpals.	Proximal Phalange of index, ring, mid finger & EX.	Deep branch of ulnar nerve.	Abduction of fingers away from the 3rd one.

Questions

1- The hypothenar muscles are supplied by:
A- Median nerve
B- Superficial branch of the ulnar nerve
C- Musculocutaneous nerve
D- Deep branch of the ulnar nerve

2- The palmar aponeurosis gives origin to the palmaris longus muscle
A- True
B- False

3-There are two other muscles in the palm that are not lumbricals or interossei and do not fit in the hypothenar or thenar compartments:
A- Abductor pollicis & Opponens pollicis
B- Opponens digiti minimi & flexor digiti minimi
C-Adductor Pollicis & Palmaris Brevis

4- which end of fibrous flexor sheath is opened ?
A- proximal end
B- distal end
C- none of them
D- both of them

5- the function of synovial sheaths is:
A- to protect the bone
B- Hold the long flexor and extensor tendons at the wrist in position.
C- minimum friction
D- flexion of the wrist

6- The lateral two lumbrical muscles are supplied by :
A-Deep branch of ulnar nerve
B-digital branches of the median nerve
C-Superficial branch of the ulnar nerve
D-axillary nerve

7- The insertion of Dorsal interossei is in :
A-Proximal Phalanges of index, ring ,middle finger & Extensors
B- distal phalanges of index, ring, middle finger & Extensors
C-Base of proximal phalanx
D- Lateral part of 1sr metacarpal

8- What is the origin of Adductor Pollicis ?
A- Flexor retinaculum.
B- Pisiform.
C- Flexor retinaculum Scaphoid and trapezium.
D- Anterior base of 2nd and 3rd metacarpals.

9- The 2 halves of tendon of Flexor digiti superficialis will meet on :
A- Anterior aspect of Profundus tendon.
B- Posterior aspect of Profundus tendon.
C- Anterior aspect of superficialis tendon.
D- Posterior aspect of superficialis tendon.

1-D
2-B
3-C
4- A
5- C
6- B
7- A
8- D
9- B

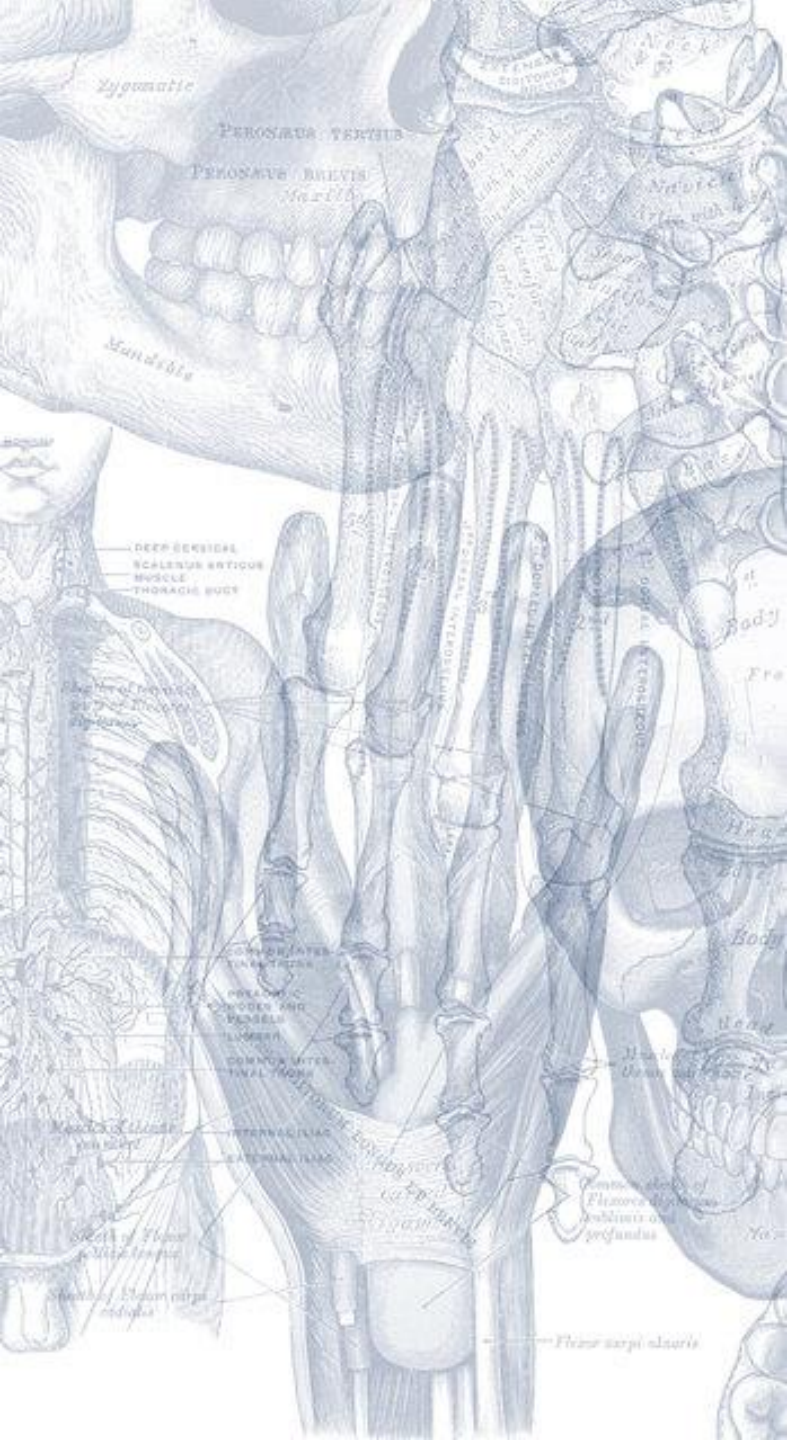
Questions

10- A boy injured his median nerve and as a result there was a wasting in the thenar muscles. List the muscles affected and the action of each one.

11- A patient presented with burning pain in the lateral three and half fingers and inability to oppose the thumb. What is the most likely diagnosis? Which nerve is affected?

12- List 4 structures superficial to the flexor retinaculum.

Answers:
10- 1) abductor pollicis brevis (abduction)
2) flexor pollicis brevis (flexion)
3) opponins pollicis (opposition)
11- Carpel tunnel syndrome. The median nerve is compressed.
12- 1) ulnar nerve
2) ulnar artery
3) palmer cutaneous branch of ulnar nerve



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