Hand and Wrist

Musculoskeletal block- Anatomy-lecture 9

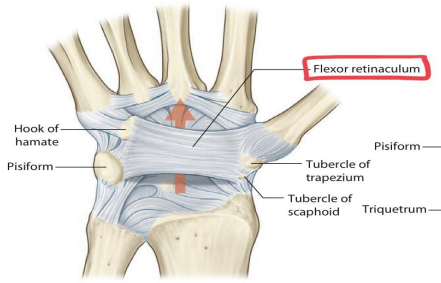
Editing file

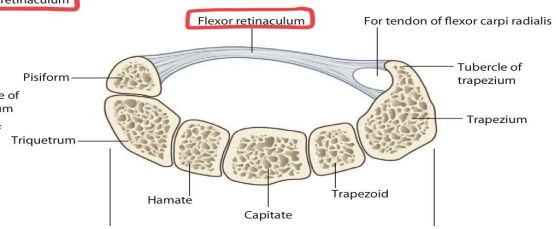
Objectives

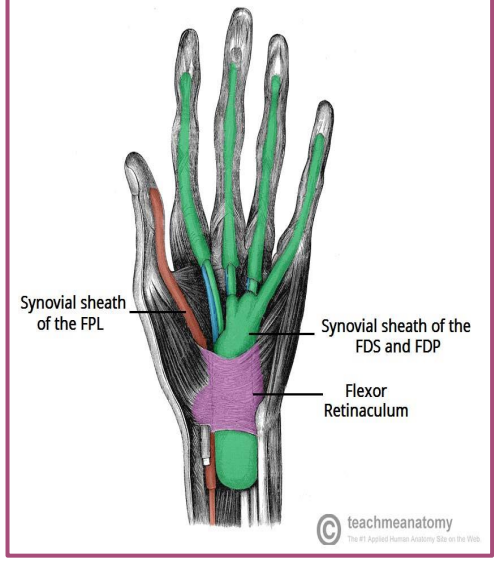
- ✓ **Describe the anatomy of the deep fascia of the wrist & hand (flexor & extensor retinaculum & palmar aponeurosis).**
- ✓ **List the structures passing superficial & deep to flexor retinaculum.**
- ✓ **Describe the anatomy of the insertion of long flexor & extensor tendons.**
- ✓ **Describe the anatomy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

Color guide :
Only in boys slides in **Blue**
Only in girls slides in **Purple**
important in **Red**
Doctor note in **Green**
Extra information in **Grey**

Retinacula







Flexor & Extensor Retinaculum:

Bands of Deep Fascia at the Wrist

Function:

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

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

Structures Superficial to Flexor Retinaculum

<u>From Medial to Lateral</u>

Tendon of Flexor carpi ulnaris.

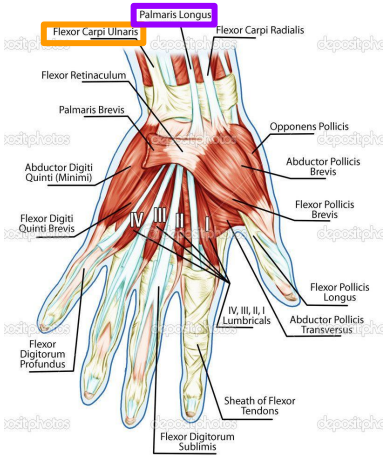
Ulnar nerve.

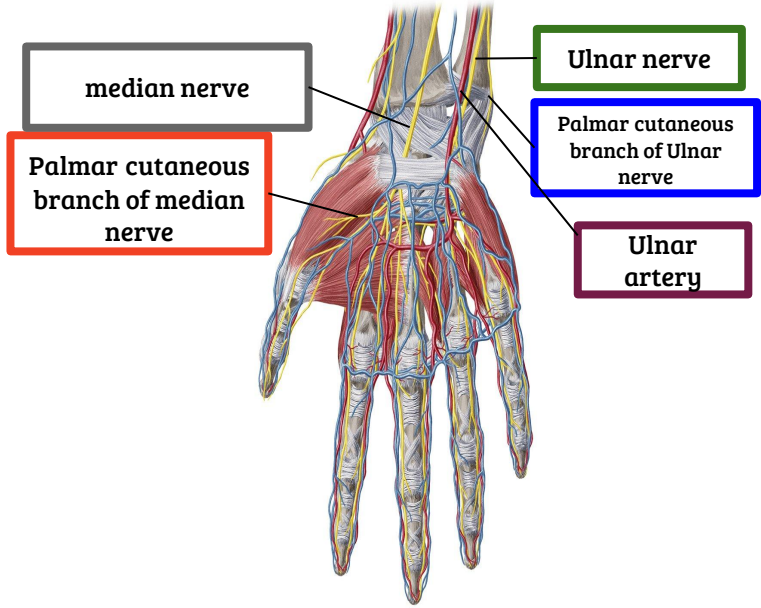
Ulnar artery

Palmar cutaneous branch of ulnar nerve.

Palmaris longus tendon.

Palmar cutaneous branch of median nerve.

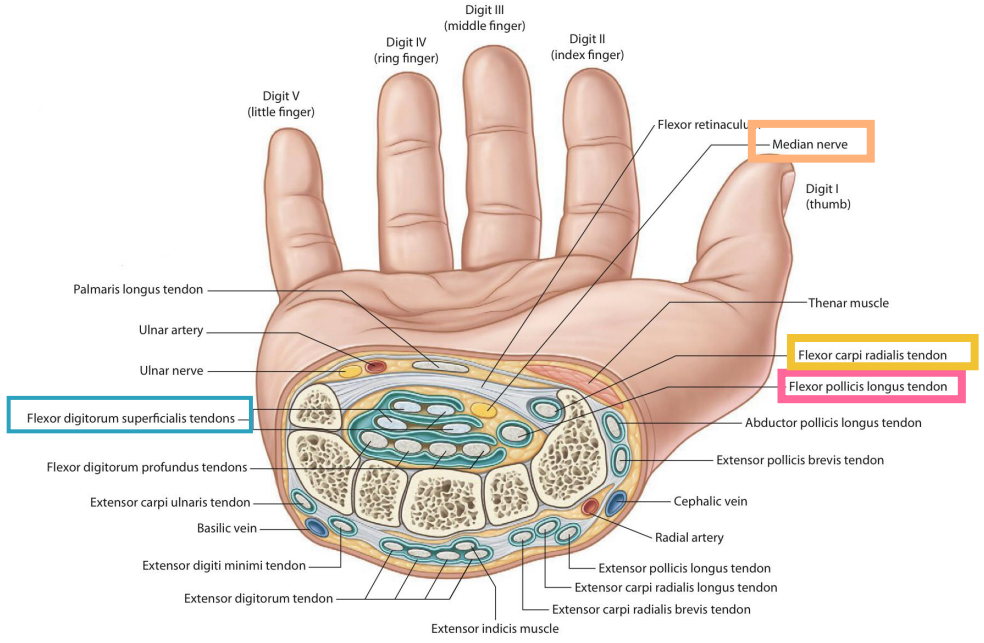




Carpal Tunnel

- **Formed from:** Concave anterior surface of the Carpus (carpal bones) covered by Flexor Retinaculum.
- **Contents** :<u>From Medial to Lateral</u>
  - 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



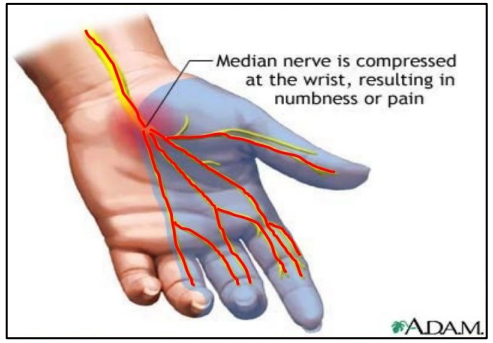
Carpal Tunnel Syndrome

<u>Causes :</u>

- Compression of the median nerve within the carpal tunnel.

<u>Manifestations:</u>

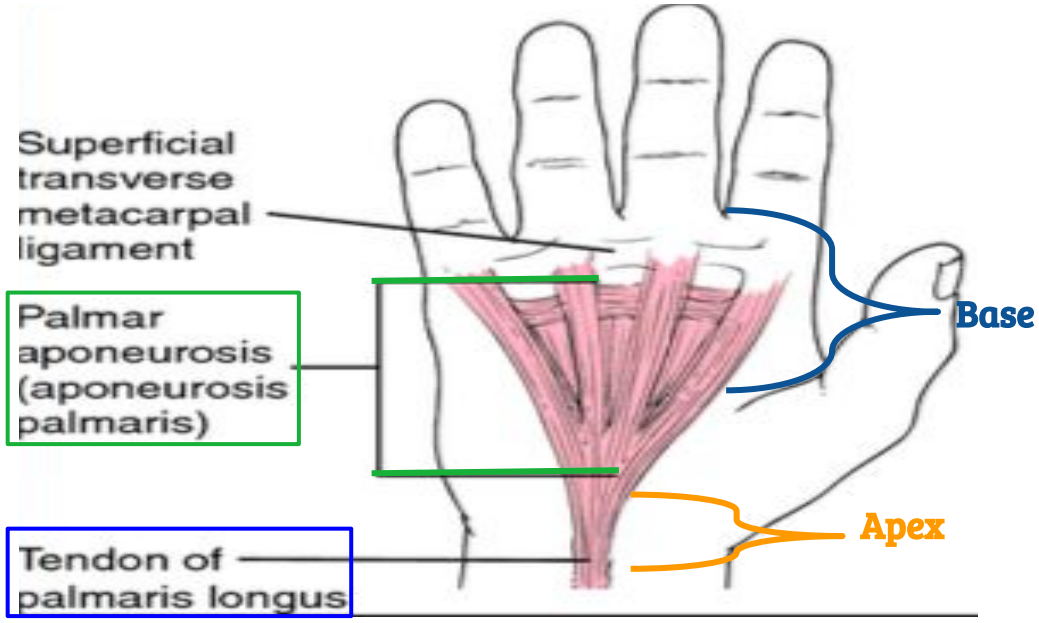
1. Burning pain (pins and needles) in the lateral three and half fingers.
- No paresthesia over the thenar eminence (because it is supplied by the palmar cutaneous branch of the median which is superficial to the flexor retinaculum)
2. Weakness or atrophy of the thenar muscles (Ape Hand).
- Inability to <u>Oppose</u> the thumb.



Beneficial video ✧
https://youtu.be/cEO5YG8Y554

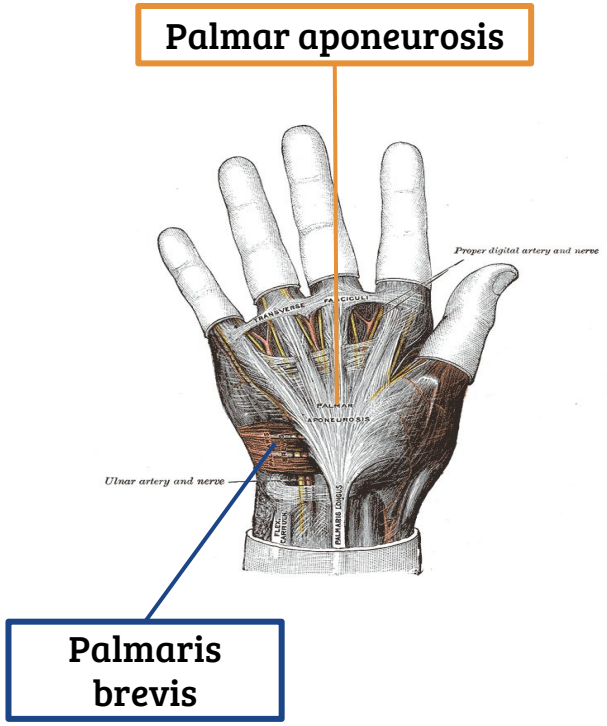
Palmar Aponeurosis:

- 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 Protects the underlying tendons, vessels & nerves.
  2. 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)	Prevents Corrugation of skin to improve grip.



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 by using the mnemonic,

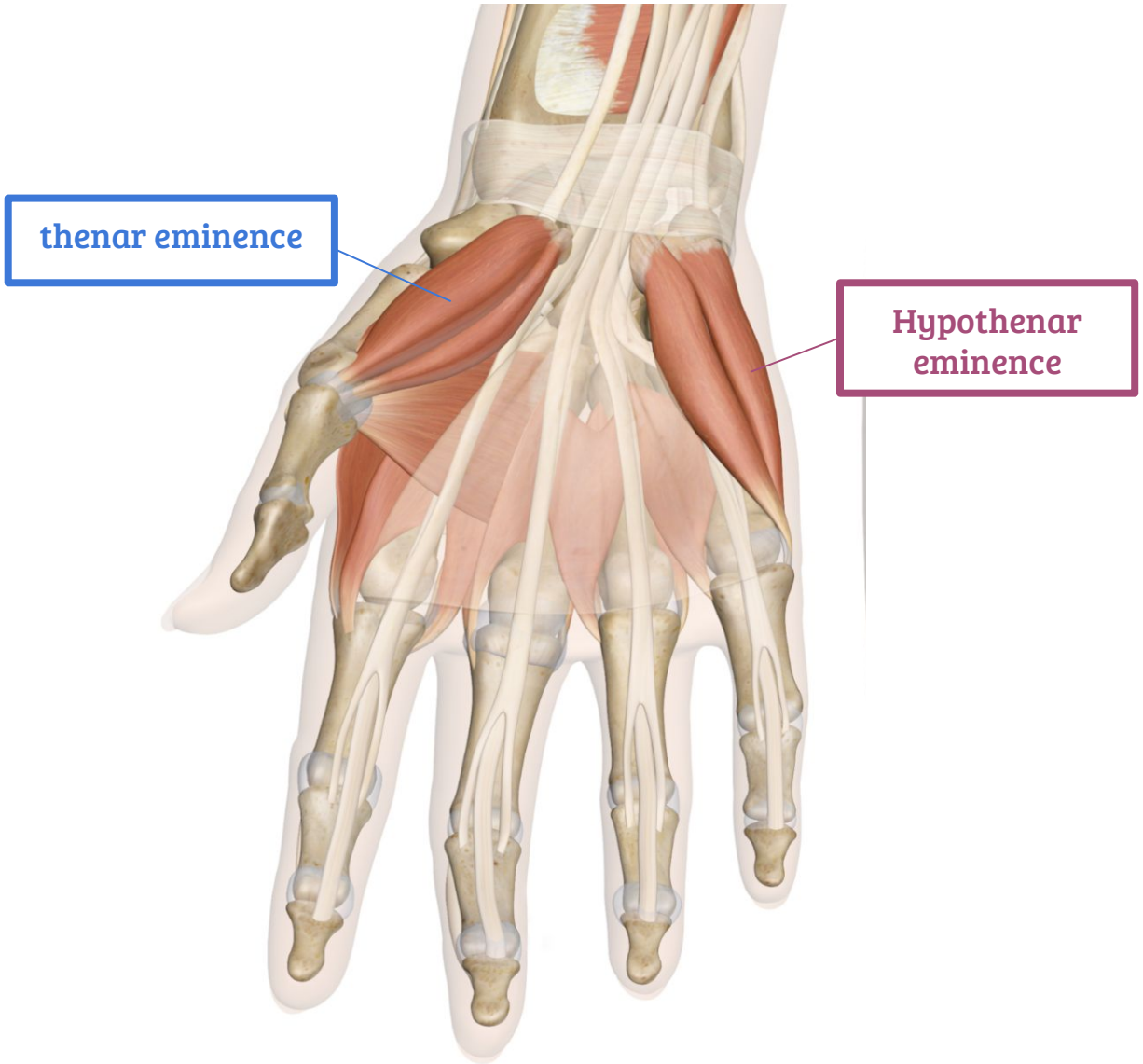
All For One And One For All

(thenar muscles)

- Abductor pollicis brevis
- Flexor pollicis brevis
- Opponens pollicis
- Adductor pollicis

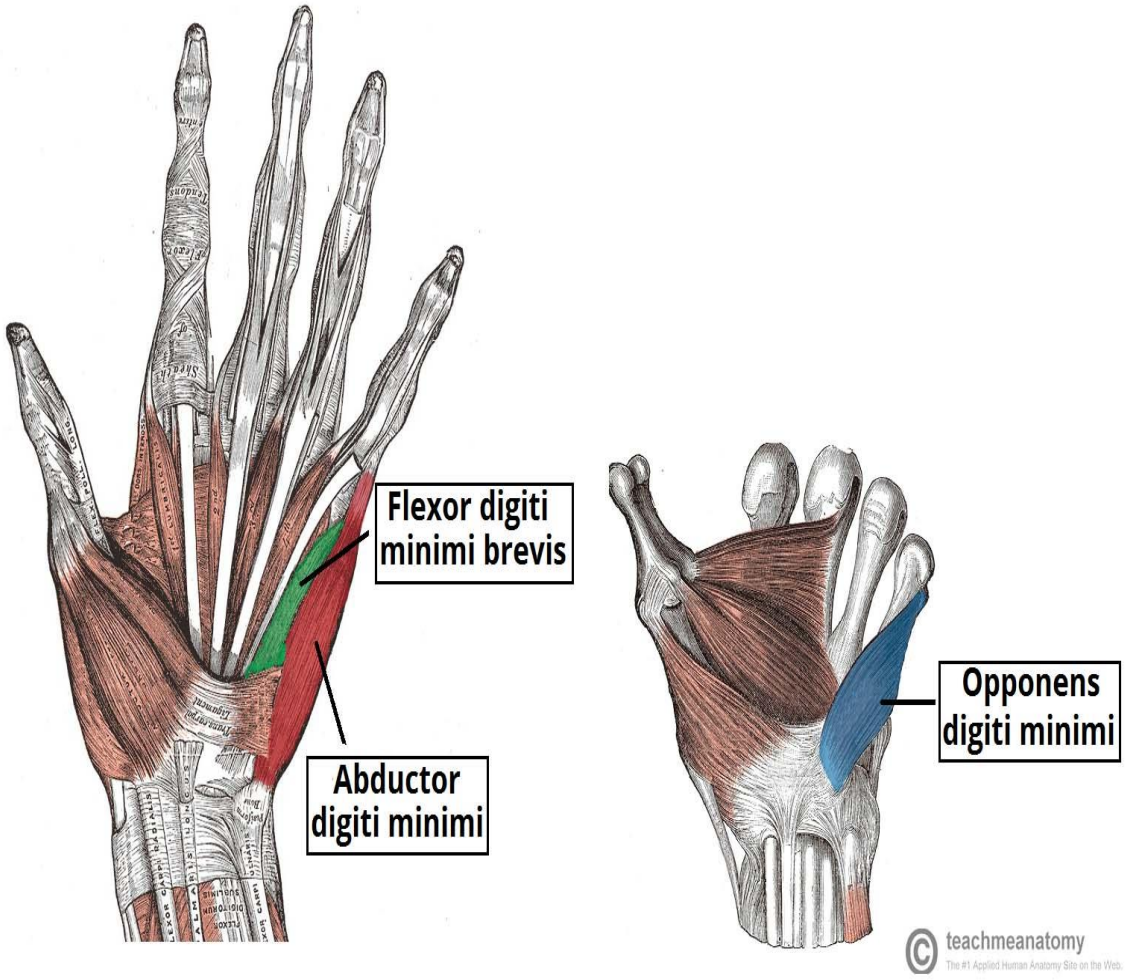
(Hypothenar muscles)

- Opponens digiti minimi
- Flexor digiti minimi
- Abductor digiti minimi



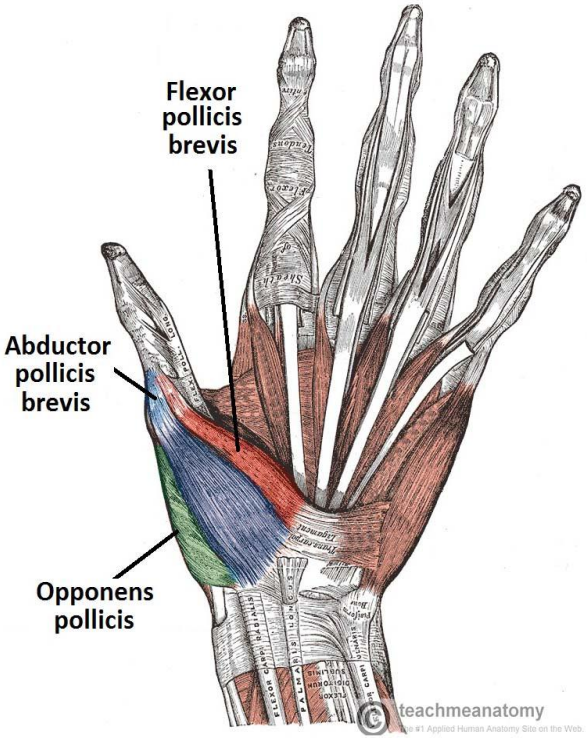
Short Muscles of the Little Finger:

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	Palmar surface of 5th metacarpal			Pulls the 5th metacarpal forward (Cup the palm)

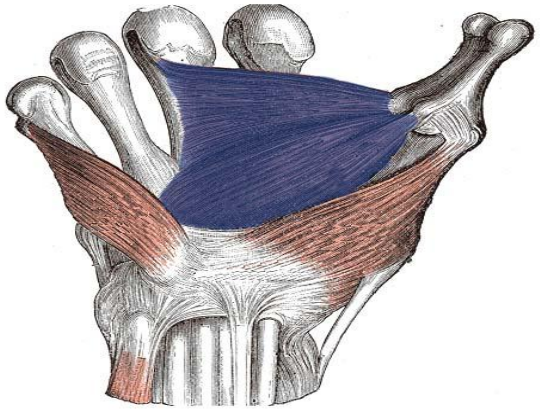


Short Muscles of Thumb :

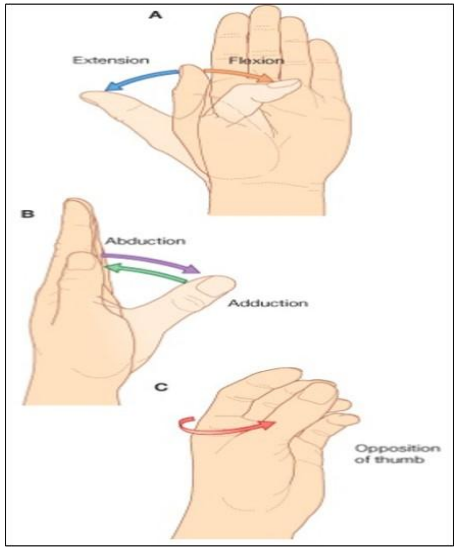
Thenar Eminence				
Muscle	**Origin**	**Insertion**	**Nerve supply**	**Action**
Abductor pollicis brevis	Flexor retinaculum, Scaphoid and trapezium	Base of proximal phalanx	All supplied by median nerve	Abduction
Flexor pollicis brevis	Flexor retinaculum			Flexion
Opponens pollicis	Flexor retinaculum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



	Origin	Insertion	Nerve supply	Action
Adductor Pollicis (also on the thumb but not part of the thenar)	Oblique head: Anterior bases of 2nd &3rd metacarpal. Transverse head : 3rd 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.

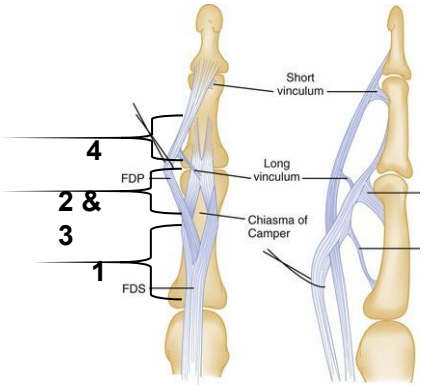
2- The two halves **<u>Meet</u>** on the <u>posterior</u> aspect of Profundus tendon (partial decussation of fibres).

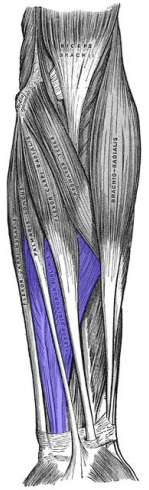
3- **<u>Reunion</u>** of the two halves.

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

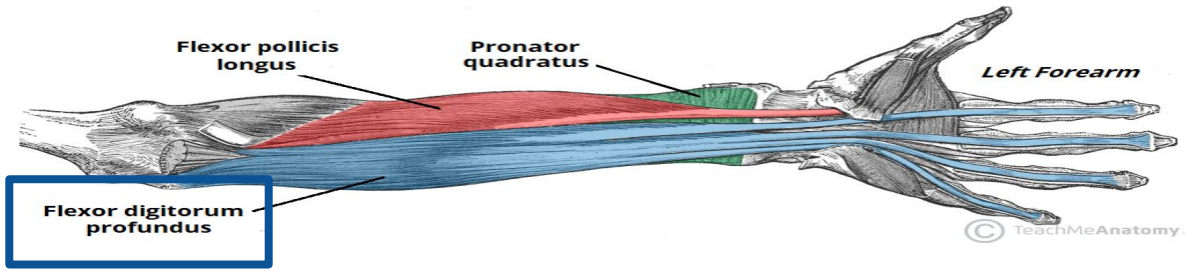
Flexor digitorum **Profundus :**

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



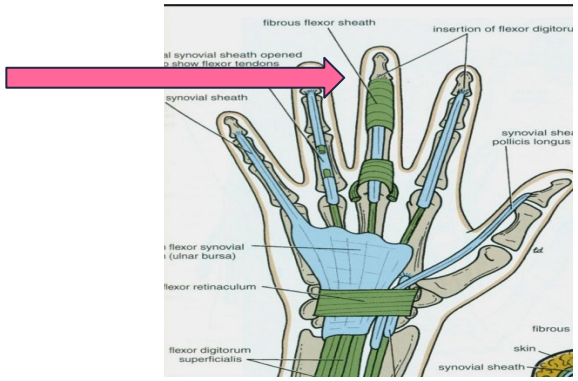


Flexor digitorum superficialis



Fibrous Flexor (Digital) sheaths

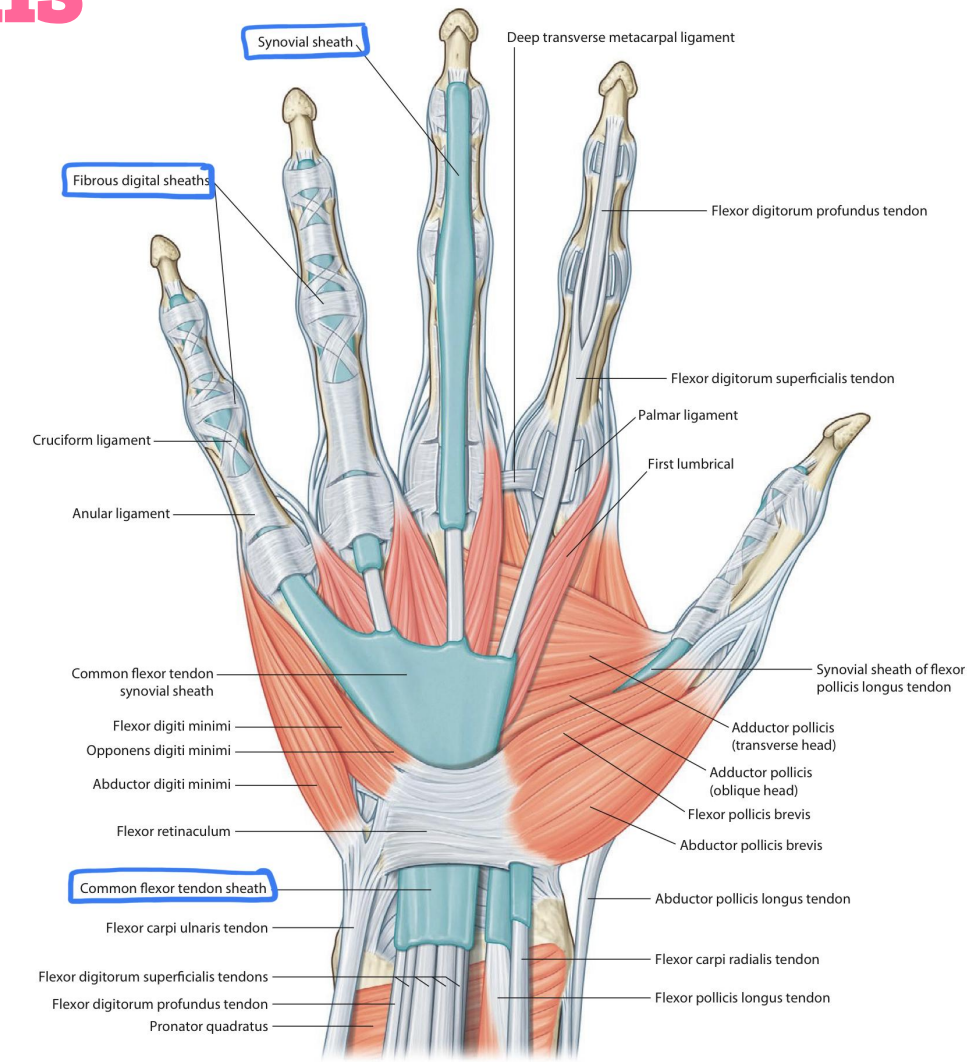
- a **strong fibrous sheath** which covers [1] the anterior surface of the fingers and attached to the sides of phalanges



- 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

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



Superficial muscles of the hand (palmar view)

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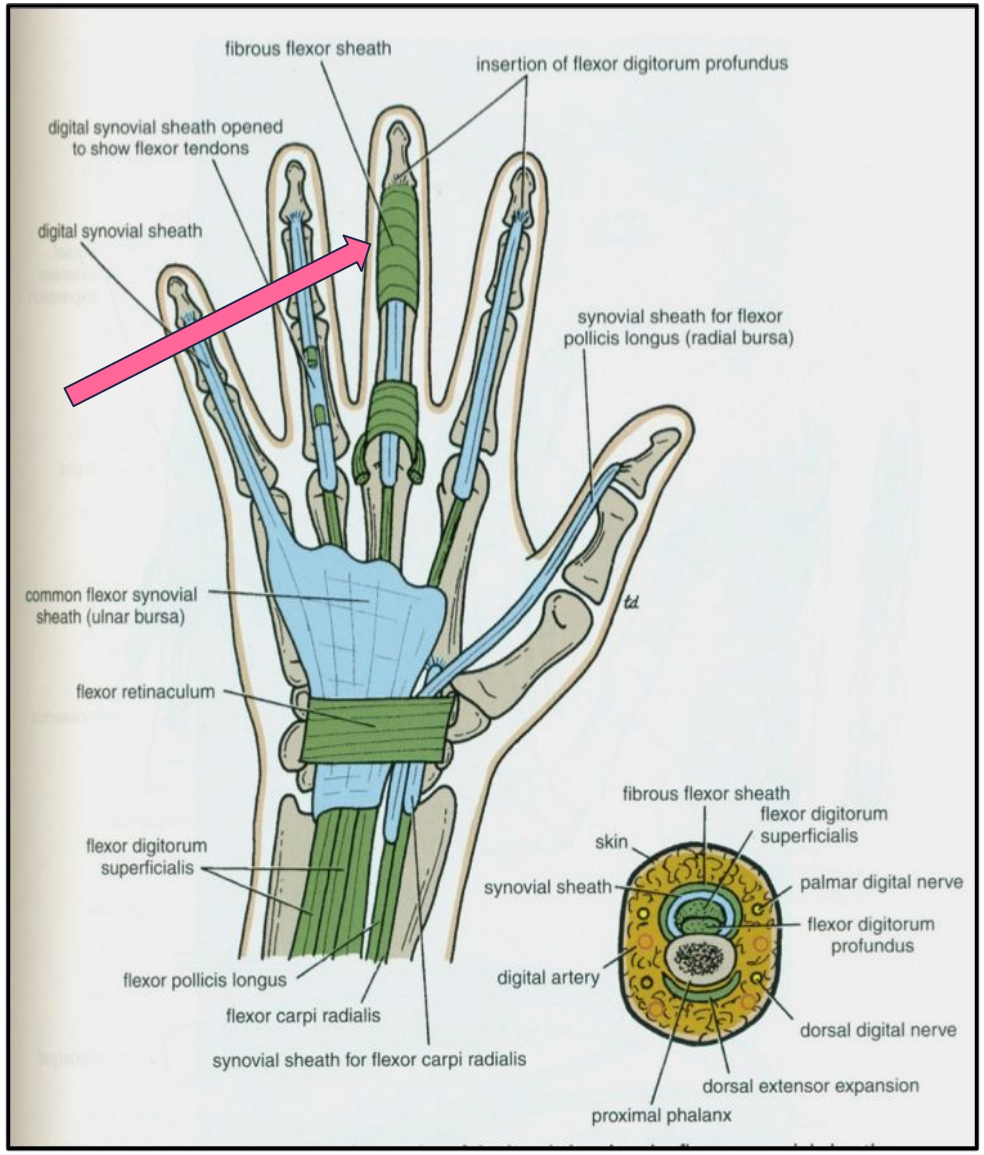


Synovial Flexor Sheaths

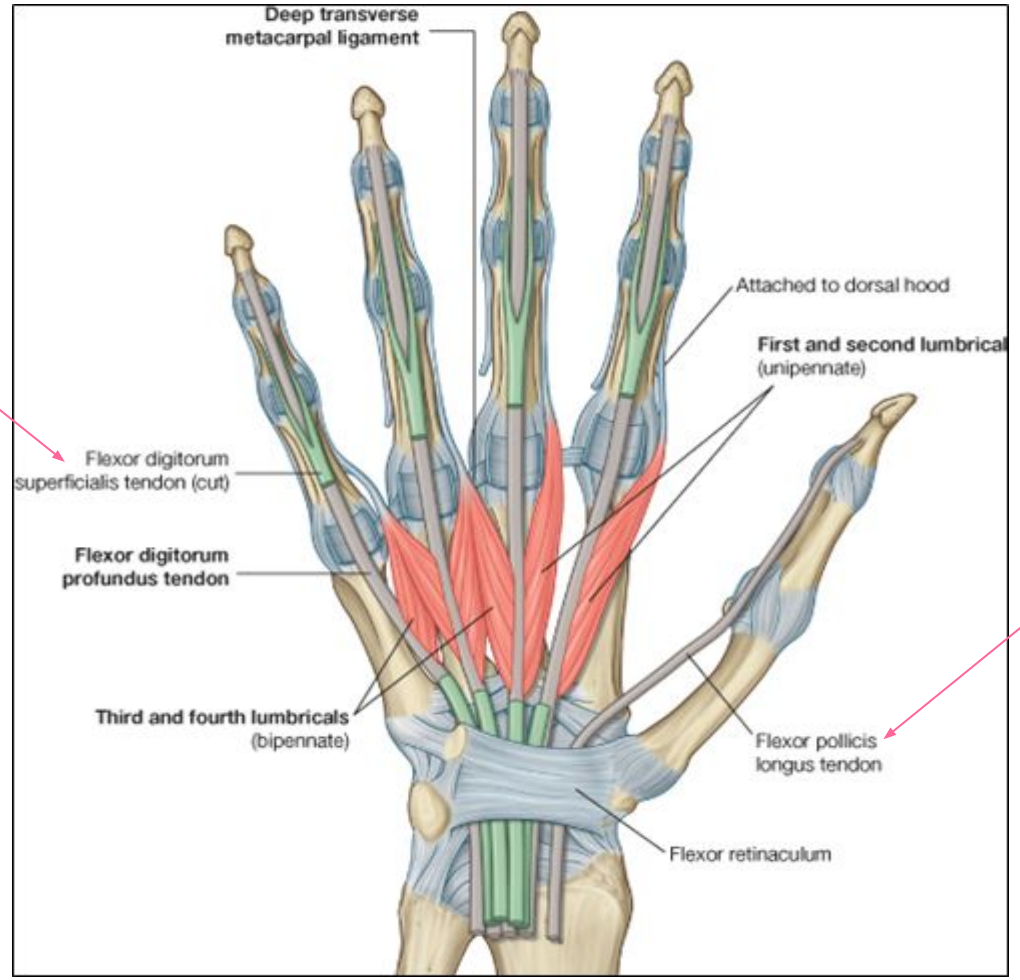
A - Common synovial sheath (ulnar bursa).

(bursa is a synovial capsule like structure, sac containing fluid minimizing the fracture)

- ❏ Cover tendons of flexor digitorum superficialis and profundus.
- ❏ The <u>medial</u> part of it **extends distally** (without interruption) 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 so they are uncovered with synovial sheath)
- ❏ 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).

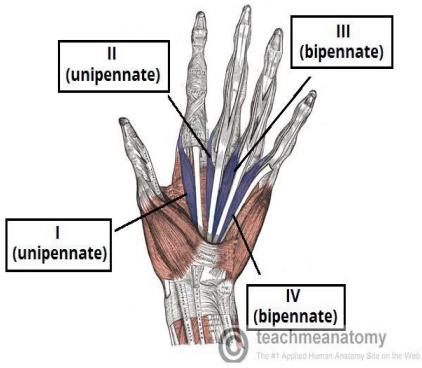
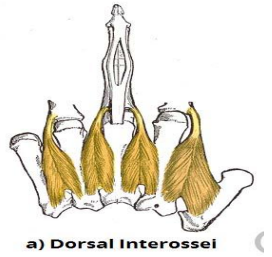
<u>Function of synovial sheaths:</u>
They allow the long tendons to move smoothly with a **minimum of friction** beneath the flexor retinaculum and the fibrous flexor sheaths.



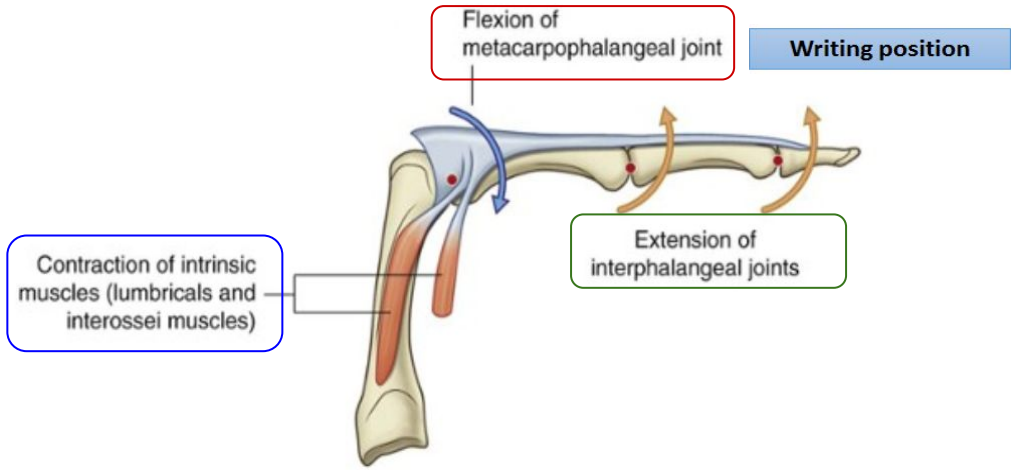
Drs note :The importance of the digital synovial sheath is that it prevents the infection from spreading. For example if you have an infection in the forearm the synovial sheath changing is going to prevent it from spreading to the hand.

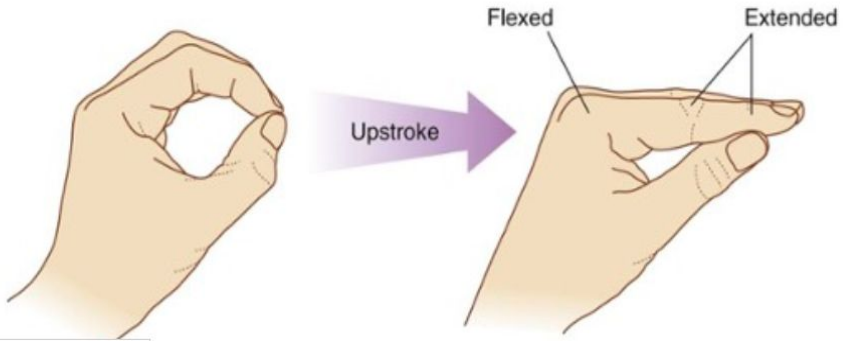
Each finger has a tendon covered by (fibrous flexor sheath) to protect it and between the tendon and the fibrous sheath there are synovial sheaths to reduce friction.

Muscles of the hand

Muscle	Origin	Insertion	Nerve supply	Action	Picture
Lumbricals (4 muscles)	Tendons of flexor digitorum profundus	Extensor expansion of medial four fingers.	Lateral two **1st & 2nd** by 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** **Writing posit**	
Palmar interossei (4 muscles) Note that our axis is the middle finger doesn't have palmar interossei	1st : Base of 1st metacarpal. Other three: Ant. Surface of Shafts of 2nd, 4rd & 5th metacarpals.* (unipennate muscle)	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 (bipennate) 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.	

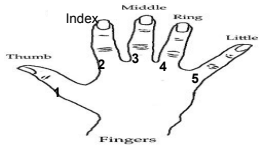
Action of Lumbricals & Interossei



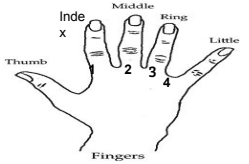


Note: you have to differentiate between numbering according to the metacarpals and numbering the digits

Metacarpals



Digits



Extensor Expansion

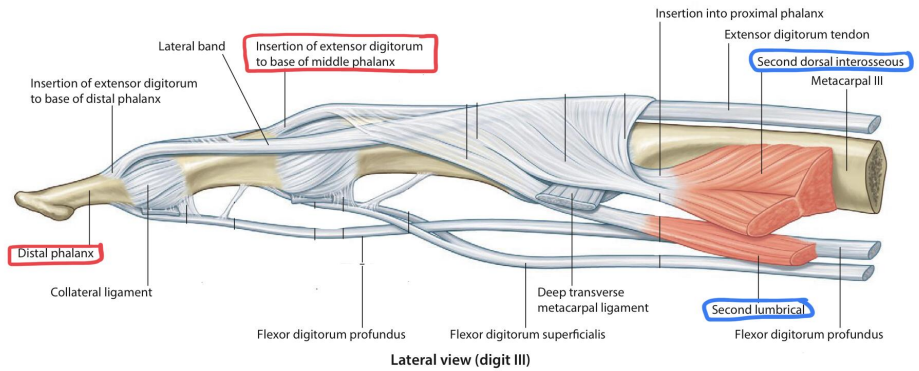
Formed from the expansion of the tendon of the extensor digitorum at the PIJ (proximal interphalangeal joint).

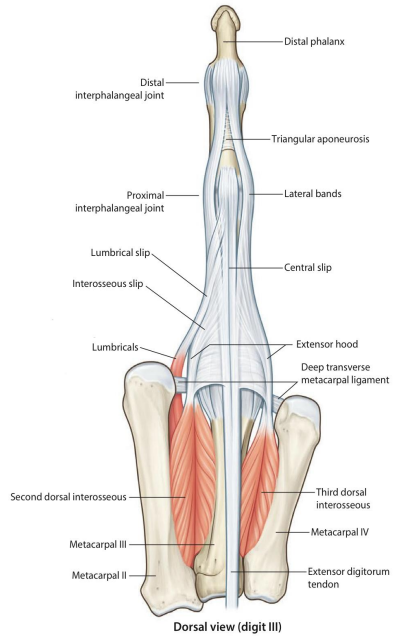
The tendon split into three parts:

- **One Central:** inserted into the base of ***Middle phalanx***.
- **Two laterals:** inserted into the base of the ***Distal phalanx***.

The Expansion Receives the insertions of:

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





MCQs

Question 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

Question 2: 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

Question 3: which end of fibrous flexor sheath is opened ?

A- proximal end

B- distal end

C- none of them

D- both of them

Question 4: 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- minimize friction

D- flexion of the wrist

Question 5: 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

Question 6: 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.

SAQ

Question 1: 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.

Answer: 1) abductor pollicis brevis (abduction)

2) flexor pollicis brevis (flexion)

3) opponens pollicis (opposition)

Question 2 : 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?

Answer : Carpal tunnel syndrome. The median nerve is compressed.

Answers: Q1.D- Q2.C -Q3.A -Q4.C- Q5.B- Q6.B

Team members

Boys team:

- Khalid AL-Dossari
- Naif Al-Dossari
- Faisal Alqifari
- Salman Alagla
- Ziyad Al-jofan
- Suhail Basuhail
- Ali Aldawood
- Khalid Nagshabandi
- Mohammed Al-huqbani
- Jehad Alorainy
- Khalid AlKhani
- Omar Alammari

Girls team :

- Jude Al Khalifah
- Ajeed Al Rashoud
- Taif Alotaibi
- Noura Al Turki
- Amirah Al-Zahrani
- Alhanouf Al-haluli
- Sara Al-Abdulkarem
- Rawan Al Zayed
- Reema Al Masoud
- Renad Al Haqbani
- Nouf Al Humaidhi
- Fay Al Buqami
- Nouf Al Hussaini
- Alwateen Al Balawi
- Rahaf Al Shabri
- Danah Al Halees
- Haifa Al Waily
- Rema Al Mutawa
- Amirah Al Dakhilallah
- Maha Al Nahdi
- Renad Al Mutawa
- Ghaida Al Braithen
- Reham Yousef

Team leaders

Abdulrahman Shadid

Ateen Almutairi

=This lecture done by

Special thank for Anatomy team 436

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Good luck

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