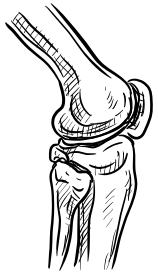
بسم الله الرحمن الرحيم



ANATOMY

FINAL | Lecture 6

The hand

وَإِن تَتَوَلَّوْا يَسْتَبْدِلْ قَوْمًا غَيْرَكُمْ ثُمَّ لَا يَكُونُوا أَمْثَالَكُم

اللهم استعملنا ولا تستبدلنا

Written by: Ghena Nusair
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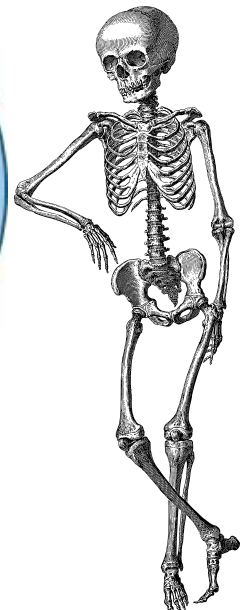


Color Code: Slides + Dr. doesn't mention | Slides + Dr. mentions | Extra from Dr.

عيد مبارك

Take ur كعكة to revise the previous lecture

The Hand

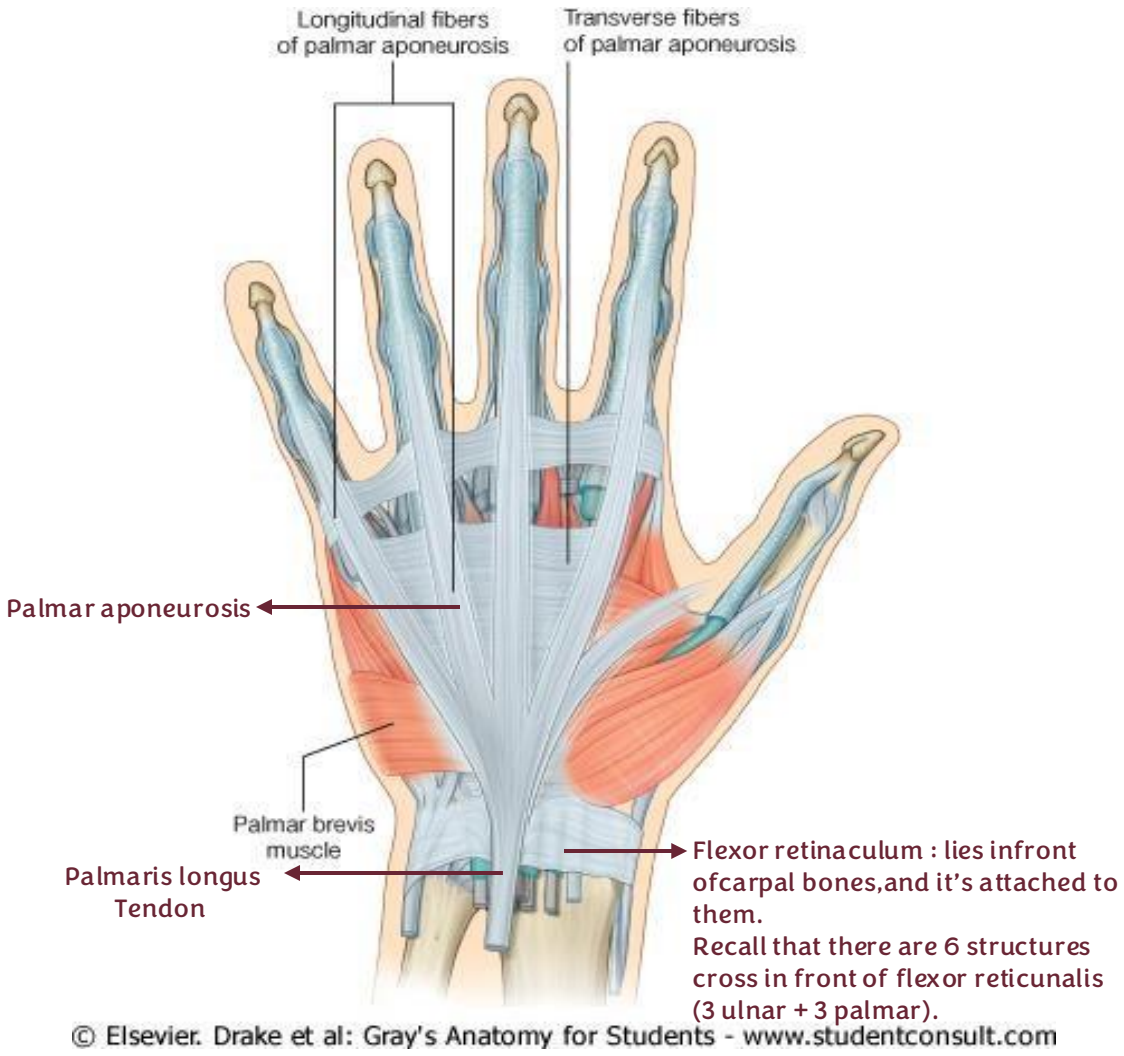
It has 2 surfaces : palmar and dorsal .

Too many slides but DW the lecture is simple
Say bismillah and go ahead

The Palm of the Hand

Deep Fascia

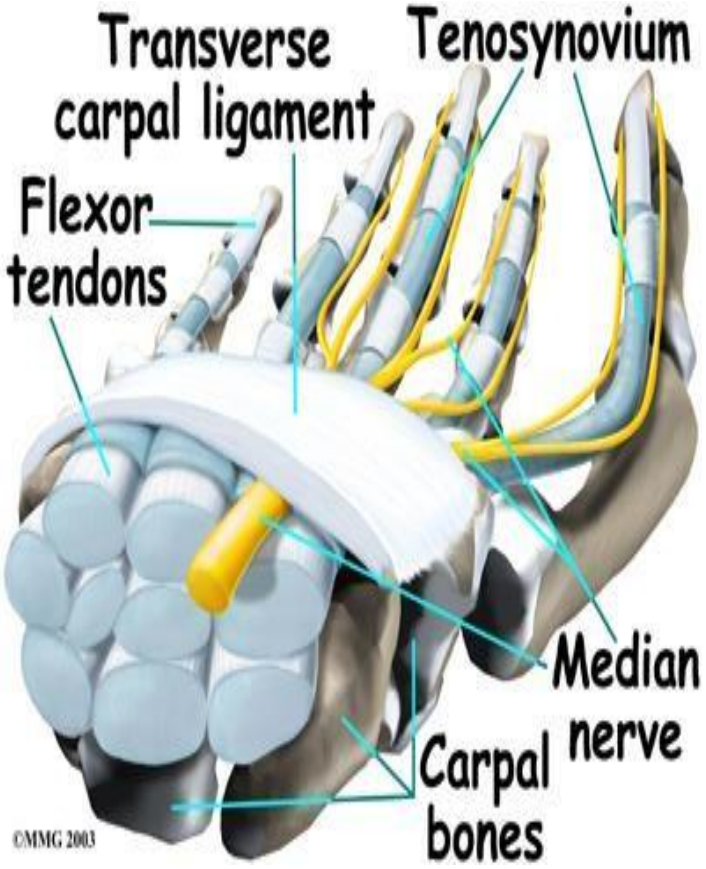
- The deep fascia of the wrist and palm is thickened to form the flexor retinaculum and the palmar aponeurosis.
- The palmar aponeurosis is triangular and occupies the central area of the palm
- The apex of the palmar aponeurosis is attached to the distal border of the flexor retinaculum and receives the insertion of the palmaris longus tendon
- The base of the aponeurosis divides at the bases of the fingers into four slips
- Each slip divides into two bands, one passing superficially to the skin and the other passing deeply to the root of the finger
- each deep band divides into two, which diverge around the flexor tendons and finally fuse with the fibrous flexor sheath and the deep transverse ligaments.
- The medial and lateral borders of the palmar aponeurosis are continuous with the thinner deep fascia covering the hypothenar and thenar muscles
- From each of these borders, fibrous septa pass posteriorly into the palm and take part in the formation of the palmar fascial spaces
- The function of the palmar aponeurosis is to give firm attachment to the overlying skin and so improve the grip and to protect the underlying tendons.



The Carpal Tunnel

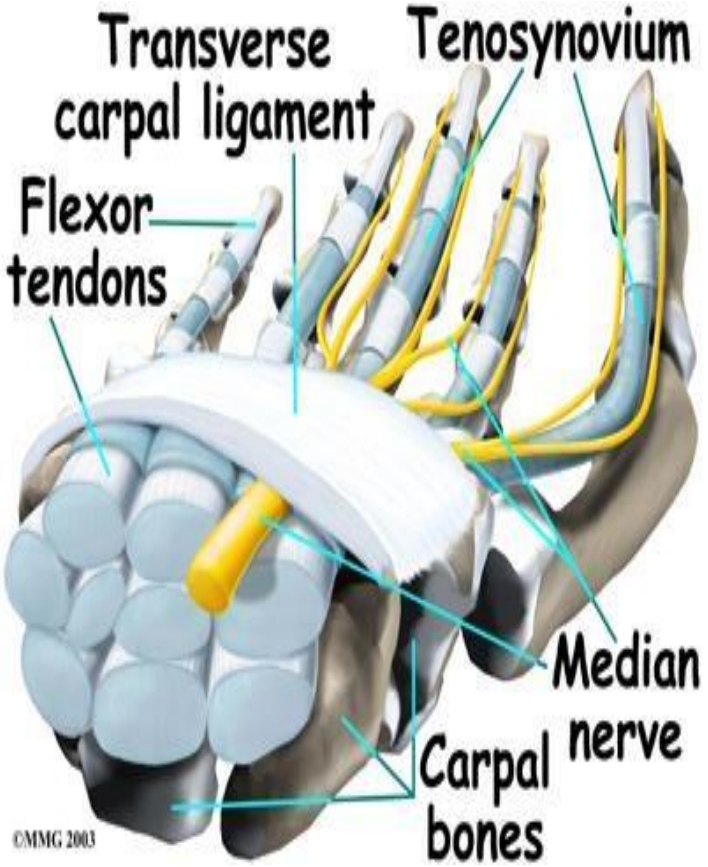
- Lies deep to flexor retinaculum and in front of carpal bones .

- The carpus is deeply concave on its anterior surface and forms a bony gutter. The gutter is converted into a tunnel by the flexor retinaculum
- The long flexor tendons to the fingers and thumb pass through the tunnel and are accompanied by the median nerve
- The four separate tendons of the flexor digitorum superficialis muscle are arranged in anterior and posterior rows, those to the middle and ring fingers lying in front of those to the index and little fingers
- At the lower border of the flexor retinaculum, the four tendons diverge and become arranged on the same plane.

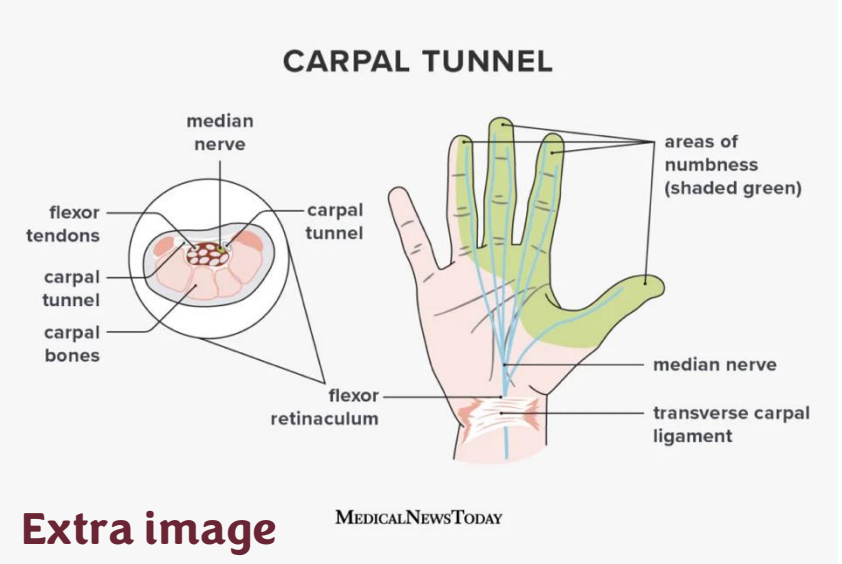


The Carpal Tunnel

- The tendons of the flexor digitorum profundus muscle are on the same plane and lie behind the superficialis tendons.
- All eight tendons of the flexor digitorum superficialis and profundus invaginate a common synovial sheath from the lateral side
- The tendon of the flexor pollicis longus muscle runs through the lateral part of the tunnel in its own synovial sheath
- The median nerve passes beneath the flexor retinaculum in a restricted space between the flexor digitorum superficialis and the flexor carpi radialis muscles



The Carpal Tunnel



Extra image

➢The **median nerve** is surrounded by **10** tendons:

4 flexor digitorum superficialis

4 flexor digitorum profundus

1 flexor pollicis longus

1 flexor carpi radialis

All of them are beneath the flexor retinaculum and compress the median nerve, this may lead to :

➢**carpal tunnel syndrome**: females are more susceptible , as they use their hands more in daily activities (cleaning, cooking).As a result, they may have infection in wrist joint around median nerve or in its wall which leads to swelling due to excess blood supply -> high pressure in the tunnel which **causes**:

1- Atrophy and paralysis in muscles

2- Tingling, numbness and gradual loss of sensation in Skin supplied by median nerve because of the high pressure.

➢ **Treatment**: decompression.

Anatomical snuffbox

Know the contents ,boundaries, roof, floor.

- The 'anatomical snuffbox' is a term given to the triangular depression formed on the posterolateral side of the wrist and metacarpal I by the extensor tendons passing into the thumb
- The base of the triangle is at the wrist and the apex is directed into the thumb. The impression is most apparent when the thumb is extended:
- the lateral border is formed by the tendons of the abductor pollicis longus and extensor pollicis brevis
- the medial border is formed by the tendon of the extensor pollicis longus;
- the floor of the impression is formed by the scaphoid and trapezium, and distal ends of the tendons of the extensor carpi radialis longus and extensor carpi radialis brevis.

Contents:

- The radial artery* passes obliquely through the anatomical snuffbox, deep to the extensor tendons of the thumb and lies adjacent to the scaphoid and trapezium.

Roof : 1 vein + 1 nerve

- Terminal parts of the superficial branch of the radial nerve (sensory innervation of lateral 2/3 of the dorsum of the hand) pass subcutaneously over the snuffbox as does the origin of the cephalic vein from the dorsal venous arch of the hand.

Extra image

- *Recall: the **radial artery** descends over the radius to the lower 7 cm (site of pulse detection) , then at the level of styloid process it winds to snuff box dorsally then it turns to the palm and pass between the two heads of adductor pollicis and forms the deep palmar arch.

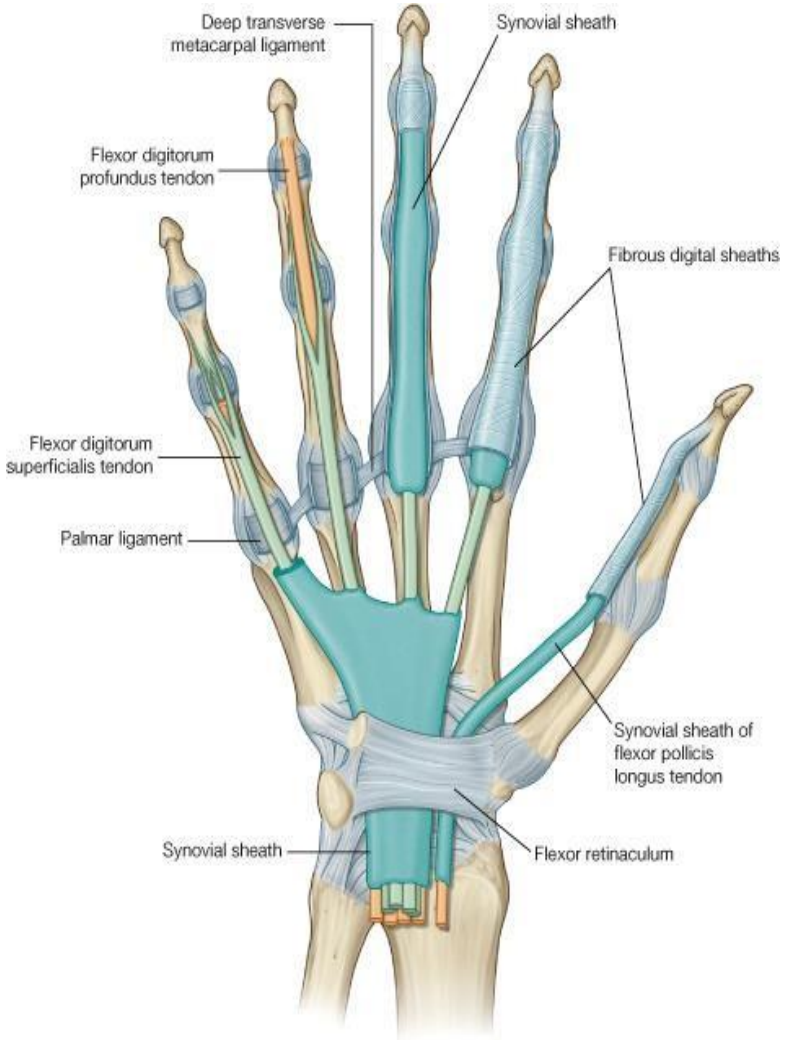
Fibrous Flexor Sheaths

1- Encloses long tendons.
2- lies in front of digits on a synovial sheath.

- The anterior surface of each finger, from the head of the metacarpal to the base of the distal phalanx, is provided with a strong fibrous sheath that is attached to the sides of the phalanges
- The proximal end of the fibrous sheath is open, whereas the distal end of the sheath is closed and is attached to the base of the distal phalanx
- The sheath and the bones form a blind tunnel in which the flexor tendons of the finger lie.
- In the thumb, the osteofibrous tunnel contains the tendon of the flexor pollicis longus
- In the case of the four medial fingers, the tunnel is occupied by the tendons of the flexor digitorum superficialis and profundus
- The fibrous sheath is thick over the phalanges but thin and lax over the joints.

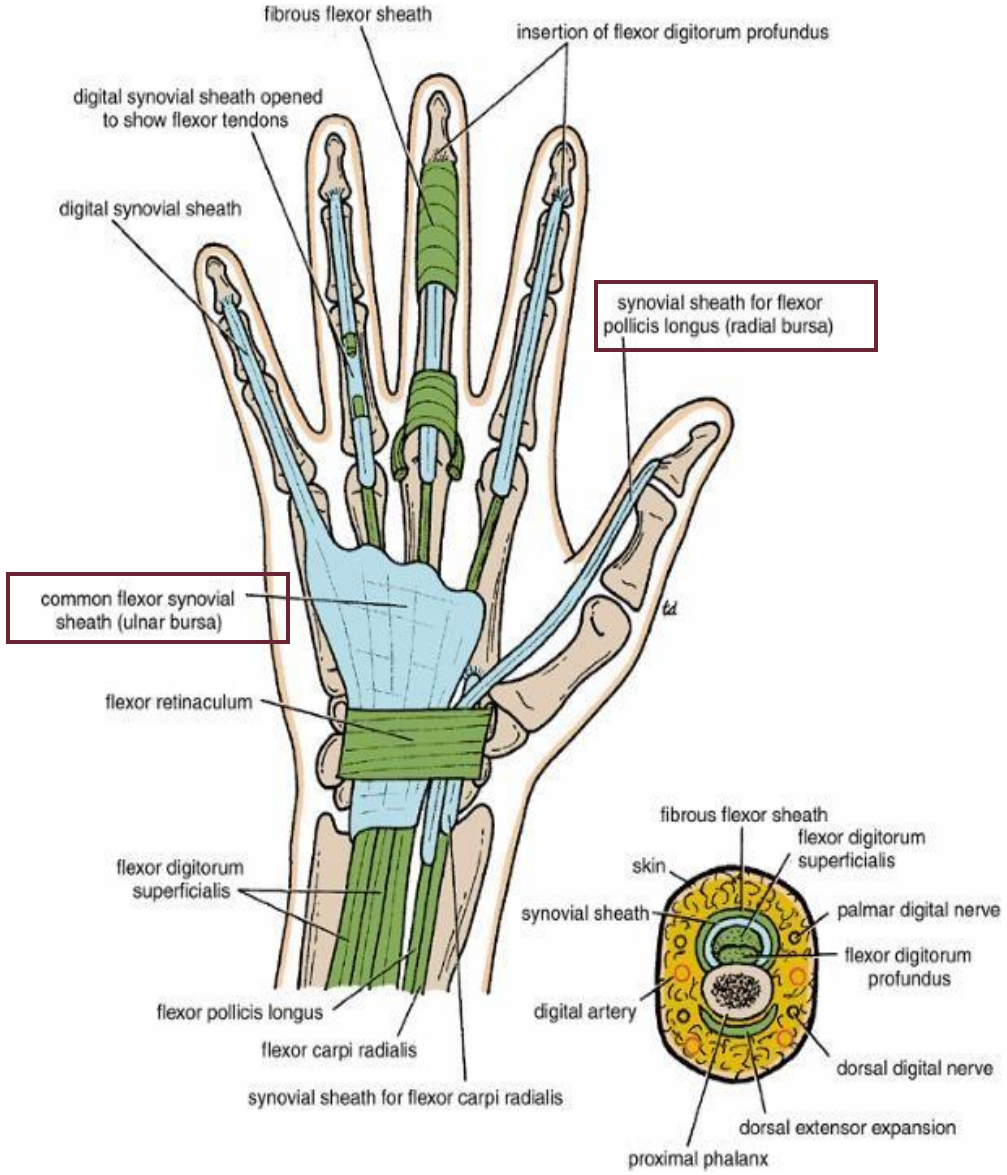
➢ **Significance** : protects long tendons

➢ In the **dorsal** side of hand there is an **extensor** fibrous sheath.



Synovial Flexor Sheaths

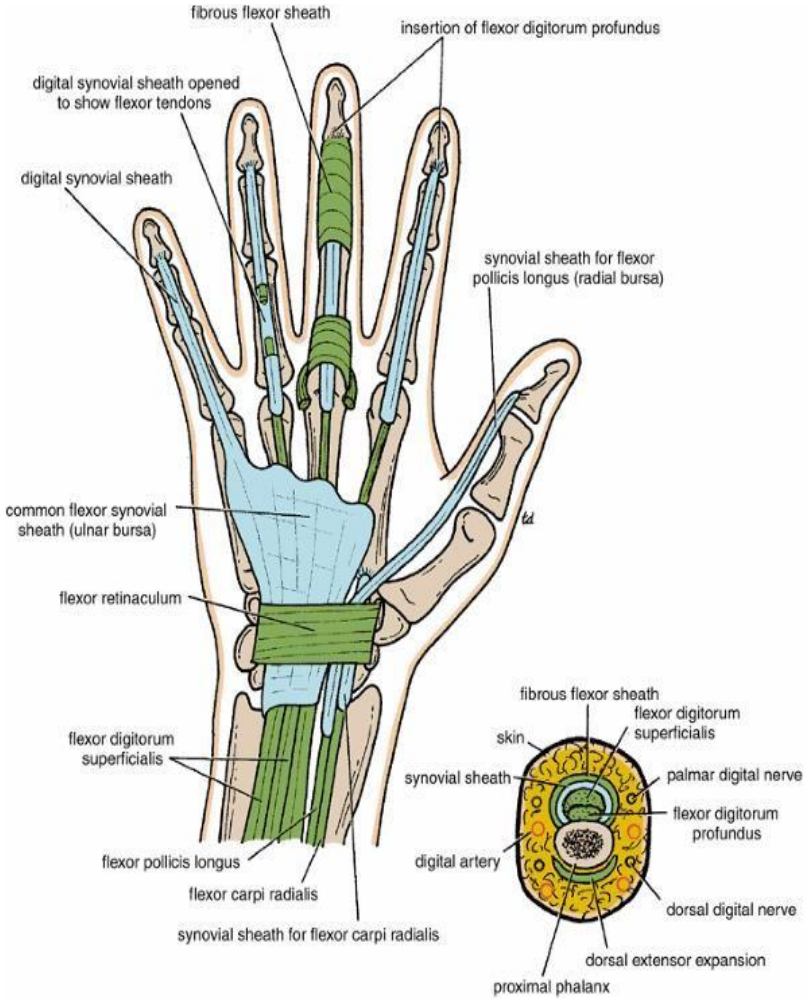
- the tendons of the flexor digitorum superficialis and profundus muscles invaginate a common synovial sheath from the lateral side
- The medial part of this common sheath extends distally without interruption on the tendons of the little finger
- The lateral part of the sheath stops abruptly on the middle of the palm, and the distal ends of the long flexor tendons of the index, the middle, and the ring fingers acquire digital synovial sheaths as they enter the fingers
- The flexor pollicis longus tendon has its own synovial sheath that passes into the thumb
- These sheaths allow the long tendons to move smoothly, with a minimum of friction, beneath the flexor retinaculum and the fibrous flexor sheaths.
- The synovial sheath of the flexor pollicis longus (sometimes referred to as the radial bursa) communicates with the common synovial sheath of the superficialis and profundus tendons (sometimes referred to as the ulnar bursa) at the level of the wrist in about 50% of subjects
- The vincula longa and brevia are small vascular folds of synovial membrane that connect the tendons to the anterior surface of the phalanges and convey blood vessels to the tendons.



Go to the next silde for explanation...

Synovial Flexor Sheaths

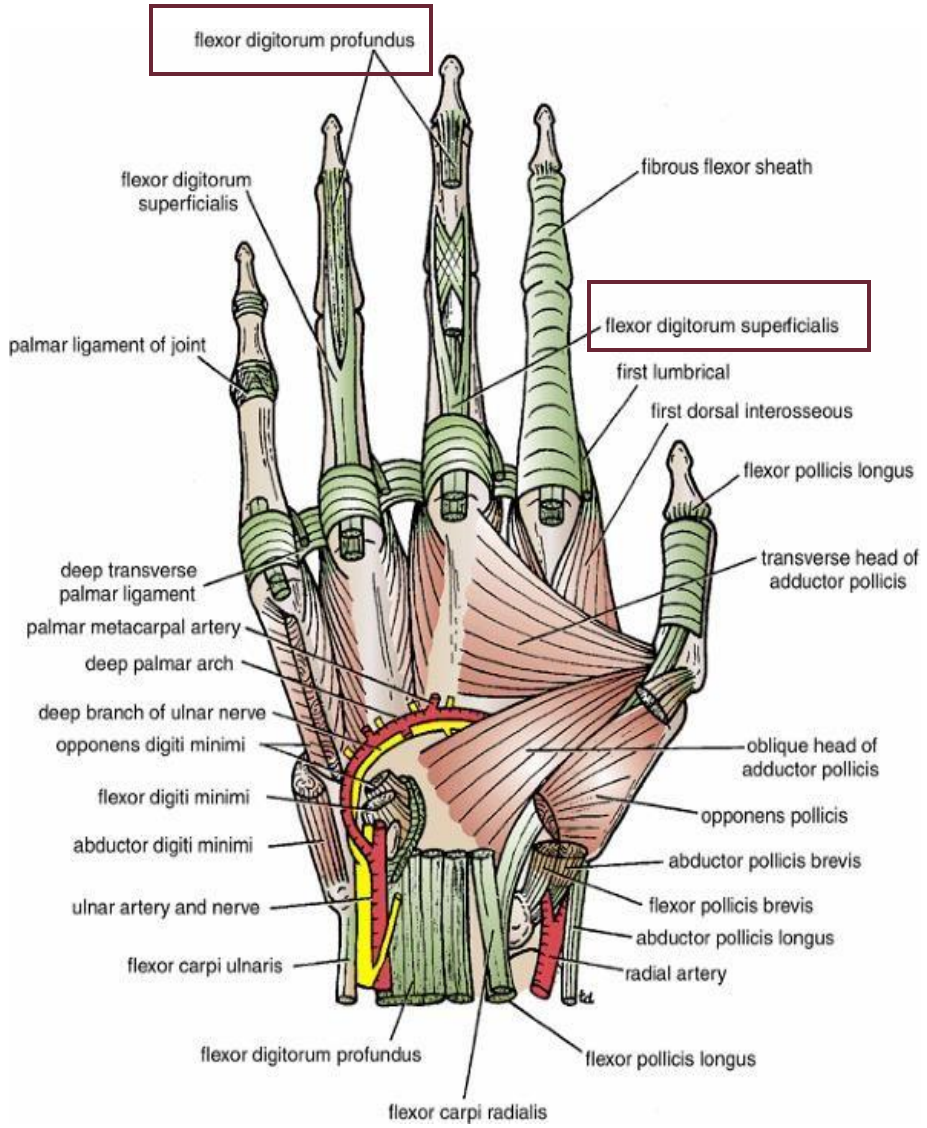
- Beneath the fibrous sheath
- Secrete **synovial fluid** that lubricate tendons to facilitate movement
- It is called **bursa**, and the bursa has two types :
  - **Ulnar bursa** : surrounding the **medial four fingers** but at the level of the middle palm it only extend to the tip of **little finger** (continuous with little finger), the rest 3 fingers have a separate synovial sheath.
  - **Radial bursa** :surrounding the **flexor pollicis longus** , it starts before the tip of the wrist joint and continues till the tip of thumb .
- The **significance** of the discontinuity is **limiting** the spread of infection so it remains localized.
- Clinical hint :If there is an abscess in the finger , radial (longitudinal) incision is performed (not transverse) in order to avoid accidental tendon cut.



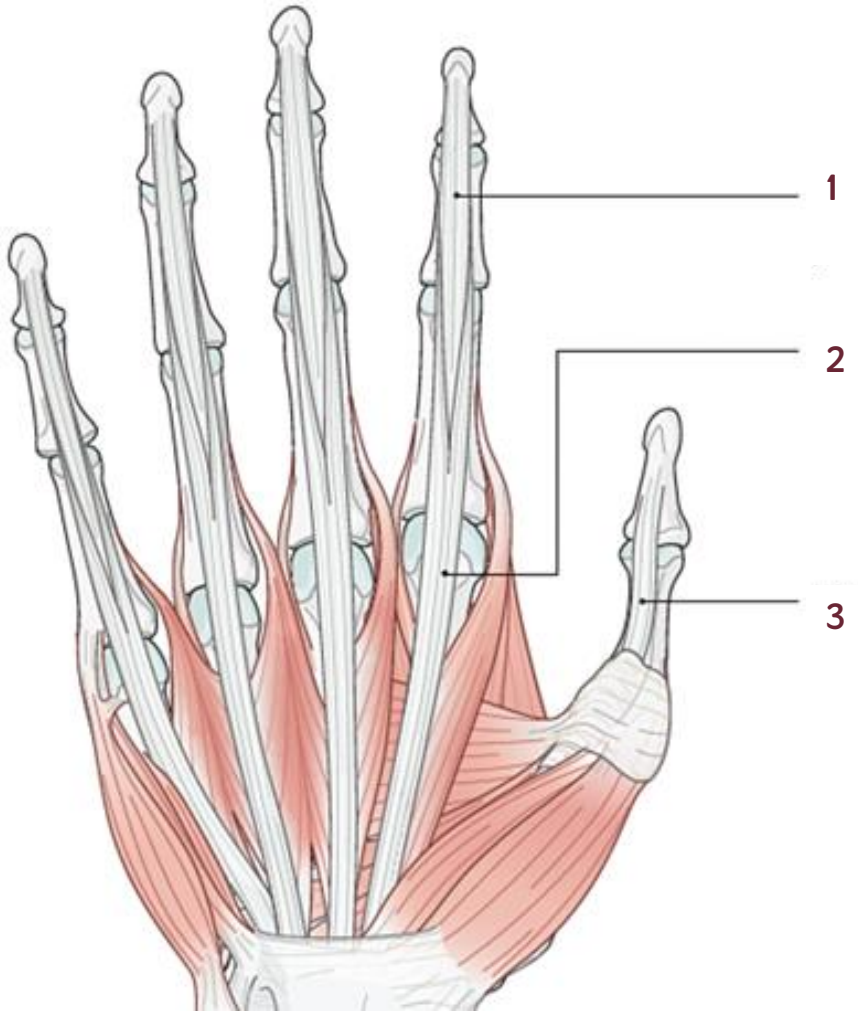
(فَنَادَى فِي الظُّلُمَاتِ أَنْ لا إِلَهَ إِلَّا أَنْتَ سُبْحَانَكَ إِنِّي كُنتُ مِنَ الظَّالِمِينَ فَاسْتَجَبْنَا لَهُ وَنَجَّيْنَاهُ مِنَ الْغَمِّ وَكَذَلِكَ نُنْجِي الْمُؤْمِنِينَ).

Insertion of the Long Flexor Tendons

- Each tendon of the flexor digitorum superficialis enters the fibrous flexor sheath
- opposite the proximal phalanx it divides into two halves, which pass around the profundus tendon and meet on its deep or posterior surface, where partial decussation of the fibers takes place
- The superficialis tendon, having united again, divides almost at once into two further slips (on the right and left) , which are attached to the borders of the middle phalanx.
- Each tendon of the flexor digitorum profundus, having passed through the division of the superficialis tendon, continues downward, to be inserted into the anterior surface of the base of the distal phalanx



Can you tell which tendon is to which muscle?



Key

- MCP= metacarpophalangial joints
- CMC= carbametacarpal joints
- PIP= proximal inter-phalangial joint
- DIP= Distal interphalangial joint
- ABD= Abduction
- ADD= Adduction

Small Muscles of the Hand

19 – 20 muscles
"palmaris brevis" would sometimes be missing

The small muscles of the hand include the:

- the eight interossei muscles,
- four lumbrical muscles,
- the short muscles of the thumb
- and the short muscles of the little finger

Small Muscles of the Hand

- The small muscles of the hand include the:
- **the eight interossei muscles,**

•They're divided into 4 palmer and 4 dorsal.
•They originate from the metacarpal bones
•They're innervated by **Ulnar nerve**.
•Palmar interossei -> **aDduction**.
•Dorsal interossei -> **aBduction**.

Palmar Interossei

- O
  - 1st – ulnar side base of 1st metacarpal bone
  - 2nd – ulnar side of 2nd MC bone
  - 3rd – radial side of 4th MC bone
  - 4th – radia side of 5th MC bone
- I Dorsal digital expansion
  - Extensor expansion of 2,4 and 5th digits
    -> being inserted on the dorsal surface helps in the writing position.
- N
  - Ulnar
- F
  - ADD of 1st, 2nd, 4th and 5th digits toward midline of hand

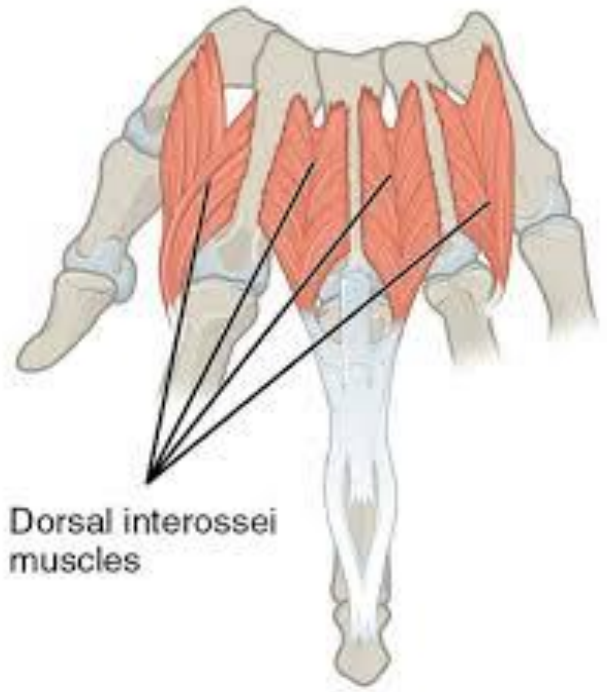
خلف خلاف

Lateral fingers originate from the ulnar side
Medial two fingers from the radial side
Middle finger doesn't have a muscle because the fingers adduct **towards it.**

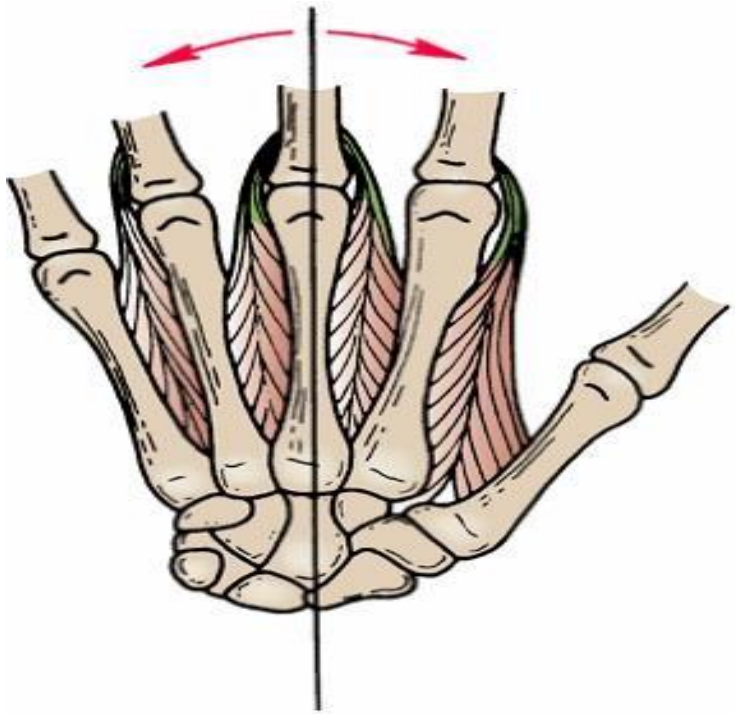
Dorsal Interossei

- O from adjacent metacarpal bones
  - 1st lateral head – ulnar side of 1st metacarpal bone
  - 1st medial head – radial side of 2nd metacarpal bone
  - 2nd, 3rd, 4th space between metacarpal bone
- I Dorsal digital expansion
  - 1st – radial side 2nd proximal phalanx
  - 2nd – radial side of 3rd
  - 3rd – ilnar side of 3rd
  - 4th – ulnar side of 4th
- N
  - Ulnar
- F

  ABD of 2nd, 3rd, and 5th finger **from midline**

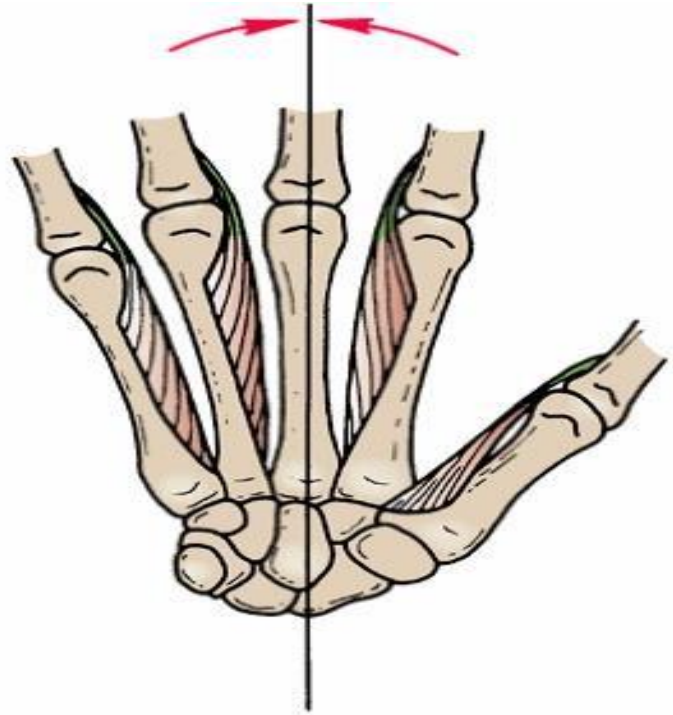


Abduction

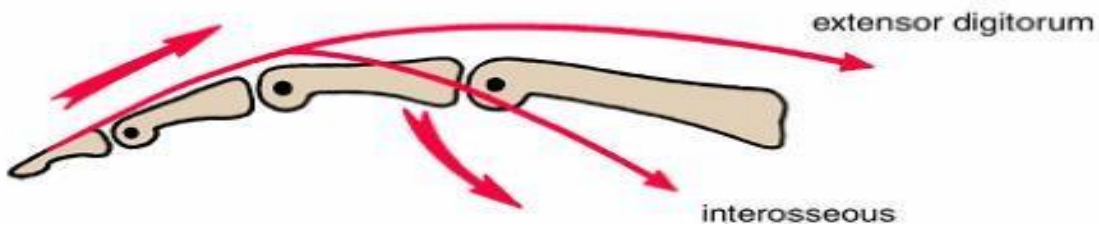


dorsal interossei

Adduction



palmar interossei

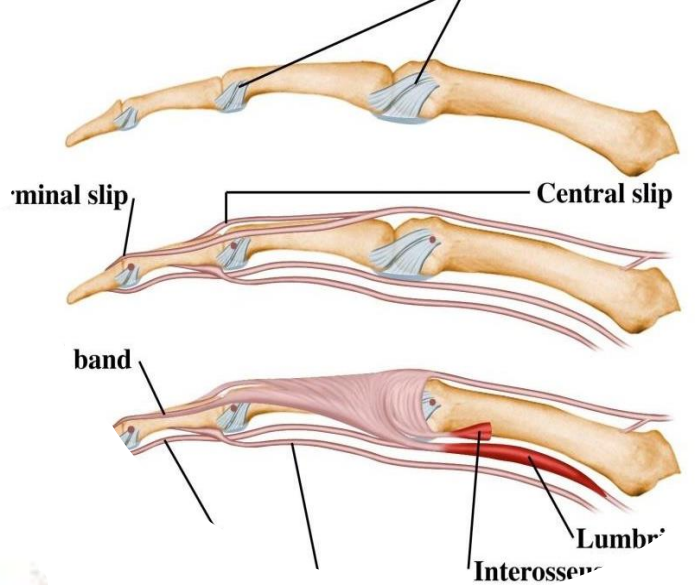


Lumbricales

- O
  - Tendons of FDP from the lateral side
- I
  - Extensor expansion on dorsal aspect of each digits radial side
- N Counting starts from **Lateral to Medial**
  - 1 and 2 – median
  - 3 and 4 – ulnar

(remember lateral side median, ulnar/medial side ulnar nerve)

- F They are important in the **writing position*** (next slide)
  - MCP flexion 2-5 digits
  - DIP & PIP ext 2-5 digits



- **Writing position ***
- Let us break down that position; *for the 4 fingers*-> lumbricalis muscles ->

1. **flexion** for MCP joint 2. **extension** for the IPJ

- *For the thumb* (3 actions 4 muscles): 1. **adduction**-> adductor pollicis.

2. **extension**-> extensor pollicis longus and brevis. 3. **rotation**/opposition-> opponens pollicis.

- **Nerve injury!!!**

Ulnar nerve-> claw hand (opposite of writing position)

Describe the action of lumbrical muscles in case of nerve injury.

Critical thinking! Would all fingers be similarly affected?

Of course not, the lateral 2 lumbricals are supplied by median nerve so they will be mildly affected.

Palmaris Brevis

Sometimes absent

- O
  - Flexor retinaculum
- I
  - Palmar surface skin on ulnar side of hand
- N
  - Ulnar
- F
  - Wrinkles skin of hand on ulnar side

TABLE 11–3 LUMBRICALS AND INTEROSSEI

Muscle	Origin	Insertion	Innervation	Action
Lumbricals 1 & 2	Lateral two flexor profundus tendons	Lateral sides of extensor expansions of fingers 2–5	Digital branches of median	Extend middle & distal phalanges
Lumbricals 3 & 4	Medial three flexor profundus tendons (two heads each)			
Palmar interossei 1–4	Shafts of metacarpals 1, 2, 4, & 5	Extensor expansions of fingers 1, 2, 4, & 5	Deep branch of ulnar	Flex proximal phalanges & adduct fingers
Dorsal interossei 1–4	Sides of metacarpals 1–5 (two heads each)	Extensor expansions & proximal phalanges of fingers 2-4		Flex proximal phalanges & abduct fingers

Small Muscles of the Hand

All For One And (thumb)
One For All (little finger)

- the short muscles of the **thumb**

5 called **thenar muscles** supplied by **median nerve**

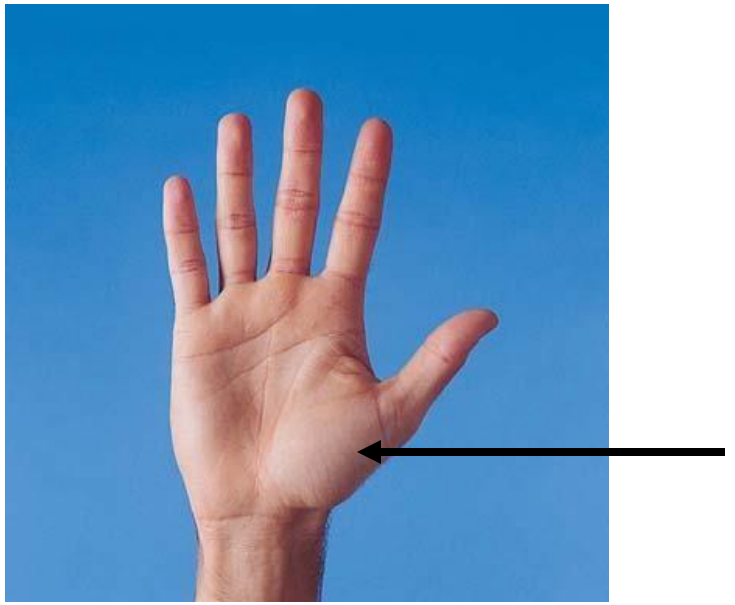
- All -> Abductor pollicis brevis. (**abduction**)
- For -> Flexor pollicis brevis. (**flexion**)
- One -> Opponens pollicis. (**counting;** movement of the thumb against the other fingers)
- And (+1) -> Adductor pollicis. (adductor)

- We say they are 3+1 "(why??) because the adductor is innervated by the **ulnar nerve.**
- Nerve injury!!! if the median nerve is injured 3 muscles (All For One) would atrophy except for 1 (And)

•The short muscles of the thumb are the abductor pollicis brevis, the flexor pollicis brevis, the opponens pollicis, and the adductor pollicis

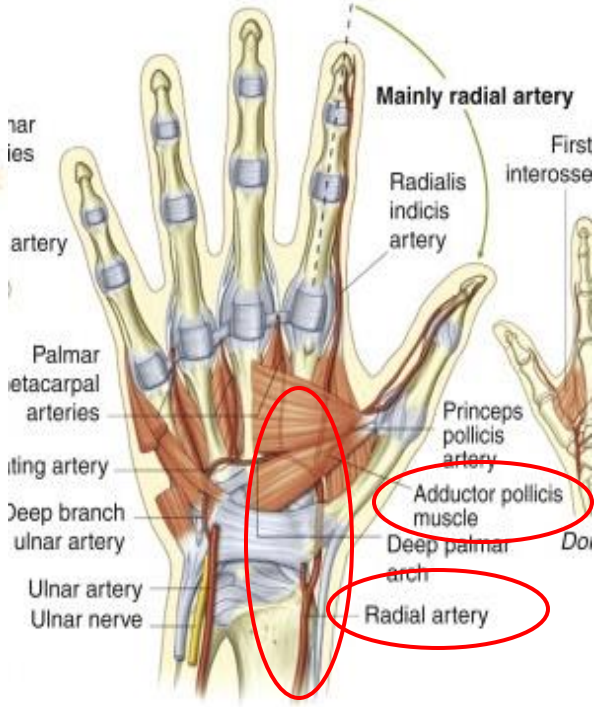
•The first three of these muscles form the **thenar eminence**.

Thenar Eminance



Adductor Pollicis

- O
  - Oblique Head
    - Capitate bone (**carpal bones**)
    - Bases of 2-3 metacarpals
  - Transverse (**horizontal**) Head
    - Proximal 2/3 of palmar surface of 3rd metacarpal (**shaft of metacarpal**)
- I
  - Ulnar side of base of 1st proximal phalanx
- N
  - Ulnar
- F
  - CMC ADD of thumb



radial artery would pass between the two heads of the muscle forming the deep palmer arch.

Abductor Pollicis Brevis

- O (carpal bones)
  - Scaphoid tuberosity
  - Trapezium ridge
  - trapezoid
  - Transverse carpal ligament
- I
  - Lateral base of proximal 1st phalanx
- N
  - Median
- F
  - CMC & MCP ABD of thumb

Flexor Pollicis Brevis

- O
  - Superficial head – trapezium
  - Deep head – trapezoid, capitate and palmar ligaments of distal carpal bones

  the Dr said it's not important to know which is superficial and deep
- I
  - Base of proximal 1st phalanx on radial side (Dr said Ulnar side)
  - Extensor expansion
- N
  - Superficial – median
  - Deep – Ulnar
- F
  - CMC & MCP Flexion of thumb

Opponens Pollicis

- O
  - Trapezium
  - Transverse Carpal Ligament
- I

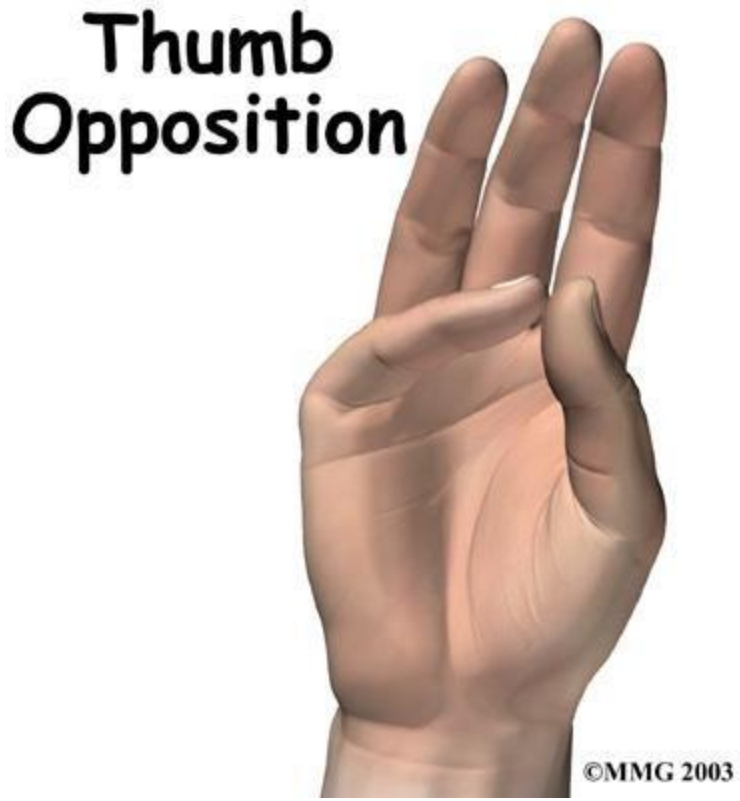
  Radial side of 1st metacarpal shaft.

- N
  - Median
- F
  - Opposition

Point the similarities and differences between the muscles of the thumb.

Opposition of the Thumb

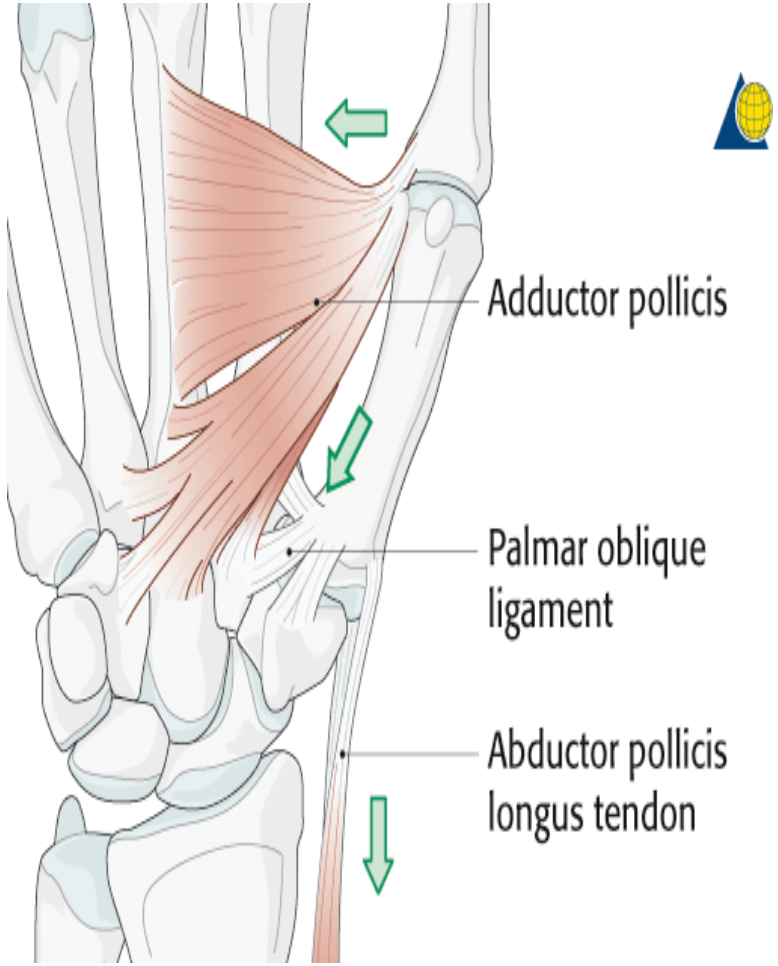
- the opponens pollicis muscle pulls the thumb medially and forward across the palm
- so that the palmar surface of the tip of the thumb may come into contact with the palmar surface of the tips of the other fingers
- It is an important muscle and enables the thumb to form one claw in the pincerlike action used for picking up objects (forming an O)
- This complex movement involves a flexion of the carpometacarpal and metacarpophalangeal joints and a small amount of abduction and medial rotation of the metacarpal bone at the carpometacarpal joint



Surgical relevance!
In case of injury to one of the muscles of the thumb's tendons, it will be replaced by another tendon from one of the other fingers because the thumb's movement is highly important.

Abduction and Adduction of the Thumb

- Abduction of the thumb may be defined as a movement forward of the thumb in the anteroposterior plane
- It takes place at the carpometacarpal joint and the metacarpophalangeal joint.
- Adduction can be defined as a movement backward of the abducted thumb in the anteroposterior plane
- It restores the thumb to its anatomic position, which is flush with the palm.
- The adductor pollicis is the muscle that, in association with the flexor pollicis longus and the opponens pollicis muscles, is largely responsible for the power of the pincers grip of the thumb.
- Adduction of the thumb occurs at the carpometacarpal and at the metacarpophalangeal joint.



Dr didn't mention details here but u should understand the movements of the thumb

Short Muscles of the **Little Finger**

All For One And (thumb)
One For All (little finger)

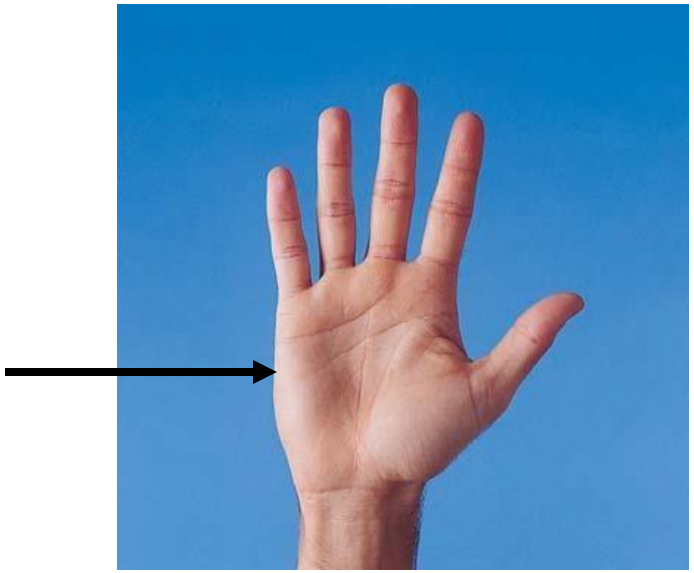
They are called **hypothenar muscles.**

- One -> Opponens digiti minimi
- For -> Flexor digiti minimi
- All -> Abductor digiti minimi

- The short muscles of the little finger are the Abductor digiti minimi, the flexor digiti minimi brevis, and the opponens digiti minimi, which together form the **hypothenar eminence**
- The opponens digiti minimi muscle is only capable of rotating the fifth metacarpal bone to a slight degree
- However, it assists the flexor digiti minimi in flexing the carpometacarpal joint of the little finger
- thereby pulling the fifth metacarpal bone forward and cupping the palm.

Intrinsic Hand Muscles

Hypothenar Eminence



Abductor Digiti Minimi

- O
  - Pisiform
    Medial carbal bone + hook of hamate
- I
  - Ulnar side base of 5th proximal phalanx
- N
  - Ulnar
- F
  - MCP ABD of 5th digit

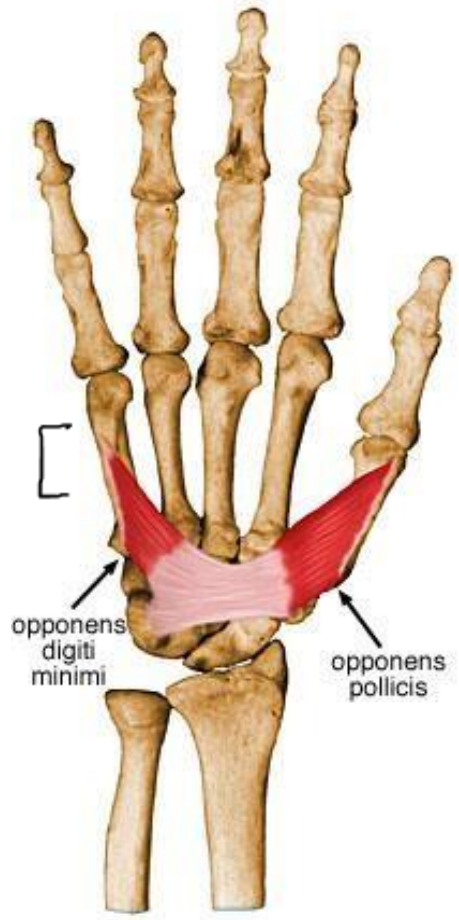
deep muscle called the Opponens Digiti Minimi located between them

Opponen Digiti Minimi

- O
  - Hook of hamate
  - Transverse carpal ligament
- I
  - Ulnar border of entire 5th metacarpal bone
- N
  - Ulnar
- F
  - MCP flexion & rotation of 5th digit

Shaft of 5th metacarpal

opponens



Flexor Digiti Minimi

- O
  - Hamate bone
  - Transverse carpal ligament
- I Medial
  - Ulnar side of proximal 5th phalanx
- N
  - Ulnar
- F
  - MCP Flexion of 5th digit

Dr said most imp thing of those muscles is innervation and function

Fascial Spaces of the Palm

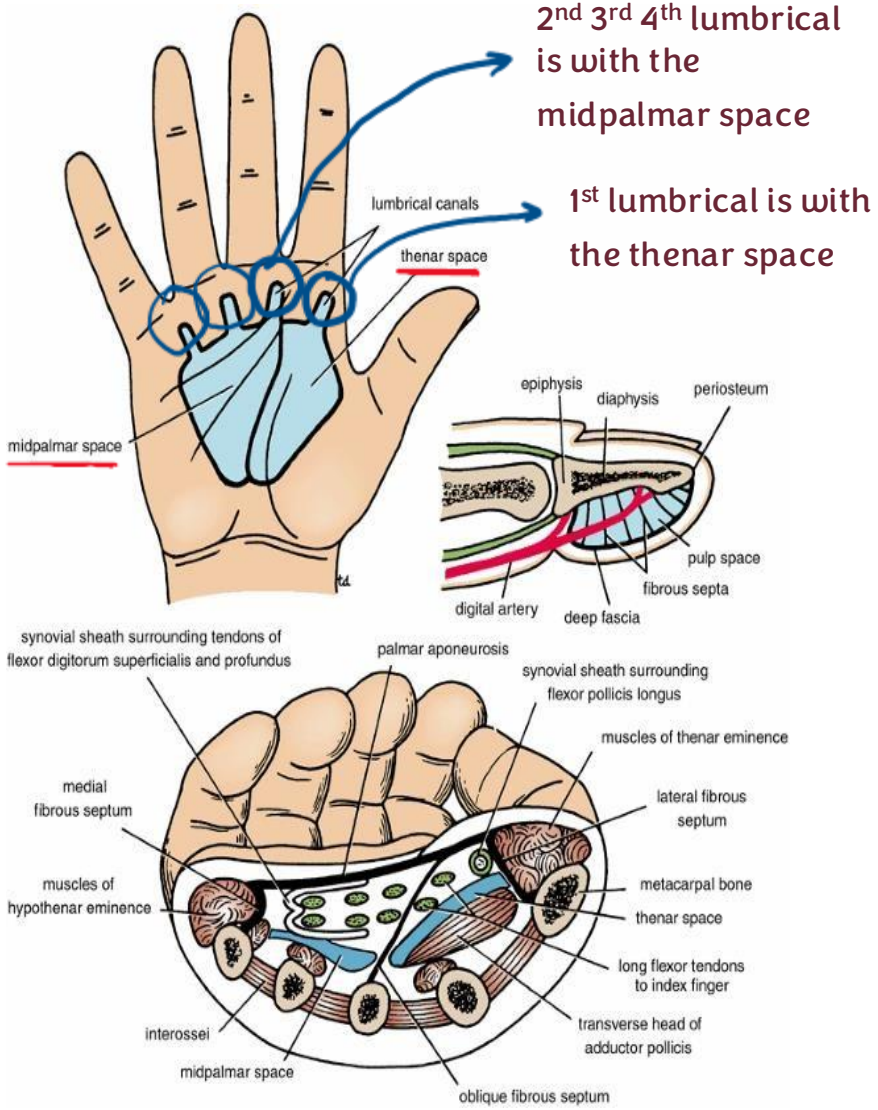
- The thenar space contains the first lumbrical muscle and lies posterior to the long flexor tendons to the index finger and in front of the adductor pollicis muscle

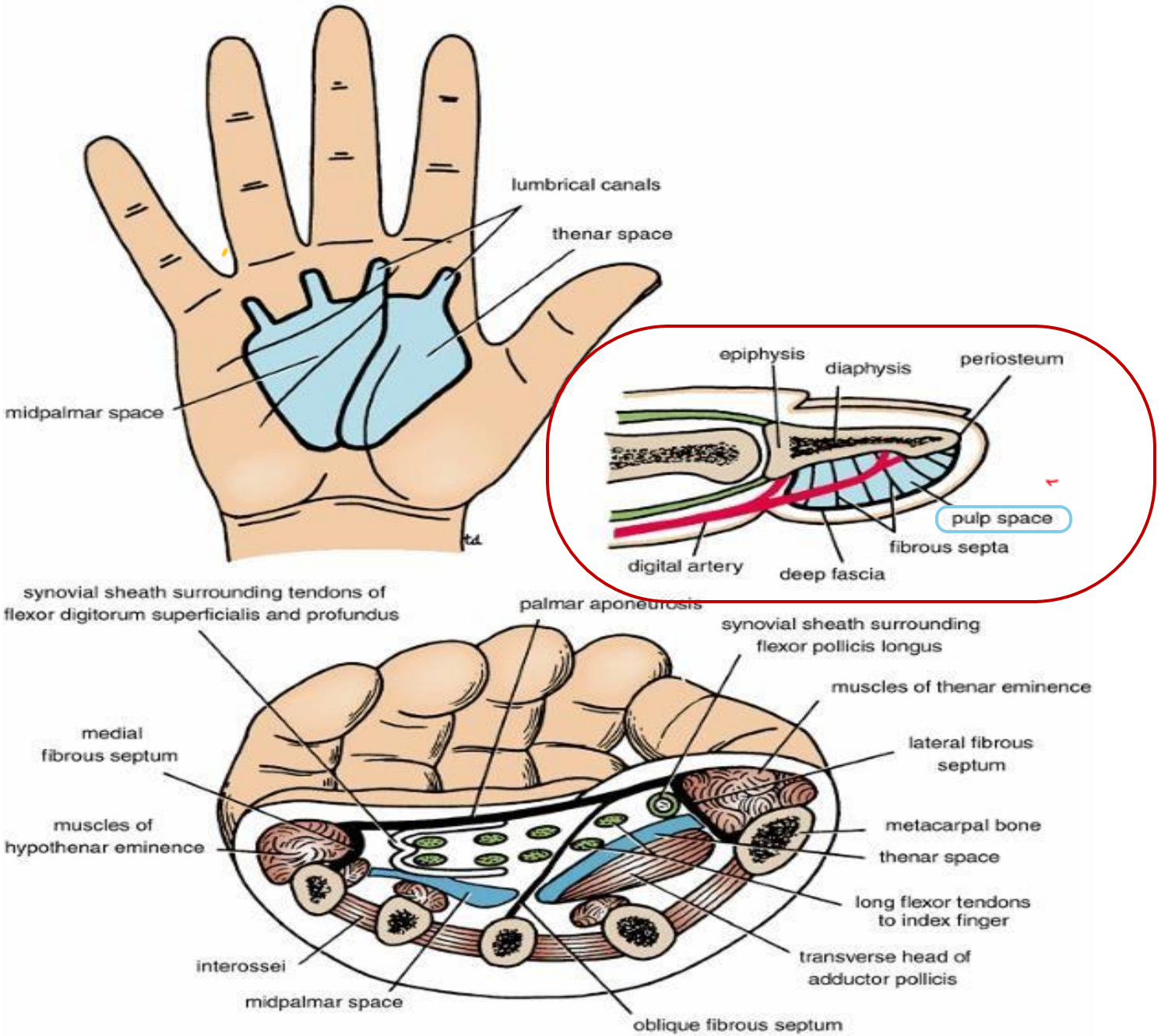
- The midpalmar space contains the second, third, and fourth lumbrical muscles and lies posterior to the long flexor tendons to the middle, ring, and little fingers

- The lumbrical canal is a potential space surrounding the tendon of each lumbrical muscle and is normally filled with connective tissue

These spaces are important for keeping infections localized, preventing them from spreading to other spaces.

(also here) The incision is radial





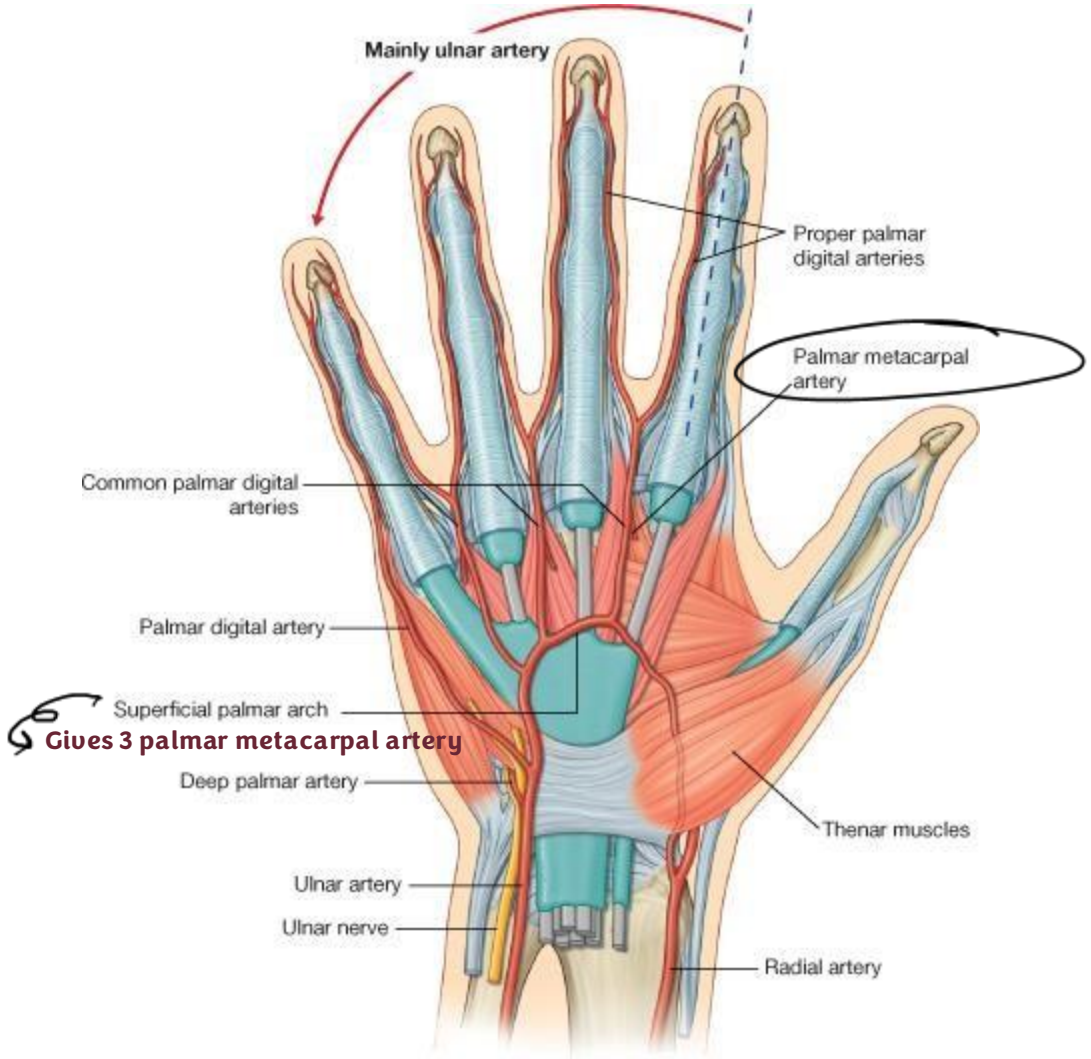
The pulp of the fingers, especially the distal part, is a **common site for infection**, particularly in the nail bed, especially when a person tries to remove part of the nail.

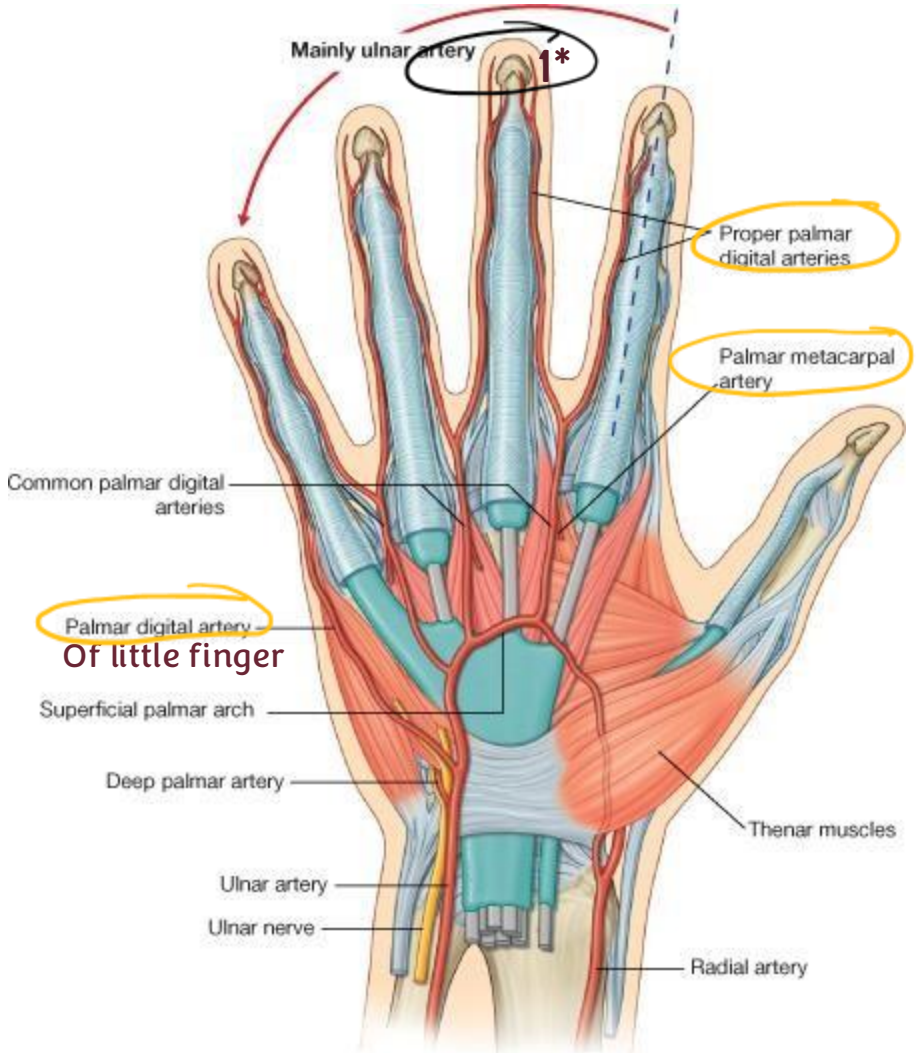
Even if the infection remains localized, performing an **incision** and evacuation can lead to **recurrence and spreading** to other spaces. This occurs because the pulp contains **multiple closely connected spaces**, so when an incision is made, the infection may spread further, leading to recurrent infections

Arteries of the Palm

Ulnar artery forms **superficial palmar arch** continued by a **branch from radial artery**
Radial forms **deep palmar arch** continued by a **branch from ulnar artery**

- Ulnar Artery
- The ulnar artery enters the hand anterior to the flexor retinaculum on the lateral side of the ulnar nerve and the pisiform bone
- The artery gives off a deep branch and then continues into the palm as the superficial palmar arch.
- The superficial palmar arch is a direct continuation of the ulnar artery
- On entering the palm, it curves laterally behind the palmar aponeurosis and in front of the long flexor tendons
- The arch is completed on the lateral side by one of the branches of the radial artery
- The curve of the arch lies across the palm, level with the distal border of the fully extended thumb
- The deep branch of the ulnar artery arises in front of the flexor retinaculum, passes between the abductor digiti minimi and the flexor digiti minimi
- joins the radial artery to complete the deep palmar arch





Anastomosis may occur between the two ends of digital arteries. When we sense the pulsation of the radial artery using three fingers, we do so because the **fingertips have no pulsation themselves**, allowing us to feel the **radial artery's pulse**. However, this does **not** apply to the **thumb**, because in the thumb, there is a **connection of arteries**. So, if you use your thumb to check the pulse, you will sense the **pulsation of your thumb's own arteries** rather than the radial artery.

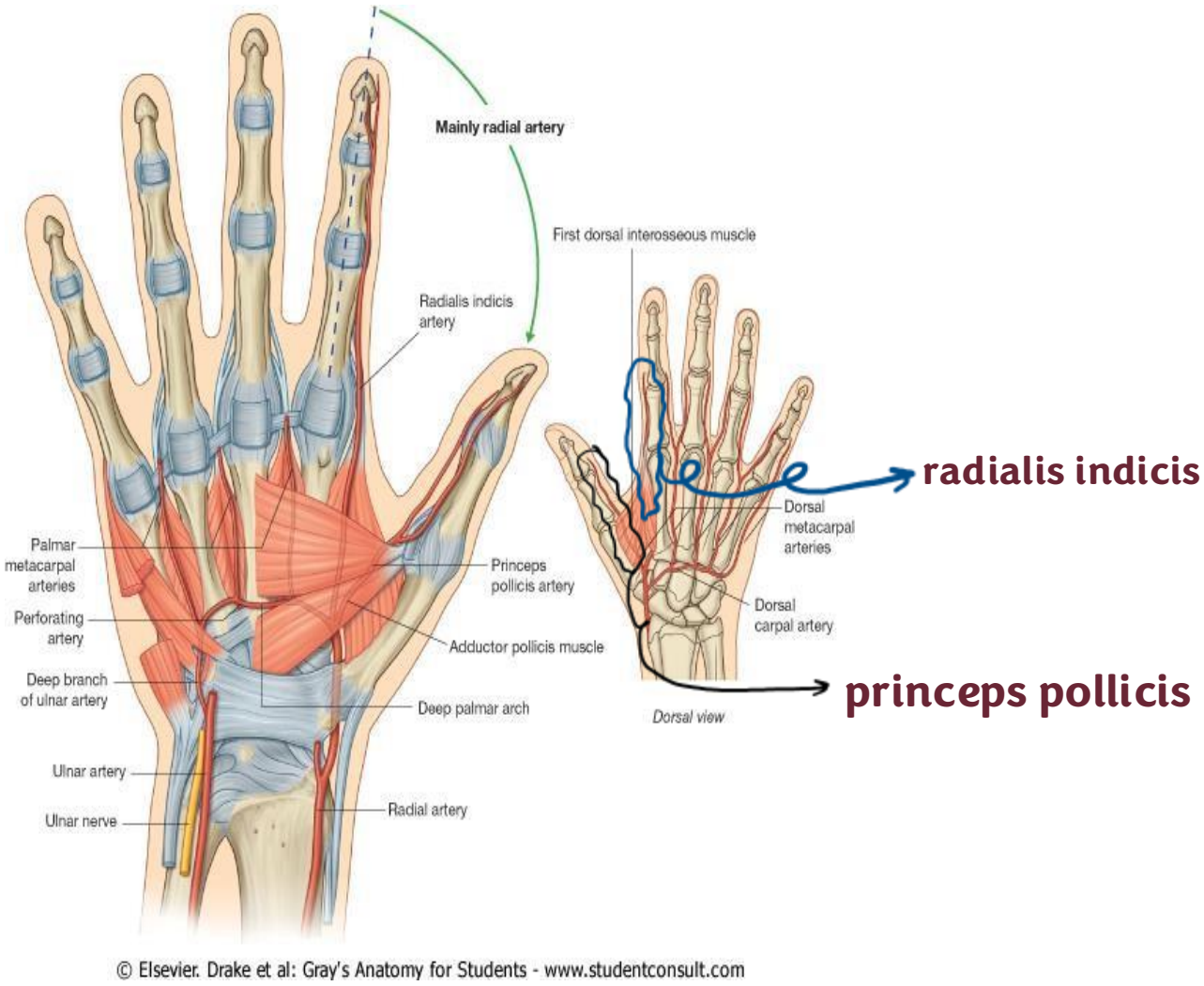
The **palmar metacarpal arteries** give rise to the **digital arteries**, supplying the fingers. Each finger has **two** digital arteries, one on each side. However, the **index finger** has only **one proper palmar digital artery** on one side, while the **little finger** receives one of its branches from the **ulnar** artery instead of the palmar metacarpal artery.

The **thumb and the lateral side of the index** finger receive their arterial supply from the **radial artery**:

- The thumb is supplied by the princeps pollicis artery.
- The lateral side of the index finger is supplied by the radialis indicis artery

- Radial Artery
- On entering the palm, it curves medially between the oblique and transverse heads of the adductor pollicis and continues as the deep palmar arch
- The deep palmar arch is a direct continuation of the radial artery
- It curves medially beneath the long flexor tendons and in front of the metacarpal bones and the interosseous muscles
- The arch is completed on the medial side by the deep branch of the ulnar artery
- The curve of the arch lies at a level with the proximal border of the extended thumb.
- The deep palmar arch sends branches superiorly, which take part in the anastomosis around the wrist joint, and inferiorly, to join the digital branches of the superficial palmar arch.

Goes to snuff box then inters between 2 heads of adductor policies . It forms arch + gives connection with superficial palmar arch



Branches of the Radial Artery in the Palm

- Immediately on entering the palm, the radial artery gives off the arteria radialis indicis, which supplies the lateral side of the index finger

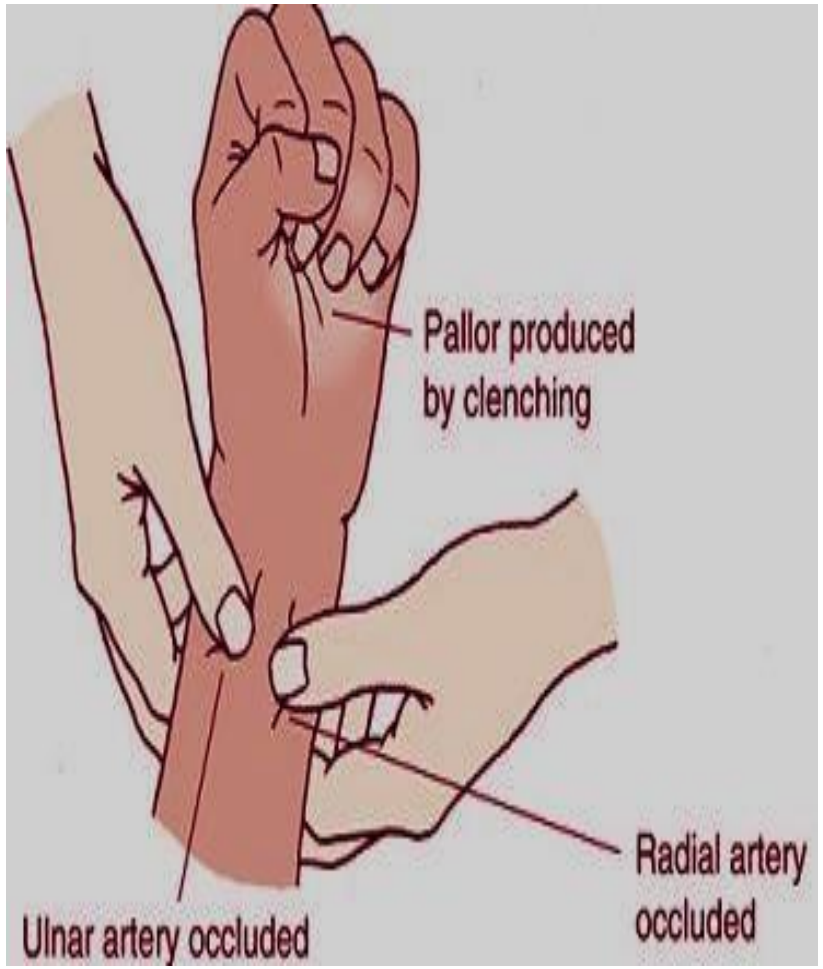
- and the arteria princeps pollicis, which divides into two and supplies the lateral and medial sides of the thumb.

Allen's test

- To test for adequate anastomoses between the radial and ulnar arteries, compress both the radial and ulnar arteries at the wrist, then release pressure from one or the other, and determine the filling pattern of the hand
- If there is little connection between the deep and superficial palmar arteries only the thumb and lateral side of the index finger will fill with blood (become red) when pressure on the radial artery alone is released.

When pressure is applied to the radial artery, it can close off blood flow. This is often shown by making a fist, where part of the hand becomes pale because the blood can't get through. Once the pressure is released, blood starts flowing again, and the hand returns to its normal color

Can be applied to radial or ulnar or both



Veins of the Palm

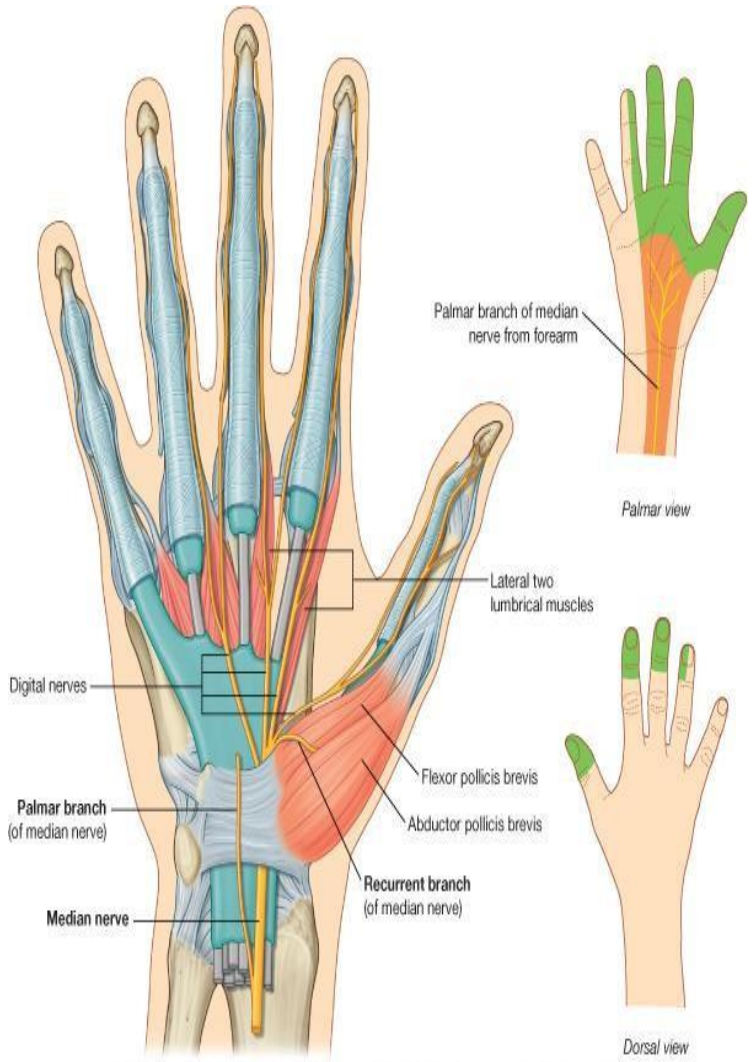
- Superficial and deep palmar arterial arches are accompanied by superficial and deep palmar venous arches, receiving corresponding tributaries.

Lymph Drainage of the Palm

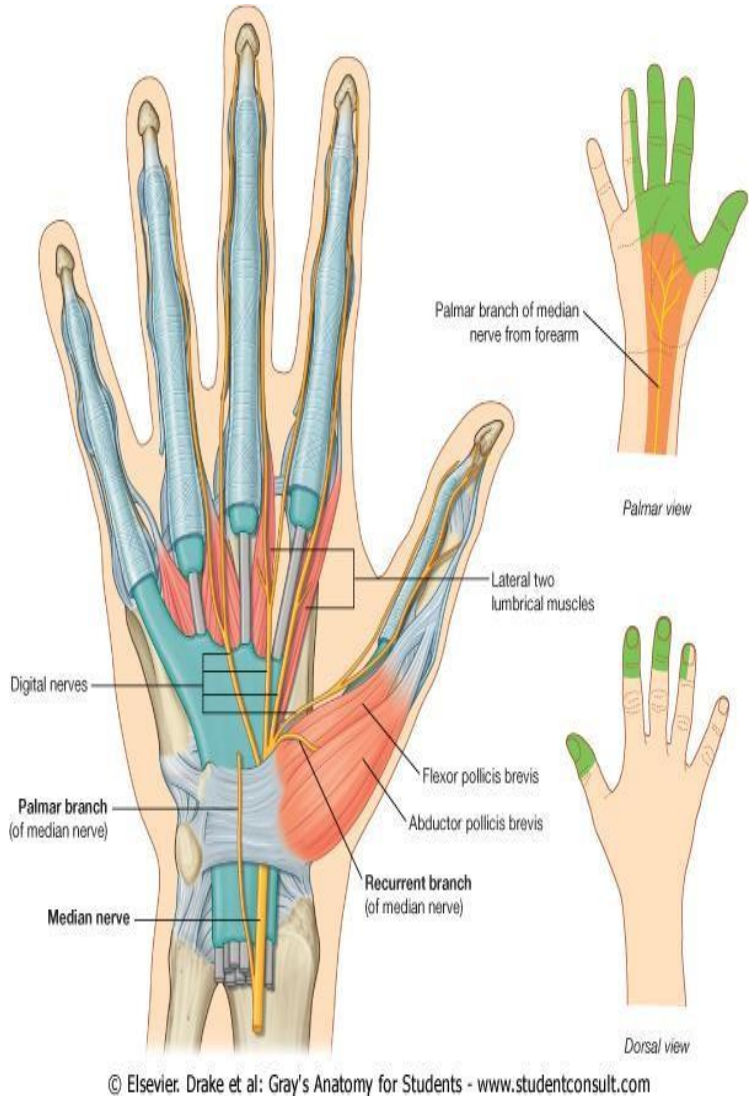
- The lymph vessels of the fingers pass along their borders to reach the webs
- From here the vessels ascend onto the dorsum of the hand
- The lymph from the medial side of the hand ascends in vessels that accompany the basilic vein
- they drain into the supratrochlear nodes and then ascend to drain into the lateral axillary nodes.
- The lymph from the lateral side of the hand ascends in vessels that accompany the cephalic vein
- they drain into the infraclavicular nodes, and some drain into the lateral axillary nodes.

Nerves of the Palm

- Median Nerve
- The median nerve enters the palm by passing behind the flexor retinaculum and through the carpal tunnel.
- It immediately divides into lateral and medial branches
- The muscular branch takes a recurrent course around the lower border of the flexor retinaculum and lies about one fingerbreadth distal to the tubercle of the scaphoid
- it supplies the muscles of the thenar eminence (the abductor pollicis brevis, the flexor pollicis brevis, and the opponens pollicis) and the first lumbrical muscle.
- The cutaneous branches supply the palmar aspect of the lateral three and a half fingers and the distal half of the dorsal aspect of each finger
- One of these branches also supplies the second lumbrical muscle.
- The palmar cutaneous branch of the median nerve given off in the front of the forearm, crosses anterior to the flexor retinaculum and supplies the skin over the lateral two-thirds part of the palm



Nerves of the Palm



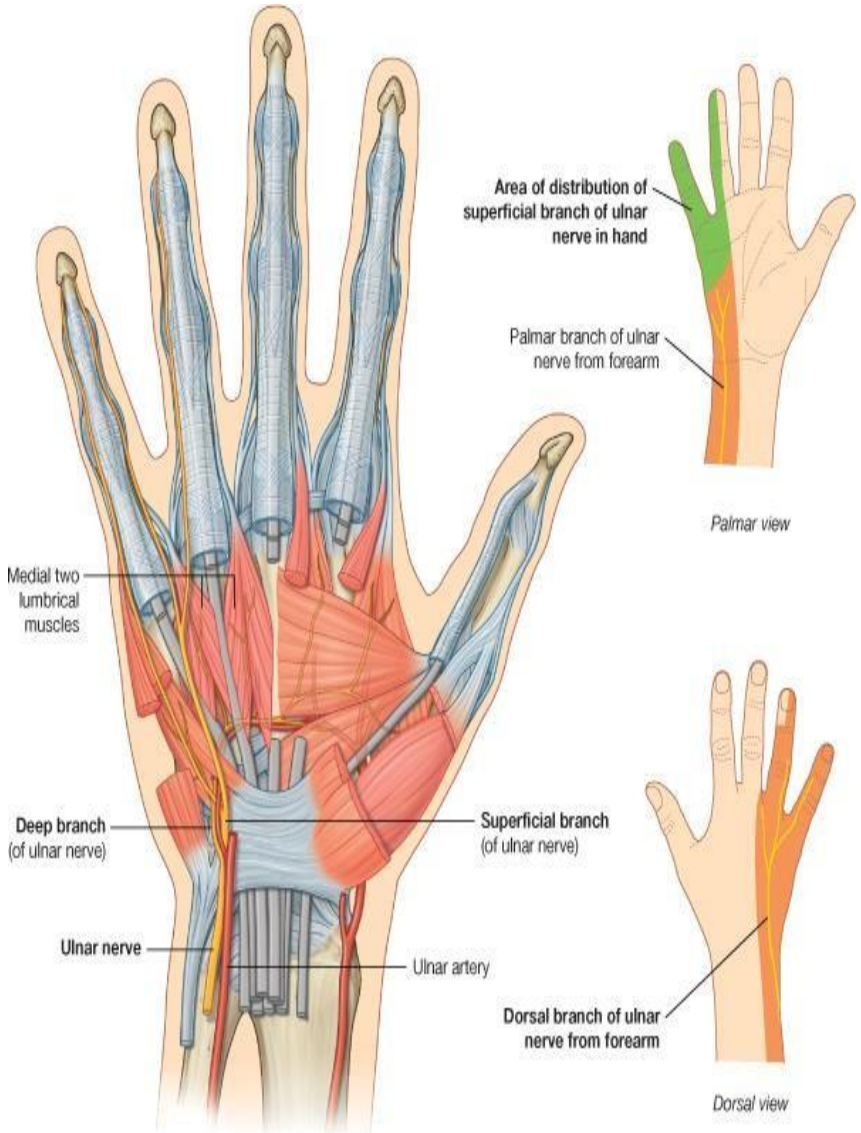
The **median nerve** innervates three **muscles**: the flexor pollicis brevis, abductor pollicis brevis, and opponens pollicis, as well as two lumbricals (1 and 2). It also provides **sensory** innervation to the lateral two-thirds of the palm. Before entering the flexor retinaculum, the median nerve gives off the **palmar cutaneous branch**, which supplies **sensation to the palm**. After passing through the carpal tunnel and reaching the palm, the median nerve gives off **digital branches** that innervate **three and a half fingers up to the middle phalanx**.

Injury to the median nerve can lead to "**ape hand**," characterized by extension of the thumb at the metacarpophalangeal joint (MCP), as the muscles normally responsible for flexion are weakened. The thumb will also be adducted due to ulnar deviation caused by the ulnar nerve. Sensation is lost in three and a half fingers and the middle part of the palm.

In **carpal tunnel syndrome**, these symptoms occur except for the palm, as sensation in the palm is preserved, since the palmar cutaneous branch branches off before the carpal tunnel
(Explained in details in lecture 7)

Ulnar Nerve

- The ulnar nerve enters the palm anterior to the flexor retinaculum alongside the lateral border of the pisiform bone
- As it crosses the retinaculum it divides into a superficial and a deep terminal branch.
- The superficial branch of the ulnar nerve descends into the palm, lying in the subcutaneous tissue between the pisiform bone and the hook of the hamate
- The ulnar artery is on its lateral side. Here, the nerve and artery may lie in a fibro-osseous tunnel, the tunnel of Guyon, created by fibrous tissue derived from the superficial part of the flexor retinaculum
- The nerve may be compressed at this site, giving rise to clinical signs and symptoms.
- The nerve gives off the following branches:
- a muscular branch to the palmaris brevis
- cutaneous branches to the palmar aspect of the medial side of the little finger and the adjacent sides of the little and ring fingers
- It also supplies the distal half of each finger.

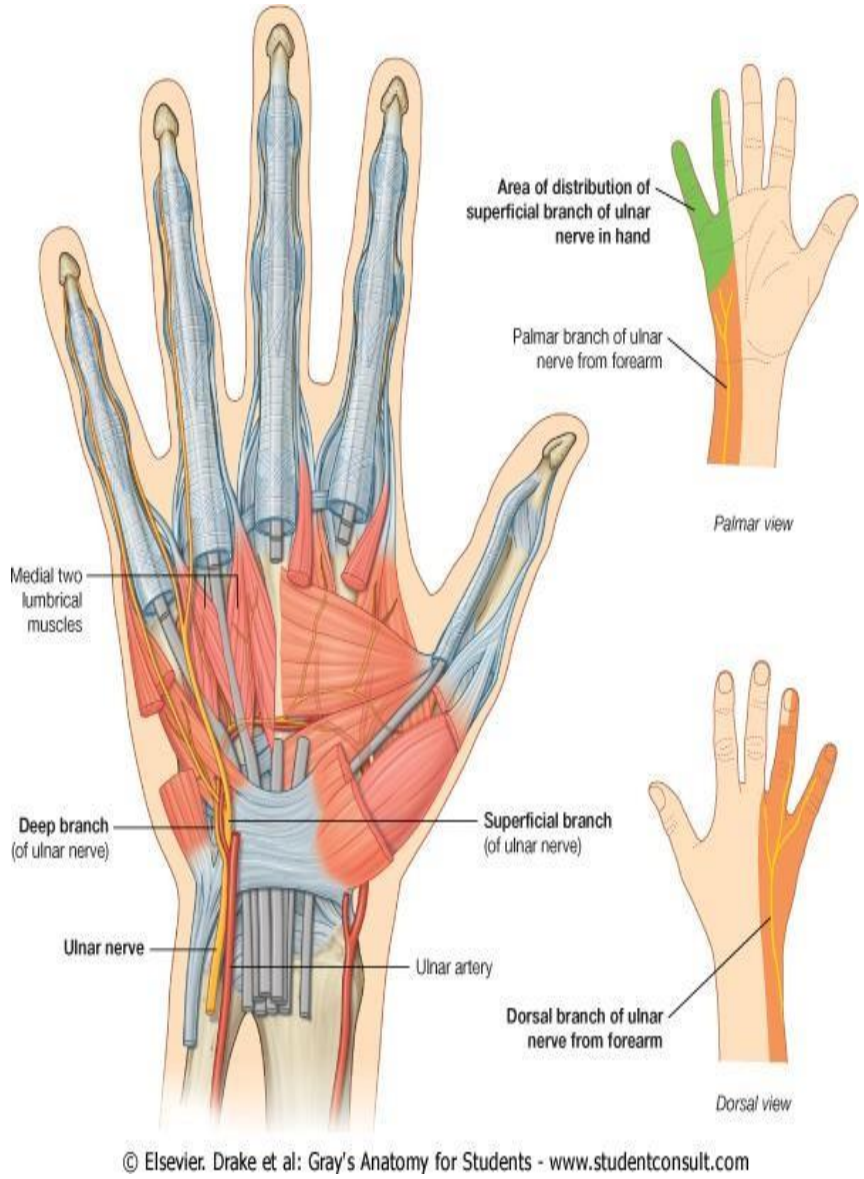


Ulnar Nerve

It innervates **14 muscles**, including **8** interossei muscles, the **third** and **fourth** lumbricals, **three** hypothenar muscles, and the **adductor pollicis**. It may also innervate the **palmaris brevis** (might be absent) bringing the total to 15 muscles.
"muscular deep branch"

In terms of **sensory** innervation, the ulnar nerve provides sensation to the **medial one-third of the hand :**
palmar : palmar cutaneous branch
Dorsal : dorsal cutaneous branch
and both palmar and dorsal aspect of **medial 1.5 finger** until proximal phalanx (dorsal digital branch)

When the ulnar nerve is injured, it leads to the characteristic "**claw hand**" appearance. This occurs because the affected muscles can no longer properly flex or extend the fingers. Specifically, the metacarpophalangeal joints (MCP) are hyperextended, and the interphalangeal joints (IP) are flexed. The index and middle fingers are less affected because they are primarily innervated by the median nerve, so they remain in a more extended position



Deep Branch of the Ulnar Nerve

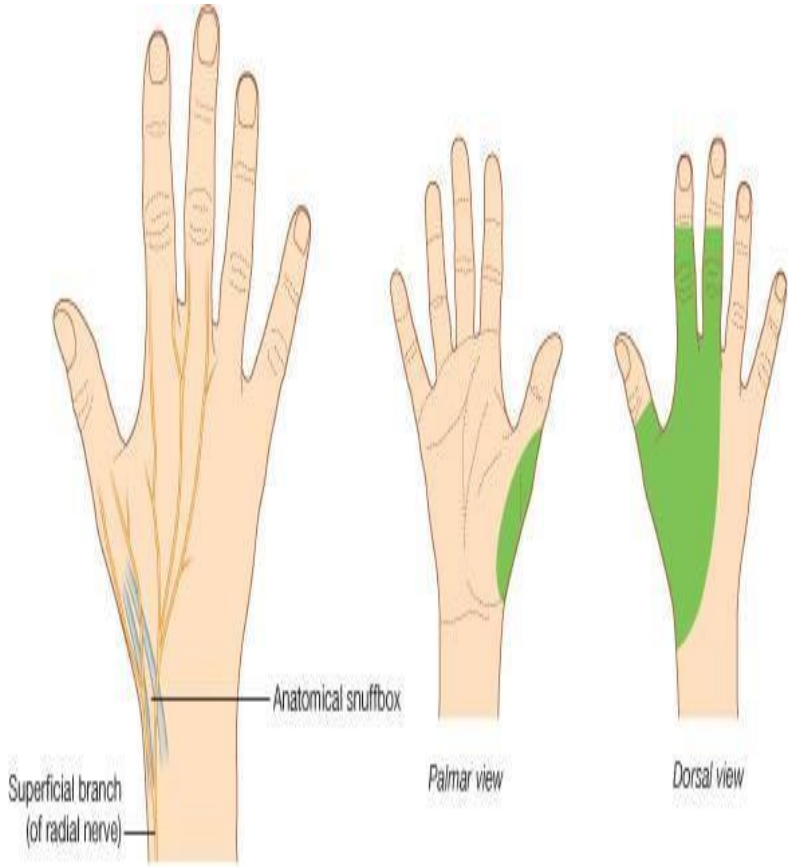
- The deep branch of the ulnar nerve runs backward between the abductor digiti minimi and the flexor digiti minimi
- It pierces the opponens digiti minimi, winds around the lower border of the hook of the hamate, and passes laterally within the concavity of the deep palmar arch.
- The nerve lies behind the long flexor tendons and in front of the metacarpal bones and interosseous muscles
- It gives off muscular branches to the three muscles of the hypothenar eminence
- the abductor digiti minimi, the flexor digiti minimi, and the opponens digiti minimi.
- It supplies all the palmar and dorsal interossei, the third and fourth lumbrical muscles, and both heads of the adductor pollicis muscle.

- The palmar cutaneous branch of the ulnar nerve given off in the front of the forearm crosses anterior to the flexor retinaculum

- and supplies the skin over the medial part of the palm

The Dorsum of the Hand

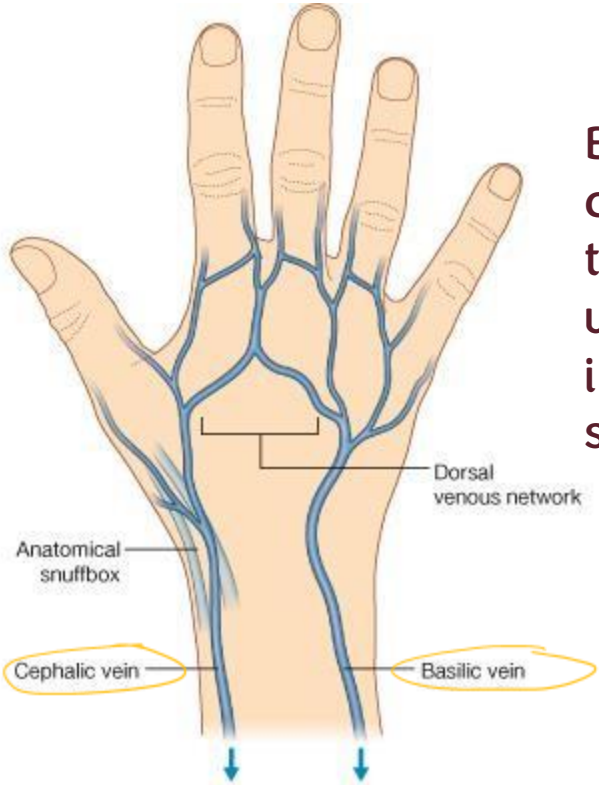
- The skin on the dorsum of the hand is thin, hairy, and freely mobile on the underlying tendons and bones.
- The sensory nerve supply to the skin on the dorsum of the hand is derived from the superficial branch of the radial nerve and the posterior cutaneous branch of the ulnar nerve.
- The superficial branch of the radial nerve winds around the radius deep to the brachioradialis tendon, descends over the extensor retinaculum, and supplies the lateral two thirds of the dorsum of the hand
- divides into several dorsal digital nerves that supply the thumb, the index and middle fingers, and the lateral side of the ring finger
- The area of skin on the back of the hand and fingers supplied by the radial nerve is subject to variation
- Frequently, a dorsal digital nerve, a branch of the ulnar nerve, also supplies the lateral side of the ring finger



- The posterior (dorsal) cutaneous branch of the ulnar nerve winds around the ulna deep to the flexor carpi ulnaris tendon
- descends over the extensor retinaculum, and supplies the medial third of the dorsum of the hand
- It divides into several dorsal digital nerves that supply the medial side of the ring and the sides of the little fingers
- The dorsal digital branches of the radial and ulnar nerves do not extend far beyond the proximal phalanx
- The remainder of the dorsum of each finger receives its nerve supply from palmar digital nerves.

Dorsal Venous Arch

- The dorsal venous arch lies in the subcutaneous tissue proximal to the metacarpophalangeal joints
- drains on the lateral side into the cephalic vein and, on the medial side, into the basilic vein
- the greater part of the blood from the whole hand drains into the arch, which receives digital veins
- freely communicates with the deep veins of the palm through the interosseous spaces.

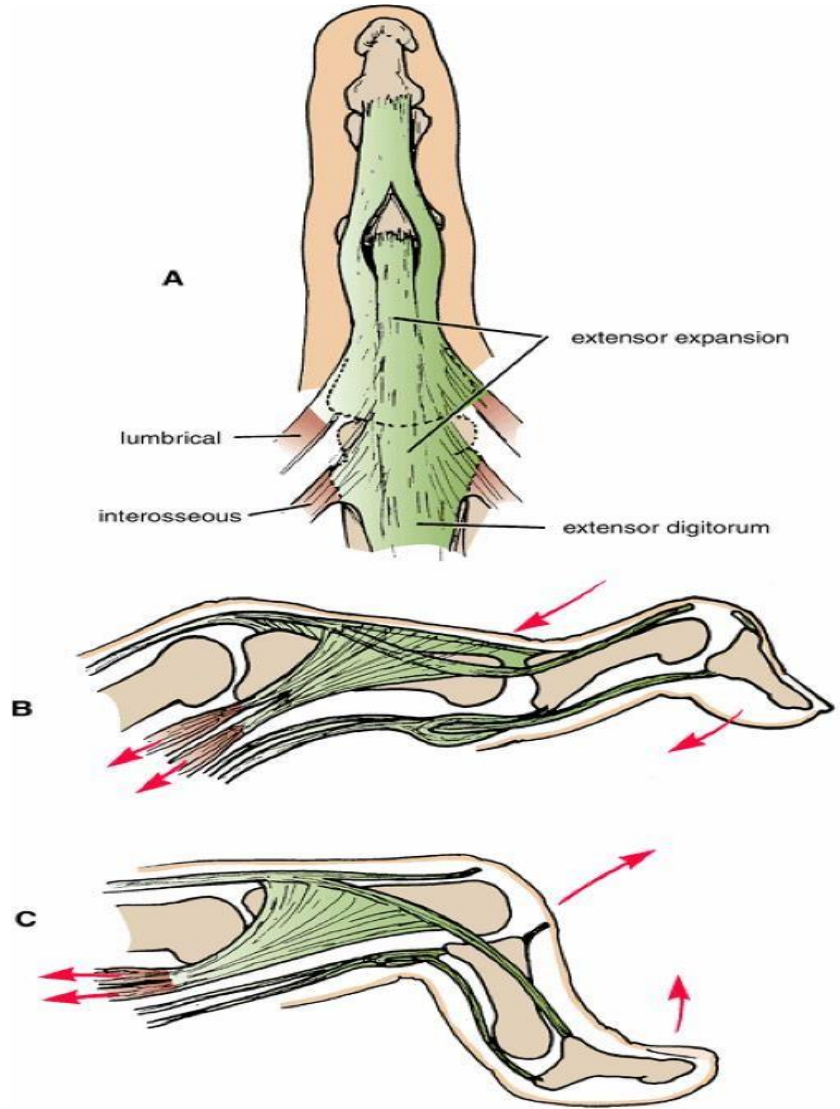


Both meet in front of cubital fossa and connect through median cubital vain important in injections and to take sample of blood

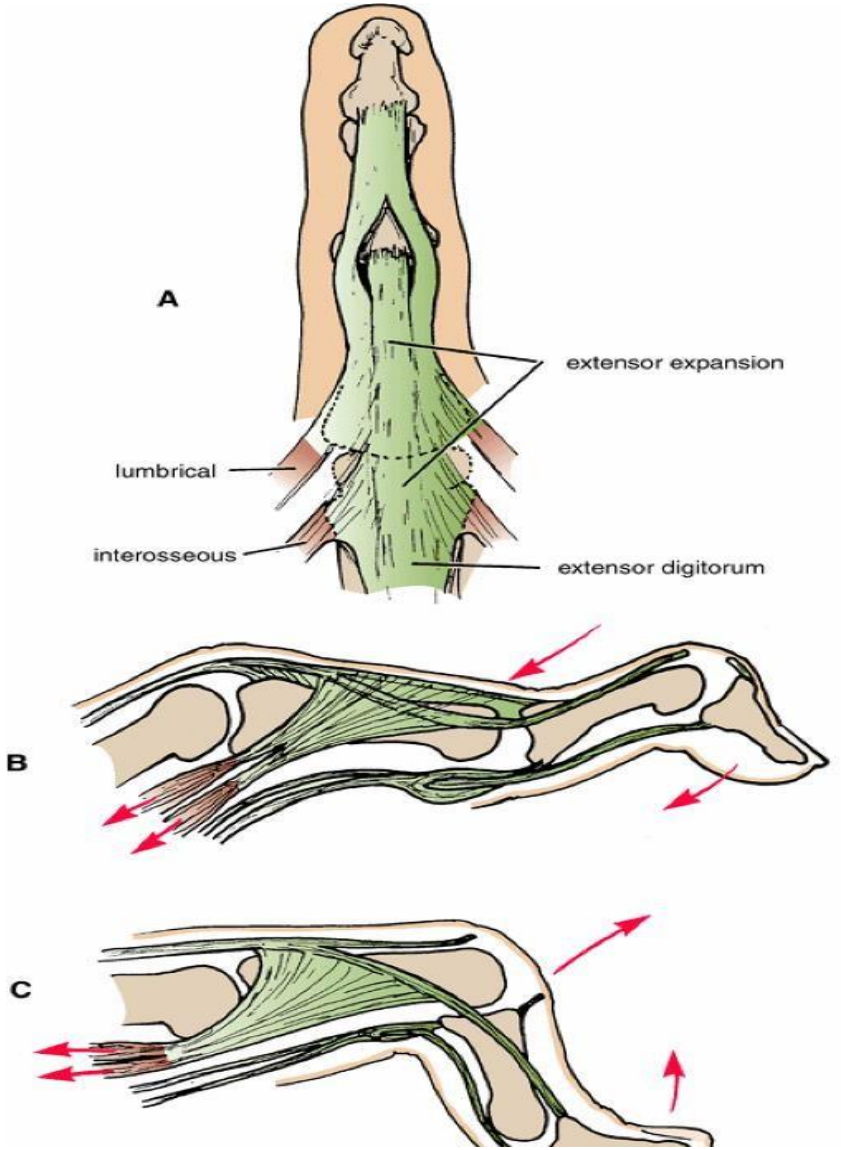
Insertion of the Long Extensor Tendons

Inserted into dorsal digital expansion

- The four tendons of the extensor digitorum emerge from under the extensor retinaculum and fan out over the dorsum of the hand
- The tendons are embedded in the deep fascia, and together they form the roof of a subfascial space, which occupies the whole width of the dorsum of the hand
- Strong oblique fibrous bands connect the tendons to the little, ring, and middle fingers, proximal to the heads of the metacarpal bones
- The tendon to the index finger is joined on its medial side by the tendon of the extensor indicis
- the tendon to the little finger is joined on its medial side by the two tendons of the extensor digiti minimi



- On the posterior surface of each finger, the extensor tendon joins the fascial expansion called the extensor expansion
- Near the proximal interphalangeal joint, the extensor expansion splits into three parts: a central part, which is inserted into the base of the middle phalanx,
- two lateral parts, which converge to be inserted into the base of the distal phalanx
- The dorsal extensor expansion receives the tendon of insertion of the corresponding interosseous muscle on each side
- distally receives the tendon of the lumbrical muscle on the lateral side



The Radial Artery on the Dorsum of the Hand

- The radial artery winds around the lateral margin of the wrist joint, beneath the tendons of the abductor pollicis longus and extensor pollicis brevis, and lies on the lateral ligament of the joint
- On reaching the dorsum of the hand, the artery descends beneath the tendon of the extensor pollicis longus to reach the interval between the two heads of the first dorsal interosseous muscle
- the artery turns forward to enter the palm of the hand
- Branches of the radial artery on the dorsum of the hand take part in the anastomosis around the wrist joint. Dorsal digital arteries pass to the thumb and index finger

Answers :)

1. Can you tell which tendon is to which muscle?

a. Flexor digitorum profundus

b. Flexor digitorum superfacialis.

c. Flexor pollicis longus.

2. Describe the action of lumbrical muscles in case of nerve injury.

Claw hand-> extension of mcp joint and flexion of ipj

the thumb is supplied by median nerve (mainly)

3. Point the similarities and differences between the muscles of the thumb.

They all originate from carpal bones

All For One -> supplied by median / And -> supplied by ulnar.

All For – And -> insert into base of phalanx / One -> insert into the shaft of metacarpal.

Cross word:

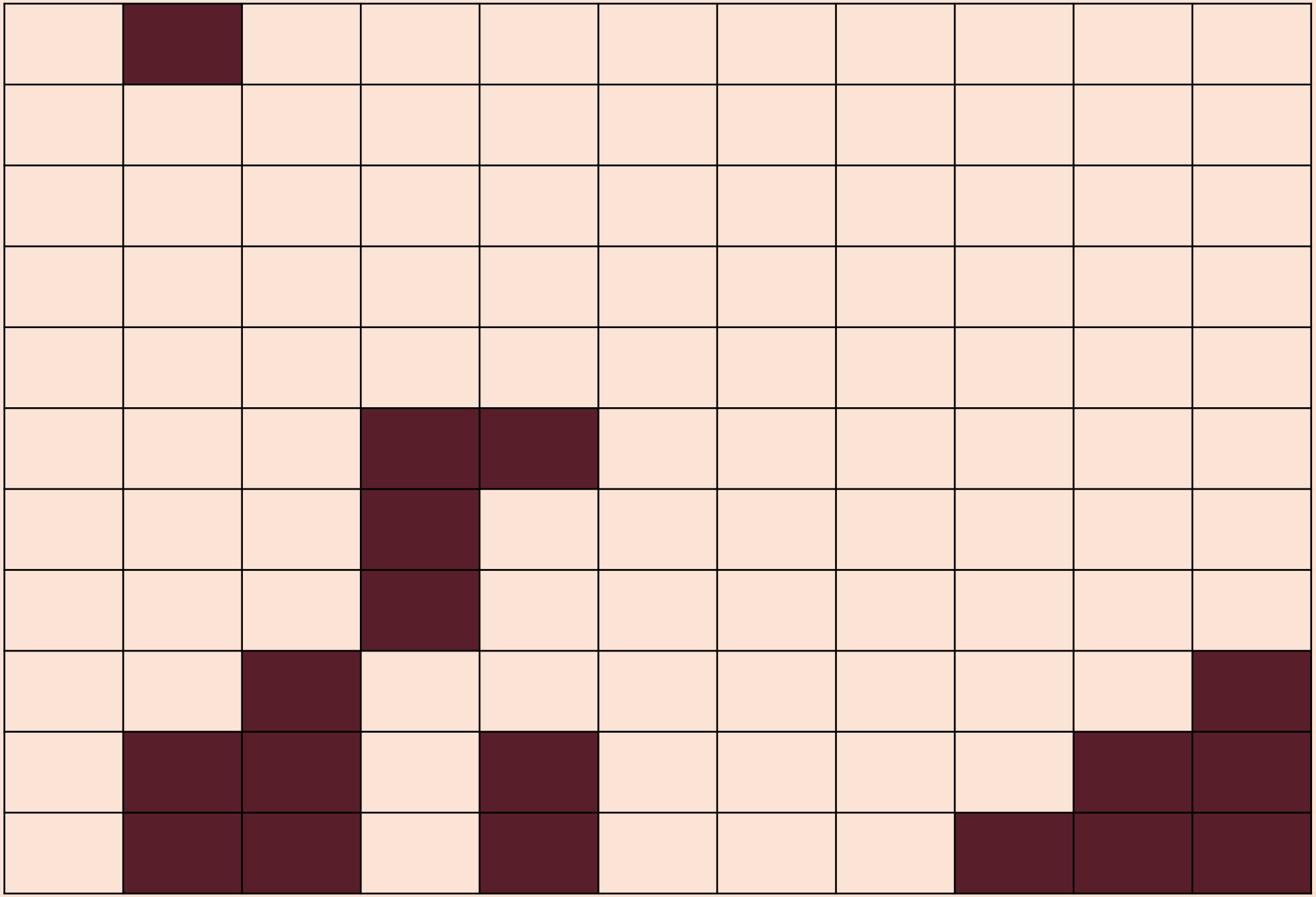
Let's play a tiny game of cross words to recap this lecture

Across

1. Thickened deep fascia of the wrist
2. Triangular depression on the posterolateral wrist
3. Tendon sheath allowing smooth movement
4. Muscle that wrinkles skin on ulnar hand
5. Artery tested with Allen's test
6. Nerve passing through carpal tunnel
7. Space containing lumbrical muscles
8. Muscle opposing the thumb
9. Superficial vein on the radial side
10. Muscle abducting the little finger

Down

2. Fibrous tunnels for flexor tendons
3. Most lateral carpal bone in snuffbox
4. Deep palmar arch is continuation of this artery
5. Insertion point of flexor digitorum profundus
6. Nerve supplying hypothenar muscles 7. Muscle adducting the thumb
8. Thenar muscle innervated by median nerve
9. Synovial sheath for FPL
10. Central palm structure

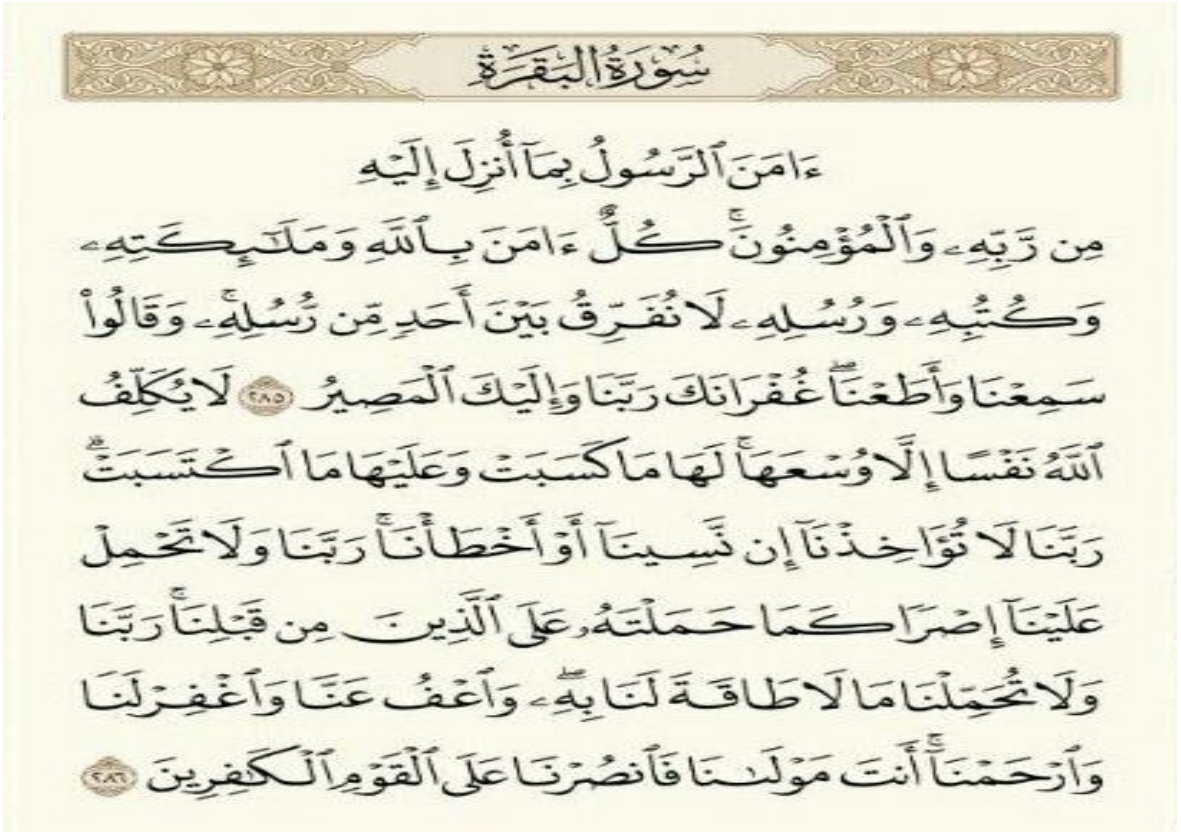


For any feedback, scan the code or click on it.

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1	Slide 25 Slide 41	All -> Abductor pollicis brevis. **(Adduction)** Sentence added	All -> Abductor pollicis brevis. **(abduction)** "Anastomosis may occur between the two ends of digital arteries"
V1 → V2			

رسالة من الفريق العلمي:



سُورَةُ البَقَرَة

ءَامَنَ ٱلرَّسُولُ بِمَآ أُنزِلَ إِلَيۡهِ
مِن رَّبِّهِۦ وَٱلۡمُؤۡمِنُونَۚ كُلٌّ ءَامَنَ بِٱللَّهِ وَمَلَٰٓئِكَتِهِۦ
وَكُتُبِهِۦ وَرُسُلِهِۦ لَا نُفَرِّقُ بَيۡنَ أَحَدٖ مِّن رُّسُلِهِۦۚ وَقَالُواْ
سَمِعۡنَا وَأَطَعۡنَاۖ غُفۡرَانَكَ رَبَّنَا وَإِلَيۡكَ ٱلۡمَصِيرُ ٢٨٥ لَا يُكَلِّفُ
ٱللَّهُ نَفۡسًا إِلَّا وُسۡعَهَاۚ لَهَا مَا كَسَبَتۡ وَعَلَيۡهَا مَا ٱكۡتَسَبَتۡۗ
رَبَّنَا لَا تُؤَاخِذۡنَآ إِن نَّسِينَآ أَوۡ أَخۡطَأۡنَاۚ رَبَّنَا وَلَا تَحۡمِلۡ
عَلَيۡنَآ إِصۡرٗا كَمَا حَمَلۡتَهُۥ عَلَى ٱلَّذِينَ مِن قَبۡلِنَاۚ رَبَّنَا
وَلَا تُحَمِّلۡنَا مَا لَا طَاقَةَ لَنَا بِهِۦۖ وَٱعۡفُ عَنَّا وَٱغۡفِرۡ لَنَا
وَٱرۡحَمۡنَآۚ أَنتَ مَوۡلَىٰنَا فَٱنصُرۡنَا عَلَى ٱلۡقَوۡمِ ٱلۡكَٰفِرِينَ ٢٨٦