

# Flexor Forearm and Palmar Hand



# SCRUBS

STUDENT COLLABORATIVE RESOURCES FOR UNDERSTANDING AND BRODY SUCCESS

# *Mission Statement*

**SCRUBS** is a student-driven initiative that aims to develop supplemental resources for current and future cohorts that will pass through Brody. Members of **SCRUBS** participate in a variety of sub-committees working to create resources for students, by students. These resources aim to offer unique perspectives from students that have walked in the same shoes, developing resources that we wish we had been exposed to during our time in the course.

The hope is this organization will become a staple of the Brody student body, exemplifying the unique collaborative community that Brody offers. If this is a mission that aligns with your goals and you have the desire to help those that will come behind you, as well as a goal to leave your mark on Brody as a whole, we invite you to join the team!

# *Disclaimer*

The resources that are included in this document are made by students and not the faculty. As such, there is the possibility for errors in our development, although this is mitigated via a team approach to development with multiple stages of vetting. If there is a contradiction with the coursework presented within your course, please go by the course documents. Additionally, **SCRUBS** aims to supply ***supplemental resources***, however these are in no way replacements to the instruction of the Brody faculty. Use these resources as a supplement, but not as your primary source for course material.

# Osteology

## Bones of the Forearm

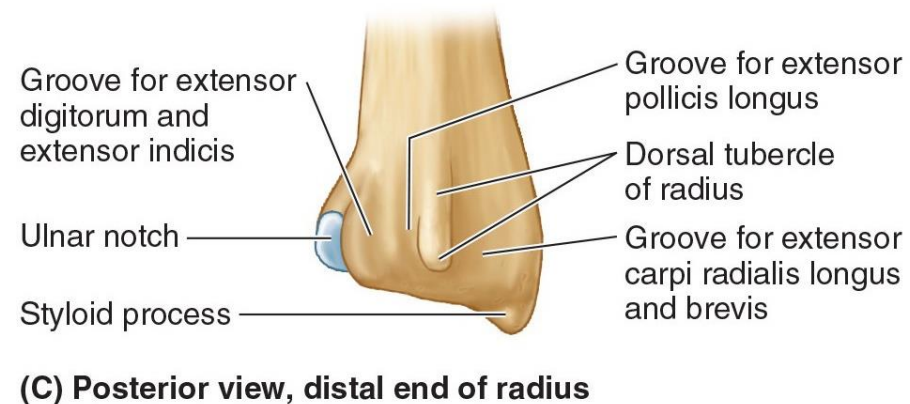
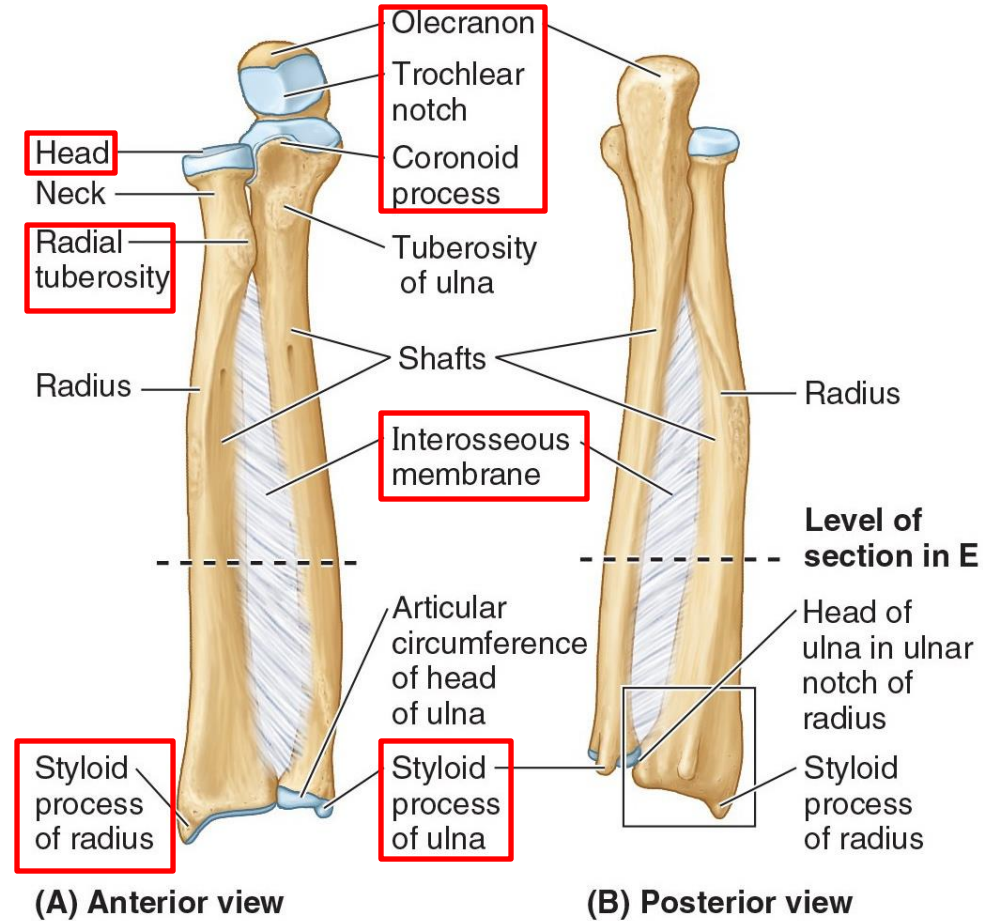
### Radius

- Radial head
- Styloid process

### Ulna

- Olecranon
- Coronoid process
- Trochlear notch
- Styloid process

Interosseous membrane



# Osteology

## Bones of the Wrist and Hand

### Proximal (lateral to medial)

**S**capoid  
**L**unate  
**T**riquetrum  
**P**isiform

### Distal (lateral to medial)

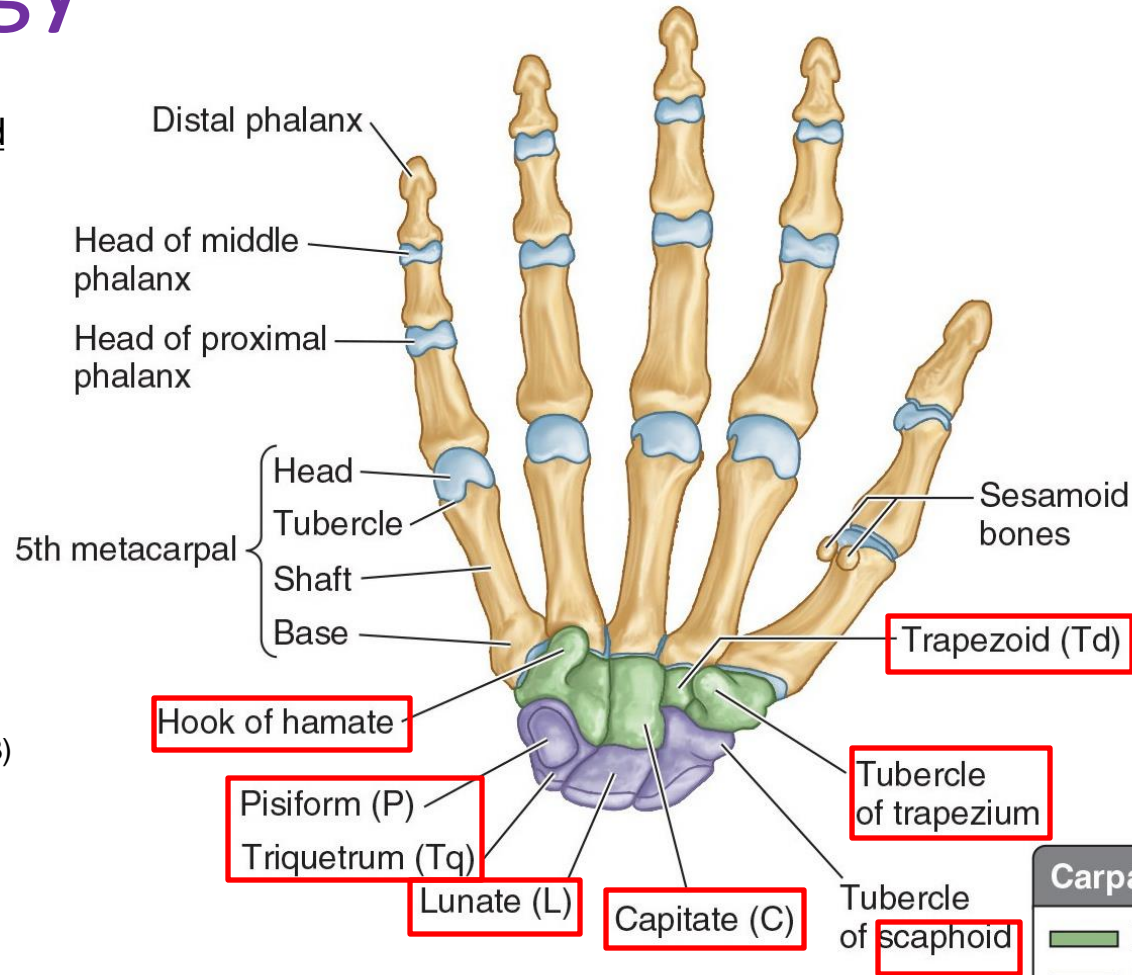
**T**rapezium  
**T**rapezoid  
**C**apitate  
**H**amate

### Hand

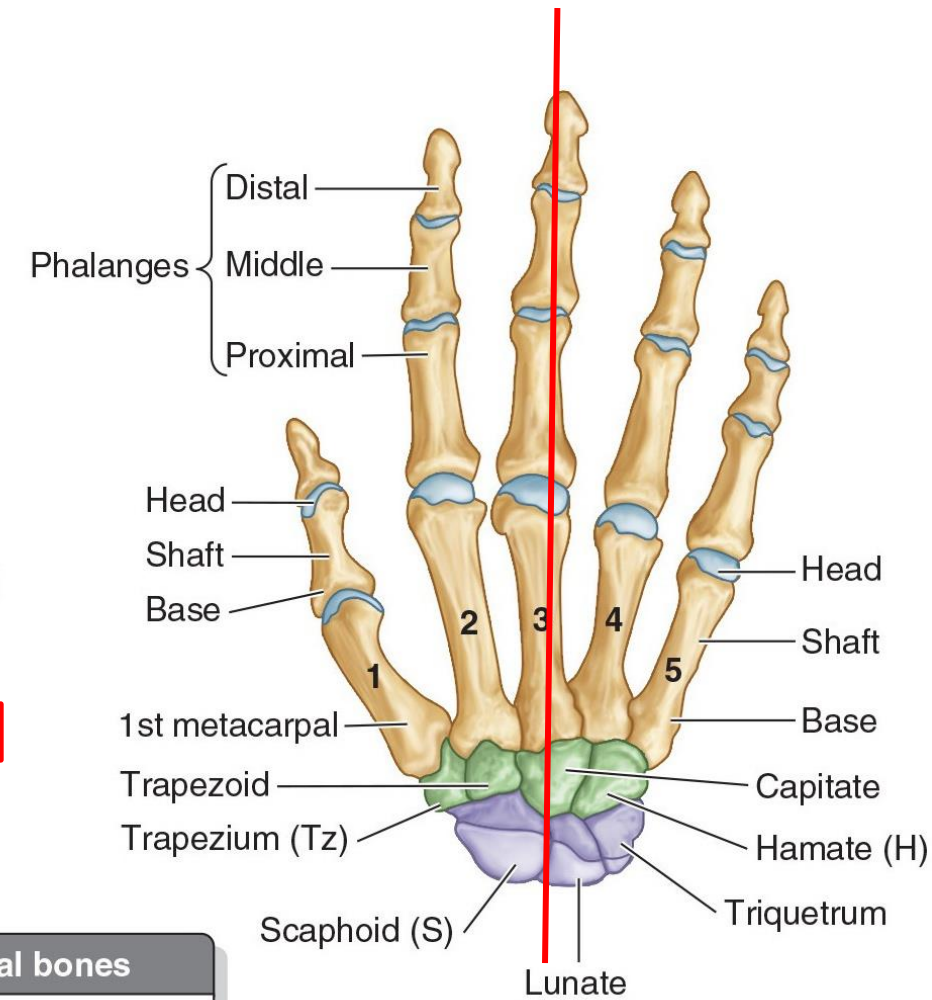
Metacarpals (n=5)

Phalanges (pollex has 2, rest have 3)

*Midline = 3<sup>rd</sup> digit of the hand*



(A) Anterior (palmar) view



(B) Posterior (dorsal) view

*Some **L**overs **T**ry **P**ositions  
That **T**hey **C**an't **H**andle !!!*



# Muscles of the Superficial Forearm

*All muscles originate from a common tendon off the medial epicondyle*

## Pronator Teres

**O:** Common flexor tendon, ulna

**I:** Middle-lateral radius

**N:** Median Nerve (C5-T1)

**A:** Pronate and flex forearm

## Flexor Carpi Radialis

**O:** Common flexor tendon

**I:** Base of the 2<sup>nd</sup> metacarpal (palmar)

**N:** Median Nerve (C5-T1)

**A:** Flex and abduct (radial deviation) hand

## Palmaris Longus

**O:** Common flexor tendon

**I:** Flexor retinaculum and palmar aponeurosis

**N:** Median Nerve (C5-T1)

**A:** Flexes hand, tightens aponeurosis

## Flexor Carpi Ulnaris

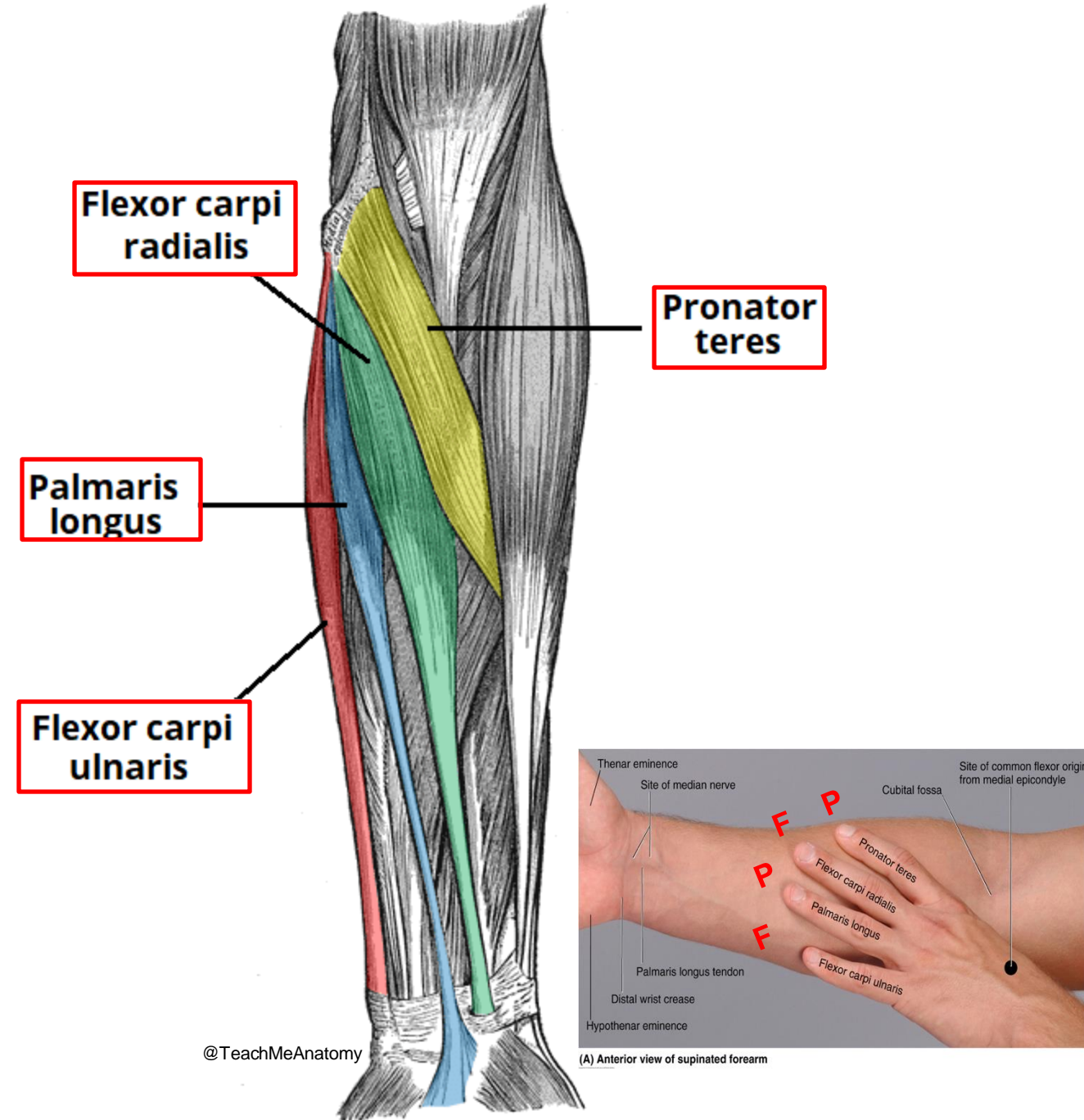
**O:** Common flexor tendon

**I:** Pisiform, hamate, 5<sup>th</sup> metacarpal

**N:** Ulnar nerve (C8-T1)

**A:** Flex and adduct (ulnar deviation) hand

*All but FCU innervated by median nerve*



@TeachMeAnatomy

# Muscle of the Intermediate Forearm

## Flexor Digitorum Superficialis

**O:** Common flexor tendon, ulna, radius

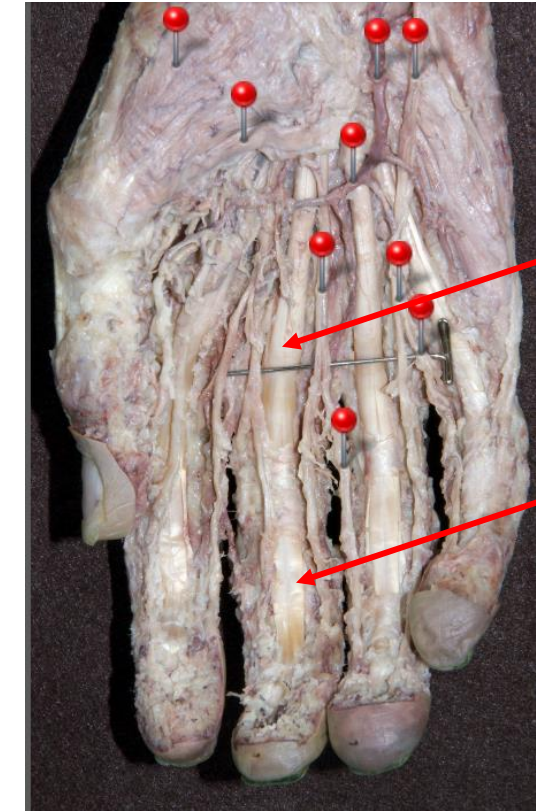
**I:** Shaft of *middle phalanges* 2-5

**N:** Median Nerve (*C5-T1*)

**A:** Flex proximal IP joints (2-5)

Flexor Digitorum  
Superficialis

## Front of Forearm



Flexor Digi  
Superficialis  
Tendon  
(*Proximal*)

Flexor Digi  
Profundus  
Tendon  
(*Distal*)

@vhdissector

# Deep Muscles of the Forearm

## Flexor Digitorum Profundus

**O:** 3/4<sup>th</sup>s of the ulna and interosseous membrane

**N:** Anterior interosseous nerve *lateral half* (Branch of median: **C5-T1**), *Ulnar nerve median half* (C8-T1)

**I:** Base of *distal phalanges* 2-5

**A:** Flex distal IP joints (2-5)

## Pronator Quadratus

**O:** Distal fourth of ulna

**I:** Distal fourth of radius

**N:** Anterior interosseous nerve (Branch of median nerve: **C5-T1**)

**A:** Pronate the forearm

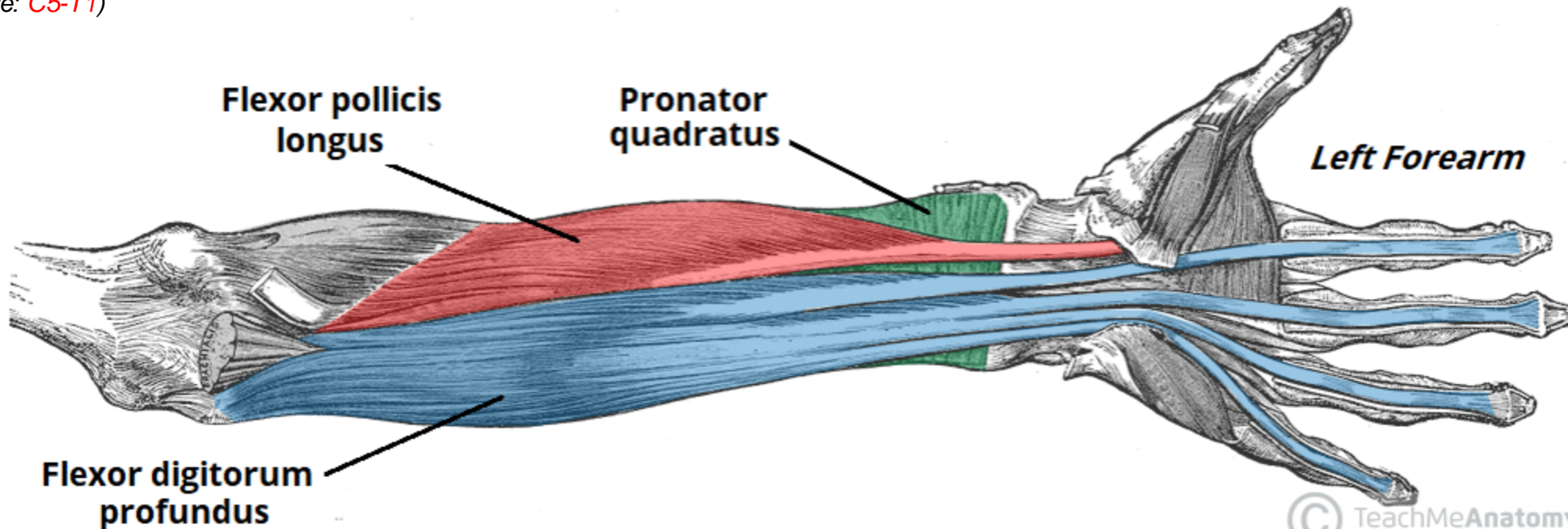
## Flexor Pollicis Longus

**O:** Radius and interosseous membrane

**N:** Anterior interosseous nerve (Branch of median: **C5-T1**)

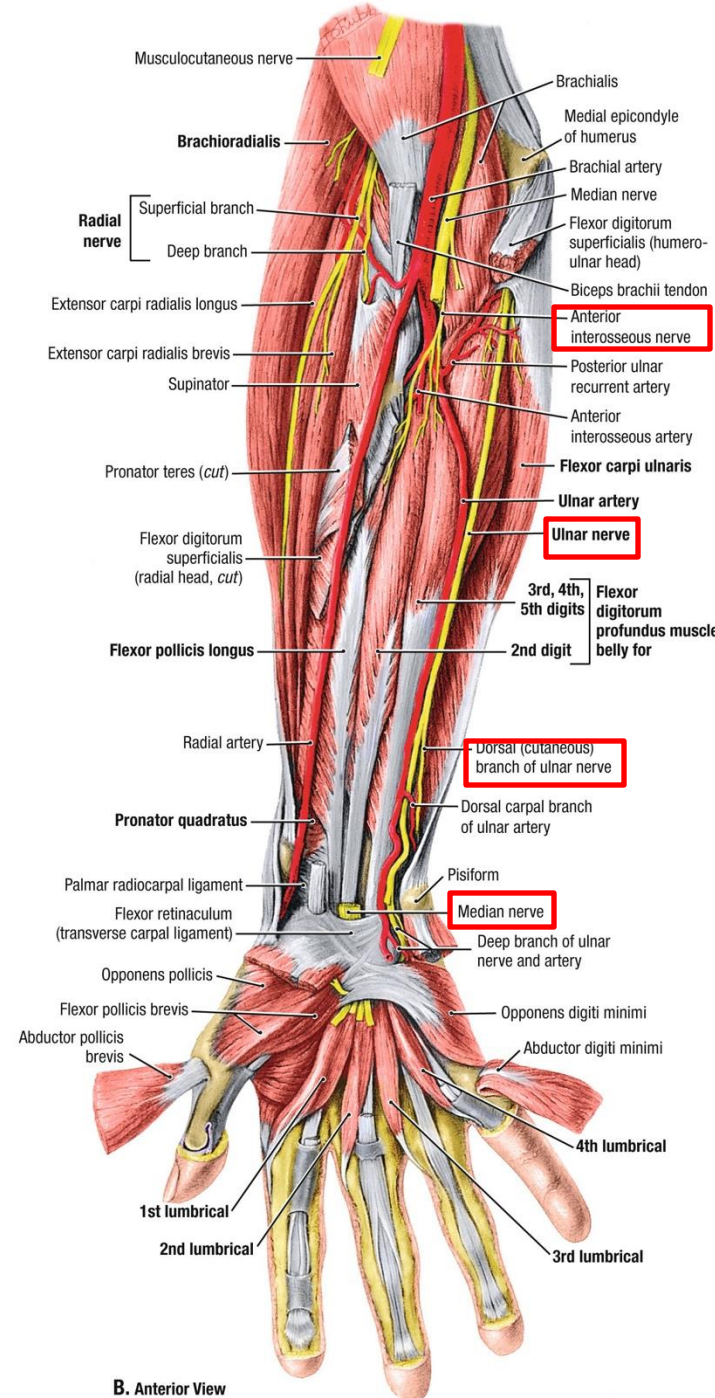
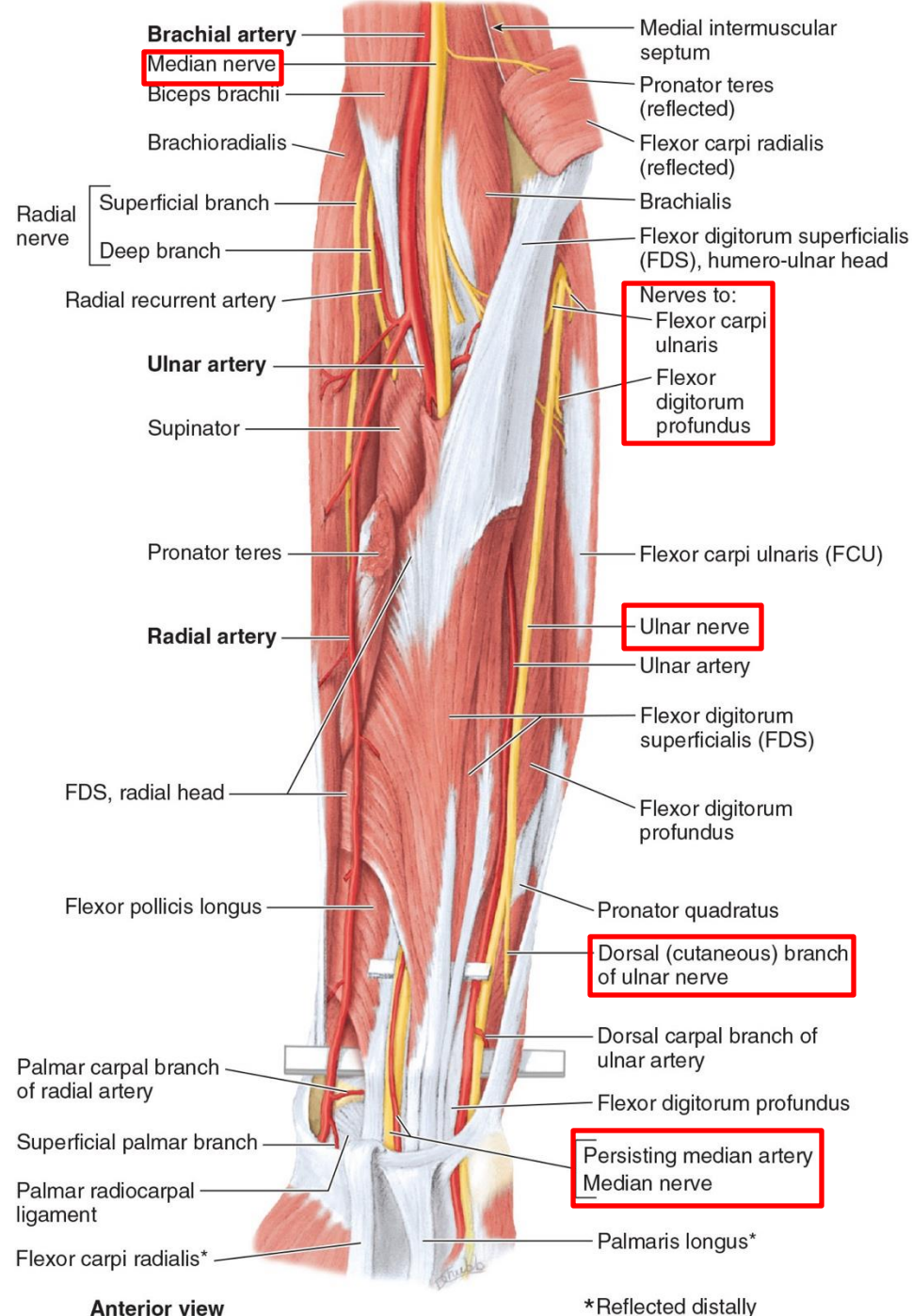
**I:** Base of distal phalanx of thumb

**A:** Flex the IP joint of the thumb





# Nerves of the Flexor Forearm



## Muscular Innervation

**Median nerve** – all but Flexor Carpi Ulnaris and ½ Flexor Digitorum Profundus (**C5-T1**)

- Anterior Interosseous Nerve is the Deep component of the Median nerve

**Ulnar Nerve** – Flexor Carpi Ulnaris and ulnar half of Flexor digitorum profundus (**C8-T1**)

- Passes superficial to flexor retinaculum

## Cutaneous Innervation

**Lateral Antebrachial Cutaneous** - From musculocutaneous nerve

**Medial Antebrachial Nerve** – From medial cord of brachial plexus

# Arteries of the Flexor Forearm

## Branch Points

### Direct Branches of Brachial

- Superior ulnar collateral
- Inferior ulnar collateral
- Ulnar
- Radial

### Direct Branches of Ulnar

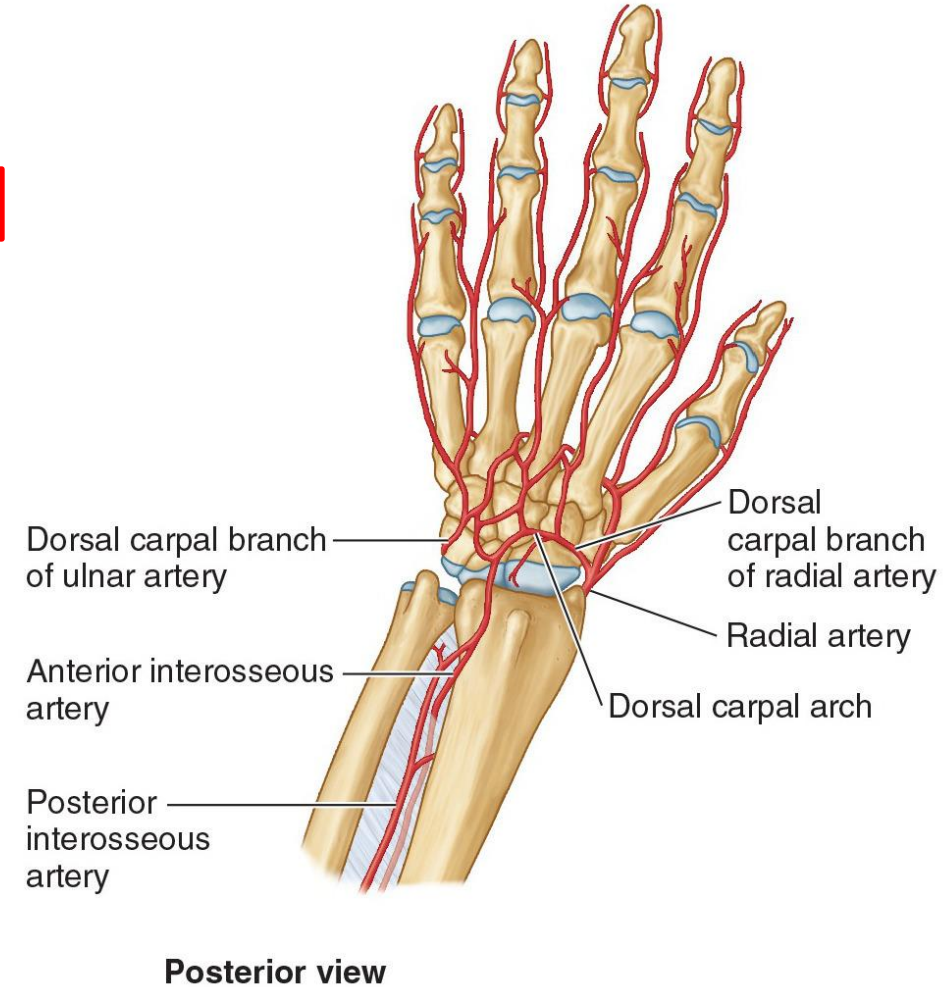
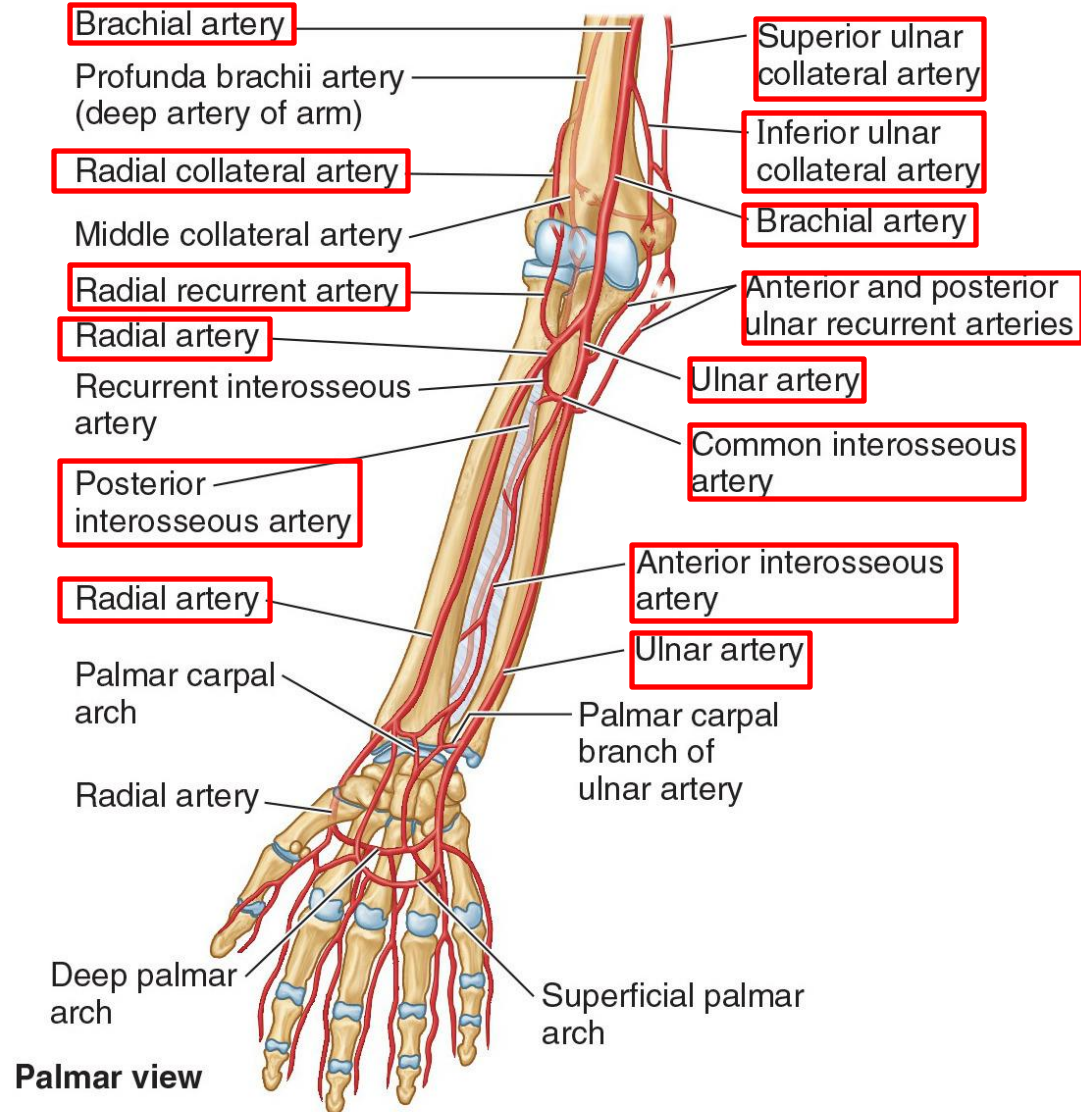
- Common interosseous
- Anterior recurrent ulnar
- Posterior recurrent ulnar

### Direct Branches of Radial

- Recurrent radial

### Direct Branches of Common Interosseous

- Posterior interosseous
- Anterior interosseous





# Compartments of the hand

## Five Compartments of the Hand

### **Superficial Three**

Thenar: Lateral (thumb)

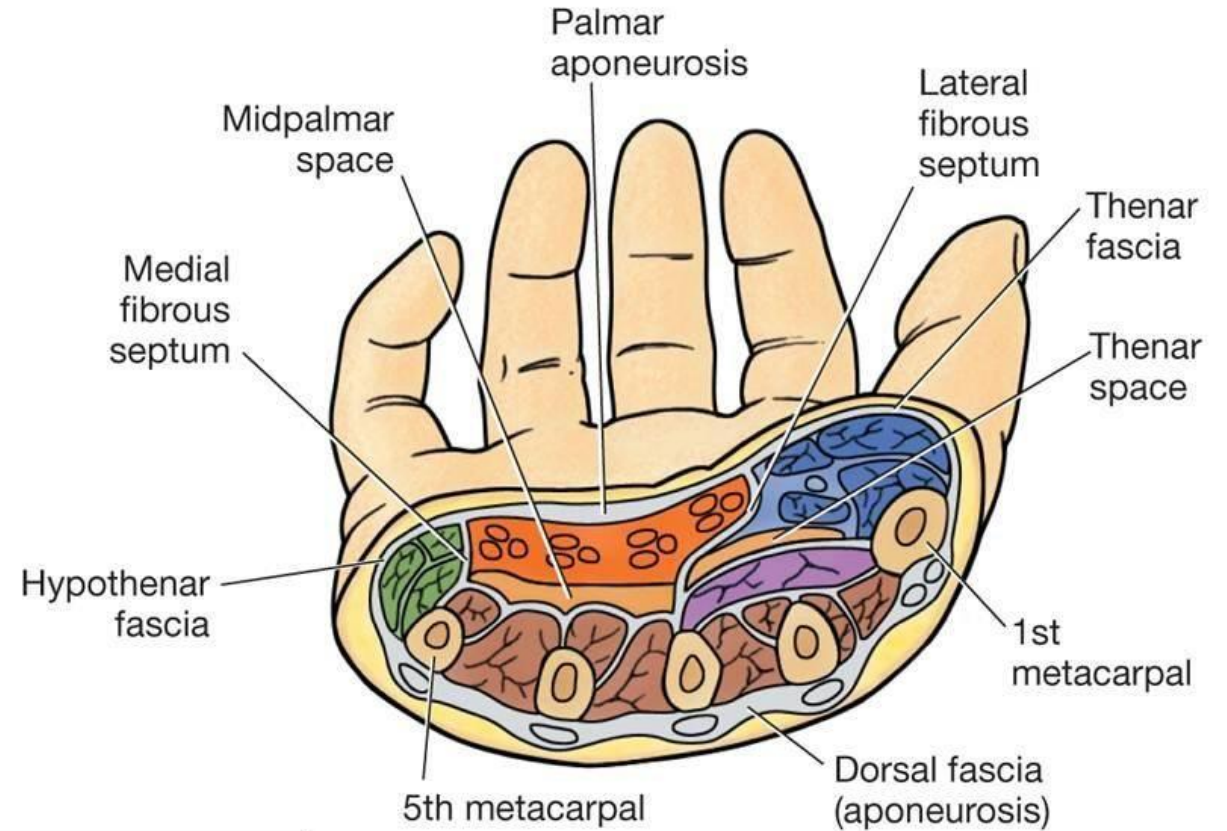
Hypothenar: Medial (little finger)

Central: Between thenar and hypothenar

### **Deep Two**

Adductor: Contains adductor pollicis

Interosseous: Deepest layer, between metacarpals



### Key for A and B

#### 5 Compartments:

- 1. Hypothenar
- 2. Thenar
- 3. Central
- 4. Adductor
- 5. Interosseous

- Fibrous septa
- Midpalmar and thenar spaces

### B Transverse section

# Muscles of the Thenar Compartment

*All muscles are innervated by recurrent branch of the median nerve*

## Abductor Pollicis Brevis

**O:** Scaphoid

**I:** Proximal phalanx (thumb)

**N:** Recurrent Branch of the Median Nerve (C5-T1)

**A:** Abduct CMC/Assist Opp.

## Flexor Pollicis Brevis

**O:** Trapezium

**I:** Proximal phalanx (thumb)

**N:** Recurrent Branch of the Median Nerve (C5-T1)

**A:** Flex thumb at MCP

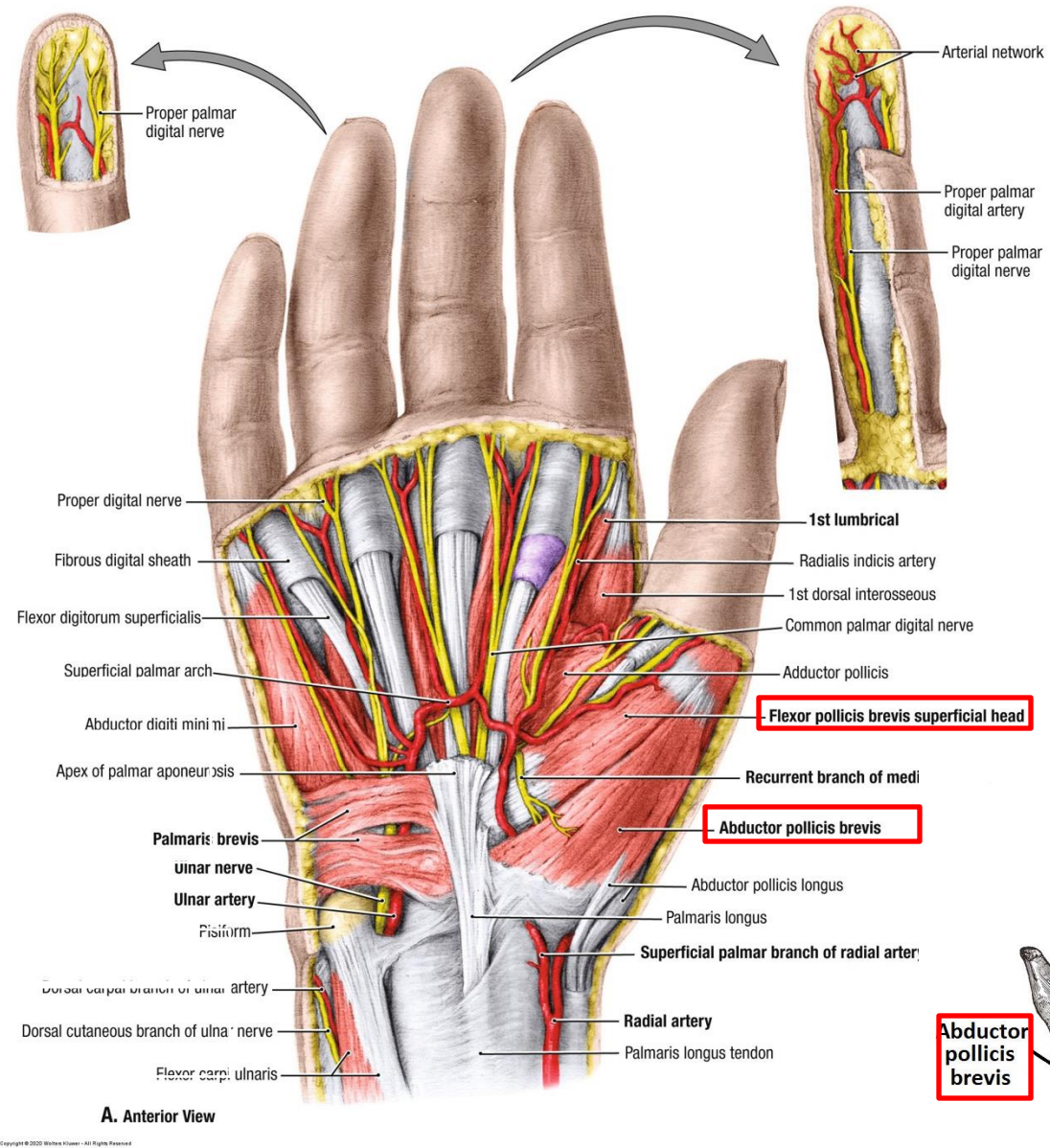
## Opponens Pollicis

**O:** Trapezium

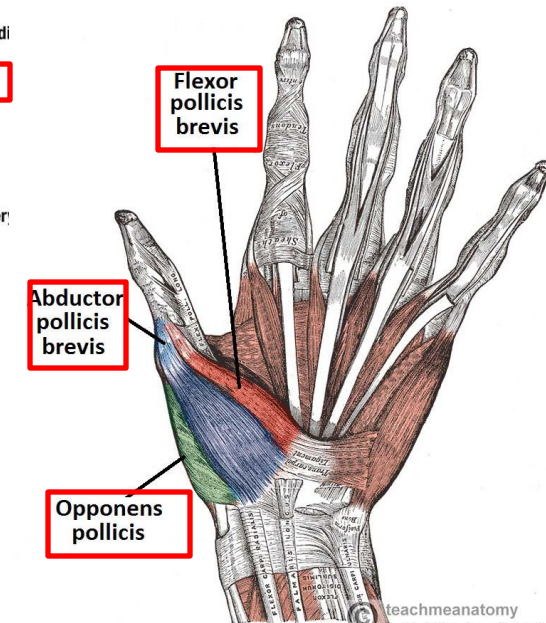
**I:** Shaft of 1<sup>st</sup> metacarpal

**N:** Recurrent Branch of the Median Nerve (C5-T1)

**A:** Opposes thumb (CMC)



Palmar Surface Left Hand





# Muscles of the Hypothenar Compartment

All muscles are innervated by the deep branch of the ulnar nerve

## Abductor Digiti Minimi

**O:** Pisiform

**I:** Proximal phalanx 5<sup>th</sup> digit

**N:** *Deep Branch* of the ulnar nerve  
(C8-T1)

**A:** Abduct 5<sup>th</sup> digit at MCP

## Flexor Digiti Minimi

**O:** Hamate

**I:** Proximal phalanx 5<sup>th</sup> digit

**N:** *Deep Branch* of the ulnar nerve  
(C8-T1)

**A:** Flex 5<sup>th</sup> digit at MCP

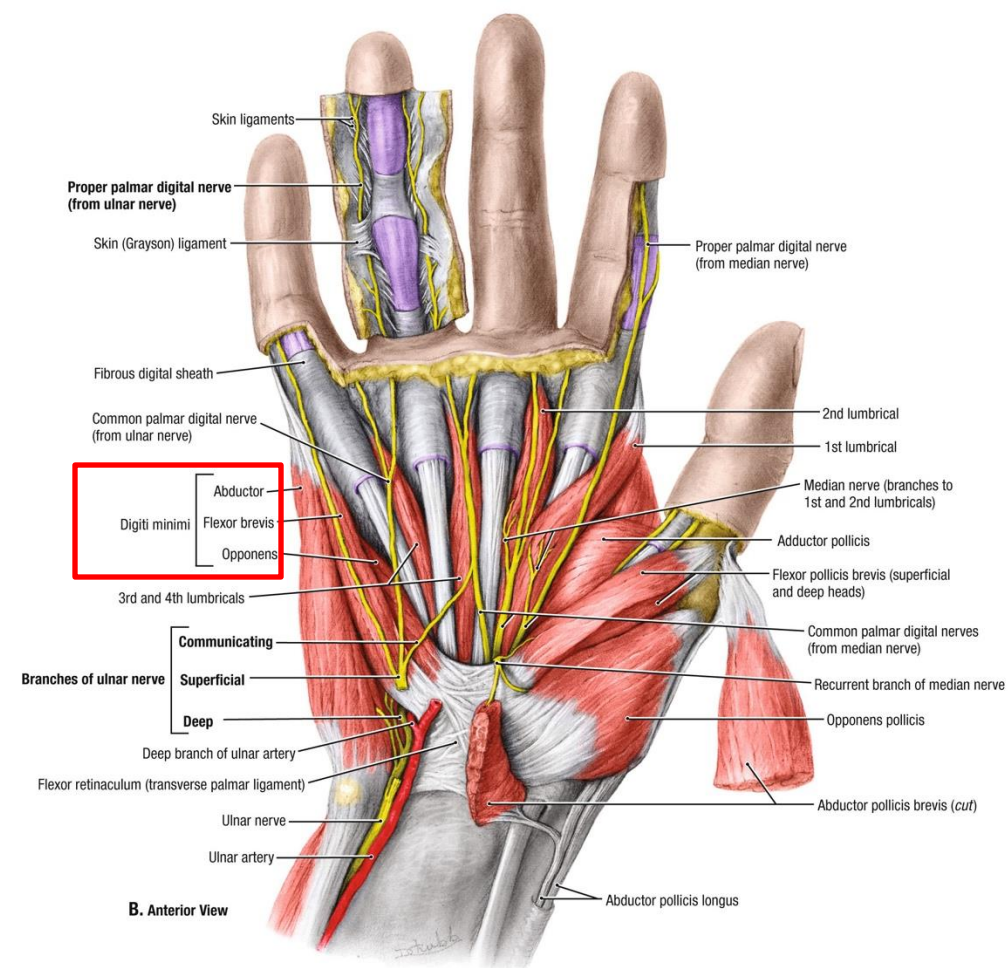
## Opponens Digiti Minimi

**O:** Hamate

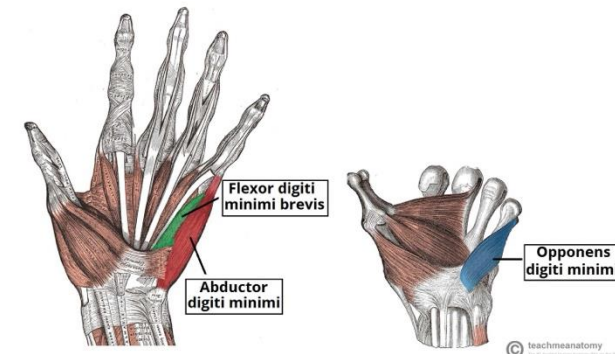
**I:** Shaft of 5<sup>th</sup> metacarpal

**N:** *Deep Branch* of the ulnar nerve  
(C8-T1)

**A:** Opposes little finger (CMC)



Palmar Surface Left Hand



# Muscles of the Central Compartment

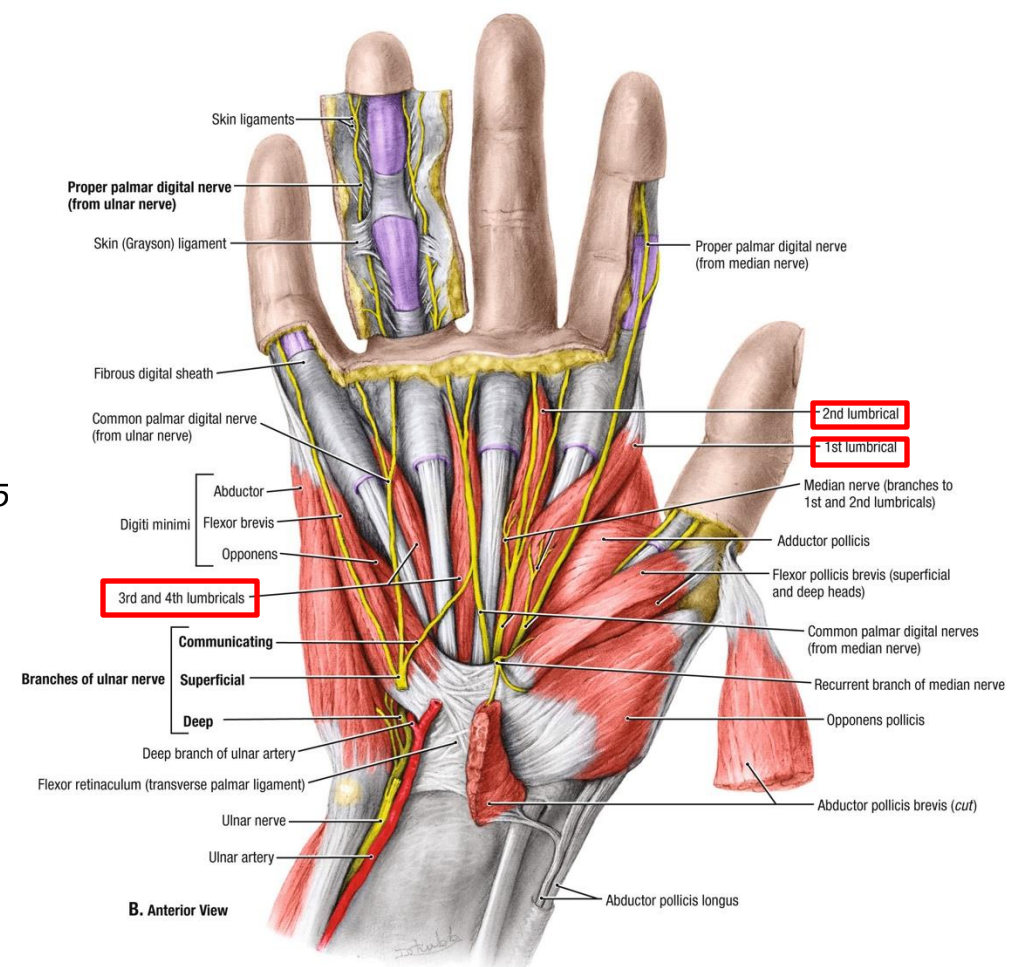
## Lumbricals

**O:** Tendons of Flexor Digi Profundus

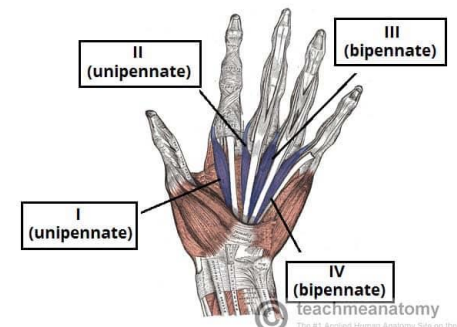
**I:** Extensor expansions of digits 2-5

**N:** *Split innervations:* Medial lumbricals by *Ulnar* nerve, Lateral by *Median* nerve

**A:** Flex at MCP, extend IP joints



Palmar Surface Left Hand



# Muscles of Adductor Compartments

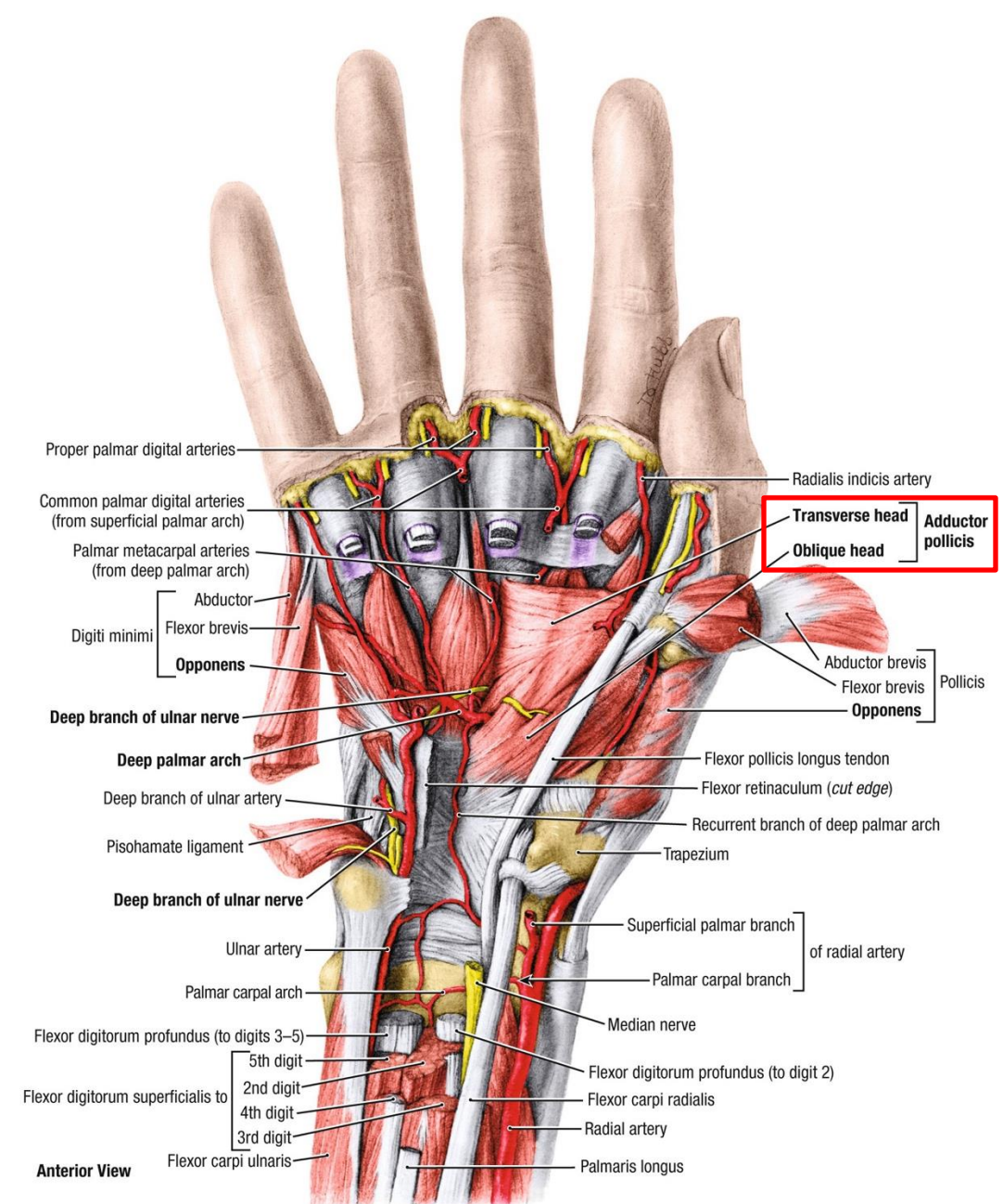
## Adductor Pollicis

**O:** Base of 2<sup>nd</sup>-3<sup>rd</sup> metacarpals (oblique) and shaft (transverse)

**N:** Deep Branch of the ulnar nerve (C8-T1)

**I:** Proximal phalanx of thumb

**A:** Adduct the thumb





# Muscles of the Interosseous Compartment

All muscles are innervated by the deep branch of the ulnar nerve

## Palmar Interossei (3)

**O:** 2<sup>nd</sup>, 4<sup>th</sup>, 5<sup>th</sup> metacarpals

**N:** *Deep Branch* of the ulnar nerve  
(C8-T1)

## Dorsal Interossei (4)

**O:** Adjacent metacarpals

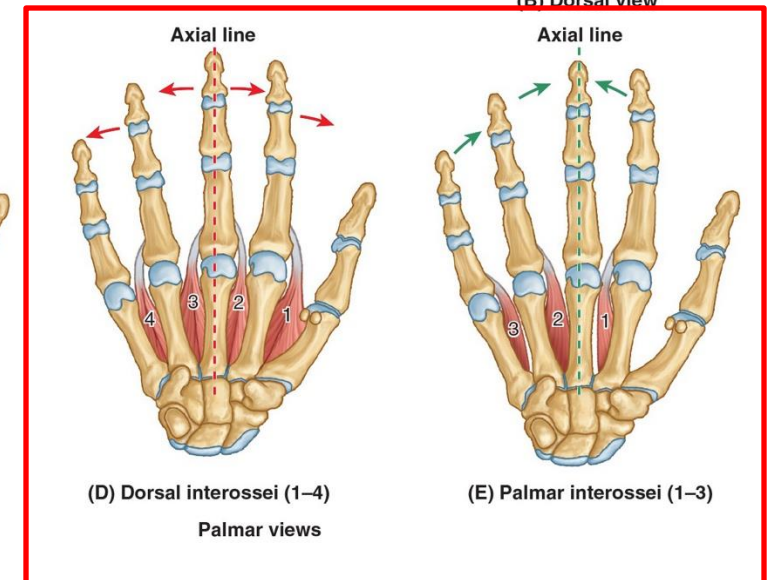
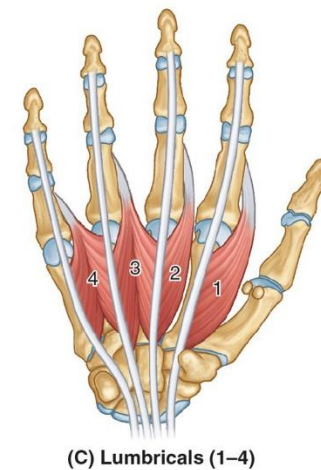
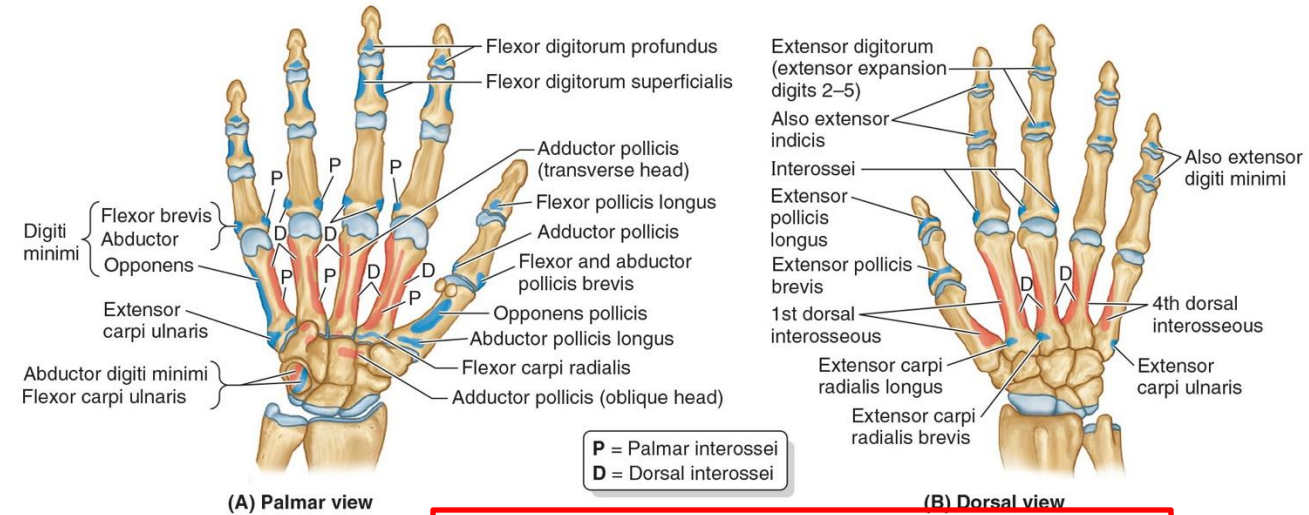
**N:** *Deep Branch* of the ulnar nerve  
(C8-T1)

**I:** Extensor expansions/prox. phalanx of  
2<sup>nd</sup>, 4<sup>th</sup>, 5<sup>th</sup> digits

**A:** Adduct to midline of hand - **PAD**

**I:** extensor expansions/ proximal phalanx  
of 2<sup>nd</sup>-4<sup>th</sup> digits

**A:** Abduct from midline of hand - **DAB**





# Nerves of the Palmar Hand

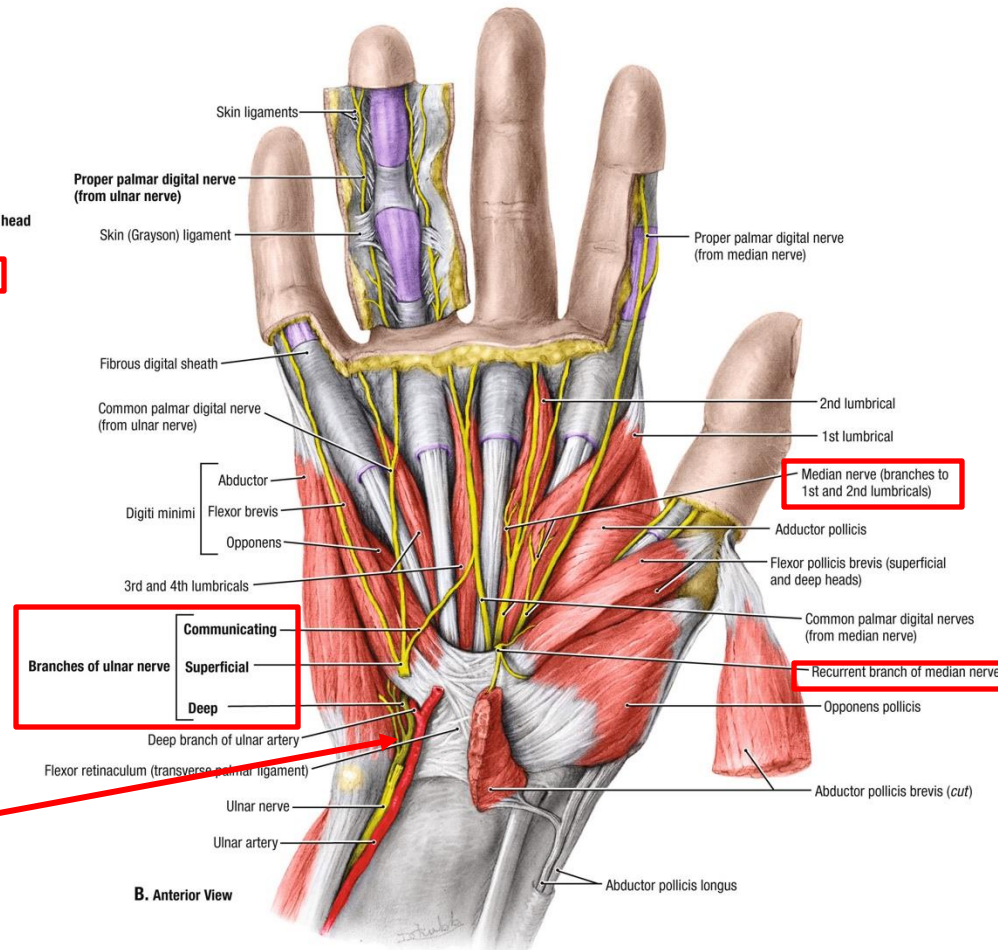
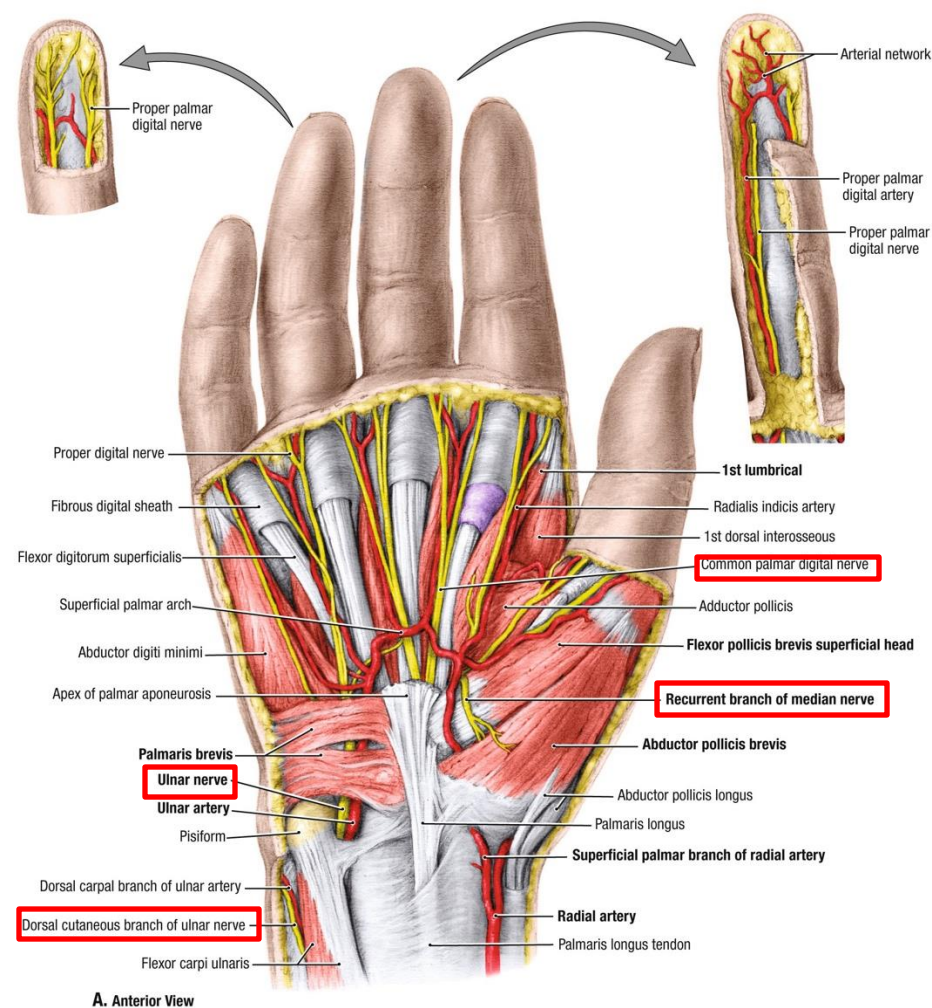
## Muscular Innervation

**Median nerve** – Innervation of the hand via the continuation of the median nerve and the recurrent branch of the median nerve

- *Recurrent branch*: Thenar compartment
- *Continuation*: Lumbricals 1 and 2

**Ulnar Nerve** – Majority of Hand (**C8-T1**)

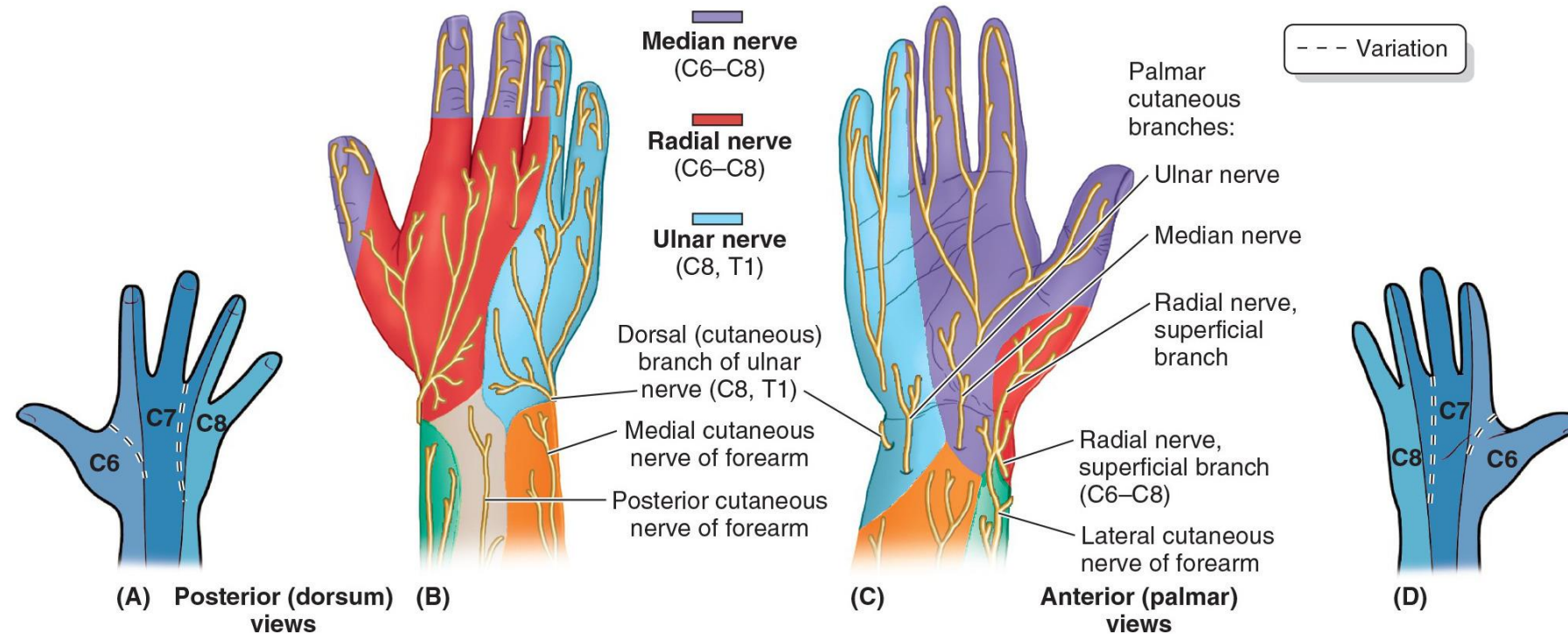
- *Superficial branch* – Palmaris Brevis
- *Deep Branch* – Remaining muscles of hand



**NOTE:**

The ulnar nerve and artery pass superficial to the carpal tunnel

# Cutaneous Innervation Palmar Hand



## Cutaneous Innervation

### Median nerve – Branches

- *Palmar cutaneous branch* – skin of lateral palm
- *Digital branches* – Palmar surface of *lateral 3.5 digits*

### Ulnar Nerve – Branches

- *Palmar and dorsal cutaneous branch* – medial region of the palmar and dorsal hand
- *Superficial Branch* – Medial 1.5 digits via digital branches

*Note the dermatomal distribution of the hand:  
Thumb – C6, Middle finger – C7, Pinky C8*



# Arteries of the Palmar Hand

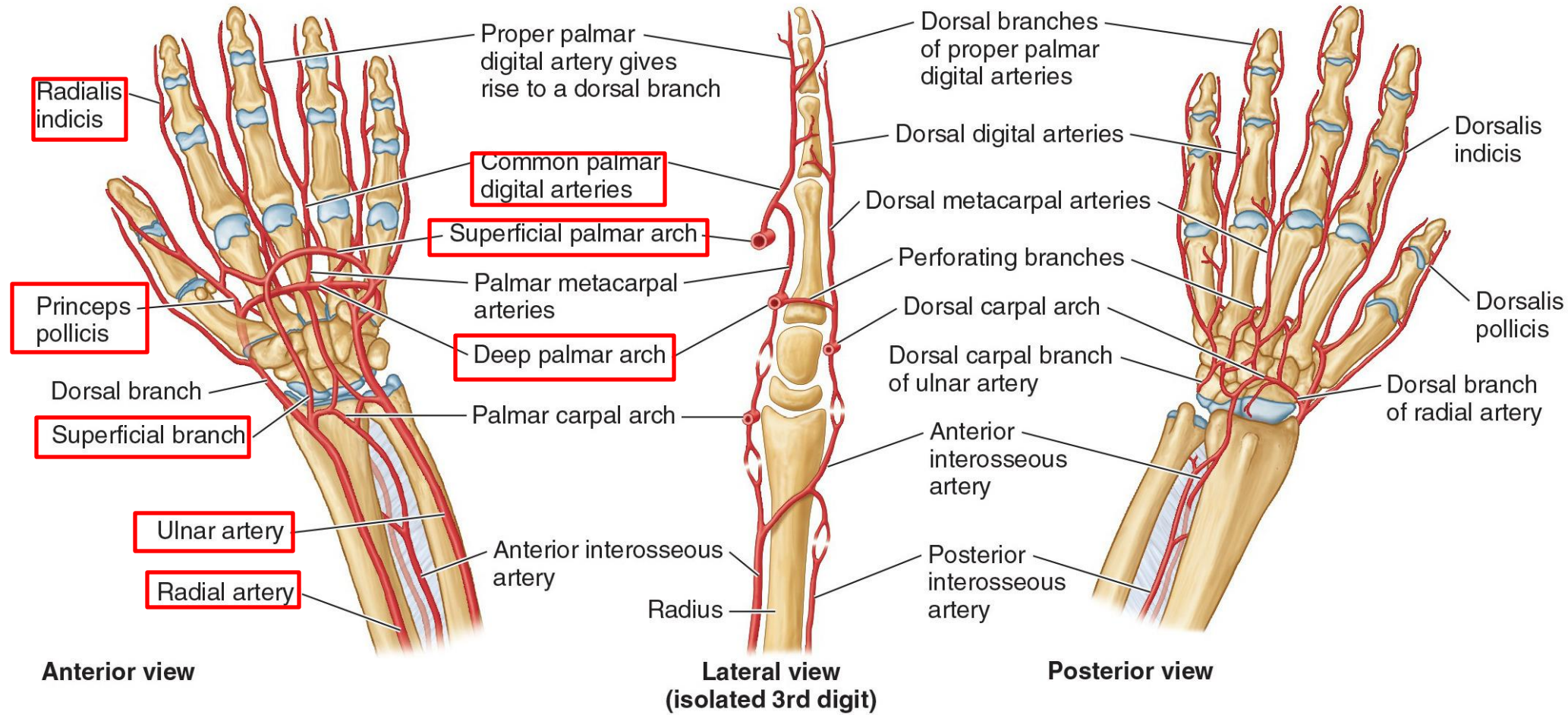
## Branch Points

### Branches of Ulnar

- Deep Palmar Branch
- Superficial Palmar Arterial Arch
- Digital Arches (med 3.5 digits)

### Branches of Radial

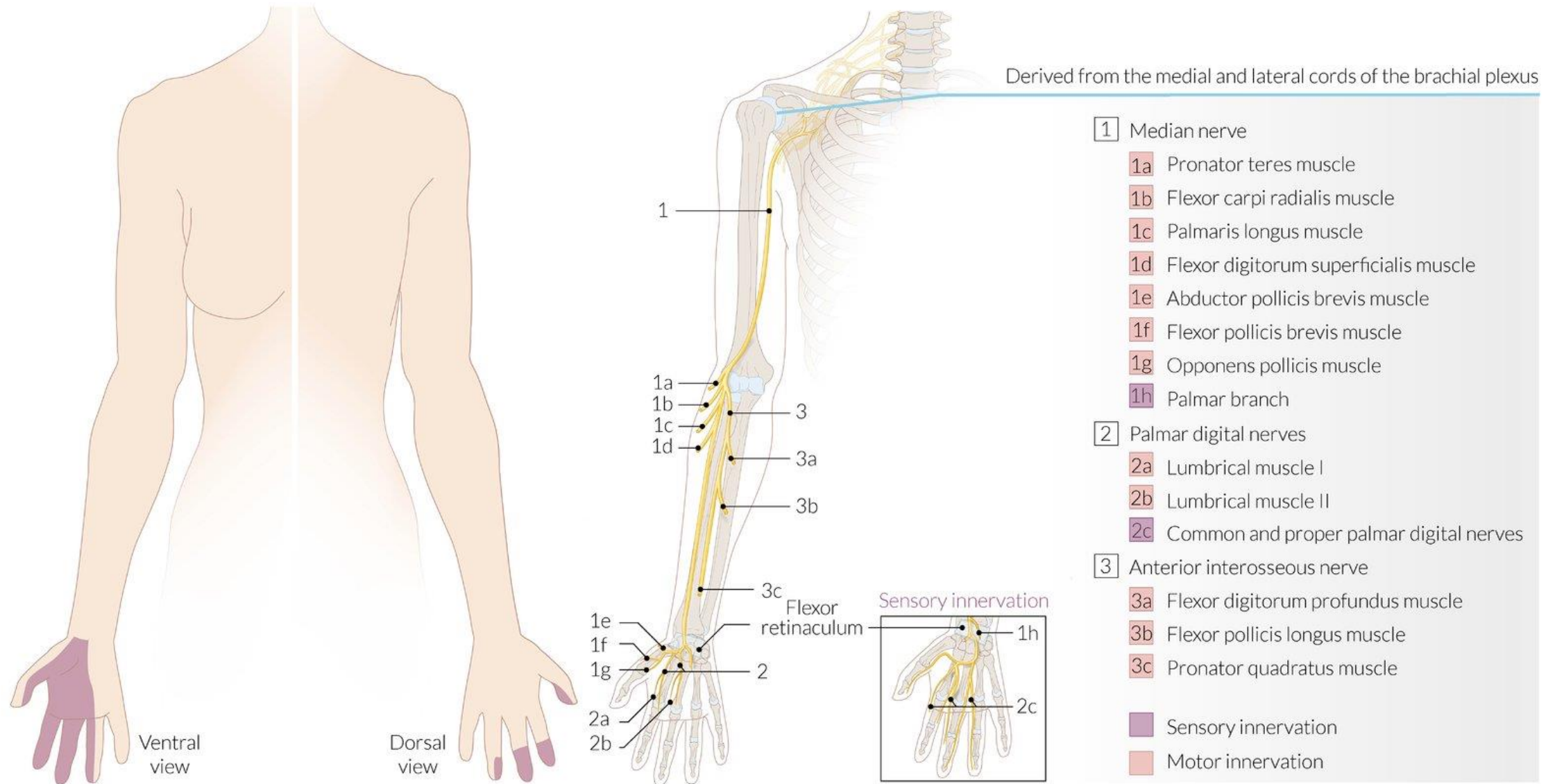
- Superficial palmar branch
- Princeps pollicis
- Radialis Indicis
- Deep palmar arterial arch



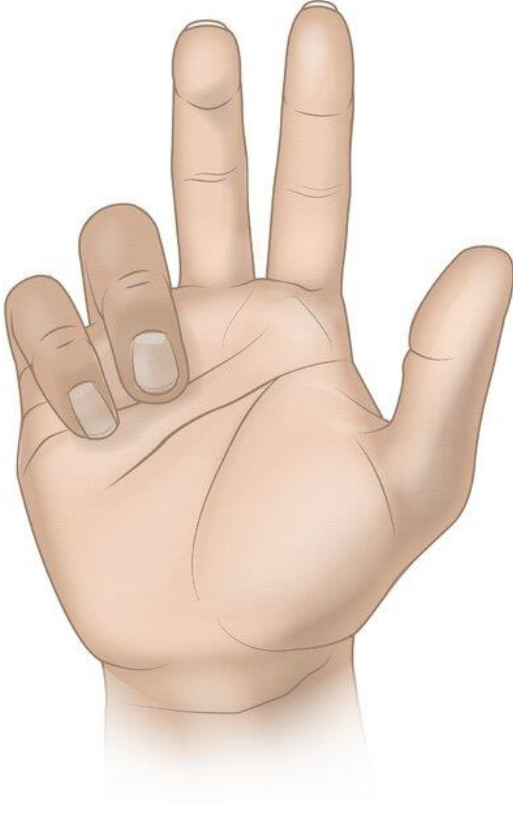
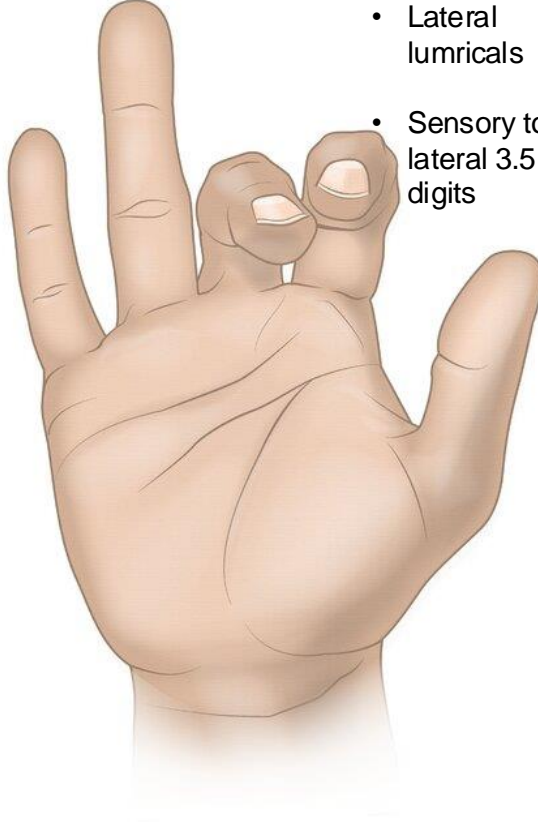
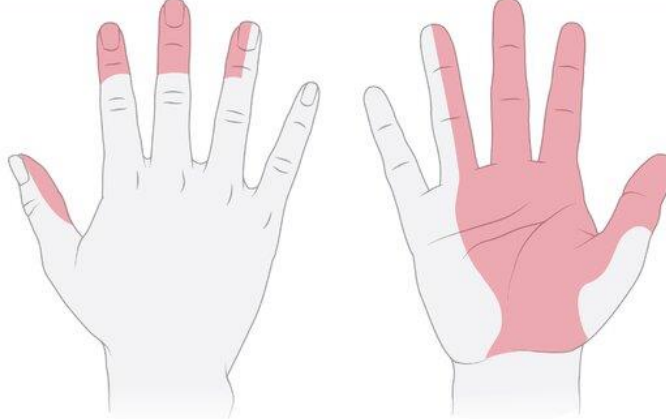
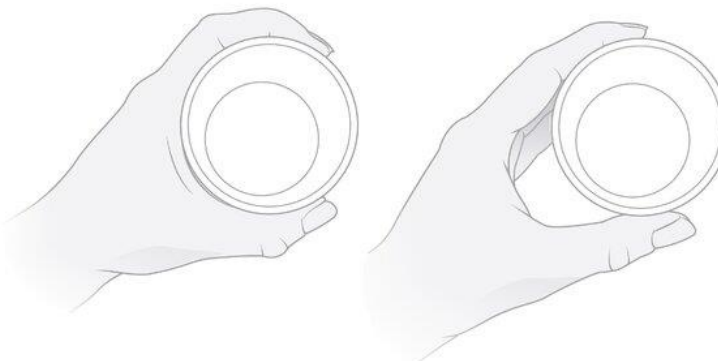
# CLINICAL ANATOMY



# Median Nerve Lesions



# Median Nerve Lesions – Continued



Proximal median nerve lesions (above AI nerve origin)	Distal median nerve lesions (below AI nerve origin)	Proximal and distal lesions
<p>AI = Anterior Interosseous</p> 	<p><u>Loss of</u></p> <ul style="list-style-type: none"> <li>• Thenar mus.</li> <li>• Lateral lumbricals</li> <li>• Sensory to lateral 3.5 digits</li> </ul> 	 <p>Sensory deficits</p>  <p>Normal      Bottle sign</p> <p>When patient holds cylindrical object</p>
<p><b>Hand of benediction (Pope's blessing)</b></p> <p>When patient tries to make a fist</p>	<p><b>Median claw</b></p> <p>When patient tries to extend fingers</p>	

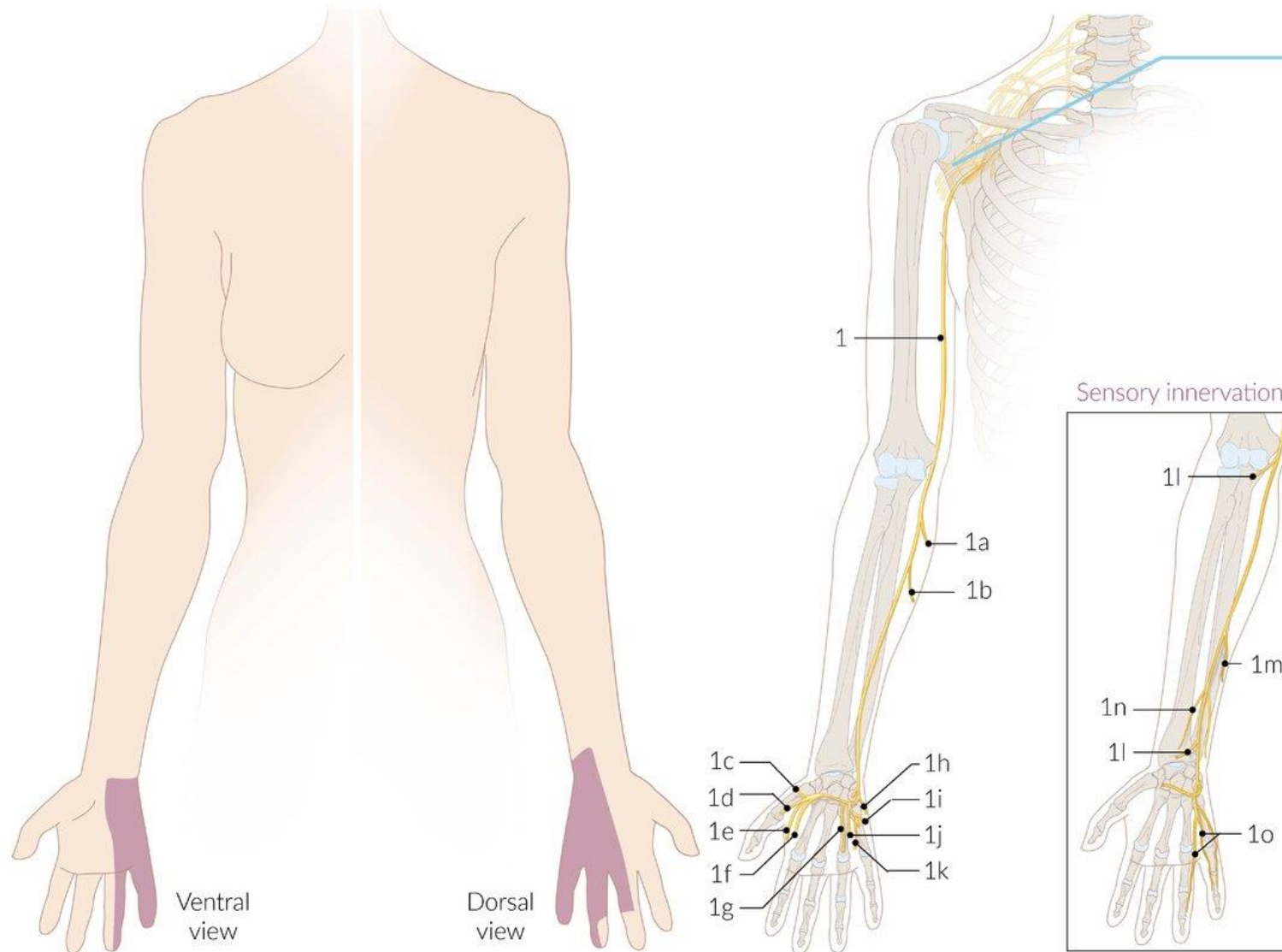
# Ulnar Nerve Lesions

Derived from the medial cord of the brachial plexus

## 1 Ulnar nerve

- 1a Flexor carpi ulnaris muscle
- 1b Flexor digitorum profundus muscle (digits III–V)
- 1c Adductor pollicis muscle
- 1d Flexor pollicis brevis muscle, deep head
- 1e Dorsal interosseous muscles I–IV
- 1f Palmar interosseous muscles I–III
- 1g Lumbrical muscles III and IV
- 1h Abductor digiti minimi muscle
- 1i Flexor digiti minimi brevis muscle
- 1j Opponens digiti minimi muscle
- 1k Palmaris brevis muscle
- 1l Articular branches
- 1m Dorsal branches of ulnar nerve
- 1n Palmar branches of ulnar nerve
- 1o Palmar digital nerves

 Sensory innervation  
 Motor innervation



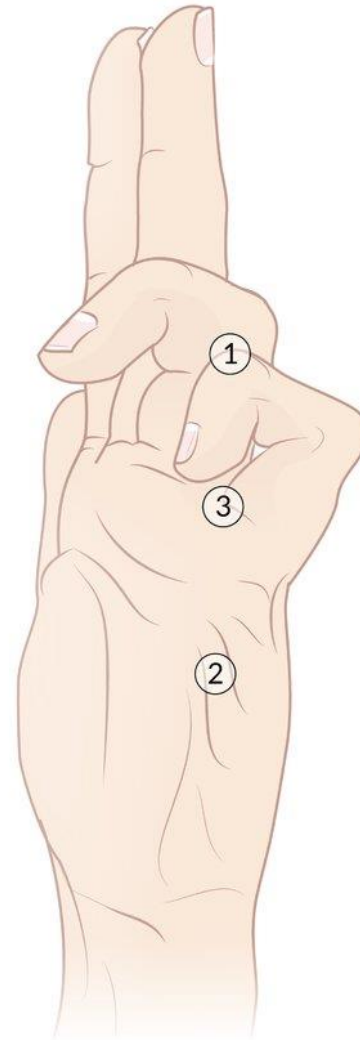


# Ulnar Nerve Lesions-Continued

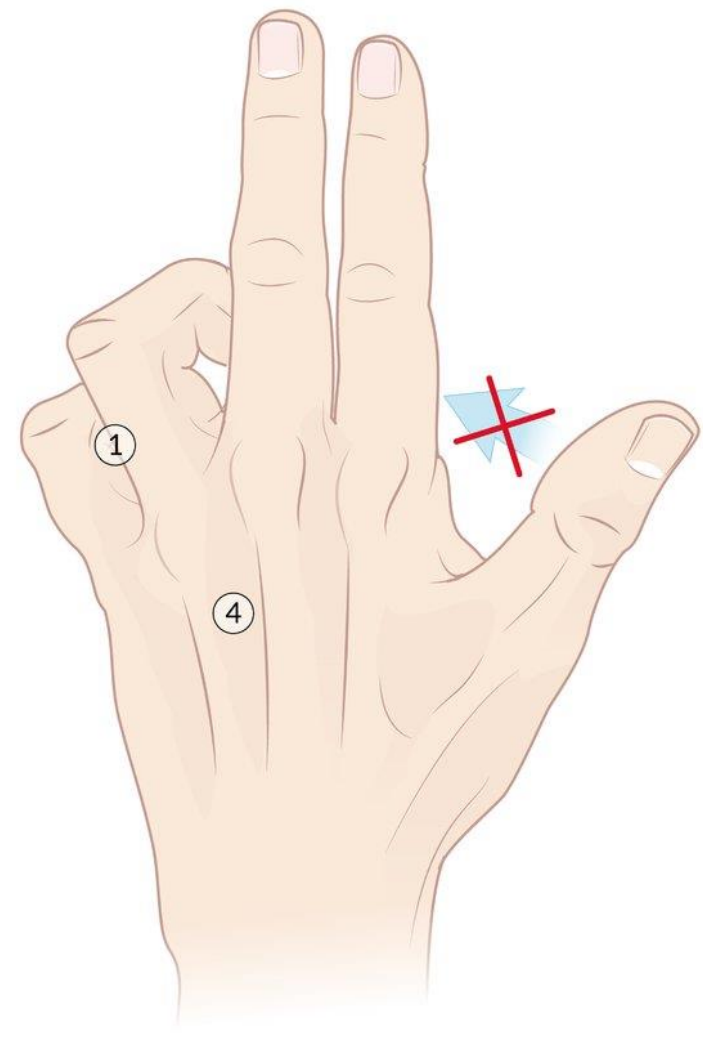
- ① Flexion of PIP and DIP at the 4<sup>th</sup> and 5<sup>th</sup> digits
- ② Hypothenar atrophy
- ③ Hyperextension of the 4<sup>th</sup> and 5<sup>th</sup> digits at the MCP joints
- ④ Atrophy of the interosseous muscles
- ✗ Inability to adduct thumb



Frontal view



Ulnar lateral view



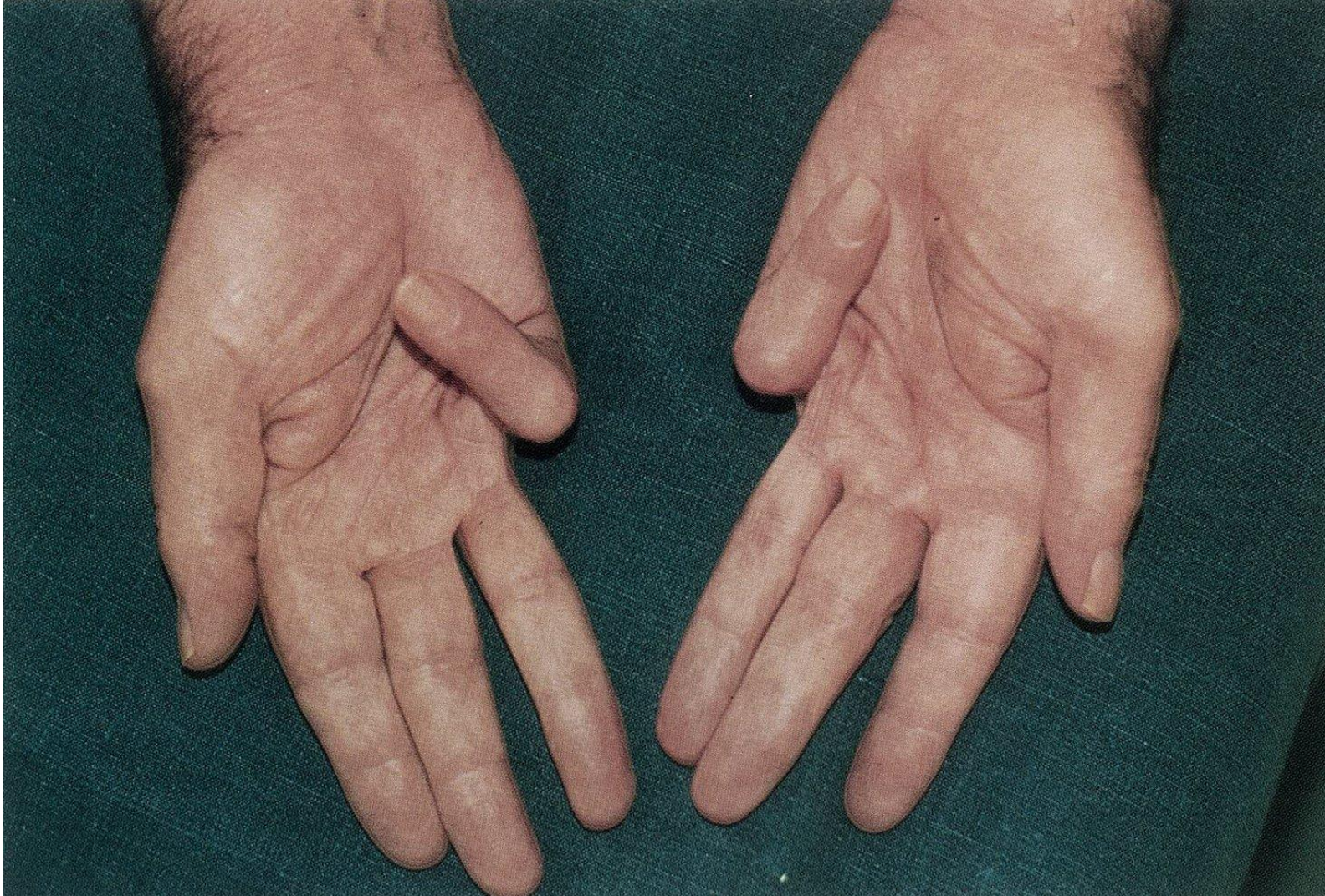
Dorsal view

## Loss of

- Abduction/Adduction of fingers
- Flexion and opposition of 5<sup>th</sup> digit
- Flexion of medial two MCP
- Extension of 4<sup>th</sup> and 5<sup>th</sup> IP joint



# Dupuytren Contracture



## Dupuytren Contracture

- Progressive shortening and fibrosis of the palmar aponeurosis
- This thickening can extend to the fingers and cause them to flex