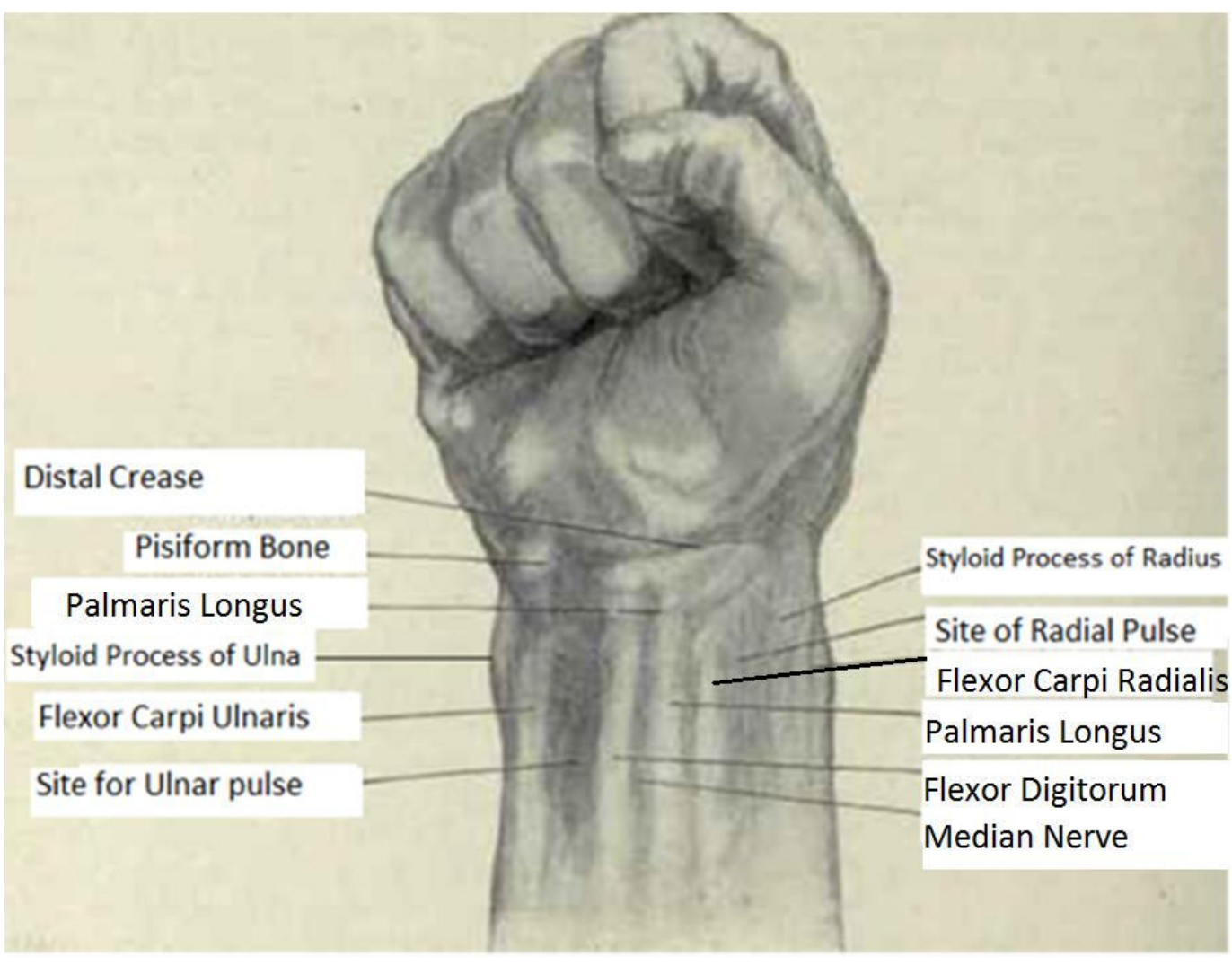
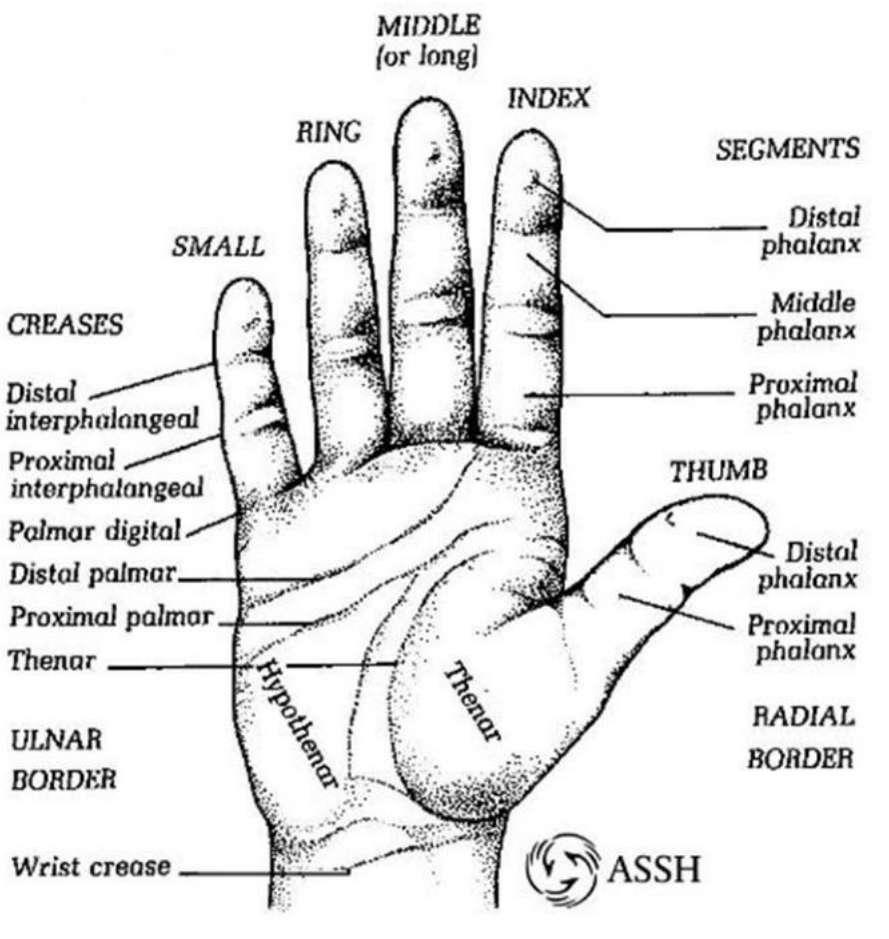
Learning objectives

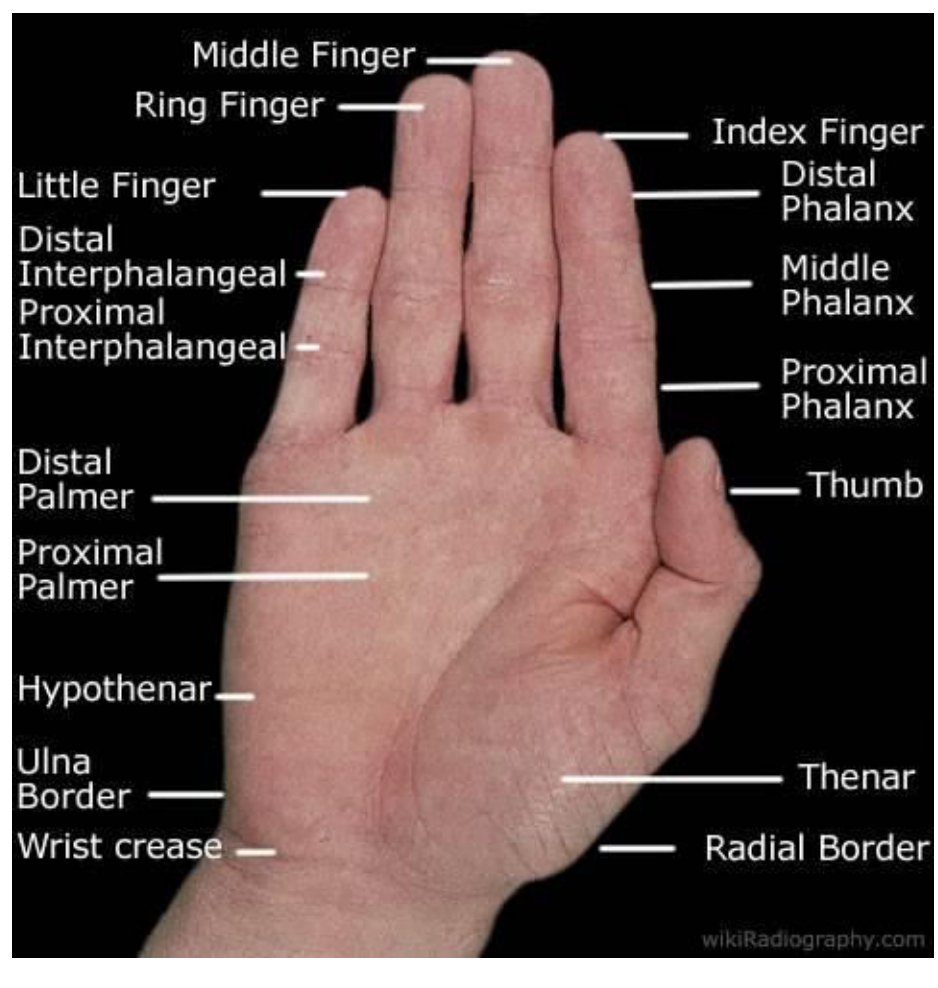
- Surface anatomy of Hand
- Bony landmarks
- Compartments and Spaces of hand
- Flexor Retinaculum & Structures passing below & above FR
- Intrinsic muscles of hand
- Superficial & Deep Palmar Arches
- Dorsum of hand & Dorsal venous Arch
- Nerves in hand
- Applied anatomy

Surface Anatomy

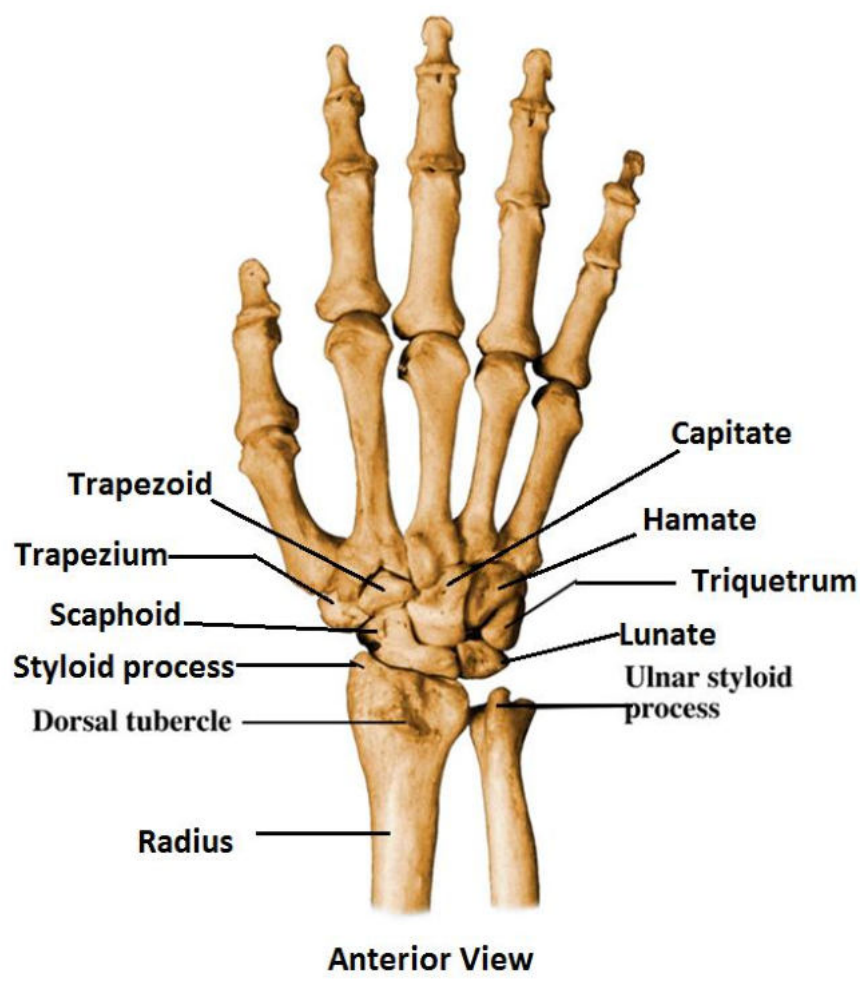


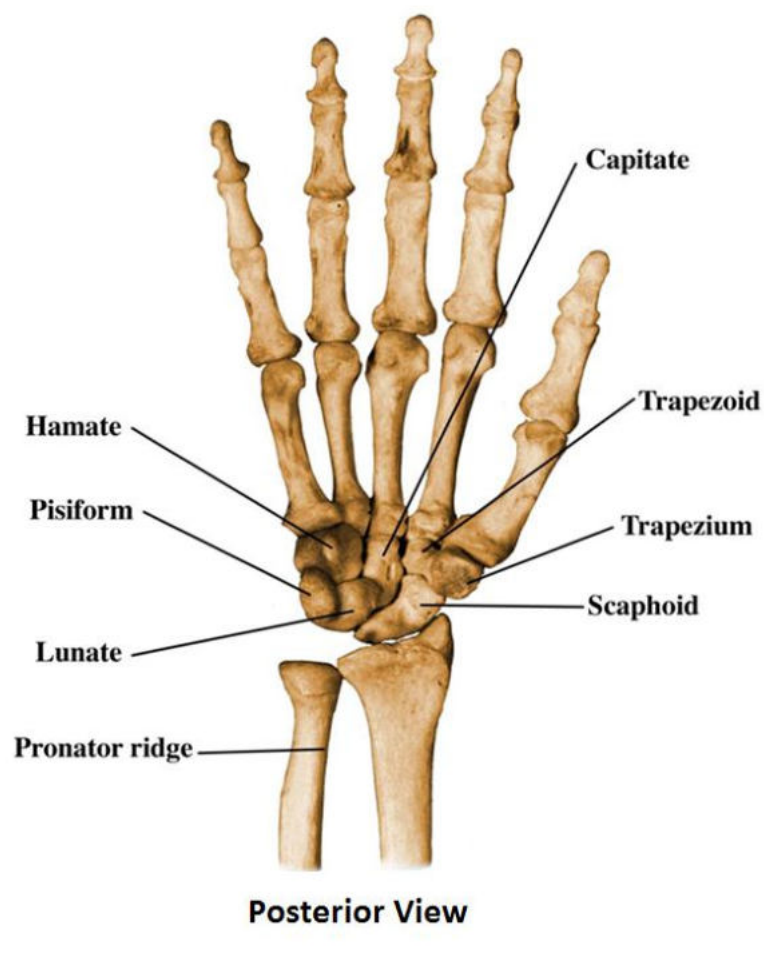
Surface Anatomy





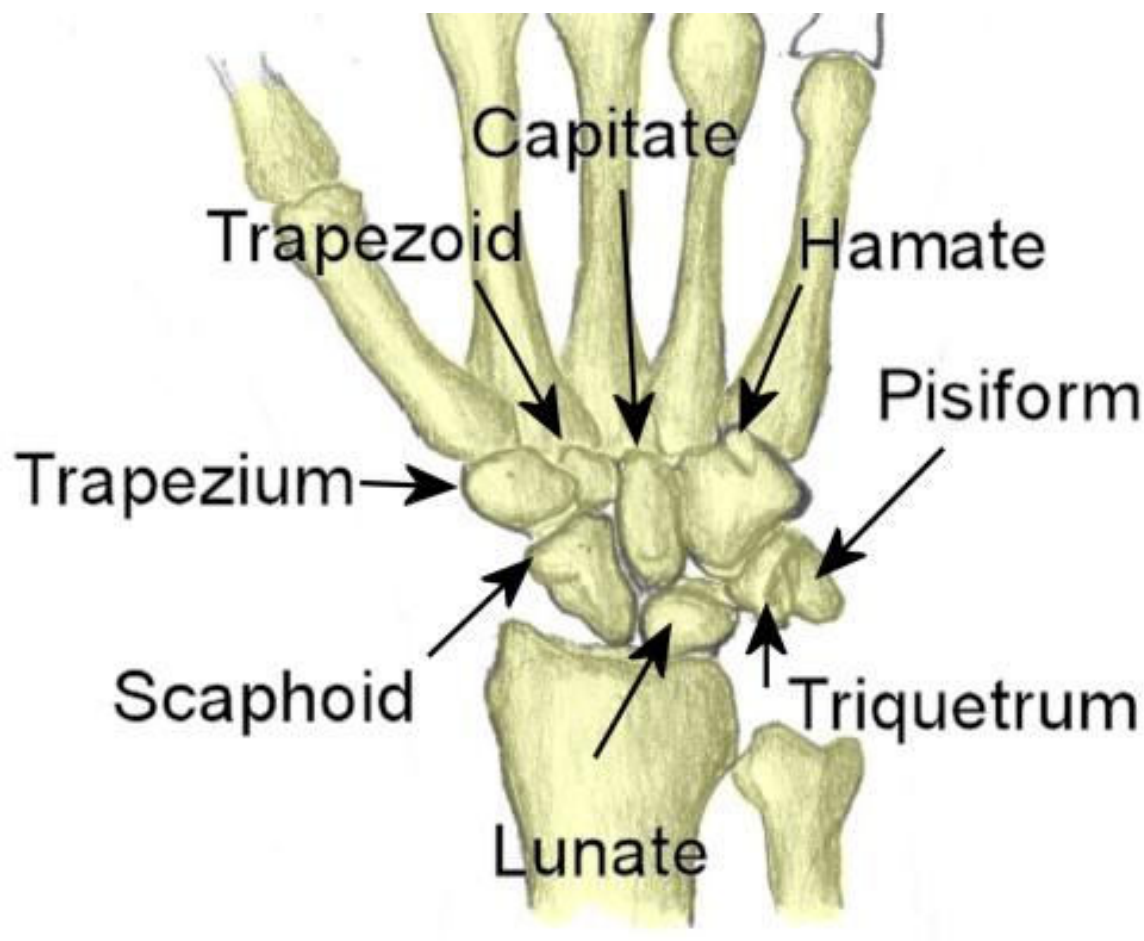
Wrist Bones



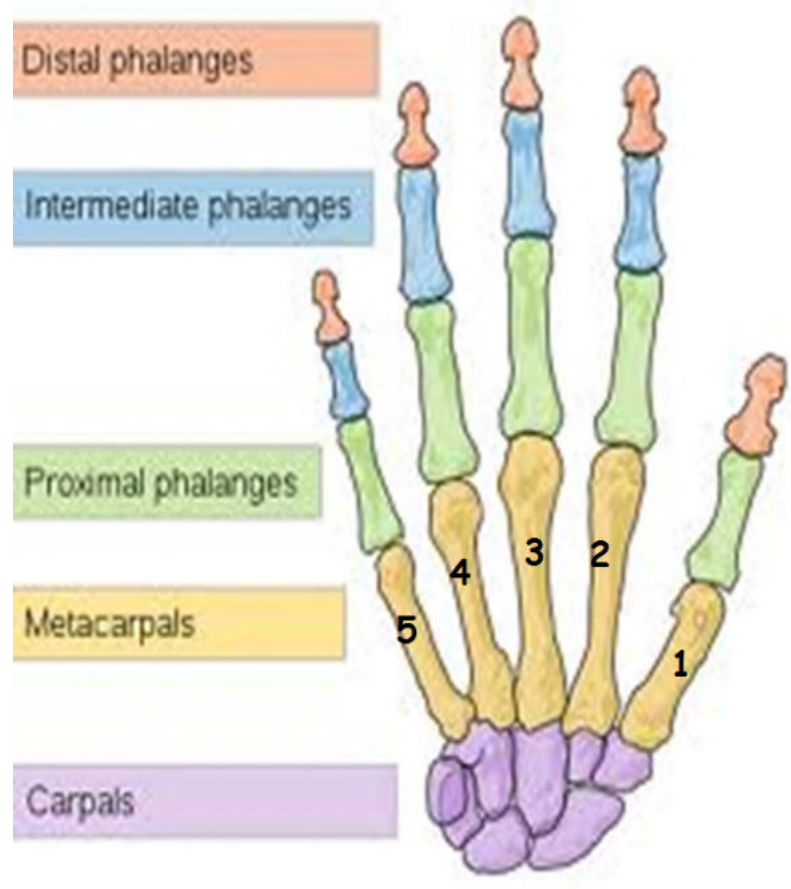


Wrist Bones

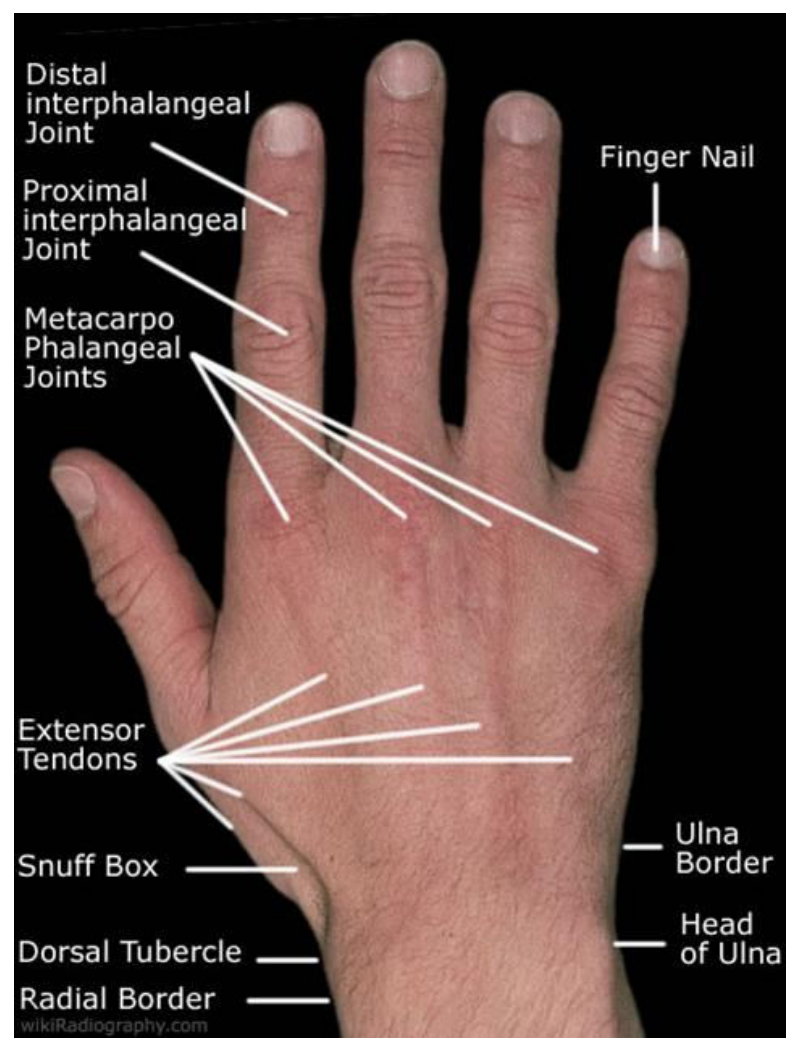
She
Looks
Too
Pretty
Try
To
Catch
Her



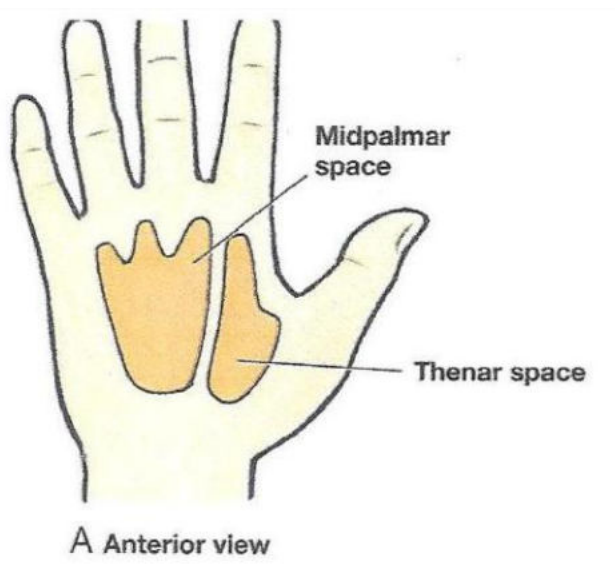
Hand Bones



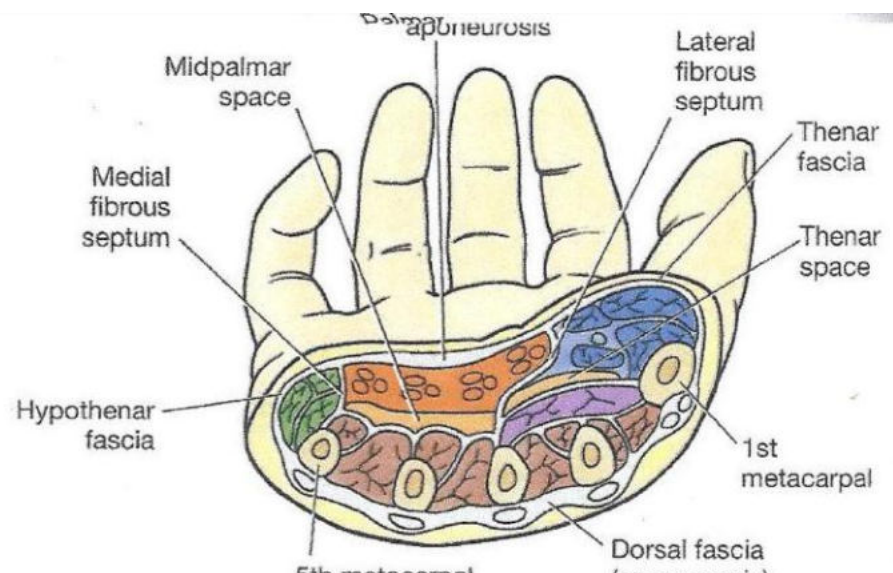
Anatomical Snuff Box



Compartments & Spaces



A Anterior view



B Transverse section

Key for A and B

5 Compartments:
1. Hypothenar
2. Thenar
3. Central
4. Adductor
5. Interosseous

Fibrous septa
Midpalmar and thenar spaces

FIGURE 6.41. Compartments and spaces of palm. A. Schematic illustration showing location of thenar and midpalmar spaces. B. Transverse sec showing compartments and spaces.

The Skin

PALM: characteristics:

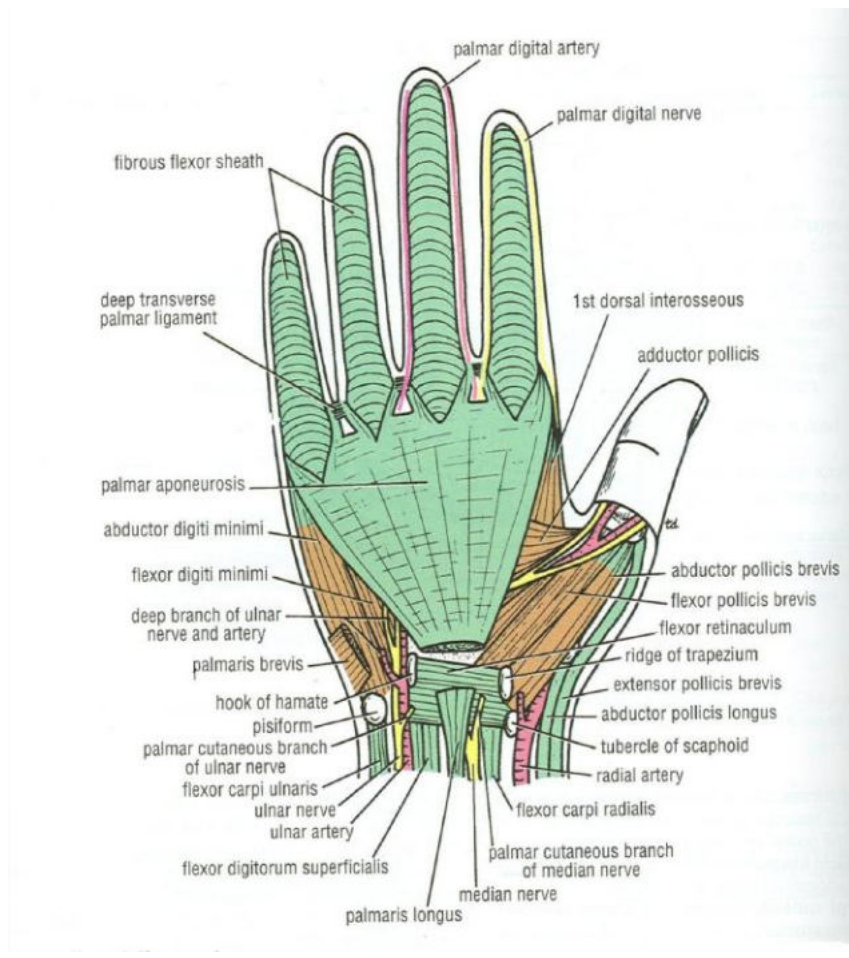
- Flexure creases (lines of palm)
- Papillary ridges (fingerprints): improve grip & increase surface area
- Fibrous bands connecting it to palmar aponeurosis & dividing subcutaneous fat into small loculi (water-cushion withstanding considerable pressure)
- Abundant sweat gland

Superficial Fascia

PALM: characteristics:

- Contains: cutaneous nerves & vessels
- Contains: Palmaris brevis (increases the hollow of palm to get a firmer grip

Deep Fascia



Palmar Aponeurosis

It is a thickening of deep fascia in the middle of the palm

DESCRIPTION: It is triangular in shape:

- Apex: directed proximally, continuous with tendon of palmaris longus
- Base: directed distally, divided into 4 slips for the medial 4 fingers
- Margins: send septa to metacarpal bones separating the structures under the aponeurosis from thenar & hypothenar muscles

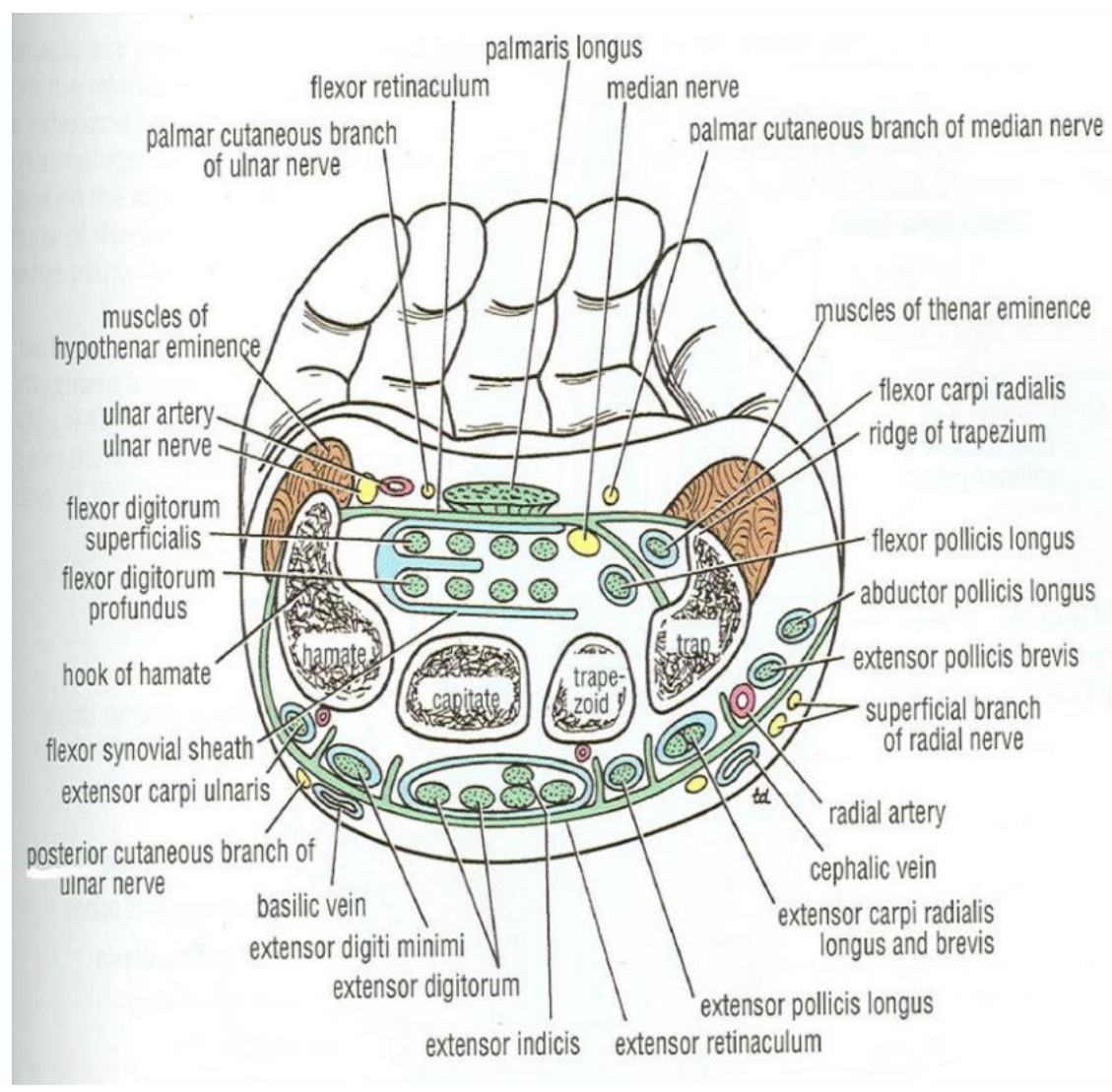
FUNCTION: It protects the underlying tendons, vessels & nerves

CLINICAL ANATOMY: DUPUYTREN'S CONTRACTURE: shortening of the medial part of aponeurosis resulting in flexion of the little & ring fingers

Deep Fascia

Flexor retinaculum:

- Definition
- Attachments
- Relations
- Functions
- Clinical anatomy: Carpal tunnel syndrome



Flexor Retinaculum

- It is a thickening of deep fascia that lies over the front of the carpal bones converting the carpal groove (formed by carpal bones) into a tunnel

ATTACHMENTS:

- Lateral: by 2 laminae: superficial (to tubercles of scaphoid & trapezium) & deep (to the medial lip of the groove on the trapezium)
- Medial: to pisiform & hook of hamate

Flexor Retinaculum

RELATIONS:

- **Superficial: from lateral to medial:**
- Superficial palmar branch of radial artery
- Palmar cutaneous branch of median nerve
- Tendon of palmaris longus
- Palmar cutaneous branch of ulnar nerve
- Ulnar vessels
- Ulnar nerve
- **Deep: Structures passing through carpal tunnel**
- Tendon of FPL & its synovial sheath (radial bursa)
- Tendons of FDS & FDP & their common synovial sheath (Ulnar bursa)
- Tendon of FCR & its synovial sheath (in a special compartment)
- Median nerve

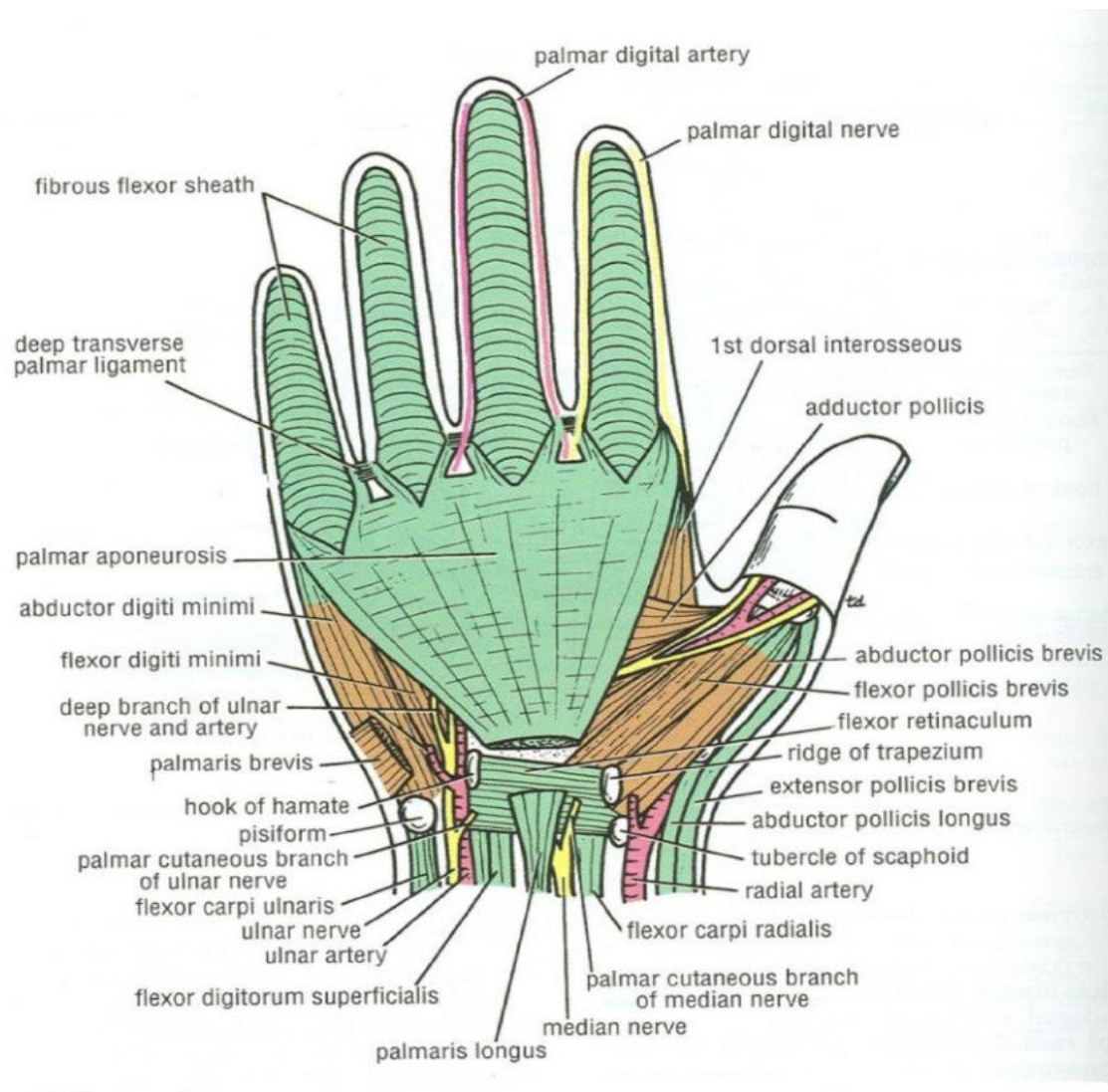
Flexor Retinaculum

- FUNCTION: It keeps the flexor tendons in position during movement of wrist joint
- CLINICAL ANATOMY (CARPAL TUNNEL SYNDROME): Compression of median nerve under the flexor retinaculum

Deep Fascia

Fibrous flexor sheaths

- Definition
- Attachments
- Function



Fibrous Flexor Sheath

- DEFINITION: It is a thickening of deep fascia in front of the fingers

ATTACHMENTS:

- Proximal: to the slips of palmar aponeurosis
- Distal: to the base of distal phalanx
- On either side: to the side of phalanx

FUNCTION: It holds the long flexor tendons during flexion of the fingers

Intrinsic Muscles Of Hand

Situated totally within the hand

Divided into 4 groups:-

- **Thenar**
- **Hypothenar**
- **Lumbricals**
- **Interossei muscles**

Intrinsic Muscles

- LATERAL GROUP:
  - FOUR THENAR MUSCLES
- MEDIAL GROUP:
  - THREE HYPOTHENAR MUSCLES
- PALMARIS BREVIS
- CENTRAL GROUP:
  - FOUR LUMBRICALS
  - FOUR PALMAR INTEROSSEI
  - FOUR DORSAL INTEROSSEI
- ALL MUSCLES ARE SUPPLIED BY C8 & T1 SPINAL SEGMENTS THROUGH MEDIAN & ULNAR NERVES

Intrinsic Muscles

Thenar Muscles:

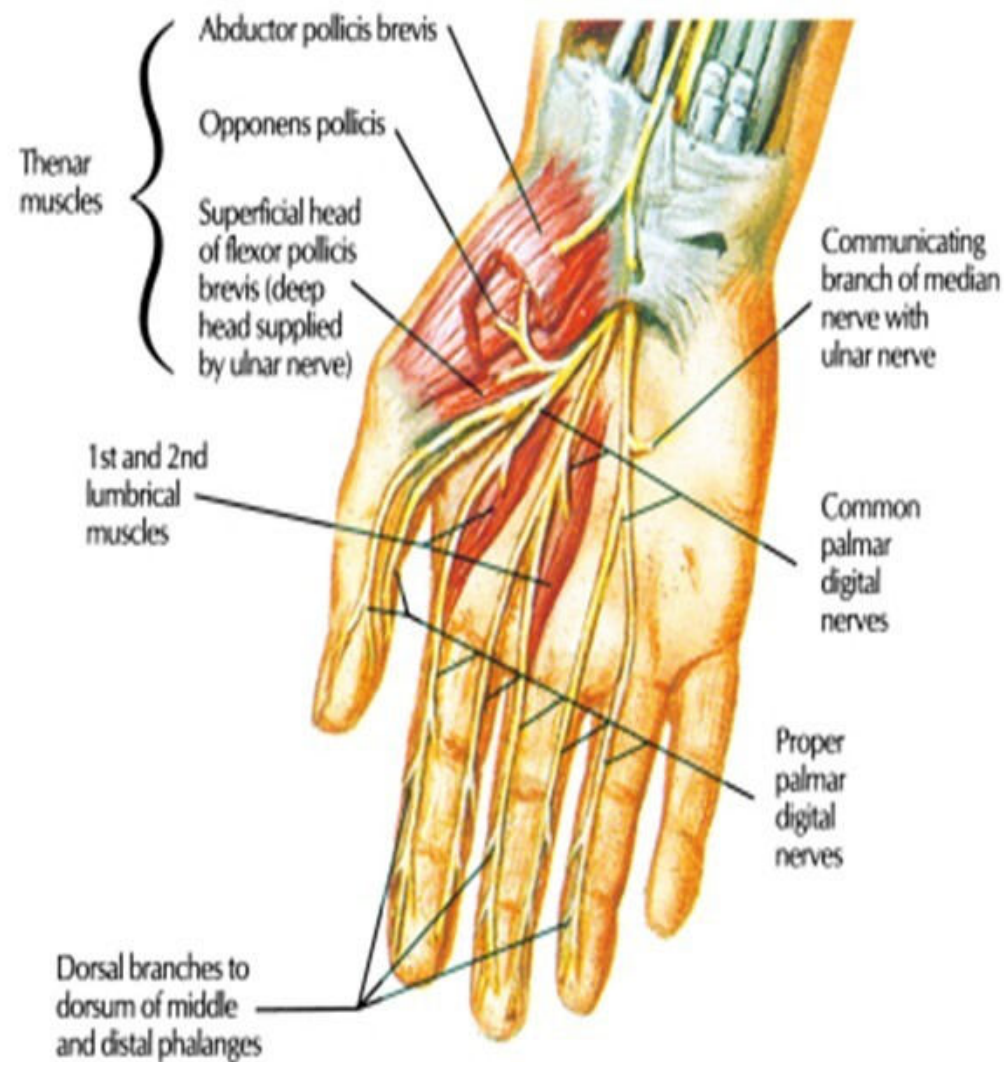
- Abductor Pollicis Brevis
- Flexor Pollicis Brevis
- Opponens Pollicis
- Adductor Pollicis

Hypothenar Muscles:

- Abductor Digiti Minimi
- Flexor Digiti Minimi
- Opponens Digiti Minimi

The Thenar Group

- Abductor Pollicis Brevis
- Flexor Pollicis Brevis
- Opponens Pollicis
- Adductor Pollicis Muscles



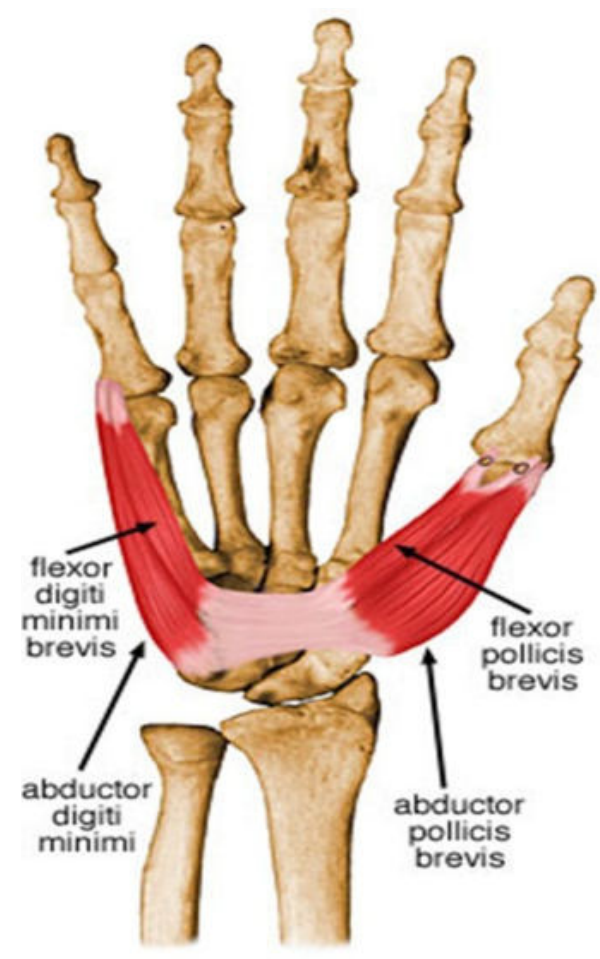
ABDUCTOR POLLICIS BREVIS

Origin Scaphoid & Trapezium & Flexor Retinaculum

Insertion Lateral side of base of proximal phalanx of thumb

Action Abducts thumb

Innervation median nerve (C8 and T1



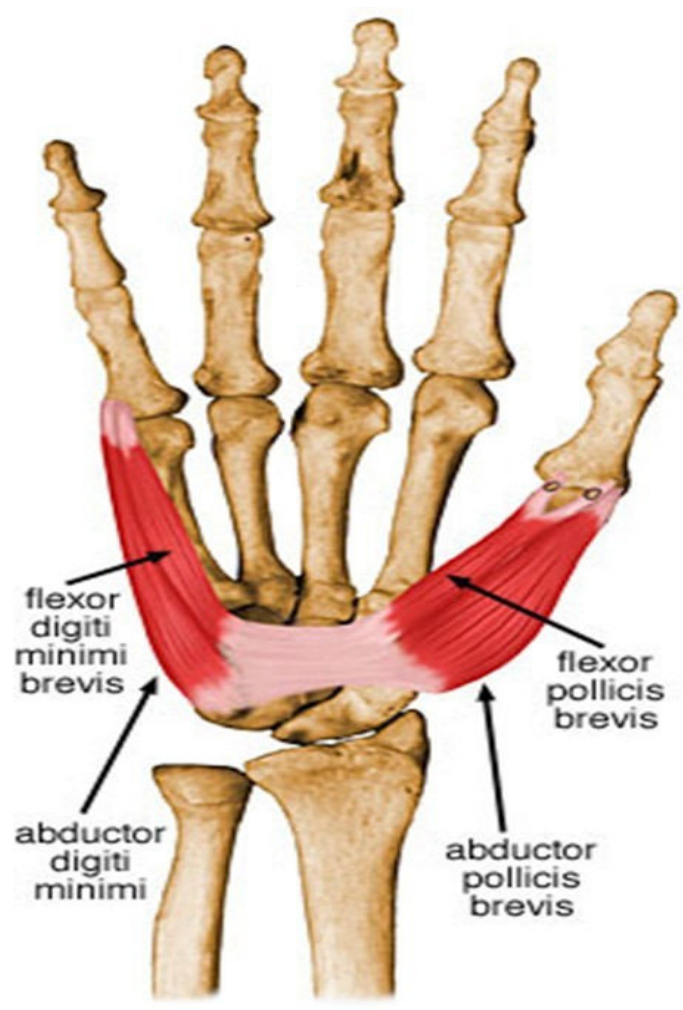
Flexor Pollicis Brevis

Origin **S-**Tubercle of Trapezium D-Capitate & Trapezoid bones

Insertion Lateral side of base of proximal phalanx of thumb

Action Flexes thumb

Innervation Recurrent branch of median nerve (**C8** and T1)



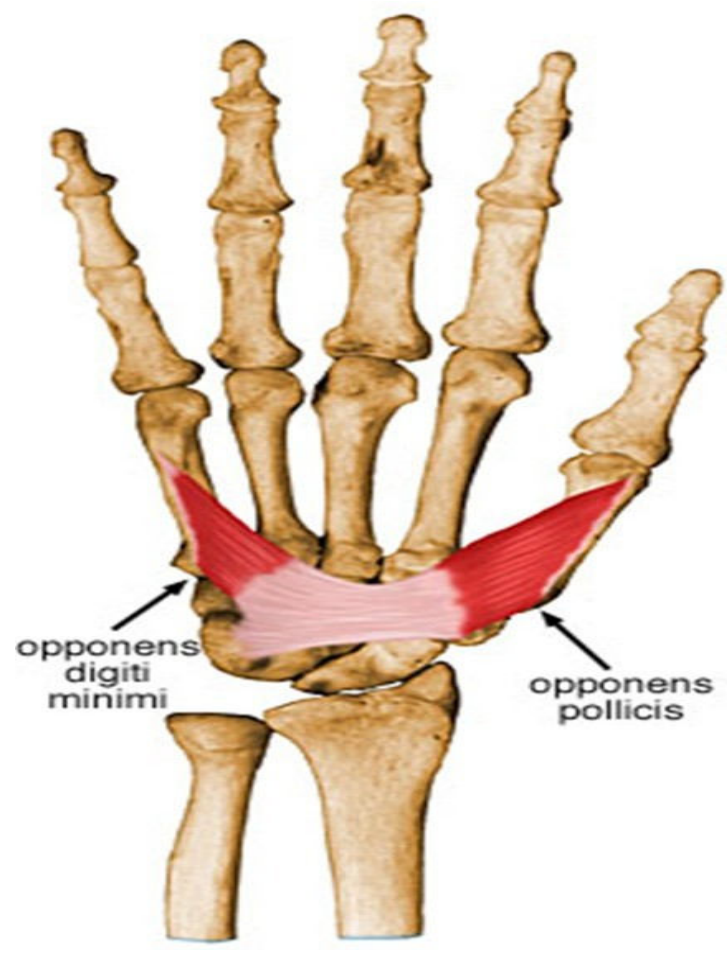
Opponens Pollicis

Origin Flexor retinaculum and Tubercles of Trapezium

Insertion Lateral side of 1st metacarpal

Action Draws 1st metacarpal laterally to oppose thumb toward center of palm

Innervation Recurrent branch of median nerve (C8 and T1)



Adductor Pollicis

It has 2 heads that are separated by a gap through which the radial artery passes

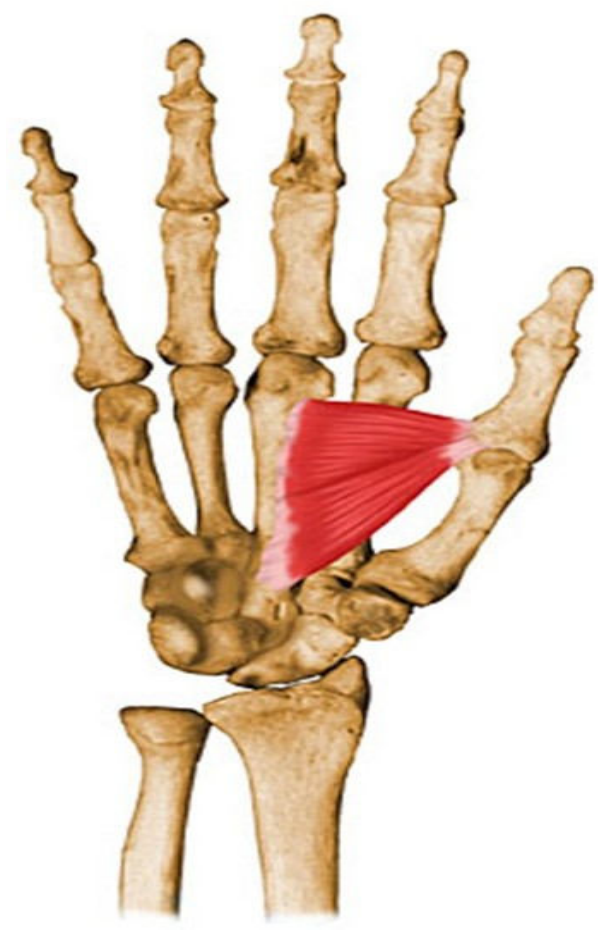
Origin: Oblique head – capitate & bases of 2nd and 3rd metacarpals,

Transverse head – anterior surface of body of 3rd metacarpal bone

Insertion: medial side of base of proximal phalanx of thumb

Innervation: ulnar nerve

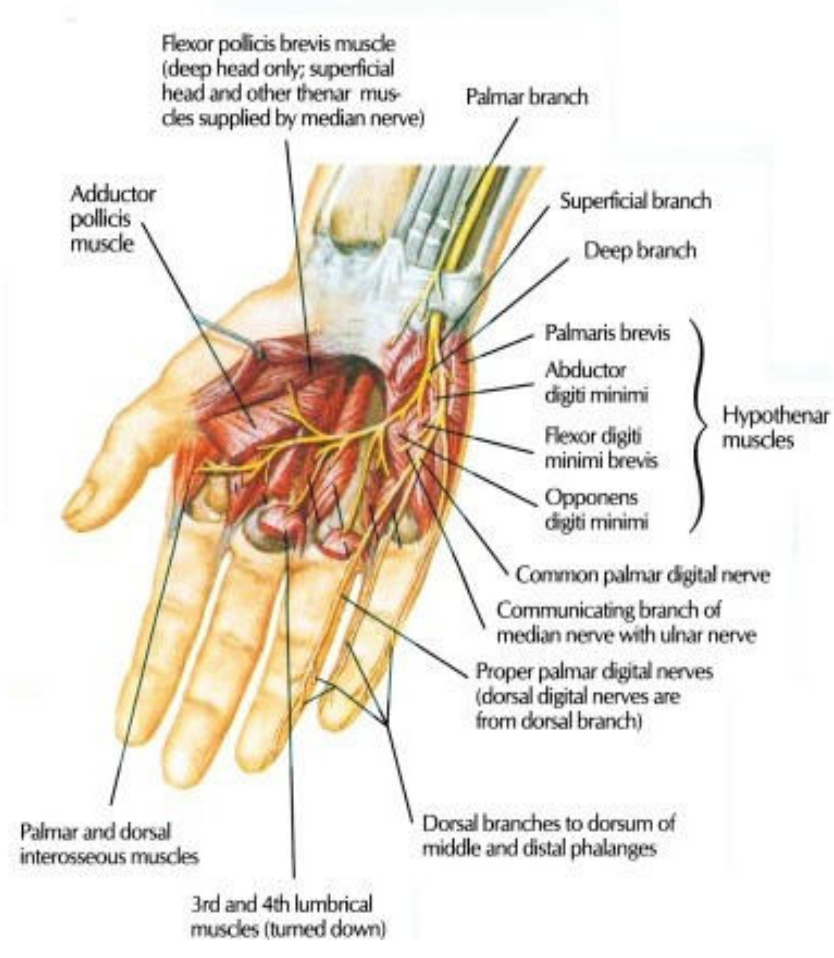
Action: adducts thumb towards middle digit



The Hypothenar Group

Hypothenar muscles

1. Opponens Digiti Minimi
2. Abductor Digiti Minimi
3. Flexor Digiti Minimi Brevis
4. Palmaris Brevis



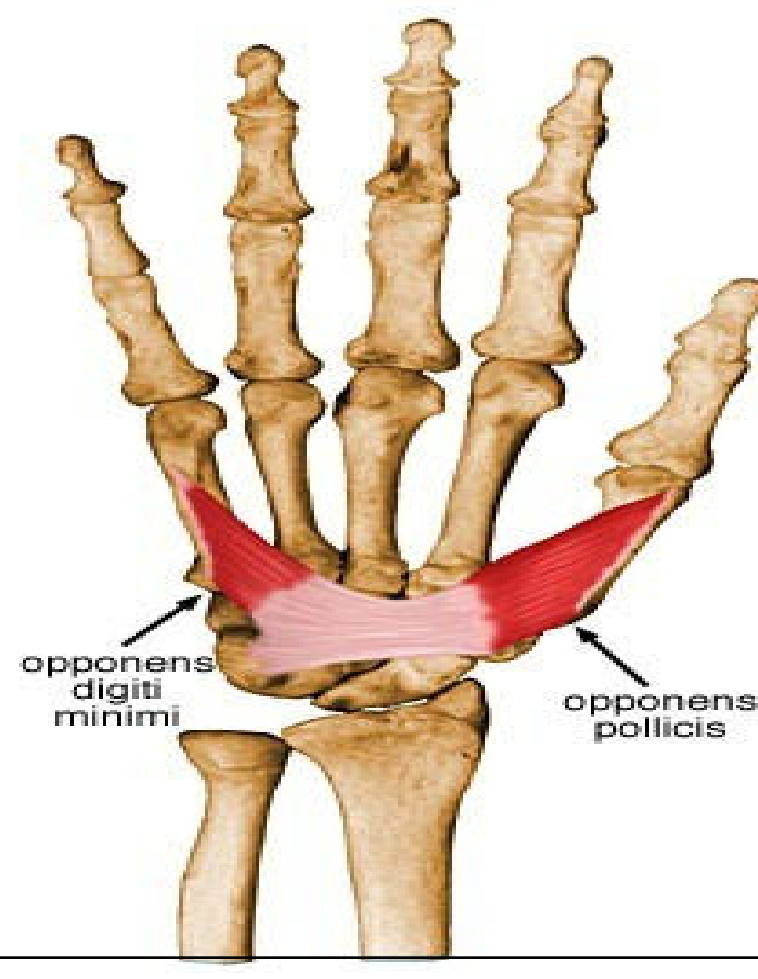
Opponens Digiti Minimi

Origin Hook of hamate and flexor retinaculum

Insertion Medial border of 5th metacarpal

Action Brings little finger (5th digit) into opposition with thumb

Innervation Deep branch of ulnar nerve (C8 and **T1**)



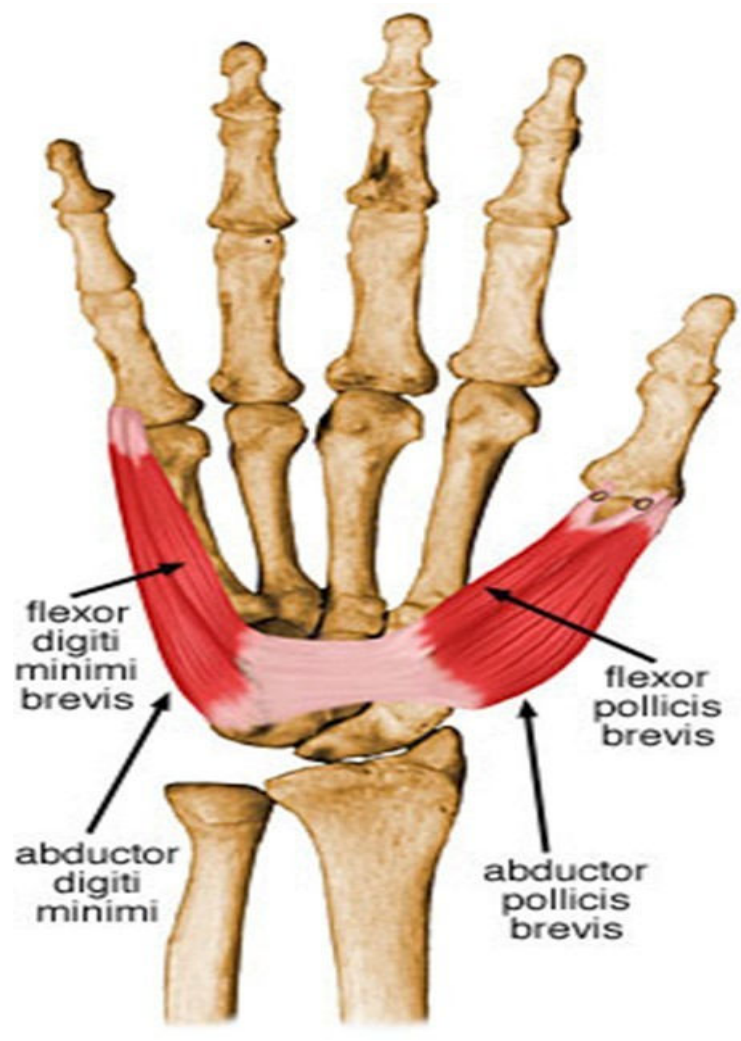
Abductor Digiti Minimi

The most superficial of the hypothenar muscles forming the hypothenar eminence

Origin : Pisiform bone

Insertion: Medial side of base of proximal phalanx of 5th digit

Action: Abducts 5th digit



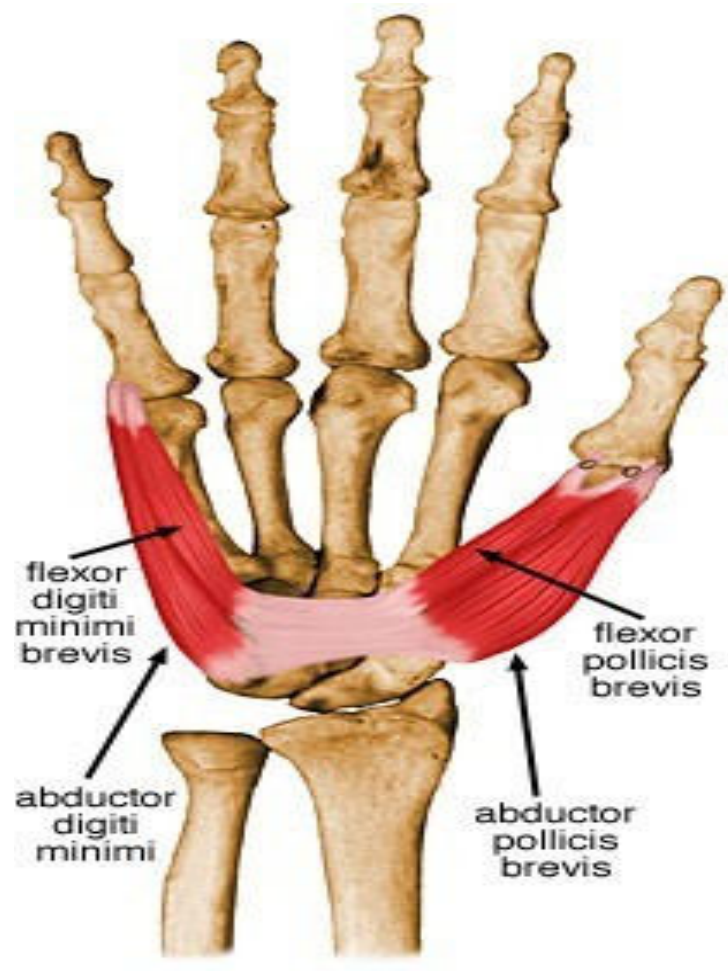
Flexor Digiti Minimi Brevis

Origin Hook of hamate and flexor retinaculum

Insertion Medial side of base of proximal phalanx of little finger

Action Flexes proximal phalanx of little (5th) finger

Innervation ulnar nerve



Palmar Brevis

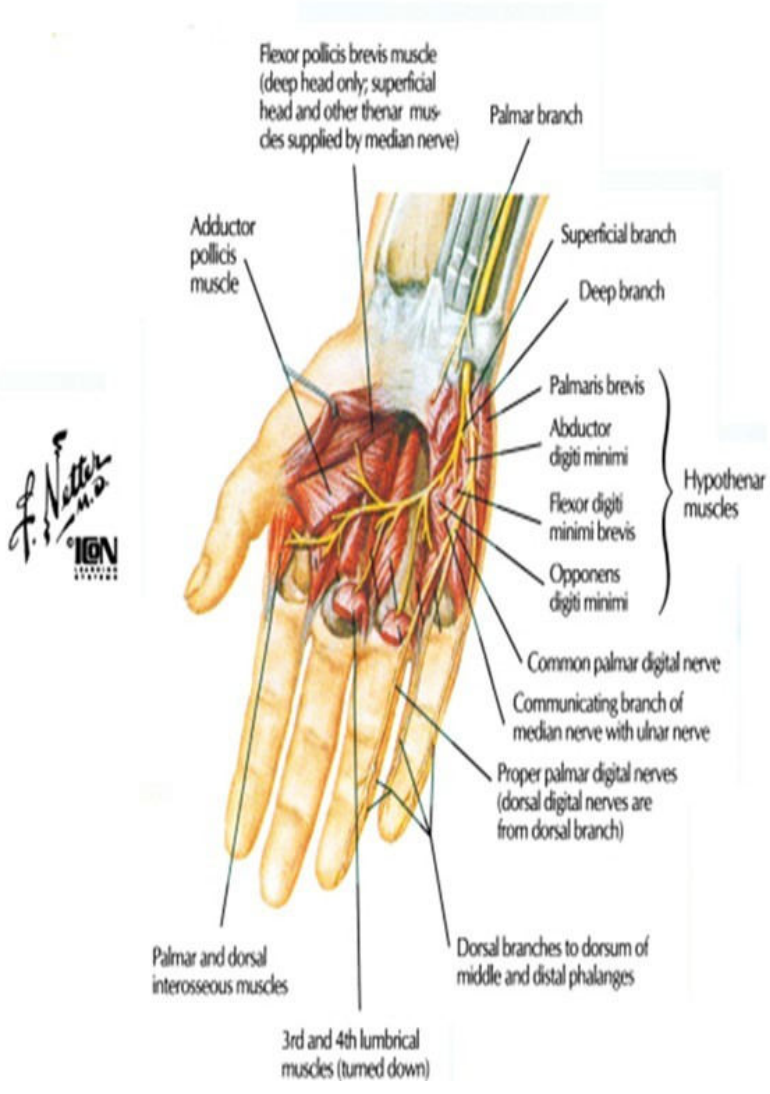
It lies in the fascia deep to the skin of the hypo thenar em inence

A relatively unimportant mu scle except that it covers and protects the ulnar nerve and artery

Origi n: Flexor retinaculum and palmar aponeurosis

Inserti on: Skin on the medial side of the palm

Acti on: Wrinkles the skin on the medial side of the palm and deepens the hollow of the palm, as in cupping of the hand, thereby aiding the grip



INTEROSSEI MUSCLES

Interosseous Muscles

They are located between the metacarpal bones

Arranged in 2 layers: 4 Palmar and 4 Dorsal

Located between bones 1. Dorsal interossei 1 to 4

Origin: Adjacent sides of 2 metacarpal bones

Insertion : Extensor expansion's and bases of proximal phalanges of digit 2 to 4

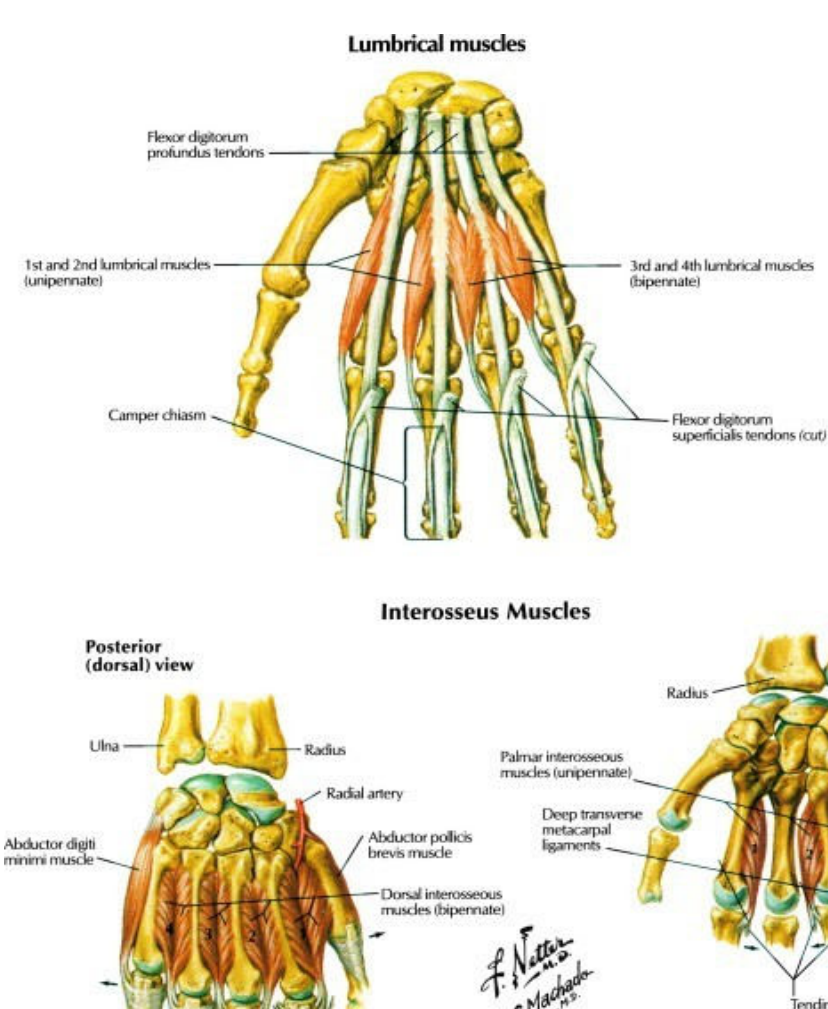
Action: Abducts digits and assist lumbricals

2. Palmar interossei 1 to 4

Origin : Palmar surfaces of 2nd, 3th , 4th and 5th metacarpal bones

Insertion: Extensor expansion of digits and bases of proximal phalanges of digits 2, 4, and 5

Action: Adducts digits and assist lumbricals



Lumbrical Muscles

They are named as such because of their elongated worml i ke form

1.Lumbri cal s 1 and 2

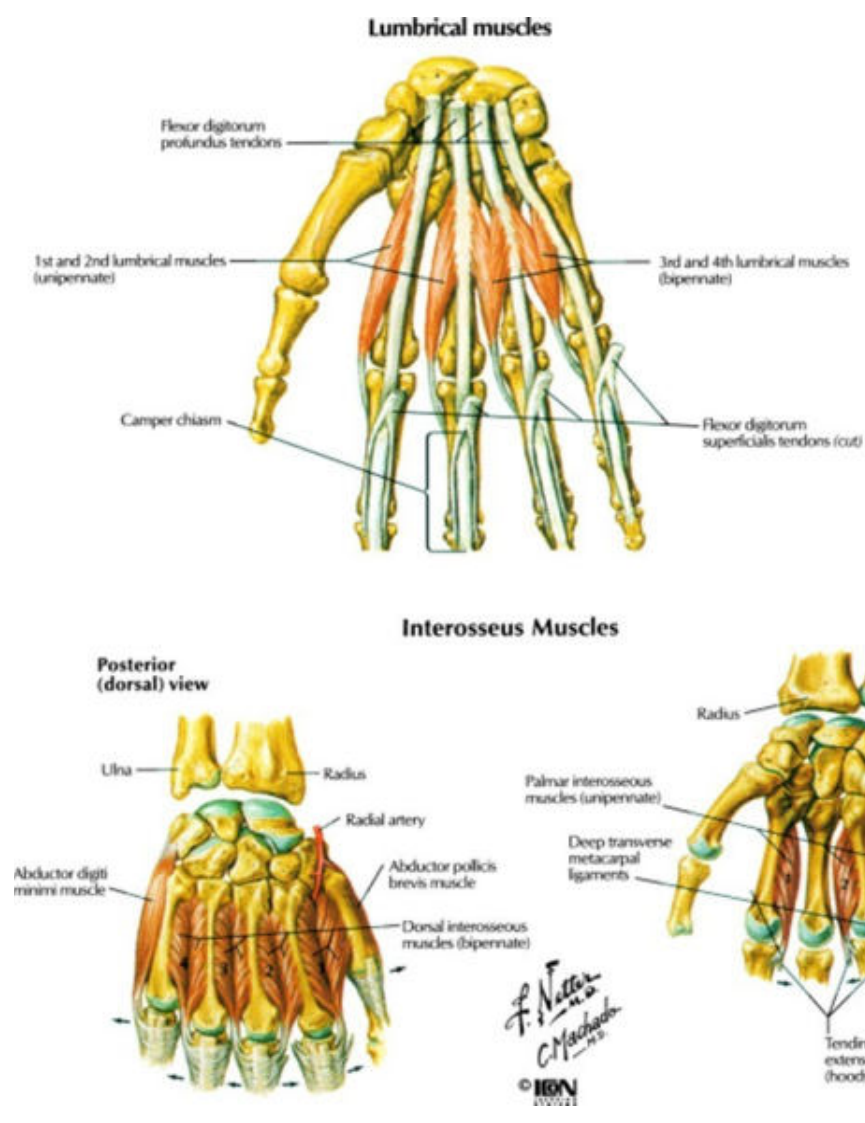
Ori gi n : lateral 2 tendons of flexor digitorum profundus

2.Lumbri cal s 3 and 4

Ori gi n: medial 3 tendons of flexor digitorum profundus

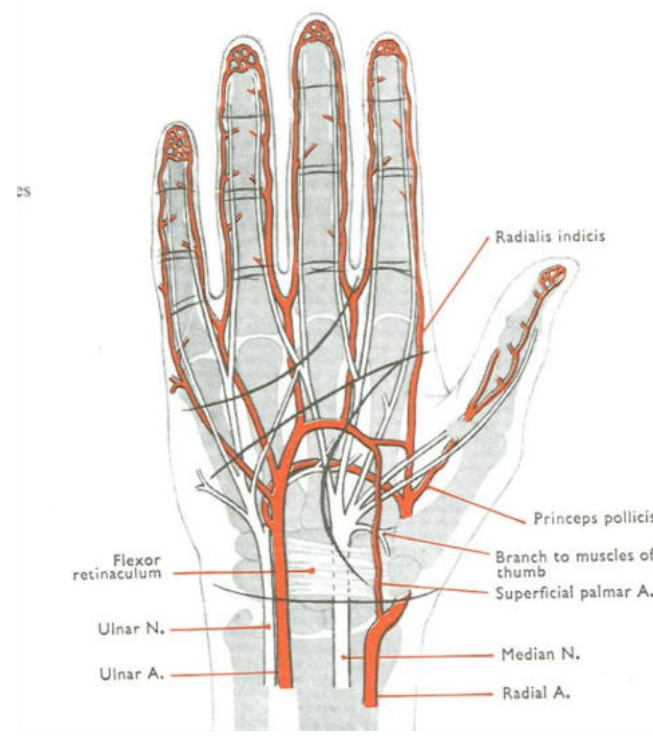
Insertion: lateral sides of extensor expansions of digits 2 to 5

Acti on: To flex digits at MCP joints and extend IP joints



ARTERIAL ARCHES IN HAND

- SUPERFICIAL PALMAR ARCH
- DEEP PALMAR ARCH
- Formation
- Site
- Surface anatomy
- Branches



Superficial Palmar Arch

FORMATION:

- Direct continuation of ulnar artery (mainly)
- Superficial branch of radial artery

SITE: between palmar aponeurosis & long flexor tendons

SURFACE ANATOMY: level with the distal border of the fully extended thumb

BRANCHES: digital branches to the medial three & half fingers

N.B.: Radial artery gives 2 branches that supplies the lateral one & half fingers:

- Radialis indicis: supplies lateral side of index
- Princeps pollicis: supplies both sides of thumb

Deep Palmar Arch

- FORMATION:

Direct continuation of radial artery (mainly)

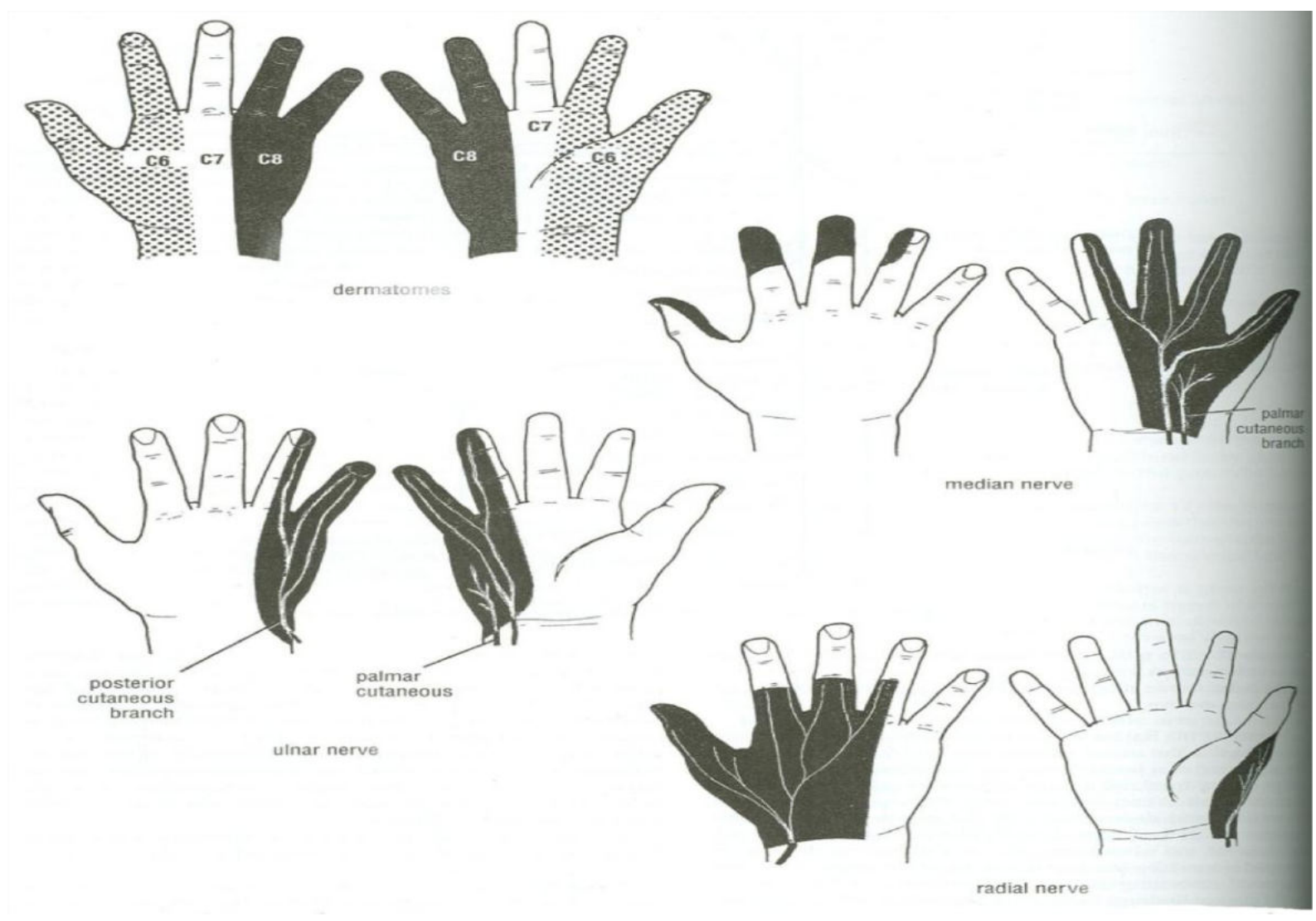
Deep branch of ulnar artery

- SITE: between long flexor tendons & metacarpal bones
- SURFACE ANATOMY: lies one inch proximal to superficial palmar arch
- BRANCHES:

Branches sharing in anastomosis around wrist joint

Articular & muscular branches

NERVES IN HAND
Cutaneous innervation



Nerves In Hand
Muscular innervation

ULNAR NERVE:

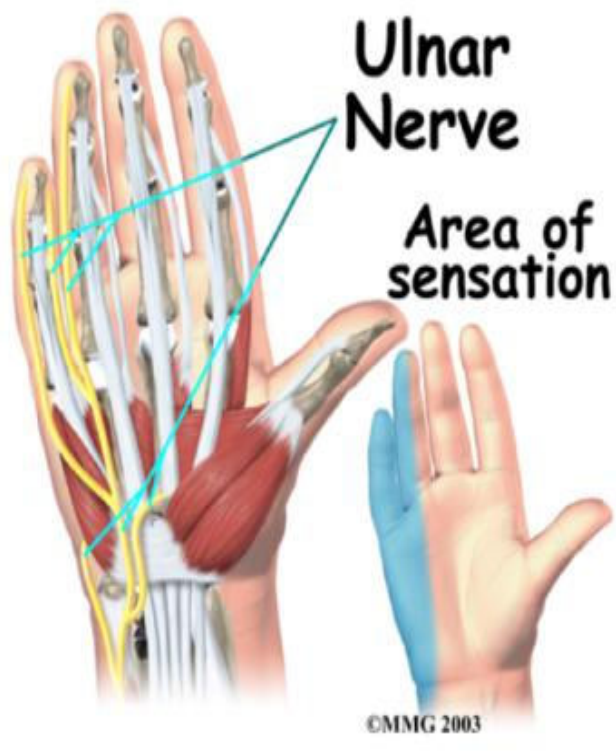
➢ Superficial Branch:

- Palmaris brevis

➢ Deep Branch:

- Adductor pollicis
- Hypothenar muscles
- Interossei
- Medial two lumbricals

Ulnar nerve



Is responsible for the innervations of the following.

- 1. Flexor carpi ulnaris
- 2. Flexor digitorum profundus

Nerves In Hand
Muscular innervations

MEDIAN NERVE:

- Abductor pollicis brevis
- Flexor pollicis brevis
- Opponens pollicis
- Lateral two lumbricals

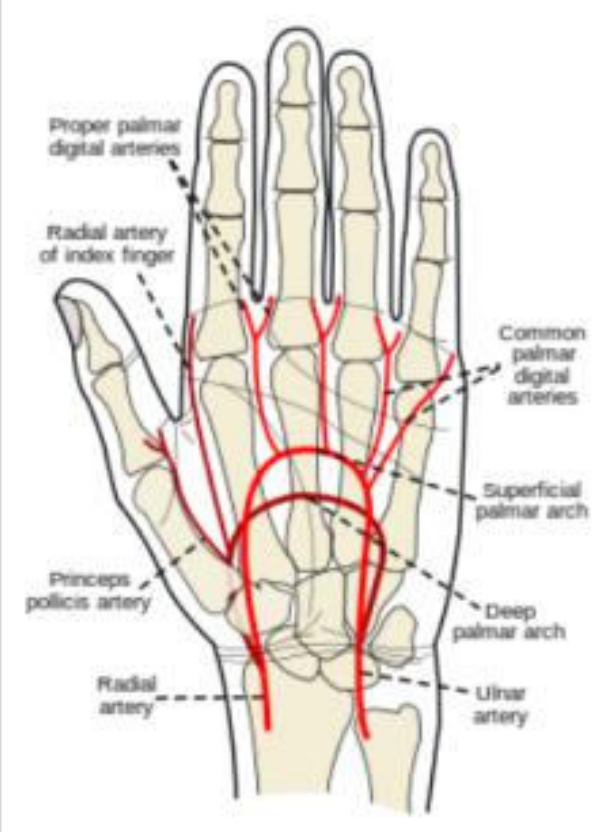
Median nerve

Is responsible for the innervations of the following soldiers.

- 1. Flexor carpi radialis
- 2 .Flexor digitorum superficialis
- 3. Flexor digitorum profundus
- 4. Flexor pollicis longus
- 5. Palmaris longus
- Gives humans the ability to oppose the thumb joint

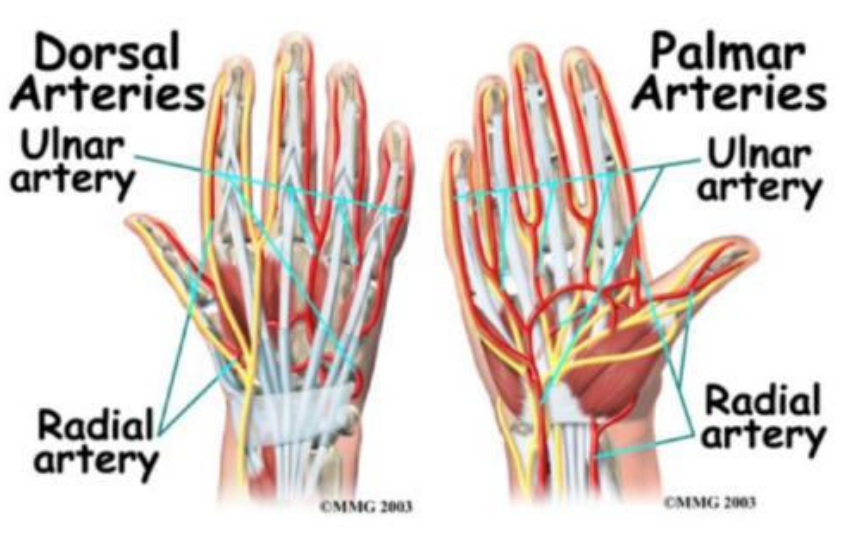
Radial Nerve

- Is responsible for the innervations of the following muscles
- 1. Extensor Carpi Radialis Longus
- 2. Extensor Carpi Radialis Brevis
- 3. Extensor Digitorum
- 4. Extensor Carpi Ulnaris
- 5. Abductor Pollicis Longus
- 6. Extensor Digiti Minimi
- 7. Extensor Pollicis Brevis
- 8. Extensor Pollicis Longus



Arteries:

- 1. Deep palmar arch
- 2. Superficial palmar arch
- 3. Common palmar digital arteries

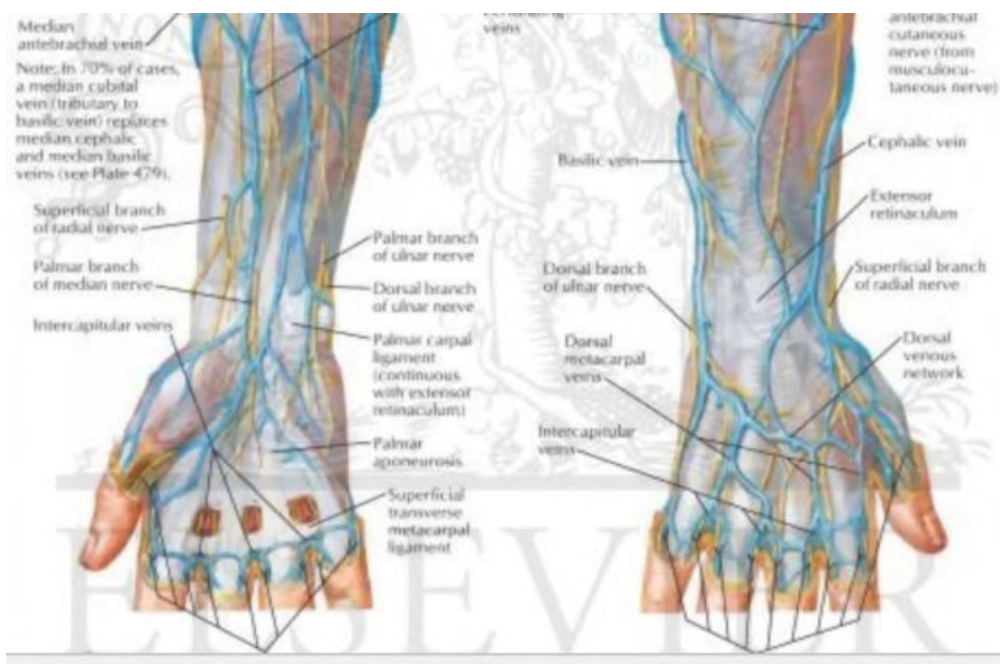


- **The Radial artery supplies blood to:**
- 1. Flexor carpi radialis
- 2. Extensor carpi radialis longus
- 3. Extensor carpi radialis brevis
- 4. Flexor pollicis longus

The Ulnar artery supplies blood to:

- 1. Flexor carpi radialis
- 2. Flexor carpi ulnaris
- 3. Extensor carpi ulnaris
- 4. Flexor digitorum superficialis
- 5. Flexor digitorum profundus
- 6. Palmaris longus

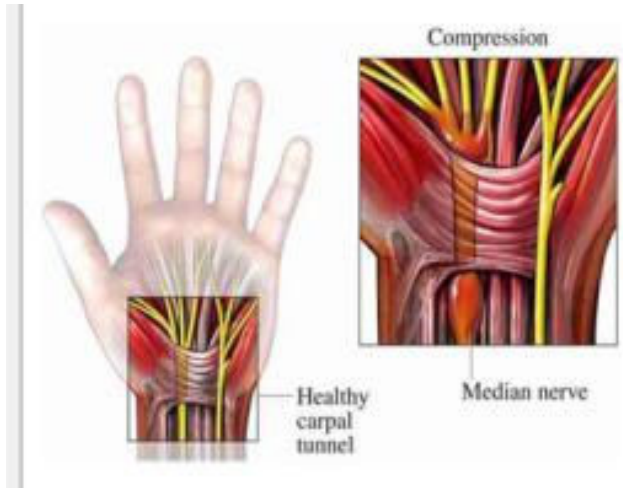
Waste Management



- 1. Cephalic vein
- 2. Basillic vein
- 3. Superficial dorsal venous arch (network)
- 4. Deep dorsal venous arch (network)

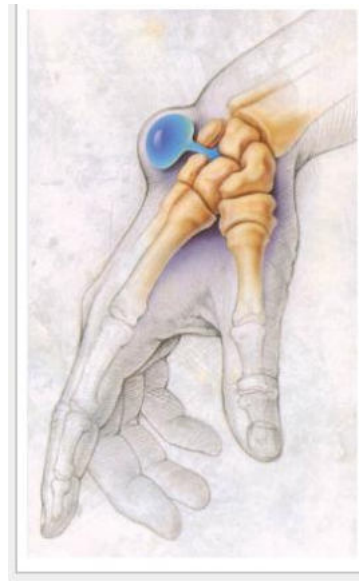
Clinical Concerns

Carpal tunnel



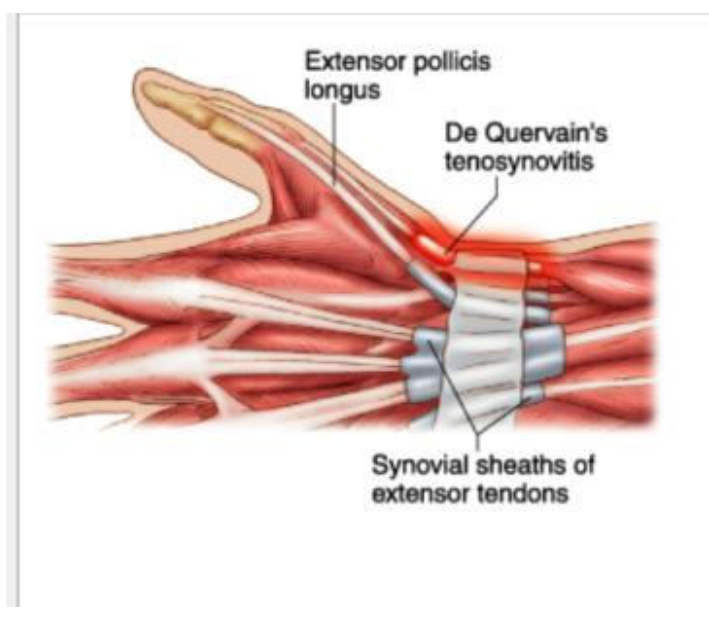
- The transverse carpal ligament in the wrist puts pressure on the medial nerve
- - possible cause: overuse, hormonal
- http://www.youtube.com/watch?v=SGyKQchSEJ4

Ganglion cyst



- Is a fluid filled cyst that develops out of a joint.
- - possible cause: joint trauma
- http://www.youtube.com/watch?v=mJ6oj3lkqm8

De Quervain's Tenosynovitis



- -irritation of the sheath around the tendon
- - affects the tendons on the thumb side of the wrist
- - possibly caused by repetitive actions, over use
- - http://www.youtube.com/watch?v=q87zSRYHa1o

1. Nerve damage that impairs the flexion of distal interphalangeal joints of index and middle fingers also produces which of the following conditions ?

a) Atrophy of Hypothenar eminence
b) Loss of adduction of thumb
c) Similar impairment of flexion of distal I.P joint of little finger
d) Weakness in pronation of forearm

2.A man is unable to hold a postcard between his index and middle fingers because of an injury to which of the following nerves ?

a) Superficial branch of ulnar nerve
b) Deep branch of ulnar nerve
c) Recurrent branch of median nerve
d) Posterior interosseous nerve

3. All of the following muscles form the boundry of the anatomical snuff box, EXCEPT :

a) Brachioradialis
b) Abductor pollicis longus
c) Extensor pollicis longus
d) Extensor pollicis brevis

4. Which is the longest metacarpal bone ?

a) Second metacarpal
b) Third metacarpal
c) Fourth metacarpal
d) Fifth metacarpal

5. After falling on his outstretched hand a patient complains of tenderness in the space between Extensor pollicis brevis and extensor pollicis longus tendons. Which bone is most likely fractured by the injury ?

a) Scaphoid
b) First metacarpal
c) Radial styloid process
d) Trapezium

6. Which is the most frequently fractured carpal bone ?

a) Lunate
b) Scaphoid
c) Capitate
d) Trapezium

7. A middle aged woman suffering from myxedema, suddenly woke up one night by a severe bout of pain in her right wrist and middle finger. The pain seems to move up her forearm. After a thorough neurological check up her physician diagnosed her condition as Carpal Tunnel Syndrome.Which nerve is involved in this syndrome ?

a) Median nerve
b) Palmar cutaneous branch of median nerve
c) Ulnar nerve
d) Anterior interosseous nerve

8. Examination of a patient reveals paralysis of the Abductor pollicis brevis muscle. All of the following can be sites of lesion that resulted in this paralysis , EXCEPT :

One answer only.

a) Lower trunk of brachial plexus
b) Lateral root of median nerve
c) Medial root of median nerve
d) Recurrent branch of median nerve

9. A patient exhibits weakness of Pinch grip ; other thumb movements are normal. There is no sensory loss in the hand. The probable cause is damage to :

a) Posterior interosseous nerve
b) Anterior interosseous nerve
c) Deep branch of ulnar nerve
d) Median nerve proximal to flexor retinaculum

10. In carpal tunnel syndrome which of the follwoing conditions occur due to motor deficit ?

a) Claw hand
b) Pointing index finger
c) Benediction hand
d) Simian hand