

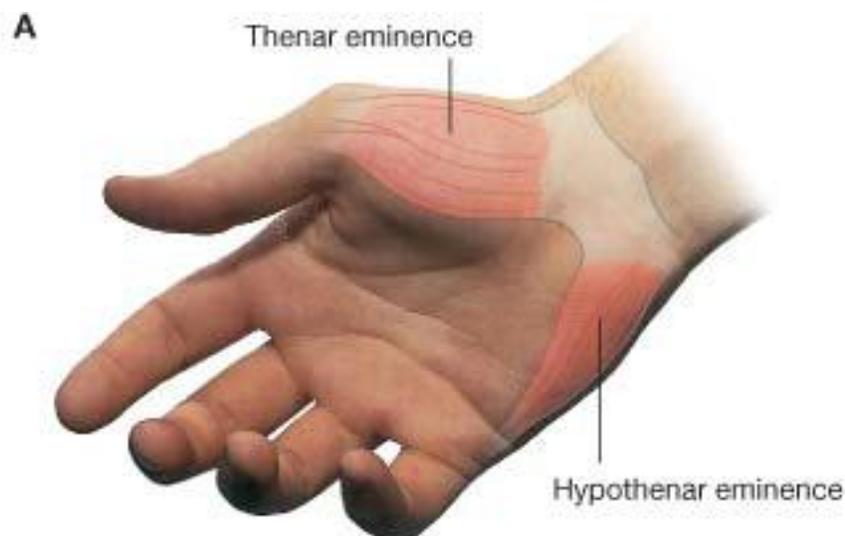
HAND AND FASCIAL SPACES

Objectives

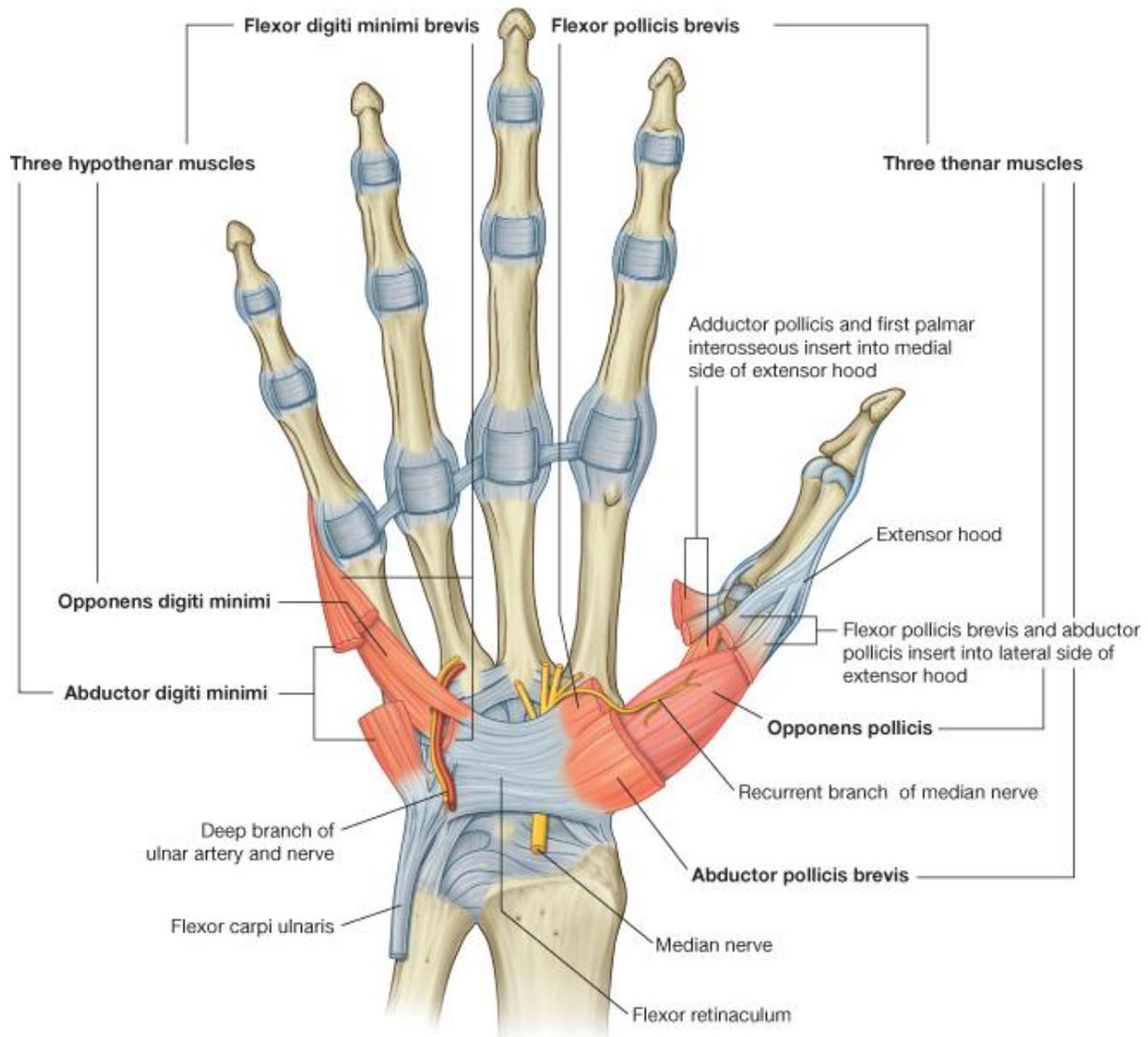
1. Study muscles (attachments and function), nerves(motor and sensory, actions), blood vessels and bones of the hand. Examine specific areas (compartments) of the hand and
2. their relationship with other areas.
Relate anatomic structures to possible clinical conditions.
3. Learn action of hand muscles.

Hand is the functional end of the upper limb. The hand consists of five metacarpal bones and their associate structures, and the phalanges of the five digits. (Pg. 709-710, Fig. 7.91)

Anatomical naming of the digits lateral to medial are Thumb, Index, Middle, Ring and Little finger. The anterior or palmar aspect of the hand is divided into three compartments: 1) **Thenar**; 2) **Midpalmar** and 3) **hypothenar**. These three compartments can be identified in the living hand as 1) Bulge at base of thumb as the thenar eminence; 2) Bulge on little finger side is the hypothenar eminence and 3) the center is the midpalmar compartment. (Compartment is defined as an area of the body which is enclosed by fascia or connective tissue and contains muscles, blood vessels, nerves, etc.) (Pg. 719-722, Table 7.15)



Thenar compartment

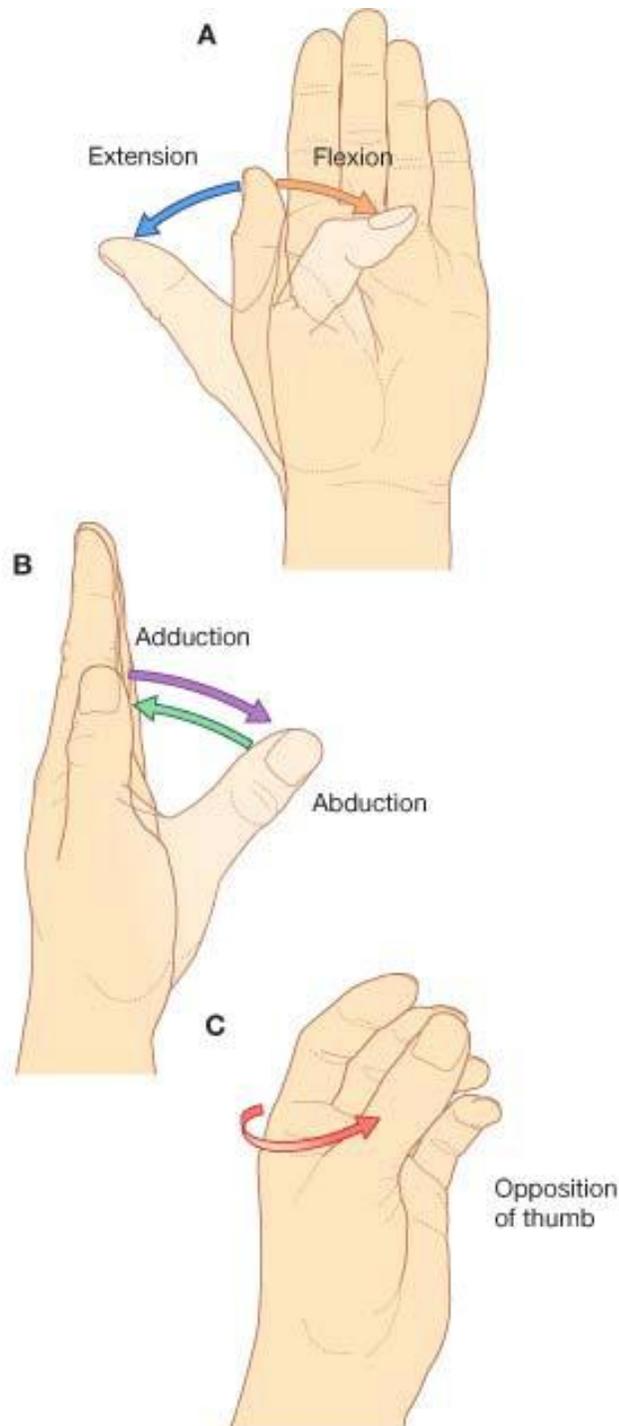


© Elsevier Ltd. Drake et al: Gray's Anatomy for Students www.studentconsult.com

Thenar Compartment Muscles:			
Name	Origin	Insertion	Function
Abductor pollicis brevis	Flexor retinaculum, scaphoid, trapezium	Sesamoid bone, proximal phalanx and extensor expansion	Abduction and flexion of proximal phalanx
Flexor Pollicis brevis	Flexor retinaculum, scaphoid, trapezium	Sesamoid, proximal phalanx and extensor expansion	Flexion of proximal phalanx
Opponens pollicis	Flexor retinaculum and trapezium	First metacarpal (lateral side)	rotation of metacarpal during opposition

Note:

- Actions of the thumb expressed with respect to the plane of the palm.
- Extension and flexion - parallel to the plane of the palm.
- Abduction and adduction - at right angles to the plane of palm.

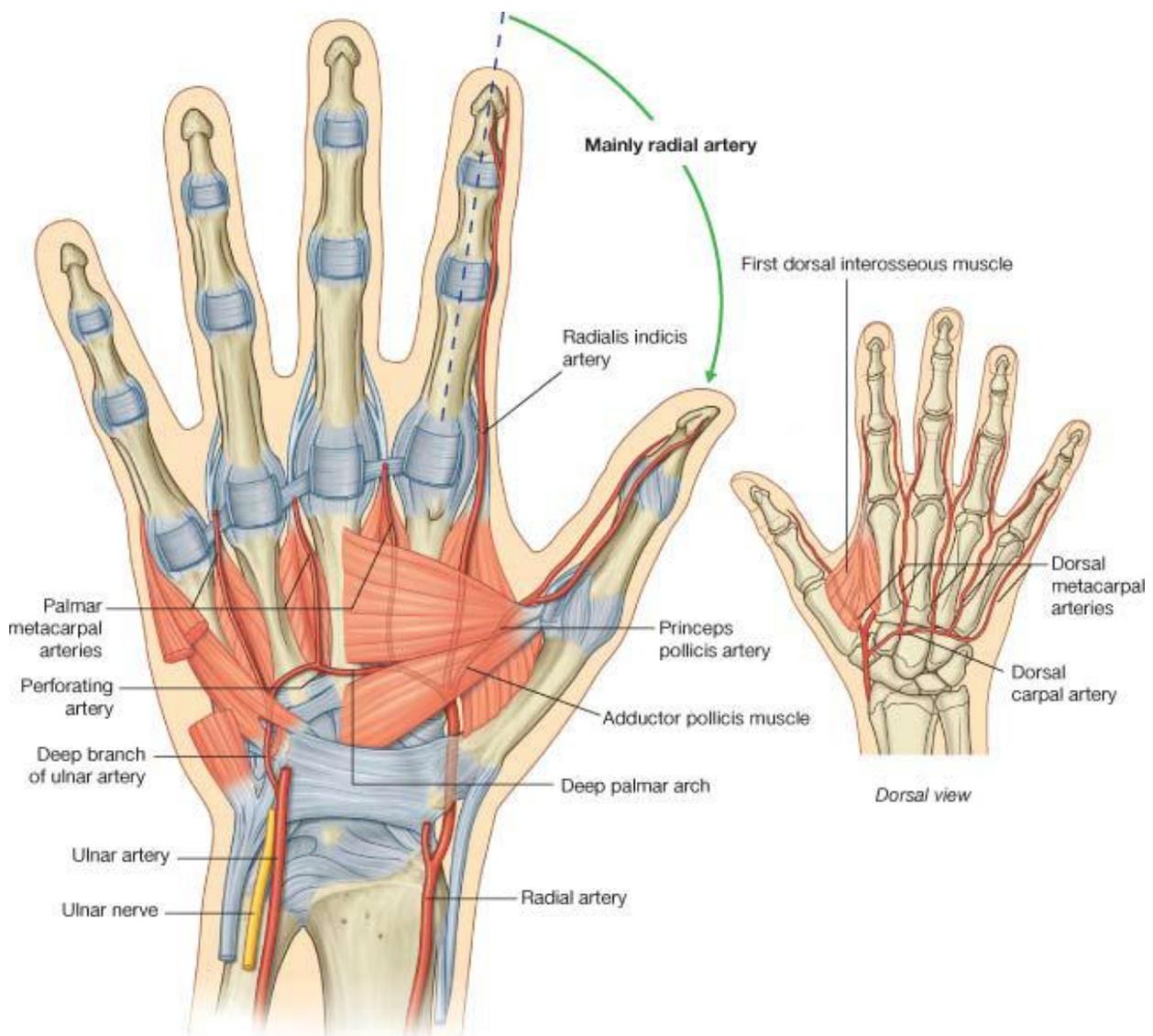


Nerves

Recurrent branch of median nerve enters the thenar compartment and supplies all thenar muscles.

Vessels (Pg. 723-726)

1. Two branches of the radial artery called the princeps pollicis artery and radialis indicis supply thenar compartment and lateral side of the index finger. It descends between the first dorsal interosseous muscle and oblique head of the adductor pollicis near the base of the first phalanx. It supplies skin and subcutaneous tissue of the thumb.
2. Superficial palmar branch - It arises from the radial artery just proximal to the wrist; it passes through the thenar eminence, which it supplies.
3. Branches of superficial palmar arch.



Hypothenar compartment

Muscles:

Palmaris brevis - It is a thin quadrilateral superficial muscle placed beneath the skin of the ulnar side of the hand.

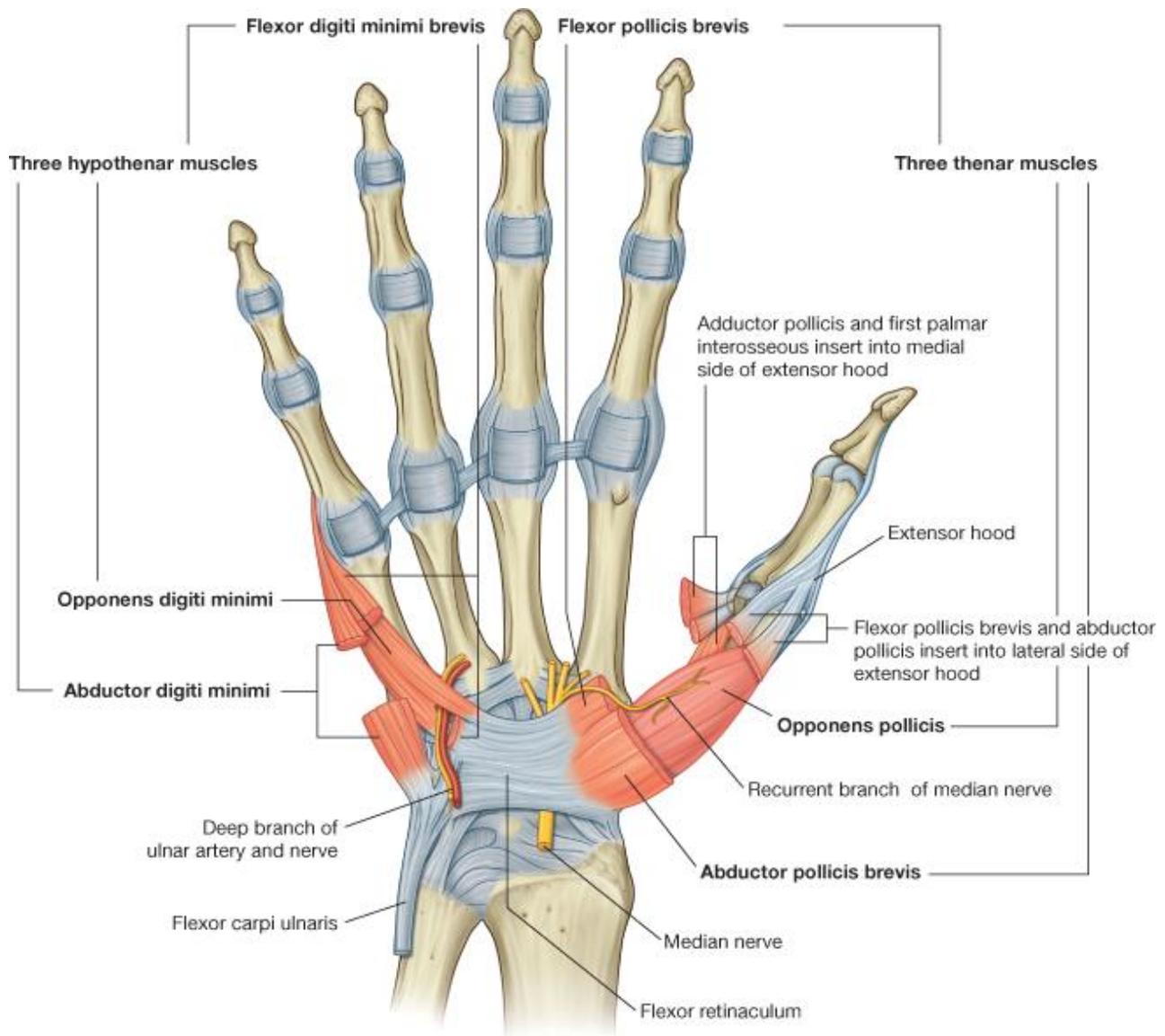
Origin - flexor retinaculum and palmar aponeurosis

Insertion - skin on the ulnar border of the palm.

Action - draws the skin at the ulnar side of the palm towards the middle of the palm.

Deepens the hollow of the palm.

Innervation – superficial branch of the ulnar nerve.



Abductor digiti minimi

Origin - pisiform

Insertion - proximal phalanx of 5th digit.

Action - abduction of digit 5.

Flexor digiti minimi

Origin - hamate

Insertion - proximal phalanx (5th digit).

Action - flexion of proximal phalanx, digit 5.

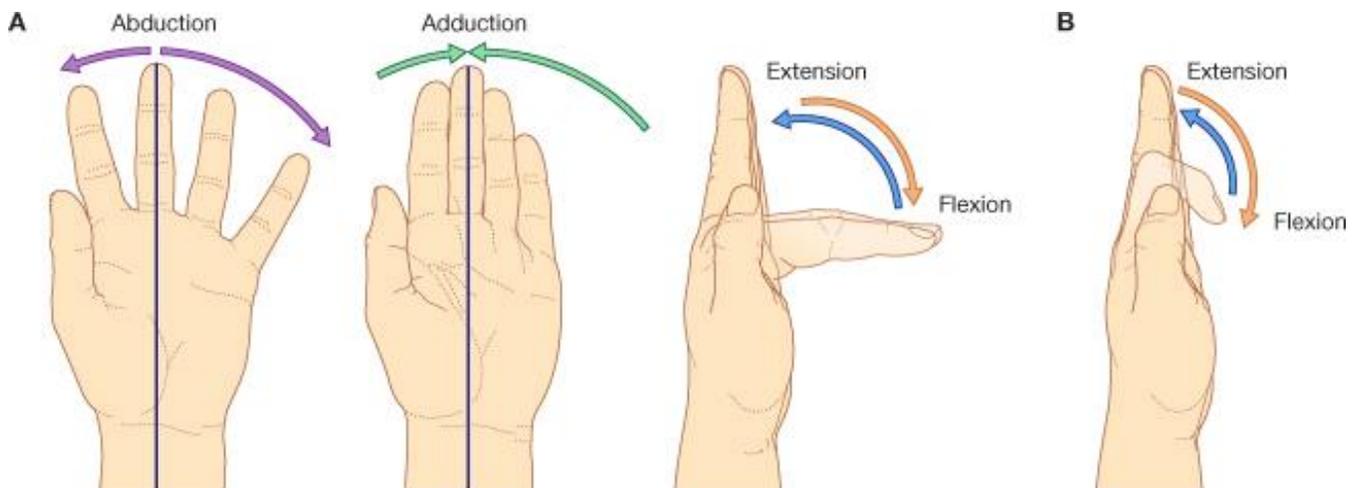
Opponens digiti minimi

Origin - hamate

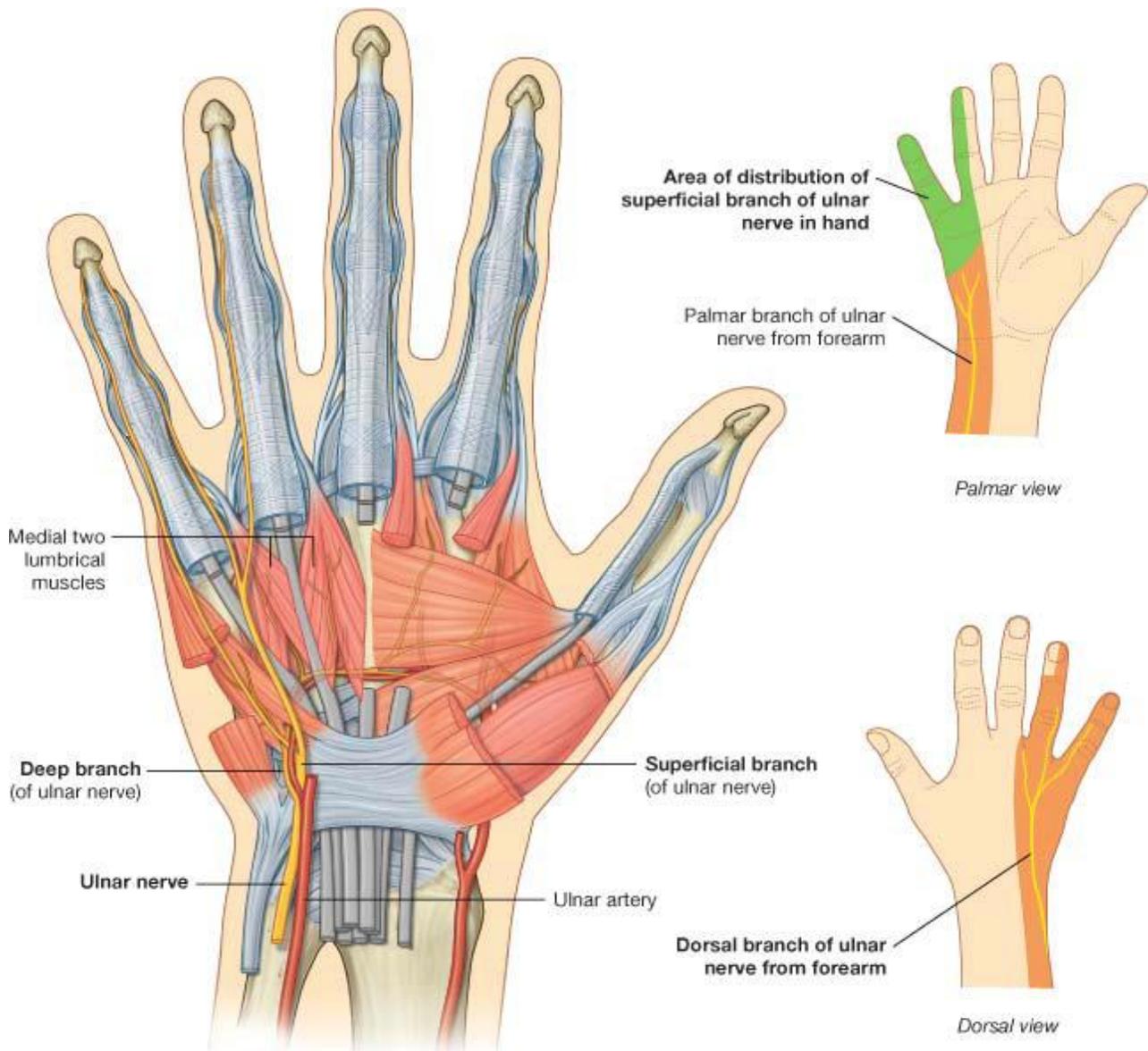
Insertion - 5th metacarpal

Action - draws 5th metacarpal anteriorly thus bringing digit 5 into contact with the thumb during opposition. Only thumb can oppose other fingers.

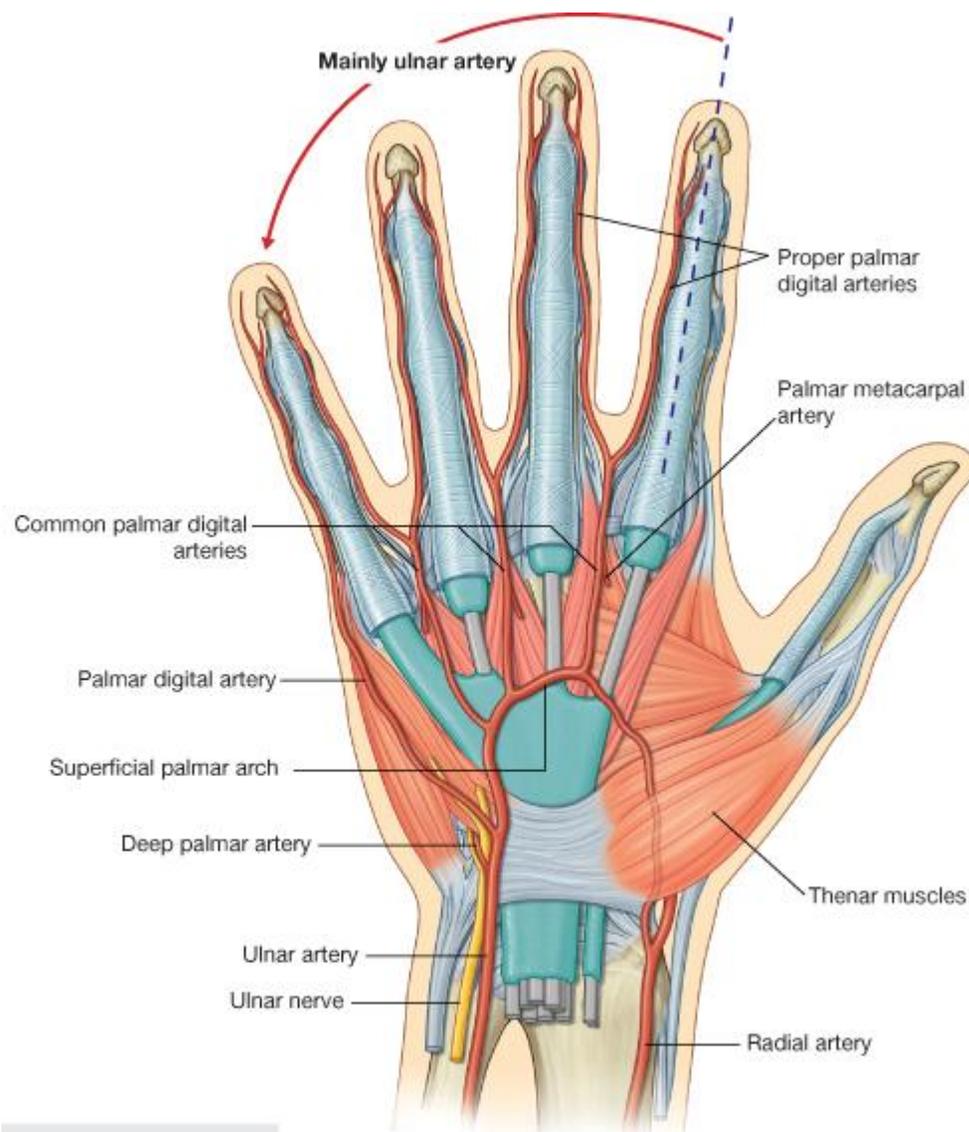
The actions of the fingers are indicated differently than the thumb. Extension and flexion are in relation to the palm, whereas abduction and adduction is expressed in relation to the middle finger. Adduction is bringing fingers together and abduction is spreading the fingers.



Nerves - All the muscles of the hypothenar compartment is supplied by the ulnar nerve. The deep branch of the ulnar nerve penetrates muscles of the hypothenar compartment, to supply deep muscles of the hand.



Vessels - Ulnar artery forms the superficial palmar arch. Deep branches of the ulnar artery supply the hypothenar compartment.



© Elsevier Ltd. Drake et al: Gray's Anatomy for Students www.studentconsult.com

Mid Palmar compartment

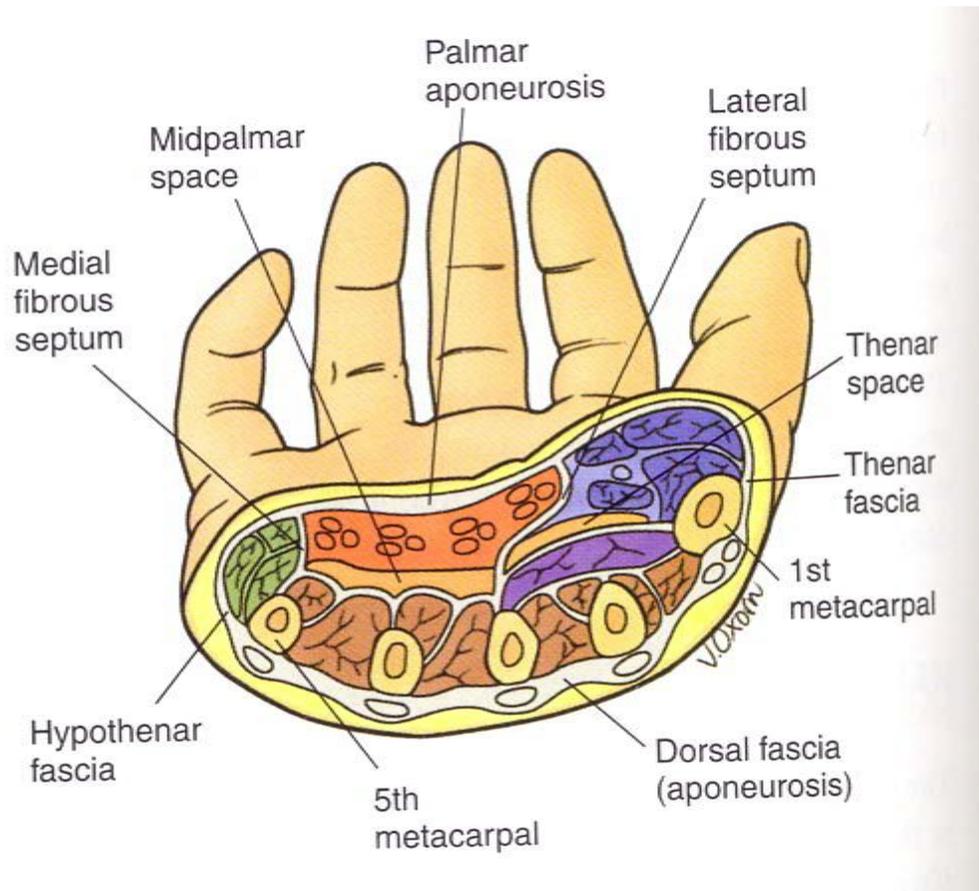
Boundaries

Anterior - Palmar aponeurosis . It has two components: 1) a thick superficial part of longitudinal bundles, continuous with the palmaris longus tendon, and 2) thinner layer of transverse fibers. Distally this aponeurosis fans out into four bands, which extend towards the base of the medial four fingers and cover the long flexor tendons. (See plate 442, Netter)

Posterior - Interosseous fascia. [Fascia that covers interossei muscles.]

Lateral - Thenar fascia and compartment.

Medial - Hypothenar fascia and compartment.



Contents

1. Tendons

- Four tendons of flexor digitorum superficialis (FDS).
- Four tendons of F.D. profundus (FDP).
- Tendon of flexor pollicis longus (FPL).

2. Synovial sheaths

- Radial bursa - covers tendon of FPL.
- Ulnar bursa - covers tendons of FDS & FDP.

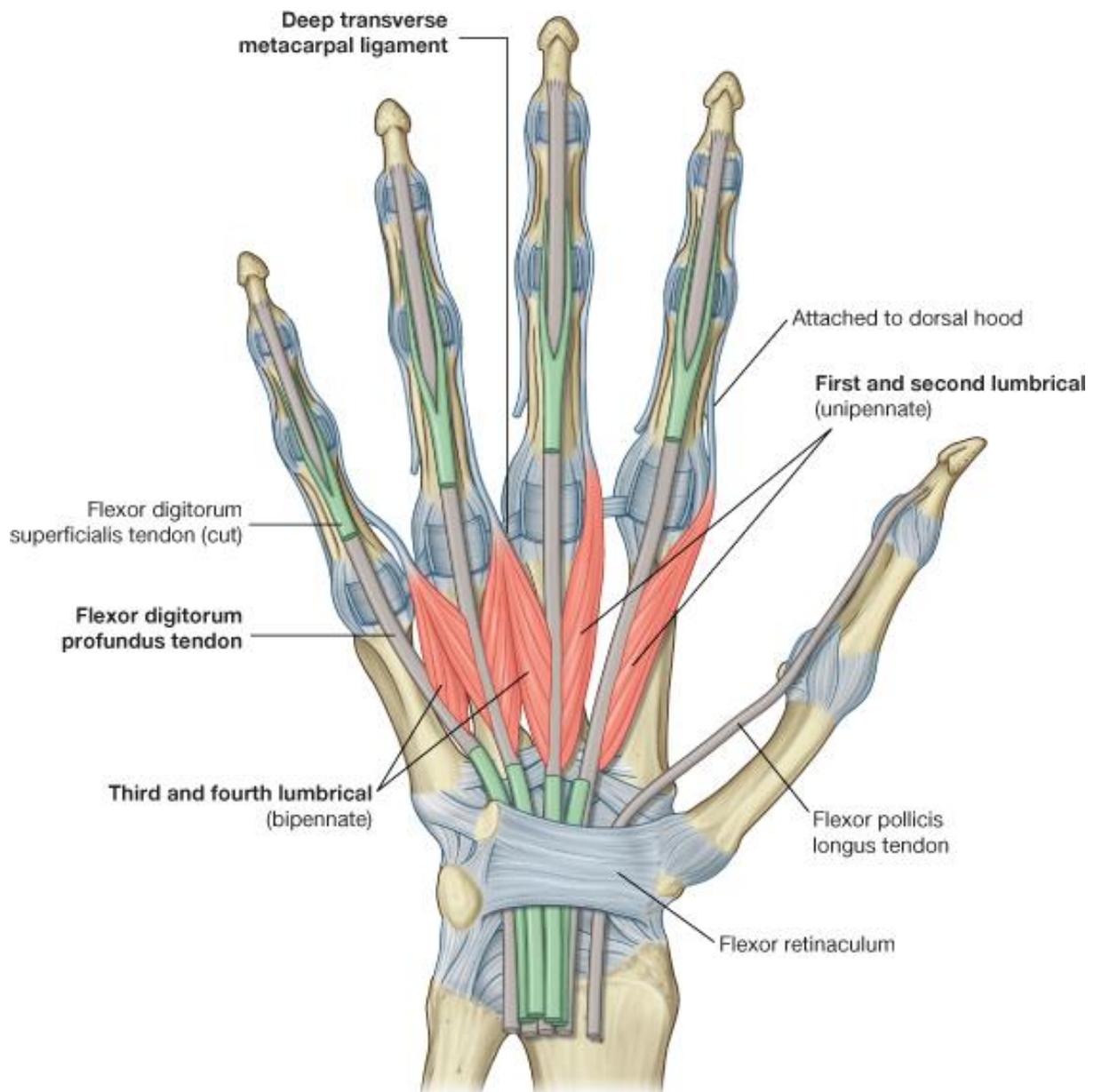
3. Muscles

1. Lumbricals - (little worm-like muscles) - Four muscles arise from tendons of FDP.

The lumbricals course on lateral side of each digit and are inserted on the extensor expansions of the 2nd to 5th fingers. Nerve -

- a. Median nerve supplies two lateral lumbricals..
- b. Ulnar nerve supplies two medial lumbricals.

Action - Flexion of digits at metacarpo-phalangeal joints and extension of interphalangeal joints.

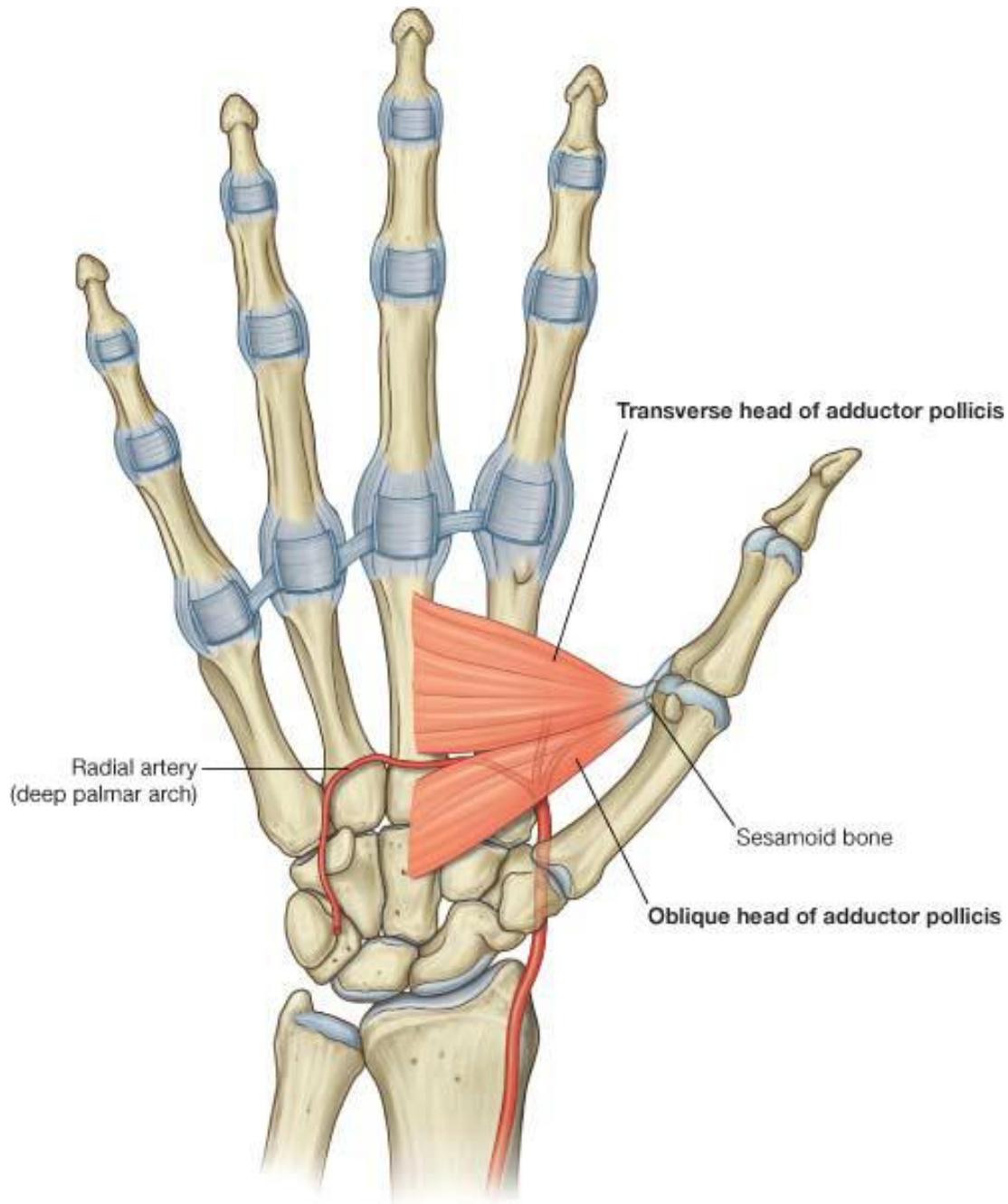


2. Adductor pollicis (2 heads)

Oblique head. Origin - 2nd metacarpal and capitate. Transverse head origin. 3rd metacarpal. Both heads insert by a common tendon into the medial sesamoid bone and the base of the proximal phalanx, and extensor expansion of the thumb. It is posterior to the tendons of FDP.

Nerve - Deep branch of ulnar nerve.

Action - Adduction of thumb, aids in opposition.

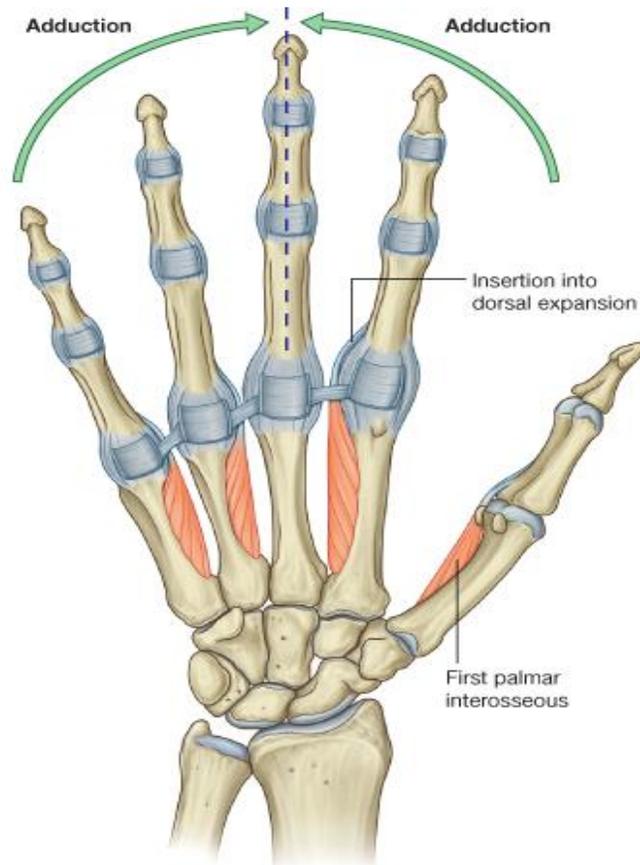


Deep muscles of hand

1. Palmar interossei

These muscles are found on the palmar surface of the metacarpals and not between them. Three palmar interossei are clearly distinct, however, some authors describe a fourth muscle.

Each palmar interosseous muscle arises from the entire length of one metacarpal bone and is inserted into the side of the base of proximal phalanx of the same finger, and into the extensor expansion on the dorsum of the finger.

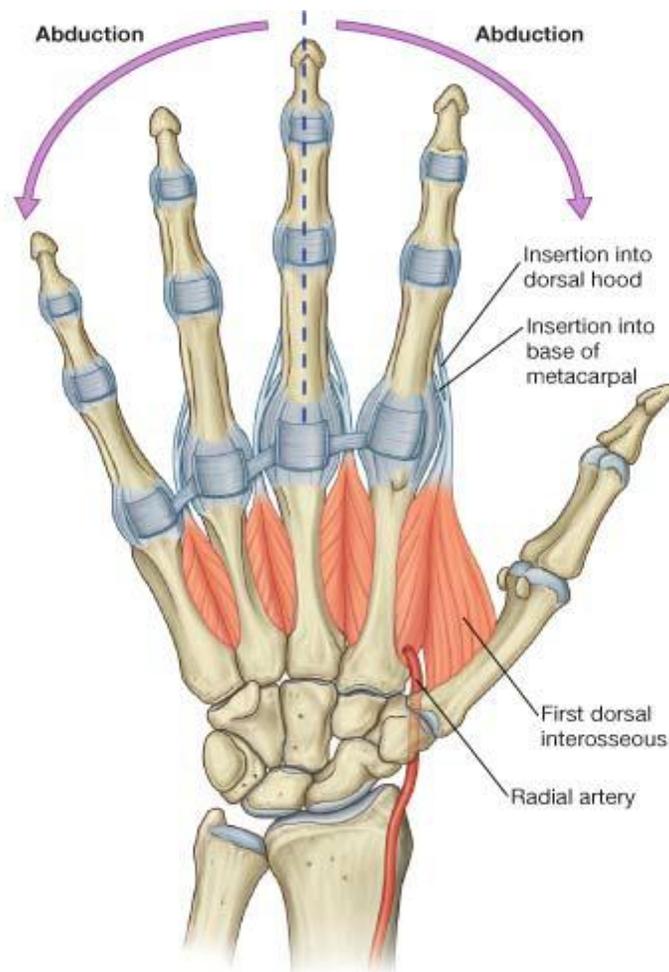


© Elsevier Ltd. Drake et al: Gray's Anatomy for Students www.studentconsult.com

ORIGIN:		INSERTION:
1 st	Medial side of 2 nd metacarpal	Medial side proximal phalanx digit 2, and extensor expansion.
2 nd	Lateral side of 4 th metacarpal	Lateral side prox. phalanx digit 4, and extensor expansion.
3 rd	Lateral side of 5 th metacarpal	Lateral side prox. phalanx digit 5, and extensor expansion.
Nerve	Deep branch of the ulnar nerve	
Action	They adduct the fingers toward the middle finger.	

2. Dorsal interossei

There are four dorsal interossei, each of them arises by two heads from the adjacent metacarpal bones and inserts into the base of the proximal phalanx and the extensor expansion.

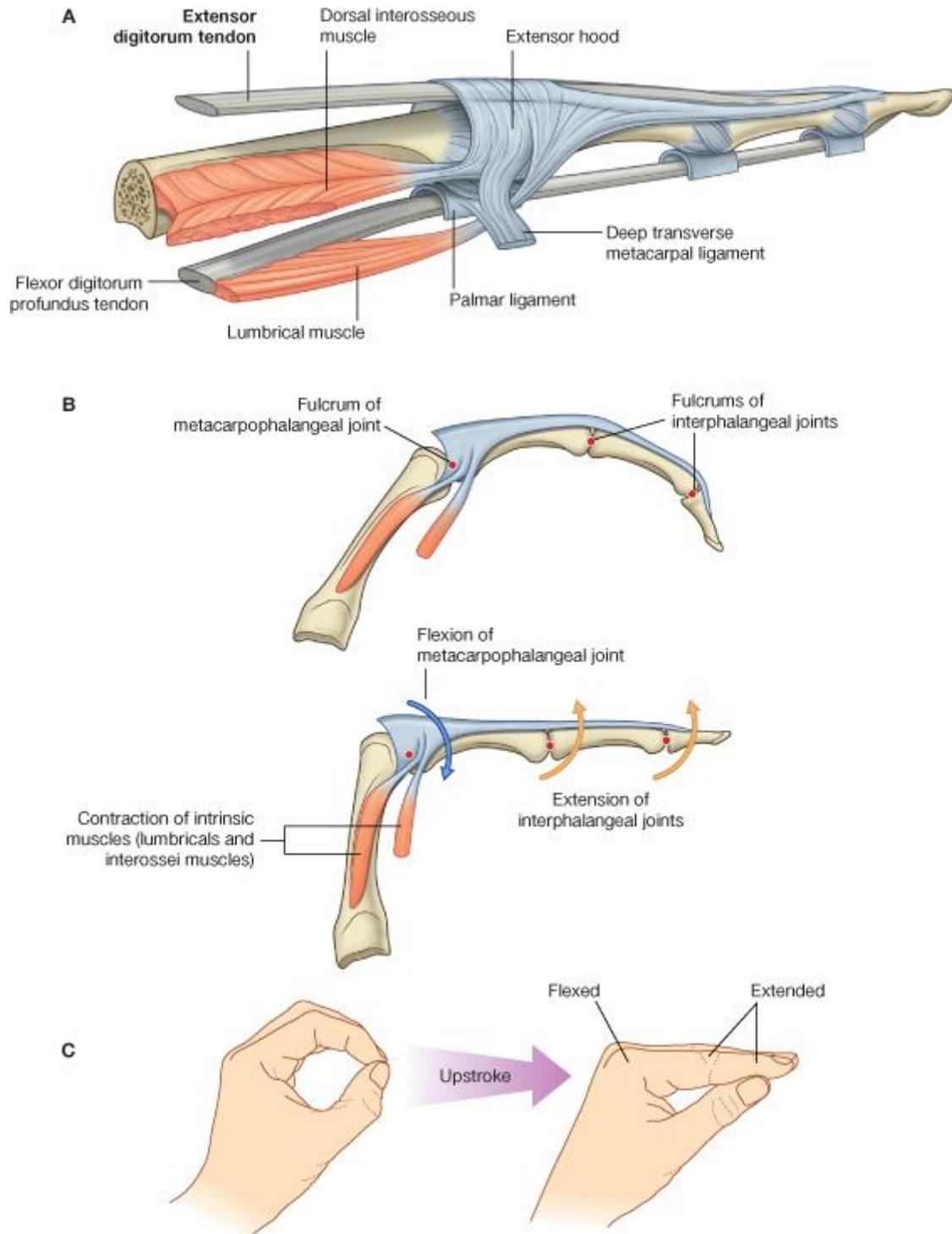


© Elsevier Ltd. Drake et al: Gray's Anatomy for Students www.studentconsult.com

1 st	This is the most prominent and largest dorsal interosseus. It is a flat, triangular muscle originating from 1st and 2nd metacarpals and inserting into the lateral side of the proximal phalanx of the index finger.
2 nd & 3 rd	Both insert into the middle finger, 2 nd on the lateral side and 3 rd on the medial side.
4 th	Inserts into the medial side of the ring finger.
Nerve	Deep branch of the ulnar nerve.
Action	Abduction of digits 2, 3, and 4 away from an imaginary longitudinal axis through the center of the middle finger. The palmar and dorsal interossei also flex the metacarpophalangeal joints and extend the interphalangeal joints of the appropriate digits 2-5.

Extensor expansion is an aponeurotic or tendinous fusion of the digital extensors, lumbricals and interossei tendons on the dorsal aspects of the digits.

Vincula - Long flexor tendons in the phalangeal region are supplied by small blood vessels, which pass from the periosteum of the phalanges enclosed within special folds of connective tissue called vincula.

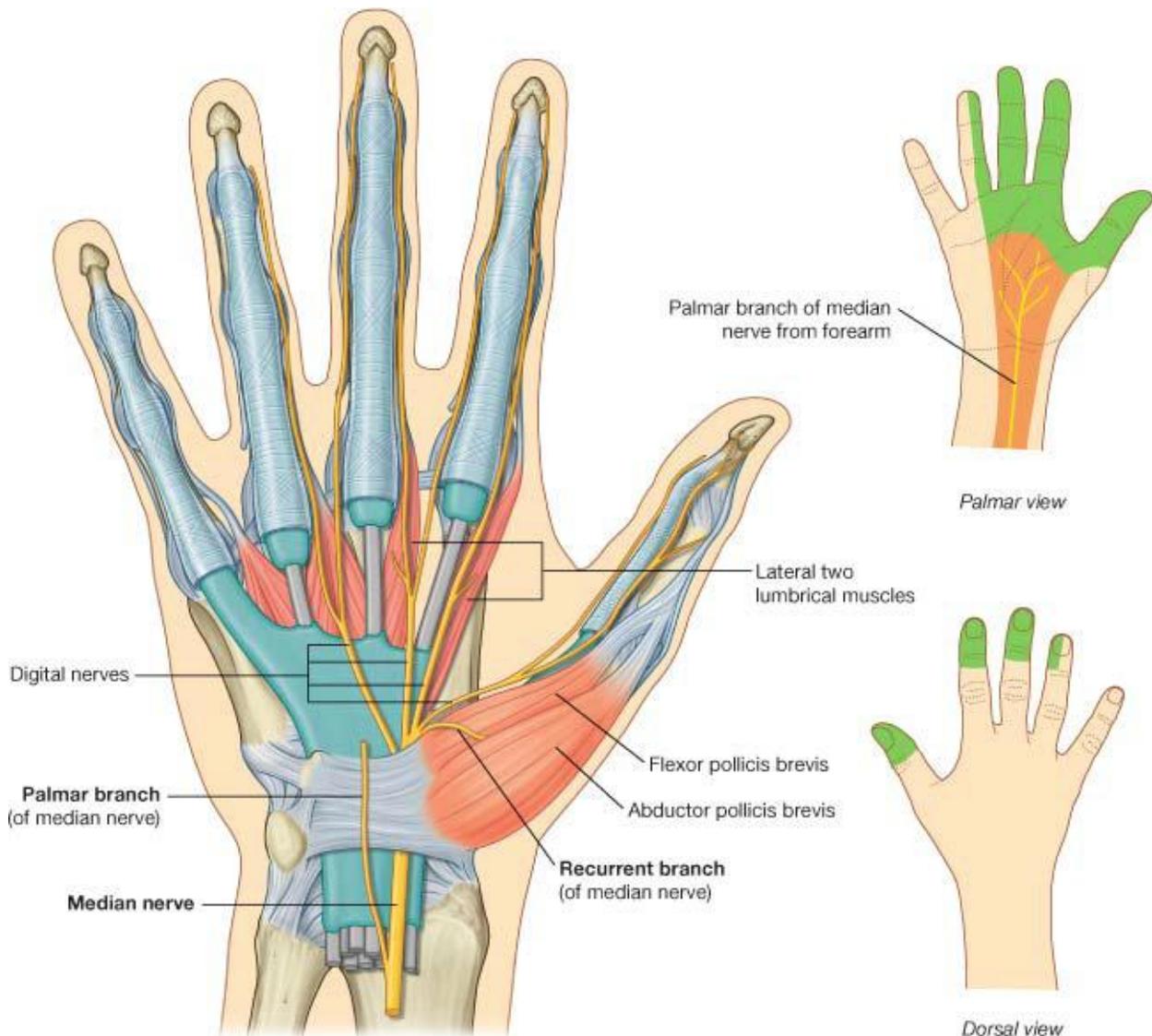


Nerves (See plate 444, Netter, Pg. 726-729)

1. Median Nerve - This major nerve courses posterior to the flexor retinaculum through the carpal tunnel. Before going through the tunnel, it gives a palmar cutaneous branch which runs anterior to the flexor retinaculum and supplies skin of the thenar area. At the distal border of the flexor retinaculum it divides into branches that are:

- a) Motor to the three thenar muscles (abd. pol. brevis, flex. pol. brevis, and opponens pol.) and the first and second lumbricals.
- b) Sensory to the lateral palmar surface, the palmar surface of digits 1-3 and the lateral half of 4. (via palmar and proper digital nerves). These nerves are also sensory to the dorsum of the distal halves of digits 2-4.

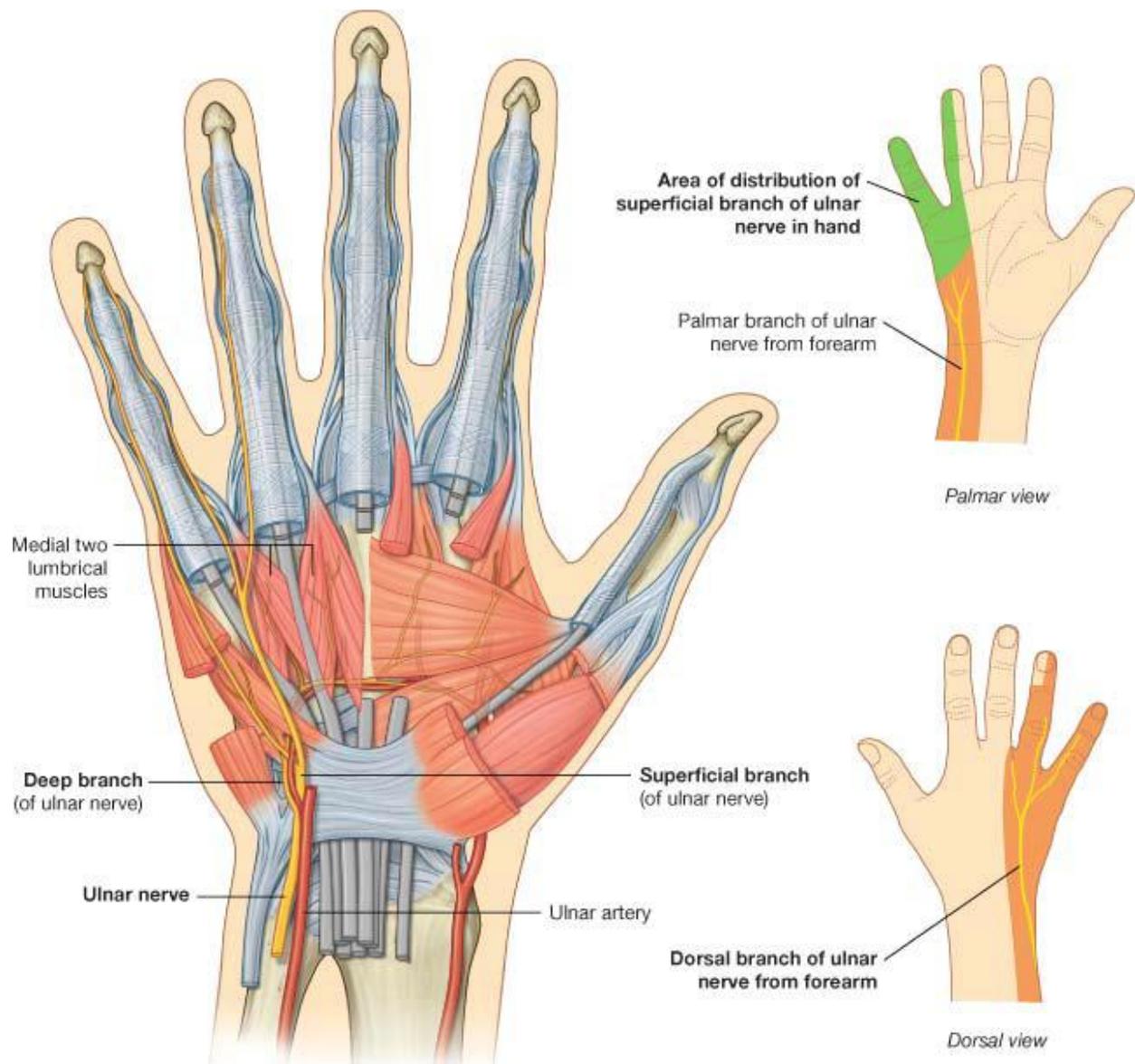
NOTE- The motor (recurrent) branch to the thenar muscles arises at the distal border of the flexor retinaculum and is superficial in position. It is vulnerable to cuts on the thenar eminence.



2. Ulnar Nerve

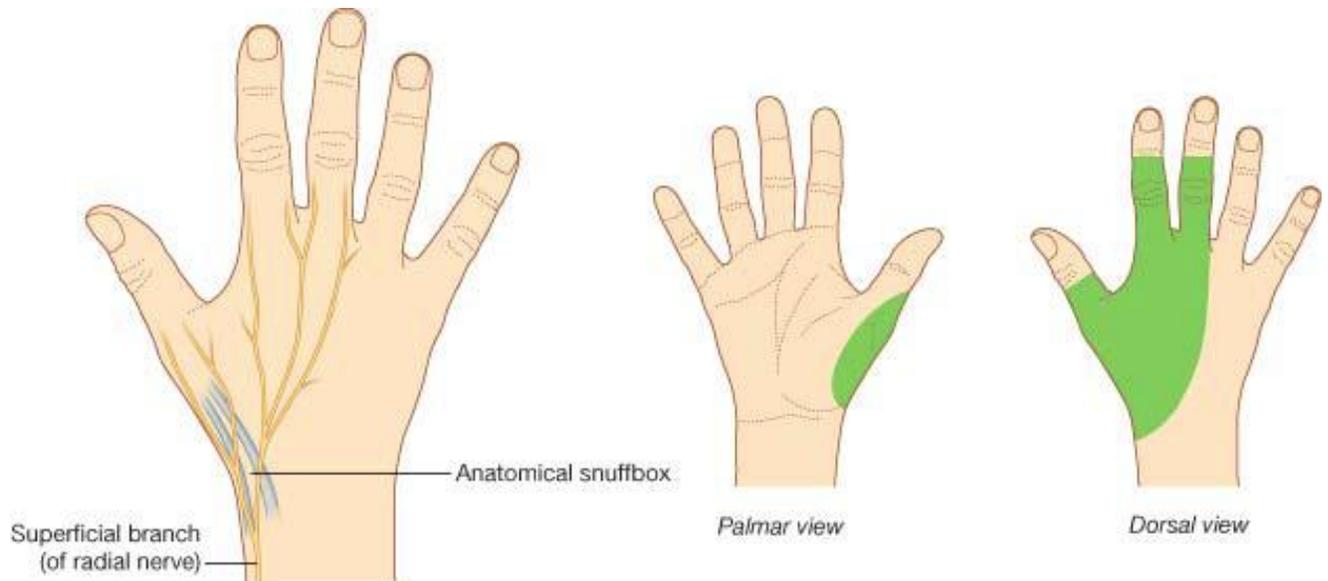
Courses lateral to the pisiform and anterior to the flexor retinaculum. In the hand it divides into superficial and deep branches. The superficial branch supplies palmaris brevis and divides into digital nerves which are sensory to the palmar surface and sides of the little finger and the medial half of the ring finger. The deep branch supplies all three muscles of the hypothenar compartment, the 3rd and 4th lumbricals, all interossei, adductor pollicis.

The dorsal branch of the ulnar nerve which arises in the lower third of the forearm gives off dorsal digital nerves that are sensory to the dorsal surface of the medial one and one half digits.



3. Superficial radial nerve

Courses through the snuff box. Supplies the skin of the posterior surface of the thumb, index and half of the middle finger. (Except the distal phalanges of these digits which are supplied by the median nerve.)

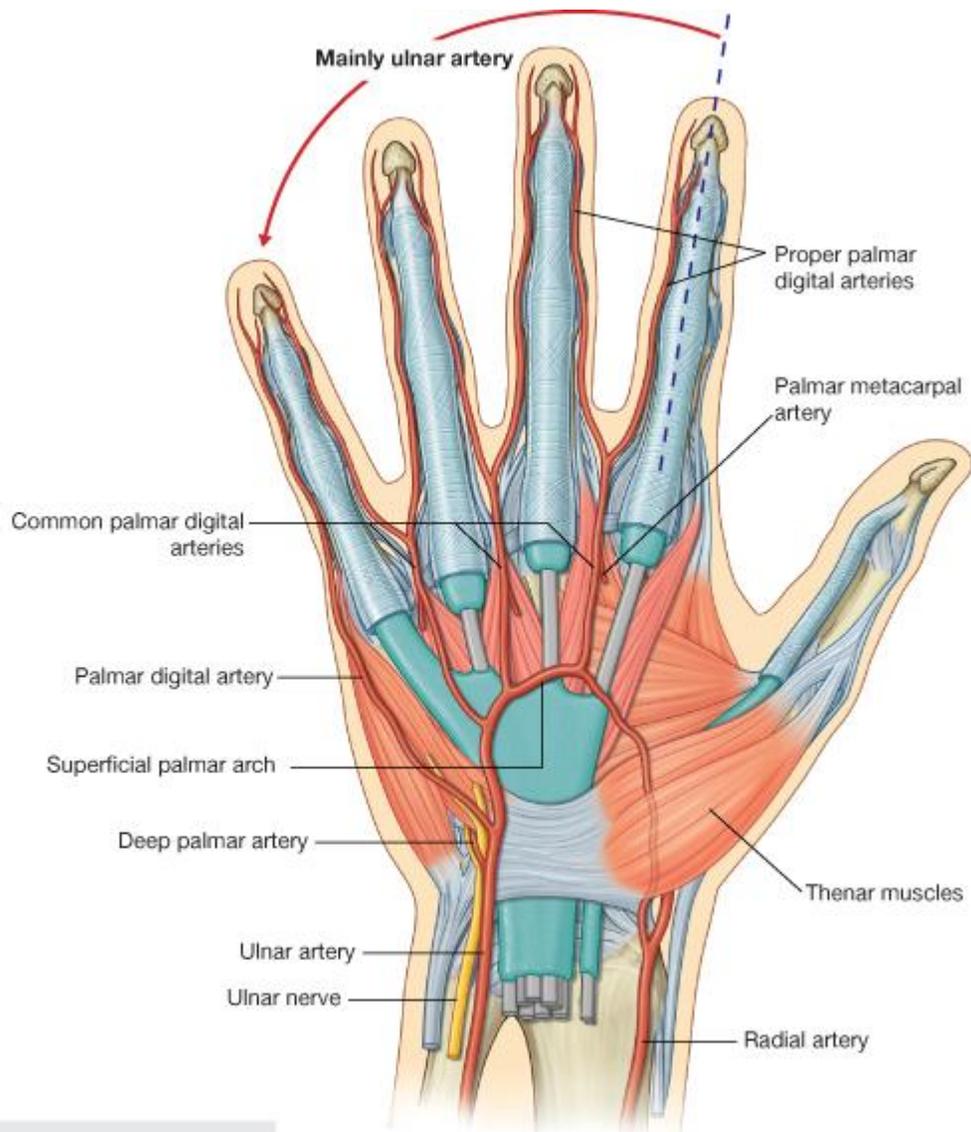


© Elsevier Ltd. Drake et al: Gray's Anatomy for Students www.studentconsult.com

Blood Vessels (only arteries) (See plate 449, Netter, Pg. 726, Allen's Test)

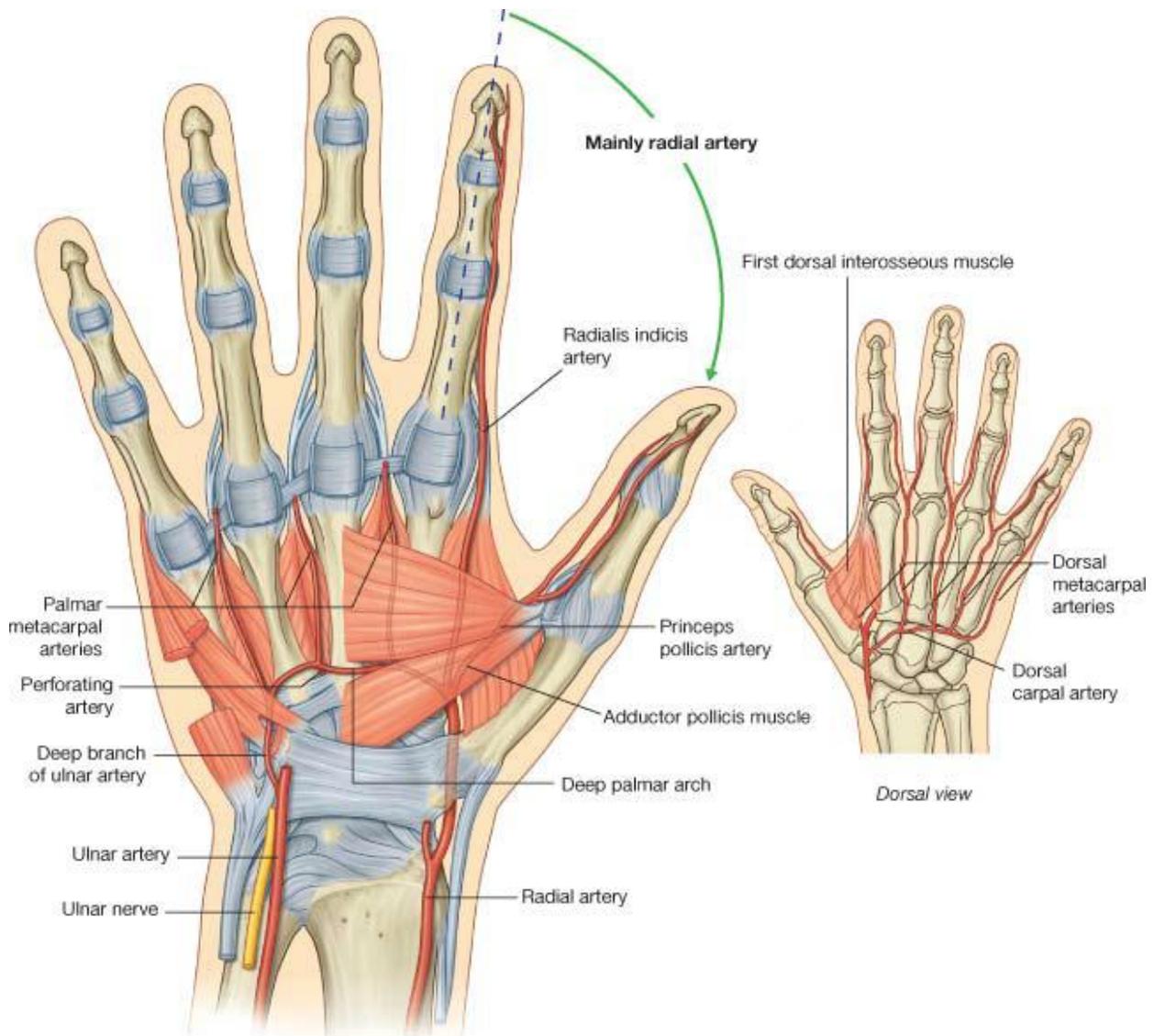
1. Superficial palmar arch - Formed mostly by the ulnar artery, which enters the palm of the hand deep to the palmar aponeurosis. Gives off branches named palmar digitals, which in turn divide into proper digital arteries (supplies fingers).

The arch is joined by the superficial palmar branch of the radial artery and is highly variable.



2. Deep palmar arch - Formed by the radial artery which enters the hand after coursing through the snuff box, and between the two heads of 1st dorsal interosseous. The radial artery also gives off the princeps pollicis artery to the thumb and the radialis indicis to the index finger.

3. Anastomoses of superficial and deep palmer arches. (Pg. 739, Fig. 7.121)



FASCIAL SPACES OF THE MID PALMAR COMPARTMENT

[SPACE - is defined as any area between fascial layers of a compartment. Generally, a space is always a potential space, as it contains nothing except maybe some tissue fluid.]

These spaces lie in the midpalmar compartment, posterior to the radial and ulnar bursa and the adductor pollicis muscle.

These spaces are separated by the oblique palmar septum, which extends from the anterior border of the 3rd metacarpal to the palmar aponeurosis.

1. Lateral palmar space is lateral to the oblique septum, and
2. medial palmar space is medial to the oblique palmar septum.

Thus any infection in these areas can move only proximally but not laterally or medially.

