

Bones, joints and muscles of the of the hand

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Bones of the hand



Palmar view

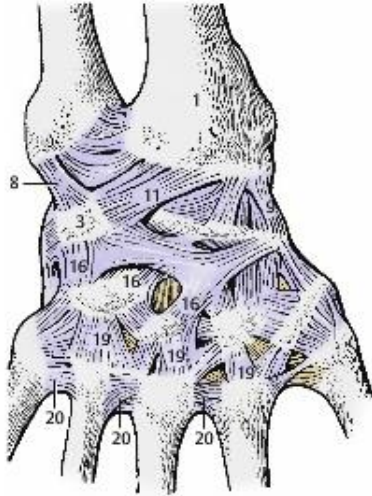
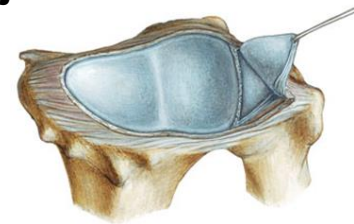


Dorsal view

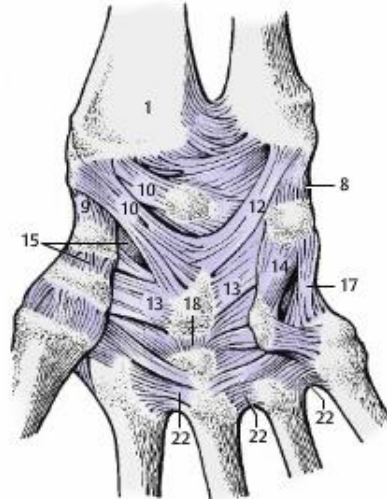


Joints of the hand

1) Wrist joint/radiocarpal (ellipsoid)



A Ligaments of right wrist, dorsal surface



B Ligaments of right wrist, palmar surface

2) Midcarpal joints (tight)

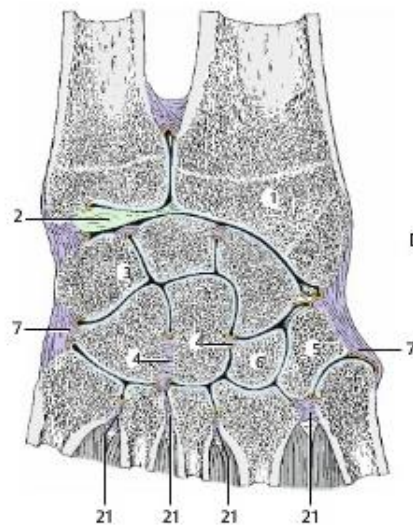
3) Carpometacarpal joint of the Thumb (saddle)

4) Carpometacarpal joints (tight)

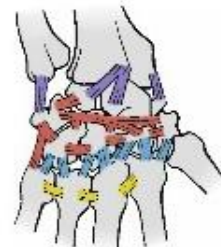
5) Intermetacarpal joints (tight)



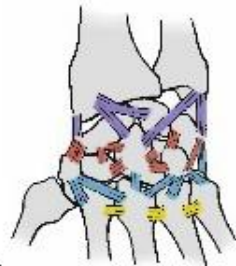
Strong dorsal and palmar ligaments



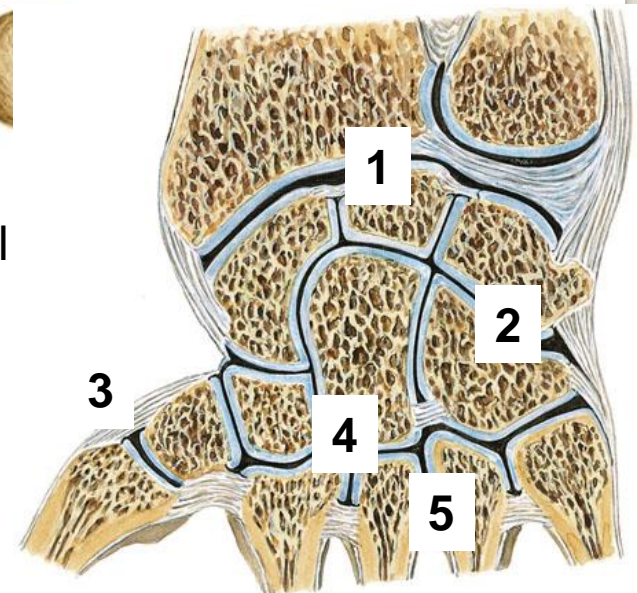
C Section through right wrist, dorsal view



D Diagram of ligaments of right wrist, dorsal surface



E Diagram of ligaments of right wrist, palmar surface



The role of the proximal and distal radioulnar joints in the movements of the hand

Uniaxial – axis (c) passes through the trochlea of the humerus, doesn't perpendicular to the axis of the upper limb, but slent slightly to medial. This position in the extensional position results obtuse angle between the axis of the upper and forearm in lateral direction [approximately 168,5°] = „**physiological abduction**”

Humeroulnar joint

Hinge

flexion-extension

multiaxial, but only subordinated role!!! It keeps the maximal rotational capability in both possible movement (flexion and extension) .

Humeroradial joint

Ball-and-socket

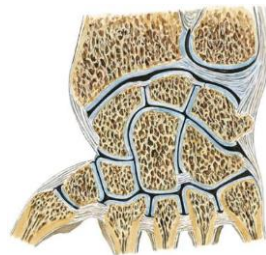
Prox. radioulnar joint

Dist. radioulnar joint

pivot

pronation-supination

Uniaxial – axis passes through the construction axis of the forearm



Intersection point of construction axis (a) of the forearm

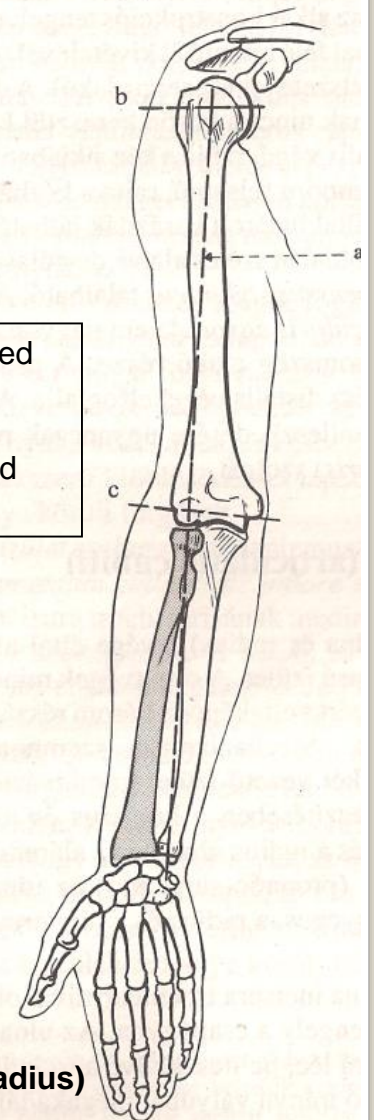
head of the humerus

head of the radius

= radial tuberosity (here leaves the radius)

head of the ulna

styloid process of the ulna



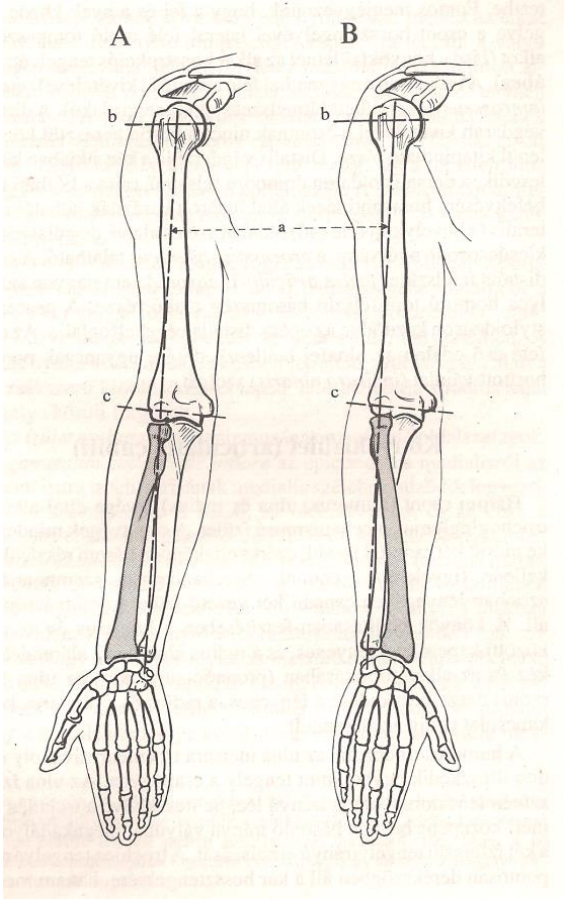
Supination - pronation



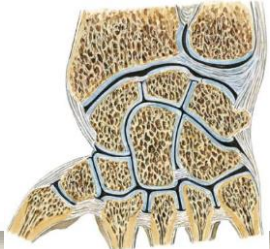
Lat.



Med.

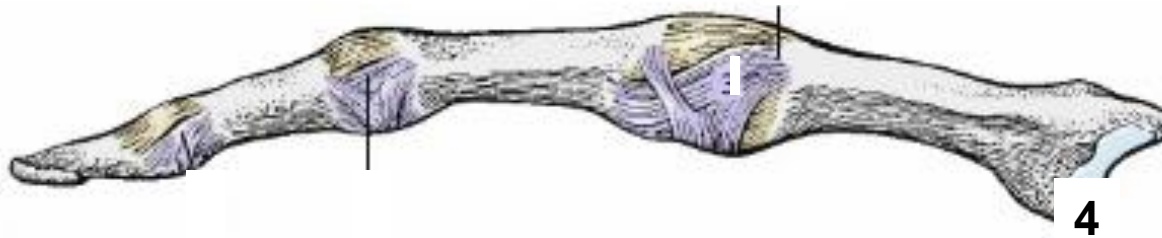
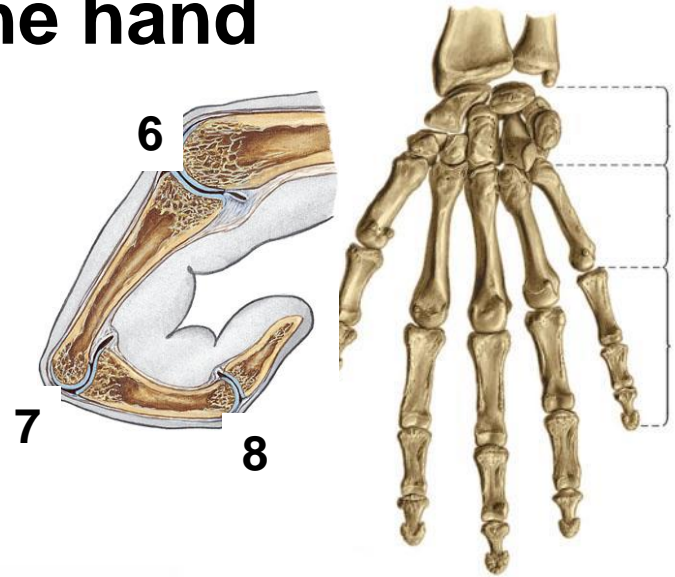


Sum. 140°



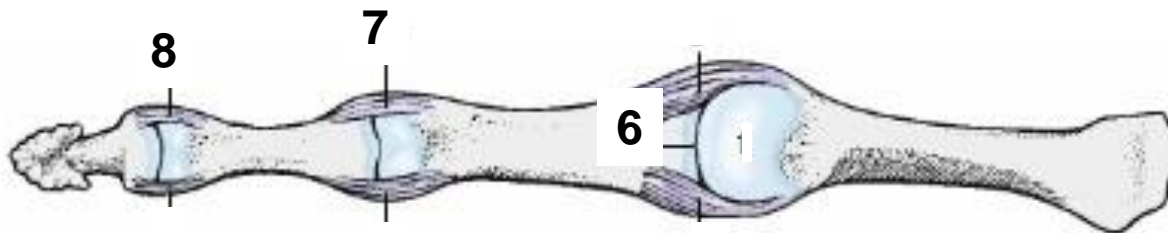
Further joints of the hand

- 1) Wrist joint/radiocarpal (ellipsoid)
- 2) Midcarpal joints (tight)
- 3) Carpometacarpal joint of the Thumb (saddle)
- 4) Carpometacarpal joints (tight)
- 5) Intermetacarpal joints (tight)
- 6) Metacarpophalangeal joint (ball-and-socket in shape)
- 7) Proximal interphalangeal (hinge)
- 8) Distal interphalangeal (hinge)

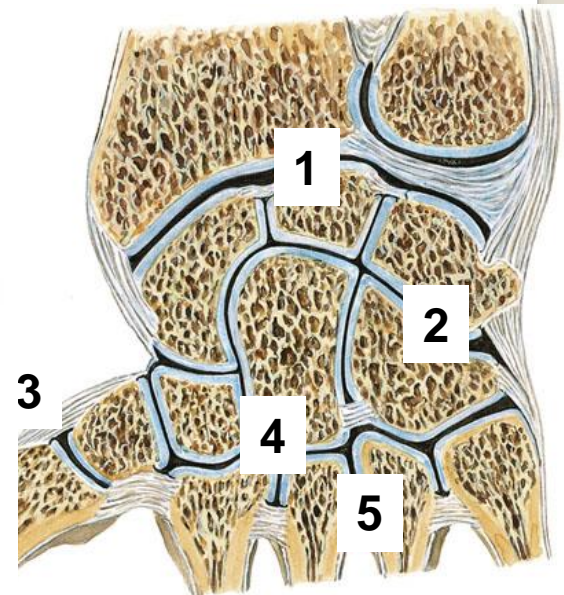


D Lateral view of digital joints

Collateral ligaments!!!

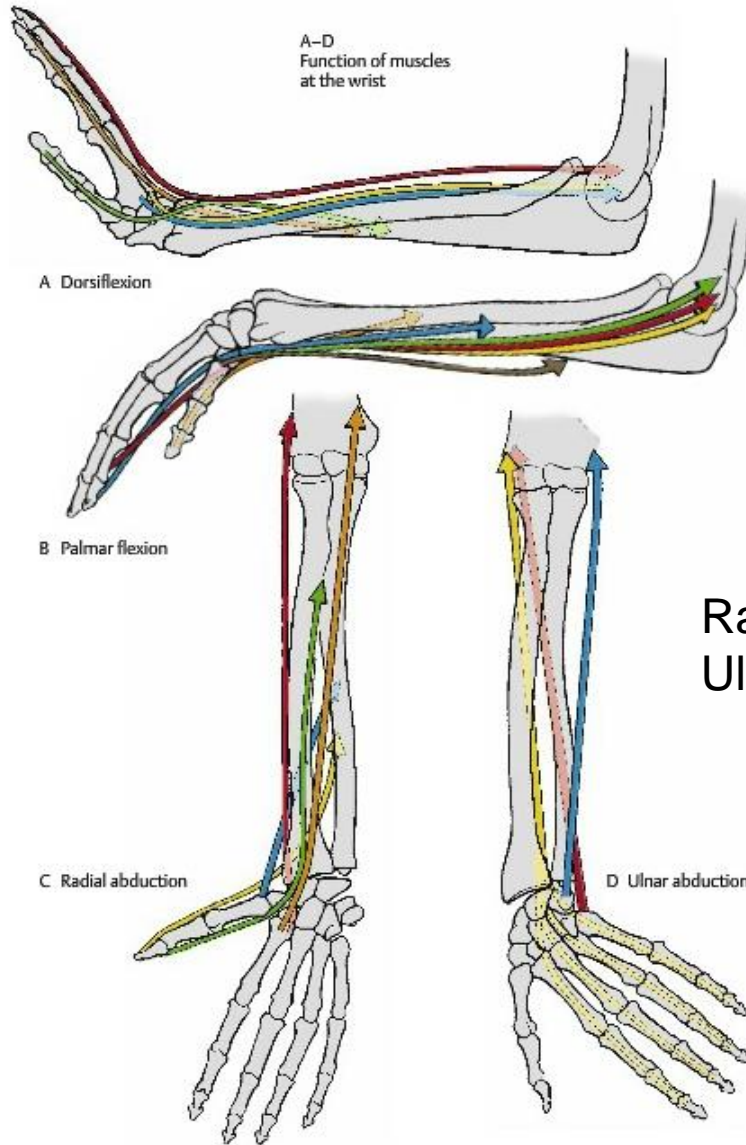
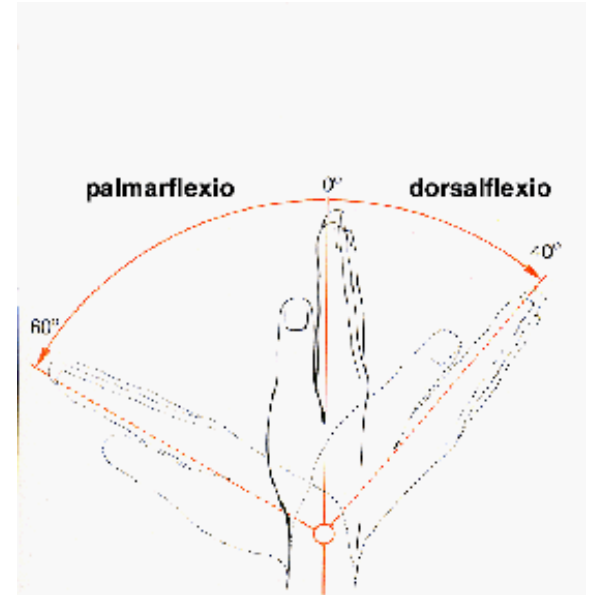


E Palmar view of metacarpophalangeal and digital joints with capsules removed

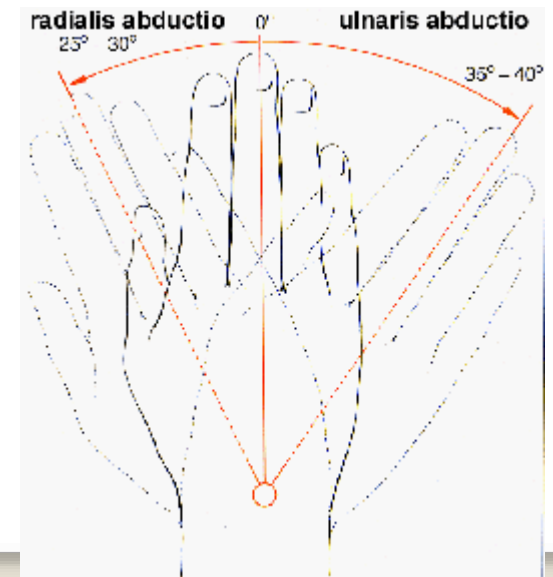


Movements of the wrist joint

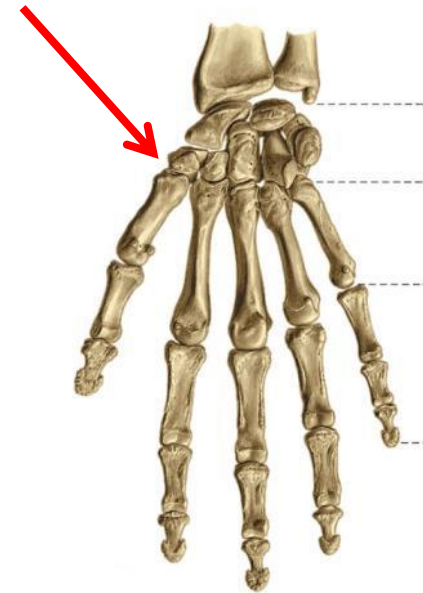
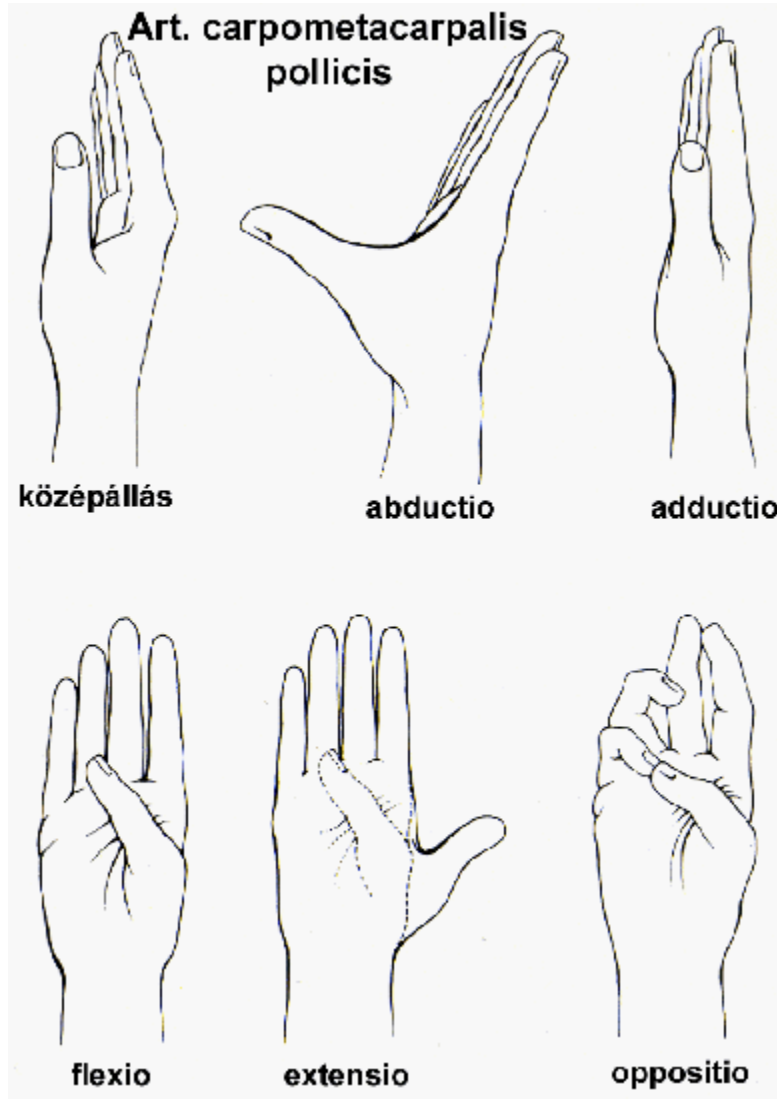
Dorsalflexion - Palmarflexion



Radial abduction Ulnar abduction

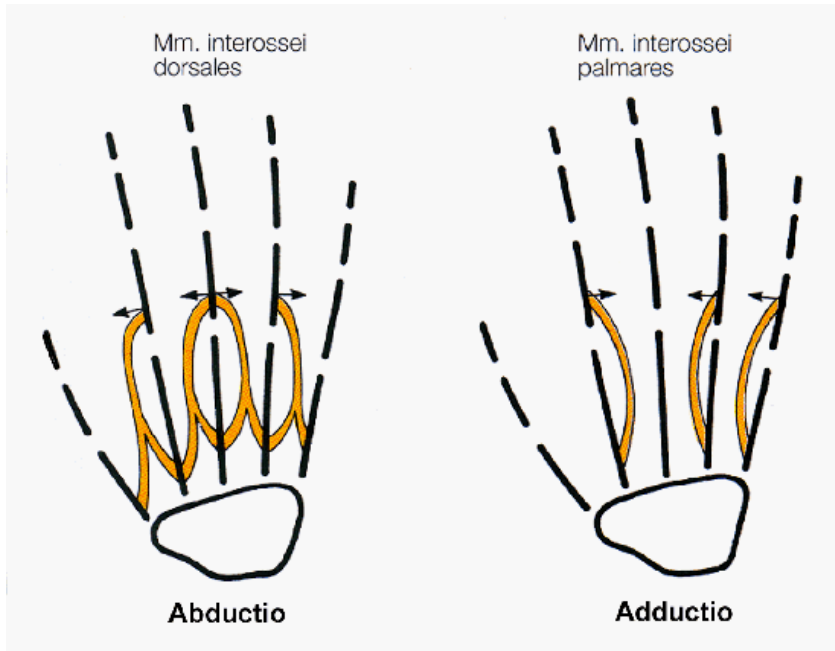


Movements of the carpometacarpal joint of the thumb

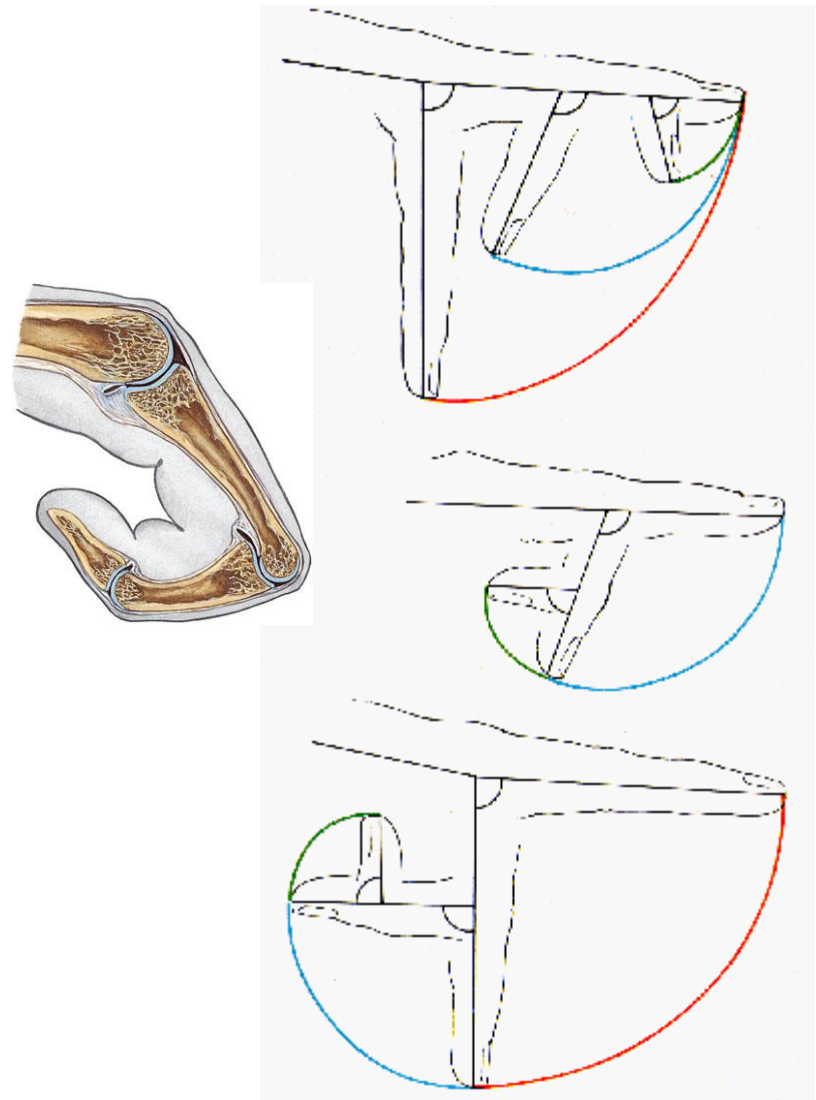


Movements of fingers

Abduction - Adduction



Flexion - Extension



Elbow joint: The muscles moving the forearm

Flexor muscles of the elbow joint (forearm):
(max. 150°)

m. biceps brachii,
m. brachialis,
m. brachioradialis,
m. pronator teres,
m. flexor carpi radialis,
m. palmaris longus,
m. extensor carpi radialis longus,
m. extensor carpi radialis brevis.

Extensor muscle of the elbow joint (forearm):
(max. 10° hyperextension)

m. triceps brachii.

Supinator muscles of the radioulnar joints:
(80-90°)

m. biceps brachii,
m. supinator,
m. abductor pollicis longus,
m. extensor pollicis longus.

Pronator muscles of the radioulnar joints:
(80-90°)

m. pronator teres,
m. pronator quadratus,
m. flexor carpi radialis.

m. brachioradialis brings the forearm to midposition.

Wrist joint: The movements of the hand

Palmarflexion: (60-90°)

m. flexor digitorum superficialis
m. flexor digitorum profundus,
m. flexor carpi ulnaris,
m. flexor carpi radialis,
m. flexor pollicis longus,
m. abductor pollicis longus,
m. palmaris longus (insignificant).

Radial abduction:

(25-30°)

m. extensor carpi radialis longus,
m. extensor carpi radialis brevis,
m. abductor pollicis longus,
m. extensor pollicis longus,
m. extensor indicis,
m. flexor carpi radialis.

Dorsalflexion: (40-90°)

m. extensor digitorum,
m. extensor carpi ulnaris,
m. extensor carpi radialis longus,
m. extensor carpi radialis brevis,
m. extensor indicis,
m. extensor pollicis longus.

Ulnar abduction:

(35-40°)

m. extensor carpi ulnaris,
m. flexor carpi ulnaris.

The muscles moving the thumb at the first carpometacarpal joint:

Flexor muscles of the thumb: (max. 60°)

m. flexor pollicis longus,
m. flexor pollicis brevis,
m. abductor pollicis brevis,
m. adductor pollicis (oblique head),
m. opponens pollicis.

Abductor muscles of the thumb: (35-40°)

m. abductor pollicis longus,
m. abductor pollicis brevis,
m. opponens pollicis,
m. flexor pollicis brevis (superficial head),

Opposition of the thumb:

m. opponens pollicis,
m. adductor pollicis,
m. flexor pollicis longus,
m. flexor pollicis brevis,
m. abductor pollicis brevis.

Extensor muscles of the thumb:

m. extensor pollicis longus,
m. extensor pollicis brevis,
m. abductor pollicis longus.

Adductor muscles of the thumb:

m. adductor pollicis,
m. extensor pollicis longus.

Reposition of the thumb:

m. abductor pollicis longus,
m. extensor pollicis longus,
m. extensor pollicis brevis,

The movements of the thumb

Metacarpo-phalangeal joint of the thumb

Flexor muscles of the proximal phalanx of the

thumb: (max. 70°)

m. flexor pollicis longus,
m. flexor pollicis brevis,
m. abductor pollicis brevis,
m. adductor pollicis.

Extensor muscles of the proximal phalanx of the

thumb:

m. extensor pollicis longus,
m. extensor pollicis brevis.

Interphalangeal joint of the thumb

Flexor muscle of the distal phalanx of the thumb:

(max. 40°)

m. flexor pollicis longus.

Extensor muscle of the distal phalanx of the

thumb:

m. extensor pollicis longus.

The movements of the proximal phalanges of the II-V. fingers
Metacarpo-phalangeal joints

Flexor muscles of the proximal phalanges:
(90°)

m. flexor digitorum superficialis,
m. flexor digitorum profundus,
mm. lumbricales,
mm. interossei palmares,
mm. interossei dorsales,
m. flexor digiti minimi,
m. abductor digiti minimi (little finger).

Extensor muscles of the proximal phalanges:
(20° hyperextensio)

m. extensor digitorum,
m. extensor indicis (index),
m. extensor digiti minimi (little finger).

The movements of the middle phalanges of the II-V. fingers

Proximal interphalangeal joint

Flexor muscles of the middle phalanges:

(max. 110°)

m. flexor digitorum superficialis,
m. flexor digitorum profundus.

Extensor muscles of the middle phalanges:

m. extensor digitorum,
mm. lumbricales,
mm. interossei,
m. extensor indicis (index),
m. extensor digiti minimi (little finger),
m. abductor digiti minimi (little finger).

The movements of the distal phalanges of the II-V. fingers

Distal interphalangeal joint

Flexor muscle of the distal phalanges:

(max. 90°)

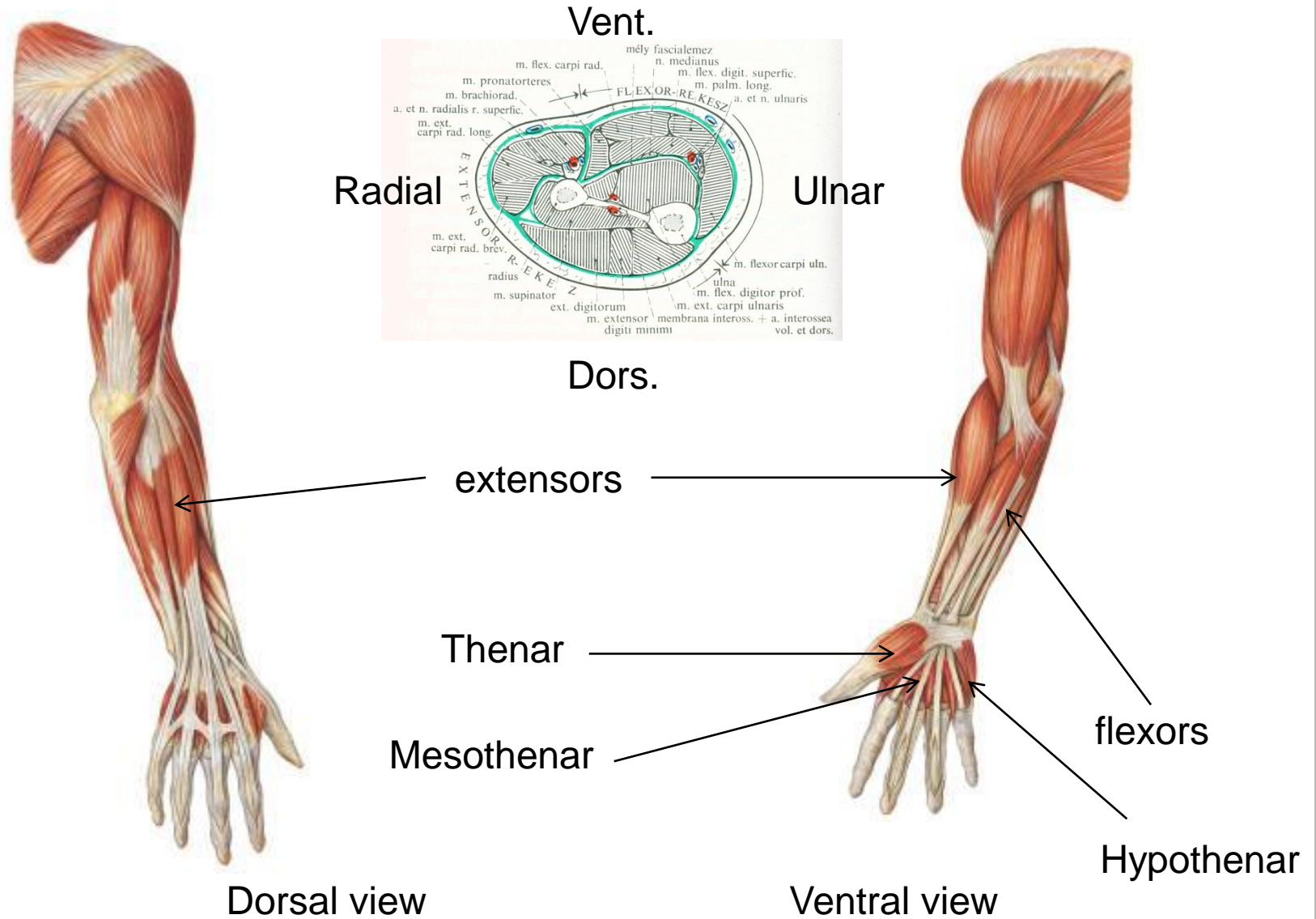
m. flexor digitorum profundus.

Extensor muscles of the distal phalanges:

(max. 5°)

m. extensor digitorum,
mm. lumbricales,
mm. interossei,
m. extensor indicis (index),
m. extensor digiti minimi (little finger).

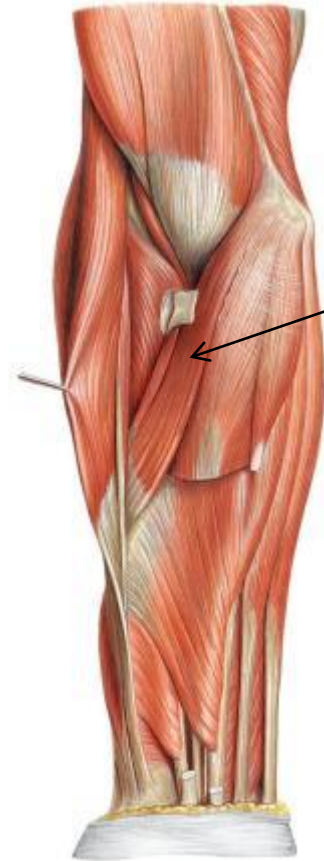
Location of the muscles



supinator m.



pronator quadratus m.

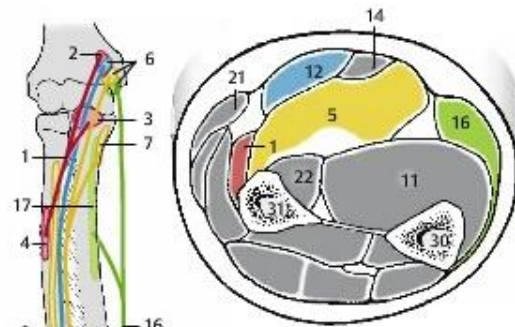


pronator teres m.

Flexors of the forearm

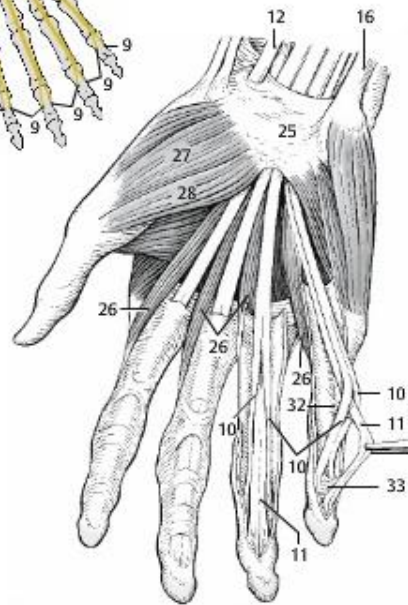


A Superficial flexors of ventral group of forearm muscles (plane of section indicated)

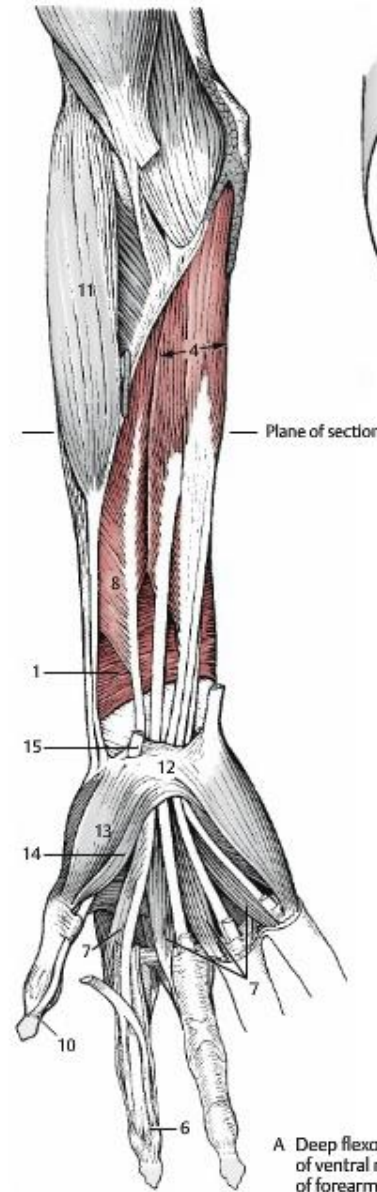


C Section through middle of forearm

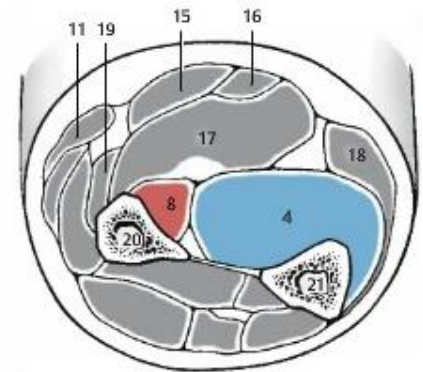
D Diagram of origin, course, and insertion of muscles; palmaris longus not shown



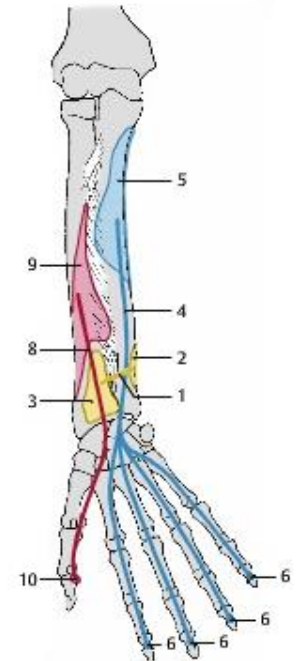
B Superficial flexors in the hand, palmar aponeurosis removed



A Deep flexor group of ventral muscles of forearm



B Section through middle of forearm



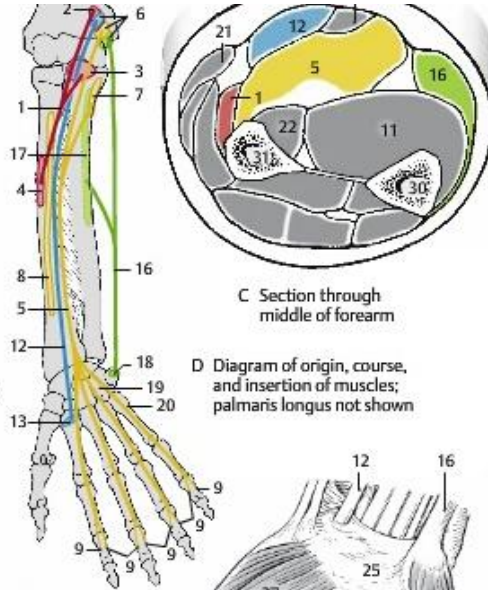
C Diagram of origin, course, and insertion of muscles

Carpal tunnel and flexor retinaculum

Palmar carpal tendinous sheaths

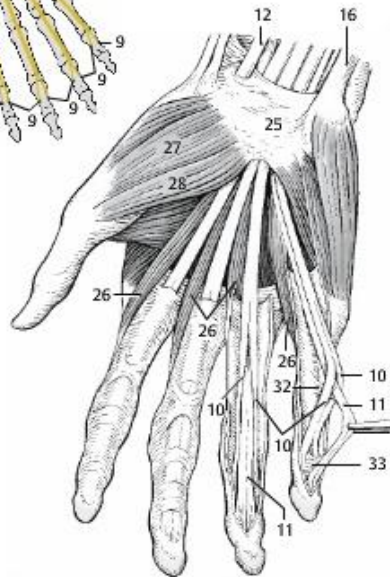


A Superficial flexors of ventral group of forearm muscles (plane of section indicated)

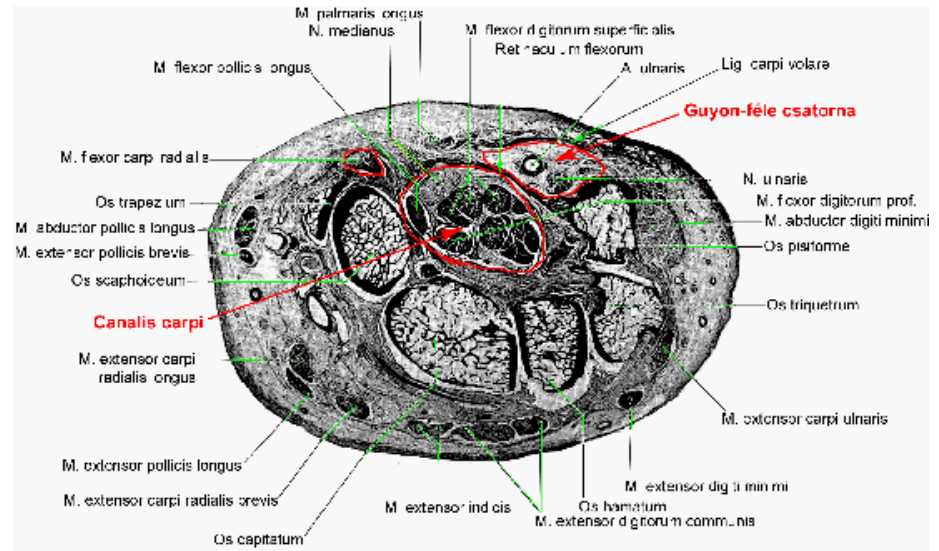
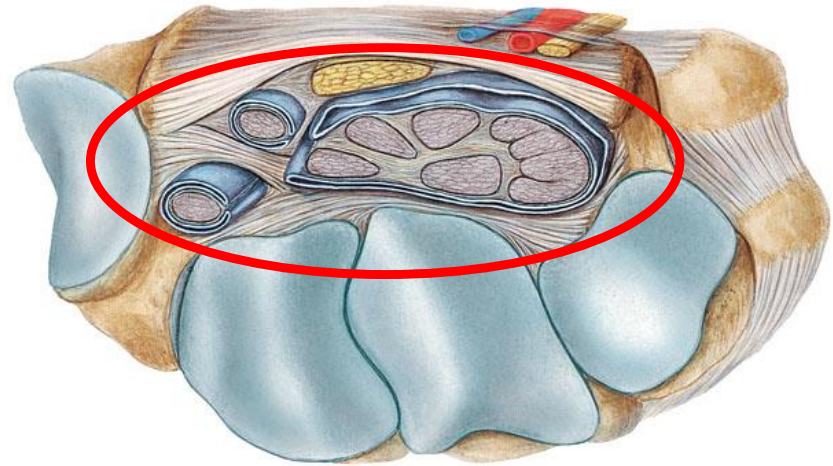


C Section through middle of forearm

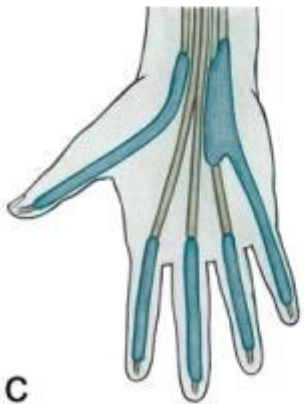
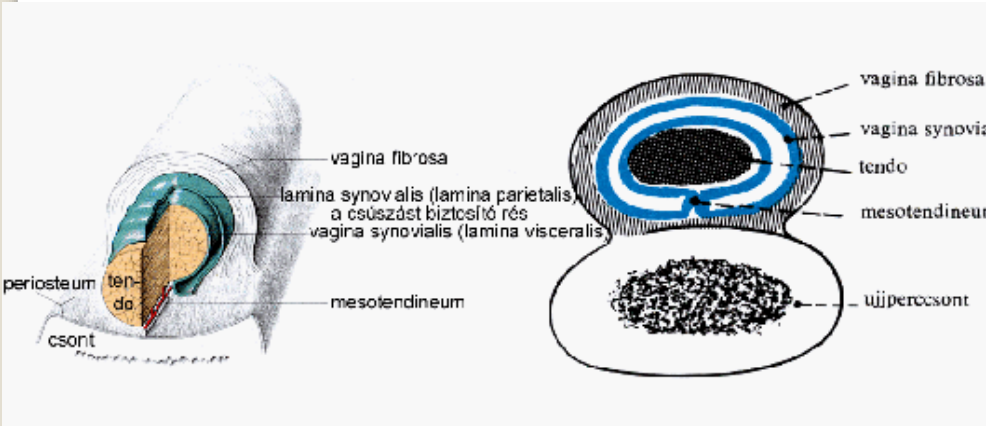
D Diagram of origin, course, and insertion of muscles; palmaris longus not shown



B Superficial flexors in the hand, palmar aponeurosis removed

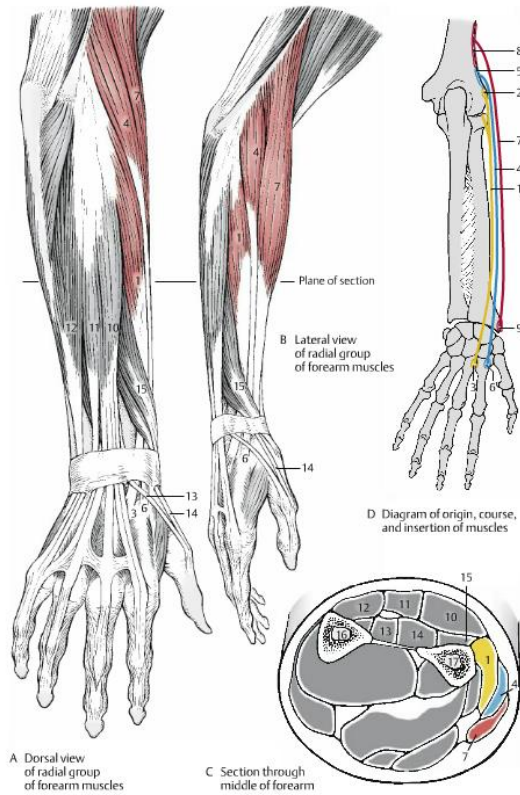


Tendon sheath

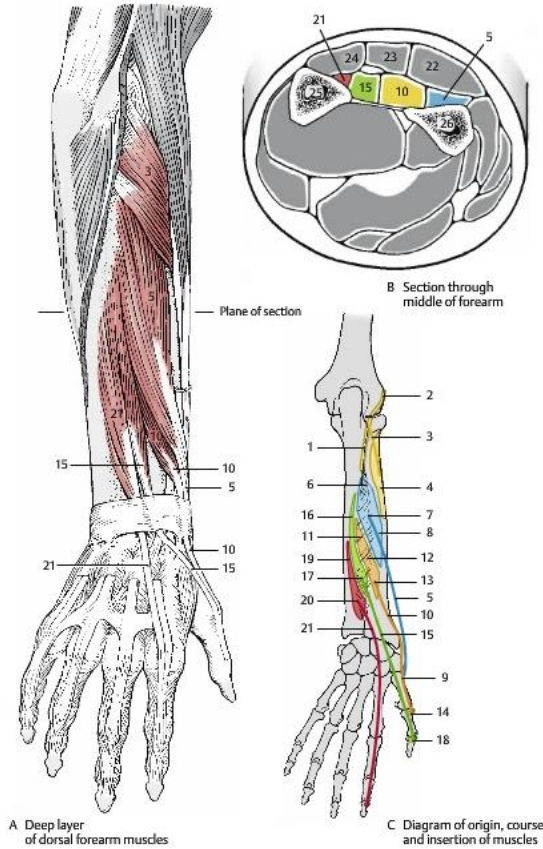


Extensors of the forearm

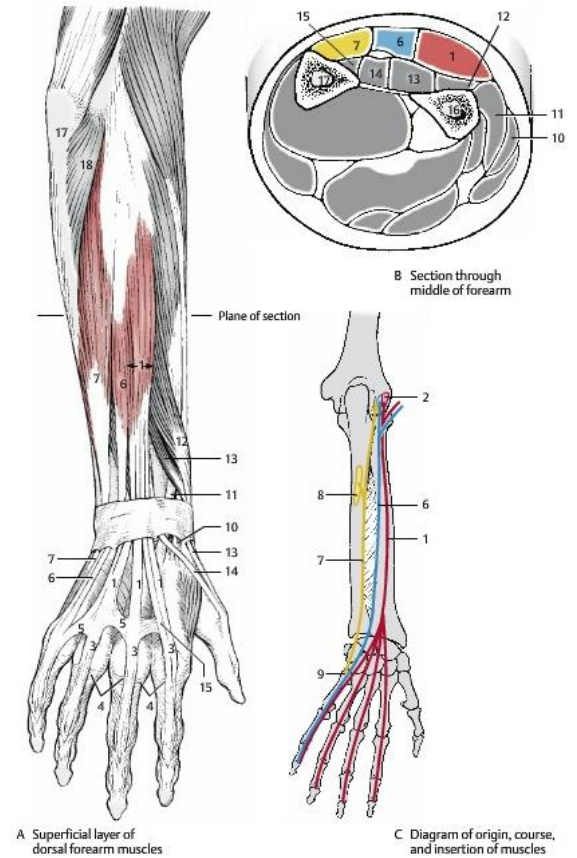
superficial radial (3)



Deep(4)



superficial ulnar (3)



Dorsal and palmar carpal tendinous sheaths

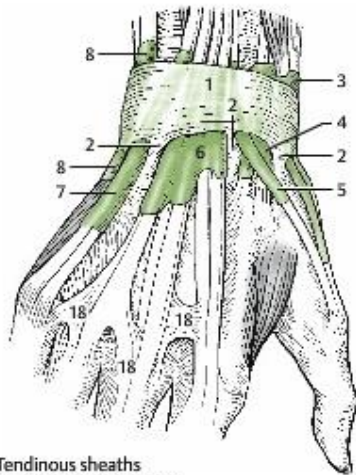
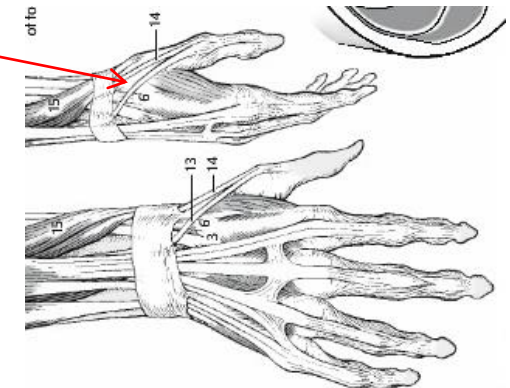
Extensor retinaculum

6 osteofibrous compartments are composed by septa arising from the extensor retinaculum and inserting on the longitudinal bony crests of the radius. Their contents from radial direction:

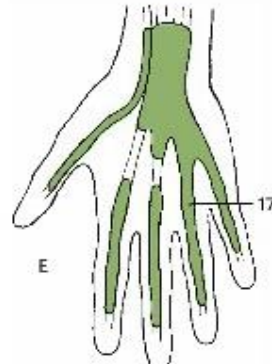
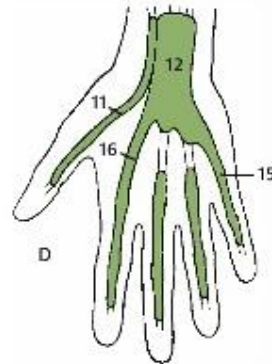
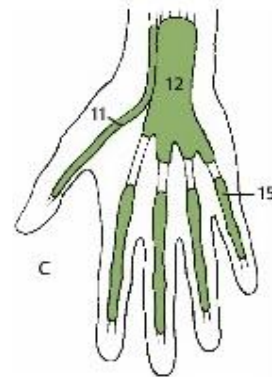
- 1) *abductor pollicis longus m.*
ext. pollicis brevis m.
- 2) *ext. carpi radialis longus m.*
ext. carpi radialis brevis
- 3) *m.ext. pollicis longus m.*
- 4) *ext. digitorum m.*
ext. indicis m.
- 5) *ext. digiti minimi m.*
- 6) *ext. carpi ulnaris m.*



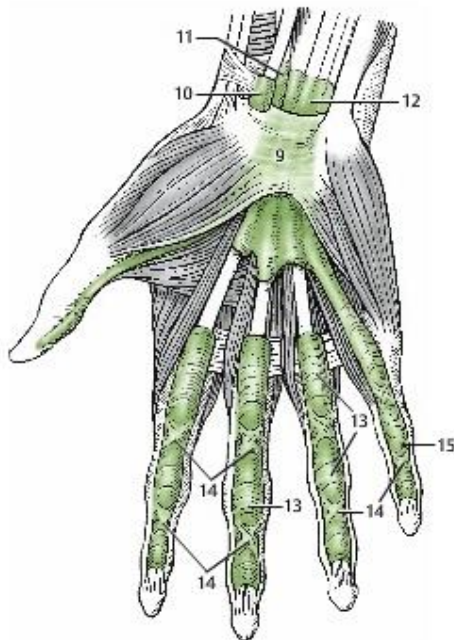
The tendons in I. and III. compartment border the anatomical snuff box (tabatiere = foveola radialis = **anatomical snuffbox**).



A Tendinous sheaths of the back of the hand

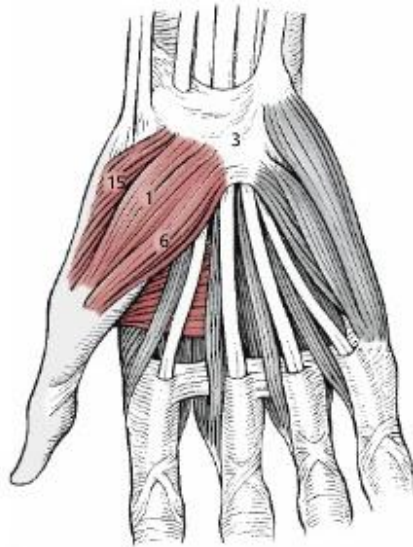


C-E Variations of the tendinous sheaths of the palm

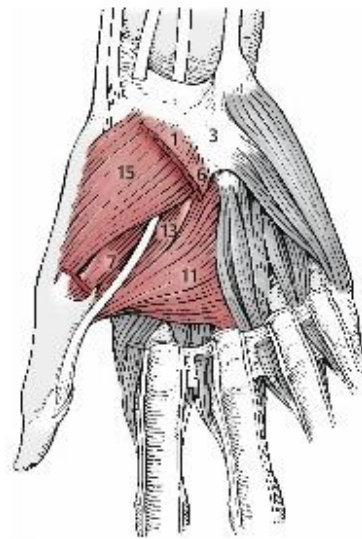


B Tendinous sheaths of the palm of the hand and of the fingers

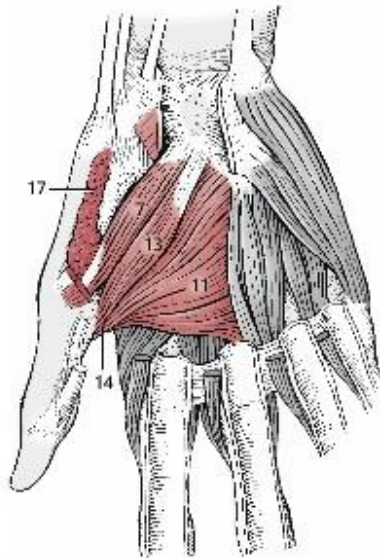
Muscles of the hand – Thenar



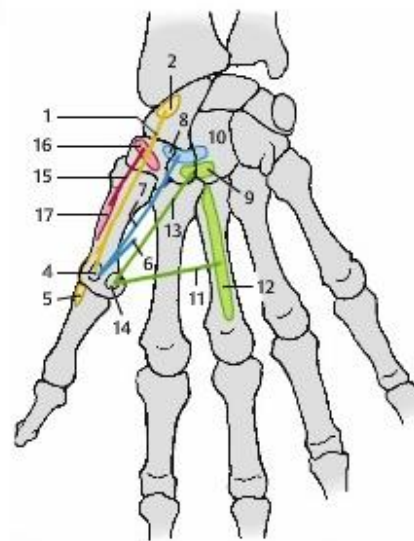
A Thenar muscles, first layer



B Thenar muscles, second layer



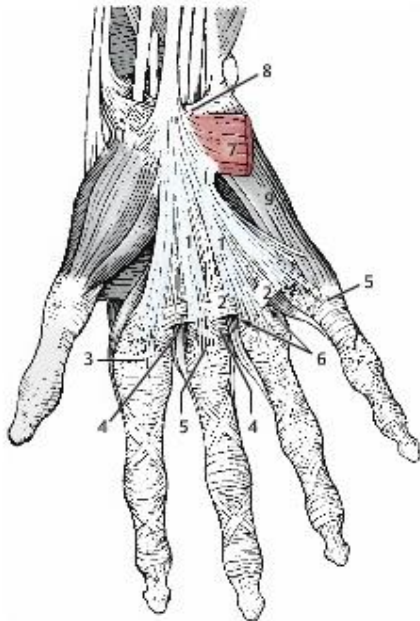
C Thenar muscles, third layer



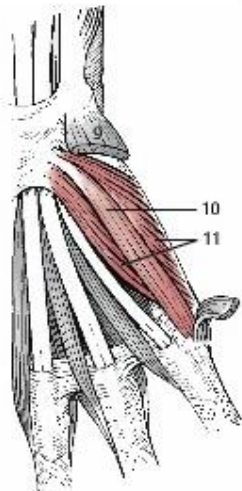
D Diagram of origin, course, and insertion of muscles

Abductor
Opponens
Adductor
Flexor

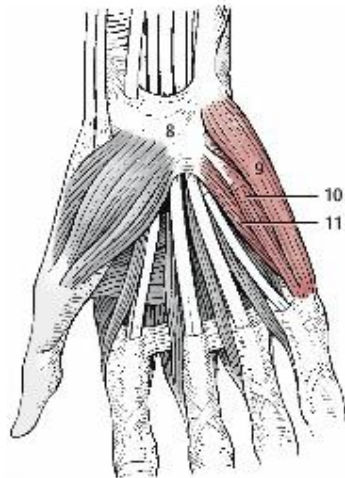
Muscles of the hand - hypothenar



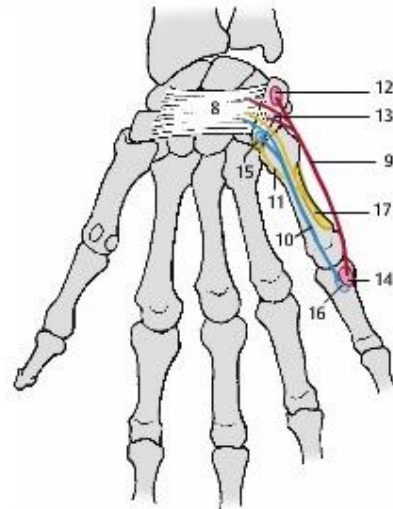
A Palmar aponeurosis and palmaris brevis



C Hypothenar muscles, second layer

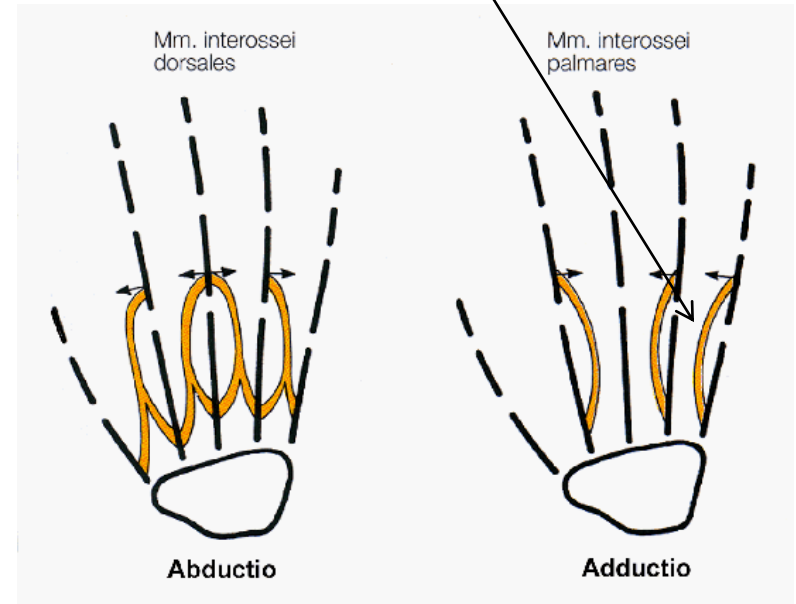


B Hypothenar muscles, first layer

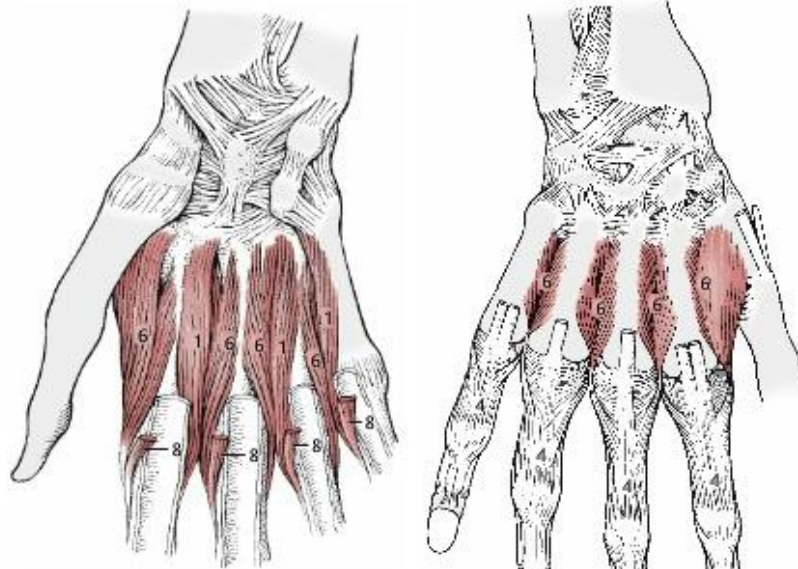


D Diagram of origin, course, and insertion of muscles

Abductor
Opponens
Adductor
Flexor

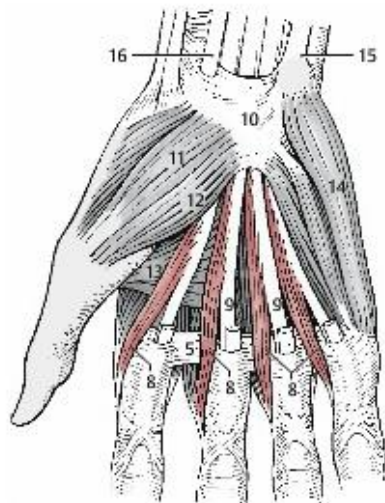


Muscles of the hand

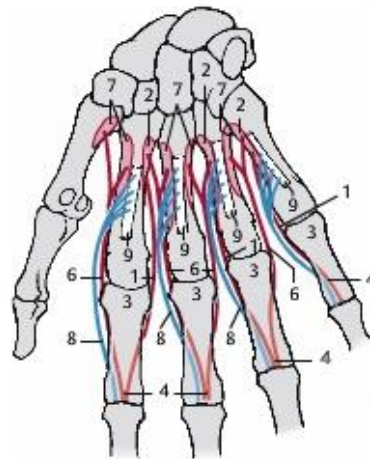


A Palmar interosseous muscles

B Dorsal interosseous muscles



C Lumbricales muscles

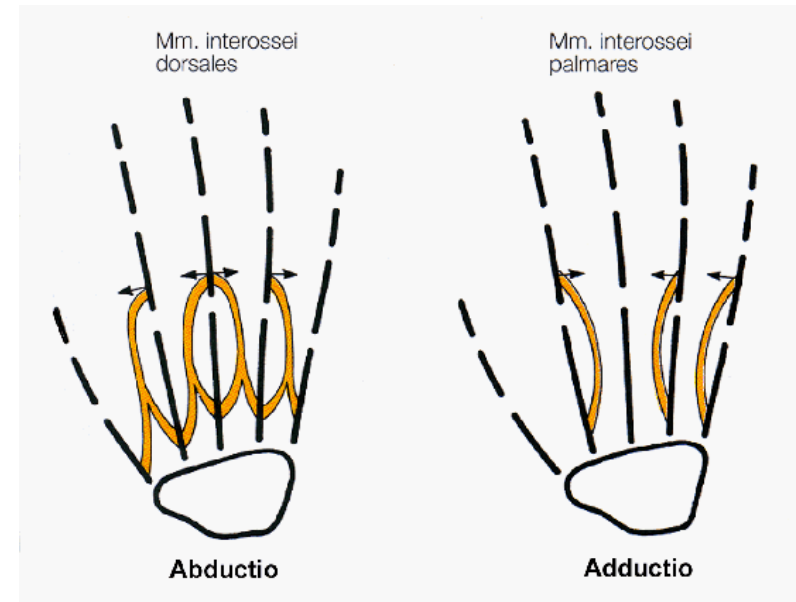


D Diagram of origin, course, and insertion of muscles

Palmar/volar interosseus muscles (3)

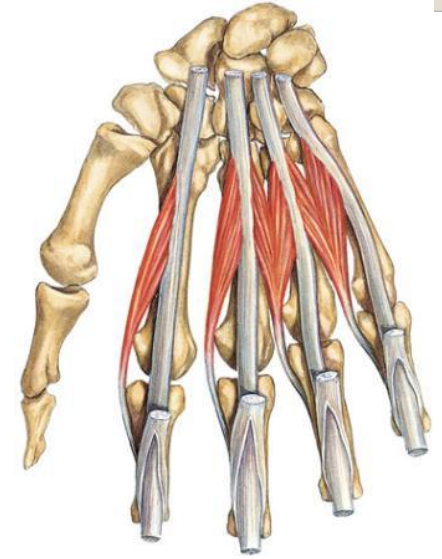
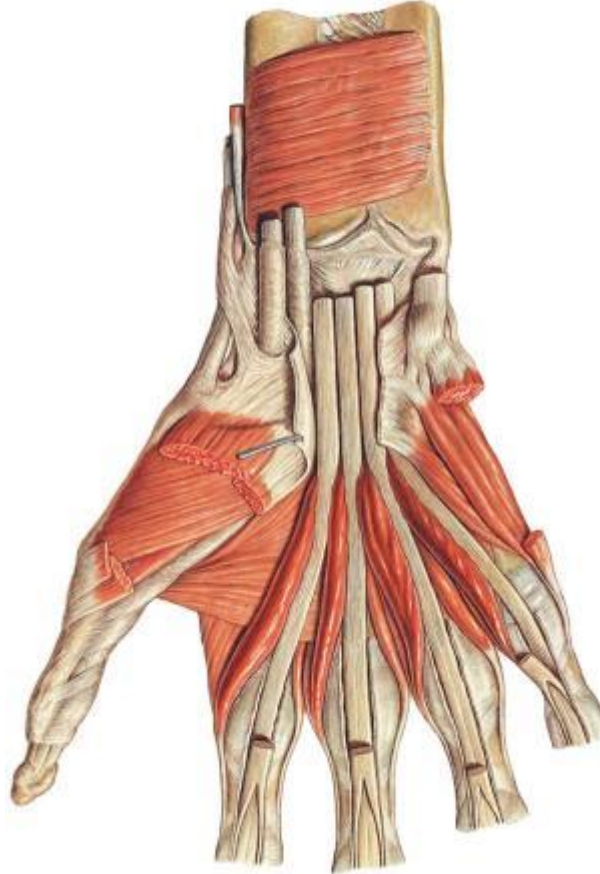
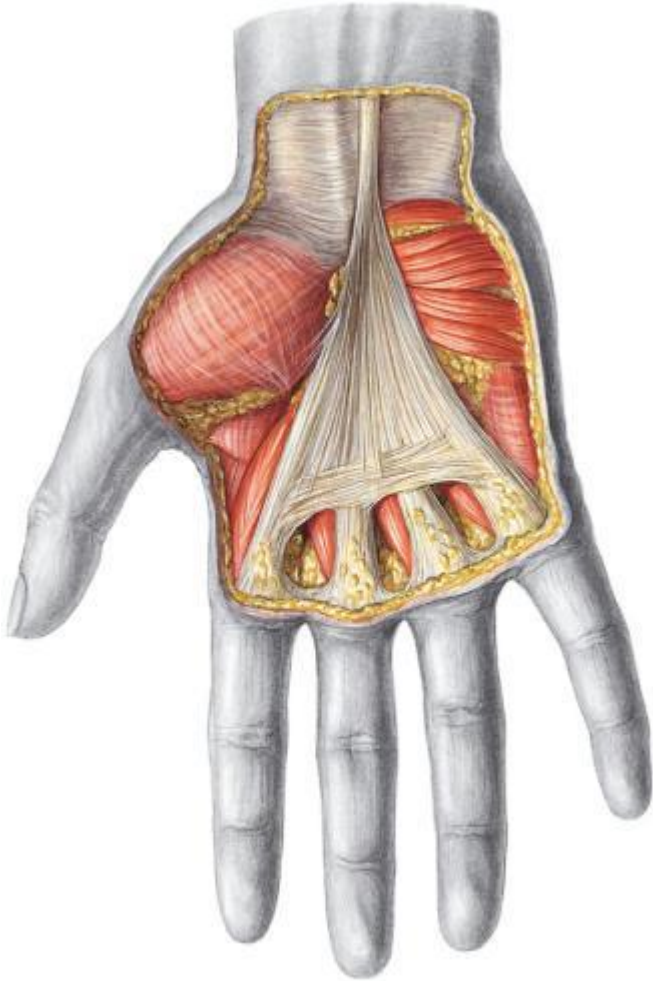
Dorsal interosseus muscles (4)

Lumbricales muscles (4)

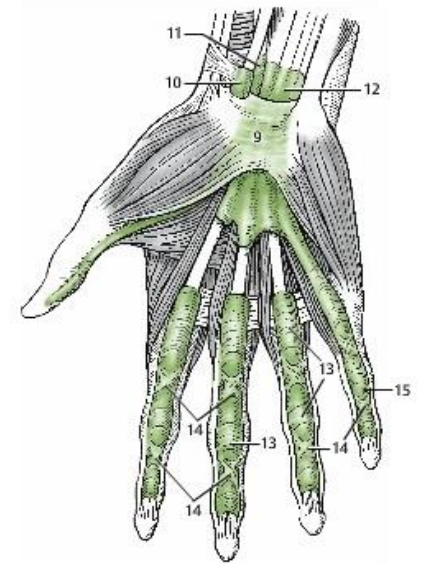
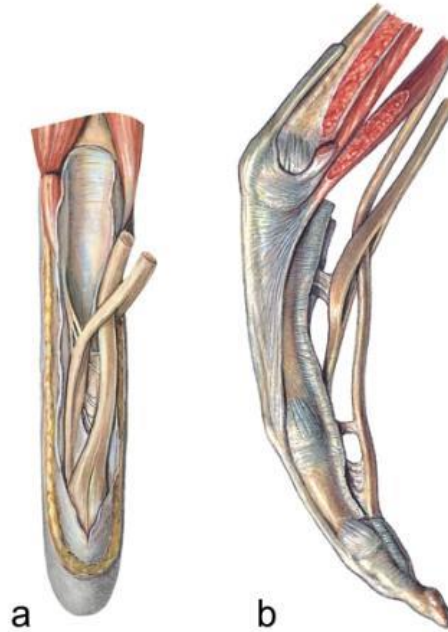
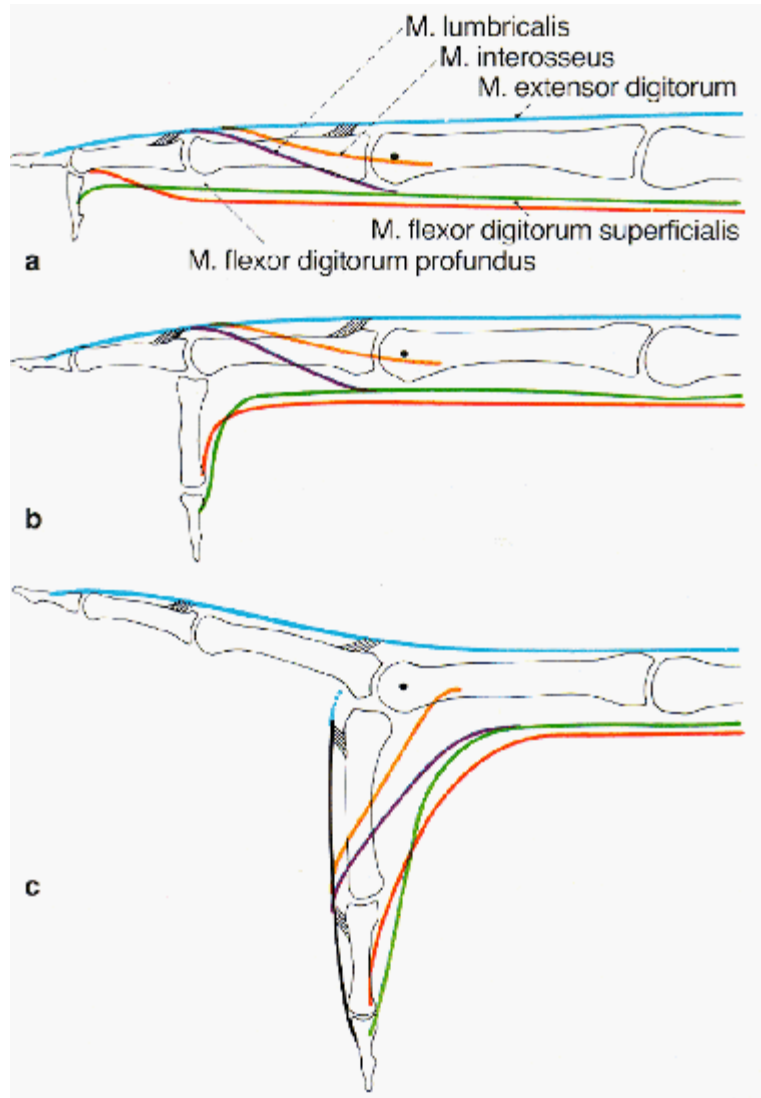


Muscles of the hand - mesothenar

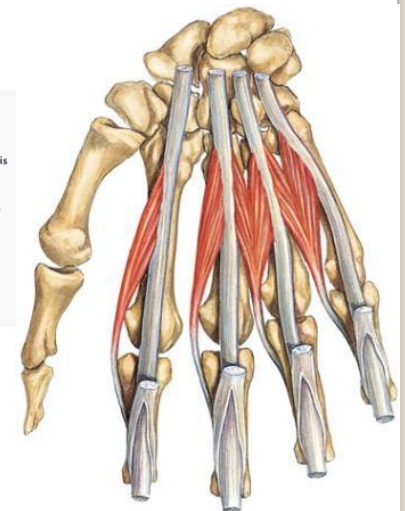
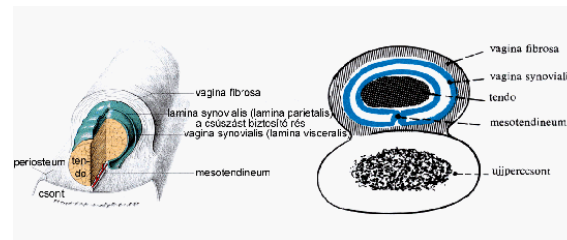
Palmar aponeurosis



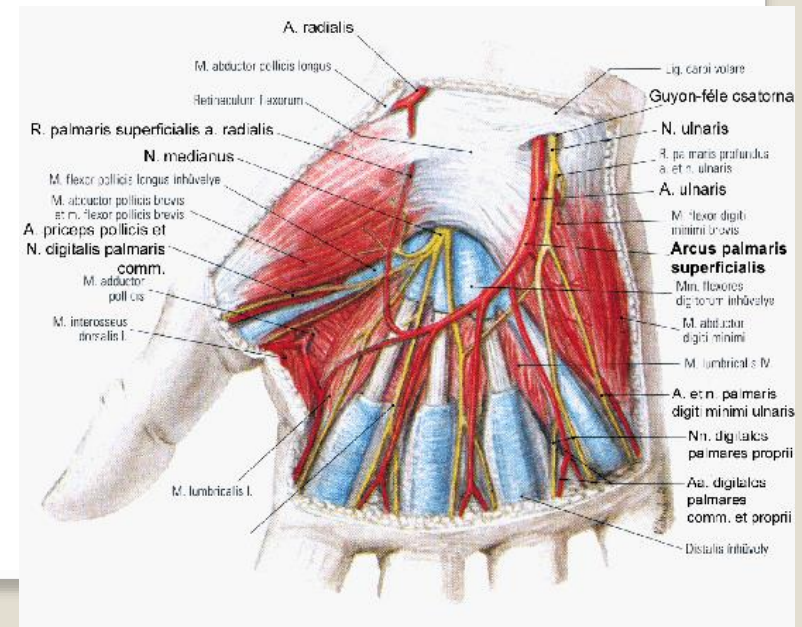
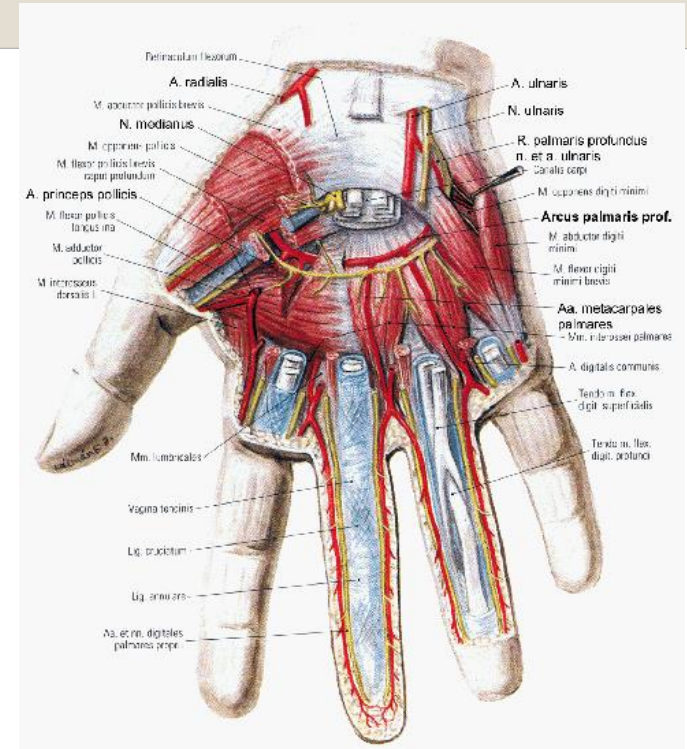
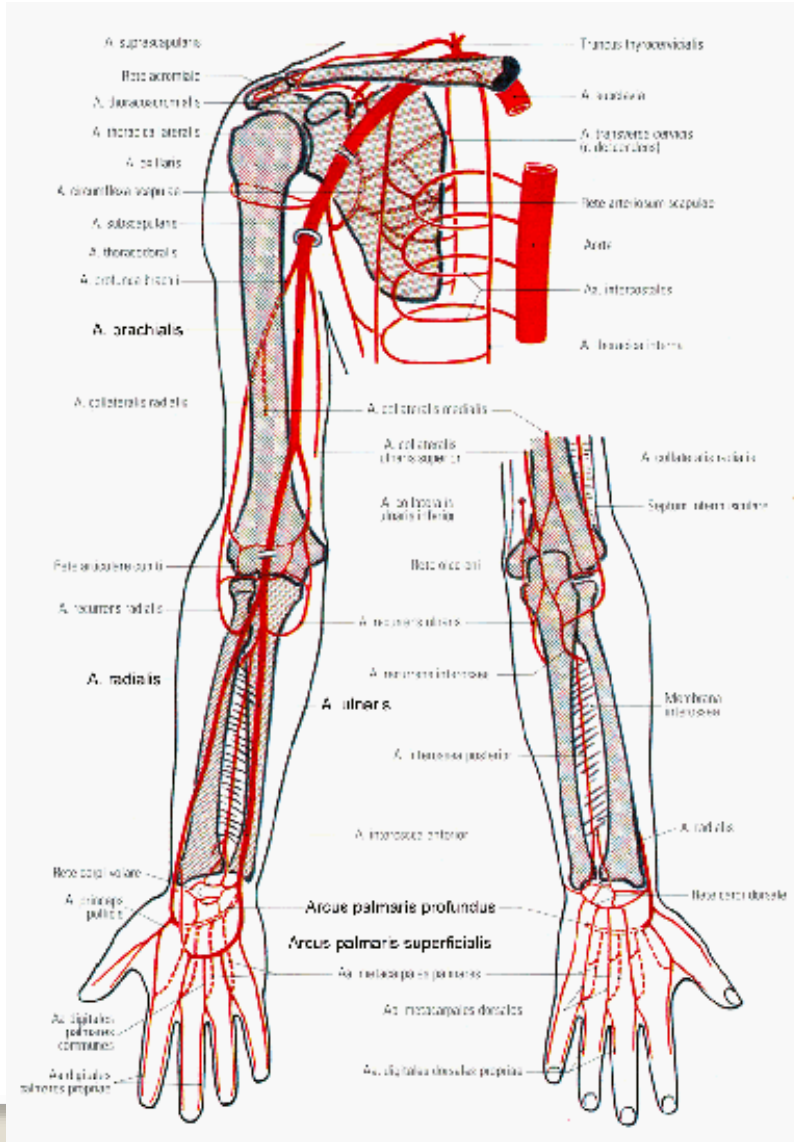
Tendons of the deep and superficial flexor digitorum muscles



B Tendinous sheaths of the palm of the hand and of the fingers



Arteries - deep and superficial palmar arches



Fascias

