Hand

Hand - Osteology
- Carpal bones (8)
  1. Scaphoid
  2. Lunate
  3. Triquetrum
  4. Pisiform
  5. Trapezium
  6. Trapezoid
  7. Capitate
  8. Hamate
- Metacarpal bones I-V (5)
- Phalanges (14)

Joints
- Interphalangeal (DIP & PIP) joint
  - Distal & Proximal
- Metacarpophalangeal (MP) joint
- Carpometacarpal (CMC) joint
- Radiocarpal (wrist) joint
Hand - Fascia

- **Palmar fascia**
  - Continuous with the antebrachial fascia
  - Palmar aponeurosis
  - Fibrous digital sheaths
  - Transverse carpal ligament (flexor retinaculum)
**Hand - Fascia**
- Carpal tunnel
  - Contents – 10 structures pass through the carpal tunnel
    - Four tendons of the flexor digitorum superficialis
    - Four tendons of the flexor digitorum profundus
    - Flexor pollicis longus
    - Median nerve
**Hand muscles - Four compartments**
1. **Thenar compartment - move the thumb (digit 1)**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abductor pollicis brevis</td>
<td>Tubercles of scaphoid and trapezium and adjacent flexor</td>
<td>Proximal phalanx and extensor hood of thumb retinaculum</td>
<td>Abducts thumb at metacarpophalangeal joint</td>
<td>Recurrent branch of median n. [C8,T1]</td>
</tr>
<tr>
<td>Flexor pollicis brevis</td>
<td>Tubercle of the trapezium and flexor retinaculum</td>
<td>Proximal phalanx of the thumb</td>
<td>Flexes thumb at metacarpophalangeal joint</td>
<td></td>
</tr>
<tr>
<td>Opponens pollicis brevis</td>
<td>Tubercle of trapezium and flexor retinaculum</td>
<td>Lateral margin and adjacent palmar surface of metacarpal 1</td>
<td>Medially rotates thumb</td>
<td></td>
</tr>
</tbody>
</table>
2. Hypothenar compartment - move the pinky (digit 5)

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abductor digiti minimi</td>
<td>Pisiform, the pisohamate ligament, and tendon of flexor carpi ulnaris</td>
<td>Proximal phalanx of little finger</td>
<td>Abducts little finger at metacarpophalangeal joint</td>
<td>Deep branch of ulnar n. [C8,T1]</td>
</tr>
<tr>
<td>Flexor digiti minimi</td>
<td>Hook of the hamate and flexor retinaculum</td>
<td>Proximal phalanx of little finger</td>
<td>Flexes little finger at metacarpophalangeal joint</td>
<td></td>
</tr>
<tr>
<td>Opponens digiti minimi</td>
<td>Hook of hamate and flexor retinaculum</td>
<td>Medial aspect of metacarpal 5</td>
<td>Laterally rotates metacarpal 5</td>
<td></td>
</tr>
</tbody>
</table>
Hand muscles - Four compartments continued …

3. Adductor compartment

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adductor pollicis</td>
<td>Transverse head: metacarpal 3; oblique head: capitate and bases of metacarpals 2 and 3</td>
<td>Base of proximal phalanx and extensor hood of thumb</td>
<td>Adducts thumb</td>
<td>Deep branch of ulnar n. [C8,T1]</td>
</tr>
</tbody>
</table>
### 4. Central compartment

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbiricales</td>
<td>Tendons of flexor digitorum profundus</td>
<td>Extensor hoods of index, ring, middle, and little fingers</td>
<td>Flex metacarpophalangeal joints while extending interphalangeal joints</td>
<td>Medial two by the deep branch of the ulnar n.; lateral two by digital branches of the median n.</td>
</tr>
</tbody>
</table>
## 4. Central compartment

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dorsal interossei</td>
<td>Adjacent sides of metacarpals</td>
<td>Extensor hood and base of proximal phalanges of index, middle, and ring fingers</td>
<td>Abduction of index, middle, and ring fingers at the metacarpophalangeal joints</td>
<td>Deep branch of ulnar n. [C8,T1]</td>
</tr>
<tr>
<td>Palmar interossei</td>
<td>Sides of metacarpals</td>
<td>Extensor hoods of the thumb, index, ring, and little fingers and the proximal phalanx of thumb</td>
<td>Adduction of the thumb, index, ring, and little fingers at the metacarpophalangeal joints</td>
<td></td>
</tr>
</tbody>
</table>

---

Gross Anatomy
Confusion?
- First palmar interosseous muscle
  OR
- Deep head of flexor pollicis brevis muscle
Hand Gross Anatomy

Hand Muscles - Four compartments continued …
Hand - Innervation

Radial nerve
- superficial branch
  C7,8

Medial nerve
  C6-8

Radial nerve
- superficial branch
  C7,8

Ulnar nerve
  C8, T1

Ulnar nerve
  C8, T1

Median nerve
  C6-8

Netter Presenter Image Copyright 2004. Icon Learning Systems. All rights reserved.

Gross Anatomy
Hand - Vasculature
- The ulnar and radial aa. branches provide all of the blood supply to the hand
- **Ulnar a.** - Enters the hand anterior to the flexor retinaculum, between the pisiform bone and hook of the hamate; lies lateral to the ulnar n.
  - **Superficial palmar arch** - Main termination of ulnar a.; gives rise to:
    - Common palmar digital aa.
    - Proper palmar digital aa.
  - **Deep palmar branch** - Contributes to the deep palmar arch
- **Radial a.** - Curves dorsally around the scaphoid and trapezium in the floor of the anatomical snuff box; enters the palm between the heads of the 1st dorsal interosseous m.; turns medially and passes between the two heads of the adductor pollicis m.
  - **Deep palmar arch** - Formed by anastomosis with deep branch of ulnar a.
    - Palmar metacarpal aa.
    - Princeps pollicis a.
  - **Dorsal carpal arterial arch**
    - Dorsal metacarpal a.
      - Dorsal digital a.
Veins and lymphatics of the hand

- Veins from the fingers (dorsal digital vv.) end in the dorsal venous network (arch) opposite the middle of the dorsum of the hand; the superficial palmar arch drains into the basilic v.

- **Superficial lymphatic vessels** - Accompany the superficial veins and enter the cubital lymph nodes - axillary lymph nodes - thoracic duct (left side) or right lymphatic duct (right side)
**Synovial sheets in hand**

- Areas of infection?
Hand - Innervation

- **Median n.**
  - Palmar branch - Skin of the central region of the palm (sensory)
  - Enters the hand through carpal tunnel (the only nerve to do so)
  - Recurrent branch
    - Thenar mm. (motor)
      - Opponens pollicis m.
      - Abductor pollicis brevis m.
      - Flexor pollicis brevis m.
    - Common palmar digital nn. (mixed)
      - Lumbrical mm. 1-2 (motor)
      - Proper palmar digital nn. (sensory)

- **Ulnar n.**
  - Dorsal branch (sensory)
  - Palmar branch (sensory)
  - Enters the hand by emerging deep from the flexor carpi ulnaris tendon (Guyon’s canal)
  - Superficial branch of the ulnar n. (sensory)
    - Common palmar digital nn.
      - Proper palmar digital nn.
  - Deep branch (motor)
    - Adductor pollicis m.
    - Hypothenar mm.
      - Opponens digitii minimi m.
      - Flexor digitii minimi m.
      - Abductor digitii minimi m.
    - Lumbrical mm. 3-4
    - Palmar interossei and dorsal interossei mm.
    - Deep head of the flexor pollicis brevis m.

- **Radial n.**
  - Superficial branch (sensory)
**Upper limb nerves**

**Terminal branches of the brachial plexus**

- **Musculocutaneous n.**
  - Motor to anterior compartment of arm
  - Coracobrachialis m.
  - Biceps brachii m.
  - Brachialis m.
  - Sensory to forearm
  - Lateral cutaneous nerve of the forearm

- **Median n.**
  - Motor to superficial anterior compartment of the forearm
  - Pronator teres m.
  - Flexor carpi radialis m.
  - Palmaris longus m.
  - Flexor digitorum superficialis m.
  - Motor to deep anterior compartment of the forearm via anterior interosseous n.
  - Radial ½ of flexor digitorum profundus m.
  - Flexor pollicis longus m.
  - Pronator quadratus m.
  - Motor to the hand via recurrent median n.
  - Abductor pollicis brevis m.
  - Opponens pollicis m.
  - Superficial head of the flexor pollicis brevis m.
  - Motor to the hand via common palmar digital nn.
  - 1st and 2nd lumbrical mm.
  - Sensory to hand
  - Palmar branch of median n.
  - Common palmar digital nn.
    - Proper palmar digital nn.

- **Ulnar n.**
  - Motor to anterior compartment of the forearm
  - Ulnar ½ of flexor digitorum profundus m.
  - Flexor carpi ulnaris m.
  - Motor to hand via superficial branch of the ulnar n.
  - Palmaris brevis m.
  - Motor to hand via deep branch of the ulnar n.
  - Abductor digiti minimi m.
  - Flexor digiti minimi (brevis) m.
  - Opponens digiti minimi m.
  - Palmar interosseous mm.
  - Dorsal interosseous mm.
  - 3rd and 4th lumbrical mm.
  - Adductor pollicis m.
  - Deep head of the flexor pollicis brevis m.
• **Ulnar n. continued**
  - Sensory to hand
    - Dorsal branch of the ulnar n.
      - Dorsal digital nn.
    - Palmar branch of the ulnar n.
    - Superficial branch of the ulnar n.
      - Common palmar digital nn.
      - Proper palmar digital nn.
  - **Axillary n.**
    - Motor to posterior shoulder
      - Deltoid m.
      - Teres minor m.
    - Sensory to posterior shoulder
      - Superior lateral cutaneous nerve of the arm
  - **Radial n.**
    - Motor to posterior compartment of the arm
      - Triceps brachii m.
    - Motor to posterior compartment of the forearm
      - Anconeus m.
      - Brachioradialis m.
      - Extensor carpi radialis longus m.
    - Motor to the lateral portion of the brachialis m.
    - Motor to posterior compartment of the forearm **via the deep radial n.**
      - Extensor carpi radialis brevis m.
    - Motor to the posterior compartment of the forearm **via the posterior interosseous n.**
      - Supinator m.
      - Extensor carpi ulnaris m.
      - Extensor digitorum m.
      - Extensor digiti minimi m.
      - Extensor indicis m.
      - Extensor pollicis longus m.
      - Abductor pollicis longus m.
      - Extensor pollicis brevis m.
    - Sensory to arm
      - Posterior cutaneous nerve of the arm
      - Inferior lateral cutaneous nerve of the arm
    - Sensory to forearm
      - Posterior cutaneous nerve of the forearm
    - Sensory to hand
      - Superficial branch of the radial n.
        - Dorsal digital nn.