CQ HAND + UPPER LIMB
SPECIALIST ORTHOPAEDIC SURGEON

EVIDENCE SUMMARY

Extensor Tendon Repair

Anatomy & Pathophysiology

GENERAL HAND ARCHITECTURE

- The hand is composed of 19 bones, 17 articulations, and 19 muscles situated entirely within the hand [2].
- Approximately the same number of tendons activated by forearm muscles are present in the hand [2].
- The hand functions efficiently only if the proximal joints of the limb are stable and yet mobile [2].
- The dorsal aspect of the hand is convex, while the anterior, palmar, or volar aspect is concave [2].
- The palmar surface is the functional surface of the hand, while the dorsal surface is usually visible and aesthetically important [2].
- The thumb has a more proximal and lateral position than the four fingers, allowing movement inward and outward from the palm [2].
- When fingers are extended and separated, their tips lie on the circumference of a circle whose center is the head of the third metacarpal [2].

METACARPAL AND LONGITUDINAL ARCH ANATOMY

- The metacarpal arch possesses adaptability due to the mobility of the peripheral metacarpals [7].
- The index metacarpal is the most firmly fixed of the metacarpals [7].
- The ring metacarpal has approximately 10 degrees of mobility in flexion and extension [7].
- The fifth metacarpal has a range of flexion–extension of approximately 20 degrees [7].
- The second to fifth metacarpals are bound together by the deep transverse intermetacarpal ligament, also known as the interglenoid ligament [7].
- The interglenoid ligament ties together the anterior glenoid ligaments of the metacarpophalangeal articulations, known as volar plates [7].
- The metacarpophalangeal joints serve as the keystones of the longitudinal arches of the hand [7].
- The volar plates prevent hyperextension at the metacarpophalangeal joints [7].
- The sagittal bands of the extensor apparatus insert onto the volar plate [7].
- The first annular segment of the pulley of the flexor tendons inserts onto the volar plate [7].

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EXTENSOR TENDON AND INTRINSIC MUSCLE ANATOMY

- There are seven interosseous muscles in the hand, consisting of four dorsal and three volar muscles [4].
- The dorsal interossei are abductors, while the volar interossei are adductors [4].
- The middle finger has two dorsal interossei and no volar interossei because the central axis of the hand lies within it [4].
- Each dorsal interosseous muscle, with the exception of the third, has two muscle heads: a superficial head and a deep head [4].
- The superficial head of the dorsal interosseous muscles abducts and weakly flexes the proximal phalanx [4].
- The deep head of the dorsal interosseous muscles forms the lateral band at the level of the metacarpophalangeal joint [4].
- The deep head of the dorsal interosseous muscles flexes and weakly abducts the proximal phalanx while extending the middle and distal phalanges [4].
- Transverse fibers arch dorsally from each lateral band to join over the dorsum of the finger, flexing the proximal phalanx [4].
- Oblique or spiral fibers from the lateral bands insert onto the lateral tubercles at the base of the middle phalanx to extend the middle phalanx [4].
- The lateral bands are joined by the lateral slips of the extensor tendon to form the conjoined lateral band [4].
- The two conjoined lateral bands unite at the distal third of the middle phalanx to form the terminal tendon [4].
- The terminal tendon inserts at the base of the distal phalanx to extend it [4].
- The volar interossei have only one muscle head and do not insert onto the proximal phalanx [4].
- The flexor digiti quinti brevis forms the ulnar lateral band of the little finger [4].

CUTANEOUS AND VASCULAR ANATOMY

- The dorsal cutaneous unit extends from the wrist to the proximal interphalangeal joints of the fingers and the interphalangeal joint of the thumb [3].
- The dorsal covering of the interphalangeal articulations forms a unique cutaneous unit characterized by considerable excess of skin when digits are in extension [3].
- The palmar integument is subdivided into two zones by the oppositional crease of the thumb [3].
- The skin of the radial portion of the palm covers the thenar eminence and is relatively well vascularized and mobile [3].
- The skin of the ulnar and distal portion of the palm covers the hypothenar eminence and has poor mobility [3].
- The central triangular part of the palm has fixed, poorly vascularized skin that covers the superficial palmar aponeurosis [3].

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- Incisions made along the sides of the diamond-shaped cutaneous contact zones in flexed digits present a minimal chance of retraction [3].
- The princeps pollicis artery is the terminal branch of the radial artery that crosses the first intermetacarpal space [8].
- The princeps pollicis artery runs along the ulnar side of the first metacarpal bone and along the volar surface of the adductor muscle [8].
- The princeps pollicis artery divides into two terminal rami, the collateral palmar arteries of the thumb, at the level of the metacarpophalangeal joint flexion crease [8].
- Only 15% of anatomical dissections of the palmar arteries of the thumb fall into the classical "typical" category [8].
- In the second segment of the thumb, the ulnar collateral artery is often easier to dissect than the radial collateral artery [8].
- A subtendinous anastomosis at the level of the neck of the first phalanx acts as a moderator between the two collateral arteries [8].
- The dorsal arteries of the thumb originate from palmar arteries at the level of the first metacarpal and head distally on the side of the two distal phalanges [8].

Investigations

- Clinical evaluation of the injured or dysfunctional hand and wrist requires combining patient history with a careful physical examination to pinpoint or narrow the scope of possible pathologic processes [1].
- Diagnostic tests such as imaging and serum laboratory studies are useful in determining pathology but can be expensive, time consuming, and often nonspecific [1].
- A careful physical examination is essential to direct care and future testing if indicated [1].
- A systematic method to approaching the physical examination of the hand and wrist is essential due to the number of structures in a small space [1].
- An 8-MHz Doppler tone assessment may be used to identify superficially displaced neurovascular bundles when Dupuytren cords lie beneath soft fleshy prominences [11].
- False-negatives are possible with 8-MHz Doppler tone assessment for identifying neurovascular bundles [11].
- Doppler imaging is a promising improvement for identifying structures, but higher resolution imaging technology is needed [11].
- MR assessment of Dupuytren's disease is hindered by the resolution of current equipment, orientation issues due to multiplanar deformities of the fingers, and lack of intraoperative availability [11].
- MRI is probably most useful in identifying additional pathology such as flexor tendon bowstringing [11].
- MRI may be helpful in providing a quantitative noninvasive measure of cellularity of affected areas, which is an index of biologic activity [11].

- The potential staging tool of MRI for measuring cellularity has not been investigated yet on a large scale [11].

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