

Eponychial Marsupialisation for Chronic Paronychia

Anatomy & Pathophysiology

CUTANEOUS ANATOMY AND FUNCTIONAL UNITS

- The dorsal integument of the distal phalanx is a unique cutaneous unit characterized by the presence of the nail bed and its matrix [3].
- The dorsal covering of the interphalangeal articulations of the digits forms a unique cutaneous unit that exhibits a considerable excess of skin when the digits are in extension [3].
- The fine, tight skin of the dorsal aspect of the middle phalanx constitutes a distinct functional cutaneous unit [3].
- The palmar integument of the digits is subdivided into phalangeal units separated by digital flexion folds, with three folds for the fingers and two for the thumb [3].
- When a digit is completely flexed, the integument of adjacent phalanges comes into contact at the flexion creases, establishing areas of cutaneous contact in the form of a diamond [3].
- The sides of the diamond-shaped cutaneous contact zones do not undergo variations in length during flexion and extension movements [3].
- Incisions made along the lines of the diamond-shaped cutaneous contact zones present a minimal chance of retraction [3].
- The web spaces are formed from the union of two nonsymmetrical cutaneous surfaces [3].
- The dorsal slope of the web space has a gradual incline and its supple skin is not adherent to the subjacent region [3].
- The palmar surface of the web space is flat and precipitously interrupted, with skin that is densely adherent to the commissural skeleton [3].
- The commissural skeleton of the web space is formed by the interdigital palmar (natatory) ligament between the fingers and by the distal transverse ligament at the level of the thumb web [3].
- The distal transverse ligament at the level of the thumb web is the deepest and most mobile component of the commissural skeleton [3].

VASCULAR ANATOMY

- The arteries of the thumb vary in both size and number, making surgical reconstruction delicate [8].
- The palmar aspect of the thumb is divided into three segments defined by the opposition, metacarpophalangeal, and interphalangeal creases [8].
- In the classical layout, the “princeps pollicis” artery crosses the first intermetacarpal space and runs along the ulnar side of the first metacarpal bone [8].
- The “princeps pollicis” artery emerges onto the subcutaneous palmar tissue at the level of the cutaneous flexion crease of the metacarpophalangeal joint [8].
- At the metacarpophalangeal joint level, the “princeps pollicis” artery divides into two terminal rami known as the collateral palmar arteries of the thumb [8].
- The collateral palmar arteries of the thumb run along the digital tunnel symmetrically and are of equal caliber [8].
- The collateral palmar arteries of the thumb head distally to finally unite in the pulp arcade [8].
- During their transit in the digital tunnel, the collateral palmar arteries break off into numerous collateral branches that are cutaneous, articular, or osseous [8].
- An arcade located deep in the flexor tendon joins the two collateral arteries at the level of the distal metaphysis of the first phalanx [8].
- Vessels originating from the subtendinous arcade at the distal metaphysis of the first phalanx enter the “vincula” and irrigate the flexor tendon [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 two arteries run alongside the flexor tendon and behind the collateral nerves [8].
- In the second segment of the thumb, the main artery is typically the ulnar collateral artery [8].
- The subtendinous anastomosis situated at the level of the neck of the first phalanx acts as a “moderator” between the two collateral arteries [8].
- In cases where the palmar ulnar collateral artery is absent, the dorsal artery takes its place by means of a branch through the subtendinous arcade [8].
- In the pulp segment of the thumb, the two arteries are of similar size and run through the thick fatty subcutaneous padding [8].
- In the pulp segment of the thumb, the arteries cross over and convert into the ends of the digital nerves at the level of the median axis [8].
- The posterior area of the thumb is vascularized by two arteries which originate from the palmar arteries at the level of the first metacarpal [8].
- These dorsal arteries run laterally along the metacarpophalangeal joint and continue obliquely from volar to dorsal before heading distally on the side of the two distal phalanges [8].

- At the level of the neck of the first phalanx, an anastomosis originating from the palmar arteries can be found on the dorsal aspect [8].
- The dorsal arteries of the thumb are joined by three arcades: one inconstant arcade under the extensor tendon at the neck of the first phalanx, the arcade of the nail matrix, and the arcade of the nailbed [8].
- The ulnar dorso-collateral artery generally stems from the “princeps pollicis” onto the medial border of the neck of the first metacarpal [8].

GENERAL HAND ARCHITECTURE

- The hand consists of 19 bones, 17 articulations, and 19 muscles situated entirely within the hand [2].
- The hand contains about the same number of tendons activated by the forearm muscles as it has intrinsic muscles [2].
- The open hand, with fingers extended and in contact, forms a balanced graceful oval in its longitudinal axis [2].
- The proximal “carpometacarpal” half of the hand is flattened, presenting two faces with unique anatomical and functional significance [2].
- The posterior or dorsal aspect of the hand is convex, while the anterior, palmar, or volar aspect is concave [2].
- The distal half of the hand is separated into five digits which flex toward the palm [2].
- The digits converge in closing by flexing and adducting, and diverge in opening by extending and abducting [2].
- The thumb has a more proximal and lateral position, allowing movement inward and outward from the palm [2].
- The four fingers are the distal extension of the carpometacarpal part of the hand [2].
- The hinges of finger movements are located at the thenar crease and at the transverse distal palmar crease, not at the bases of the digits [2].
- When the fingers are extended and separated, the tips of the fingers lie on the circumference of a circle whose center is the head of the third metacarpal [2].
- The web space of the thumb is the largest and deepest among the digital web spaces [2].

Investigations

- Clinical evaluation of the 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].

- 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 over handheld Doppler assessment 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].

References

[1] Orthopaedic Knowledge Update 13 Ebook Without Multimedia. Anatomy, Evaluation, Clinical Examination, and Imaging > Evaluation and Clinical Examination: Current Concepts.

[2] Exam Of The Hand Wrist 2Ed. INTRODUCTION.

[3] Exam Of The Hand Wrist 2Ed. Functional cutaneous units.

[8] Exam Of The Hand Wrist 2Ed. Techniques of investigation of the arterial supply by J P Melki > Vascularization of the thumb > Palmar aspect.

[11] Dupuytren S Disease And Related Hyperproliferative Disorders. 54. The Future of Dupuytren's Research and Treatment > 54.4 Mechanical Measurements and Procedures > 54.4.4 Imaging.