

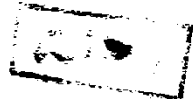
# HAND INFECTIONS

## ESSAY

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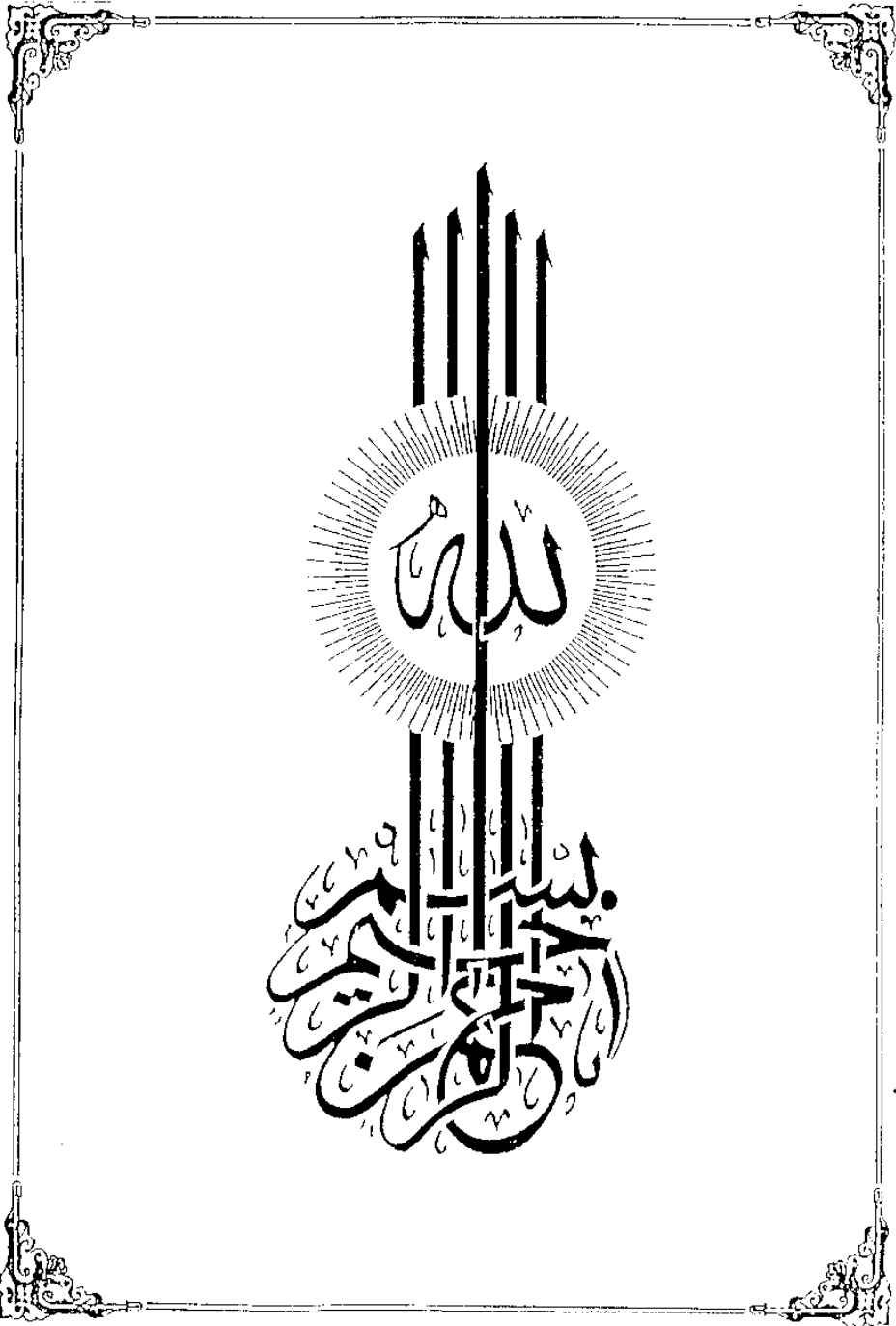


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## INTRODUCTION

Hand infections are a very common problem. Owing to many hours lost during treatment, this problem is of a considerable economic concern. Also infections can cripple a hand as major trauma can do.

The work done by Kanavel(1905), Koch(1949), and Manson (1955) still holds good. However, with the discovery of new antibiotics and with the recent advances in surgery, there is some deviations.

In this review, we through spotlights on some of the nowadays change that could occur in hand infections. We hope it to be of some help to lessen the disasters and to get better final prognostic function.

## SURGICAL ANATOMY

Anatomical knowledge of the hand is necessary not only for diagnosis and application of surgical approach, but also for understanding the pathological process with its consequent reflections on the clinical picture (Mikhail et al., 1976).

The skin of the palm is closely attached to the underlying palmar aponeurosis by minute, strong fibrous fasciculi (Fig. 1.1). The subcutaneous tissue of the dorsum is loose and creates the so called dorsal subcutaneous space.

The lymph from the palmar aspects of the fingers, web areas, hypothenar, and thenar eminences flows into lymph channels and lacunae located in the loose areolar tissue on the dorsum of the hand. This anatomic fact accounts for the marked lymphedematous swelling frequently seen on the back of the hand even when the focus of infection is on the palmar aspect. Occasionally the back of such swollen hand may be incised and only lymphedema is found without pus (Lampe, 1966).

The central portion of the palmar aponeurosis is an exceedingly dense white ligamentous structure which prevents the outward spread of pus or blood. Distally, it widens

CUTANEOUS BR. OF RADIAL N. TO LAT. THENAR AREA  
 PALMAR CUTANEOUS BR. OF MEDIAN N.  
 THENAR MUSCLES  
 MOTOR BR. OF MEDIAN N. TO THENAR M.  
 PALMAR CUTANEOUS BR. OF ULNAR N.  
 PALMARIS LONGUS TENDON  
 VOLAR CARPAL LIGAMENT  
 PISIFORM BONE  
 ULNAR ARTERY  
 HYPOTHENAR MUSCLES  
 PALMAR APONEUROSIS  
 MINUTE FASCICULI ADHERENT TO DERMA

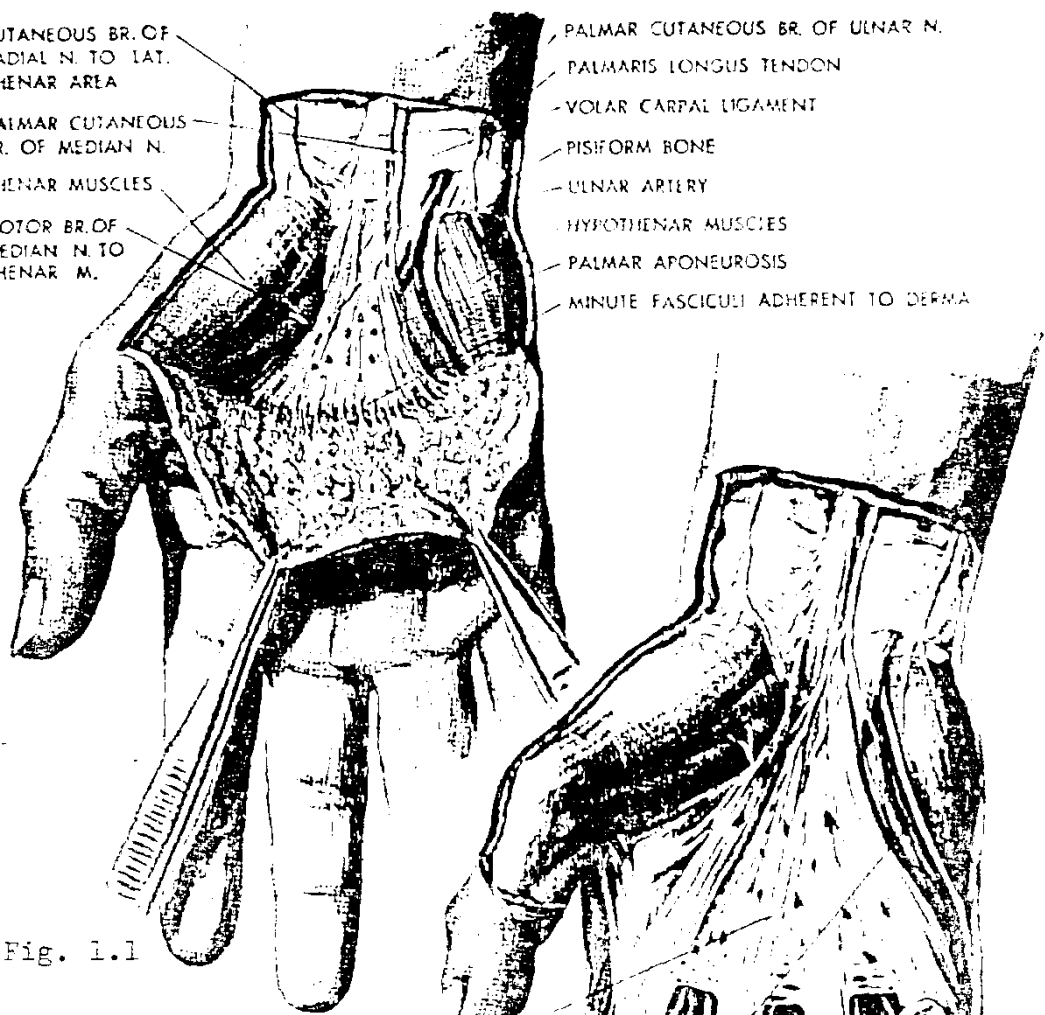


Fig. 1.1

PALMAR APONEUROSIS  
 DIGITAL ARTERIES AND NERVES  
 SUPERFICIAL TRANSVERSE METACARPAL LIGAMENT  
 CUTANEOUS BRANCH OF ULNAR NERVE TO 5th FINGER



Fig. 1.2

\* *Journal of Anatomy*, 1961, 96, 101.

out and divides into four slips. The digital arteries and nerves lie between these slips en route to the webs of the fingers (Anson and Mc.Vay, 1971), (Fig. 1.2).

The thenar muscles lie in a separate compartment on the radial side. When pus forms among these muscles, it is localized definitely and manifests no tendency to spread backward or medially. All are supplied by the median nerve from which the motor branch enters the eminence medially (Fig. 1.1).

The hypothenar eminence is made up of the abductor, opponens, and flexor digiti minimi brevis muscles. All of which are supplied by the deep branch of the ulnar nerve which runs with the deep branches of the ulnar artery through the interval between the abductor and flexor digiti minimi to the subtendinous part of the palm. The digital branches of the superficial palmar arch and the ulnar nerve run distally in front of the flexor digiti minimi brevis muscle to the ulnar side of the small finger (Goldner, 1981)

#### Fascial Spaces Of The Hand

There are five major fascial spaces in the hand in which pus can accumulate. These are the dorsal subcutaneous, the dorsal subaponeurotic, the thenar, the midpalmar,



and the web spaces. There are other anatomical spaces of minor surgical importance, but isolated infection of such spaces is uncommon and if it occurs the infectious material passes into one of the larger spaces (Kanavel, 1943).

Since Kanavel (1905) described the deep fascial spaces as the midpalmar and thenar, there had been some controversy about the anatomy. Brickel (1939) stated that there is one common deep fascial space and not two. Anson and Ashley (1940) described a fascial septum which separated the two spaces. Kaplan (1953) believes that there are two deep fascial spaces in the palm, separated by a fascial septum. However, it is convenient to remember that the deep fascial spaces are spaces deep to the flexor tendons (Flynn, 1975).

The midpalmar space lies under the inner half of the hollow of the hand, between the thenar and hypothenar eminences. It is limited anteriorly by flexor tendons with their synovial sheaths of the little, ring and middle fingers, and lumbrical muscles related to the tendons of the ring and little fingers. Posteriorly, there is the dense fascia covering the interossei and metacarpal bones. Radially lies the midpalmar septum, and the hypothenar muscles on the ulnar side. The space extends proximally to

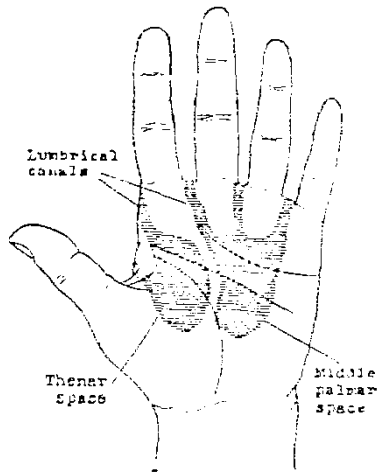


Fig. 1.3

The thenar and midpalmar spaces.\*

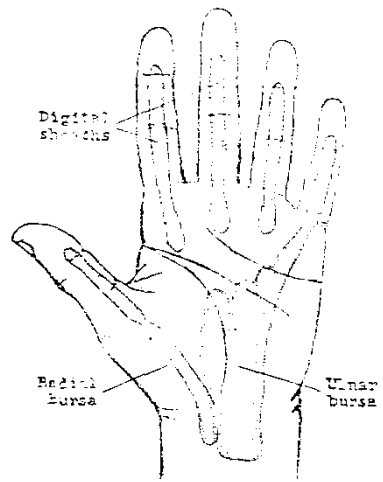


Fig. 1.4

The synovial sheathe in the fingers and palm.\*\*

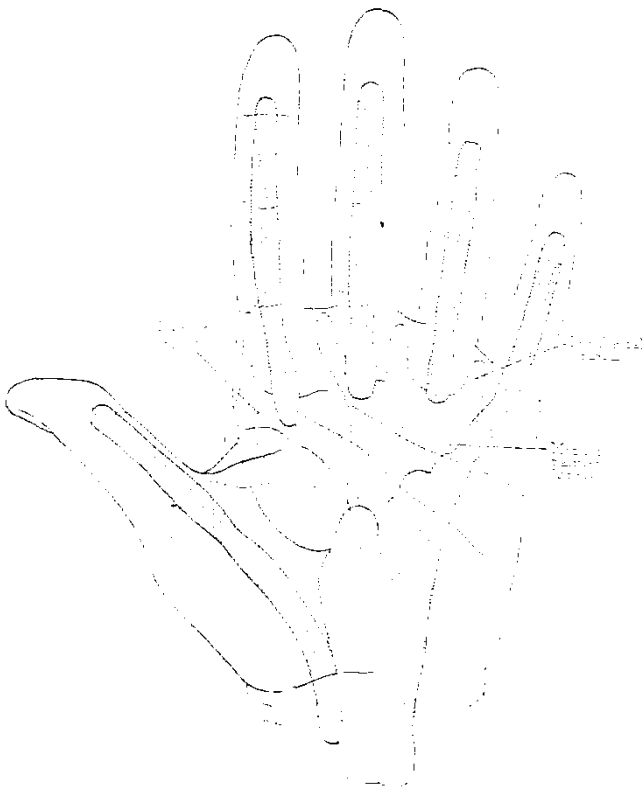


Fig. 1.5

Relation of the synovial sheaths to the fascial compartment of the hand.\*\*

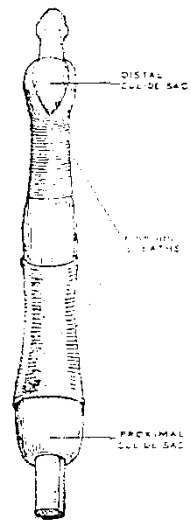


Fig. 1.6

Anatomy of the digital sheath.\*

\* From Gray's Anatomy, 1912, p. 117.

\*\* From Gray's Anatomy, 1912, p. 117.

the level of the distal margin of the transverse carpal ligament and distally it reaches almost to the level of the distal palmar crease (Plessis, 1975). The space is closed proximally by the firm attachment of the parietal layer of the common flexor synovial sheath to the walls of the carpal tunnel (Last, 1978). The distal boundary is composed mainly of fascial septa extending from the palmar aponeurosis to the floor of the space and to some transverse fasciculi (Flynn, 1975), (Fig. 1.3 and 1.7).

The thenar space lies under the outer half of the hollow of the palm, deep to the thenar eminence, the flexor tendons of the index finger, the first and second lumbricals, and more superficially the palmar fascia. It is bounded posteriorly by the adductor pollicis muscle; mainly its transverse head which is covered by the adductor fascia. Proximally, the space reaches to the distal border of the transverse carpal ligament where it is closed by fusion of the parietal layer of the synovial sheath with the walls of the carpal tunnel. Distally, the space reaches to the proximal transverse palmar crease (Plessis, 1975), (Fig. 1.5 and 1.7).

The space is continuous with the slit-like space that lies between the adductor pollicis and the first dorsal interosseous muscles (Last, 1978).

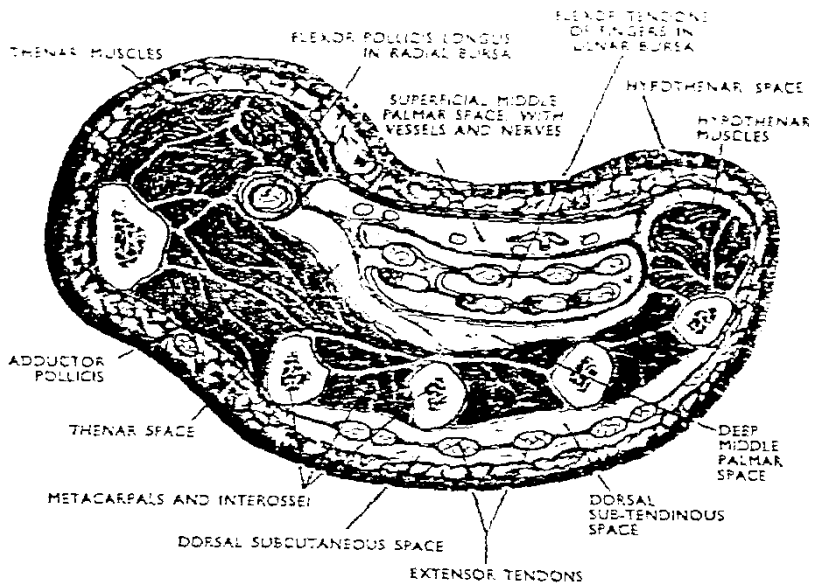


Fig. 1.7 Cross-section through the proximal part of the palm\*

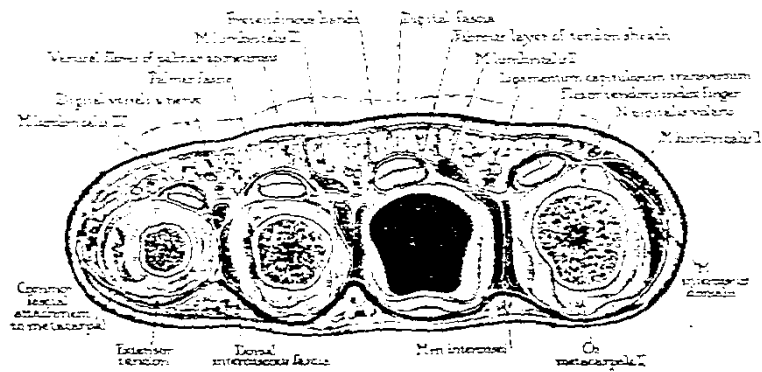


Fig. 1.8 Cross-section through the metacarpophalangeal joints\*\*.

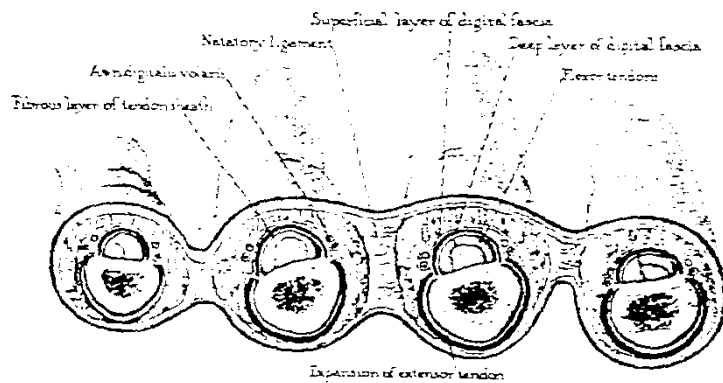


Fig. 1.9A Cross-section through the bases of the proximal phalanx\*\*.

\* From Farquharson, 1978.

\*\* From Kanavel, 1943.

The distribution of fascia over the anterior, lateral, and dorsal aspects of the adductor pollicis muscle clearly indicates why abscesses of the thenar space may extend to the posterior aspect of the muscle. The fact remains, however, that abscesses of the space tend to remain anterior to the adductor pollicis muscle (Flynn, 1975).

The lumbrical muscles have delicate fascial sheaths which are so intimately related to the palmar spaces that infection of the space causes infection of the related lumbrical sheaths. Each lumbrical sheath may therefore almost be looked on as a diverticulum of the space to which it is related. The third and fourth sheaths should therefore be a diverticula of the midpalmar space, the first lumbrical a diverticulum of the thenar space, and the second lumbrical sheath a diverticulum of either the thenar or the midpalmar space (Flessis, 1975), (Fig. 1.3).

The three webs of the palm lie between the four slips of the palmar aponeurosis. From the skin edge they extend proximally as far as the metacarpophalangeal joints. Between the palmar and dorsal layers of the skin lie the superficial and deep transverse ligaments of the palm, the digital vessels and nerves, and the tendons of the interossei and lumbricals on their way to the extensor expansions. The web is filled in with a packing of loose fibro-

fatty tissue. (Fig. 1.8).

The superficial transverse ligament of the palm lies beneath the palmar skin across the free margins of the webs. The digital vessels and nerves lie immediately deep to the superficial ligament, a point to be remembered in making web incisions. Here the nerves lie on the palmar side of the arteries. The lumbrical tendon lies beneath the vessels. The lumbrical canal is a condensation of fibro-fatty tissue that surrounds the tendon.

The web of the thumb lacks both superficial and deep transverse ligaments. From the slit-like space between the transverse head of adductor pollicis and the first interosseous muscle, emerge the arteries radialis indicis and princeps pollicis. Each hugs its own digit and the central part of the web can be incised without risk to either vessel (Last, 1978).

Forearm space "Parona's space" is merely a fascial interval deep to the flexor tendons in the distal part of the forearm. It is continuous proximally with the intermuscular spaces of the forearm, so pus may track from this space any distance into the forearm. The space extends to the outer and inner borders of the forearm and is drained by incisions along these borders. Infection can occur from infected ulnar or radial bursa which from the anterior

boundary at the space. Pus from these bursae presents behind and not in front because anteriorly the synovial sheath is firmly attached to the tendons while posteriorly there is little connective tissue intervening (Plessis, 1975).

The extensors of the fingers are connected to each other by fibrous tissue which forms with the extensor tendons an aponeurotic barrier between two spaces; the dorsal subcutaneous and the dorsal subaponeurotic spaces. These spaces are continuous with the subcutaneous tissue of the forearm proximally while distally they are continuous with the subcutaneous tissue of the webs of fingers. Medially and laterally they are continuous with the subcutaneous tissue around the ulnar border of the hand and second metacarpal respectively (Plessis, 1975). These spaces are separated but freely communicate with one another. Their limitations are not very precise from a clinical viewpoint (Kaplan, 1953).

#### Synovial Flexor Sheaths

In the carpal tunnel the flexor tendons are invested with synovial sheaths that extend proximally to a point two fingerbreadths proximal to the upper margin of the transverse carpal ligament and proceed distally to a vary-