BURNS OF THE HAND

ESSAY

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General Surgery

BY

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C O N T E N T S

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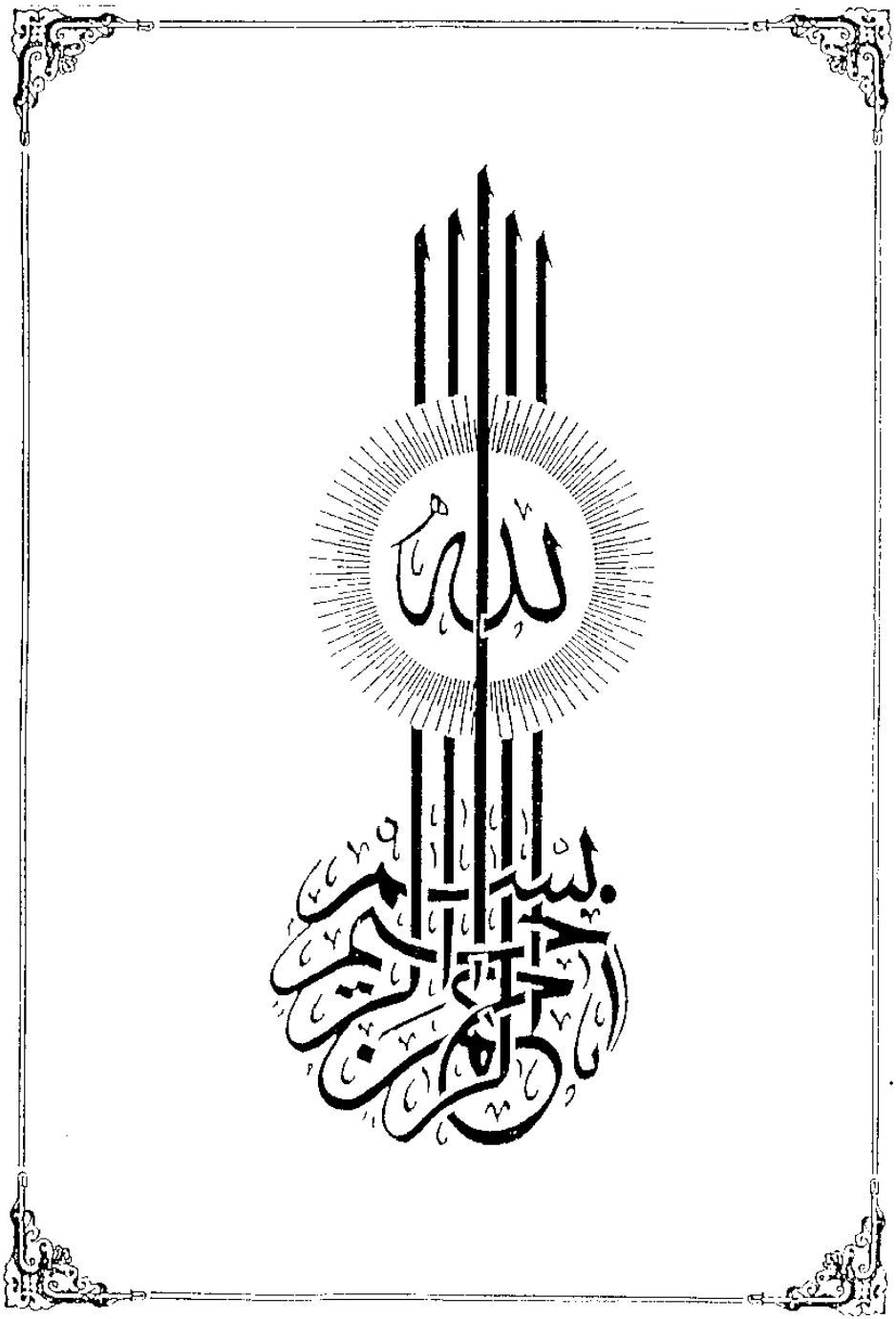

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INTRODUCTION

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Although a minor burn of the hand may result in only temporary disability and inconvenience, more extensive thermal injury of the upper extermity often causes permanent loss of function and needs long months of rehabilitation.

For many persons so disabled, employment will never be possible in a competitive job market.

In as much as our hands are used, they are frequently traumatised and their vitality is hampered. The loss of one finger or more is very critical for those who depend on their fingers in their daily life.

Burns of the hand in modern life are of diverse types whether thermal, electrical, chemical, ... etc. They can cause major invalidity of the hand or even the individual either due to a crippled hand or due to stiff useless hand or due to associated social and psychological burdens.

Hand disability after thermal injury has been attributed to multiple causes including:

(1) Loss of skin with subsequent scar contractures.

(2) Direct thermal injury destroying deep structures.

(3) Long immobilisation with subsequent disuse atrophy and adhesions between gliding surfaces.

(4) Inadequate splinting and physical therapy.

(5) Ischaemic necrosis of the intrinsic muscles.

These disabilities are manifested in the form of deformities which are of different degrees and morphology.

Unfortunately, thermal injuries to the upper extremity are many. The cost to the patient and to society makes it imperative for the burn team to approach this problem in an orderly fashion to minimize the loss of tissue and function and to decrease morbidity.

Although the skin of both hands constitutes about 5% (2½% each) of total body surface, yet its valuable function, with that of the hand as a whole should list it as one of the sites of priority and importance in treatment of extensive burns specially it is estimated that more than 50 percent of the cases with major burns have their hands involved.

There is no spare skin in hands, so it is our responsibility to salvage any spared areas and to try to avoid any harmful factor during the treatment.

Aim of work:

This essay will discuss the functional anatomy and physiology of the hand to understand the mechanism of motion and the dynamics of the hand. Also it deals with the pathology and will explain the complications resulting from deep burns of the hand starting by the soft tissue then muscle and nerve affections in their various forms and management of the burned hand. In the conclusion a trial for finding the ideal line of treatment for the burned hand will be made.

ANATOMY OF THE HAND

(I) The Skin:

The skin is loose on dorsum of hand, thus in plastic repair on the dorsal aspect, various flaps and transfers are easy to perform.

There are creases which have a characteristic disposition. The skin creases over the dorsum of the fingers are parallel to the creases of the proximal and distal interphalangeal joints. At the metacarpophalangeal joints, transverse creases are found running in a distally convex arch.

The lines on the dorsum of the hand and fingers are mostly horizontal.

Important creases in the palm:

(A) The palmar skin in contrast to the dorsal skin is not yielding because the skin is steadied by its firm attachment to the palmar aponeurosis. Fibrous strands connect the two and divided the subcutaneous fat into myriads of small loculi forming a "water-cushion" capable of withstanding considerable pressure.

(B) The skin of the palm is characterised by flexure creases (the lines of the palm) and the papillary

ridges or finger prints which occupy the whole of the flexor surface of the fingers and increases their surface area.

(C) The distal crease runs from the ulnar border of the palm proximal to the metacarpophalangeal crease.

(D) The proximal or thenar crease and the mid palmar crease. (Flynn and Kaplan, 1966).

Nerve supply:

The dorsum of the hand is supplied by the terminal branches of the radial nerve and the dorsal cutaneous branches of the ulnar nerve. The nerves pass to the dorsum of each digit where they stop short to the nail beds (Last, 1980).

The median nerve enters the palm beneath the flexor retinaculum and divides into two branches. The medial branch divides into two and supplies the cleft and adjacent sides of ring and middle fingers, also the cleft and adjacent sides of middle and index fingers. The lateral branch supplies the radial side of the index, the whole of the thumb.

The superficial branch of the ulnar nerve divides into two branches; the medial one supplies the ulnar side of the little finger, the lateral supplies the cleft and adjacent sides of little and ring fingers. (Last, 1980).

Blood supply: (Fig. 1)

(I) Arterial: (1)The posterior carpal arch is an arterial anastomosis between the radial, ulnar and anterior interosseous arteries. It lies on the back of the carpus and sends dorsal metacarpal arteries distally in the intermetacarpal spaces deep to the long tendons. These split at the webs to supply the dorsal aspects of adjacent fingers.

They communicate through the interosseous spaces with the palmar metacarpal branches of the deep palmar arch.

(2) Superficial palmar arch: It is formed by the direct continuation of the ulnar artery beyond the flexor retinaculum. On the radial side it is usually completed by the superficial palmar branch of the radial artery and it lies across the centre of the palm, level with the distal border of the outstritched thumb. From its convexity four palmar digital arteries pass distally. The most medial of these passes to the ulnar side of the little finger. The remaining three pass to the webs between the fingers, where each divides into two vessles that supply adjacent fingers.

(II) Venous drainage: Companion veins bring blood from the palm into the dorsal venous arch. The dorsal venous

arch lies in the subcutaneous tissue (superficial to the extensor tendons) proximal to the metacarpal heads and drains on the radial side into the cephalic vein and on the ulnar side into the basilic vein. Large veins lie beneath the skin of the dorsum of the hand, they drain from the palm so that the pressure of gripping does not impede venous return (Last, 1980).

(II) The Fascia:

The Palmar Aponeurosis: It is a dense strong fibrous sheath. Its lateral and medial margins are continuous with the deep fascia that covers the thenar and hypothenar muscles. From each margin, a septum is sent backwards into the palm to fuse with the fascia on the muscles that lie deeply in the palm. Opposite the distal parts of the metacarpal bones the aponeurosis divides into four processes, one for each finger and each divides into two slips which encircle the base of the digit, and fuse with the deep fascia on the back of the digit and with the strong bands called the deep transvers ligament of the palm (Romans, 1971).

Fascial planes and compartments of the palm: They are divided into:

(1) A lateral compartment which contains the thenar muscles.

(2) A medial compartment which contains the hypothenar muscles.

(3) An intermediate compartment separated into:

(a) A superficial part contains the superficial palmar arch, and its branches and branches of the median and ulnar nerves.

(b) A deeper part enclosing the flexor tendons and their sheaths.

(4) An adductor compartment which contains the adductor pollicis muscle.

Flexor Retinaculum (F.R.): It is a strong band that is attached on the radial side to the tubercle of the scaphoid and ridge of the trapezium and on the ulnar side to the pisiform and hook of hamate.

Superficial to the F.R., there are:

(1) Ulnar nerve and vessels.

(2) Palmar cutaneous branch of ulnar nerve.

(3) Palmaris longus tendon.

(4) Palmar cutaneous branch of median nerve.

Fibrous flexor sheaths: From the metacarpal heads, to the distal phalanges all five digits are provided with strong unyielding fibrous sheaths in which the flexor tendons lie. They form the deep fascia of front of digits and holds

the flexor tendons in contact with the palmar surfaces of phalanges and the joints during flexion of the digits.

The distal end is attached to the palmar surface of the distal phalanx and the proximal end is continuous with the corresponding slip or process of the palmar aponeurosis.

Each sheath together with the phalanges and the palmar ligaments of the joints, form an osteofibrous canal which lodges the flexor tendons enclosed in a synovial sheath (Romans, 1971).

(III) The Muscles of the hand:

They are divided into:

- Thenar muscles.
- Hypothenar muscles.
- Lumbricals.
- Interossei.

The Thenar Muscles

They are present on the radial side of the hand. They are:

(1) Flexor pollicis brevis:

It originates by two heads, one from the distal lateral border of the volar carpal ligament and from