SOFT TISSUE INJURIES OF THE HAND

THESIS

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of Master Degree in
General Surgery

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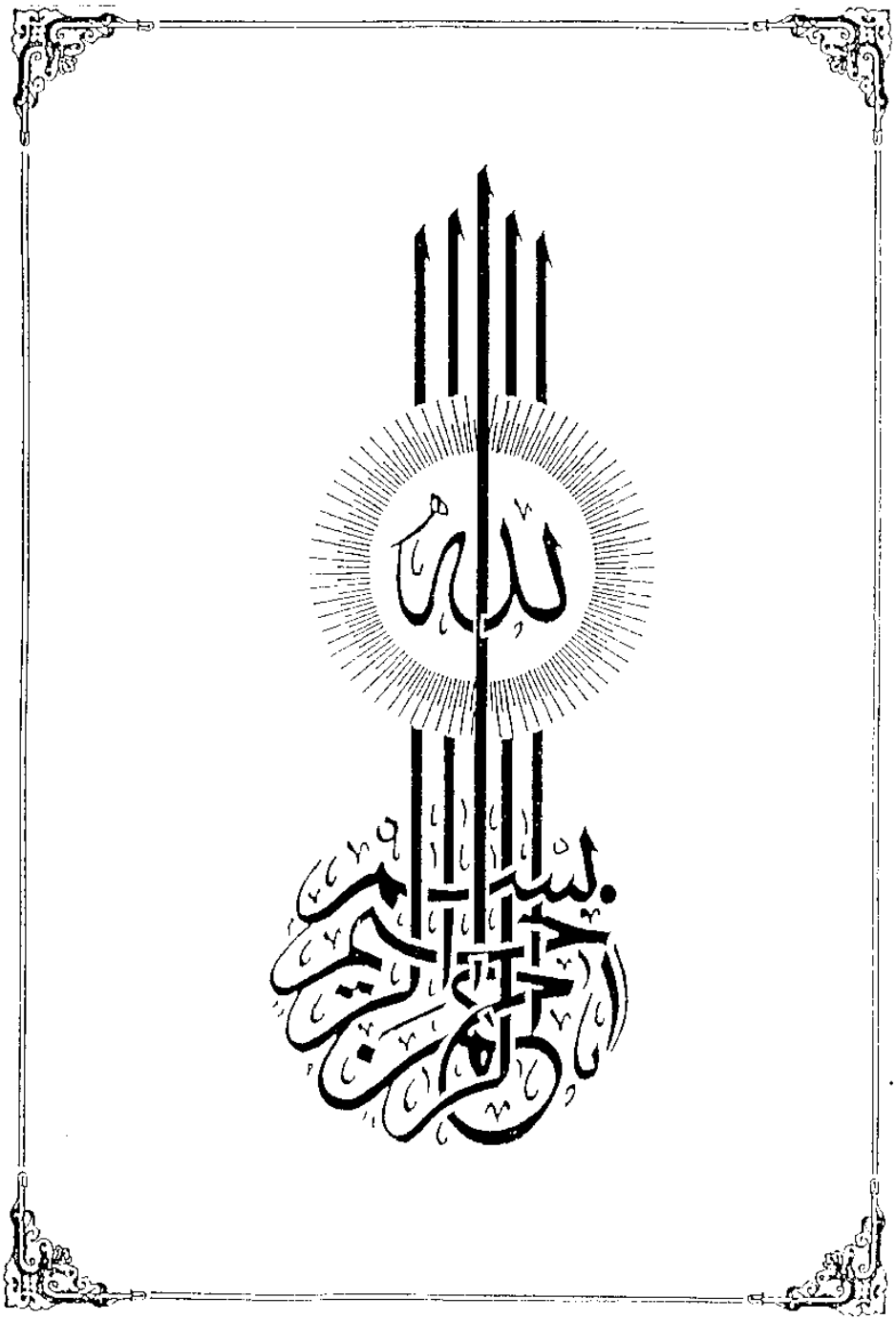
TO MY PARENTS



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The hand is man's great physical asset and anatomically, one of his most distinctive features. It has enabled him to make and use the tools that his brain has invented, and is indispensible to his well-being, (Norman, 1978).

In fact it is the properly working hand that is the basis of all civilization.

A slight injury to a finger or to the hand may rob a young man of his livelihood and alter the whole course of his life.

Hand injuries have become fairly common in our country due to the development of industries and also to the increased incidence of traffic accidents. The loss of many work hours, caused by these injuries, again has its effect on the economy of the country.

Clear understanding of the surgical anatomy of the hand, proper examination and diagnosis of the extent of the injury are all essential for the proper management of these injuries.

Every thing that the surgeon does to the hand should be aimed at restoring or maintaining its function. The

initial treatment of hand injuries is of paramount importance and it should be adequately proper since in most cases it determines the final result.

The main brunt of this study has been devoted towards skin and tendon injuries and this entailed most of this work. Injuries of the nerves of the hand has also been included together with some pictures that may give an addition to this study.

REVIEW OF LITERATURE

SURGICAL ANATOMY OF THE HAND

Anatomy of the Skin:

The skin of the hand varies from the volar to the dorsal aspects.

The volar skin is tethered by an extensive network of fascial strands to the underlying palmar aponeurosis to stabilize it for efficiency of grasp and pinch. The concentrations of these strands, is greatest at the level of the palmar and digital creases and the lateral borders of the digits and palm. These become a problem when they restrict expansion and stretching of skin to accomodate congestion, thus a tourniquet-like effect of the skin over the palmar fat pads is easily aggravated by injury or infections (Clement, 1975). The palmar skin is also thick and has a rich concentration of sweat glands.

The dorsal skin is unthethered and is subjected to much more excursion and stretching than the palmar skin. This is functionally necessary in order to allow the fist to close without restriction. Under the dorsal skin lies the predominant venous and lymphatic drainage of the hand. The looseness of the skin favours the sequestration of oedema fluid beneath it even when the focus of infection is on the palmar aspect of the hand. With distension of the subcutaneous space, the tense skin forces the

metacarpophalangeal joints into extension and the thumb lays in adduction.

In contrast to the volar skin, there are two specialized appendages of the dorsal epidermis, namely, the hairs and nails, "Last, 1978".

Anatomy of the subcutaneous fat:

The dorsal is similar to body fat elsewhere, while the palmar fat is specialized and does not regenerate. It remains constant in amount and does not fluctuate in response to changes in body weight. However, it does atrophy with sensory denervation. Clinically its importance is:

1- It is involuable as medium for vascularising tendons.

2- It is at times indispensable as a cushion around nerves, tendons and bony prominences.

The Fascia of the Hand:

The Palmar Aponeurosis:

This strong unyielding ligament is phylogenetically the degenerated tendon of palmaris longus, "Last, 1978".

It extends in continuity with the tendon, from the distal border of the flexor retinaculum, whence it fans out in a thick sheet towards the bases of the fingers. Each slip divides into two bands over the

proximal end of the fibrous flexor sheath; they are inserted into the deep transverse ligament of the palm, and into the bases of the proximal phalanges and the fibrous flexor sheaths.

Over the hypothenar muscles the deep fascia is much thinner than the palmar aponeurosis and it is thinnest of all over the thenar muscles.

The function of the palmar aponeurosis is purely mechanical. It gives firm attachment to the skin of the palm to improve the grip, and it protects the underlying tendons. Contraction of the aponeurosis and its digital slips in Duputren's contracture results in a fixed flexion of the fingers concerned (usually the ring and little fingers), "Goss 1973".

The Flexor Retinaculum:

This is a strong band of fibrous tissue 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 the hamate. A deep partition, on the radial side, bridges the groove on the trapezium. The fibro-osseous tunnel so formed transmits the tendon of flexor carpi radialis and its synovial sheath.

The muscles of the thenar and hypothenar eminences arise from the retinaculum and several structures pass across it. The tendon of palmaris longus is fused to the midline of the retinaculum as it passes distally to expand into the palmar aponeurosis. The ulner nerve lies on the retinaculum alongside the pisiform bone, with the ulnar artery on its lateral side. The nerve divides into a superficial (cutaneous) and a deep (muscular) branch at the distal border of the retinaculum; the latter is accompanied by a small deep branch of the artery. On the radial side of the palmaris longus tendon the palmar branch of the median nerve and the superficial palmar branch of the radial artery cross the retinaculum. The radial side of the retinaculum is pierced proximally by the tendon of flexor carpi radialis over the scaphoid; further distally the tendon lies deeply in its fibro-osseous tunnel on the trapezium, "Last 1978".

The Extensor Rentinaculum:

It lies obliquely across the extensor surface of the wrist joint. Its proximal attachment is to the radius at the anterolateral border above the the styloid process. It is not attached to the ulna. It is attached to the pisiform and triquetral bones.

From the deep surface of the extensor retinaculum fibrous septa pass to the bones of the forearm, dividing the extensor tunnel into 6 compartments. The most lateral compartment lies over the lateral surface of the radius at its distal extremity. Through this compartment pass the tendons of abductor pollicis longus and extensor pollicis brevis, each usually lying in a separate synovial sheath. The next compartment extends as far as the radial tubercle of lister, and conveys the tendons of the radial extensors of the wrist (longus and brevis) each lying in a separate synovial sheath. The groove on the ulnar side of the radial tubercle lodges the tendon of extensor pollicis longus, which lies within its own compartment invested with a synovial sheath. Between this groove and the ulnar border of the radius is a shallow depression in which all four tendons of extensor digitorum communis lie crowded together over the tendon of extensor indicis. All five tendons in this compartment are invested with a common synovial sheath. The next compartment lies over the radio-ulnar joint and transmits the tendon, often double, of extensor digiti minimi in its synovial sheath, lastly, the groove near the base of the ulnar styloid transmits the tendon of extensor carpi ulnaris (in its synovial sheath), "Last, 1978".

The extensor retinaculum acts as a pulley system of the extensors. Clinically it has to be respected in the conduct of tenorrhephies and the relief of stenotic changes, "Clement, 1975".

Fascia of the Digits:

The fascia of the digits is composed of an encircling membrane and specific restraining ligaments of the skin and extensor hood mechanisms symmetrically arranged on the radial and ulnar sides of the digits. In addition, it forms the specialised retinacular system of the flexor tendon sheaths. The encircling membrane is barley definable on the volar hemisphere. On the sides of the digits it can be identified as the lateral fascial sheet closely allied to the skin, and dorsally as a membrane immediately over the extensor bands.

There are specific subdivisions (Septa and bands) of this system which have important functions in stablizing the skin against tangential movement. The volar fat pads are tethered to the underlying bone or flexor sheath with a myriad of fine vertical strands erroneously refered to as septae. At the flexion creases the fat pads are reduced and the fascia acts as drawstring to pull in the skin, so flexion can occur. In so doing, it also creates what is referred to as "anterior closed space" by almost interrupting the continuity of the fat pads.