An Essay
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Sensory Loss and Sensory Recovery After Finger Trauma

Presented by

Samir Abdel Fattah Mohamed Hamdy
M.B.B.Ch.

Supervised by

Dr. Ikram Ibrahim Safe
Assistant Professor of Plastic and Reconstructive Surgery - Ain Shams University

Assistant Supervisor

Dr. Mohamed Khaled Hassan
Lecturer of Plastic and Reconstructive Surgery
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
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الله

بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ .

صدق الله العظيم
البقرة - ٣٢ -

بسم الله الرحمن الرحيم

I dedicate this work with love and respect to my

parents, my wife

Acknowledgment

First and for most, I always feel that aim in debt to the most merciful and Gracious God.

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Trauma to the finger are very common among various injuries to the hand. (Dellon et al., 1993).

It has long been recognized that peripheral nerve injuries are difficult to assess in the immediate post injury period. The development of micro surgery over the last twenty years has resulted in a number of publications demonstrating the immediate recovery of sensory function, (Lynch and Quinlon, 1986).

Digital nerve division is a common injury but studies of the results of repair have been inadequate in that the intervals between repair and review has often been short, (Young et al., 1981; Tupper et al., 1988).

Conventional nerve graft and vascularized nerve graft may be used for nerve gap with good sensory recovery, (Elliott et al., 1989). Autogenous vein conduct and bioabsorbable polyglycolic acid nerve conduit used for digital nerve defect up to three am, (Dellon et al., 1988).

Tissue expansion of a nerve offers a possible method of over coming the nerve gap without recourse or graft, (Milner, 1989). Nerves regenerate into the skin graft from both the margins and the graft bed. It's most likely secondary to chemotactic influence from the target tissues on the regenerating nerves, (Waris et al., 1983).

The process of reinnervation of skin flaps is poorly under stood. Reinnervation of existing receptors already present in the flaps or adaptation of ignoring nerve ending forms the basis of sensory return. The sequence of sensory return can be followed clinically, (NishiKawa and Smith, 1992).

By this essay we aim to present an assessment of the sensory loss and sensory recovery after different techniques for digital nerve repair and finger resurfacing.

REVIEW OF LITERATURE

Anatomy of the hand

During the Renaissance Versailles corrected early misconception and brought anatomy into proper focus. Since that time many investigators have embellished the basic structural with functional, physiological, and philosophical observations the hand has been included in those observations, (Mc Carthy,1990).

Bell (1834), presented a concept of hand anatomy that placed it in proper context with man's position in the animal kingdom. Duchenne (1867) carried out detailed analysis of muscular function by isolated electrical stimulation. Wooljones (1920) probed more extensively into comparative anatomy and anthropology. The hand of man differs from the hands of other creatures in being a gasping mechanism combining great strength with finely controlled accuracy and at the same time serving as the chief tactile organ.

Apart from free mobility of the hand its component parts differ a little from those of the foot. Indeed their similarity is very striking in their powerful aponeurosis, four lagers of muscles and sensory and motor distribution of the nerves. The great differences lay in their richness of cortical connections, both sensory and motor, in the case of the hand. Over half of the fibres of corticospinal tract are concurred with upper limb movements, which are usually directed to getting the hand into the required position and putting it to work (Mc Minn, 1990).

Skin of the hand:

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

The volar skin:

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 concentration of these strands is great at the level of the palmar and digital creases and the lateral borders of the digits and palm. Injury or infection easily stretches the skin and restricts expansion by accommodation of congestion. Thus make tourniquet like effect of the skin over the palmar fat. (Clement, 1975).

The palmar skin is also thick characterized by flexure crease and papillary ridges that occupy the whole of the flexor surface. The latter serve to improve the grip. They increase the surface area. The importance of the palmar creases to the surgeon is in placing of incisions, [Mc Minn, 1990]

The dorsal skin:

The dorsal skin is untethered 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 of the hand. The looseness of the skin favors the sequestration of oedma fluid beneath it .Even when the focus of infection is on the palmar aspect of the hand with distention of the subcutaneous space, the tense skin forces the metacarpophalangeal joint into extension and the thumb lies in adduction. In contrast to the volar skin, there are two specialized appendages on the epidermis, namely, the hair and nails, (Mc Minn, 1990). Kaplan et al, (1975) stated that it is easy to retract the skin in folds on the dorsal aspect, thus in plastic repair on the dorsum, the various flaps and transfers are easier to perform.

The subcutaneous fat:

The dorsal fat 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 invaluable as medium for vasclarizing tendons and at times indispensable as cushion around nerves, tendons and bony prominence.

The fascia of the hand:

The palmar aponeurosis:

This strongly unyielding ligament is phylogentically the degenerated tendon of palmaris longus. It extends in continuity with tendon, from the distal border of the flexor retinaculum, where it fans out into a thick sheet toward the bases of each finger. It divides into four slips one for each finger. Each slip gives off superficial fibers It inserts into the skin in the region of the crease at the base of the finger. The main part 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. Some strands from the aponeurosis pass up on each side of the finger. When the fingers are forcibly extended the soft tissues of the palm can be seen bulging in the three intervals between the four slips just proximal to the interdigited webs. Over the hypothenar muscles the deep fascia is much thinner than the palmar aponeuosis and is the thinnest all over the thenar muscle. This is keeping with the increased mobility of the metacarpal bone of the thumb. 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. (Mc Minn, 1990).

Fasica 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 specialized retinacular system of the flexor tendon sheaths. The encircling membrane is barely definable on the volar hemisphere. On the sides of the digits it can be identified as lateral fascial sheet closely allied to the skin, and dorsally as a membrane immediately over the extensor bands. Fig.(1)

There are specific subdivisions (septa and bands) of the system that have important functions in stabilizing the skin against shearing movement. The volar fat pads are tethered to the underlying bone or flexor sheath with a myriad of fine vertical strands referred to as septa.

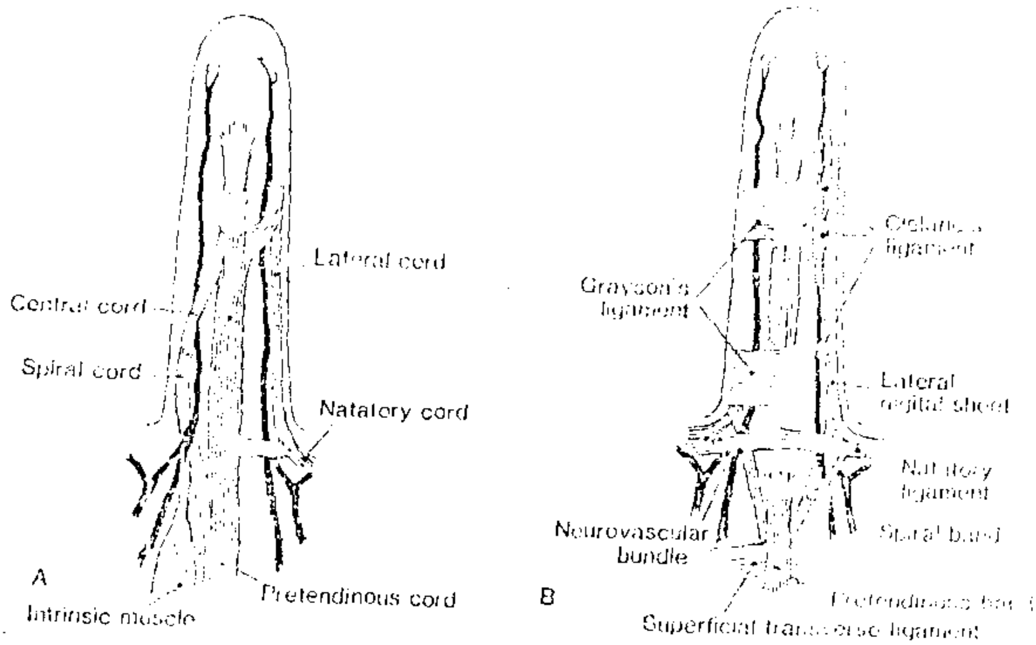

Figure (1) A & B . The components of the digital fascia. (Modified from Mc Farlane).After Chase, 1990.