THE ANATOMY AND FUNCTION OF THE PALMAR FASCIA

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It has been said that little new is written regarding gross anatomy. This is surprisingly true regarding the palmar fascia. Anatomical descriptions of the palmar fascia reveal great disparity in our present-day anatomy texts (Anson, 1966; Basmajian, 1971; Davis, 1929; Gardner, 1965; Gray, 1962, and Kaplan, 1965). It was found, however, that an excellent description was available, in French (Legueu and Juvara 1892).

This paper is therefore an attempt to bring our description of the anatomy of the palmar fascia up to date, and to clarify many of the names of the supporting fibrous attachments, based on seventeen fresh adult hand dissections.

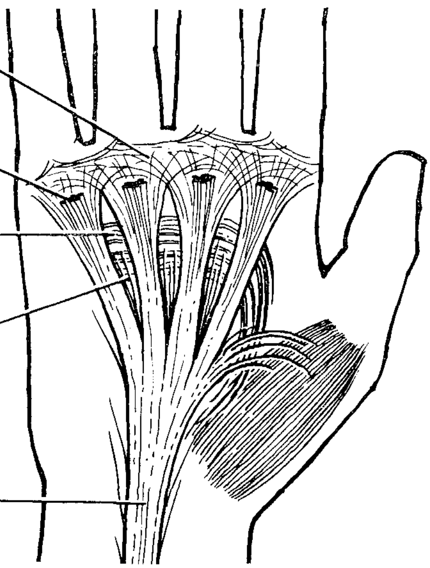

Fig. 1 A diagram of the palmar fascia and its supporting fibrous attachments.

ANATOMY

The palmar fascia is a triangular structure in the palm of the hand based distally (Fig. 1). It is a continuation of the deep fascia of the forearm. The palmaris longus, when present, lies freely between the superficial and deep layers of the deep fascia. The superficial layer and the palmaris longus join together at the distal wrist crease, send multiple attachments into the skin, thenar and hypothenar fascia, and project out on to the palm as the palmar fascia. The deep layer joins into the transverse oriented fibres of the transverse carpal ligament. From the transverse carpal ligament strong attachments are sent volarly and distally into the palmar fascia and skin. When the palmaris longus is missing, the superficial portion of the deep fascia becomes the superficial portion of the palmar fascia.

The palmar fascia inserts into the skin by strong fibrous attachments over its entirety, from the distal wrist crease to a point just distal to the distal palmar crease (Fig. 2). Medially and laterally, the palmar fascia joins into the thenar and

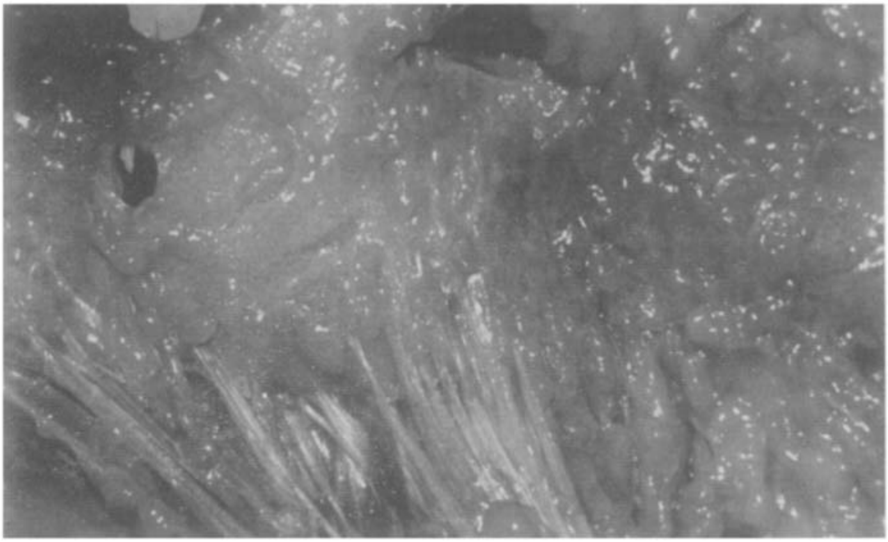

Fig. 2 The terminations of fibres of the longitudinal system. They are mainly to the skin in the region of the distal palmar crease.

hypothenar fasciae respectively. The palmar fascia is broken up into longitudinal, intertendinous, and transverse fasciculi (Fig. 1). The longitudinal fasciculi (pretendinous bands) vary in number, but basically are five bundles of fibres, a short one towards the thumb over the thenar fascia, terminating into the thenar fascia itself with an occasional fibre into the skin in the region just proximal to the metacarpophalangeal flexor crease. The four remaining longitudinal fasciculi move in the direction of each digit and terminate mainly into the skin just distal to the distal palmar crease (Fig. 2). There are small fibrous continuations moving distally to the next transverse oriented fibrous structure, situated at the proximal digital flexor creases and distal border of each web space (Fig. 1). This structure has been referred to as the superficial transverse ligament of the palm or natatory ligament. We prefer the former term only because another structure, the deep transverse ligament of the palm is well ingrained in our terminology. Prior to the insertion of the longitudinal fasciculi into the skin deep branches move to each side of the flexor tendon sheath and continue out into the finger to join Cleland's ligament (Fig. 4). Distal to the deep transverse ligament of the palm multiple deep fibrous structures coming from the palmar fascia are noted to separate the lumbrical and neurovascular structures (Fig. 4). Some of these fibrous structures continue dorsally to join the deep fascia on the dorsum of the hand and finger. They do not attach to the dorsal expansion itself. The lumbricals, which are based on either side by fibrous bands, move to the dorsal hood, under an arcade of these bands and fibres to Cleland's ligament (Fig. 4). Thus, the deep fascia of the forearm can be found to continue out into the fingers both volar and dorsal.

The intertendinous fasciculi are small continuations of the palmar fascia between the longitudinal fasciculi which are not directed specifically toward the fingers, are few in number, and terminate into the palm of the hand throughout their course, as do the longitudinal fasciculi (Fig. 1).

Fig. 3 Haemostats on the terminations of the longitudinal fasciculi to the middle and ring fingers. Tension on the transverse fasciculi shows that it lies at a deeper level. The fasciculus to the little finger has been raised to show that it can be separated from the transverse fibres.

The transverse fasciculi (transverse fibres of the palmar fascia) make a transverse oriented structure, which begins in the region of the thenar fascia just adjacent to the attachment of the transverse carpal ligament to the tuberosity of the trapezium (Fig. 1). These fibres then move distally over and adherent to the thenar fascia to the region of the distal palmar creases, then arch ulnarwards in a transverse manner separating the palmar fascia into superficial and deep portions (Fig. 3). The superficial longitudinal fasciculi can be separated from this structure by blunt dissection, but the deeper portions cannot. The width of the transverse fasciculus is about one centimetre and is in the region between the proximal and distal palmar creases. It is firmly attached to the deep portion of the palmar fascia.

The deep portion of the palmar fascia at the level of the transverse carpal ligament has a rather unusual structure. The ulnar fibres travel to the thenar fascia in a radial direction and the radial fibres travel to the hypothenar fascia to form a letter "X" just distal to the transverse carpal ligament. There is an occasional loose fibrous connection between the palmar fascia and the interosseous fascia for about 1.5 to 2 centimetres distal to the transverse carpal ligament. At this level, depending on the finger, thick fibrous bands (paratendinous bands) extend from the deep surface of the palmar fascia to the volar interosseous fascia (Fig. 5), separating the flexor tendons to each finger from the neurovascular bundle on the ulnar side and the lumbricals on the radial side; the radial band is usually shorter in length because of the lumbrical attachment on the radial side. These bands form tunnels about the flexor tendons. They cover but do not adhere to the proximal portion of the flexor tendon sheaths, and extend to a variable length more proximal over the flexor tendons themselves. The ulnar bands to the middle and ring finger are by far the strongest and most proximally situated. Legueu and Juvara (1892) have suggested that these paratendinous bands (the perforating fibres) extend through the volar interosseous fascia to separate the interossei. These bands do connect to the interosseous

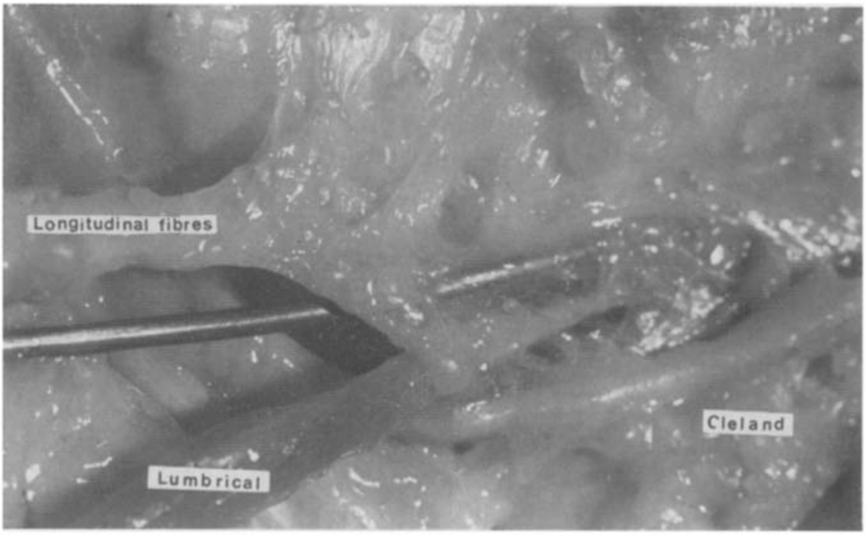

Fig. 4 To the right of the figure the neurovascular structures lie volar to Cleland's ligament. Fibres from the longitudinal pretendinous bands extend to the right to join Cleland's ligament. The probe and the lumbrical muscle pass beneath this continuation of the palmar fascia to reach the dorsum of the finger.

fascia; whether the fascia separating the interossei is coming from the dorsal fascia or from the paratendinous bands cannot be determined from this dissection. It is presumed that these fascial structures that separate the interossei are not extensions of the palmar fascia, because the paratendinous bands do not cover the whole length of the interossei.

FUNCTION

A proximal pull on the palmaris longus, when present, produces a proximal movement of the distal wrist crease, minimal cupping of the palm, and has literally no effect on the fingers. When the attachments to the distal wrist crease are cut, it can be seen that the proximal pull of the palmaris longus on the apex of the palmar fascia has a tendency not only to cup the hand, but flex the metacarpophalangeal joint to a minimal degree. This is most marked in the middle and index finger. When the transverse carpal ligament is sectioned, there is a greater tendency for the proximal pull of the palmar fascia to cup the hand as well as to flex the metacarpophalangeal joints. When the longitudinal fascicular insertions into the skin have been transected, there is little increase in the ability of the palmar fascia to flex the metacarpophalangeal joints. Only after excision of the paratendinous bands and attachments to the thenar and hypothenar fascia does the proximal pull of the palmar fascia produce maximal metacarpophalangeal joint flexion (about 60–70°). At no time could flexion of the interphalangeal joints be produced by a proximal pull on the palmar fascia, even after division of the paratendinous bands. Thus, it seems that the main function of the palmar fascia is as a protective mechanism of the deeper, more sensitive structures, and a means of maintaining the transverse arch and cupping of the hand by its fixation to the metacarpals.

SUMMARY

The palmar fascia is a prolongation of the deep fascia of the forearm and

Fig. 5 The thick paratendinous bands extending from the palmar fascia to the deeper level. In the middle of the photograph can be seen a smaller paratendinous band just to the left of the tendon.

continues out into the fingers to join Cleland's ligament. It is firmly fixed to the palmar aspect of the skin from the distal wrist crease to the distal palmar crease. It basically protects the flexor tendons, lumbricals, and neurovascular structures, and separates these by thick paratendinous bands.

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