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Abstract

The adductor pollicis muscle was studied in fifty hands of Japanese adult cadavers of both sexes. The radial portion of the oblique head of the adductor pollicis muscle has carpal and metacarpal origins and an insertion into the wing tendon of the extensor apparatus. This portion was located dorsal to the palmar metacarpophalangeal articular nerve and superficial palmar metacarpal artery. Thus, the radial portion of the oblique head of the adductor pollicis muscle (more strictly, the slips dorsal to the palmar-penetrating twig of the ulnar nerve) is similar to the palmar interosseous muscles, except that its slips cannot be clearly distinguished from each other.

KEYWORDS: adductor pollicis muscle, palmar interosseous muscle, deep palmar artery, deep palmar nerve, wing tendon

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Palmar Interosseous Muscle of the Human Thumb

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The adductor pollicis muscle was studied in fifty hands of Japanese adult cadavers of both sexes. The radial portion of the oblique head of the adductor pollicis muscle has carpal and metacarpal origins and an insertion into the wing tendon of the extensor apparatus. This portion was located dorsal to the palmar metacarpophalangeal articular nerve and superficial palmar metacarpal artery. Thus, the radial portion of the oblique head of the adductor pollicis muscle (more strictly, the slips dorsal to the palmar-penetrating twig of the ulnar nerve) is similar to the palmar interosseous muscles, except that its slips cannot be clearly distinguished from each other.

Key words : adductor pollicis muscle, palmar interosseous muscle, deep palmar artery, deep palmar nerve, wing tendon

The first or most lateral number of the palmar series, which has the same insertion as the adductor pollicis muscle, has been referred to both as "the palmar interosseous muscle of the thumb" and as "the deep head of the flexor pollicis brevis muscle" (1).

Henle first described the palmar interosseous muscle of the thumb (2). McMurrich supported this description and regarded the dorso-radial slips of the adductor pollicis muscle as the palmar interosseous muscle of the thumb (or deep head of the flexor pollicis brevis muscle) (3). However, Horster reported that these slips were difficult to identify as a separate entity (4). Lewis investigated the insertions of the deep palmar muscles and contended that the palmar interosseous muscle of the thumb has a characteristic insertion into the ulnar wing tendon of the thumb (5). Murakami and his associates studied the deep palmar arteries and regarded a part of the adductor pollicis muscle dorsal to the princeps pollicis artery as the palmar interosseous muscle of the thumb (6, 7).

The present study reinvestigates the origins and insertions of the adductor pollicis muscle in relation to the nerves and arteries, and elucidates anew the palmar interosseous muscles of the human thumb.

Materials and Methods

Fifty hands of Japanese adult cadavers, which had been fixed with formalin by vascular perfusion, were dissected in the dissecting room of Okayama University Medical School. Thirty hands were female ones, and the remaining twenty were male ones.

Findings

No sex-difference was noted in the form,

origin, insertion, arterial supply or nerve supply of the adductor pollicis muscle.

Origin and Insertion of the Adductor Pollicis Muscle. The adductor pollicis muscle consists of the transverse and oblique heads. These heads are separated at their origins by the deep palmar branch of the ulnar nerve and the arterial arch(deep palmar arch) formed by the radial and ulnar arteries (Figs. 1, 2).

The transverse head arises from the neck and shaft of the third metacarpal bone though it occasionally receives some additional slips from the neck of the second metacarpal bone (11 out of the 50 cases). Oblique head arises from the shaft and base of the first metacarpal bone, the corpuses of the trapezoid and capitate bones, and the bases of the sec-

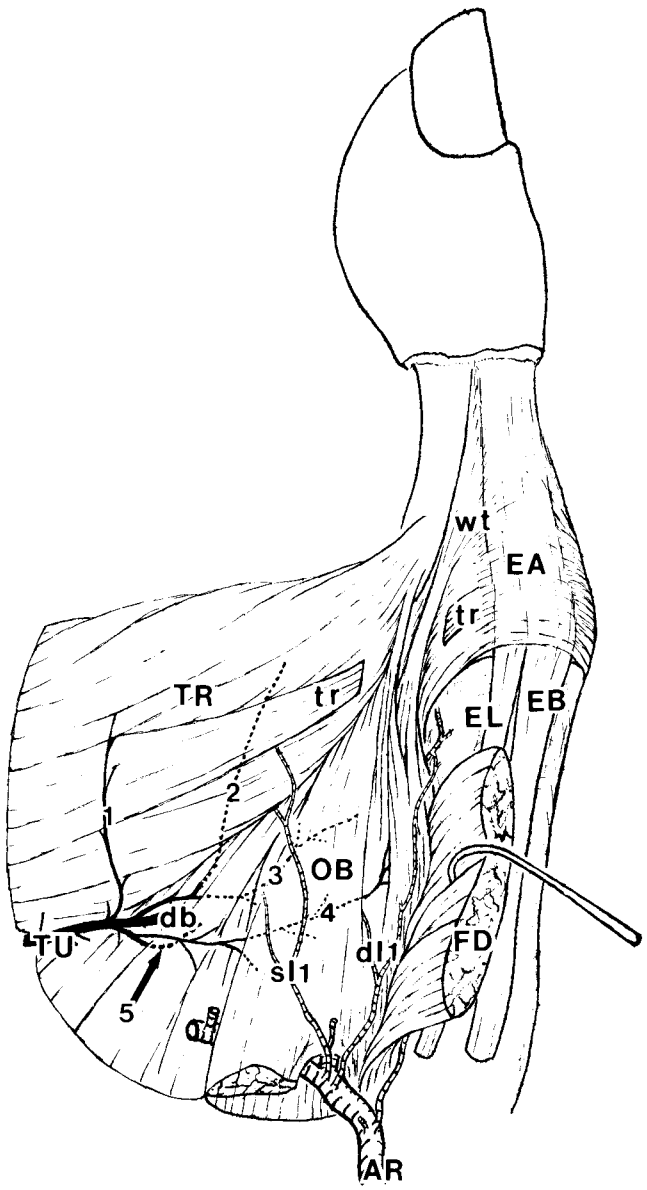

Fig. 1 Drawing of a dissected hand of an adult male (dorsal view).
AR: radial artery (dorsal branch)
EA: extensor apparatus of the thumb
EB: extensor pollicis brevis muscle
EL: extensor pollicis longus muscle
FD: first dorsal interosseous muscle (radial head)
OB: oblique head of the adductor pollicis muscles
TR: transverse head of the adductor pollicis muscle
TU: deep terminal branch of the ulnar nerve
db: dorsal branch of the deep terminal branch of the ulnar nerve
tr: transverse slips continuing into the extensor apparatus
wt: wing tendon
dI1: the first deep palmar intermetacarpal artery of Murakami (7)
sI1: the superficial intermetacarpal artery of Murakami (7)
1-4: dorsal-descending, palmar-descending, palmar-transversing and dorsal-transversing nervous twigs terminating within the adductor pollicis muscle
5: palmar-penetrating twig penetrating the oblique head of the adductor pollicis muscle

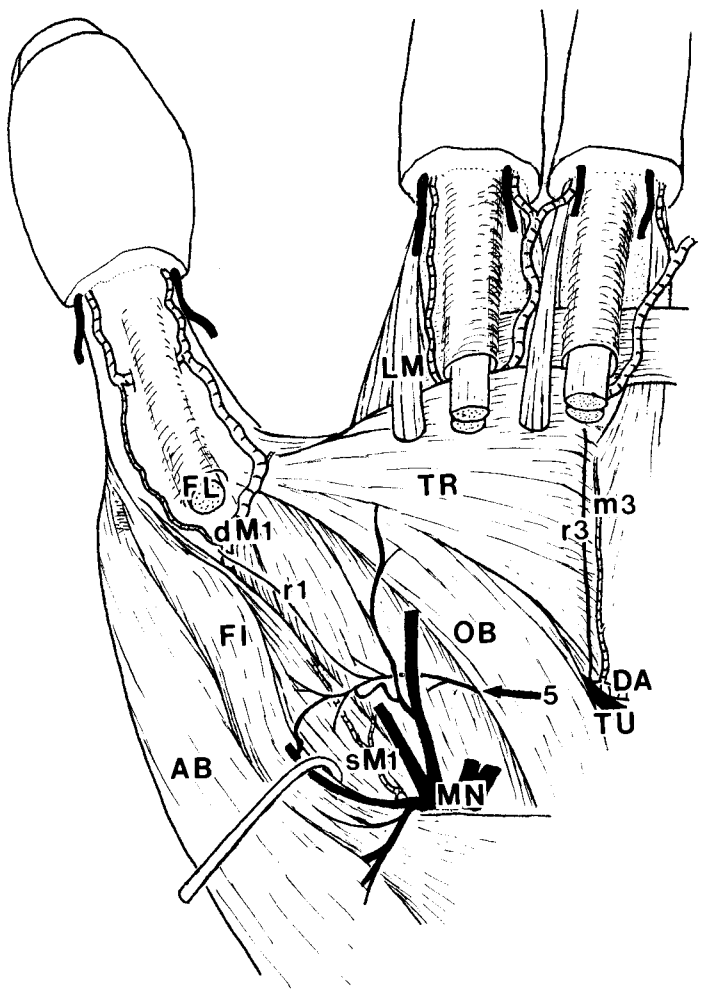

Fig. 2 Drawing of a dissected hand of an adult male (palmar view).
AB: abductor pollicis muscle
DA: deep palmar arch
FL: flexor pollicis longus muscle
Fl: flexor polliocis brevis muscle
MN: median nerve
LM: lumbrical muscle
rl: palmar articular branch which arises from the anastomosis between the median nerve (MN) and palmar-penetrating twig (5) and terminates in the first metacarpophalangeal joint
r3: palmar articular twig to the third metacarpophalangeal joint
dM1: the first deep palmar metacarpal artery of Murakami (7)
sM1: the first superficial palmar metacarpal artery of Murakami (7)

ond and third metacarpal bones. On occasion, it receives some additional slips from the trapezium bone (12 out of the 50 cases).

The transverse and oblique heads are mixed, so that muscular slips or groups are not identified as a separate entity. Thus, most slips of the transverse and oblique heads converge into a common tendon, which contains a sesamoid bone and attaches to the ulnar tubercle of the bases of the proximal phalanx of the thumb (Figs. 1,2). However, some slips, especially radial ones, of the oblique head run dorsally and form the wing tendon of the ulnar extensor expansion of the thumb (Fig. 1). More strictly, the wing tendon-forming slips arise from the shaft and base of the first metacarpal bone (38 out of the 50 cases), the shaft and base of the first metacarpal bone and the base of the second metacarpal bone (8 out of the 50 cases), or the bases of the second and third metacarpal bones (4 out of the 50 cases).

In 14 out of the 50 cases, some faint aberrant slips arose from the transverse head and attached over the oblique head to the extensor expansion (Fig. 1).

Innervations of the Adductor Pollicis Muscle. The deep terminal branch of the ulnar nerve runs between the transverse and oblique heads of the adductor pollicis mus-

cles, together with the deep palmar arch(see above). It then divides into the dorsal and ventral branches(Fig. 1).

The dorsal branch runs along the palmar surfaces of the interosseous muscles of the second and third fingers and gives off twigs to these muscles as well as the radial head of the first dorsal interosseous muscle. It also gives off palmar articular twigs to the second and third metacarpophalangeal joints. These articular twigs descend along the palmar surfaces of the interosseous muscles, together with the superficial palmar metacarpal(sM) arteries(7)(Fig. 2).

The ventral branch divides into the dorsal-descending, palmar-descending, palmar-transversing, dorsal-transversing and palmar-penetrating twigs (Fig. 1). The former four twigs terminate within the adductor pollicis muscle. In contrast, the palmar-penetrating twig penetrates the oblique head and joins with one or a few twigs which come from the median nerve (recurrent or common digital nerve)(Figs. 1,2). This communication is constant and always gives off the palmar articular nerve to the first metacarpophalangeal joint(Fig. 2).

Arterial supply of the adductor pollicis muscle. The dorsal branch of the radial artery penetrates the first dorsal interosseous muscle and adductor pollicis muscle at the proximal end of the first intermetacarpal space(Fig. 1). Here, it gives off the dI1, sM1, sI1 and dM1 arteries(7). The dI1 artery is thin and descends along the ulnar side of the first metacarpal bone(Fig. 2). The dM1 or princeps pollicis artery is thick and descends along the ulnar side of this bone (Fig. 2). The sI1 artery is thin and descends along the mid-dorsal surface of the adductor pollicis muscle(Fig. 1). The sM1 artery is thin and descends along the palmar surface of the adductor pollicis or flexor pollicis muscle, together with the palmar articular nerve to the first metacarpophalangeal joint(Fig. 2).

The adductor pollicis muscle is supplied by the dI1, sM1, sI1 and dM1 arteries, in addition to some branches coming from the common digital arteries.

Discussion

This study shows that the adductor pollicis muscle occasionally contains some aberrant slips which arise from the trapezium bone. These slips are sometimes included in the deep head of the flexor pollicis muscle (or palmar interosseous muscle of the thumb) (8,9). It is well known that the transverse head of the adductor pollicis muscle occasionally contains some aberrant slips from the neck of the second metacarpal bone(10).

This study also shows that the oblique head of the adductor pollicis muscle constantly contains some slips which form a wing tendon, while such wing-formation is rather rare in the transverse head. This finding coincides with that of Day and Napier(9). It is well known that the oblique head of the adductor pollicis muscle rarely receives twigs from the median nerve(8,10-13), and that a twig(palmar-penetrating twig, see above) of the ulnar nerve always joins with the median nerve (8,10,14). This study confirms the rare occurrence of the former anomaly, and also clarifies the constant occurrence of the latter communication. This study further clarifies that this communication constantly gives off the palmar articular nerve to the first metacarpophalangeal joint. This fact suggests that the communication contains not only the motor nerve fibers but also the sensory nerve fibers from the joint.

This study confirms the existance of four arteries(dI1, dM1, sI1 and sM1) in the deep thenar. This finding coincides with that of Murakami and his associates(6,7). Of these arteries, the sM1 artery is noteworthy since

it is accompanied by the palmar articular nerve to the first metacarpophalangeal joint.

It is believed that the palmar interosseous muscles are derived from the short flexor muscles in the lower animals, and that the dorsal interosseous musles are derived from the dorsal interosseous muscles(5). In man, the palmar interosseous muscles, which occur in the second, forth and fifth fingers, are located dorsal to the superficial palmar (sI and sM) arteries(7) and the palmar articular nerves to the metacarpophalangeal joints(7). The palmar interosseous muscles of the second, fourth and fifth fingers have metacarpal and carpal origins and insertions into wing tendons(1,5).

As described above, the adductor pollicis muscle, especially the radial portion of the oblique head (more strictly, the muscular slips located dorsal to the palmar-penetrating twig of the ulnar nerve), has similar carpal and metacarpal origins and similar insertions as the palmar interosseous muscles. The radial portion of the oblique head is also dorsal to the sM1 artery and the palmar articular nerve to the first metacarpophalangeal joint as are the palmar interosseous muscles. Thus, we would like to regard the adductor element dorsal to the palmar-penetrating twig of the ulnar nerve as the palmar interosseous muscle of the thumb.

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