The Vascular Anatomy of the Abductor Digiti Minimi and the Flexor Digiti Minimi Brevis Muscles

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Purpose: The abductor digiti minimi (ADM) and the flexor digiti minimi (FDM) brevis muscles could be used as flaps with their low functional morbidity, especially in severe crushed injuries of the hand. The vascular anatomy of both of the muscles were investigated to classify the muscles according to the Mathes–Nahai classification.

Methods: Nine cadavers embalmed with formaline were dissected under loupe magnification (×4) from the wrist proximally to the proximal phalanx of the small finger distally, delineating the branches of the ulnar artery along the ADM and FDM muscles.

Results: The dissections and the microangiography of the muscles revealed 1 major and 2 minor pedicles. Both of the muscles could be classified as type II muscles according to the Mathes–Nahai classification.

Conclusions: The vascular pattern of the ADM muscle has been described previously, this study explored the vascular anatomy of the FDM muscle. The information regarding the vascular supplies of these muscles could be of help to the clinician when manipulating the muscles. The FDM muscle could be a suitable alternative for the ADM muscle in opponensplasty. When the pedicles are preserved the muscles could be used-based proximally or distally. (J Hand Surg 2005;30A: 172–176. Copyright © 2005 by the American Society for Surgery of the Hand.)

Key words: Anatomy, vascular, abductor, flexor, flap, muscle.

In the reconstruction of defects of the hand with tendon, bone, or nerve exposure, when conventional skin grafts are not useful, local or distant flaps commonly are used. The transposition, rotation, and advancement flaps are suitable in small defects in the hands with undamaged adjacent soft tissue.[1–8] There are a few muscle and musculocutaneous flaps in the hand that have been described in the literature such as the first dorsal interosseous, lumbrical, abductor digiti minimi (ADM) and abductor pollicis brevis muscle flaps.[9] The vascular pattern of the ADM muscle has been described previously, this study explored the vascular anatomy of the flexor digiti minimi (FDM) muscle.[9] The information about the vascular supplies of the muscles of the hand could be of help to the clinician when manipulating these

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muscles. The ADM opponensplasty was popularized by Littler and Cooley.[10] The FDM muscle could be a suitable alternative for the ADM muscle in opponensplasty. The ADM and the FDM muscle flaps could be used based proximally or distally. Therefore the vascular anatomy of the ADM and the FDM muscle were investigated.

Materials and Methods

Eighteen cadaver hands with no known vascular diseases were used in this study. Nine cadavers were embalmed with formaline, 2 of them were female and 7 were male, with a mean age of 43 years (38–59 y). The ulnar arteries of the cadavers were dissected at the distal third of the forearm and 5 mL of latex barium was injected manually under physiologic pressure for each hand. A barometer was attached to the angiocatheter with a 3-way stopcock and the pressure was controlled and stabilized according to the normal physiologic pressure of the ulnar artery. The latex was allowed to cure overnight at room temperature. Dissection was performed under loupe magnification (×4) from the wrist proximally to the proximal phalanx of the small finger distally, delineating the branches of the ulnar artery along the ADM and the FDM muscles. The diameter of the ulnar artery where it passes through the flexor retinaculum, the deep palmar branch of the ulnar artery at its origin, and the major and minor pedicles at their origin were measured with a micrometer. Between the origins (ie, the pisiform bone and the pisohamate ligament for the ADM muscle and the convex surface of the hook of hamate for the FDM muscle) and the insertions (ie, the ulnar side of the proximal phalangeal base of the minimus and the ulnar border of the dorsal digital expansion of the extensor digiti minimi for the ADM muscle and for the FDM muscle) the lengths of the muscles also were noted for each cadaver. The hypothenar regions of the hands of the cadavers were excised totally, preserving the tissues. The distal part of the deep palmar arch was clamped and radiopaque solution was applied to the muscles through the ulnar artery and microangiography was performed. The microangiography measurements were calculated according to the muscle length and ratio.

Results

The FDM muscle was absent in 1 hand and it was found to be fused with the ADM muscle in 2 hands. The lengths of the ADM and the FDM muscle were 81 mm (76–90 mm) and 80 mm (76–90 mm), respectively.

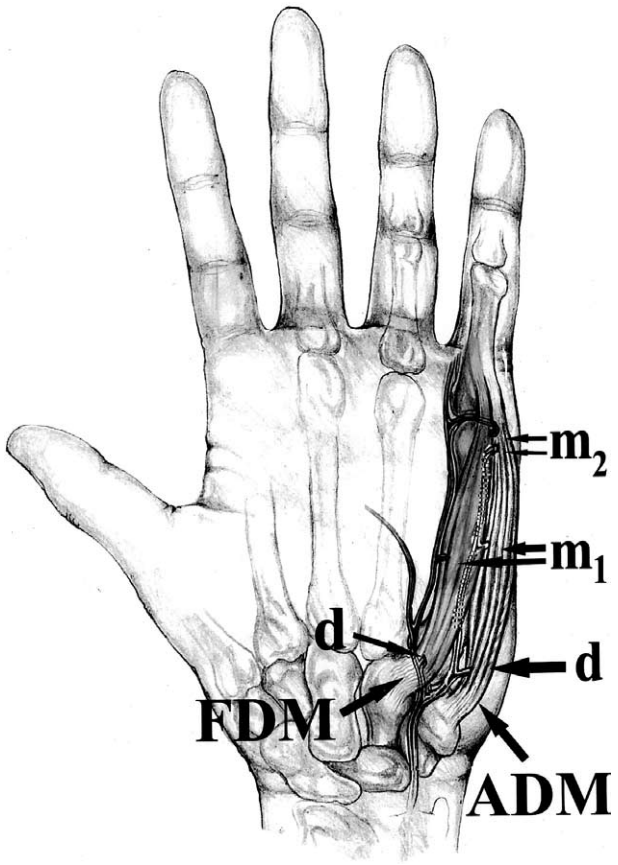

Figure 1. The drawing of the vascular anatomy of the ADM muscle and the FDM brevis muscle of the left hand. D, dominant (major) pedicle; M_1, first minor pedicle; M_2, second minor pedicle.

The meticulous anatomic dissections of the latex-injected hands of the formaline-embalmed cadavers revealed several findings. The ulnar artery gives off the deep palmar artery branch approximately 5 to 10 mm after passing through the flexor retinaculum. The deep palmar artery curved posteroulnarly, giving off the branches to the palmaris brevis and ADM muscles as the major pedicles of these 2 muscles (Figs. 1, 2). The diameter of the ulnar artery was 2.0 mm (±0.2 mm) and the diameter of the deep palmar artery was 0.5 mm (±0.15 mm). The major pedicle of the ADM brevis muscle was 0.3 mm (±0.18 mm).

The artery passed deep to the ADM muscle 2 to 3 mm distal to the origin of the muscle that was the pisiform bone and the pisohamate ligament. Inferior to the FDM muscle and 2 to 3 mm distal to its origin (ie, the convex surface of the hook of hamate) the artery gives off the major pedicle branch to the muscle. The major pedicle of the FDM muscle was 0.2 mm (±0.15 mm).

The fourth common digital artery coursed on the