Identification of Two Accessory Muscle Bundles with Anomalous Insertions in the Flexor Side of the Right Forearm

By

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Summary: During dissection practice held at Kyorin University School of Medicine in 2004, two anomalous muscles were observed on the Rt-forearm-flexor-side of an 83-year-old man. The results of this investigation are reported.

One accessory muscle originated from the tendinous insertion of the biceps brachii and medial epicondyle. After passing through the deep layer of the pronator teres, it became tendinous, passing towards the trapezium and second metacarpal base. Its two origins fused superficial to the ulnar artery distal to the cubital fossa, and it merged with the deep region of the pronator teres. More distally, the accessory muscle formed a belly before again becoming tendinous and bifurcated, one branch attaching to the trapezium and the other fusing with the belly of the second accessory muscle. These findings suggested that this accessory muscle was similar to Gantzer’s muscle.

The other accessory muscle arose distal to the origin of the flexor pollicis longus and inserted onto the second metacarpal base. In addition, from the distal side of its origin, a small muscle bundle was formed and became tendinous. It fused with the insertion tendon of the first accessory muscle to the trapezium. The second accessory muscle was thought to be deep radial carpal flexor.

Subjects and Methods

The flexor side of the right forearm of an 83-year-old man who died of acute ischemic heart disease was examined in dissection practice at Kyorin University School of Medicine in 2004. Two accessory muscles on the flexor side of the right forearm were carefully dissected to ascertain their origin, insertion, alignment, relationship to surrounding structures and innervation.

Results

Observations identified a long muscle extending from the cubital fossa to the wrist (hereafter referred to as Accessory Muscle A) and a muscle running from the distal end of the radius to the index finger (hereafter referred to as Accessory Muscle B). The details of these muscles are discussed below (Fig. 1).

1. Accessory Muscle A (Fig. 2a–2e).
Origin: Accessory Muscle A had two origins. One was the medial epicondyle of the humerus (1) and the other was the insertion tendon of the biceps brachii muscle (2) (Fig. 2a).
Alignment (relationship to surrounding structures): The origins of these two muscles fused superficial to the ulnar artery approximately 5.0 cm distal to the cubital fossa (3) (Fig. 2b). About 5.0 cm distal to this fusion, Accessory Muscle A merged with the ulnar head of the pronator teres (4) (Fig. 2c). Further distally, Accessory Muscle A formed a belly 4.5 cm long and 0.8 cm wide (5) before again becoming tendinous and bifurcated (6).
Insertion: One of the tendon branches attached to the tubercle of the trapezium about 6.0 cm distal to the bifurcation (7) (Fig. 2d) while the other fused with the belly of Accessory Muscle B about 2.0 cm distal to the bifurcation (Fig. 2e).
Innervation: After the partial fusion of Accessory Muscle A with the ulnar head of the pronator teres, a branch of the median nerve entered the belly.

2. Accessory Muscle B (Fig. 3a and 3b)
Origin: The origin of Accessory Muscle B was distal to the origin of the flexor pollicis longus muscle of the radius (8) and was in the shallow layer of the
insertion of the pronator quadratus muscle, with a width of 5.0 cm (Fig. 3a).

Alignment (relationship to surrounding structures): After a muscular portion of about 5.0 cm, Accessory Muscle B formed a narrow tendon (hereafter referred to as the main portion), but from 1.8 cm distal to the distal side of the origin of Accessory Muscle B, a small muscle bundle with a width of 0.2 cm branched out, eventually becoming tendinous (hereafter referred to as the accessory portion). The accessory portion headed towards the wrist and fused with Accessory Muscle A.

Insertion: The main portion was inserted distal to the insertion of the flexor carpi radialis at the base of the second metacarpal bone (9) (Fig. 3b). Also, the accessory portion fused with the insertion tendon of Accessory Muscle A to the trapezium.

Innervation: Innervation could not be confirmed.

Discussion

I. Accessory Muscle A

Gantzer’s muscle is one of the common accessory muscles on the flexor side of the forearm [14-17]. Accessory Muscle A in the present study differed from Gantzer’s muscle in several respects.

According to Yamada et al. [13], Gantzer’s muscle is similar to the proximal belly (superficial flexor...
Fig. 2a. Origin of Ma.

Fig. 2b. Photograph of origin of Ma-tendon fusion area.
Fig. 2c. Photograph of Ma-PT fusion region.

Fig. 2d. Insertion on trapezium.
muscle) of the index finger and is often innervated by the nerve controlling this muscle (a branch of the median nerve reaching the proximal belly of the index finger near the biceps of the pronator teres). As to muscle location, Accessory Muscle A was located between the pronator teres and the radial head of the flexor digitorum superficialis. In contrast, Gantzer’s muscle is often located between the flexor digitorum superficialis and flexor digitorum profundus.

Although Accessory Muscle A and Gantzer’s muscle arose in similar areas, it is difficult to assume that a muscle near the proximal belly of the index finger, which is relatively deep, would pass through the superficial layer of the radial head of the flexor digitorum superficialis, which fuses with the belly heading towards the middle finger. This finding differentiates Accessory Muscle A from Gantzer’s muscle.

In addition to investigating Gantzer’s muscle, Mangini, Pijman et al., and Kudo et al. examined a muscle that originated from the lateral surface of the coronoid process and inserted near the wrist. This muscle also passed through the deep layer of the radial head of the flexor digitorum superficialis, thus resembling Gantzer’s muscle. Furthermore, the insertion tendon divided almost equally into two parts and entered the trapezium and the belly of Accessory Muscle B. No aberrations were observed in the insertion of the flexor pollicis longus or flexor digitorum profundus. Further investigation is needed regarding the fusion with Accessory Muscle B at the insertion in order to clarify the insertion of both muscles.

Kudo et al. examined Gantzer’s muscle and reported that the muscle usually originates from the medial epicondyle of the humerus and/or the ulnar coronoid process and then exhibits partial tendinous fusion with the flexor digitorum superficialis, but it occasionally forms an independent bundle. Gantzer’s muscle was observed to form a belly and travel distally over the ulnar artery. After transitioning to an insertion tendon, Gantzer’s muscle

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**Fig. 2c. Fusion area of Ma & Mb.**
Fig. 3a. Origin of Ms & FRL.

Fig. 3b. Photograph of MB (Insertion).
fused with either the flexor pollicis longus muscle or the flexor digitorum profundus muscle near the proximal area of the forearm.

Accessory Muscle A in the present study is similar to Gantzer’s muscle with respect to its location. Moreover, Gantzer’s muscle often originates from the coronoid process, but to the best of our knowledge, it has not been reported to originate from the biceps brachii muscle. Furthermore, like Accessory Muscle A, Gantzer’s muscle is innervated by the median nerve. However, while Accessory Muscle A merged with the pronator teres, Gantzer’s muscle does not. Furthermore, Accessory Muscle A inserted into the trapezium and did not fuse with the tendon of the flexor pollicis longus but instead with the tendon of Accessory Muscle B. As a result, Accessory Muscle A has features that differ from those of Gantzer’s muscle, and it is currently not possible to ascertain the origin of this muscle. Based on one of the origins, location and innervation, Accessory Muscle A could be a variation of Gantzer’s muscle, but based on the other origin, fusion with the pronator teres and insertion, Accessory Muscle A does not appear to be a variation of Gantzer’s muscle.

II. Accessory muscle B

Yoshida et al. examined 450 arms in 225 specimens, and in 4 arms of 3 specimens they observed the existence of a muscle originating from the flexion side of the radius at a location distal to the insertion of the pronator teres and lateral to the origin of the flexor pollicis longus, and inserting onto the flexor pollicis longus. The muscle inserted onto either the base of the third metacarpal bone or the radial carpal bone. They referred to this muscle as the flexor carpi radialis profundus and classified it.

The origin of Accessory Muscle B resembles that of the Type 1 flexor carpi radialis profundus reported by Yoshida et al. However, unlike the flexor carpi radialis profundus, Accessory Muscle B was observed to insert onto the base of the second metacarpal bone. The muscle reported by Yoshida et al. did not have this insertion. However, another tendon was observed to fuse with the tendon of Accessory Muscle A that passed toward the trapezial bone and extended from the belly, and if this tendon can also be considered an insertion tendon then Accessory Muscle B also inserted onto the radial carpal bone, thus resembling the muscle reported by Yoshida et al. Because the origin and insertion of flexor carpi radialis profundus were broad and the muscle has the same innervation as the pronator quadratus (i.e., the terminal branch of the anterior interosseous nerve), Yoshida et al. postulated that this muscle arose due to atavism as a section of the primordium of the pronator quadratus which became independent. However, as no nerve was observed to enter Accessory Muscle B, discussion of the innervation of this muscle was not possible. Therefore, because Accessory Muscle B inserted at the base of the second metacarpal bone, it seems highly possible that Accessory Muscle B was equivalent to the flexor carpi radialis profundus.

Conclusion

Two related accessory muscles were confirmed on the flexor side of the right forearm of an 83-year-old man. The first accessory muscle originated from the insertion tendon of the biceps brachii muscle and the medial epicondyle of the humerus, and after passing through the deep layer of the pronator teres, it inserted onto the trapezium and the base of the second metacarpal. The two originating tendons of the accessory muscle fused approximately 5.0 cm distal to the cubital fossa, and at 5.0 cm after this fusion point, the tendon merged with the deep area of the pronator teres. In a further distal area, the first accessory muscle formed a belly and again became tendinous and bifurcated. The muscle entered, fused, and inserted onto the belly of the second accessory muscle and trapezium. We therefore concluded that the first accessory muscle was similar to Gantzer’s muscle.

The second accessory muscle originated distal to the origin of the flexor pollicis longus on the radius, passed toward the wrist and inserted onto the base of the second metacarpal bone. A small muscle bundled was evident from the distal side of the origin of the second accessory muscle, and this fused with the insertion tendon of the first accessory muscle and inserted into the trapezium. We therefore concluded that the first accessory muscle was equivalent to the flexor carpi radialis profundus.

References