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Aberrant accessory abductor digiti minimi manus muscle: a rare anatomical variation

Ioannis Antonopoulos et al., Accessory abductor digiti minimi

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ABSTRACT

The hypothenar muscle with the greatest frequency of variations is the abductor digiti minimi manus. Except from morphological variations of this muscle, have also been reported cases of an extra wrist muscle, the accessory abductor digiti minimi manus muscle. This case report presents a rare case of an accessory abductor digiti minimi muscle characterized by an unusual origin from the tendons of the flexor digitorum superficialis. This anatomical variation was identified on a formalin – fixed male cadaver of Greek origin during routine dissection. This anatomical variation, which may result in Guyon's canal syndrome or complicate common wrist and hand surgical procedures such as the carpal tunnel release, should be known to orthopedic surgeons and hand surgeons in particular.

Key words: wrist muscles, hypothenar muscles variations, abductor digiti minimi

INTRODUCTION

The hypothenar eminence is formed by four muscles; the abductor digiti minimi muscle, the flexor digiti minimi brevis muscle, the opponens digiti minimi muscle, and the palmaris brevis muscle [1]. Many researchers have described abnormalities of the hypothenar muscles focusing mainly on their morphology and topography [2-7]. The hypothenar muscle with the greatest frequency of variations appears to be the abductor digiti minimi manus and the second more variable muscle is the flexor digiti minimi manus [7]. Contrarywise, the opponens digiti minimi muscle mostly lacks anatomical variations [7]. To the best of our knowledge, the first description of an accessory abductor digiti minimi manus (AADM) was done by Wood in 1868 [8].

This small aberrant muscle usually originates either from the tendon of palmaris longus muscle [9-12] or the tendon of flexor carpi radialis [6]. In addition, AADM origins may extend to the flexor retinaculum [13]. As for its insertion, the most common point is the proximal phalanx of the 5th finger [14].

The aim of this article is to present a rare case of an accessory abductor digiti minimi manus muscle with an unusual origin, and further highlight the potential clinical implications regarding ulnar nerve and artery compression.

CASE REPORT

The reported case was identified during the dissection of the right wrist and hand of a male formalin-fixed (10% v/v solution) cadaver. The dissection was held for both educational and research purposes at the Dissection's Hall of our Anatomy Department. The cadaver was of Greek origin and derived from body donation with the written and informed consent of the donor, according to the relevant legislation [15]. The specimen was properly cleaned and photographed. A Würth™ digital Vernier caliper (0.01 mm, accuracy) was used for the measurements of the distances and nerves' diameters.

The case described refers to the existence of an accessory abductor digiti minimi manus muscle (AADM) identified in the right wrist of a male adult. The muscle originated from the tendons of the flexor digitorum superficialis and after following a course under the pisohamate ligament (Figure 1) its tendon inserted with

the tendon of ADM into the base of the 5th proximal phalanx beneath the flexor digiti minimi muscle (Figure 2). The ulnar artery and ulnar nerve passed beneath the AADM.

The length (L) of the AADM was 53.54 mm. The width of the muscle was 7.98 mm at its origin (w_1), 2.14 mm at its insertion (w_2) and its belly was of maximum thickness 0.96 mm (Figure 3). The muscle was innervated by minor motor branches arising from the ulnar nerve. This was a unilateral finding.

DISCUSSION

Supernumerary hypothenar muscles mostly involve the abductor and flexor digiti minimi muscles [7]. The existence of an AADM muscle has been previously described and C.A. May recently proposed the use of term “long abductor digiti minimi” for this category of aberrant muscles [16]. However, we describe a unique case of an AADM that originates from the tendons of the flexor digitorum superficialis and insert to the head of the 5th metacarpal.

Embryology

The development of the hand muscles has been thoroughly studied by Cihák back in 1970's [17]. According to his study, there are six embryonic origins for these muscles. The surface layer differentiates first, resulting in the formation of three blastemas. The radial, middle, and ulnar blastemas are responsible for the development of the abductor pollicis brevis, flexor digitorum superficialis, and abductor digiti minimi muscles (in that order) [17]. Thus, the flexor digitorum superficialis originates in the carpal area, but its blastema migrates proximally [18], and the abductor digiti minimi and abductor pollicis brevis originate from where their blastema started [16].

Frequency

The existence of an AADM muscle is considered among the most common variations of the hypothenar muscles. Its frequency varies between 22 and 35%. [19].

Clinical Considerations

Generally, the existence of an AADM muscle has been implicated with ulnar nerve compression at the wrist [7, 16]. Dimitriou (2007) reported a case of intraoperative identification of an AADM that was covering Guyon's canal and creating apparent undue pressure on the ulnar nerve proximal to its bifurcation [20]. In that case the neurological symptoms were relieved by the resection of the AADM. Moreover, AADM's course via Guyon's canal may induce compression of the deep branch of the ulnar nerve and the ulnar vessels, which consists a major structural cause of Guyon's canal syndrome [5, 21]. Therefore, hand surgeons and orthopedic surgeons in general, should consider the potential existence of an AADM muscle when diagnosing Guyon's canal syndrome. Worth mentioning is that, when passing through the Guyon's canal or in cases like the one we described, the AADM may compress not only the ulnar nerve but also the ulnar artery. In addition, the presence of an AADM muscle may complicate other common surgical procedures in hand, for instance during a surgical decompression of the carpal tunnel [22].

CONCLUSIONS

It is described a case of an aberrant AADM muscle found during routine dissection in the right hand of a male cadaver. This muscle took its origin from the tendons of the flexor digitorum superficialis and inserted into the head of the 5th metacarpal. Orthopedic surgeons and especially hand surgeons should be aware of this anatomical variation that may cause Guyon's canal syndrome or complicate common wrist and hand surgical procedures, for instance the carpal tunnel release.

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Conflicts of interest: None declared

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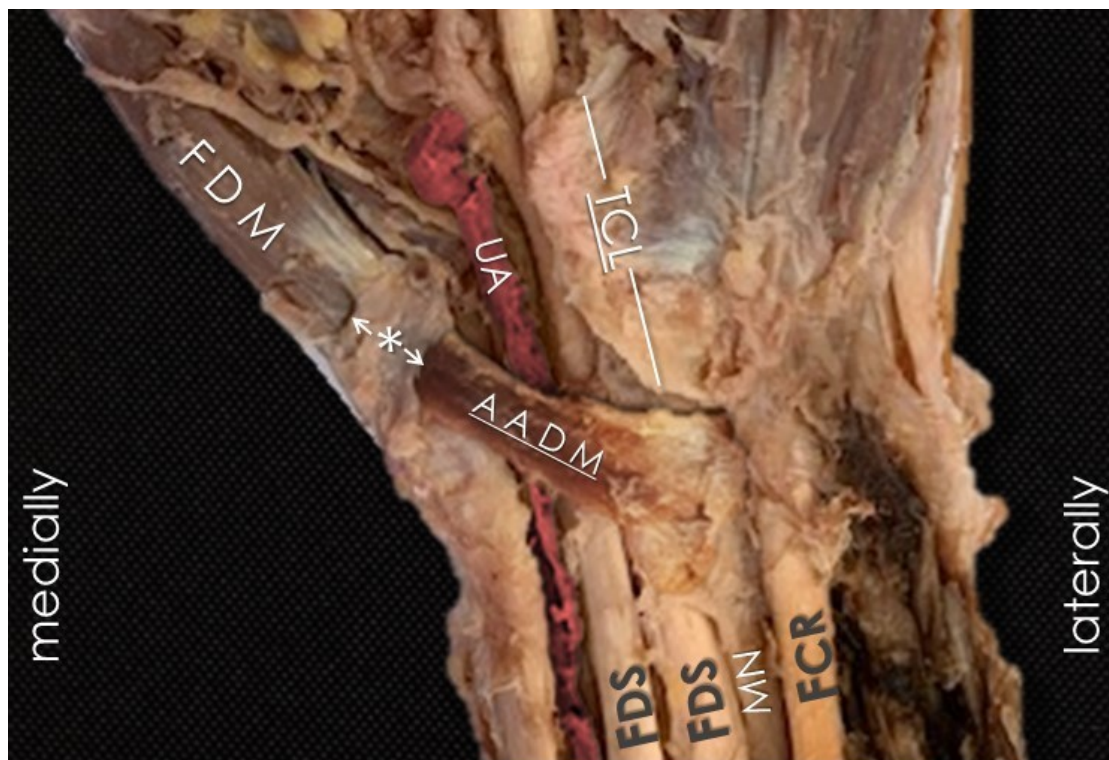


Figure 1: The accessory abductor digiti minimi manus (AADM) as first identified during the wrist dissection. It originates from the tendons of the flexor digitorum superficialis (FDS) and seems to stop under the pisohamate ligament (*). TCL: transverse carpal ligament, FDM: flexor digiti minimi, FCR: flexor carpi radialis, FCU: flexor carpi ulnaris.

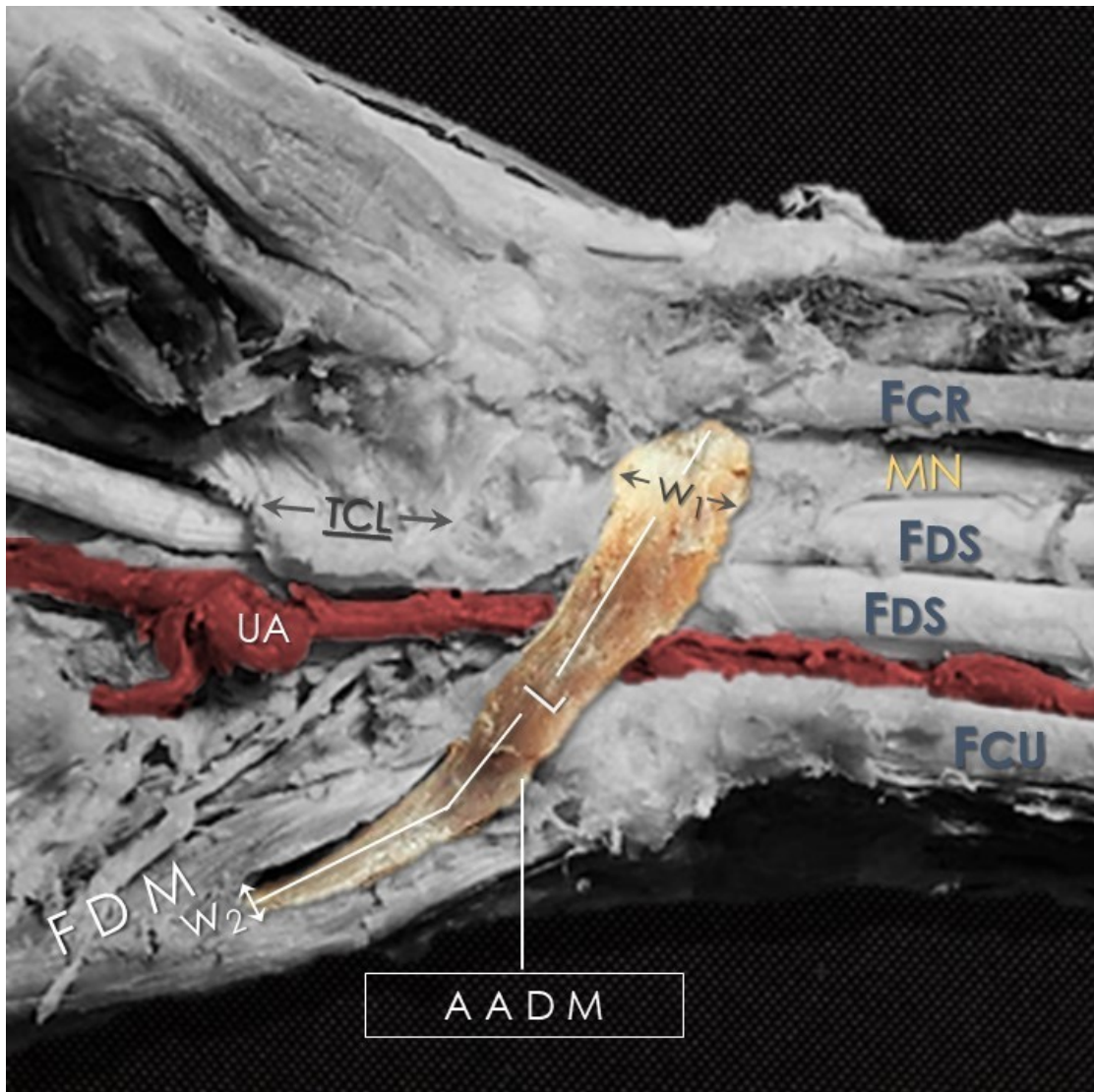


Figure 2: The full accessory abductor digiti minimi muscle (AADM) visualized by retraction of the flexor digiti minimi (FDM) muscle. UA: ulnar artery, FDS: flexor digitorum superficialis, FCR: flexor carpi radialis, FCU: flexor carpi ulnaris.

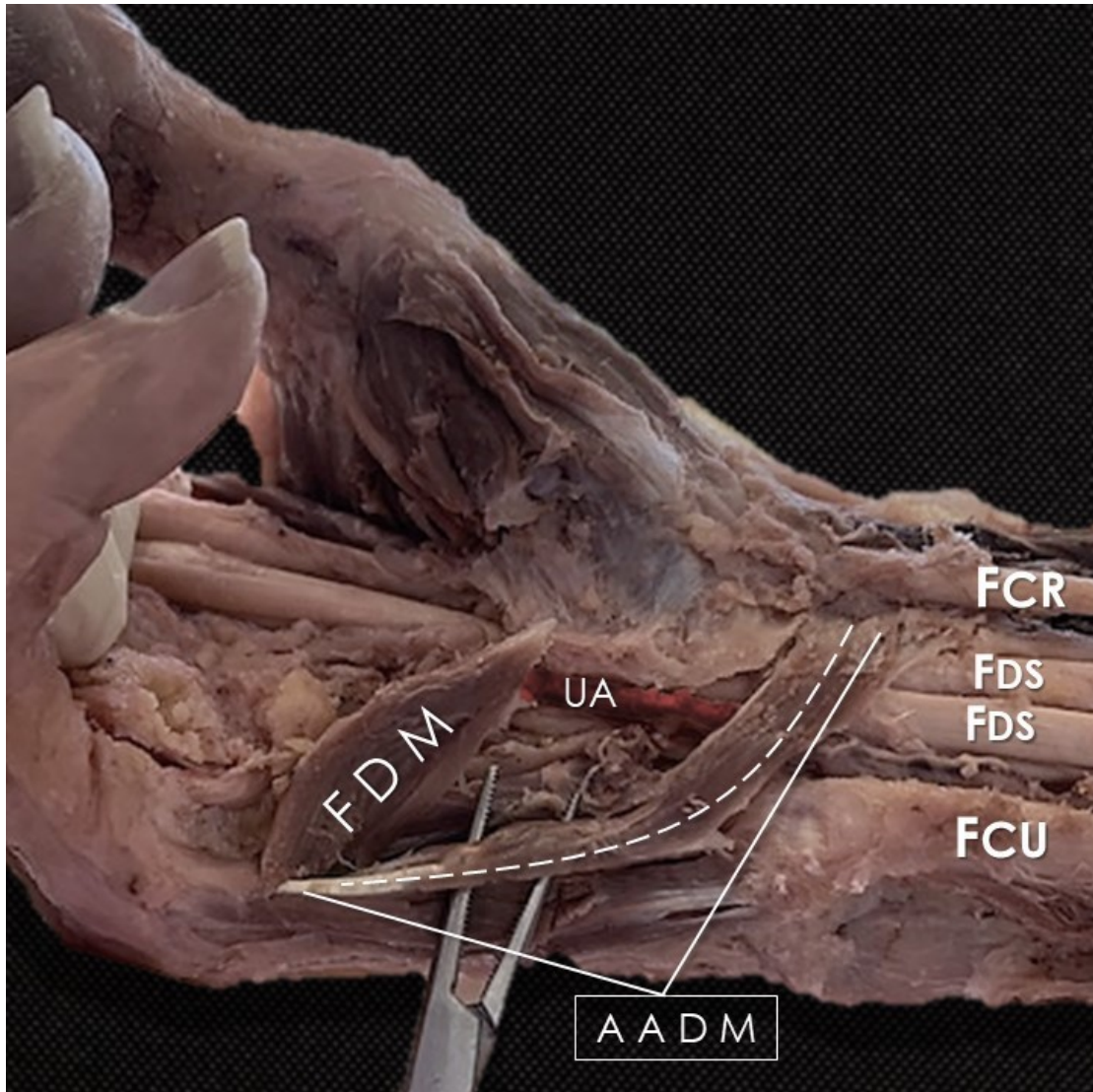


Figure 3: The length (L) of the accessory abductor digiti minimi (AADM) was 53.54 mm. The width of the muscle was 7.98 mm at its origin (w_1) and 2.14 mm at its insertion (w_2). Beneath the aberrant muscle passed the ulnar artery (UA – red) and the ulnar nerve. TCL: transverse carpal ligament, FDM: flexor digiti minimi, FCR: flexor carpi radialis, FCU: flexor carpi ulnaris, FDS: flexor digitorum superficialis, MN: median nerve.