

An Anatomic Variation of the Accessory Abductor Digiti Minimi Muscle

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Abstract : Accessory muscles passing through Guyon's canal are common; the most common anomalous muscle at Guyon's canal is the accessory abductor digiti minimi muscle (AADM). The aim of this study was to demonstrate and describe the gross anatomy of an anatomic variant of the AADM relative to the surrounding structures.

The AADM was found in the left forearm and hand of a 61-year-old male cadaver during dissection in a gross anatomy course. It was observed by focusing on the shape, the course, and its relationship with the surrounding structures.

The AADM originated as muscle fibers from the antebrachial fascia. It coursed downward in the distal forearm and crossed the ulnar nerve and artery obliquely at Guyon's canal. The AADM narrowed and became a long tendon in the hypothenar region. The abductor digiti minimi muscle was partly attached to the tendon of the AADM, running along the tendon. The tendon of the AADM inserted into the ulnar side of head of the fifth metacarpal bone. The AADM was innervated by several twigs from the ulnar nerve.

We reported herein another variant of the AADM at Guyon's canal, which may be helpful to surgeons performing diagnoses and surgical procedures.

Keywords : Accessory abductor digiti minimi muscle, Guyon's canal, Abductor digiti minimi muscle, Ulnar nerve

Introduction

Accessory muscles passing through Guyon's canal are common; the most common anomalous muscle at Guyon's canal is the accessory abductor digiti minimi muscle (AADM) (Dodds et al. 1990), which occurs in up to 35% of cases (Harvie et al. 2004). Anomalous muscles and tendons can compress the ulnar nerve within Guyon's canal (Bozkurt et al. 2005). And it may cause Guyon's canal syndrome which is manifest by hypoaesthesia in the medial one

and a half fingers and weakness of the intrinsic muscles of the hand (Moore and Dalley 2006). The symptoms resulting from the AADM compressing the ulnar nerve can be completely resolved by excision of the muscle (James et al. 1987, Netscher and Cohen 1997, Al-Qattan 2004, Spiess and Gursel 2006, Dimitriou and Natsis 2007).

The aim of this study was to demonstrate and describe the gross anatomy of an anatomic variant of the AADM relative to the surrounding structures, thereby providing data that would be beneficial for diagnoses and surgical procedures.

Case Report

The AADM was found in the left forearm and hand of a 61-year-old male cadaver during dissection in a gross anatomy course (Fig. 1). The AADM originated as muscle fibers

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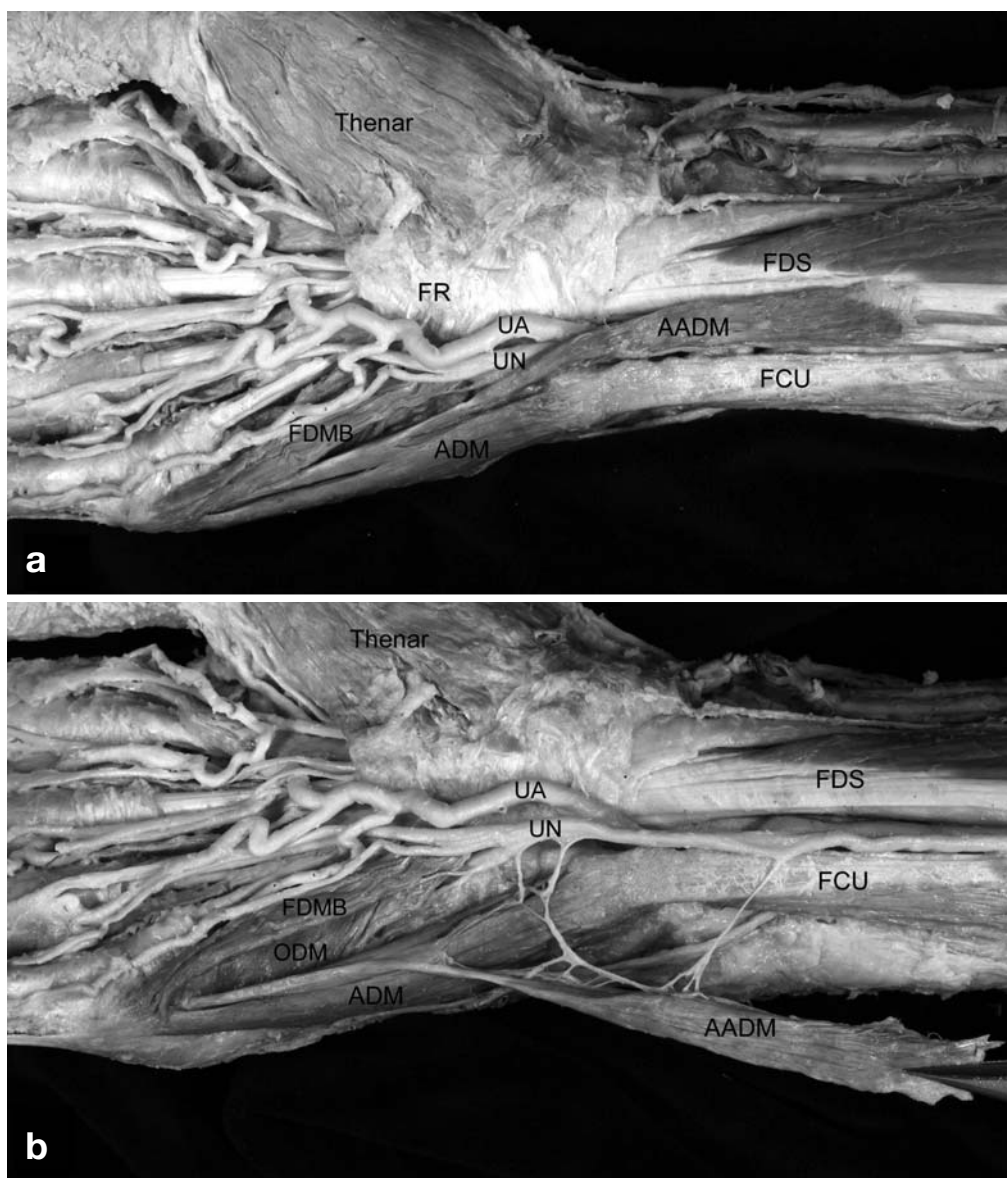


Fig. 1. Photographs showing a ventral view of the accessory abductor digiti minimi muscle (AADM). a: The AADM originated from the antebrachial fascia, and coursed downward in the distal forearm. The AADM crossed the ulnar nerve (UN) and the ulnar artery (UA) obliquely at Guyon's canal. b: The AADM became a long tendon in the hypothenar region, and inserted into the ulnar side of head of the fifth metacarpal bone. Some muscle fibers of the abductor digiti minimi muscle (ADM) were attached to the tendon, running along it. The deep surface of the AADM was innervated by several twigs from the UN. The AADM is reflected medially to show its innervations. The flexor digiti minimi brevis muscle (FDMB) was slightly elevated to reveal the tendinous insertion of the AADM. FCU, flexor carpi ulnaris muscle; FDMB, flexor digiti minimi brevis muscle; FDS, flexor digitorum superficialis muscle; ODM, opponence digiti minimi muscle; Thenar, thenar muscles.

from the antebrachial fascia covering the flexor digitorum superficialis muscle (FDS), where it was approximately 5.1 cm proximal to the pisiform. It coursed downward in the distal forearm and crossed the ulnar nerve and artery obliquely at Guyon's canal. It enclosed the ulnar nerve just before its division into superficial and deep branches. The

AADM narrowed and became a long tendon in the hypothenar region. The abductor digiti minimi muscle (ADM) fibers were divided into two parts before its insertions. The ADM was partly attached to the tendon of the AADM, running along the tendon. The tendon of the AADM inserted into the ulnar side of head of the fifth metacarpal bone, and

the other part of the ADM inserted into the ulnar border of the dorsal digital expansion of extensor digiti minimi. The AADM was 78.5 mm long from the origin site to the point where the ADM muscle fibers began to attach to the tendon; it was 10.1 mm wide at its origin, and 4.3 mm wide and 2.3 mm thick at Guyon's canal.

The AADM was innervated by several twigs from the ulnar nerve in the distal forearm and from the ulnar nerve just before its division into the superficial and deep branches at Guyon's canal. These nerve branches were interconnected, coursing along the deep surface of the AADM. The branches arising from the ulnar nerve at Guyon's canal innervated the adjacent sides of the ADM and the AADM. The ADM was not innervated by the deep branch of ulnar nerve.

Discussion

While the existence of an AADM is not usually symptomatic (Netscher and Cohen 1997), there have been several reports regarding surgical procedures involving the AADM to resolve symptoms of ulnar-nerve decompression (James et al. 1987, Luethke and Dellon 1992, Netscher and Cohen 1997, Al-Qattan 2004, Spiess and Gursel 2006, Dimitriou and Natsis 2007). The high incidence of the AADM at Guyon's canal makes it important to have a detailed understanding of its anatomy.

The AADM originates from various sites, but usually from the antebrachial fascia (Dodds et al. 1990, Luethke and Dellon 1992, Netscher and Cohen 1997, Al-Qattan 2004, Dimitriou and Natsis 2007). Less common AADM origins are the styloid process of the radius and the tendon of the flexor carpi radialis (Bakinde et al. 2005, Pasquini and Zaidenberg 2008). When the AADM has these unusual origins, it crosses the wrist obliquely from lateral to medial (Pasquini and Zaidenberg 2008).

There is some degree of consistency with regard to the insertions of the AADM, most commonly as the ulnar aspect of the base of the small finger proximal phalanx (Dodds et al. 1990, Curry and Kuz 2000, Bakinde et al. 2005, Dimitriou and Natsis 2007) or the ADM (Luethke and Dellon 1992, Netscher and Cohen 1997, Al-Qattan 2004, Pasquini and Zaidenberg 2008). In the case described herein, the insertion point of the AADM was the ulnar side of head of the fifth metacarpal bone, which is similar to

one of the previously described ADM insertions. In normal anatomy, the ADM ends in a flat tendon that divides into two slips: one of these is attached to the ulnar side of the base of the proximal phalanx of the little finger, and the other to the ulnar border of the dorsal digital expansion of extensor digiti minimi (Standing 2008). Thus, it seems that primordially, the ultimate destiny of the AADM may be to become a portion of the ADM, attaching it to the proximal phalanx of the little finger.

However, the reason why the AADM extended to the forearm can be attributed to the proximal abnormal migration of the primordia of ADM. Since the FDS has its origin in the carpal region and its primordium migrates proximally, the proximal migration of the primordia of ADM may be related to that of the FDS (Sañudo et al. 1993). This abnormal proximal migration may result in the formation of the AADM, which may explain why the AADM is usually found in the radial part of the ADM, where some of the ADM primordium was close to that of the FDS. In addition, the adjacent sides of the ADM and AADM were innervated by the same branches of the ulnar nerve in the hand, suggesting that these muscles have the same origin.

Depending on the anatomic relationships at Guyon's canal, ulnar nerve compression in the wrist and hand can cause sensory or motor deficit (Shea and McClain 1969). In our case, the AADM crossed the ulnar nerve just before its division into the superficial and deep branches at Guyon's canal. Thus, if the AADM compresses the nerve, both the superficial and deep ulnar branches may be involved, explaining both the sensory and motor deficits.

We reported herein another variant of the AADM at Guyon's canal, which may be helpful to surgeons performing diagnoses and surgical procedures.

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손의 새끼벌림근 덧근육의 해부학적 변이

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간추림 : Guyon's canal을 지나는 덧근육은 흔하게 발견되며, 그 중 가장 많이 관찰되는 근육은 새끼벌림근 덧근육이다. 이 연구의 목적은 새끼벌림근 덧근육의 해부학적 변이를 나타내고, 주위구조와의 관계를 기술하는데 있다.

새끼벌림근 덧근육은 61세 남자 시신의 왼쪽 팔에서 관찰되었다. 새끼벌림근 덧근육의 형태, 경로, 주위구조와의 관계에 초점을 맞추어 해부하였다.

새끼벌림근 덧근육은 아래팔근막에서 일어나 아래쪽으로 내려왔고, Guyon's canal에서 자신경을 비스듬히 덮으며 지나갔다. 새끼벌림근 덧근육은 새끼두덩부위에서 힘줄이 되었고, 새끼벌림근의 힘살 일부가 이 힘줄에 부착되었다. 이 힘줄은 다섯째 손허리뼈머리의 자측면에 닿았다. 새끼벌림근 덧근육에는 자신경줄기에서 나온 가지가 분포하였다.

이 결과는 새끼벌림근 덧근육에 대한 해부학적 자료를 제공함으로써, 이 근육의 진단과 수술에 도움이 될 것으로 기대된다.

찾아보기 낱말 : 새끼벌림근 덧근육, Guyon's canal, 새끼벌림근, 자신경