

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

Ioannis Antonopoulos¹, Georgios Tsikouris¹, Dimosthenis Chrysikos¹, Irene Asouhidou², George Paraskevas², Theodore Troupis¹

¹Department of Anatomy, School of Medicine, National and Kapodistrian University of Athens, Greece

²Department of Anatomy, Medical School, Aristotle University of Thessaloniki, Greece

[Received: 13 November 2022; Accepted: 29 December 2022; Early publication date: 16 February 2023]

The hypothenar muscle with the greatest frequency of variations is the abductor digiti minimi manus. Except for 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 orthopaedic surgeons and hand surgeons in particular. (Folia Morphol 2024; 83, 1: 221–225)

Keywords: 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 [10]. Many researchers have described abnormalities of the hypothenar muscles focusing mainly on their morphology and topography [1, 4, 6, 13, 17, 22]. 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 [6]. Contrarywise, the opponens digiti minimi muscle mostly lacks anatomical variations [6]. To the best of our knowledge, the first description of an accessory abductor digiti minimi manus (AADM) was done by Wood in 1868 [23].

This small aberrant muscle usually originates either from the tendon of palmaris longus muscle [2, 7, 20, 21] or the tendon of flexor carpi radialis [1]. In addition, AADM origins may extend to the flexor retinaculum [3]. As for its insertion, the most common point is the proximal phalanx of the 5th finger [12].

The aim of this article is to present a rare case of an AADM 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.

Address for correspondence: Prof. Theodore G. Troupis, Department of Anatomy, School of Medicine, Faculty of Health Sciences, National and Kapodistrian University of Athens, 75 Mikras Asias str., Goudi, 11527, Athens, Greece, tel: +30 2107462388, e-mail: ttroupis@med.uoa.gr

This article is available in open access under Creative Common Attribution-Non-Commercial-No Derivatives 4.0 International (CC BY-NC-ND 4.0) license, allowing to download articles and share them with others as long as they credit the authors and the publisher, but without permission to change them in any way or use them commercially.

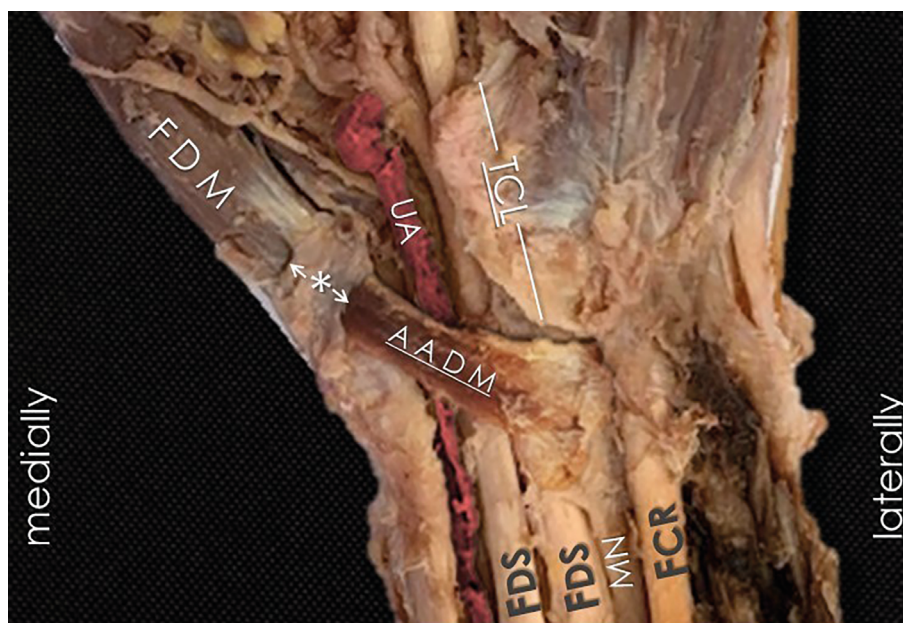


Figure 1. The accessory abductor digiti minimi manus (AADM) as first identified during the wrist dissection. It originates from the tendons of the flexor digitorum superficialis (FDS) and seems to stop under the pisohamate ligament (*); TCL — transverse carpal ligament; FDM — flexor digiti minimi; FCR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

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 [16]. The specimen was properly cleaned and photographed. A Würth™ digital Vernier calliper (0.01 mm, accuracy) was used for the measurements of the distances and nerves' diameters.

The case described refers to the existence of an AADM muscle 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 (Fig. 1) its tendon inserted with the tendon of AADM into the base of the 5th proximal phalanx beneath the flexor digiti minimi muscle (Fig. 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 (Fig. 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 [6]. The existence of an AADM muscle has been pre-

viously described and May [15] recently proposed the use of term “long abductor digiti minimi” for this category of aberrant muscles. 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 [5]. 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) [5]. Thus, the flexor digitorum superficialis originates in the carpal area, but its blastema migrates proximally [9], and the abductor digiti minimi and abductor pollicis brevis originate from where their blastema started [15].

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%. [18].

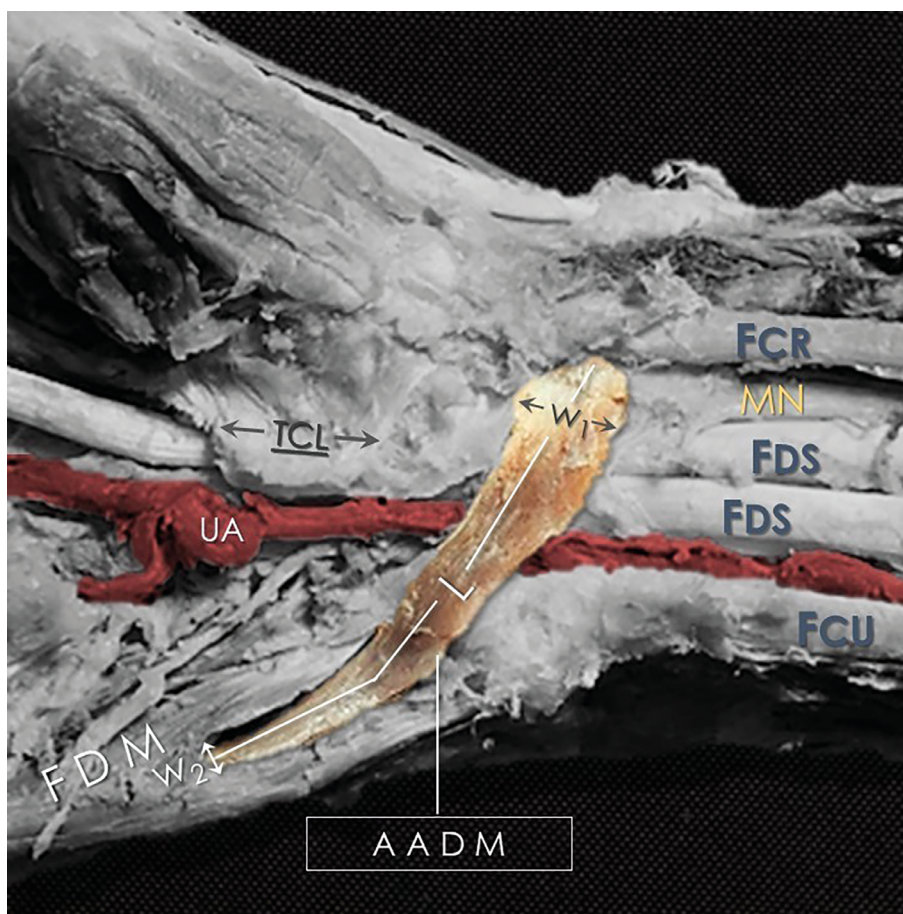


Figure 2. The length (L) of the accessory abductor digiti minimi (AADM) was 53.54 mm. The width of the muscle was 7.98 mm at its origin (w_1) and 2.14 mm at its insertion (w_2). Beneath the aberrant muscle passed the ulnar artery (UA — red) and the ulnar nerve; TCL — transverse carpal ligament; FDM — flexor digiti minimi; FCR — flexor carpi radialis; FCU — flexor carpi ulnaris; FDS — flexor digitorum superficialis; MN — median nerve.

Clinical considerations

Generally, the existence of an AADM muscle has been implicated with ulnar nerve compression at the wrist [6, 15]. Dimitriou and Natsis (2007) [8] 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. 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 [14, 17]. Therefore, hand surgeons and orthopaedic 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 [19].

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. Orthopaedic 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.

Acknowledgements

Our sincere thanks to Emeritus Prof. of Anatomy Alexandros Paraschos for his quite useful assistance.

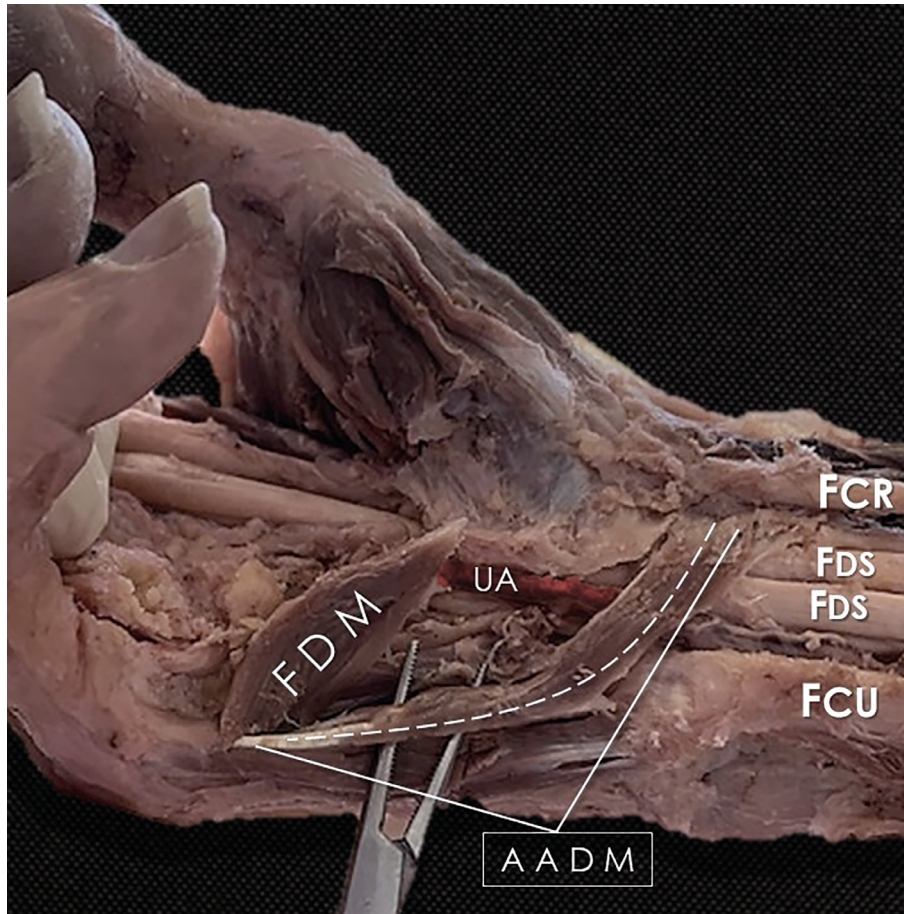


Figure 3. The full accessory abductor digiti minimi muscle (AADM) visualized by retraction of the flexor digiti minimi (FDM) muscle; UA — ulnar artery; FCR — flexor carpi radialis; FDS — flexor digitorum superficialis; FCU — flexor carpi ulnaris.

The authors also, sincerely thank those who donated their bodies to science so that anatomical research could be performed. Results from such research can potentially increase mankind's overall knowledge that can then improve patient care. Therefore, these donors and their families deserve our highest gratitude [11].

Conflict of interest: None declared

REFERENCES

1. Bakinde N, Yotovskii P, Voigt T, et al. Accessory muscle in the hypothenar region: a functional approach. *Ann Anat.* 2005; 187(2): 149–152, doi: [10.1016/j.aanat.2004.10.002](https://doi.org/10.1016/j.aanat.2004.10.002), indexed in Pubmed: [15900700](https://pubmed.ncbi.nlm.nih.gov/15900700/).
2. Ballesteros LE, Ramirez LM. Possible implications of an accessory abductor digiti minimi muscle: a case report. *J Brachial Plex Peripher Nerve Inj.* 2007; 2: 22, doi: [10.1186/1749-7221-2-22](https://doi.org/10.1186/1749-7221-2-22), indexed in Pubmed: [18053190](https://pubmed.ncbi.nlm.nih.gov/18053190/).
3. Bozkurt MC, Tagil SM, Ersoy M, et al. Muscle variations and abnormal branching and course of the ulnar nerve in the forearm and hand. *Clin Anat.* 2004; 17(1): 64–66, doi: [10.1002/ca.10094](https://doi.org/10.1002/ca.10094), indexed in Pubmed: [14695591](https://pubmed.ncbi.nlm.nih.gov/14695591/).
4. Bucher O. Über die Varietäten des M. abductor digiti quinti. *Anat Anz.* 1943; 943: 17–324.
5. Cihák R. Ontogenesis of the skeleton and intrinsic muscles of the human hand and foot. *Ergeb Anat Entwicklungsgesch.* 1972; 46(1): 5–194, doi: [10.1007/978-3-662-09081-7](https://doi.org/10.1007/978-3-662-09081-7), indexed in Pubmed: [5043313](https://pubmed.ncbi.nlm.nih.gov/5043313/).
6. Claassen H, Schmitt O, Schulze M, et al. Variation in the hypothenar muscles and its impact on ulnar tunnel syndrome. *Surg Radiol Anat.* 2013; 35(10): 893–899, doi: [10.1007/s00276-013-1113-5](https://doi.org/10.1007/s00276-013-1113-5), indexed in Pubmed: [23558800](https://pubmed.ncbi.nlm.nih.gov/23558800/).
7. Curry B, Kuz J. A new variation of abductor digiti minimi accessorius. *J Hand Surg Am.* 2000; 25(3): 585–587, doi: [10.1053/jhsu.2000.6004](https://doi.org/10.1053/jhsu.2000.6004), indexed in Pubmed: [10811767](https://pubmed.ncbi.nlm.nih.gov/10811767/).
8. Dimitriou C, Natsis K. Accessory abductor digiti minimi muscle causing ulnar nerve entrapment at the Guyon's canal: a case report. *Clin Anat.* 2007; 20(8): 974–975, doi: [10.1002/ca.20518](https://doi.org/10.1002/ca.20518), indexed in Pubmed: [17583589](https://pubmed.ncbi.nlm.nih.gov/17583589/).
9. Dylevsky I. Contribution to the ontogenesis of the flexor digitorum superficialis and the flexor digitorum profundus in man. *Folia Morphol.* 1967; 15(3): 330–335, indexed in Pubmed: [6056246](https://pubmed.ncbi.nlm.nih.gov/6056246/).
10. Gray H, Howden R, Pick T. *Gray's anatomy.* 15th ed. Barnes & Noble, New York 2010: 745–753.

11. Iwanaga J, Singh V, Ohtsuka A, et al. Acknowledging the use of human cadaveric tissues in research papers: Recommendations from anatomical journal editors. *Clin Anat*. 2021; 34(1): 2–4, doi: [10.1002/ca.23671](https://doi.org/10.1002/ca.23671), indexed in Pubmed: [32808702](https://pubmed.ncbi.nlm.nih.gov/32808702/).
12. Kanaya K, Wada T, Isogai S, et al. Variation in insertion of the abductor digiti minimi: an anatomic study. *J Hand Surg Am*. 2002; 27(2): 325–328, doi: [10.1053/jhsu.2002.31155](https://doi.org/10.1053/jhsu.2002.31155), indexed in Pubmed: [11901393](https://pubmed.ncbi.nlm.nih.gov/11901393/).
13. King TS, O’Rahilly R. M. palmaris accessories and duplication of M. palmaris longus. *Acta Anat (Basel)*. 1950; 10(3): 327–331, doi: [10.1159/000140477](https://doi.org/10.1159/000140477), indexed in Pubmed: [14777258](https://pubmed.ncbi.nlm.nih.gov/14777258/).
14. Lal RA, Raj S. Guyons canal syndrome due to accessory palmaris longus muscle: aetiological classification: a case report. *Cases J*. 2009; 2: 9146, doi: [10.1186/1757-1626-2-9146](https://doi.org/10.1186/1757-1626-2-9146), indexed in Pubmed: [20062663](https://pubmed.ncbi.nlm.nih.gov/20062663/).
15. May CA. Long abductor digiti minimi muscle: variation of the hypothenar muscles and clinical consequences. *Clin Anat*. 2020; 33(5): 643–645, doi: [10.1002/ca.23472](https://doi.org/10.1002/ca.23472), indexed in Pubmed: [31573103](https://pubmed.ncbi.nlm.nih.gov/31573103/).
16. McHanwell S, Brenner E, Chirculescu ARM, et al. The legal and ethical framework governing Body Donation in Europe: a review of current practice and recommendations for good practice. *Eur J Anat*. 2008; 12: 1–24.
17. Nam Y, Hwang S, Eo S, et al. An aberrant abductor digiti minimi muscle crossing Guyon’s canal. *J Wrist Surg*. 2017; 6(3): 235–237, doi: [10.1055/s-0036-1597682](https://doi.org/10.1055/s-0036-1597682), indexed in Pubmed: [28725506](https://pubmed.ncbi.nlm.nih.gov/28725506/).
18. Rixey A, Wenger D, Baffour F, et al. Accessory abductor digiti minimi muscle, less muscular than thought: an update on prevalence, morphology, and review of the literature. *Skeletal Radiol*. 2021; 50(8): 1687–1695, doi: [10.1007/s00256-021-03728-5](https://doi.org/10.1007/s00256-021-03728-5), indexed in Pubmed: [33533963](https://pubmed.ncbi.nlm.nih.gov/33533963/).
19. Slavchev S, Georgiev G. Aberrant abductor digiti minimi muscle found during open surgical decompression of the carpal tunnel: case report. *Rev Argen Anat Clin*. 2016; 5(2): 88–91, doi: [10.31051/1852.8023.v5.n2.14063](https://doi.org/10.31051/1852.8023.v5.n2.14063).
20. Soldado-Carrera F, Vilar-Coromina N, Rodríguez-Baeza A. An accessory belly of the abductor digiti minimi muscle: a case report and embryologic aspects. *Surg Radiol Anat*. 2000; 22(1): 51–54, doi: [10.1007/s00276-000-0051-1](https://doi.org/10.1007/s00276-000-0051-1), indexed in Pubmed: [10863748](https://pubmed.ncbi.nlm.nih.gov/10863748/).
21. Uzel AP, Bulla A, Joye ML, et al. Variation of the proximal insertion of the abductor digiti minimi muscle: correlation with Guyon’s canal syndrome? Case report and literature review. *Morphologie*. 2012; 96(313): 44–50, doi: [10.1016/j.morpho.2012.07.001](https://doi.org/10.1016/j.morpho.2012.07.001), indexed in Pubmed: [23021108](https://pubmed.ncbi.nlm.nih.gov/23021108/).
22. Wahba MY, Singh GD, Lozanoff S. An anomalous accessory flexor digiti minimi profundus muscle: a case study. *Clin Anat*. 1998; 11(1): 55–59, doi: [10.1002/\(SICI\)1098-2353\(1998\)11:1<55::AID-CA9>3.0.CO;2-R](https://doi.org/10.1002/(SICI)1098-2353(1998)11:1<55::AID-CA9>3.0.CO;2-R), indexed in Pubmed: [9445099](https://pubmed.ncbi.nlm.nih.gov/9445099/).
23. Wood J. XVII. Variations in human myology observed during the winter session of 1867–68 at King’s College, London. *Proceedings of the Royal Society of London*. 1868; 16: 483–525, doi: [10.1098/rspl.1867.0110](https://doi.org/10.1098/rspl.1867.0110).