

Notes on the Accessory Flexor Carpi Ulnaris Muscle: A Rare Supernumerary Variation

Lucas Alves Sarmiento Pires^{1,2} Graciele de Caro Reis Machado¹ Rodrigo Mota Pacheco Fernandes¹
Jorge Henrique Martins Manaia^{1,2} João Francisco Silva Champs³ Marcio Antonio Babinski^{1,2,4}

¹Department of Morphology, Biomedical Institute, Universidade Federal Fluminense, Niterói, RJ, Brazil

²Medical Sciences Postgraduation Program, Hospital Universitário Antonio Pedro, Universidade Federal Fluminense, Niterói, RJ, Brazil

³Orthopedics Service, Rede SARAH de Hospitais de Reabilitação, Brasília, DF, Brazil

⁴Traumatology and Orthopaedic Service, Hospital Salgado Filho, Rio de Janeiro, RJ, Brazil

Address for correspondence Lucas Pires, MsC, Departamento de Morfologia, Instituto de Biomedicina da Universidade Federal Fluminense (UFF) Rua Ernani Mello, 101, São Domingos CEP 24.210-150, Niterói, RJ, Brazil (e-mail: lucaspres@id.uff.br).

J Morphol Sci 2019;36:138–140.

Abstract

Variations of the forearm muscles are well described in the literature. In spite of that, reports regarding the accessory flexor carpi ulnaris muscle are scarce due to its rarity. This muscle usually originates from the medial epicondyle of the humerus with the flexor muscle mass and inserts itself into the palmar aponeurosis or the pisiform bone together with the flexor carpi ulnaris muscle. Supernumerary and anomalous muscles of the anterior compartment of the forearm have been associated with ulnar nerve and artery compression. Furthermore, they may also mimic neuromas and soft tissue tumors. The study of supernumerary muscles is necessary, as they may be an option to tendon grafts and muscle flaps. The aim of this paper is to describe the presence of the accessory flexor carpi ulnaris muscle on the left forearm of a cadaver fixated in a phenol solution and discuss its clinical and anthropological significance.

Keywords

- ▶ anatomic variations
- ▶ flexor carpi ulnaris muscle
- ▶ ulnar nerve
- ▶ ulnar artery
- ▶ anthropology

Introduction

The flexor carpi ulnaris muscle (FCUM) originates from two slips: one from the olecranon and another from the medial epicondyle of the humerus; these muscle bands fuse and forms a fleshy muscle with a strong tendon that inserts itself onto the pisiform bone.^{1,2}

The FCUM is innervated by the ulnar nerve (UN), which lies between these fasciculi before they fuse, and it is accompanied by the posterior ulnar recurrent artery. FCUM allows the hand to flex over the forearm and has a slight adductor function.^{1,3}

Although variations of the FCUM are rare, it is a clinically significant muscle, as it can cause compression of the UN, and it can be used as a muscle flap for soft tissue reconstruction.^{4–6}

Accessory muscles of the forearm can also mimic neuromas or soft tissue tumors, and can contribute to the onset of thrombosis and syndromes such as carpal tunnel. Knowledge of these variations are important to surgery, as most of them are discovered intraoperatively^{5,7}

The present work reports the presence of an accessory flexor carpi ulnaris muscle (aFCUM) in a male cadaver and discusses its clinical significance.

Case Report

A male cadaver fixated in a phenol solution was dissected for teaching purposes. The presence of a supernumerary muscle was observed, which was identified as an aFCUM in his left forearm. There were no other associated variations on any side.

received
September 3, 2018
accepted after revision
January 28, 2019

DOI <https://doi.org/10.1055/s-0039-1681108>.
ISSN 2177-0298.

Copyright © 2019 by Thieme Revinter Publicações Ltda, Rio de Janeiro, Brazil

License terms



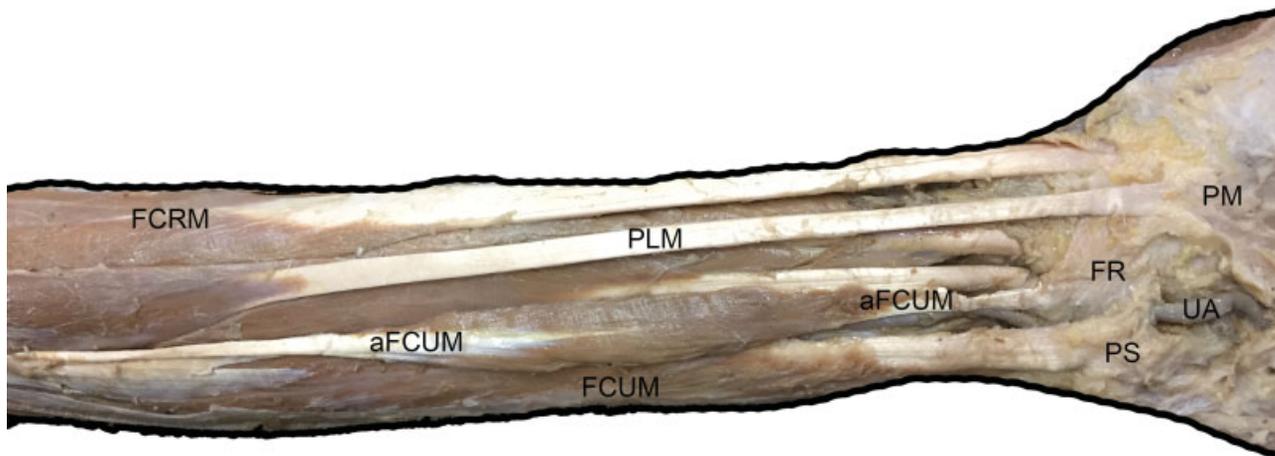


Fig. 1 Anterior view of the dissected forearm. Abbreviations: aFCUM, accessory flexor carpi ulnaris muscle; FCRM, flexor carpi radialis muscle; FCUM, flexor carpi ulnaris muscle; FR, flexor retinaculum; PLM, palmaris longus muscle; PM, palmar aponeurosis; PS, pisiform bone; UA, ulnar artery.

The aFCUM was located medial to the FCUM and lateral to the palmaris longus muscle. Its proximal tendon originated from the medial intermuscular septum together with adjacent muscles, and its distal tendon inserted itself into the flexor retinaculum (► **Fig. 1**). This accessory muscle had a fusiform shape and measured 19.8 cm in length.

The ulnar artery and nerve were covered by this accessory muscle during their entire trajectory of the forearm. The floor of the Guyon canal was reinforced by the distal tendon of this muscle (► **Fig. 1**). It was innervated by branches of the UN.

Discussion

Development of the muscles starts with segmentation of the paraxial mesoderm into somites. Each somite has two portions: the sclerotome (which gives origin to bones and cartilages of the thorax and vertebral column) and the dermomyotome (which will form the muscles)^{5,8,9}

The myotomes give origin to myoblasts, which go through extensive migration in order to originate the limb muscles. This process starts during the fifth week of development. Then, all myoblasts condense and fuse to form 2 distinct muscle masses on the forearm: the ventral and the dorsal. The ventral mass forms the flexors and pronators, while the dorsal mass forms the extensor and supinator muscles of the forearm.^{5,8,9}

Through apoptotic mechanisms and growth factors, each muscle begins to take its shape and current appearance. The presence of supernumerary muscles is usually caused by an increase of cell stimuli, which causes proliferation of muscle tissue and the lack of apoptotic stimuli to cease its growth.^{5,8,9}

The FCUM is a fairly consistent muscle that rarely varies (0.02% of all flexor compartment variations). Aberrant origin or insertion, additional slips, partial muscle belly, split tendon, fusion with palmaris longus muscle and the presence of an aFCUM are among reported variations of the

FCUM.^{1,4,10-12} According to Le Double (1897), the aFCUM was first described by Jarjavay in 1857.¹¹

Variations regarding the insertion onto the metacarpals and their joints can be interpreted as regressive dispositions of mammals such as koalas, hyenas and sloths.¹¹

Moreover, the ulnar slip of the FCUM is absent in pigs and is in a fibrous state in tapir (*Tapiridae tapirus*). The proximal portion of the FCU is blended with the palmaris longus muscle in rats.^{11,13} Its tendon is bifurcated in dogs.¹⁴ Those patterns represent the fact that numerous variations of the FCUM in humans possess similarities with other those of mammals and animals from other species.

Clinically, the presence of supernumerary or abnormally large muscles on the forearm may be the cause of neurovascular bundle compression.^{3-5,7,12,15,16} The length, girth, width and the relations of the aFCUM reported herein could predispose an individual to develop compressive neuropathies of the UN not only on the Guyon's canal, but in the whole forearm instead. In addition, the distal insertion on the flexor retinaculum by the aFCUM could compromise the median nerve as well. Furthermore, The aFCUM may simulate a ganglion or a soft tissue tumor.²

The ulnar artery could also be a target to compression, as the presence of more muscle mass in the fascial compartment would cause more pressure on this vessel, thus, provoking a decreased local blood flow either during forearm flexion or even in stationary position.¹⁵

The clinical diagnosis of an accessory muscle belly should be kept in mind when there is a soft and palpable mass at the wrist associated with flexion deformities, albeit not a constant symptom.¹⁶

Diagnosis often requires imaging techniques, such as CT-scan and MRI. Despite that, most of the muscle anomalies of the forearm are found during surgery or cadaveric dissection. Hence the importance of reporting anatomical variations to provide knowledge and further expand the surgeon's awareness.^{2,3}

Furthermore, the FCUM has been used as local and free muscular flap in soft-tissue reconstruction surgery, as well as

in tendon transfer procedures.⁵ As the tip of the olecranon has a thin and movable skin, postoperative complications of total elbow arthroplasty are not uncommon. In light of this, FCUM flap has been performed recently due to its regular vascular supply and easy flap obtainment from this muscle.⁶ Thus, an aFCUM would also be a good candidate for this procedure, despite its rarity in the general population.

In conclusion, the aFCUM is a clinical and surgical significant variation that should be further studied despite its rare incidence. Nerve compression caused by supernumerary muscles is well described in the literature, specifically in the forearm-hand complex, as the muscles are more prone to vary and the nerves are more exposed due to their relations with the adjacent structures. Supernumerary muscles of the forearm may also confuse diagnosis of soft tissue tumors and neuromas.

Conflicts of Interest

The authors have no conflicts of interest to declare.

Acknowledgments

We wish to thank the body donor and his family for his contribution to the present study.

References

- 1 Testut L, Latarjet A. *Tratado de Anatomía Humana*. 8 ed ed. Barcelona: Salvat; 1958
- 2 Ciftçioğlu E, Kopuz C, Çorumlu U, Demir MT. Accessory muscle in the forearm: a clinical and embryological approach. *Anat Cell Biol* 2011;44(02):160–163
- 3 Campos D, Nazer MB, Bartholdy LM, Souza PL. Accessory flexor carpi ulnaris muscle: a case report of a rare variation in human. *Journal of Morphological Sciences*. 2010;27(01):30–31
- 4 Niumsawatt V, Soliman BA, Rozen WM. The aberrant flexor carpi ulnaris and its clinical implications. *J Plast Reconstr Aesthet Surg* 2013;66(06):e172–e174
- 5 Sakthivel S, Verma S. Accessory Flexor Carpi Ulnaris and Bilaterally Variant Vascular Anatomy of Upper Limb: An Unusual Presentation. *Int J Appl Basic Med Res* 2017;7(02):143–145
- 6 Okamoto S, Tada K, Ai H, Tsuchiya H. Flexor carpi ulnaris muscle flap for soft tissue reconstruction after total elbow arthroplasty. *Case Rep Surg* 2014;2014:798506
- 7 Pires L, Perissé JP, Araújo GCS, Manaia J, Fonseca Júnior A, Babinski MA. Hypertrophic reversed palmaris longus muscle: a cadaveric finding. *Folia Morphol (Warsz)* 2018;77(02):403–405
- 8 Buckingham M, Bajard L, Chang T, et al. The formation of skeletal muscle: from somite to limb. *J Anat* 2003;202(01):59–68
- 9 Schoenwolf G, Bleyl S, Brauer P, Francis-West P. *Larsen's Human Embryology*. 5th ed. Philadelphia: Churchill Livingstone; 2014:576
- 10 Tubbs RS, Shoja MM, Loukas M, Eds. *Bergman's Comprehensive Encyclopedia of Human Anatomic Variation*. Philadelphia: Wiley-Blackwell; 2016
- 11 Le Double A-F. *Traité des variations du système musculaire de l'homme et de leur signification au point de vue de l'anthropologie zoologique*. Paris: Schleischer Frères; 1897
- 12 Ang GG, Rozen WM, Vally F, Eizenberg N, Grinsell D. Anomalies of the flexor carpi ulnaris: clinical case report and cadaveric study. *Clin Anat* 2010;23(04):427–430
- 13 Diogo R, Abdala V, Aziz MA, Lonergan N, Wood BA. From fish to modern humans—comparative anatomy, homologies and evolution of the pectoral and forelimb musculature. *J Anat* 2009;214(05):694–716
- 14 Kuan SY, Smith BA, Fearnside SM, Black AP, Allan GS. Flexor carpi ulnaris tendonopathy in a Weimaraner. *Aust Vet J* 2007;85(10):401–404
- 15 Fröber R, Linss W. Anatomic bases of the forearm compartment syndrome. *Surg Radiol Anat* 1994;16(04):341–347
- 16 Iliev A, Georgiev GP, Landzhov B. A rare case of bilateral flexor carpi ulnaris variation: anatomical and clinical considerations and literature review. *Revista Argentina de Anatomía Clínica*. 2016;8(02):98–103