



A Rare Variation of Palmaris Longus Muscle and Flexor Carpi Ulnaris Muscle with Clinical Significance: Case Report

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ABSTRACT

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Not so many variations of the muscles belonging to the flexor muscle group of the forearm are described in comparison to the tendons of extensor muscle group of the forearm. During routine dissection in the section hall of the Department of Anatomy, Histology and Embryology in Medical University of Sofia we came across a very interesting variation of palmaris longus muscle and the tendons of flexor carpi ulnaris muscle. We observed the division of the tendon of palmaris longus into two wide and flat tendon bellies called lateral and medial. These bellies formed a Y-shaped figure. The lateral tendon belly passed over the upper part of the flexor retinaculum and inserted into the palmar aponeurosis. The medial tendon however ran deeper than the lateral one and the beginning of the palmar aponeurosis and finally reached the flexor retinaculum where it was inserted. We also came across the presence of additional tendon belly belonging to the flexor carpi ulnaris muscle. That additional belly arose from the pisiform like the pisohamate and pisometacarpal ligaments, then ran deeper than usual and finally joined the fourth metacarpal bone.

KEYWORDS: Palmaris longus muscle, flexor carpi ulnaris muscle, variations, hand surgery.

INTRODUCTION

Palmaris longus muscle and flexor carpi ulnaris muscle belong to the superficial group of the anterior antebrachial muscles, the so called flexor-pronator group. The palmaris longus arises from the medial epicondyle of the humerus by the common flexor tendon and from intermuscular septa between it and the adjacent muscles. It ends in a slender, flattened tendon, which passes superficial to the flexor retinaculum and inserts onto the central part of the flexor retinaculum and centrally to the palmar aponeurosis. Frequently, it sends a tendon belly to the short muscles of the thumb. The palmaris longus muscle is innervated by a branch of the median nerve. Its function is to flex the hand at the wrist [1].

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The flexor carpi ulnaris has two heads: humeral and ulnar. The humeral head arises from the medial epicondyle of the humerus by the common flexor tendon. The ulnar head originates from the medial margin of the olecranon of the ulna and the upper two-thirds of the dorsal border of the ulna by an aponeurosis. It also takes origin from the intermuscular septum between it and the flexor digitorum superficialis. Usually the flexor carpi ulnaris goes into the pisiform, hooks to the hamate (by the pisohamate ligament) and the anterior surface of the base of the fifth metacarpal (by the pisometacarpal ligament). It also attaches by a few fibers to the flexor retinaculum. The flexor carpi ulnaris is supplied by a branch of the ulnar nerve. The main function of the flexor carpi ulnaris is to flex and adduct in the wrist joint [1].

On one hand many variations concerning the palmaris longus muscle are described in the literature, but on the other the variations concerning the flexor carpi ulnaris muscle described in the literature are very few.

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MATERIALS AND METHODS

The material for the present study was taken from formol-carbol fixed human cadavers. The fixation of cadavers used for dissection in the section hall for students and graduates of each medical university in the European Union is very specific and it is regulated by the principal politics of the state law. During routine dissection in April 2018 in the section hall, we came across a very interesting variation of the palmaris longus muscle and the tendons of the flexor carpi ulnaris muscle. Upper limb from a human cadaver was used as material for the present study.

The presented unusual anatomical variations of the tendons of the palmaris longus muscle and the tendons of the flexor carpi ulnaris muscle were photographed using a Nikon

COOLPIX 95 3.34 MP digital camera. We took some pictures to describe the present observation.

RESULTS

We came across the division of the tendon of palmaris longus into two wide and flat tendon bellies that form a Y-shaped figure. The lateral tendon belly passed over the upper part of the flexor retinaculum and inserted into the palmar aponeurosis. The medial tendon belly distally approached the lateral one and between the divisions an approximately triangular shape was formed. The medial tendon however ran deeper than the lateral one and the beginning of the palmar aponeurosis and finally reached the flexor retinaculum where it was inserted (Figure 1.).



Figure 1. The tendon of palmaris longus was divided into two wide and flat tendon bellies that form a Y-shaped figure. The lateral tendon belly (**marked with horizontal arrow**) passed over the upper part of the flexor retinaculum and inserted into the palmar aponeurosis. The medial tendon belly (**marked with vertical up arrow**) distally approached the lateral one. A triangular shape was formed between the divisions. It was seen that medial tendon ran deeper than the lateral one and the beginning of the palmar aponeurosis and finally reached the flexor retinaculum where it was inserted (**marked with 4-point star**).

We also came across the presence of additional tendon belly belonging to the flexor carpi ulnaris muscle. This additional belly arose from the pisiform like the pisohamate and pisometacarpal ligaments, then ran deeper than usual and finally joined the fourth metacarpal bone (Figure 2.).



Figure 2. There was an additional tendon belly (marked with horizontal arrow) arose from the pisiform. This tendon belly ran deeper than usual and joined the fourth metacarpal bone.

The superficial branch of the ulnar nerve ran medially and superficially to the additional tendon belly, before division of the branches to the fourth and fifth finger (Figure 3.).



Figure 3. The superficial branch of the ulnar nerve ran medially and superficially to the additional tendon belly, before division of the branches to the fourth and fifth finger (marked with vertical down arrow).

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In our case there were two wide and flat tendon bellies of palmaris longus, lateral and medial that form a Y-shaped figure. The deeper location of the medial belly that inserted to the flexor retinaculum was important, because this belly could have caused symptomatic ulnar nerve compression before the entry of the ulnar nerve into the canal of Guyon.

DISCUSSION

There are described many variations concerning palmaris longus muscle of the flexor-pronator muscle group of the forearm. It is known from the literature that in approximately 14 % of the population palmaris longus is absent [2]. The reported prevalence of absent palmaris longus muscle ranges from 2% to 23.1%, and Caucasian population studies consistently demonstrate higher percentages than found in Asian and African-American populations [3]. The absence of palmaris longus muscle is more prevalent in females than males [4]. The other variations concern its form and belly. Variation with presence of the reverse belly of the palmaris longus localized within the carpal tunnel and producing symptoms of carpal tunnel syndrome is described [5]. The other described variations of the palmaris longus include the so called duplicated or bitendinous palmaris longus muscle [6]. This duplicated palmaris longus may cause ulnar nerve compression at the wrist [7]. It is interesting to mention the presence of anomalous accessory palmaris longus muscle with reversed belly [8] which may cause symptomatic median nerve compression [5, 9]. Other variations include the presence of palmaris profundus muscle. It is important to emphasize that the presence of anomalous palmaris profundus tendon usually cause carpal tunnel syndrome [10]. Although rarely, there is bilateral palmaris profundus and it is a reason for the failed carpal tunnel release in hand surgery [11]. It may exist in addition to the normal palmaris longus muscle [12] or alone instead of the normal palmaris longus muscle [13].

On the other hand variations concerning flexor carpi ulnaris are fewer in comparison to the variations of palmaris longus muscle. There are few variations described in the literature. In 2010 a rare variety with accessory flexor carpi ulnaris muscle is mentioned [14]. Similar variations with associated anterior interosseous artery variation also occur in the literature [15]. Additional slips or heads of muscles also are described with anomalous ulnar nerve and ulnar artery in the distal forearm [16]. There is a rare variety in which accessory flexor carpi ulnaris inserts to flexor retinaculum and hook of hamate bone [17].

In the literature, there was palmaris longus muscle variation plus flexor carpi ulnaris variation, which were previously described. In this variation flexor carpi ulnaris had additional tendon belly that joined to the ring finger at the

level of the ulnar nerve. This belly caused symptomatic ulnar nerve compression into the canal of Guyon [18].

In our case the additional belly arose from the pisiform like the pisohamate and pisometacarpal ligaments, but ran deeper than usual and joined to the fourth metacarpal bone. Its deeper and medial location is important because we may conclude that this additional belly will always cause ulnar nerve compression into the canal of Guyon, which will require surgical intervention.

It is important to emphasize that in our case we have extremely rare combination of two variations – two tendon bellies of the palmaris longus lateral and medial forming a Y-shaped figure and an additional tendon belly of the flexor carpi ulnaris joined the ring finger. The deeper location of the medial belly of palmaris longus muscle that inserted to the flexor retinaculum may cause symptomatic ulnar nerve compression before the entry of the ulnar nerve into the canal of Guyon. As well as the additional tendon belly of the flexor carpi ulnaris, which ran deeper than usual and finally joined the fourth metacarpal bone may also cause ulnar nerve compression into the canal of Guyon.

When the surgical release in such variations is performed of the ulnar nerve inside of the canal of Guyon or the median nerve in the carpal tunnel surgeons must adhere to the principles of hand surgery which are described wonderfully in the literature [19].

CONCLUSION

It is of such importance because the surgical release of the ulnar nerve inside of the canal of Guyon even performed exactly according to the principles of hand surgery won't be enough in our case. The reason for this would be the double compression of the ulnar nerve before it's entry into the canal of Guyon caused by the additional deeper medial tendon belly of the palmaris longus muscle and the additional tendon belly of the flexor carpi ulnaris. So we can conclude that even when we apply the principles of hand surgery exactly, the result may not be good. This is why knowing and accepting the presence of multiple variations of the muscles, vessels and nerves especially of the upper extremity is so important not only in hand surgery but in orthopedic surgery in general.

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Statement of Ethics

The fixation of cadavers used for dissection in the section hall for students and graduates of each medical

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university in the European Union is very specific and it is regulated by the principal politics of the state law.

The observations were made in accordance to the ethical principles applied by the European Union. All legislative requirements protecting the human rights have been respected as well.

‘Conflict of Interest Statement’:

The authors do not have any conflicts of interest to declare.

Data Availability Statement

All data of images generated during this case report are included in this article. Any further enquires can be directed to the corresponding author.

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