

# Accessory Head(s) of the Palmaris Longus Muscle in an 86 Year-Old White Female Cadaver and an 81 Year-Old White Male Cadaver

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## ABSTRACT

It is known that the palmaris longus muscle is one of the most variable muscles in the human body. The palmaris longus muscle has a high morphological diversity and variations are frequently reported in the literature. Recognizing anatomical variation in the palmaris longus muscle and tendon is important for clinical associations such as neurovascular entrapment and compression, as well as tendon graft and transfer for reconstruction. While neglecting to identify palmaris longus variations rarely leads to an increase in mortality, it is essential to identify for clinical relevance. During anatomical dissection of fifty cadavers in the 2020 undergraduate first-year anatomy course at the Uniformed Services University of Health Sciences (USUHS), we found two separate cases of accessory heads of the palmaris longus muscle. The first case involved a preserved 86-year-old White Female who had one unilateral accessory head of the left palmaris longus muscle. The second case involved a preserved 81-year-old White Male who had a unilateral pair of accessory heads of the right palmaris longus muscle.

**Keywords:** Palmaris longus muscle anatomical variations; Forearm flexor muscle anatomical variations; Palmaris longus muscle; Anatomical muscle variations; Anatomical variations; Palmaris longus muscle; Human anatomical variations

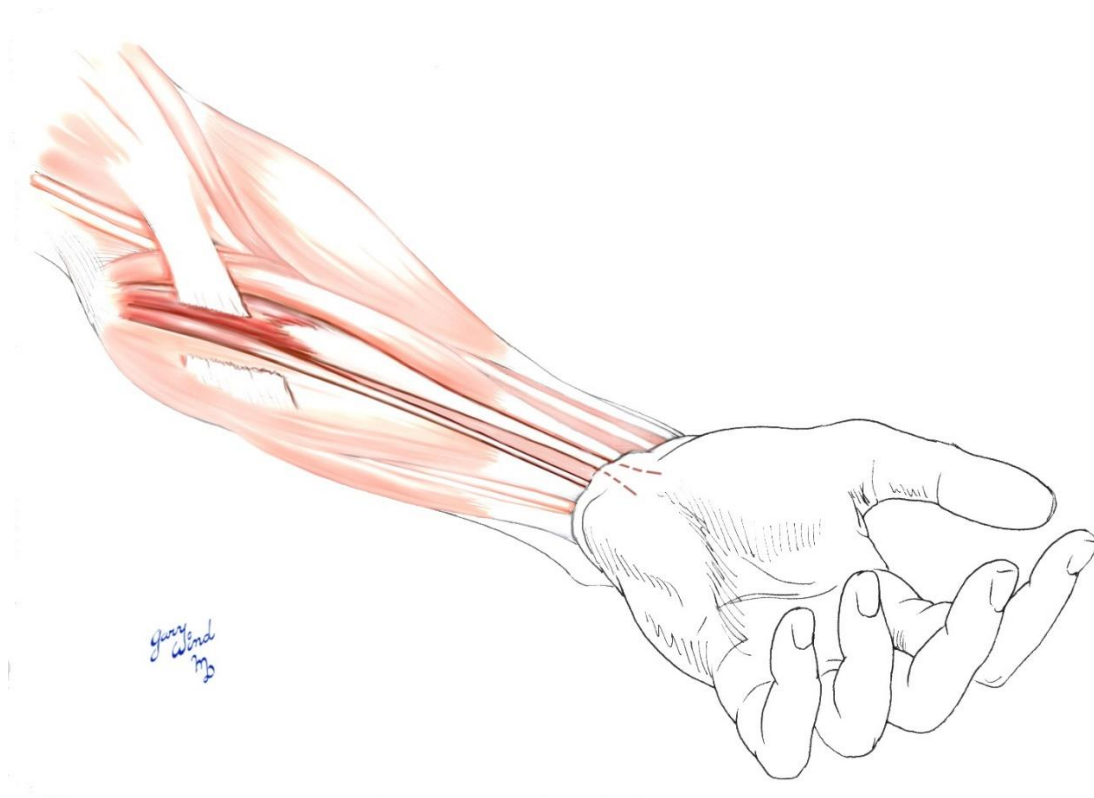
## INTRODUCTION

The palmaris longus muscle is the most superficial muscle of the superficial volar compartment muscles of the forearm, interposed between the flexor carpi ulnaris muscle and the flexor carpi radialis muscles. It shares its origin at the medial epicondyle with the flexor digitorum superficialis muscle, the flexor carpi radialis muscle, and the flexor carpi ulnaris muscle. The palmaris longus muscle tendon is most commonly in continuum with the palmar aponeurosis.

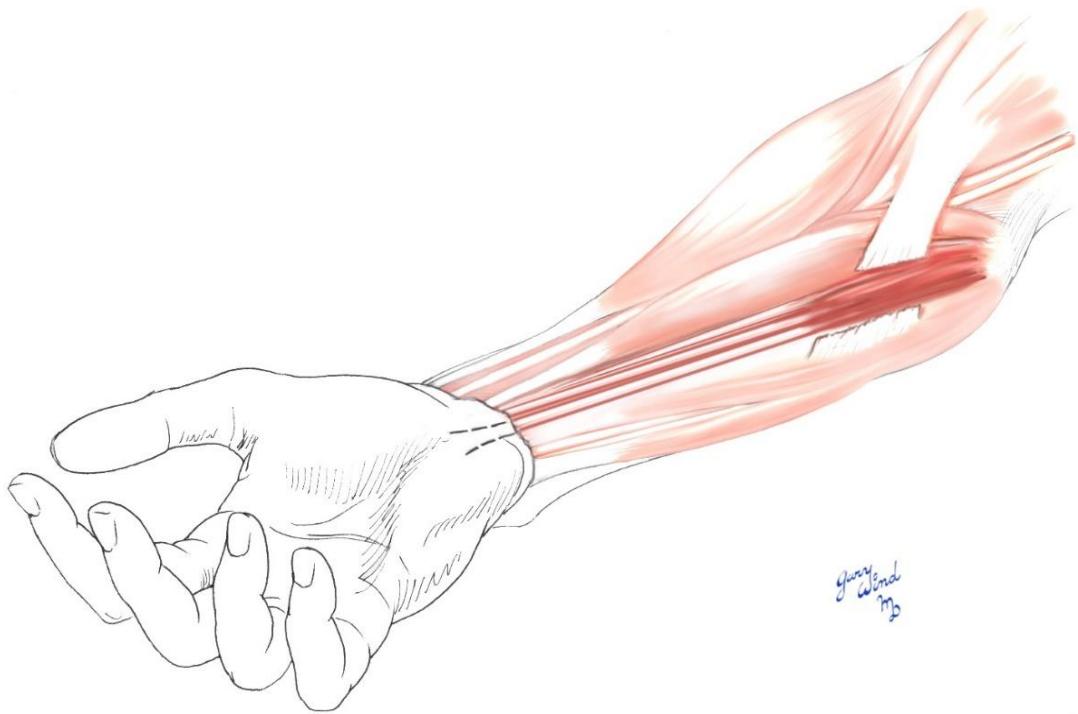
The palmaris longus muscle has a high morphological diversity and variations are frequently reported in the literature [1-5]. Variations in the palmaris longus muscle belly and tendon are not uncommon and include absence of the muscle and tendon, duplicate muscle belly, fusion with another muscle, bifurcated or trifurcated tendon, tendinous, digastric, or inverted reversed muscle. The palmaris longus muscle and tendon may also vary by the tendon course and insertion [6]. There are also reports of an anomalous palmaris longus muscle with three heads or as three distinct muscles [7].

The palmaris longus muscle is used as a landmark during volar approaches to the wrist and forearm. The tendon is commonly used for reconstructive surgeries since it is easily accessible, has an adequate length and diameter, and removing the muscle and tendon does not compromise function at the wrist. Recognizing anatomical variation in the palmaris longus muscle and tendon is important for clinical associations such as neurovascular entrapment and compression, as well as tendon graft and transfer for reconstruction. While neglecting to identify palmaris longus variations rarely leads to an increase in mortality, it is essential to identify for clinical relevance.

During anatomical dissection of fifty cadavers in the 2020 undergraduate first-year anatomy course at the Uniformed Services University of Health Sciences (USUHS), we found two separate cases of accessory heads of the palmaris longus muscle. The first case involved a preserved 86-year-old White Female who had one unilateral accessory head of the left palmaris longus muscle (**Figure 1a**). The second case involved a preserved 81-year-old White Male who had a unilateral pair of accessory heads of the right palmaris longus muscle (**Figure 1b**).



**Figure 1a:** Illustrative schematic of the unilateral accessory head of the left palmaris longus muscle found with Case 1.



**Figure 1b:** Illustrative schematic of the unilateral pair of accessory heads of the right palmaris longus muscle found with Case 2.

### CASE DESCRIPTION 1

A unilateral accessory head of the left palmaris longus muscle was found with an 86-year-old White Female cadaver (listed cause of death of coronary artery disease) (**Figure 1a**). The origin and insertion of the palmaris longus muscle were normal. The accessory head ran in tandem with the palmaris longus muscle and attached to the antebrachial fascia of the wrist, while the palmaris longus muscle continued on to the palmar aponeurosis (**Figure 2**). The accessory head muscle belly length was approximately 9 cm in length (**Figure 3**). The accessory head muscle tendon length was approximately 9 cm in length (**Figure 2**). The palmaris longus muscle belly was approximately 8 cm in length and the palmaris longus muscle tendon was approximately 10 cm in length (**Figures 2 and 3**).



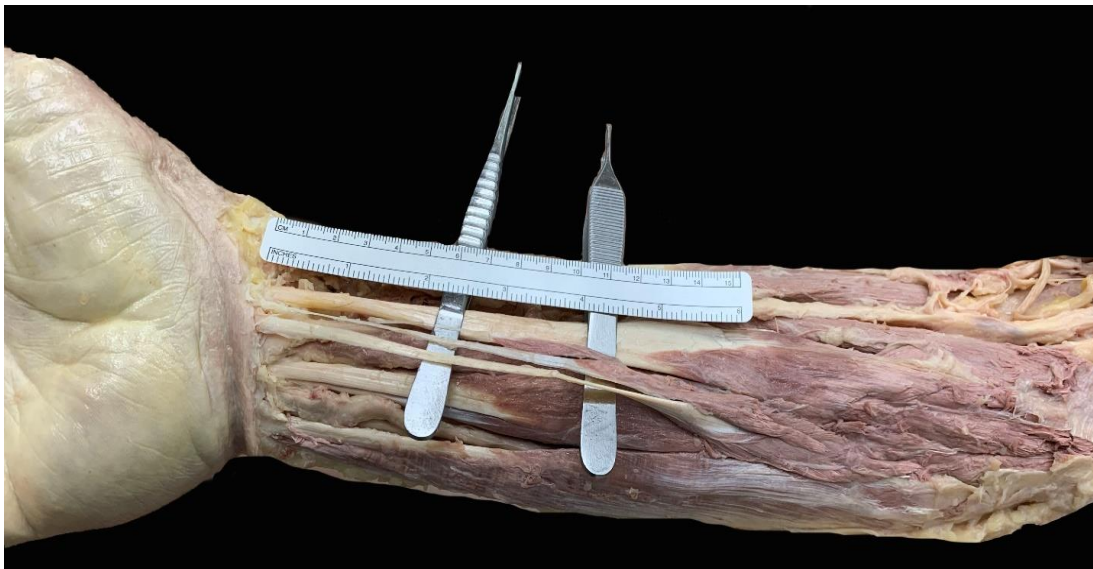
**Figure 2:** Facilitated display using two forceps to highlight the unilateral accessory head and the left palmaris longus muscle in Case 1.



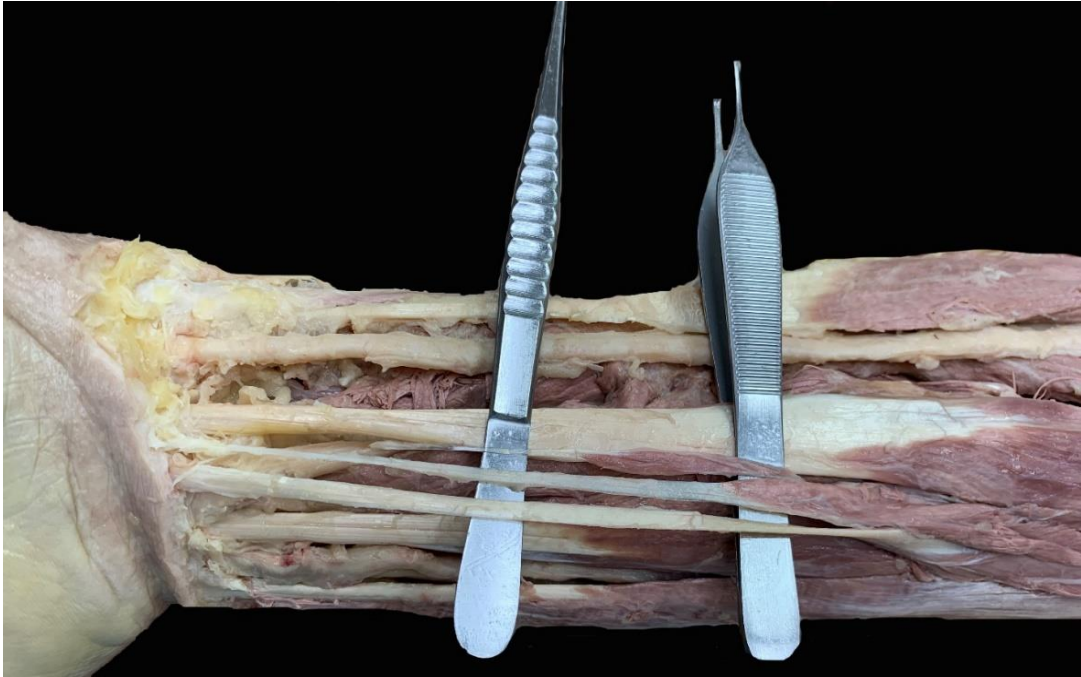
**Figure 3:** Facilitated display using two forceps and a ruler to highlight the length of the unilateral accessory head and the left palmaris longus muscle belly in Case 1.

## CASE DESCRIPTION 2

A unilateral pair of accessory heads of the right palmaris longus muscle was found with an 81-year-old White Male cadaver (listed cause of death of atherosclerotic cardiovascular disease) (**Figure 1b**). The pair of accessory heads ran in tandem with the palmaris longus muscle and attached to the antebrachial fascia of the wrist while the palmaris longus muscle continued to the palmar aponeurosis (**Figure 4**). The most medial accessory head muscle belly was approximately 5 cm in length and the most medial accessory head muscle tendon was approximately 10.1 cm in length. The most lateral accessory head muscle belly was approximately 4.5 cm in length and the most lateral accessory head muscle tendon was approximately 7.2 cm in length. The palmaris longus muscle belly was approximately 6.4 cm in length and the palmaris longus muscle tendon was approximately 14.5 cm in length (**Figures 4 and 5**).



**Figure 4:** Facilitated display using two forceps and a ruler to highlight the muscle belly and tendon lengths of the unilateral pair of accessory heads and the right palmaris longus muscle in Case 2.



**Figure 5:** Facilitated display using two forceps to highlight the unilateral pair of accessory heads and the right palmaris longus muscle in Case 2.

## DISCUSSION

The palmaris longus muscle is a superficial flexor of the forearm that lies anteriorly. It normally originates at the medial epicondyle with the flexor muscles of the wrist, forearm, and hand. When present, it consists of a proximal muscle belly and long distal tendon that inserts onto the palmar aponeurosis. Yammine 2013's comprehensive meta-analysis involving 26 studies totaling 22,408 subjects found that the prevalence of palmaris longus muscle agenesis was 20.25%, however it did not report on other anatomical variations [8].

It is known that the palmaris longus muscle is one of the most variable muscles in the human body [9]. Palmaris longus is present in mammals and most developed in mammals who ambulate using their forelimb for propulsion [8]. The palmaris longus muscle is thought to be phylogenetically degenerating and the functional value of the muscle is decreasing. The short muscle belly and increasing tendon length are consistent with the phylogenetic degeneration [10]. The presence of a palmaris longus tendon can be easily ascertained in individuals with normal anatomy by bringing the distal aspects of the thumb and small finger together while actively flexing the wrist. This is known as the standard test, or Schaeffer's test [11].

A 2020 retrospective study conducted by Kikano examined wrist and distal forearm MRIs and found the prevalence of a normal palmaris longus muscle of 65.2% [12]. A morphological variation was only present in 0.6% of cases. The only variation present was an inverted palmaris longus muscle; no duplication or other variations were found. Reimann et al. (1944) and Pai et al. (2010), however, noted variations in the palmaris longus muscle to be around 7-9% [13,14].

A 2018 study by Olewnik and colleagues characterized the morphological variability of the palmaris longus muscle found in nine types of palmaris longus muscles based on variation of the form and insertion [15]. The most common type, Type 1, was found in 52% of the study population with the natural origin at the medial epicondyle and insertion into the palmar aponeurosis [15]. Reimann et al. (1944) reported 0.8% duplication of muscle or tendon [13]. The unilateral accessory head found in our Case 1 with a doubling of the muscle belly and tendon has been reported by Olewnik 2018 and Albay 2013 [15,16]. The unilateral pair of accessory heads found in our Case 2 with a trifurcation of the muscle belly and three separate tendons has been reported in fetal studies, but not yet found in adults [15].

There are multiple reports of palmaris longus variation causing nerve compression and entrapment at the wrist. Hashem et al. (2020) reported a hypertrophied palmaris longus muscle causing median nerve compression that resolved with conservative management [2].

Palmaris longus muscle variation can cause nerve entrapment [17], medial nerve compression [1,4] and ulnar nerve compression [18]. The most frequently compressed nerve is the median nerve, however the ulnar nerve may also be affected. The presence of accessory heads of the palmaris long provides more avenues for compression.

Palmaris longus has clinical significance for orthopedic and reconstructive surgery. It may be used as a tendon graft for flexor and extensor tendon repair, chronic mallet finger, and carpometacarpal joint arthroplasty. In reconstructive surgery, the palmaris longus has also been used for lip augmentation, ptosis correction, and management of facial paralysis [19]. Variations in the palmaris longus muscle may preclude its use for tendon transfer, tendon graft, or reconstruction.

## CONCLUSION

The presence of accessory muscle heads for clinical implications should always be considered. Knowledge of these anatomical variations is important when performing surgical interventions at the wrist and hand, as well as when using the palmaris longus muscle and tendon for reconstructive surgery.

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## CONFLICT OF INTEREST

The authors do not have any conflict of interest.

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