Proceedings S.Z.M.C. Vol: 37(3): pp. 24-27 , 2023. PSZMC-892-37-3-2023

# An Indigenous Study on The Palmaris Longus Muscle Anatomical Variations

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## ABSTRACT

**Introduction:** The Palmaris longus muscle is one of the superficial flexor muscles of the forearm that flexes the hand on the wrist and makes the palmar aponeurosis tense for gripping. It is variable both in number and form like inverted, doubled, split, three-headed or absent palmaris longus. These variabilities may cause clinical features due to abnormal pressure on the median and ulnar nerves. Its tendon can be used as a graft in various transplant surgeries.
**Aims & Objectives:** This study was conducted to observethe number of cadavers showing anatomical variations of palmaris longus muscle in the Pakistani population.
**Place and Duration of Study:** This study was conducted in the Anatomy Department of FMHCM&D, Lahore. The duration of the study was January 2019 - January 2022.
**Material & Methods:** Cadaveric dissected upper limb specimens with normal palmaris longus were listed in Group: A, upper limbs having reversed palmaris longus were listed in Group: B, while upper limbs with absent palmaris longus were listed in Group: C. The RPL (reversed palmaris longus) muscle is the structure that is tendinous proximally and muscular distally (opposite of normal palmaris longus).Results were tabulated and percentages calculated.
**Results:** It was observed that out of 80 dissected cadaveric upper limbs,77 (96.25%) showed normal palmaris longus while a right cadaveric upper limb (1.25%) showed anomalous palmaris longus with the reversed tendon. Palmaris longus muscle was found absent in two cadaveric left upper limbs (2.5%).
**Conclusion:** Our study highlighted the percentage of different anatomical variations of the Palmaris longus muscle in terms of its presence with reversed tendons as well as its absence in a few human cadaveric upper limbs. This information may help anatomists, radiologists, physiotherapists and plastic surgeons.

**Keywords:** Palmaris longus, anatomical variations, reversed tendon

## INTRODUCTION

Palmaris longus is a thin spindle-shaped muscle present midway between the flexor carpi radialis and flexor carpi ulnaris muscles in the superficial muscle group of the anterior fascial compartment of the forearm.[1]Its nerve supply is the median nerve (C7, C8). It has a common origin from the anterior aspect of the medial epicondyle of the humerus. It has a small muscle belly and an elongated strand-like tendon that passes just in front of the flexor retinaculum and joins it and the tip of the palmar aponeurosis.[1,2,3] In the palm, it breaks into length-wise running fibers of the palmar aponeurosis. The Palmaris longus tendon is helpful in finding the median nerve at the wrist. Here it is located a little bit medial or in front of the median nerve. It is a weak flexor of the hand at the wrist and makes the palmar aponeurosis tense. It also attaches the skin and fascia of the hand during clasping. Its tendon is useful as a graft in transplant surgeries.[1,2]Normally, the tendon can be noticed and explored through touch when the wrist is flexed and the tips of the thumb and little finger are in opposition[1,2,3]. The palmaris longus muscle shows remarkable anatomical variabilities in contrast with other muscles of the upper limb. The most commonly noticeable variability is its deficiency. In 10-14% of individuals, it might not be present on one or both sides, most commonly on the left[1,2,3]. The muscle belly of palmaris longus might be present midway or distant in some individuals instead of a proximate one that is normal. The muscle is comparatively fragile that's why its non-existence does not create any dysfunction[1]. It varies both in quantity and appearance namely duplicated, bifid, three-headed, reversed, or hypertrophied palmaris longus tendon. These anomalies may cause median and ulnar nerve compression with inflammation of the anterior side of the wrist[4,5]. The RPL reversed palmaris longus muscle is the structure that is tendinous proximally and muscular distally (opposite of normal palmaris longus).Palmaris longus is used as a transplant in the surgical relocation of a tendon for correcting

droopy eyelids while doing the cosmetic procedure to increase lip fullness and in plastic surgeries because of its adequate dimensions and convenient picking without causing any harm to the benefactor's area[6,7,8].

The aim of this study is to highlight various anatomical variations of the palmaris longus muscle in the Pakistani population. This knowledge would be essential not only for anatomists, radiologists, and physiotherapists but for plastic surgeons as well.

## MATERIAL AND METHODS

A study on cadaveric upper limbs fixed in 10% formalin was conducted in the Anatomy Department ofFMH College of Medicine & Dentistry, Lahore, from January 2019 to January 2022 to investigate the presence of normal palmaris longus and palmaris longus with anatomical variations. After getting approval of the Institutional Review Board vide ref letter No. FMH-12-2020-IRB-841-M. Cadavers of both sexes with the age group ranging from 40 to 60 years were included in this study. The upper limbs that were noted with visible trauma were excluded. This study was designed after an accidental finding of palmaris longus muscle with an inverted tendon in the right upper limb of a male cadaver during routine dissection of its flexor compartment of the forearm using standard procedure.[9]His occupational and medical records were unknown. Median and Ulnar nerves were found normal in thickness.

The right and left upper limbs of all cadavers were observed for the presence of palmaris longus muscle with Anatomical variabilities. The upper limbs that were found to have palmaris longus muscles with normal tendons were noted in group A, while the upper limbs having palmaris longus with inverted tendons were listed in group B and the upper limbs with absent palmaris longus muscles were noted in group C.The groups, laterality, numbers and their percentages are presented in Table-1.

## RESULTS

Out of 80 dissected cadaveric upper limb specimens (40 right and 40 left upper limbs), 77(96.25%) were showing palmaris longus with the normal tendon of insertion Fig-1. 01(1.25%) right upper limb of a cadaver out of 80 dissected cadaveric upper limb specimens was having reversed palmaris longus. The origin of reversed palmaris longus was found tendinous from the medial epicondyle of the humerus and then the musculotendinous junction was seen and the muscular belly was inserted into the ventral aspect of the wrist Fig-2. 02(2.5%) left upper limbs of two cadavers out of 80 dissected cadaveric upper limb specimens were deficient in palmaris longus muscle Fig-3.

Results were tabulated, percentages were calculated and represented in the form of Table-1.

| Groups | Side | | Number of Upper limb specimens | Percentage of variations |
|---|---|---|---|---|
| | Right | Left | | |
| **A** (Upper limb specimens with normal palmaris longus) | 39 | 38 | 77 | 96.25% |
| **B** (Upper limb specimen with reversed palmaris longus RPL) | 01 | - | 01 | 1.25% |
| **C** (Upper limb specimens with absent palmaris longus) | - | 02 | 02 | 2.5% |
| **Total** | 40 | 40 | 80 | 100% |

**Table-1: Showing percentage of upper limb specimens with normal and anatomically variable Palmaris longus muscle**

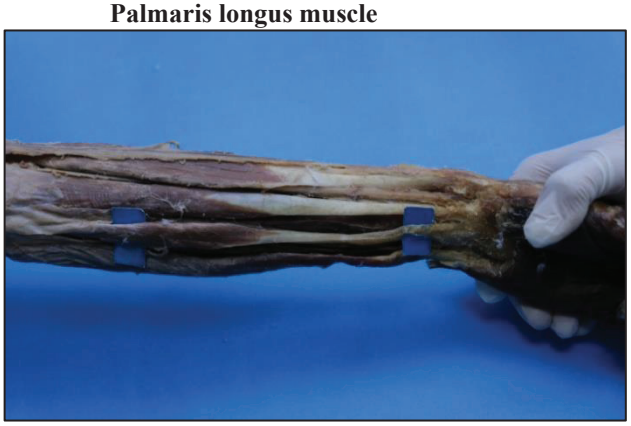

**Fig-1: Showing normal palmaris longus muscle in the cadaveric left upper limb specimen.**

**Fig-2: Showing Reversed Palmaris longus RPL in the cadaveric right upper limb specimen.**

**Fig-3: Showing absence of Palmaris longus in the cadaveric left upper limb specimen.**

## DISCUSSION

Palmaris longus exhibits different variabilities in its number, morphology and location. In the present study of variations of Palmaris longus muscle in cadaveric upper limb specimens, it was found normal in 77(96.25%) of cases, right-sided palmaris longus muscle with reversed tendon was noted in1(1.25%) and in 2(2.5%) of the left-sided upper limbs it was found absent.

Reiman et al.,[10]studied the upper limbs of 1600 cadavers for anomalies of the palmaris longus muscle for the first time. He noticed that the occurrence of its absence was 12.9% and the incidence of other anomalies was 9% such as the muscle belly of palmaris longus may be present in the middle or distally placed or there may be two bellies[10].These findings support the present study results. Rajesh S et al.,[11]studied cadaveric upper limbs and observed that palmaris longus was normal in 45 (90%) upper limbs, reversed was found in two upper limbs (4%), and its agenesis was noted in two (4%) upper limbs. The results of this study are more or less close to the present study results as both variations like reversal and absence of palmaris longus were noted in the same percentage. This information about this muscle is not only important for radiologists to diagnose wrist swellings with involvement of forearm nerves but for surgeons in grafting procedures of limbs like tendon transfer for first dorsal interosseous muscle, lumbrical replacement, reconstruction of tendo-calcaneus and glottis[11].

Sunitha R et al.,[12]observed that Palmaris longus was absent in one male cadaver on both sides and its agenesis was found in one female cadaver on the right side. Total absence of palmaris longus was 5%. Right-sided absence is 3.3% and left-sided absence is 1.6%. Reversed belly of the right-sided palmaris longus in a male cadaver was also noted. The results of this study are consistent with the present study findings. The presence of reversed palmaris longus may produce the most likely clinical features of Carpal tunnel syndrome or Guyon's canal syndrome due to the involvement of the median nerve or ulnar nerve respectively. The knowledge of the variability of Palmaris longus is essential for surgeons, clinicians, orthopedic surgeons, anatomists, researchers and interventional radiologists[12].

Gune AR et al.,[13] found a case with bilateral reversed palmaris longus muscle with insertion on three different sites, first in fascia covering the thenar muscles, second into palmar aponeurosis and third with abductor digiti minimi. Reversed palmaris longus can compress the median nerve or ulnar nerve and may cause compartment syndrome leading to swelling and pain in the wrist. Using this knowledge, a surgeon can use it as a graft while doing procedures on the wrist region and hands[13].

Lalit M et al.,[14] while teaching undergraduate students, noticed the right forearm of a 54 years old male cadaver having a reversed palmaris longus with the tendinous origin and muscular belly with two slips near insertion. This muscle is of great interest to surgeons because of its pivotal role in repairing collateral ligaments and in the treatment of facial paralysis and other nerve palsies[14].

Hashem et al noted a patient with right-sided distal forearm painful swelling on the ventral side due to RPL affecting the median nerve that produced clinical features of median nerve involvement. Ultrasonography was done to see the painful wrist mass and then Magnetic resonance imaging was done to know the details of this mass. He was treated with anti-inflammatory medicines; wrist supports and physiotherapy[15].

Demir CI et al.,[16] observed a case of reversed palmaris longus with clinical features of median nerve compression. A female patient of 16 years of age was reported for the presence of swelling in front of the wrist due to RPL muscle that was causing compression of the median nerve leading to the feeling of pins and needles in the first three fingers of the left hand and an increase in severity of the feeling was noted while doing some hand activity. The clinical tests showed the presence of reversed Palmaris longus muscle. Ultrasonography and then MRI highlighted the RPL muscle along with its attachments. While making the diagnosis of various swellings at the wrist, the RPL muscle may be one of the causes that should also be kept in consideration[16].

Waghray Net al.,[17]The palmaris longus was found absent in left upper limb of a 58 years old cadaver. It was concluded that the information about Palmaris longus is significant for surgeons who use

the tendon of this particular muscle as a graft in various replacement surgeries[17].

## CONCLUSION

The knowledge of anatomical variations of palmaris longus muscle is important for anatomists for the awareness of their presence and the related clinical significance. This information is useful for radiologists as well for diagnosing patients who come with wrist swellings and pains. These details related to the variations of the palmaris longus muscle are decisive for physiotherapists in order to treat patients with clinical features of the median nerve or ulnar nerve compression. These findings are also necessary for plastic surgeons who are planning to use the palmaris longus tendon as a graft for reconstructive surgeries in human bodies.

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