Research Article

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A GUIDE TO SURGEON IN HAND RECONSTRUCTIVE SURGERIES WITH THE KNOWLEDGE OF REVERSED PALMARIS LONGUS MUSCLE

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ABSTRACT

Palmaris longus is one such fusiform muscle present in the flexor compartment of forearm. The muscle is frequently absent in most of the population. It has an origin from the common flexor origin [medial epicondyle of humerus] and insertion into the flexor retinaculum of the wrist. The tendon of Palmaris longus was proximal while the belly of the muscle was distal. Aim: The aim of this study is to document the incidence of variation, morphological features, and clinical implications of Palmaris longus muscle through the cadaveric dissection thereby contributing to a better understanding of it. Methods: During the routine BAMS-UG dissection in the Department of Shareera Rachana at Sri Dharmasthala Manjunatheshwara Institute of Ayurveda and Hospital, Bengaluru, a variation was found in the attachment of Palmaris longus Muscle in a 55-year-old female cadaver. Dissection of the Palmaris longus muscle was done as per the dissection manual to look for any anatomical variations, the findings were compared with previous literature. Results: It was found as a Reversal of the Palmaris longus muscle in the right forearm, which means the tendon has proximal attachment to the medial epicondyle of humerus while the insertion of muscle belly is into the palmar aponeurosis. Discussion: The variation in the attachment of Palmaris longus muscle is clearly understood by phylogenetic regression as per various studies sourced from different journal articles. Conclusion: The awareness of Palmaris longus muscle variations becomes important for a physician, surgeon and a radiographer in the fields of clinical practice, surgery, and radiography.

Keywords: Palmaris longus, flexor retinaculum, common flexor origin, Palmar aponeurosis, tendon graft, Reversal, Agenesis, Carpal tunnel.

INTRODUCTION

All the muscles have an origin and insertion. However, in some cases, the origin and insertion can be reversed. One such muscle is the Palmaris longus, a slender fusiform muscle that originates from the medial epicondyle of humerus through the common flexor origin and passes medial to flexor carpi radialis [2] and further gets inserted into the flexor retinaculum that covers the carpal bones on the palmar aspect of hand.[3] It is renowned as "Fresher's nerve" as it resembles a nerve and maybe easily cut by the fresher students.[4]

The tendon of palmaris longus is expanded into the palmar aponeurosis tensing the skin for easy grasping of objects. [5] It also supports flexion of wrist joint due to the tendon passing anterior to the wrist.

As the tendon lies superficial to flexor retinaculum, it can be easily felt when the wrist is flexed against resistance. It passes in between flexor carpi radialis laterally and flexor carpi ulnaris medially, lying superficial to flexor digitorum profundus. [2]

MATERIALS AND METHODS

A proper method of dissection is required in properly exposing the underlying structures of the body.

Instruments
Gloves, Scalpel, Forceps, Scissors, Needles, kidney tray etc.

Procedure
Take an incision in the anterior compartment of the forearm to expose the superficial and the deep fascia. Cut the superficial fascia from the cubital fossa till the margin of flexor retinaculum. Take a transverse incision close to the flexor retinaculum and carefully reflect the structures beneath it. The Flexor group of muscles are seen on the medial aspect whereas the extensor group of muscles are seen on the lateral aspect. Trace each muscle from the point of origin till insertion, thereby separating the flexor muscles and the extensor muscles. Brachioradialis, an extensor muscle is observed in the most lateral aspect of the front of the forearm and medial to this muscle will be the flexor group of muscles. Palpate the medial epicondyle of the humerus to mark for the common flexor origin. Now, separate each flexor muscles from lateral to medial. The most lateral being in order- The Pronator teres, Flexor carpi radialis, Palmaris longus, Flexor digitorum superficialis, Flexor carpi ulnaris and medial to Flexor carpi ulnaris lies the Palmaris longus. Feel the tendon superficially at the flexor retinaculum that further joins the Palmar aponeurosis and just below it and between the tendon of Palmaris longus and Flexor carpi radialis, median nerve can be felt.[4]

OBSERVATION

During the routine First year BAMS-UG dissection in the department of Shareera Rachana at Sri Dharmasthala Manjunatheshwara Institute of Ayurveda and hospital, Bengaluru, a case of reversal of the Palmaris longus muscle was found as a variation in the right flexor compartment of forearm in a female cadaver.

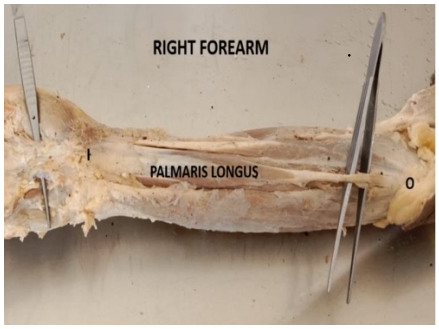

Figure 1: Reversed Palmaris longus. O: Origin; I: Insertion

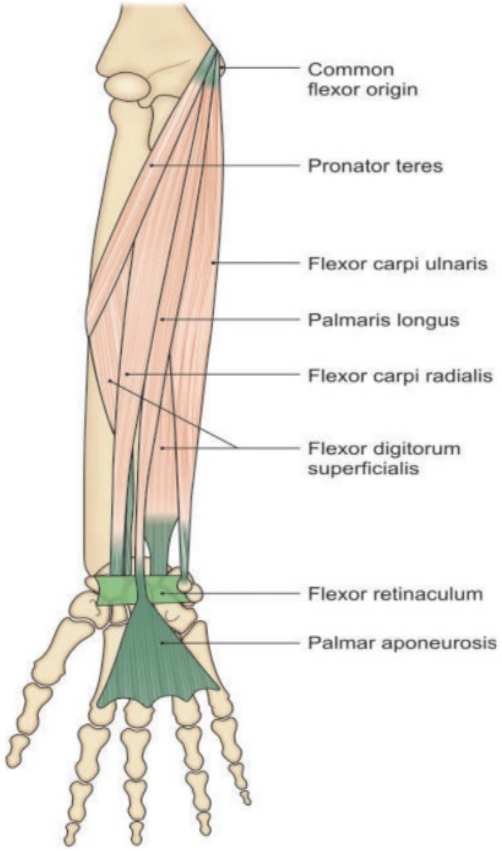

Figure 2: Anterior aspect of forearm.[1]

It was a case of unilateral reversal of palmaris longus. The tendon of right palmaris longus was proximally attached to the medial epicondyle of humerus whereas the muscle belly being inserted into palmar aponeurosis. The length of the muscle along with its tendon was found to be approximately 9 inches (23cm), muscle along with palmar aponeurosis was 10inches (25cm). The length of tendon at the point of origin was 3.5 inches and at the point of insertion it was 1.7 inches. Other than this, no other change was observed.

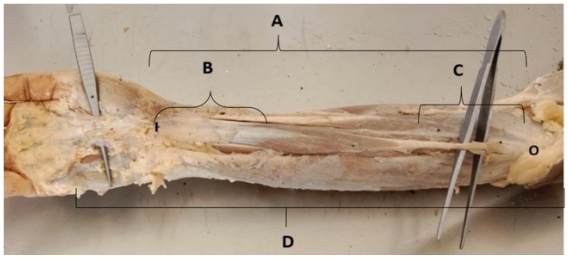

Figure 3
Measurement of: A-Muscle with tendon: 9 inches (23cm), B-Tendon at the site of insertion: 1.7 inches, C-Tendon at the point of origin: 3.5 inches, D-Muscle with palmar aponeurosis: 10 inches (25cm)

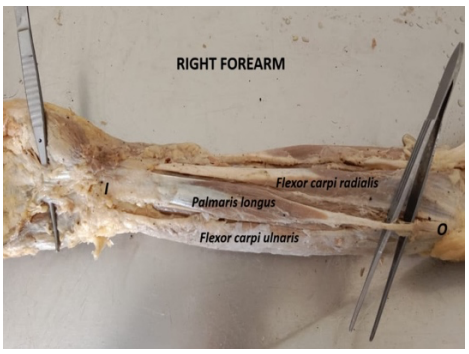

Figure 4: Reversed Palmaris longus
O: Origin; I: Insertion; FCR: Flexor carpi Radialis; FDS: Flexor Digitorum Superficialis.

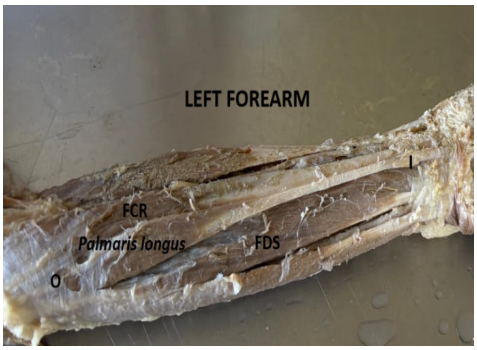

Figure 5: Palmaris longus without reversal
O: Origin; I: Insertion; FCR: Flexor carpi Radialis; FDS: Flexor Digitorum Superficialis.

DISCUSSION

The variation in the attachment of Palmaris longus muscle is clearly understood by phylogenetic regression [6]. In a study, where 112 upper limbs were dissected, 9 cadavers showed variations of Palmaris Longus muscle. Out of these, 0.89% showed reversed PL muscle.[7] Agenesis is the most common anomaly, ranging from 1.5%-63.9%[8]. However, the other anomalies of the muscle ranges only up to 9% of the population. The muscle is said to become a vestigial muscle [12] as some reports also prove that there is no change in the grip of the hand in the absence or variation in the muscle. Out of 30 cadaveric dissections done by Pai et al (2008), it was found that the muscle was absent in 4 cadavers and was reversed in 3 of the cadavers. Totally 20 articles reported other anomalies of the muscle from 1975-2014 out of which, 10 were from intraoperative studies, 9 were cadaveric dissections and 1 was from an MRI scan. The cadaveric dissections revealed the Palmaris longus muscle to be unilaterally or bilaterally

duplicated, unilaterally or bilaterally reversed, reversed along with three bellies.[8]

There was another study done on the Bulgarian population to understand the variations of Palmaris longus muscle. Out of 112 cadavers, 9 were showing variations which included: Agenesis (2.68%), Reversed Palmaris longus existing along with digiti minimi muscle (0.89%), intermediate muscle belly (1.79%). The tendon was observed unilaterally on the left side with a length of 13.6cm and width of 0.5cm, attached to the medial epicondyle of humerus.[9]

Guyon's canal, also called as 'ulnar canal' situated medially extending from Pisiform bone to Hamate bone enclosing the ulnar nerve and ulnar artery. The most common anomaly in the canal is the presence of an accessory muscle like: Accessory abductor digiti minimi(61.5%), accessory palmaris longus (8.6%). A British Caucasian, 69-year-old, was suffering with severe pain in the hypothenar aspect of the palm in the last six months, in the area between ring finger and middle finger. A scan showed the entrapment of ulnar nerve in the Guyon's canal. Median nerve was normal. After surgery, an accessory palmaris longus originating from the tendon of palmaris longus and deep fascia of forearm, joining with the hypothenar muscles. The accessory muscle was compressing the ulnar nerve and vessels.[10]

A meta-analysis study was conducted on 497 fetuses and 1027 fetal limbs. Among the 494 muscle studies, 67 variations were found: 10 cases of bifid tendon (2%), 9 cases of Palmaris longus reversal (1.9%), digastric muscle (5.1). It was concluded that the variations were more found in fetus than adults.[11]
Some studies also suggest the Palmaris longus muscle actively participates in thenar musculature movements like abduction, flexion, opposition of the thumb with zero movement of the wrist. The study included 10 males, the activity of Palmaris longus was at its maximum during thenar muscle contractions when viewed under an ultrasound. The activity of muscle recorded were thenar abduction (46%), flexion (35%) and opposition (37%). So, the muscle is accepted as an extrinsic muscle of the palmar aspect of the hand.[13]

Many tests can be done to palpate the muscle tendon. Few of them include:

1. Schaeffer's test, where the thumb is opposed and the tendon is felt.
2. Thompson's test, with a clenched fist, the thumb is opposed over all the fingers.
3. Mishra's test 1, the examiner slightly hyperextends the subject's metacarpo-phalangeal joint asking the subject to flex the wrist
4. Mishra's test 2, wrist is flexed and the thumb is abducted with slight resistance [14]

Another case of an Arab man, 24 years old, working in a software company complained about severe pain in the distal part of right forearm. A painful mass was observed which was affecting the movements of the wrist joint especially during flexion without affecting the motion of the fingers. After thorough examination, a small fusiform bulk which was 2 x 3 x 3 in volume was observed, which was more prominently seen during flexion of wrist. The mass was observed to be having similarities to the adjacent muscles. The mass was located medial to flexor carpi radialis, in the place of palmaris longus tendon. In the reports, the tendon of PL muscle was reversed and the mass was reaching to the extent of flexor retinaculum. It was a case of hypertrophied muscle belly of the reversed Palmaris Longus, compressing the median nerve and restricting the range of motion.[15]

Another study was done to study the prevalence of Palmaris Longus on the basis of hand dominance. Among the 542 participants, 452 were right dominant and 90 were left hand dominant. In right-handed subjects, absence of Palmaris Longus muscle on the right side was recorded to be 24(5.3%), left side 50(11.1). In the left-handed subjects, absence of Palmaris Longus muscle on the left side was recorded to be 2(2.2%), right side 18(20%). It was concluded the absence of PL in right dominant subjects was more on left side(forearm) and vice versa.[16]

In the year 2000, a study was performed describing the case of a female patient with a Palmaris Longus reversal on the right forearm. In their study they reported 15 cases of reversed Palmaris longus prior to the year, they found that more than 65% of them were found to be in females. All 15 were unilaterally found on the right side except for the one with reversed Palmaris Longus found bilaterally.[17]

CONCLUSION

The awareness of such variations becomes important for a physician, surgeon and a radiographer. In reversed cases, the position and orientation of a muscle can influence or compress the adjacent nerves, leading to conditions such as Carpal Tunnel Syndrome (CTS) and Guyon's Canal Syndrome (GCS), especially when the muscle becomes hypertrophied from repetitive activity.

A surgeon must have the knowledge of these variations to not cut the tendon, mistaking it to a fascia. A patient might also experience swelling or pain distally in the forearm. So, the physician must be aware of the muscle variant. The muscle tendon is the most preferred muscle for a graft due to its superficial position. A physician or surgeon has to test for the muscle tendon to eliminate the possibilities of compression in the area. If the tendon is not palpable, it can be either agenesis or reversal. Analysis based on the studies and different tests done becomes important for proper diagnosis and treatment.

Variations of the muscle were earlier found in literature. Hence, a thorough understanding about the origin and insertion of the muscle, though vestigial, becomes important in the fields of clinical practice, surgery, and radiography. Also, having in-depth knowledge of variation of Palmaris longus muscle is required for surgeons as it assists them to smoothly carry out the tendon grafting, cosmetic related procedure, ligamental reconstructions etc.

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