

## An unusual coexistence of a duplicated Palmaris longus giving origin to Accessory Abductor digiti minimi

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### Abstract

*Palmaris longus* (PL) is a muscle of the forearm that is known for its many anatomical variants in the human body. Though the action of PL is frivolous, it is of significance to the surgical practice of both plastic and hand surgeons. In the current case we report the findings of a duplicated Palmaris longus which was partially fused, and also the presence of an *Accessory abductor digiti minimi* (AADM) muscle that arises from the duplicated segment of Palmaris longus. In the current report, we explain the course of the above muscles and their effects on the surrounding vital nerves and vessels. Clinical knowledge of such anatomical variants could help facilitate the approach to a patient with hand problems and address the use of PL graft for reconstructive hand surgeries.

**Keywords:** Palmaris longus; Accessory abductor digiti minimi

### Introduction

Palmaris longus [PL], is a slender fusiform muscle present in the superficial layer of the anterior aspect of the forearm. It is located between flexor carpi radialis and flexor carpi ulnaris muscles and takes its origin from common flexor origin (CFO) from the medial epicondyle of humerus. The muscle belly of palmaris longus is usually short and it has a slender, long and a flat tendon that passes superficial to the transverse carpal ligament and continues distally as a thick fibrous fascia. This distal fibro fascial component, '*Palmar aponeurosis*', indicates that PL is most likely to be a primitive muscle and has undergone considerable phylogenetic degeneration during evolution.<sup>(8,10,15)</sup> Since PL is a retrogressive muscle, it has a short belly and ends in a long tendon (hence its name PL), the fibers of which are partly inserted into the flexor retinaculum while the majority of the fibers crosses the flexor retinaculum to form palmar aponeurosis.

Though PL is considered to be a degenerated muscle, its presence is of high value especially for Plastic, Reconstructive and Hand surgeons. Understanding the different variations of PL is very important as it is often used as common graft material for tendon and reconstructive surgeries.

### Case Report

An adult middle aged male cadaver of East Asian origin, fixed up in 10% formalin, was taken up for dissection to demonstrate the muscles of the upper limb for health professional students at RAK Medical Health Sciences University, UAE. During the dissection of the left forearm, a curious muscle was found to lie medial to the PL. Initially, before complete dissection, this muscle was mistook to be Flexor carpi ulnaris (FCU). After thorough dissection, it was found this muscle was not FCU, as a separate FCU was present, but a duplication of PL muscle itself. Further analyzing the

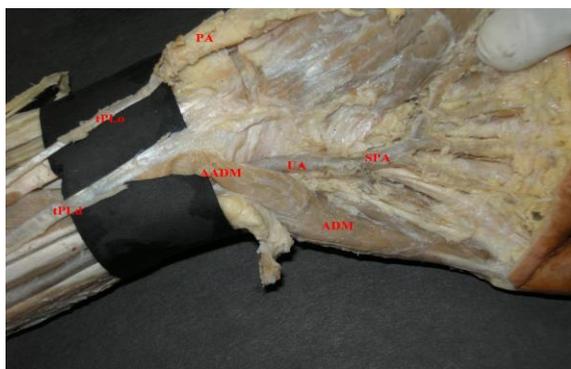
origin of this duplicated segment of PL, which was lying medial to the original PL, it was found they both shared the same origin (CFO). The origin of both the segments of PL was fused proximally for 8.5 cm from the medial epicondyle of humerus, following which, the fused origin of both the segments of PL were completely separated. However, tracing it distally, it was observed that both the bellies of PL were once again fused, at a distance of 12.8 cm from the medial epicondyle of humerus, thereby leaving a small gap between the two bellies. The distal fusion between the two bellies of PL extended for approximately 3.7 cm and once again the two muscle bellies were separated and continued distally as long tendons. The tendon of the original PL, which lay towards the radial side of the forearm, had its insertion partially into the flexor retinaculum and the rest of the tendon fibers continued as palmar aponeurosis. The tendon of the duplicated segment of PL lying towards the ulnar aspect, also had its insertion into the flexor retinaculum and did not progress as palmar aponeurosis as the original tendon did. (Fig. 1)



**Fig. 1: Dissection of the left forearm showing the partial fusion with intermittent gap between the muscle bellies. [bPLo – muscle belly of Palmaris**

**longus (original); bPLd – muscle belly of Palmaris longus (duplicated)]**

Another interesting finding observed during dissection was the presence of a muscle in the distal end of the duplicated tendon of PL. These fleshy muscle fibers were found to arise 2.3cm above the imaginary horizontal line drawn from the tip of radial styloid process. (Fig. 2)



**Fig. 2: Dissection of the distal part of left forearm, anterior wrist and proximal part of left hand. [tPLo – tendon of Palmaris longus (original); tPLd – tendon of Palmaris longus (duplicated); AADM – Accessory Abductor Digiti Minimi; ADM – Abductor Digiti Minimi; PA – Palmar aponeurosis; UA – Ulnar artery; SPA – Superficial Palmar arch].**

The accessory muscle passed beneath the *Palmaris brevis* in the hypothenar eminence and had its innervation from superficial branch of ulnar nerve. The palmaris brevis and the small twigs from the superficial branch of ulnar nerve giving branches to the palmar accessory muscle were dissected out and the muscle was traced distally. The fleshy part of the muscle blended finally with the abductor digiti minimi. Dissection of the Median nerve was also performed and analyzed for any signs of compression. The Median nerve was found between the two tendons of PL and was round. No prominent sign of compression was detected during the dissection. No significant changes were observed in the course of deep branch of ulnar nerve, ulnar artery or the superficial palmar arch. There was no obvious muscle wasting noted in the small muscles of the hand. The PL and abductor digiti minimi was normal on the right upper limb of the same cadaver.

**Discussion**

PL muscle is of clinical significance as it is used for many tendon transfer operations with almost no functional impairment.<sup>(17)</sup> Many surgeons prefer the tendon of the PL as the first choice as a donor tendon because it fulfils the necessary requirements of length, diameter and easy availability. PL tendon graft use has been documented in a variety of procedures namely lip

augmentation,<sup>(5)</sup> ptosis correction<sup>(9,11)</sup> and in the management of facial paralysis<sup>(2)</sup> without producing any functional deformity of the hand. PL tendon is considered Ideal for replacement of the long flexors of the fingers and the flexor pollicis longus tendon.<sup>(19)</sup>

The most common muscle that undergo structural variations in human body is PL.<sup>(4)</sup> PL muscle variants are many including agenesis, digastric, proximal tendon (reversed PL), duplication, abnormal origin and insertion.<sup>(1,3,13,16)</sup> Amongst all the reported variations of PL, agenesis has been accounted as the most common, observed in approximately 2% to 25% of the population, with a higher prevalence in Caucasians.<sup>(1)</sup> Other variants that are clinically symptomatic include anomalous insertion deep to the flexor retinaculum (*Palmaris profundus*) and a distal belly of PL (digastric), both causing apparent compression of median nerve producing a carpal tunnel like syndrome.<sup>(3)</sup> It also reported that PL, can have a distal belly (reversed PL), an abnormal origin or insertion into the antebrachial fascia or may slip into the abductor pollicis longus, abductor digiti minimi can cause ulnar nerve entrapment in the Guyon’s canal or to the median nerve as discussed previously.<sup>(14)</sup> Polesuk and Helms documented a pseudo mass in the forearm which was later confirmed to be a hypertrophied PL.<sup>(12)</sup> Yildiz, Sener and Aynaci in their case report documented even a three headed reversed PL.<sup>(18)</sup>

In our report, we found the existence of duplicated PL. However, the muscle bellies of original and the duplicated PL were fused both proximally and distally with a significant gap between them. Many cases have documented the median nerve entrapment. However, in our dissection we couldn’t find any gross pathological evidence of the compression of median nerve.

Another significant abnormality detected during dissection was the presence of an accessory muscle that originates from the distal end of the duplicated tendon of PL, passing underneath the palmaris brevis and fusing with the abductor digiti minimi, the *Accessory Abductor digiti minimi* (AADM). This variant is unique as the previous reports on AADM, were isolated and arise from the common origin, either the flexor retinaculum, flexor carpi ulnaris or from the tendon of PL.<sup>(6)</sup> Another report which is closely related to our observation was the presence of AADM in a reversed PL.<sup>(7)</sup> Contrarily in our study we detected the presence of AADM from the duplicated segment of a partially fused PL. It also received branch from the superficial branch of ulnar nerve. Georgiev & Jeleu reported that these accessory muscles could cause compression of median or ulnar nerves.<sup>(7)</sup> The AADM in our dissection was overlying the deep branch of ulnar nerve and the ulnar artery which could have posed a significant compression of the above structures.

## Conclusion

Though PL is considered to be phylogenetically degenerated and has no important function on the wrist joint, it is a highly regarded useful graft in various plastic and reconstructive surgeries. Also, the coexistence of such complicated abnormal PL and the AADM can cause various symptoms due to the compression of the adjacent vital structures like the ulnar artery, median and ulnar nerves. We believe that such variations, though rare, need to be borne in mind by every surgeon

## Conflict of Interest

We declare that we do not have conflict of interest in the above topic.

## References

1. Amera Murabit, Maria Gnarra and Adel Mohamed (2013) Reversed palmaris longus muscle: Anatomical variant – case report and literature review, *Can J Plast Surg. Spring*;21(1):55–6.
2. Atiyeh BA, Hashim HA, Hamdan AM, Kayle DI, Musharafieh RS (1998) Lower reconstruction and restoration of oral competence with dynamic palmaris longus vascularized sling, *Arch Otolaryngol Hand Neck Surg.* 124:1390-3.
3. Backhouse KM., Churchill–Davidson D (1975) Anomalous palmaris longus muscle producing carpal tunnel-like compression, *Hand.* 7(1):22–4.
4. Bergman RA, Thompson SA, Afifi AK (1984) Catalog of human variation, Urban & Schwarzenberg: Baltimore Davidson BA (1995) Lip augmentation using the palmaris longus tendon, *Plast Reconstr Surg.* 95:1108–10.
5. Georgi P Georgiev, Lazer Jelev, Plamen Kinov (2010) Aberrant muscles at the Guyon's canal, *International Journal of Anatomical Variations.* 3:67-9.
6. Georgiev GP, Jelev L (2009) Unusual coexistence of a variant abductor digiti minimi and reversed palmaris longus and their possible relation to median and ulnar nerve entrapment at the wrist. *Rom J Morphol Embryol.* 50(4):725-7.
7. Gray H, Bennister LH, Berry MM and Williams PL (1999) *Gray's Anatomy: The Anatomical Basis of Medicine and Surgery*, 38th edn. Churchill Livingstone, London, pp 853.
8. Kurihara K, Kojima T, Marumo E (1984) Frontalis suspension for blepharoptosis using palmaris longus tendon, *Ann Plast Surg.*13(27):488-9.
9. Mangala M Pai, Latha V prabhu, S R Nayak, S Madhyastha, Rajanigandha Vadgaonkar, A Krishnamurthy, A Kumar (2008) The Palmaris longus muscle: its anatomic variations and functional morphology. *Rom J Morphol Embryol* 49(2):215-217.
10. NaugleTC Jr, Faust DC (1999) Autogenous palmaris longus tendon as frontalis suspension material for ptosis correction in children, *Am J Ophthalmol.* 127:488-9.
11. Polesuk BS, Helms CA (1998) Hypertrophied palmaris longus muscle, a pseudomass of the forearm: MR appearance – case report and review of the literature, *Radiology.* 207(2):361-2.
12. Reimann AF, Daseler EH, Anson BJ, Beaton IE (1944) The Palmaris longus muscle and tendon: A study of 1,600 extremities. *Anta Rec.* 89:495–505.
13. Roberts PH (1972): An anomalous accessory palmaris longus muscle, *Hand.* 4(1):40-1.
14. Romanes GJ (1964) *Cunningham's Text book of Anatomy*, Oxford University press, London, New York and Toronto. pp 331.
15. Schuurman AH, Van Gils AP (2000) Reversed palmaris longus muscle on MRI: Report of four cases. *Eur Radiol.* 10:1242–4.
16. Troha F, Baibak GJ, Kelleher JC (1990) Frequency of Palmaris longus tendon in North American Caucasians, *Ann Plast Surg.* 25(6):477-478.
17. Yildiz M, Sener M and Aynaci O (2000) Three-headed reversed palmaris longus muscle: a case report and review of the literature. *Surg Radiol Anat.* 22(3-4):217-9.
18. Zeybek A, Giirinuoglu R, Cavdar S, Bayramigli M (1998) A clinical reminder: A palmaris longus muscle variation, *Ann Plast Surg.* 41:224-5.