

ANATOMY

Median nerve suppression by hypertrophied palmaris longus muscle, a rare anatomic aberration

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Abstract. The palmaris longus muscle (PLM) is considered to be a phylogenetically degenerate muscle. For many authors, this may be the cause of its great variability. The loss of function in the PLM makes it an important muscle in plastic and reconstructive surgery. During a study of PLM agenesis rate in the Hungarian population, a 19-year-old male showed an unusual patterns of muscles in his forearms, which were found to be a hypertrophied PLM. The hypertrophied muscle was causing symptoms of median nerve compression.

Keywords: *palmaris longus, median nerve compression, muscle hypertrophy, muscle anomaly.*

Introduction. By many authors, the palmaris longus muscle (PLM) is described as a phylogenetically degenerate muscle, since the human hand can perfectly function even with the complete absence of the muscle. This is considered as the main reasons for its great variability and frequent absence. The human hand can function perfectly without this muscle and thus its absence or variation in shape and structure usually doesn't affect the proper function of the hand [4]. The PLM is currently one of the most variable muscles in the human body; its described variations include: agenesis, the most frequent anatomical variation [18], reversed PLM [20], double PLM [13], variation in location [18], and many others.

The loss of function of the PLM and its superficial location, easy accessibility and the fact that the muscle is fully developed at birth and can be used as tendon donor muscle in any age group, make it the first-choice donor muscle for tendon grafts in plastic and reconstructive surgery, and have also allowed it to become probably the most variable muscle in the human body [2–6, 24, 25].

Unfortunately, different variations and anomalies of the PLM may be the cause of pathologies of the forearm, like median or ulnar nerve compression. The literature review showed that the pathologies mentioned above primarily develop in cases when the muscular part of the PLM is located distally, and that if this is accompanied by another anomaly like bifid muscle, accessory muscle, hypertrophy of the muscular part then the chance of the development of the pathology seems even higher. Hypertrophy of the muscle, or its anomalous position also may cause pathologies, like nerve entrapments, or nerve compressions which lead to inflammation and constant, or periodically reoccurring pain in patients [1, 5, 9, 16, 22, 23, 26].

According to literature review, the following variations and anomalies of the PLM may cause pathologies of the forearm: reverse PLM, reverse PLM with multiplication of muscular part (bifid, or 3-headed PLM), accessory PLM, accessory muscles taking their origin from the tendinous part of the PLM [5, 9, 11, 16, 17, 19, 22, 23, 26].

All the facts mentioned above serve as evidence for the importance of all possible information regarding the variations, anomalies and pathologies caused by PLM in orthopaedics, plastic, and reconstructive surgery. The article presents a case report of PLM hypertrophy, according to searches done in Google Scholar and PubMed; this is a quite uncommon anomaly of the PLM.

Case report. A study on the prevalence or absence of the PLM was carried out among Hungarian students in Budapest. One of the examined students (a 19-year old male) showed an unusual muscular pattern in his both hands. During a more detailed visual examination and palpation done while the patient was performing the Thompson's et al. [24], Schaeffer's [21], Pushpakumar's et al. [15], Mishra's 1, Mishra's 2 [12], Gangata's [8] and Hiz-Ediz et al. [10] tests, it was established that the patient had severe hypertrophy of the PLM.

1. Thompson's: the patient is asked to make a fist, then flex the wrist and finally the thumb is opposed and flexed over the fingers. (Fig 1) [24].



Fig. 1.

2. Shaffer's: the patient is asked to oppose the thumb to the little finger and then flex the wrist. (Fig 2.) [21].



Fig. 2.

3. Pushpakumar's: the patient is asked to fully extend the index and middle finger, the wrist and other fingers are flexed and finally the thumb is fully opposed and flexed (Fig 3.) [15].



Fig. 3.

4. Mishra's 1: metacarpo-phalangeal joints of all fingers are passively hyperextended by the examiner and the patient is asked to actively flex the wrist (Fig 4.) [12].

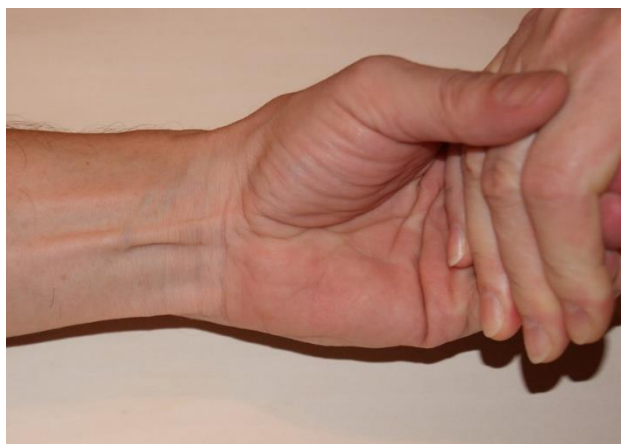


Fig. 4.

5. Mishra's 2: The patient is asked to abduct the thumb against resistance with the wrist in slight palmar flexion (Fig 5.) [12].



Fig. 5.

6. Hiz-Ediz test: performed by applying resistance to flexion of fingers and wrist while all fingers were at the opposite position with the wrist at slight flexion (Fig 6.) [10].



Fig. 6.

The muscles appeared as a strong protrusions under the skin of the forearm leading to the distal end of forearm and ending almost over the retinaculum flexorum. A short less than 1 cm-long tendinous part could be palpated over the retinaculum flexorum in both forearms of the patient..

The muscles in both hands had unusually prominent and strong muscular parts that could be easily palpated all the way to the middle of the upper quarter of the forearm .

During the examination the patient showed symptoms of median nerve compression, complaining about a twinge in the middle and index finger and wrist, and also about strong stabbing pain which appeared when the patient tried to flex his fingers, and form a fist.

Because of the symptoms described above the patient was advised to visit a specialist.

Discussion. During the investigation of the described case, there was no opportunity to examine the patient with ultrasound, magnetic resonance imaging or computed tomography, so we can only rely on the results of visual evaluation and palpation. Though the patient most likely had hypertrophy of the Palmaris longus muscle, since the PLM has a large number of variations it would be unwise to exclude some other variations of the muscle. In literature we can find certain cases which produce similar pathologies or analogous shapes to those which were described in this case. The article by Paraskevas et al. [14] describing a failure of PLM duplication appears to be a case similar to this one. Zeiss and Jakab [27] describe the case of an anomalous muscle originating from the PLM tendon, in which the patient shows very similar symptoms to this one. In the report presented by Acikel et al. [1] a reversed 3-headed and hypertrophied PLM with an extension of Guyon's canal causes effort-related compression of median and ulnar nerves.

Unfortunately many of the variations of the PLM have a negative influence on the functionality of hand by causing nerve compression and thus producing unpleasant and painful symptoms [1, 2, 5, 6, 9, 11, 16,

17, 19, 22, 23, 26], as happened in this case. Usually symptoms caused by different variations of the PLM can be relieved.

REFERENCES

1. Acikel C, Ulkur E, Karagoz H, Celikoz B (2007) Effort-related compression of median and ulnar nerves as a result of reversed three-headed and hypertrophied palmaris longus muscle with extension of Guyon's canal. *Scan J Plast Reconstr Surg Hand Surg*, 41: 45–47.
2. N. Barkáts (2014) Hypertrophy of palmaris longus muscle, a rare anatomic aberration, *Folia Morphol*. Vol. 74, No. 2, pp. 262–264. DOI: 10.5603/FM.2015.0040
3. Barkáts N, Nagy M (2013) Agenesis of palmaris longus muscle in representatives of Hungarian population of Slovakia. *Science Education New Dimension*, 2: 184–187.
4. Ceyhan O, Mavt A (1997) Distribution of agenesis of Palmaris longus muscle in 12 to 18 years old age groups. *Indian J Med Sci*, 51: 156–160.
5. Cope JM, Looney EM, Craig CA, Gawron R, Lampros R, Mahoney R (2009) Median nerve compression and the reversed palmaris longus. *Int J Anat Variations*, 2: 102–104.
6. De Smet L (2002) Median and ulnar nerve compression at the wrist caused by anomalous muscles. *Acta Orthopædica Belgica*, 68: 431–438.
7. Enye LA, Saalu LC, Osinubi AA (2010) The prevalence of agenesis of palmaris longus muscle amongst students in two lagos-based medical schools. *Int J Morphol*, 28: 849–854.
8. Gangata H (2009) The clinical surface anatomy anomalies of the palmaris longus muscle in the Black African population of Zimbabwe and a proposed new testing technique. *Clin Anat*, 22: 230–235.
9. Green MB (2006) Median nerve compression at the wrist caused by a reversed palmaris longus muscle. *Int J Surg*, 7: 9.
10. Hiz Ö, Ediz L, Fethi Ceylan M, Gezici E, Gülcü E, Erden M (2011) Prevalence of the absence of palmaris longus muscle assessed by a new examination test (Hiz-Ediz Test) in the population residing in the area of Van, Turkey. *J Clin Experimental Investigations*, 2: 254–259.
11. Lal RA, Raj S (2009) Guyons canal syndrome due to accessory palmaris longus muscle: aetiological classification: a case report. *Cases J*, 2: 9146.
12. Mishra S (2001) Alternative tests in demonstrating the presence of palmaris longus. *Indian J Plast. Surg*, 34: 12.
13. Park MJ, Namdari S, Yao J (2010) Anatomic variations of the palmaris longus muscle. *Am J Orthop*, 39: 89–94.
14. Paraskevas G, Tzaveas A, Natsis K, Kitsoulis P, Spyridakis I (2008) Failure of palmaris longus muscle duplication and its clinical application. *Folia Morphol*, 67: 150–153
15. Pushpakumar SB, Hanson RP, Carroll S (2004) The 'two finger' sign. Clinical examination of palmaris longus (PL) tendon. *Br J Plast Surg*, 57: 184–185.
16. Regan PJ, Roberts JO, Bailey BN (1988.) Ulnar nerve compression caused by a reversed palmaris longus muscle. *SJ Hand Surg Br*, 13: 406–407.
17. Regan PJ, Feldberg L, Bailey BN (1991) Accessory palmaris longus muscle causing ulnar nerve compression at the wrist. *J Hand Surg Am*, 16: 736–738.
18. Reimann AF, Daseler EH, Anson BJ, Beaton LE (1944) The palmaris longus muscle and tendon. A study of 1600 extremities. *Anat Rec*, 89: 495–505.
19. Robinson D, Aghasi MK, Halperin N (1989) Ulnar tunnel syndrome caused by an accessory palmaris muscle. *Orthop Rev*, 18: 345–347.
20. Salgado G, Cantin M, Inzunza O, Munoz A, Saez J, Macuer M (2011) Bilateral reversed palmaris longus muscle: a rare anatomical variation. *Folia Morphol*, 71: 52–55.
21. Schaeffer JP (1909) On the variations of the palmaris longus muscle. *Anat Rec*, 3: 275–278.
22. Schlafly B, Lister G (1987) Median nerve compression secondary to bifid reversed palmaris longus. *J Hand Surg Am*, 12: 371–373.
23. Schuurman AH, van Gils AP (2000) Reversed palmaris longus muscle on MRI: report of four cases. *Eur Radiol*, 10: 1242–1244.
24. Thompson JW, McBatts J, Danforth CH (1921) Hereditary and racial variations in the musculus palmaris longus. *Am J Phys Anthropol*, 4: 205–220.
25. Wehbe MA (1992) Tendon graft donor sites. *J Hand Surg Am*, 17: 1130–1132.
26. Yildiz M, Sener M, Aynaci O (2000) Three-headed reversed palmaris longus muscle: a case report and review of the literature. *Surg Radiol Anat*, 22: 217–219.
27. Zeiss J, Jakab E (1995) MR demonstration of an anomalous muscle in a patient with coexistent carpal and ulnar tunnel syndrome. Case report and literature summary. *Clin Imaging*, 19: 102–105.