

A Cadaveric Study On the Incidence and Association of the Absence of the Palmaris Longus Muscle and Flexor Digitorum Superficialis Tendon to The Little Finger

Geeta Anasuya D¹, Vijaianand M², Sobana M³, Anitha S⁴

¹Professor, Department of Anatomy, KMCH Institute of Health Sciences and Research, Coimbatore, Tamil Nadu, India. ²Professor & Head, Department of Anatomy, KMCH Institute of Health Sciences and Research, Coimbatore, Tamil Nadu, India. ³Tutor, Department of Anatomy, KMCH Institute of Health Sciences and Research, Coimbatore, Tamil Nadu, India. ⁴Statistician, Department of Community Medicine, KMCH Institute of Health Sciences and Research, Coimbatore, Tamil Nadu, India.

Abstract

Background: The palmaris longus (PL), a superficial forearm muscle, is frequently absent in humans due to its anatomical diversity. In reconstructive procedures, it is frequently utilized as a donor tendon. There is also variation in the Flexor Digitorum Superficialis (FDS) tendon to the little finger, which ranges from total absence to functional weakening. This has clinical implications in hand function, grip strength, and surgical planning. It is crucial for surgeons (tendon graft planning), anatomists (variation studies), and clinicians (functional assessment) to comprehend the co-existence or correlation between the lack of a palmaris longus and a flexor digitorum superficialis to the little finger. Nevertheless, there is a dearth of regional statistics, particularly for the cadaveric studies. The aim is to determine the frequency of absence of the Flexor Digitorum Superficialis tendon to the little finger and the Palmaris Longus muscle, as well as to evaluate any correlation between the two. **Material and Methods:** Palmaris longus was absent in nine forearms and the flexor digitorum superficialis tendon to the little finger on the left side of one hand in a male cadaver, according to observational research conducted on 42 cadavers during normal dissection for undergraduate students. **Results:** Palmaris longus was found in 75 forearms (89.3%) and absent in 9 forearms (10.7%). **Conclusion:** Understanding these differences would be crucial when performing surgery to correct tendon cuts.

Keywords: Absent Palmaris longus, flexor digitorum superficialis tendon to the little finger, Tendon transfer.

Received: 20 June 2026

Revised: 10 July 2026

Accepted: 23 July 2026

Published: 07 September 2026

INTRODUCTION

The palmaris longus muscle is a slender, fusiform muscle situated medially to the flexor carpi radialis. It originates from the medial epicondyle of the humerus and from the adjacent intermuscular septa and deep fascia. It descends as a lengthy tendon that passes anteriorly to the flexor retinaculum. Most of the tendon goes distally; however, a few fibers split off from it and mix with the transverse fibers of the retinaculum. The tendon expands into a flat sheath after passing through the retinaculum, and this sheath eventually merges with palmar aponeurosis.^[1] One of the most variable muscles in the human body is the palmaris longus, and numerous variations have been reported.^[2]

Tendon grafts can be helpful in a number of upper limb reconstructive procedures, lip augmentation, ptosis correction, and the treatment of facial palsy.^[3-5] Wehbe et al. came to the conclusion that the lack of palmaris longus is inherited, although genetic transmission was not demonstrated.^[6] Radiological, anatomical, and surgical research have described a variety of supernumerary and mutant muscles. The absence of Palmaris longus varies by sex, race, and side (left and right). A wide range of incidence was reported in the literature, with an overall absence rate of 16% unilateral and 9% bilateral. Additionally, research has

shown that PL variants are known to produce a variety of entrapment syndromes, including Dupuytren's contracture.^[7] The only muscle in the forearm's intermediate layer is the flexor digitorum superficialis. It originates from the radial and humeroulnar heads. They originate from the anterior oblique line of the radius and the medial epicondyle of the humerus. The palmar aspects of the index, middle, ring, and little fingers are attached to the four tendons of the flexor digitorum superficialis. Flexion of the wrist joint, intercarpal joints, carpometacarpal joints, metacarpophalangeal joints, and proximal interphalangeal joints is its primary action.^[1] Austin et al. in their study proposed that a variant of a shared distal FDS tendon to the ring and small fingers restricts independent proximal interphalangeal joint flexion of the little finger.^[8]

Address for correspondence: Dr. Geeta Anasuya D,
Professor, Department of Anatomy, KMCH Institute of Health Sciences and
Research, Coimbatore, Tamil Nadu, India.
E-mail: geetagee1@gmail.com

DOI:

10.21276/amit.2026.v13.i3.1009

How to cite this article: Anasuya DG, Vijaianand M, Sobana M, Anitha S. A cadaveric study on the incidence and association of the absence of the Palmaris Longus muscle and Flexor Digitorum Superficialis tendon to the little finger. Acta Med Int. 2026;13(3):12-16.

MATERIALS AND METHODS

During the routine dissection of 84 upper extremities of 42 embalmed cadavers of both sexes for undergraduate students in the Department of Anatomy, KMCH Institute of Health Sciences and Research, we observed variations of the palmaris longus and flexor digitorum superficialis tendons to the little finger.

Inclusion criteria: Well-preserved upper limbs of either gender available in the department as well as the upper limbs available during routine dissection of I MBBS students in KMCHHSR.

Exclusion criteria: Damaged limbs, congenital deformities of upper limbs

Standard dissection of the forearm and hand was performed following Cunningham's manual of practical anatomy. The flexor compartment of the forearm and palm has been dissected to reach the superficial flexors of the forearm. Later, these tendons were traced distally to the flexor retinaculum. The incision was extended to the palm to expose the superficial muscles of the palm. Anatomical variations were recorded with photographic and schematic documentation. Results were expressed as percentages & a chi-square test was done for categorical comparisons.

RESULTS

We observed differences in the flexor digitorum superficialis to the little finger and palmaris longus tendons among the 84 extremities that were dissected. Palmaris longus was found in 75 forearms (89.3%) and absent in 9 forearms (10.7%). The flexor digitorum superficialis tendon to the little finger was present in 83 hands (98.8%) and absent in 1 left hand (2.4%). Among 83 forearms with the FDS tendon present, the palmaris longus was present in 75 (90.4%) and absent in 8 (9.6%). The single hand with an absent FDS tendon also

lacked the Palmaris longus (100%). However, no statistically significant difference was observed between the incidence of these variations with a p-value of 0.341.

On the right side, Palmaris longus was present in 39 (92.2%) and absent in 3 (7.1%) forearms. On the left side, it was present in 36 (85.7%) and absent in 6 (14.3%). There was no significant association between the two sides with a p-value of 0.289. The flexor digitorum superficialis tendon to the little finger was present in all right hands (100%) and in 41 of 42 left hands (97.6%). It was absent in one left hand (2.4%). No statistically significant difference was observed between the incidence of these variations with a p value of 0.617 [Figure 1, 2, 3, 3a, 4].

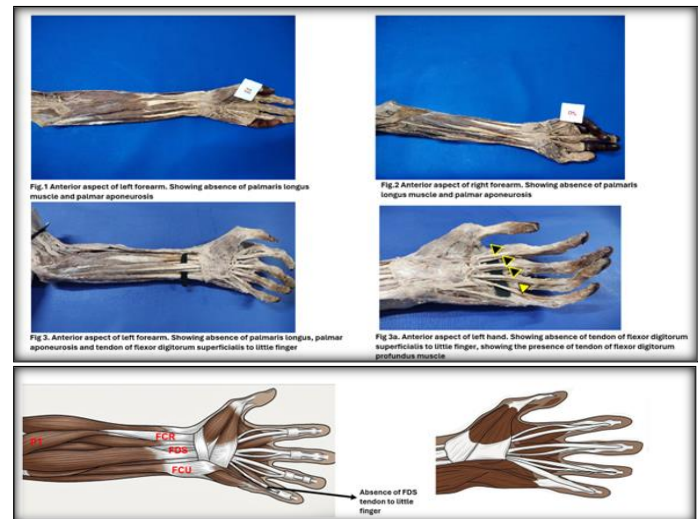


Figure 4: Schematic representation showing anterior aspect of left forearm and hand showing absence of palmaris longus and flexor digitorum superficialis tendon to little finger. PT – Pronator teres, FCR – Flexor carpi Radialis, FDS- Flexor digitorum superficialis, FCU - Flexor carpi Ulnaris.

Table 1: Summary of the Percentages of the PL Muscle Agenesis in Various Clinical and Cadaveric Studies

Author	Study population/sample size	Year	Cadaveric/ Clinical study	Incidence (%)
Kigera et al. [16]	East African n= 800	2011	Clinical	4.4
Morais et al. [17]	Brazilian n= 740	2012	Clinical	26.5
Offei et al.[18]	Ghana n= 210	2014	Clinical	3.8
Lamichhane et al.[19]	Filipino n= 503	2017	Clinical	17.5
Sharma et al. [20]	Nepalese n= 400	2019	Clinical	14.8
Lalit et al. [21]	North Indian n=62	2019	Cadaveric	11.30
Venkatapathy et al. [22]	South Indian n=300	2021	Clinical	32
C. M. Sadacharan et al. [23]	Indian American n=600	2022	Clinical	15.33
Kumar, Sambhav et al. [24]	North Indian n=32	2025	Cadaveric	9.4
Present study	South Indian N=42	2026	Cadaveric	10.7%

Table 2: Comparative Analysis of PL Agenesis and FDS Tendon Absence Across Previous Studies

Study and Type	Furnas et al 1973 (Cadaveric study) N=100	Shrewsbury & Kuczynski 1974 (Cadaveric study) N= 23	Kapoor et al. 2008 (Clinical study) N=1500	Agarwal et al. 2010 (Clinical study) N=385	Rajendiran et al. 2024 (Clinical study) N=400	Present study 2026 (Cadaver study) N=84
Absent Palmaris longus	-----	-----	10.9%	20.2%	6.5%	10.7%
Absent Flexor digitorum superficialis tendon little finger	6%	~30%	42%	16.1% Both 4.5%	18%	1.2%
Any association	Not studied	Not studied	Significant association	Significant association	No significant association	No significant association

DISCUSSION

Reversed palmaris longus muscle, bifid or trifid reversed digastric palmaris longus muscle with intermediate muscle belly, absence or duplication of palmaris longus muscle, triplication, accessory slips to hypothenar muscles, profundus palmaris longus muscle, and variations related to compression of the median or ulnar nerves or simulating soft tissue mass were among the variations of palmaris longus.^[9] As evolution changed, the flexor compartment muscles started to somewhat atrophy from the distal to the proximal end.^[10] As a result, the hand's intrinsic muscles began to act similarly to the palmaris longus. Palmaris longus partially deteriorated as a result, and palmar aponeurosis took its place in the hand. It was an easy option for tendon transplants due to its superficial position, appropriate diameter, sufficient length, and availability. During surgeries, it also aids in identifying the median nerve. Electromyographical tests of the median nerve and even wrist endoscopic procedures are challenging when the palmaris longus is absent.^[4] There is no synovial membrane in the Palmaris longus tendon. Its paratenon does not encourage gliding. Thus, it is the tendon that is most favored for reconstruction.^[11] Numerous tests, including Schaeffer's test, Thompson's test, Mishra's tests I & II, and Pushpa Kumar's test, have been documented to identify the presence of Palmaris longus in living patients.^[12] Flexor muscles of the forearm develop during the seventh week of intrauterine life from mesodermal condensation of somite dorsolateral cells, which then move to the limb bud. These mesenchymal cells then divide to generate the forearm's deep and superficial flexor muscles. The HOX gene controls the morphogenetic development of the palmaris longus tendon and muscle.^[13] From the somatic mesoderm of the myotomes, it grows into a skeletal muscle. The intrinsic factor and environmental cues control the pre-myogenic cells' migration, proliferation, and differentiation into muscle tissue. The absence of these signals and muscle regulatory factors during embryogenesis causes premature differentiation of myogenic cells, resulting in the agenesis or incomplete genesis of the corresponding muscles.^[14] These cells must be pre-committed to the myogenic lineage through the transcription factor Pax3.^[15] Columbus initially mentioned the lack of a palmaris longus muscle in his 1559 book *De Re Anatomica*.^[13] Palmaris longus absence varies around the world and even within a single nation.^[7] A rather common congenital defect is the absence of the little finger's flexor digitorum superficialis, which may occur with the lack of the palmaris longus. The flexor digitorum superficialis tendon and palmaris longus tendon are more frequently absent in different ethnic groups. In the present study, a summary of percentages of palmaris longus muscle agenesis in each study has been tabulated.^[16-19,21-24] According to D.K. Sharma et al.,^[20] there is a statistical correlation between the lack of the flexor digitorum superficialis to the little finger and the absence of the palmaris longus tendon, and unilateral absence is more prevalent than bilateral absence.^[11] However, Aakash Mugalur et al. in their study observed that there was a significant association between bilateral absence of palmaris

longus and flexor digitorum superficialis muscle.^[9]

According to Gupta et al.'s research, professional and high-caliber musicians depend heavily on the operation of their FDS tendons.^[25] The evaluation of hand trauma and appropriate planning for the harvesting of the little finger FDS tendon depend on an understanding of the variations of FDS. Anomalies like a single, unilateral lack of the flexor digitorum superficialis tendon to the little finger.^[26] The absence of the FDS tendon to the little finger might be confusing when assessing hand injuries. One left forearm in the current study lacked flexor digitorum superficialis and palmaris longus [Figure 3a]. During surgical hand injury repair, Carter J. T. et al. discovered a congenital lack of a bilateral little finger flexor digitorum superficialis tendon.^[27] According to Aakash Mugalur's research, there is considerable variation in the flexor digitorum superficialis and palmaris longus tendons to the little finger, both between nations and within the same nation.^[9] In the present study, the association between the palmaris longus and FDS tendon to the little finger was compared between clinical and cadaveric studies [Table 2]. The Furnas cadaveric study examined anatomical differences of the flexor digitorum superficialis (FDS), the tendon that flexes the middle knuckles of the fingers, by directly dissecting 100 cadaver forearms. The study showed a 6% absence rate, offering conclusive, tangible evidence that a tiny portion of people are born without this particular forearm tendon.^[28] The architecture, variations, and functional morphology of the flexor digitorum superficialis (FDS) tendons in the human hand were examined in cadaveric research by M.M. Shrewsbury and K. Kuczynski. The study highlights the morphological variability of the FDS and its surgical relevance, and it is frequently quoted in hand anatomy and orthopedics.^[29] The flexor digitorum superficialis (FDS) tendon of the little finger was gone in 42% of cases, while the palmaris longus (PL) tendon was bilaterally absent in about 17.2% of people, according to a study by Kapoor et al. The results confirm that the absence of these tendons has no effect on hand function and show no statistical association between the absences.^[30] The palmaris longus (PL) tendon is absent in 3.3% of people bilaterally and 16.9% unilaterally, with a larger absence incidence in males, according to a 2010 study by Agarwal et al. The study found a strong correlation between a weak or absent functional flexor digitorum superficialis (FDS) of the little finger and the lack of the PL tendon, with a higher unilateral absence on the left side.^[31] The palmaris longus (PL) tendon was gone in 6.5% of upper limbs, while the functional flexor digitorum superficialis (FDS) of the little finger was lost in 18% of instances, according to Rajendiran et al. The study found no statistically significant relationship between the absence of the two tendons, although it did show a modest right-side dominance for both absences.^[32]

The alterations in the typical development of skeletal muscle typically entail specific mutations in the genes linked to muscle growth. The alterations may be intermittent, associated with genetic disorders, or a component of specific dysmorphic syndromes. Some dysmorphic syndromes, such as Holt-Oram syndrome, Fryns syndrome, and DiGeorge syndrome or chromosome 22q11.2 syndrome, are linked to the lack of skeletal muscles, such as PL.^[33] It is also the source of graft for the reconstruction of lateral collateral or ulnar collateral ligaments of the elbow joint.^[34] When repairing tendon lacerations surgically,

it's crucial to identify these abnormalities. When treating a finger injury, the treating surgeon should take into account both digits.^[35]

Limitations of the study: A bigger sample size would offer more reliable data to investigate potential differences based on gender, ancestry, and other demographic characteristics, as the comparatively small sample size restricts the generalizability of our findings. To verify that the absence of the palmaris longus muscle does not result in any functional loss of the hand and wrist, larger sample sizes and more diverse populations must be included in future research.

CONCLUSION

Understanding muscle variations is crucial since they can be mistaken for soft tissue abnormalities. Both radiologists and surgeons may find these findings of the current study helpful for accurate diagnosis and hand treatments. Palmaris longus can be easily retrieved for a variety of reconstructive procedures because of its superficial placement. Since PL is the preferred option for autograft tendon transfer, its existence must be verified prior to orthopedic and plastic operations. The lack of PL and FDS tendons should be considered in the occurrence of any forearm injury and intervention. In order to identify anatomical problems before any operations, careful testing such as classical and alternative tests by physical examination, ultrasound, or MRI must be carried out. This is because the PL and FDS demonstrated a high degree of morphological variability.

Acknowledgements: We sincerely thank Kirti Sankar, Phase III, Part 1 MBBS student, KMCH Institute of Health Sciences and Research, Coimbatore, for the outstanding anatomical illustrations, whose precision and artistic excellence greatly enhanced the understanding of the abnormalities detected.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Strandring. S. Gray's Anatomy: The Anatomical Basis of Clinical Practice 41st edition. Newyork : Churchill Livingstone 2008; 1410- 42.
- Clemente CD. Anatomy of the Human body. 30 th Ed. Philadelphia: Lea and Febiger ;1985.
- Davidson BA (1995) Lip augmentation using the palmaris longus tendon. *Plast Reconstr Surg* 95, 1108 – 1110.
- Suyashi S. Anatomic Variant of Retrogressive Palmaris Longus: A Case Report. *Int J Anat Var*.2021;15(4):169-170.
- Kurihara K, Kojima T, Marumo E (1984) Frontalis suspension for blepharoptosis using palmaris longus tendon. *Ann Plast Surg* 13, 274-278
- Wehbe MA (1992). Tendon graft donor sites. *J Hand Surg Am* 17, 1130-1132.
- Powell BW, Mc Lean NR, Jeffs JV (1986) The incidence of a palmaris longus tendon in pateients with Dupuytren's disease. *J Hand Surg Br* 11, 382–384.
- Austin GJ, Leslie BM, Ruby LK: Variations of the flexor digitorum superficialis of the small finger. *J Hand Surg*.1989, 14: 262-267.
- Mugalur A, Shahane SM, Samant A, Pathak AC, Patil A & Reddy R (2015) Anatomic variation of palmaris longus and flexor digitorum superficialis of little finger in Indian population SICOT J, 1,5
- Kumar P. Duplication of palmaris longus muscle. *Int J Anat Var*. 2013;6:207-9.
- Thomas A, Alapatti VK. A case report of unilateral absence of palmaris longus. *Int J Health Sci Res*.2019; 9(7): 285-288
- Fatih Irmak, Aysin Karasoy Yesilada, Selami Serhat Sirvan, Kamuran Zeynep Sevim. Prevalence of Muscular and Tendinous variations of Flexor Digitorum Superficialis and Absence of Palmaris Longus Muscle in Turkey : A Population Study. *The Medical Bulletin of Sisli Etfal Hospital*,2017; 51(4): 303 -308
- Angelini Junior LC, Angelini FB, de Oliveria B. Use of the tendon of the palmaris palmaris longus muscle in surgical procedures: Study on cadavers. *Acta Ortop Bras*.2012; 20 (4): 226-9.
- Neha, Krishna H. Unusual bilateral sensory innervation of the dorsum of hand by lateral antebrachial cutaneous nerve: a case report. *Anat Cell Biol* 2018;51:66-69.
- Goulding M, Lumsden A, Paquette AJ.Regulation of Pax-3 expression in the dermomyotome and its role in muscle development. *Development* 1994;120:957-971.
- Kigera JW, Mukwaya S. Frequency of agenesis Palmaris longus through clinical examination--an East African study. *PLoS One*. 2011;6(12):e28997. doi: 10.1371/journal.pone.0028997
- Morais MA, Gomes MS, Helrigle C, Malysz T. Prevalence of agenesis of the palmaris longus muscle in Brazil and its clinics correlation. *Braz J Morphol Sci*. 2012;29(4):238–242.
- Offei EB, Abledu JK. Prevalence of agenesis of palmaris longus muscle and its association with sex, body side, handedness and other anomalies of the forearm in a student population in Ghana. *Rawal Medical Journal*. 2014;39(2):203–207
- Lamichhane PS, Sharma K, Lamichhane N. Study on palmaris longus muscle tendon agenesis among first year Filipino medical students. *J Gandaki Med Coll-Nepal*. 2017;10(1):18–21.
- Sharma DK, Shukla CK, Sharma V. Clinical assessment of absence of palmaris longus muscle and its association with gender, body sides, handedness and other neighbouring anomalies in a population of central India. *J Anat Soc India*. 2012; 61:13-20.
- Lalit M, Piplani S, Mahajan A, Verma P. Morphological analysis of palmaris longus muscle and its anatomic variations: a cadaveric study in north India. *Ital J Anat Embryol* 2019;124:443-454.
- Venkatapathy S, Bhargavan R. Clinical assessment of existence of palmaris longus muscle among South Indian population. *J Hand Surg Asian Pac Vol*. 2020;25(2):189–193.
- Sadacharan CM, Packirisamy V. Prevalence of the palmaris longus muscle in Indian American population through clinical evaluation. *Muscles Ligaments Tendons J*. 2022;12(1):65–72.
- Sambhav K, Krishna H, Singh P, Bhardwaj N, Ghatak S. Anatomical variations of palmaris longus muscle and its clinical significance. *Maedica*. 2025;20(3):560–565
- Gupta A, Kumar V: Bilateral Absence of flexor digitorum superficialis (FDS) tendon of the little finger: Clinical significance. *J Clin Diagn Res*.2014, 8:135-136.
- Townley WA, Swan MC, Dunn RL: Congenital absence of flexor digitorum superficialis: implications for assessment of little finger lacerations. *J Hand Surg Eur Vol*.2010, 35:417-418.
- Carter J T, Polmear M, Herrera F, Gilberto Gonzalez: (February 11,2020) Bilateral Congenital Absence of Small Finger Flexor Digitorum Superficialis Tendons in a Trauma Patient. *Cureus* 12 (2): e6948.
- Furnas DW. Muscle-tendon variations in the flexor compartment of the wrist. *Plast Reconstr Surg*. 1965;36(3):320–324.

29. Shrewsbury MM, Kuczynski K. Flexor digitorum superficialis tendon in the fingers of the human hand. *Hand*. 1974;6(2):121–133.
30. Kapoor SK, Sharma S, Singh B. Co-existence of palmaris longus and flexor digitorum superficialis variation. *Indian J Orthop*. 2008;42(3):337–341.
31. Agarwal P. Absence of the palmaris longus tendon in Indian population. *Indian J Orthop*. 2010;44(2):212–215.
32. Rajendiran S, et al. Prevalence of the absence of the palmaris longus and functional flexor digitorum superficialis of the little finger in the Indian population. *Indian J Plast Surg*. 2024;57(04):282–287
33. Muntoni F, Brown S, Sewry C, Patel K. Muscle development genes: their relevance in neuromuscular disorders. *Neuromuscul Disord*. 2002;12:438–446.
34. Vernet E, Bacle G, Marteau E, et al. Lateral elbow ligamentoplasty by autologous tendon graft in posterolateral rotatory instability: Results in 18 cases at a mean 5 years' follow-up. *OrthoTrauma: Surg Res* 2015;101:S199-S202.
35. Bowman P, Johnson L, Chiapetta A, Mitchell A, Belusko E. The clinical impact of the presence or absence of the fifth finger flexor digitorum superficialis on grip strength. *J Hand Ther*. 2003;16:245–8.