

# A Study of Absence of Palmaris Longus Tendon and its Association with other Anatomical Anomalies - A Central Indian Population Study

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**Abstract:** ***Introduction:** Palmaris Longus is considered to be a dispensible tendon because its absence dose not significantly affects the function of the wrist. It assumes great importance when used as a donor tendon for transfer or transplant. In this study an attempt has been made to correlate the absence of Palmaris longus with other anatomical anomalies. **Material and Methods:** The presence of Palmaris longus was clinically determined in 300 normal Indian men and women using the standard technique. Allen's test was done to assess the palmar arches. All the subjects were examined for the presence of Flexor digitorum superficialis (FDS) to the little finger. **Results:** The overall prevalence of absence of the Palmaris longus was 26.9%.*

**Keywords:** Palmaris longus, Indian Population, Tendon Grafts, Allens Test, Flexor digitorum superficialis

## 1. Introduction

Palmaris longus muscle is located between Flexor carpi radialis and flexor carpi Ulnaris muscles. It is slender, fusiform in shape and arises from the common flexor origin around the medial epicondyle. It ends as a slender flattened tendon passing superficially over the transverse carpal ligament and into the palmar aponeurosis. Palmaris longus is considered to be a dispensible tendon because its absence does not significantly affect the function of wrist. It is therefore very useful in orthopedics hand and reconstructive surgery. It is commonly used by hand surgeons for tendon transfers, second stage tendon reconstruction, pulley reconstruction as well as tendon grafts.<sup>13</sup> plastic surgeons utilize the Palmaris longus tendon in restoration of lip and chin defects.<sup>2,4</sup> it is also used in various combinations to repair oncologic defects of head and neck, congenital ptosis is successfully corrected using Palmaris longus to suspend Frontalis<sup>5</sup>. It is used in arthritis of the thumb with trapezium resection and in camitz opponensplasty for acute thenar muscle injury<sup>6</sup>. Lip augmentation is carried out using Palmaris longus muscle and its tendon.<sup>2,4</sup> Some authors suggest that apart from its ethnic variations, the absence of Palmaris longus is more common in women, bilateral absence is more common, and that unilateral absence occurs more frequently on the left side<sup>15</sup>. some authors correlated the absence of the Palmaris longus with other anomalies, like an anomalous superficial palmar arch, and absence of the plantaris.<sup>11,19</sup> A clinical study has even attempted to explore the relationship between the functional absence of the flexor digitorum superficialis (FDS) to the little finger and the absence of the Palmaris longus.<sup>10</sup> Very few studies have reported the prevalence of Palmaris longus absence exclusively in Indian subjects.<sup>16</sup> Many techniques for clinically determining the presence of the Palmaris longus have been described in the literature.<sup>8,12</sup>

In the present study 300 Indian subjects were examined (600 upper limbs). The study includes the prevalence of absence of Palmaris longus and its correlation with other anatomical variations like the examination of flexor

digitorum superficialis (FDS) to the little finger, and the assessment of palmar arches.

## 2. Material and Methods

For the purpose of the study 300 Indian subjects (150 males, 150 females) were randomly selected. Individuals who had a history of injury to upper limbs, those with any deformity or congenital anomaly of the upper limbs, and those too young to co-operate in the clinical test for Palmaris longus or the examination of flexor digitorum superficialis (FDS) to the little finger or the implementation of Allen's test (less than five years of age) were excluded from the study.

The examination was carried out in three parts. The first part of the examination assessed the presence of the Palmaris longus. The subject was initially asked to do the standard test for the assessment of the Palmaris longus tendon. If the tendon was not visualized or palpable four additional tests were done to confirm the absence.

- 1) Standard test (Schaeffer's test)<sup>14</sup>: The subject is asked to oppose the thumb to the little finger and then flex the wrist. Four additional tests to confirm the absence of Palmaris longus are
  - a) Thomson's test<sup>17</sup>,
  - b) Mishra's test I<sup>18</sup>,
  - c) Mishra's test 2<sup>8</sup>,
  - d) Pushpakumar's two finger sign method<sup>12</sup>

The second part of the examination assessed the functional ability of the Flexor digitorum superficialis (FDS) tendon to flex the proximal interphalangeal joint (PIPJ) of little finger. First, full and free range of motion of the PIPJ of both little fingers was confirmed. FDS function in the little finger was assessed by standard and modified tests and divided into independent, common and absent function.<sup>10</sup> Independent function was defined as the ability to flex the PIPJ of the little finger >90° with the PIPJ of the other fingers extended, while common function was defined as the ability to flex the PIPJ of the little finger >90° only

when the ring finger PIPJ was allowed to flex simultaneously. Absent function was the inability to flex the PIPJ  $>90^\circ$  even when flexion of the ring finger PIPJ was allowed. The third part of the examination assessed the completeness of the palmar arch in the hand using Allen's test<sup>1</sup>. This test first described in 1929 was initially used to evaluate occlusive disease in the ulnar artery distribution and is frequently used as a bedside evaluation of collateral circulation of hand. The Radial and Ulnar artery were occluded at the wrist between the thumb and fingers. The subject was asked to make a tightly clenched fist several times to exsanguinate the palmar skin. The subject then opened his or her fingers avoiding hyperextension. The ulnar artery was then released and the time taken for adequate capillary refill was noted. The test was defined as "normal" if the capillary refill time was less than 5 seconds and abnormal if more than 5 seconds.



Figure 1: Showing bilateral absence of Palmaris longus

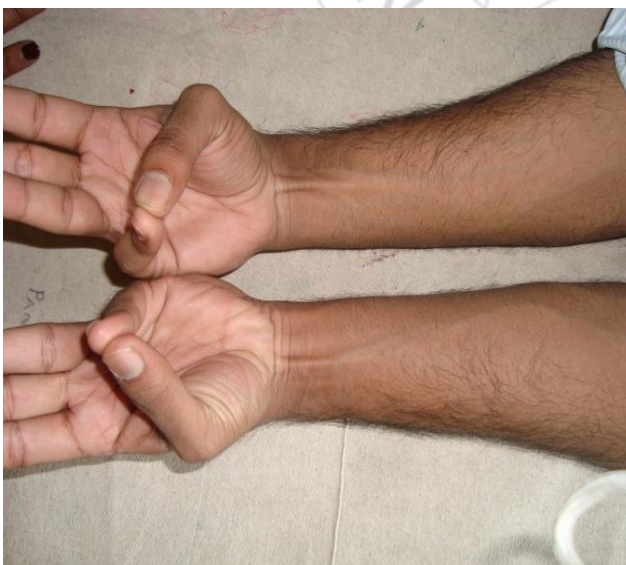


Figure 2: Showing bilateral presence of Palmaris longus

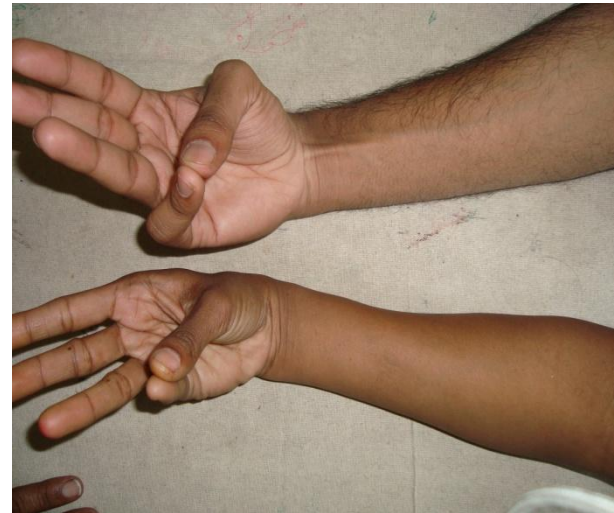


Figure 3: Showing presence & absence of Palmaris longus

### 3. Results

Out of 300 subjects (150 males, 150 females) 15 subjects were left hand dominant, average age was 32.68 yrs (range 7-74 yrs). 40 subjects (13.3%) were found to have bilateral absence of the Palmaris longus (PL) tendon. (95% CI 9-16%). 41 subjects (13.7%) had a unilateral absence of the tendon. (95% CI 10-18%). Of this group the tendon was absent on the right side in 15 subjects. 26 subjects had absence of the tendon on the left. Of the subjects with bilateral absence of PL 14 were males and 26 females. Of these with unilateral absence, 19 male subject and 22 female subjects were affected.

Table 1

PL Tendon absence	Males (150)	Right	Left
Unilateral	19	8	11
Bilateral	14	-	-

Table 2

PL Tendon absence	females (150)	Right	Left
Unilateral	22	7	15
Bilateral	26	-	-

On testing for Flexor digitorum superficialis (FDS) functionality of the little finger, it was found that out of 600 little finger studied, FDS was absent in 2 fingers (0.3%), had a common function in 278 fingers (46.33%) and independent function in 320 fingers (53%). The subjects with bilateral absence of the PL did not show concomitant absence of the FDS to the little finger.

Table 3

Function of FDS (males)

Absent		Common		Independent	
Rt	Lt	Rt	Lt	Rt	Lt
1	1	68	56	82	92

Function of FDS (females)

Absent		Common		Independent	
Rt	Lt	Rt	Lt	Rt	Lt
0	0	86	68	66	80



Allen's test was performed on all the subjects (600 hands). This test indicated a complete palmar arch in 591 hands. An incomplete palmar arch was found in 9 hands. (Right hand 4 males and 2 females; left hand 1 male and 2 females.) Only 1 female subject with bilateral absence of PL showed abnormal Allen's test i.e. incomplete palmar arch on both sides. 1 male with unilateral absence of left PL showed incomplete palmar arch on right side. 1 male with absence of PL showed abnormal Allen's test on left side.

Table 5

Males		Females	
Rt	Lt	Rt	Lt
4	1	2	2

#### 4. Discussion

Many surgeons agree that the PL tendon is the first choice as a donor tendon because it fulfills the necessary requirement of length, diameter and availability and can be used without producing any functional deformity.<sup>12</sup> It is clear that prevalence of absence of PL varies depending on the populations. Caucasians have a high rate of absence which is between 12-24%<sup>13</sup> while Singaporean Chinese have a low rate of absence (4.6%). The study in Chinese population by wagenseil cited the figure as 2.8% while Amazon Indians were noted to have a 3.7% absence of PL. the Malayas have a prevalence of PL absence of 11.3% followed by Indians at 10.7% and the Chinese at 6%. A study of PL agenesis by Sudhir Kapoor et.al showed the prevalence of PL agenesis to be 17.2% (8% bilateral and 9.2% unilateral) in Indian population. The present study revealed the absence of PL to be 26.9% (13.3% bilateral and 13.6% unilateral). The unilateral absence of PL was not found to be statistically significant ( $p=0.61$ ) unlike the bilateral absence of PL between males and females which was found to be statistically significant ( $p=0.04$ ). The bilateral absence of PL between males and females on Left and right side was not statistically significant ( $P=0.41$ ,  $P=0.79$ ) respectively.

#### Association of absence of PL with other anatomical structures

In the present study when the FDS functionality of little finger was assessed it was found that out of 600 little finger only 2 fingers showed FDS absence but the subjects with bilateral or unilateral absence of PL did not show concomitant absence of FDS to the little finger. The common function of FDS to the little finger on right side between male and female was found to be statistically significant ( $P=0.03$ ) whereas on left side it was not statistically significant ( $P=0.15$ ). The independent function on right side between male and female was not significant ( $P=0.06$ ) also on left side it was not significant ( $p=0.16$ ). Allen's test was performed on all the subjects (600 hands), only one female subject with bilateral absence of PL showed abnormal Allen's test i.e. incomplete palmar arch on both sides.

#### 5. Conclusion

Clinical testing of PL on 300 subjects (150 males and 150 females) revealed unilateral absence of 13.6% and bilateral

absence of 13.3% in the Indian population. No statistically significant correlation was found between the tendon absence and gender or body side. The prevalence of absence of FDS to the little finger in Indian population is 0.3% which is lower as compared to other studies in Chinese population<sup>14</sup>. There seems to be no association between the absence of the PL and other anatomical structures like the FDS to the little finger. There seemed to be no association between absent PL and the superficial palmar arch.

#### References

- [1] Cable DG, Mullany CJ, Schaff HV. The Allen's test. *Ann. Thorac surg.* 1999;67:876-877.
- [2] Carroll CM, Pathak I, et al. Reconstruction of total lower lip and chin defects using the composite radial forearm Palmaris longus tendon free flap. *Arch facial plast surg* 2000; 2(1):53-6.
- [3] Chauhan R. Atypical innervation of Palmaris longus- a case report. *J. Anat.soc.India* 52(2) 171-173 (2003).
- [4] Davidson B.A. lip augmentation using the Palmaris longus tendon. *Plast Recons surg.* 1995; 95:1108-10.
- [5] Lam D.S.G, NG, J.S.K Chang, et al (1998) Autogenous Palmaris longus tendon as frontalis suspension material for ptosis correction in children. *American journal of Ophthalmology.* 126(1):109-115.
- [6] Lin C.H,wei F.C (2000) Immediate Camitz opponensplasty in acute thenar muscle injury. *Annals of plastic surgery* 44. (3): 270-276.
- [7] Machado AB Didio LJ, frequency of the musculus Palmaris longus studied in vivo in some Amazon Indians. *Am J Phys Anthropol* 1967; 27: 11-20.
- [8] Mishra S. Alternating tests in demonstrating the presence of Palmaris longus. *Indian J plas surg* 2001; 34:12
- [9] NW Thompson, BJ Mockford, GW Cran, Absence of the Palmaris longus muscle : a population study, *The ulster Medical journal*, volume 70,no.1,pp 22-24,May 2001.
- [10] NW Thompson, BJ Mockford et al, Functional absence of flexor digitorum superficialis to the little finger and absence of Palmaris longus -is there a link? *J hand surg(Br)*2002;7:433-4
- [11] O'Sullivan E, Mitchell BS. Association of the absence of the Palmaris longus tendon with an anomalous superficial palmar arch in the human hand. *J Anat* 2002;201:405-8. Erratum in *J Anat* 2003;202; 253.
- [12] Pushpakumar SB, Hanson RP, Carroll S. The two finger sign. Clinical examination of Palmaris longus (PL) tendon *Br. J plas surg* 2004; 57: 184-5
- [13] SA Roohi, L Choon-sian, A Shalimar et al, A study on the absence of Palmaris longus in a Multiracial population, *Malaysian orthopaedic journal* 2007 vol.1 No.1
- [14] Sandeep J Sebestian et al, Clinical Assessment of absence of the Palmaris longus and its association with other Anatomical Anomalies. A Chinese population study *Ann Acad Med Singapore* 2006; 35; 249-53.
- [15] Schaeffer JP. On the variations of the Palmaris longus muscle. *Anat Rec* 1909; 3: 275-8.
- [16] Sudhir Kapoor, Akshay Tiwari et al, Clinical relevance of Palmaris longus agenesis: common anatomical

aberration. Anatomical science international (2008)  
83, 45-48.

- [17] Thompson JW, MC Batts J, Danforth CH. Hereditary and racial variations in the musculus Palmaris longus. Am J phys Anthrop 1921; 4: 205-20 1
- [18] Troha F, Baibak GJ, Kelleher J.C Frequency of the Palmaris longus tendon in North American Caucasians. Ann plast surg 1990: 25: 477-8.
- [19] Wehbe M.A (1992) tendon graft donor sites, journal of Hand surgery 17: 1130-1132.

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