



Research Article

STUDY OF AGENESIS OF THE PALMARIS LONGUS TENDON IN TWO INDIAN POPULATIONS - A SAMPLING METHOD

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ABSTRACT

The presence or absence of the tendon Palmaris longus (PL) is a study of growing importance due to its use in tendon graft surgeries and its possible link to evolution. It is estimated that its agenesis is prevalent in about 14% of the general population. The present study aims at determining the prevalence of absence of Palmaris longus (PL) among two ethnic groups within Tamilnadu, South India – the South Indians and the Northeast Indians.

Keywords: Evolution, Palmaris longus, South India, Tendon.

INTRODUCTION

The Palmaris longus is a muscle visible as a small tendon between the flexor carpi radialis and the flexor carpi ulnaris, although it is not always present. It is absent in about 14 percent of the population; however, this number varies greatly in African, Asian, and Native American populations (Sebastin *et al.*, 2005). Absence of the palmaris longus does have an effect on grip strength (Sebastin *et al.*, 2005).

The Palmaris longus (PL) muscle is a slender, superficial flexor muscle of the forearm whose presence is anatomically highly variable and in many cases absent, either unilaterally or bilaterally. The presence of the PL can be determined through non-invasive and standard physical examination of the volar wrist (Erić *et al.*, 2011; Kose *et al.*, 2009). Several exams have been described which test for the PL, the standard being Schaeffer's test in which the patient joins the thumb to little finger while flexing the wrist (Oluyemi Kayode *et al.*, 2008). It has been suggested that the palmaris longus contributes to the strength of thumb abduction and may provide an advantage to sports that require hand grip (Fowlie & Pratten, 2012; Gangata, 2009) however, most studies have shown that absence of the PL is not associated with any significant physical or functional deficits, and therefore, the PL is frequently

harvested for use in many different hand, reconstructive, and orthopaedic surgeries (Kose *et al.*, 2009). The PL has a characteristically short belly and long tendon, making it an ideal donor for tendon grafts for secondary tendon reconstruction, tendon transfers, and other reconstructive efforts (Singh *et al.*, 2012).

Palmaris longus is an active muscle in non-human primates used for prehensile progression from tree to tree. PL is found to be present in orangutan, but is variably absent in chimpanzee and gorilla. Phylogenetically, PL is classified as a retrogressive muscle in the human body i.e., a short muscle belly proximally with long tendon distally. Subjected to numerous evolutionary influences, the muscle may be absent, double or with anomalous insertions. Very rarely the PL shows proximally the tendon and distally the muscle belly. The agenesis of PL in human appears to be hereditary but its genetic transmission is not clear (Sankar *et al.*, 2011).

Even though the PL carries a lot of clinical importance, considering its prospective uses; information about its presence/absence is still not available from many parts of the country as well as the world. Considering the pragmatic value of the muscle, the present study was undertaken to determine the presence/absence of the PL in a population group located in South India.

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MATERIALS AND METHODS

The present study was undertaken on subjects who included the students and staff of the college to investigate regarding the PL absence/presence. The exclusion criteria included subjects with trauma, any surgery done prior to the examination and injuries to the concerned area. All the subjects were examined for the absence or presence of PL utilizing certain tests as mentioned below.

a) Schaffer's Test: This is the standard test for the assessment of the Palmaris longus tendon. Each of the subjects was asked to oppose the thumb to the little finger and then flexes the wrist slightly. If the Schaffer's test failed to demonstrate a PL tendon, it was considered absent.

b) Thompson's test: The subjects were asked to make a fist and then flex the wrist and finally the thumb is opposed and flexed over the fingers.

c) Pushpakumar's test: The subject was asked to fully extend the index finger and middle finger, the wrist and other fingers are flexed and finally the thumb is fully opposed and flexed.

d) Mishra's test 2: The subjects were asked to abduct the thumb against resistance with the wrist in slight palmar flexion.

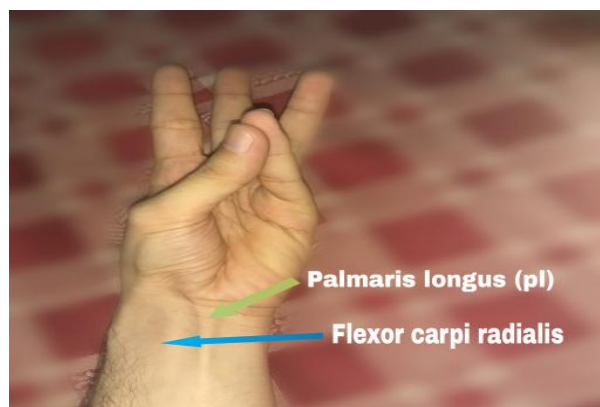
A group of random male volunteers (north-east Indians and south Indians) of age group 18 to 30 years from Chennai, Tamilnadu, India were randomly used for this study. Those who were having any deformities or injury in the upper extremity were strictly excluded from the present study. In this present study, the prevalence of presence or absence of PL was determined by series of tendon examination techniques described by Schaeffer's test, Thompson's fist, Mishra's 2nd test, and Pushpakumar two finger sign.

SAMPLE COLLECTION

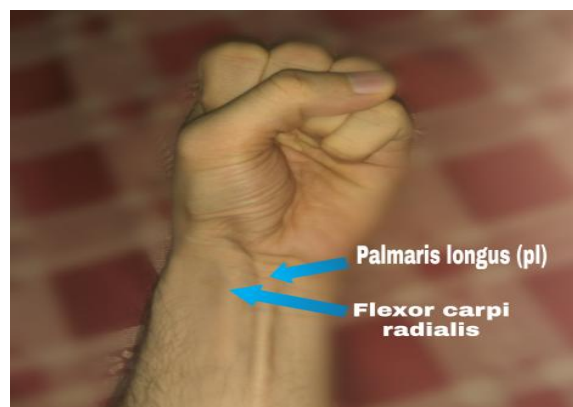
Most of the samples pertaining to the present study were collected in the library of the Zoology department by asking the volunteers to perform the tests and photographing their hands (Figure 1), few of the samples were collected via social media networking sites like Whatsapp and Facebook. Photos were taken of both the hands of an individual such that the position of the fingers, wrist and the fore arm were visible (Figure 2-3). Four photos were taken of the left hand and four photos of the right hand, a total of eight photos were obtained from each volunteer (Figure 4-5). The collected data was tabulated such that a photo showing agenesis of Palmaris longus was recorded as “-” and a photo showing the presence of Palmaris longus was recorded as a “+”.



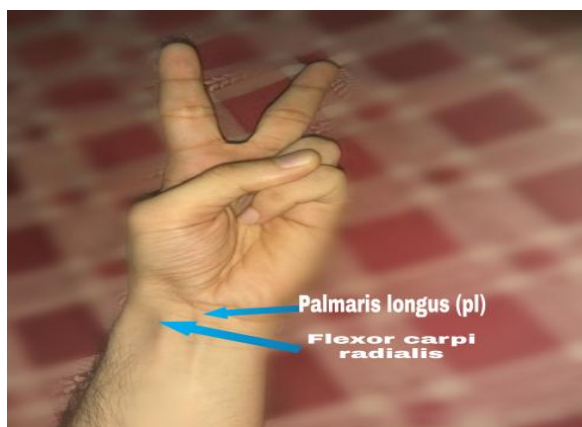
Figure 1. Sample collection.



Schaefer's test.



Thompson's fist test



Pushpakumar's two finger test.



Mishra's test 2

Figure 2. Photos showing the methods.



Schaeffer's test



Thompson's fist test



Pushpakumar's test



Mishra's test

Figure 3. South Indian sample showing bilateral agenesis.



Schaefer's test



Thompson's fist test



Pushpakumar's two finger test



Mishra's ii test

Figure 4. South Indian sample showing unilateral agenesis in the left hand.



Schaeffer's test



Thompson's fist test



Pushpakumar's two finger test



Mishra's ii test

Figure 5. South Indian sample showing agenesis in the right hand.

OBSERVATIONS

Out of the 68 south Indian Tamilian samples, 19 (27.9%) showed agenesis. Out of the 19, 6 (8.8% of the total sample) showed bilateral agenesis, 9 (13.24% of the total

sample) showed unilateral agenesis in the left hand and 4 (5.88% of the total population) showed unilateral agenesis in the right hand (Table 1, Figure 6). Out of the 60 Northeast Indian samples, none showed agenesis (Table 2).

Table 1. Tamilian (South Indian) males.

	Schaffer's test		Thompson's fist test		Pushpa Kumar's 2 finger test		Mishra's test II	
	Left	Right	Left	Right	Left	Right	Left	Right
1	-	-	-	-	-	+	-	+
2	+	+	+	+	+	+	+	+
3	-	-	-	-	-	-	-	-
4	+	-	+	+	+	+	+	+
5	+	+	+	+	+	+	+	+
6	+	+	+	+	+	+	+	+
7	-	+	+	+	+	+	+	+
8	-	-	-	-	-	-	-	-
9	+	-	+	-	+	-	+	-
10	+	+	+	+	+	+	+	+
11	+	+	+	+	+	+	+	+
12	-	-	-	-	+	-	+	-
13	-	+	+	+	-	+	-	+
14	-	+	-	+	-	+	+	+
15	+	+	+	+	+	+	+	+
16	+	+	+	+	+	+	+	+
17	+	+	+	+	+	+	+	+
18	+	+	+	+	+	+	+	+
19	-	+	-	+	-	+	-	+
20	+	+	+	+	+	+	+	+
21	+	+	+	+	+	+	+	+
22	+	+	+	+	+	+	+	+
23	+	+	+	+	+	+	+	+
24	+	+	+	+	+	+	+	+
25	-	-	-	-	-	-	-	-
26	-	+	-	+	-	+	-	-
27	-	-	-	-	-	-	-	-
28	+	+	+	+	+	+	+	+
29	+	+	+	+	+	+	+	+
30	-	+	-	+	-	+	-	+
31	+	+	+	+	+	+	+	+
32	-	-	-	-	-	-	-	-
33	+	-	+	-	+	-	+	-
34	+	+	+	+	+	+	+	+
35	+	+	+	+	+	+	+	+
36	+	-	+	-	+	-	+	-
37	+	+	+	+	+	+	+	+
38	+	+	+	+	+	+	+	+
39	+	+	+	+	+	+	+	+

40	-	+	-	+	-	+	-	+
41	-	+	-	-	-	+	-	+
42	+	+	+	+	+	+	+	+
43	-	-	+	+	-	-	-	+
44	+	+	+	-	+	+	+	-
45	+	+	+	+	+	+	+	+
46	-	+	-	+	-	+	-	+
47	+	+	+	+	+	+	+	+
48	+	+	+	+	+	+	+	+
49	+	+	+	+	+	+	+	+
50	+	+	+	+	+	+	+	+
51	-	+	-	+	-	+	-	+
52	+	+	+	+	+	+	+	+
53	+	+	+	+	+	+	+	+
54	+	+	+	+	+	+	+	+
55	+	+	+	+	+	+	+	+
56	+	+	+	+	+	+	+	+
57	+	+	+	+	+	+	+	+
58	+	+	+	+	+	+	+	+
59	+	+	+	+	+	+	+	+
60	+	+	+	+	+	+	+	+
61	+	+	+	+	+	+	+	+
62	+	+	+	+	+	+	+	+
63	+	+	+	+	+	+	+	+
64	+	+	+	+	+	+	+	+
65	+	+	+	+	+	+	+	+
66	+	+	+	+	+	+	+	+
67	+	+	+	+	+	+	+	+
68	-	-	-	-	-	-	-	-

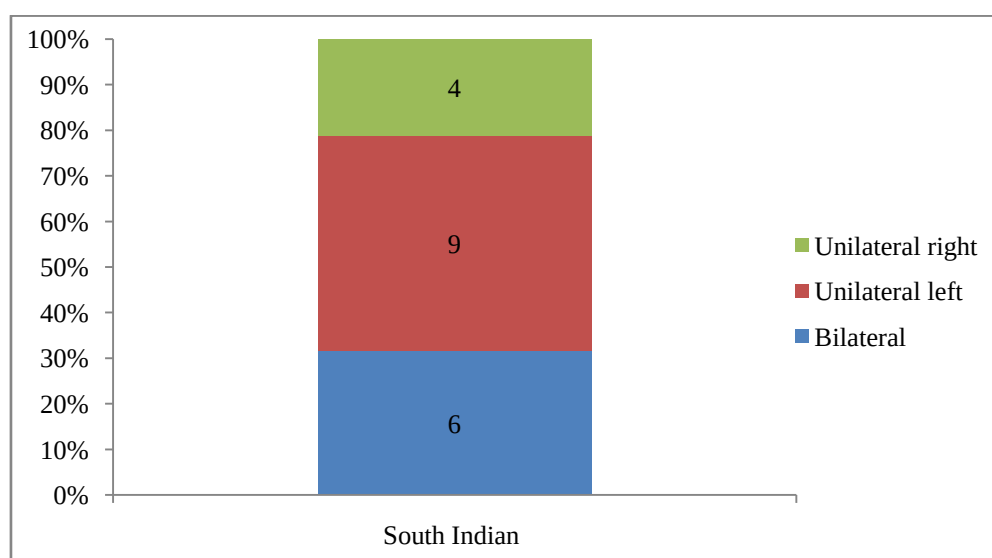


Figure 6. South Indian (Tamilian) samples showing the percentage of agenesis.

Table 2.North-east Indian population

	Schaffer's Test		Thompson's fist Test		Pushpa Kumar's 2 Finger Test		Mishra's test II	
	Left	Right	Left	Right	Left	Right	Left	Right
1	+	+	+	+	+	+	+	+
2	+	+	+	+	+	+	+	+
3	+	+	+	+	+	+	+	+
4	+	+	+	+	+	+	+	+
5	+	+	+	+	+	+	+	+
6	+	+	+	+	+	+	+	+
7	+	+	+	+	+	+	+	+
8	+	+	+	+	+	+	+	+
9	+	+	+	+	+	+	+	+
10	+	+	+	+	+	+	+	+
11	+	+	+	+	+	+	+	+
12	+	+	+	+	+	+	+	+
13	+	+	+	+	+	+	+	+
14	+	+	+	+	+	+	+	+
15	+	+	+	+	+	+	+	+
16	+	+	+	+	+	+	+	+
17	+	+	+	+	+	+	+	+
18	+	+	+	+	+	+	+	+
19	+	+	+	+	+	+	+	+
20	+	+	+	+	+	+	+	+
21	+	+	+	+	+	+	+	+
22	+	+	+	+	+	+	+	+
23	+	+	+	+	+	+	+	+
24	+	+	+	+	+	+	+	+
25	+	+	+	+	+	+	+	+
26	+	+	+	+	+	+	+	+
27	+	+	+	+	+	+	+	+
28	+	+	+	+	+	+	+	+
29	+	+	+	+	+	+	+	+
30	+	+	+	+	+	+	+	+
31	+	+	+	+	+	+	+	+
32	+	+	+	+	+	+	+	+
33	+	+	+	+	+	+	+	+
34	+	+	+	+	+	+	+	+
35	+	+	+	+	+	+	+	+
36	+	+	+	+	+	+	+	+
37	+	+	+	+	+	+	+	+
38	+	+	+	+	+	+	+	+
39	+	+	+	+	+	+	+	+
40	+	+	+	+	+	+	+	+
41	+	+	+	+	+	+	+	+
42	+	+	+	+	+	+	+	+
43	+	+	+	+	+	+	+	+
44	+	+	+	+	+	+	+	+
45	+	+	+	+	+	+	+	+
46	+	+	+	+	+	+	+	+
47	+	+	+	+	+	+	+	+
48	+	+	+	+	+	+	+	+

49	+	+	+	+	+	+	+	+
50	+	+	+	+	+	+	+	+
51	+	+	+	+	+	+	+	+
52	+	+	+	+	+	+	+	+
53	+	+	+	+	+	+	+	+
54	+	+	+	+	+	+	+	+
55	+	+	+	+	+	+	+	+
56	+	+	+	+	+	+	+	+
57	+	+	+	+	+	+	+	+
58	+	+	+	+	+	+	+	+
59	+	+	+	+	+	+	+	+
60	+	+	+	+	+	+	+	+

DISCUSSION

PL is an active muscle in non-human primates used for prehensile progression from tree to tree. PL is found to be present in Orangutans, but is variably absent in chimpanzee and gorilla. Palmaris longus is often described as one of the most variable muscles in the human body and is classified as a phylogenetically retrogressive muscle i.e. a short belly with a long tendon. In humans, the absence of palmaris longus appears to be hereditary but its genetic transmission is not clear (Tandel *et al.*, 2012). No earlier studies have been conducted on the North Easter population of India which is a racially distinct and separate part of India, the Northeast Indians have slight mongoloid racial features. The results of the Tamil (South Indian) sample population are not comparable to the results of a similar study on the Andhra (South Indian) population (14.7% agenesis) (Sankar *et al.*, 2011). Previous studies on the incidence of the PL tendon show a wide variation from 0% in a series of 299 Tibbu to 36.8% in a group of 126 Jews and up to 38.2% in a group of 1433 Egyptians (Agarwal, 2010). The results of the Northeast Indian sample population seem to be unique and not comparable to any previous Indian study, further research may be required. The methods used in this experiment are merely physical and based on surface appearance, they are not confirmatory. An MRI scan may be needed for confirmatory detection. Tendon grafts are frequently needed in reconstructive surgery on the hand. Many surgeons agree that the PL tendon is the first choice as a donor's tendon because it fulfills the necessary requirements of length, diameter, and availability, and can be used without producing any functional deformity (Erić *et al.*, 2011). The data obtained may be used as secondary data for further studies. A database may be created to note probable donors for transplantation.

CONCLUSIONS

None of the Northeast Indian samples showed agenesis of the Palmaris longus tendon, since the Palmaris longus is thought to be a vestigial structure it would be lost over evolution, it is hypothesized that the Northeast Indian tribes are evolutionarily more primitive.

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REFERENCES

- Agarwal, P. (2010). Absence of the palmaris longus tendon in Indian population. *Indian Journal of Orthopaedics*, 44(2), 212.
- Eric, M., Koprivic, I., Vucinic, N., Radic, R., Krivokuca, D., Leksan, I., & Selthofer, R. (2011). Prevalence of the palmaris longus in relation to the hand dominance. *Surgical and Radiologic Anatomy*, 33(6), 481-484.
- Fowlie, C., Fuller, C., & Pratten, M.K. (2012). Assessment of the presence/absence of the palmaris longus muscle in different sports, and elite and non-elite sport populations. *Physiotherapy*, 98(2), 138-142.
- 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. *Clinical Anatomy: The Official Journal of the American Association of Clinical Anatomists and the British Association of Clinical Anatomists*, 22(2), 230-235.
- Kose, O., Adanir, O., Cirpar, M., Kurklu, M., & Komurcu, M. (2009). The prevalence of absence of the palmaris longus: a study in Turkish population. *Archives of Orthopaedic and Trauma Surgery*, 129(5), 609.

- Oluyemi Kayode, A., Adesanya Olamide, A., Odion Blessing, I., & Ukwenya Victor, O. (2008). Incidence of palmaris longus muscle absence in Nigerian population. *International Journal of Morphology*, 26(2), 305-308.
- Sankar, K.D., Bhanu, P.S., & John, S.P. (2011). Incidence of agenesis of palmaris longus in the Andhra population of India. *Indian Journal of Plastic Surgery: Official Publication of the Association of Plastic Surgeons of India*, 44(1), 134.
- Sebastin, S., Lim, A., Bee, W., Wong, T., & Methil, B. (2005). Does the absence of the palmaris longus affect grip and pinch strength? *Journal of Hand Surgery*, 30(4), 406-408.
- Sebastin, S., Puhaindran, M., Lim, A., Lim, I., & Bee, W. (2005). The prevalence of absence of the palmaris longus—a study in a Chinese population and a review of the literature. *Journal of Hand Surgery*, 30(5), 525-527.
- Singh, D., Kumar, K.A., Dinesh, M., & Raj, R. (2012). Chronic triceps insufficiency managed with extensor carpi radialis longus and palmaris longus tendon grafts. *Indian Journal of Orthopaedics*, 46(2), 236.
- Tandel, M., Kanjiya, D., Sutaria, L., Patel, B., & Patel, V. (2012). Pensi CA Prevalance of agenesis of Palmaris longus muscle in Gujarat population. *International Journal Biology Medical Research*, 3(4), 2597-2602.