

A CLINICAL STUDY ON THE AGENESIS OF PALMARIS LONGUS MUSCLE AMONG MEDICAL STUDENTS

Anatomy

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ABSTRACT

Introduction- The Palmaris longus is a slender muscle of the anterior compartment of the forearm. It has a long tendon which is often used in reconstructive surgery. It is one of the most variable muscle in the human body in relation to race, sex & body side. **Aim-** To study the incidence of agenesis of Palmaris longus muscle among the medical students of SMCH, Silchar. **Materials & methods-** The presence or absence of Palmaris longus muscle was clinically determined among the undergraduate medical students of both sexes with the help of the standard Schaeffer's test. In those with absent Palmaris longus tendon, other tests like Thompson's test, Mishra's test, Pushpakumar's test, Gangata's test, Bunched finger test & Hooked finger tests were performed for confirmation of its absence. **Observations & results-** In this study, a total of 430 medical students were examined (male-215, female-215). The Palmaris longus tendon was found to be absent in 46 (10.6%) subjects: male- 28 (6.5%), female- 18 (4.1%). Unilateral absence of the tendon was found in 33 (7.6%) individuals of which 18 (4.1%) were right sided & 15 (3.4%) were left sided. Bilateral absence of the tendon was seen in 13 (3%) subjects of which seven were males & eight were females. **Conclusion-** Anatomical variation of the Palmaris longus tendon should be taken into consideration while planning any reconstructive surgery using tendon grafts.

KEYWORDS

Agenesis, Palmaris longus, tendon, reconstructive surgery, tendon grafts.

INTRODUCTION:

The Palmaris longus muscle is one of the superficial muscles of the flexor compartment of the forearm. In many species, the Palmaris longus operates the claws. In human, it is vestigial & can act only at the wrist joint. Its short muscular belly arises in common with the other superficial muscles from the medial epicondyle of humerus and is soon succeeded by a long slender tendon that crosses the wrist superficial to the flexor retinaculum. The tendon ends by fanning out & blending with the palmar aponeurosis (1). The power it contributes to the wrist flexion is inconsequential in comparison with that of other wrist flexors. Its tendon at the wrist serves as a useful landmark both for locating & testing the median nerve which supplies the muscle. At the level of wrist, the tendon of Palmaris longus lies between the flexor carpi radialis laterally & flexor carpi ulnaris medially. The median nerve at this level lies between this tendon & the flexor carpi radialis. The Palmaris longus muscle is one of the most variable muscle of the human body. The muscle or its tendon may be absent unilaterally or bilaterally. Conversely, its tendon or the entire muscle may be duplicated. Occurrence of absence of Palmaris longus muscle is reported to be 15-30.7% by different authors (2,3,4). Though the role of Palmaris longus in flexion of the wrist is negligible, there is growing interest in the existence of this muscle because its tendon is often harvested for reconstructive plastic surgery and hand surgery (5). Plastic surgeons also use this tendon in restoration of lip and chin defects, ptosis correction & in the management of facial paralysis (6,7,8,9).

AIMS AND OBJECTIVES:

The present study was carried out to know the incidence of agenesis of Palmaris longus muscle among the undergraduate medical students of Silchar Medical College, Assam and to compare it with previous studies.

MATERIALS AND METHODS:

The present study was carried out among the medical students of Silchar Medical College. A total of 430 students of both the sexes participated. After explaining the aim of our study to them, informed consent was taken.

INCLUSION & EXCLUSION CRITERIA: Only those students who volunteered for the study were included in the study. Students with obvious hand & wrist deformities or with history of hand surgery

were excluded. Those who refused to give written informed consent were also excluded.

Ethical clearance: Ethical clearance from the institutional ethical committee of Silchar Medical College was obtained as per Ethical Guidance of 1975, Helsinki.

To detect the presence of Palmaris longus tendon, the subjects were first evaluated with the standard Schaeffer's test. In those subjects where the test was negative, other tests (Mishra's test, Thompson's test, Pushpakumara's test, Gangata's test, Bunched finger test & Hooked finger test) were conducted to confirm the absence of the Palmaris longus tendon. The clinical tests were performed as follows-

In Schaeffer's test, the subjects were asked to oppose the thumb to the little finger with wrist partially flexed. Prominence of the tendon of Palmaris longus at the wrist makes the test positive (figure- 1(a)) (10). **In Mishra's test,** passive hyperextension of the metacarpophalangeal joint was done along with mild active flexion of the wrist (figure-1(b)) (11). **In Thompson's test,** a fist was made followed by flexing the wrist against resistance, with the thumb flexed over the fingers (figure- 2(a)) (12). **In Pushpakumar's (two finger sign) test,** the subject was asked to fully extend the index & middle finger & flex the wrist & other fingers as shown (figure-2(b))(13). **In Gangata's test,** the thumb is initially in abduction and the subject is then asked to resist both thumb abduction & wrist flexion (figure-3(a))(14). We came upon two new clinical tests for detection of Palmaris longus tendon. They are the Bunched finger test & the Hooked finger test. These are simple tests that visualize the Palmaris longus tendon easily & prominently (15). **In Bunched finger test,** the subjects were asked to place their hand flat on the table with the palm facing upwards. They were then asked to bunch their fingers (as if preparing them for smothering the forehead) & exert firm pressure at the opposing finger tips. Next, they were asked to flex the wrist which makes the tendon to stand out prominently. The tendon becomes more prominent if the forearm is pronated by 5-10 degree in this position (figure 3(b)). **In Hooked finger test,** the participants were asked to hook their fingers. These fingers were then hooked with the examiner's fingers. The subjects were then asked to flex their wrist while the examiner gives resistance. This makes the Palmaris longus tendon stand out prominently, if present (figure-4(a)). So, by using these seven tests, the presence or absence of the Palmaris longus tendon on both sides was recorded in all the participants.

The data collected were analysed by chi square test using Instat 3 statistical software.

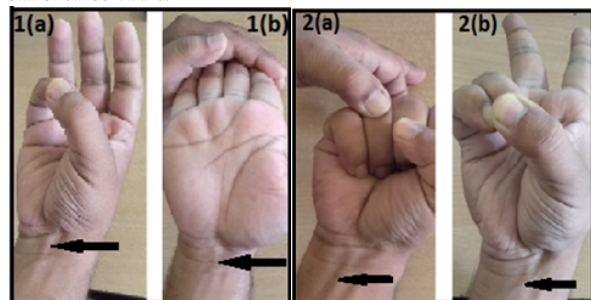


Figure 1(a) Schaeffer's test; 1(b) Mishra's test; 2(a) Thompson's test; 2(b) Pushpakumar's test. The arrow indicates presence of Palmaris longus tendon.

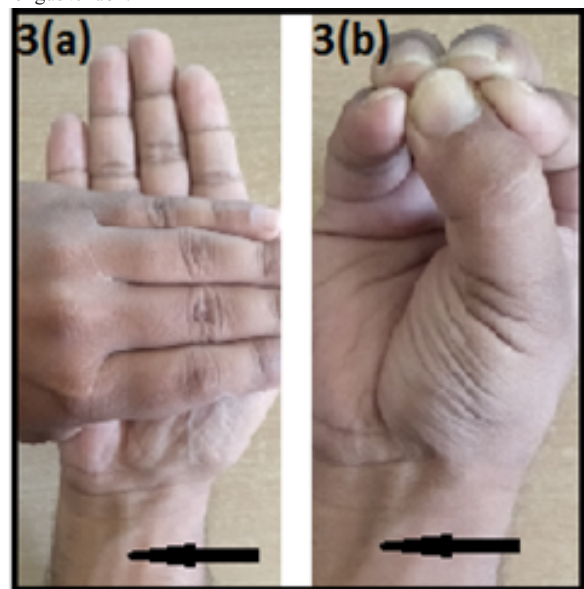


Figure 3(a) Gangata's test; 3(b) Bunched finger test. The arrow indicates presence of Palmaris longus tendon.

OBSERVATIONS AND RESULTS:

Among the 430 participants, the Palmaris longus muscle was found to be absent in 46(10.6%) subjects. It was found to be absent in 18(4.1%) female subjects & in 28(6.5%) male subjects. It was absent bilaterally in 13(3%) participants and unilaterally in 33(7.6%) participants. Among the unilateral absence, 18(4.1%) were right sided & 15(3.4%) were left sided (Table 1).

Table 1: Incidence of Agenesis of Palmaris longus tendon

Gender	No Agenesis (%)	Agenesis (%)	Unilateral Agenesis (%)	Bilateral Agenesis (%)	Unilateral Agenesis	
					Left sided (%)	Right sided (%)
Male	190 (88.4)	25 (11.6)	18 (72.0)	7 (28.0)	7 (38.9)	11 (61.1)
Female	194 (90.2)	21 (9.8)	15 (71.4)	6 (28.6)	8 (53.3)	7 (46.7)
Total	384 (89.3)	46 (10.7)	33 (71.7)	13 (28.3)	15 (45.5)	18 (54.5)
	n= 430		n= 46		n= 33	
	Chi-Square value= 0.3895		Chi-Square value= 0.0018		Chi-Square value= 0.6885	
	Degree of freedom= 1		Degree of freedom= 1		Degree of freedom= 1	
	P= 0.5326		P= 0.9658		P= 0.4067	
	Not significant		Not significant		Not significant	

DISCUSSION:

The Palmaris longus is one of the most variable muscle of the human body. It is considered equivalent to the plantaris muscle of the lower limb. According to the standard textbooks, the incidence of absence of Palmaris longus is approximately 15% (16,17). It is well developed in animal species which tolerate more weight on the upper limbs than

other species. In human, absence of Palmaris longus doesn't have an effect on the grip strength. This is why the tendon of this muscle is used in tendon grafting without fear of hampering functions of the hand.

According to literature, the absence of Palmaris longus varies greatly in African, Asian & native American population. In American population it is found to be 25% while in Chinese subjects it is found to be 6% (18). In Japanese subjects it was reported to be 5.5% (19). It was reported to be 1.5% in the population of Zimbabwe, 4.1% in Korean population 11.5% in South African population, 11.8% in Nepalese population & 11.3% in the population of Malaysia (20,21,22,23). On the other hand, incidence of higher degree of absence of Palmaris longus was reported from studies conducted in Bahrain(36.4%) and two studies conducted in Serbia (22.4% & 37.5%)(24,25). We came across many studies conducted in various parts of India on this topic but none from North Eastern part of India. The Indian studies states that the incidence of absence of Palmaris longus in India ranges from 16% to 28% (26, 27, 28) (Table 2).

Table 2: Incidence of agenesis of Palmaris longus as reported by various authors

Research worker	Year of study	Race/population	Percentage of agenesis found
George R (31)	1953	European	15.2%
Troha et al (33)	1990	North American caucasians	24.4%
Wehbe MA (34)	1992	Pennsylvanians	25%
Igbigbi&Ssekitoileko	1998	Ugandan	2%
Ito MM et al (19)	2001	Japanese	5.5%
Thompson NW et al (32)	2001	North Ireland Caucasians	24%
Sebastin SJ et al (18)	2005	Chinese	6%
Sebastin SJ et al (29)	2006	Chinese	4.6%
Roohi SA et al (23)	2007	Malaysian	11.3%
Kapoor S Ketal (3)	2008	Indian	17.2%
GO Mbaka et al (36)	2008	Nigerian	6.7%
Gangata H (14)	2009	Zimbabwean	1.5%
Satan MS et al (24)	2010	Bahraini	36.4%
Eric M et al (25)	2010	Serbian	22.4% & 37.5%
Agarwal P (27)	2010	Indian	20.25%
Sankar KD et al (28)	2011	South Indian	28%
Kyung DS et al (20)	2012	Korean	4.1%
Dr Girish V Patil et al(26)	2014	South Indian	16%
Venter G et al (21)	2014	South African	11.5%
Tesfamichael&Assegedech (37)	2014	Ethiopian	15.3%
RanjibJha et al (22)	2015	Nepalese	11.8%
EbrahimNasiri et al (30)	2016	Iranian	13.2%
Present study	2020	Indian (North East)	10.6%

Our findings correlates with the findings of Venter G et al,RanjibJha et al &Roohi SA et al (21,22,23) & to some extent with the result as reported by Ebrahim et al (30). If we compare our study with other Indian studies, our finding is slightly lower than the findings of others (3,26,27,28).

Table 3: Findings regarding agenesis of Palmaris longus reported by various authors

Research workers	Number of cases studied	unilateral agenesis found	bilateral agenesis found	overall cases found
RanjibJha et al (22)	400	8.2%	3.5%	11.8%
Agarwal P (27)	385	16.9%	3.3%	20.25%
Sankar KD et al (28)	942	70.5%	29.5%	28%
Thompson NW et al (32)	300	16%	9%	24%
Sebastin SJ et al (29)	329	3.3%	1.2%	4.6%
EbrahimNasiri et al (30)	562	9.3%	3.9%	13.2%
George R (31)	276	13%	8.7%	15.2%
Roohi SA et al (23)	450	6.4%	2.9%	9.3%
Dr Girish V Patil et al(26)	200	12%	4%	16%
Tesfamichael & Assegedech (37)	712	7.2%	8.1%	15.3%
Present study	430	7.6%	3%	10.6%

Thus it is seen that our findings of unilateral agenesis (figure 4(b) & 5) is similar to that of Roohi SA et al, Tesfamichael & Assegedech & Ranjib Jha et al. As for the bilateral agenesis (figure 6), ours is similar to Dr Girish V Patil et al, Roohi SA et al, Ebrahim Nasiri et al, Agarwal P & Ranjib Jha et al (Table 3).

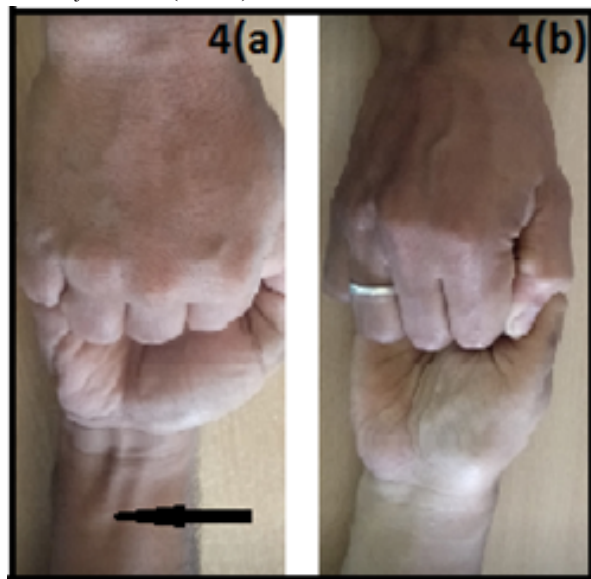


Figure 4(a) Hooked finger test. The arrow indicates presence of Palmaris longus tendon.

Figure 4(b) Hooked finger test showing unilateral agenesis of Palmaris longus tendon.

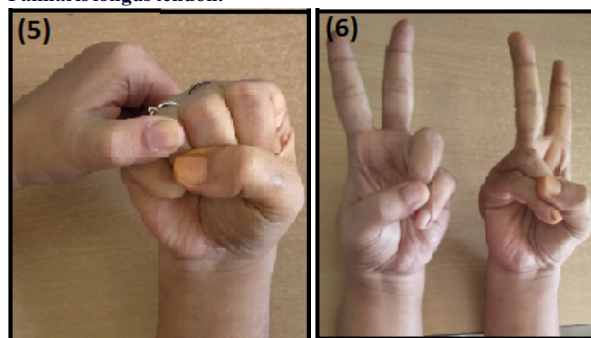


Figure 5 Thompson's test showing unilateral agenesis.

Figure 6 Pushpakumar's test showing bilateral agenesis of Palmaris longus tendon.

Table 4: Side distribution of unilateral Palmaris longus agenesis reported worldwide

Research workers	year	Right side %	Left side %
RanjibJha et al (22)	2015	2.2%	6%
Dr Girish V Patil et al(26)	2014	6%	6%
EbrahimNasiri et al (30)	2016	4.1%	5.2%
Thompson NW et al (32)	2001	9.6%	6.6%
Agarwal P (27)	2010	5.7%	11.1%
Sankar KD et al (28)	2011	51.6%	48.4%
Present study	2020	4.1%	3.4%

We found that agenesis of the Palmaris longus occurred more on the right side. Same was reported by Thompson NW et al & Sankar KD et al (32,28) (Table 4).

CONCLUSION:

There is a wide variation in the reported absence of palmaris longus muscle among different study population ranging from 0% to 63%. Therefore it is necessary for surgeons all over the world to know about the local incidence of agenesis of the Palmaris longus muscle before planning any reconstructive surgery by using the tendon of this muscle. This study is a humble effort to give an idea of its incidence of agenesis in this part of the country.

Conflict of interest: None

Source of funding: None

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