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Prediction of Palmaris Longus Tendon Length: Study in Indian Fresh Frozen Cadavers

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Abstract

Background: To assess a correlation between forearm length and palmarislongus tendon length in the cadavers of Indian population. A preoperative knowledge on the length of the tendon to be harvested can help a surgeon for better planning of the surgery. *Methods*: We dissected 84 forearms with 42 pairs of fresh frozen cadavers of Indian origin. The forearm length was measured with a measuring tape. The length and width of the tendon was measured using digital calipers. Student's 't' test was applied to analyze the data and P value <0.05 was considered statistically significant. Age, sex and side of the cadavers were noted. Pearson's correlation coefficient was applied to find out the correlation between the forearm length & the length and the width of the palmaris longus tendon. Forearms with absence of palmaris longus or with congenital anomaly or previously operated were excluded from the study. *Results*: Out of the 42 fresh frozen cadavers with 84 pairs of forearm, one cadaver had bilateral absence of palmarislongus. Hence, 41 cadavers with 82 forearms were studied. There were 46 male and 36 female forearms with mean age of 69.3± 6.7 years for males and 72.1± 7.3 years for females. The mean lengths of the palmaris longus tendons were 175.18±12.12 mm in males and 165.75 ±12.30 mm in females. The mean lengths of the forearms were 268.94 ± 11.74 mm in males and 261.23 ± 12.91 mm infemales. A significant correlation was found in between the lengths of the tendon and the forearm in males (r =0.62; p <0.05), females (r=0.598; p <0.05) and for combined males and females (r= 0.651; p< 0.05). *Conclusion*: Our study helps the surgeon to plan the incision site based on the forearm length in Indian population.

Keywords: Palmaris Longus Tendon; Forearm Length; Fresh Frozen Cadavers; Indian Population; Preoperative Plan.

Introduction

Palmaris longus has known to have variations in its anatomy, presence and this knowledge is important for our clinical practice [1].

Palmaris longus is a frequently used donor tendon for various procedures in hand surgery as well as various plastic and reconstructive procedures like ligament reconstruction or as a bridging tendon graft [2-6]. It would be useful if the surgeon could preoperatively predict the probable length of the tendon available and also to make an optimum site of incision to harvest the tendon. Few studies done previously in various population help to estimate the probable length of the tendon [7-9]. There is no study that gives us similar reference in Indian population as well as none of the studies were performed in fresh frozen cadavers. Our study aims at measuring the length and also assessing the correlation between the length of the forearm and the palmarislongus tendon in fresh frozen cadavers of

Indian origin. We would also note the correlation of the width of the tendon with the length of the forearm.

Materials and Methods

We dissected 84 forearms with 42 pairs of fresh frozen cadavers of Indian origin. The forearm length was measured from the tip of the olecranon to the tip of the ulnar styloid with a measuring tape (Figure 1). Through a volar incision the palmarislongus tendon was exposed. The distal extent of the tendon was taken at the level of the imaginary line joining the pisiform and the scaphoid tuberosity, the proximal extent was taken as the distal most part of musculotendinous junction where there was muscle on two sides of the tendon (Figure 2) as the muscle ends at different levels on the volar and dorsal aspectand the width of the tendon was measured at this level (Figure 3). The length (Figure 2) and width (Figure 3) of the tendon was measured using digital calipers.

Student's 't' test was applied to analyze the data and P value <0.05 was considered statistically significant. Age, sex and side of the cadavers were noted. Pearson's correlation coefficient was applied to find out the correlation between the forearm length & the length and the width of the palmaris longus tendon. Forearms with absence of palmaris longus or with congenital anomaly or previously operated were excluded from the study.

Results

Out of the 42 fresh frozen cadavers with 84 pairs of forearm, one cadaver had bilateral absence of palmaris longus. Hence, 41 cadavers with 82 forearms were studied. There were 46 male and 36 female forearms with mean age of 69.3± 6.7 years for males and 72.1± 7.3 years for females. Agenesis of palmarislongus was the only anomaly noticed[10-13].

The mean lengths of the palmaris longus tendons were 175.18±12.12 mm in males and 165.75 ±12.30 mm in females. The mean lengths of the forearms were 268.94 ± 11.74 mm in males and 261.23 ± 12.91 mm infemales. The mean percentage ratio of the length of the palmaris longus tendon to the length of the forearm was 65.14 ±3.56 % in males, 63.46 ±3.82 % infemales and 64.43 ± 3.72%in combined males and females (Table 1).

The mean lengths of the tendon were significantly different between males and females (p=0.001). There was no statistically significant difference, however, in the mean width of the palmaris longus tendon

Table 1: Percentage of length of palmarislongus tendon to the forearm

	Tendon length (mm)	Tendon width (mm)	Forearm length (mm)	TL/FL X 100 (%)
Males	175.18 ±12.12	4.060 ± 0.4488	268.94± 11.74	65.14± 3.56%
Females	165.75± 12.30	3.899 ± 0.4488	261.23 ± 12.91	63.46± 3.82%
Total	171.16 ± 12.99	3.99 ± 0.44	265.64 ± 12.76	64.43 ± 3.72%

The palmarislongus tendon length & width and forearm length measured with a measuring tape in mm and the percentage of tendon to forearm length is tabulated.

Table 2: Correlation between the lengths of the palmarislongus tendon and forearm

	R Value
Males	0.620
Females	0.598
Total	0.651

Correlation coefficient(r) value in males, females and combined males & females is tabulated

Table 3: Shows comparative values between present study and similar other studies

		Ito MM et al[7]	Angelini Junior LC et al[8]	Our study
Forearm length (in mm)	M	240 ± 12.6	277.5 ± 17.8	268.94± 11.74
	F	218.8 ± 14.6	270.8 ± 17.8	261.23 ± 12.91
	C	229.8 ± 17.1	275.4 ± 17.9	265.64 ± 12.76
Palmaris longus tendon length (in mm)	M	124.6 ± 17.9	123.0 ± 1.04	175.18 ±12.12
	F	108.3 ± 17.7	111.4 ± 2.05	165.75± 12.30
	C	116.6 ± 18.5	119.9 ± 1.52	171.16 ± 12.99
Palmaris longus tendon width (in mm)	M	4.5 ± 0.7	3.9 ± 1.4	4.06 ± 0.4
	F	4.0 ± 0.7	4.7 ± 1.7	3.89 ± 0.44
	C	4.2 ± 0.8	4.1 ± 1.5	3.99 ± 0.44
Tendon length/ Forearm length (in%)	M	52 ± 6.4	44.6 ± 3.3	65.14± 3.56
	F	49 ± 6.5	41.1 ± 6.9	63.46± 3.82
	C	50.7 ± 6.5	43.5 ± 4.9	64.43 ± 3.72

Measurements of forearm and tendon in males (M), females (F), combined males and females (C)

Fig. 1: Showing the method of measuring the forearm length using a measuring tape

Fig. 2: Showing the method of measuring the Palmaris longus tendon length using digital calipers

Fig. 3: Showing the method of measuring the Palmaris longus tendon width using digital calipers

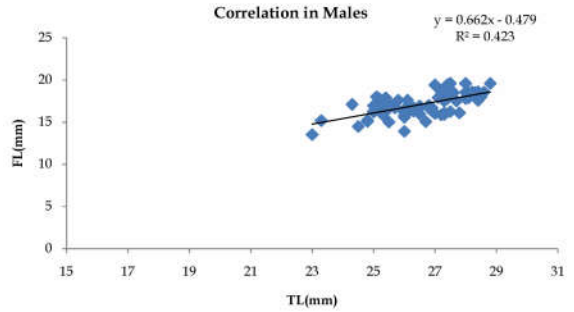

Fig. 4: Scatter plot showing a strong correlation between the tendon length (TL) and the forearm length (FL) in males

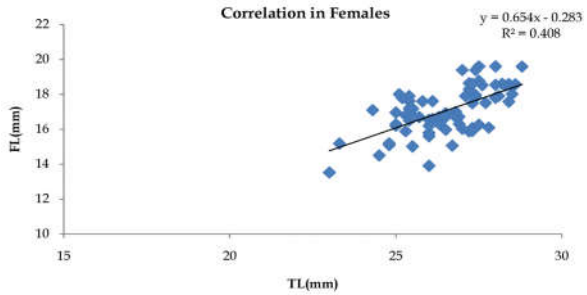

Fig. 5: Scatter plot showing a strong correlation between the tendon length (TL) and the forearm length (FL) in females

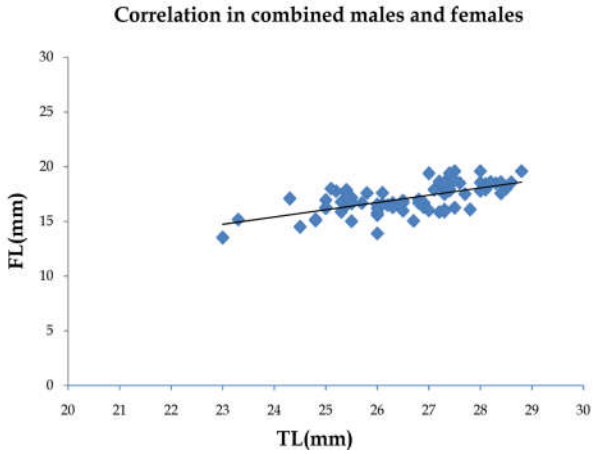

Fig. 6: Scatter plot showing a strong correlation between the tendon length (TL) and the forearm length (FL) in combined males & females

(p=0.102) & forearm length (p=0.06) between males and females.

A significant correlation was found in between the lengths of the tendon and the forearm in males (r=0.62; p<0.05) (Figure 4), females (r=0.598; p<0.05) (Figure 5) and for combined males and females (r= 0.651; p<0.05) (Figure 6). The palmarislongus tendon length is approximately 60% of the length of the respective forearm of harvest. There was no statistically significant correlation between forearm length and the width of the tendon in either males (r=0.110; p<0.05) or females (r=0.457; p<0.05).

Discussion

Surgeons are concerned about the adequacy of the length and width of the tendon before harvesting the tendon for surgical procedures and there are very few studies in this line [9,14]. There are no studies on palmarislongus length and its correlation to the forearm length in Indian population.

Few studies have showed that the ratio of the length of the tendon to the bone has been constant and helps in morphologic assessment of the tendon graft donor and a study by Ito MM et al [7] was done on Japanese population, AngeliniJúnior LC et al [8] studied on Mexican population. However we found that the ratio of the tendon to the forearm length was different from the previous studies. Probably this difference could be because of the difference in the technique of measurement and also this study has been performed on fresh frozen cadavers. Present study on Indian population showed the largest percentage of tendinous component in palmarislongus 65.14± 3.56 for males, 63.46 ± 3.82

for females and 64.43 ± 3.72 for combined male and female population (Table 1). A study by Angelini Júnior LC et al [8] showed lowest percentage of tendinous component with males 44.6 ± 3.3, females 41.1 ± 6.9 and combined male and female population as 43.5 ± 4.9 (Table 3).

The incidence of agenesis of palmaris longus shows a large range from 4.6% to 68% based on different ethnicity[10,15]. In our study we found that the palmaris longus was absent in only one cadaver bilaterally, which is much lesser than the previous studies and this could be probably because majority of the studies were clinical studies and also the sample size was larger.

This study helps us to preoperatively predict the possible length of the tendon available for harvest by measuring the forearm length as well as guides us to place the incision for palmaris longus tendon harvest.

Biostatistics Statement

The statistical methods of this study were reviewed by Dr Radhika, Statistician from M S Ramaiah Medical College & Hospitals. The statistical data pertaining to the study is explained in the figures 4,5,6.

Conflict-of-Interest Statement

The authors have no conflict of interest and nothing to disclose.

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