

## AGENESIS OF PALMARIS LONGUS IN SOUTHERN OF IRAN: A POPULATION BASED STUDY

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### ABSTRACT

The Palmaris Longus (PL) muscle is a weak flexor muscle with wide prevalence of agenesis in world. This study was conducted to determine the prevalence of agenesis of PL in a southern population of Iran. A total of 732 subjects aged 7-86 years were selected randomly. The participants were primarily asked to do the standard test (Schaeffer's test). Four tests were done for confirmation of the absence of the tendon in the subjects. The overall agenesis of muscle in both genders was 30.7±1.7%. This prevalence was more in females than in males (38.6 Vs. 22.7%,  $p < 0.001$ ). The bilateral agenesis was seen in 19.5% and left and right sided absences were 6.8% and 4.4%, respectively. There were significant differences between total and bilateral agenesis with age groups ( $P = 0.016$  and  $P = 0.017$ ). The agenesis of PL was higher than it reported in literature. The prevalence of bilateral absent was more common in present study adversely to the report in text that it was more on left side hand.

**Keywords:** Muscle Agenesis, Palmaris Longus, Gender

### 1. INTRODUCTION

Palmaris Longus (PL) is a surface flexor muscle of the forearm. It is a muscle with a short muscle belly and long tendon and located medial to the Flexor Carpi Radialis (Yildiz *et al.*, 2000). This muscle is a weak flexor of the hand at wrist. Although the function of PL is considered very less, but its tendon is reported to be useful for reconstructive plastic and hand surgery in tendon graft (Sebastin *et al.*, 2005a), in lip augmentation (Davidson, 1995), ptosis correction (Chauhan, 2003), in management of some facial paralysis (Atiyeh *et al.*, 1998), opponensplasty for severe carpal tunnel syndrome (Park *et al.*, 2010) and excisional arthroplasty for management of keibock's disease (Kucuk *et al.*, 2011).

Absence of PL may be associated with some morbidities such as carpal tunnel syndrome, wrist compartment syndrome and Guyon's syndrome (Saied and Karamoozian, 2009; Salgado *et al.*, 2012).

PL is one of the most variable muscles in the body. This variation varied according to race, sex and unilateral or bilateral agenesis. The agenesis of PL was reported in 15% of general population in text (Kapoor *et al.*, 2008). The higher prevalence of the PL agenesis (63.9%) was reported in Gaziantan Turkish population and as low as prevalence 0.6% in Korean population (Ceyhan and Mavt, 1997). In the Indian population, the prevalence of agenesis reported 16.88-19.48% in male and a 4.21% in female (Agarwal, 2010). Also in a study, the frequency of muscle absence was 4.1% in Korean population, 4.7% in men and 3.1% in women (Kyung *et al.*, 2012). Overall agenesis of PL in both sexes was 28%, out of which 40.2% was seen in females and 14.7% in males. However the unilateral agenesis was seen in 19.7% and bilateral agenesis in 8.3% subjects (Sankar *et al.*, 2011).

In a study, the prevalence of PL muscle agenesis in the north of Iran (Tehran) was reported as 22.8% in medical students (Ashouri *et al.*, 2011) and in another study this

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prevalence was reported 21.0% in patients referred to one health center (Kamrani *et al.*, 2005).

The aim of this study is to determine the prevalence of agenesis of PL and its association with sex in a southern population of Iran.

## 2. MATERIALS AND METHODS

In this study, 732 persons who lived in a southern region of Iran (Jahrom, Fars province) were randomly enrolled in present study. Of these subjects, 362 were male and 370 (50.5%) were female, with an age range between 7 and 86 years (mean age  $\pm$  standard deviation, 30.12 $\pm$ 19.47). Subjects who are having any deformities, diseases or injury in the upper extremity were excluded. In this study, the presence or absence of PL was determined by series of tendon examination techniques described by Schaeffer's test (standard test) (Schaeffer, 1909), Thompson's fist (Thompson *et al.*, 1921), Mishra's 1st and 2nd test (Mishra, 2001) and Pushpakumar's two finger sign (Pushpakumar *et al.*, 2004). Each subject was initially asked to do the standard test. In this technique, if present, PL appears as a prominent tendon medial to tendon of Flexor Carpi Radialis (FCR) in the middle of the lower part of the front of forearm, just above the wrist. If PL tendon was not satisfactorily visualized, others (Thompson's, Mishra's and Pushpakumar's tests) were used to prove the absence. To be considered to have an absence of a PL, the person must have a negative test for all 5 tests. If

a person had a positive result for any of the five tests, the person was considered to have a PL.

The data was analysed using SPSS 11.5 statistical software. The prevalence of the PL agenesis was presented with a 95% confidence interval. The association between an absent PL and gender and age groups was assessed using chi-square tests. Statistical significance was set at  $p < 0.05$ .

## 3. RESULTS

The overall prevalence of the absence of the PL tendon was 30.7 $\pm$ 3.34% (225 subjects) in our population study. The prevalence of agenesis was 15.9% higher in women than in men (38.6 $\pm$ 4.96 Vs. 22.7 $\pm$ 4.31%;  $p < 0.001$ ). Unilateral agenesis was seen in 82 (11.2%) and bilateral agenesis was seen in 143 (19.5%) subjects. The bilateral absence of muscle was higher in females than in males (25.4 Vs. 13.5%,  $p < 0.001$ ) but the prevalence of unilateral agenesis was not significant in both sexes. The left-side agenesis was seen in 50 subjects (6.8%) that it was more often in females than in males ( $p = 0.002$ ). The right-side agenesis was observed in 32 (4.4%) subjects with no difference in both sexes (**Table 1**).

The prevalence of agenesis was higher in subjects aged 40-49 years (41.9%) and was the most least older age group (21.3%) ( $p = 0.016$ ). Adversely, the most common prevalence of bilateral agenesis was for persons aged 20-29 years (30.4%) and was less for person in 50-59 age group ( $p = 0.017$ ), but the prevalence of agenesis on right and left side was equal in seven age groups (**Table 2**).

**Table 1.** Gender distribution of palmaris longus muscle agenesis in participants

		Total (%)	Male (%)	Female (%)	P*
Number		732	362 (49.5)	370 (50.5)	NS
Agenesis	Total	225 (30.7)	82 (22.7)	143 (38.6)	<0.001
	Bilateral	143 (19.5)	49 (13.5)	94 (25.4)	<0.001
	Unilateral	82 (11.2)	33 (9.1)	49 (13.2)	NS
	Left sided	50 (6.8)	14 (3.9)	36 (9.7)	0.002
	Right sided	32 (4.4)	19 (5.2)	13 (3.5)	NS

\*compare between male and female, NS: Non Significant

**Table 2.** The prevalence of palmaris longus agenesis in age groups

Agenesis		Total (%)	Bilateral (%)	Unilateral (%)	Left side (%)	Right side (%)
Age group (years)	Number (%)	225 (30.7)	143 (19.5)	82 (11.2)	50 (6.8)	32 (4.4)
< 10	65 (8.9)	25 (38.5)	12 (18.5)	13 (20.0)	8 (12.3)	5 (7.7)
10-19	252 (34.4)	69 (27.4)	39 (15.5)	30 (11.9)	19 (7.5)	11 (4.4)
20-29	79 (10.8)	30 (38.0)	24 (30.4)	6 (7.6)	3 (3.8)	3 (3.8)
30-39	114 (15.6)	34 (29.8)	21 (18.4)	13 (11.4)	9 (7.9)	4 (3.5)
40-49	93 (12.7)	39 (41.9)	27 (29.0)	12 (12.9)	8 (8.6)	4 (4.3)
50-59	49 (6.7)	11 (22.4)	7 (14.3)	4 (8.1)	1 (2.0)	3 (6.1)
$\geq 60$	80 (10.9)	17 (21.3)	13 (16.3)	4 (5.0)	2 (2.5)	2 (2.5)
P value		0.016	0.017	0.123	0.163	0.808

#### 4. DISCUSSION

The Palmaris Longus muscle may be absent, double or with anomalous insertions. The absence of PL in human appears to be inherited but the genetic spread of PL agenesis is not clear (Wehbe, 1992). This muscle is an important muscle because clinicians used its tendon as a graft in various surgical procedures (Davidson, 1995; Chauhan, 2003; Atiyeh *et al.*, 1998).

In present study, the overall prevalence of absence of PL was 30.7% that it was higher than two studies performed in Iran (Ashouri *et al.*, 2011; Kamrani *et al.*, 2005). It differs from the reported of 17.2 to 28.0% in three study in Indian population (Agarwal, 2010; Kapoor *et al.*, 2008; Sankar *et al.*, 2011), 25.0% in America (Thompson *et al.*, 2001) and 26.6% in Turkey (Kose *et al.*, 2009). Another studies showed a lower value of 1.5% in Zimbabwe to 11.5% in a South African population (Kyung *et al.*, 2012; Kigera and Mukwaya, 2011; Ndou *et al.*, 2010). The prevalence of PL absent was higher in Bahrain (36.4%) and Serbia (37.5%) than our result (Sater *et al.*, 2010; Eric *et al.*, 2010).

This widely distribution of absent prevalence of PL may be due to race, sex and age of population study. The agenesis of PL is very low in African and eastern Asian population than in Iran, Bahrain, Turkey and North American Caucasian (Sater *et al.*, 2010; Ndou *et al.*, 2010; Kose *et al.*, 2009; Kigera and Mukwaya, 2011; Ashouri *et al.*, 2011).

From the literature, PL agenesis in different races and ethnic groups was found to be more common in females (Sankar *et al.*, 2011; Sater *et al.*, 2010; Kose *et al.*, 2009) that it is similar to our result where agenesis of PL in females was 38.6% than 22.7% in males. However, another findings have also been suggested that PL agenesis is more frequent in males than in females (Thompson *et al.*, 2001). Also, in one study reported the higher prevalence of PL agenesis in males (Agarwal, 2010). But in Iran (Ashouri *et al.*, 2011), Korea (Kyung *et al.*, 2012), Nigeria (Mbaka and Ejiwunmi, 2009), China (Sebastin *et al.*, 2005b) and Uganda (Kigera and Mukwaya, 2011) the prevalence of agenesis was not associated with sex.

In the present study, similar to other studies in Korea (Kyung *et al.*, 2012), Bahrain (Sater *et al.*, 2010), Africa (Ndou *et al.*, 2010), Serbia (Eric *et al.*, 2010), India (Kapoor *et al.*, 2008) and Turkey (Kose *et al.*, 2009) suggestion, incidence of agenesis of PL frequently was seen on bilateral sides (19.5%). This result is opposite to the result of other studies where the agenesis was more on right sided (Thompson *et al.*, 2001; Ashouri *et al.*, 2011) or left sided hand (Agarwal, 2010; Sankar *et al.*, 2011; Mbaka and Ejiwunmi, 2009; Kigera and Mukwaya, 2011).

Our study showed that the prevalence of agenesis were significant between seven age groups. But, Eric in his study reported that agenesis was not related to age (Eric *et al.*, 2010).

There are some limitations in present study: Thompson's test, Schaeffer's test, Mishra's second test and Pushpakumar's two-finger sign test require the patient to flex the fingers and/or the wrist. This commonly leads to a prominence of the flexor carpi radialis in most cases. Another disadvantage of the above tests is that they all depend on thumb abduction for making the PL prominent. These tests are therefore of less value if the patient cannot abduct his thumb, as is commonly seen in patients with median nerve palsy.

Further worldwide researches are recommended to show the prevalence of PL in other area and in different races.

#### 5. CONCLUSION

In summary, It was concluded that there is a high prevalence of PL agenesis. The cause of this variation is not clear. As similar to literature, we revealed the higher frequency of agenesis in female but adversely to literature, the agenesis was more bilaterally instead of in left side of hand.

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