



Research Article

Prevalence of Missing Palmaris Longus Muscle in the Arm of Secondary School Children in Ibadan, Nigeria

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Abstract

Palmaris longus muscle (PLM) is one of the most inconsistent muscles in the human body whose morphology, nerve supply and functions have been comprehensively discussed. This study examined the prevalence of the agenesis of PLM in relation to sex and handedness in 209 individuals. The subjects were screened for PLM tendon using four different tests; Thompson's test, Mishra's test I, Schaeffer's test and Pushpakumar's "two-finger sign" method. The data obtained were analyzed statistically by Chi square tests using SPSS software. Total agenesis of PLM was 73 (34.9%); Unilateral: 22 (30.1%) and bilateral: 51 (69.9%). Prevalence was significantly higher in females 51 (49%) than in males 22 (21.4%) ($p < 0.05$) while female individuals have higher agenesis in the right hand. The prevalence of absence of PLM to handedness was higher among right handed individuals compared to the left handed individuals. The prevalence of PLM absence in right handed subjects was more on the left than the right hand (5.4% vs 4.3%) while in the left handed it was more on the right hand (15% vs 0%).

Keywords: Palmaris longus, absence, prevalence, sex, handedness

INTRODUCTION

Palmaris longus Muscle (PLM) belongs to one of the most variable muscle in the human body that had been phylogenetically categorised as a retrogressive muscle (Koo and Roberts, 1997). It is a slender and fusiform muscle, that bears a short belly proximally and a long tendon (10-12 cm) which passes anteriorly and distally in the forearm of the upper limb of humans lying medial to the flexor carpi radialis. This muscle originates from the medial epicondyle (common flexor origin) and inserts predominantly into the aponeurosis of the central palm and flexor retinaculum. The nerve and blood supplies are from the median nerve and branches from anterior ulnar recurrent arteries (Moore and Dalley, 2007).

In addition, the muscle may be double, tendinous, split, incomplete, digastric or may exhibit atypical insertions (Koo and Roberts, 1997; Tellez and Acuna, 1998; Kawashima *et al.*, 2002). The PLM that is tendinous in its upper part and muscular in its lower part was named as reversed palmaris longus (Schuurman and Gils, 2000). In man, PLM acts as a weak flexor of the wrist, and aids in cupping of the palm (Kapoor *et al.*, 2008; Kose *et al.*, 2009). Although, the absence of PLM is of no major significance to the functioning of the wrist (Thompson *et al.*, 2001), there is an increased interest in the existence of the muscle because its tendon is most frequently harvested for reconstructive plastic and hand surgery (Hirayama *et al.*, 1986). It has also been used for repairing ptosis, urinary incontinence and the restoration of facial paralysis (Kapoor *et al.*, 2008; Kose *et al.*, 2009).

As studies are on-going on the prevalence of PLM absence in the South Western Nigerian population, this work aims to establish the prevalence of unilateral and bilateral absence of palmaris longus muscle in secondary school students in

Ibadan, Oyo state, Nigeria and also, highlight the proportion of absence based on gender, age and handedness. It is anticipated that the study will add to the body of information on the prevalence of Palmaris longus muscle in Nigeria.

MATERIALS AND METHODS

The sample population included 209 boys and girls (10-21 years old) from two secondary schools in Akinyele local government area, Ibadan who agreed to participate based on their conviction and parents' consent. The students are predominantly children of members of staff of University of Ibadan. Ethical approval was obtained from the ethical committee of the ministry of health. Individuals with a history of injury, abnormality or diseases of at least one upper limb, which render the performance of flexion of the fingers and wrist difficult or impossible, were not included in the study. The presence or absence of the PLM was evaluated by the use of four tests; Schaeffer test (standard test), Thompson's test, Mishra's test I and Pushpakumar's "two-finger sign" methods as recommended and adopted by Sebastin and Lim (2006). The tests are described as follow:

Schaeffer's test: The subjects were requested to oppose the thumb to the little finger and then flex the wrist (Schaeffer, 1909).

Thompson's test: A fist was made and followed by flexing the wrist against resistance with the thumb flexed over the fingers.

Mishra's test I: The subjects were asked to abduct the thumb against resistance with the wrist moderately flexed.

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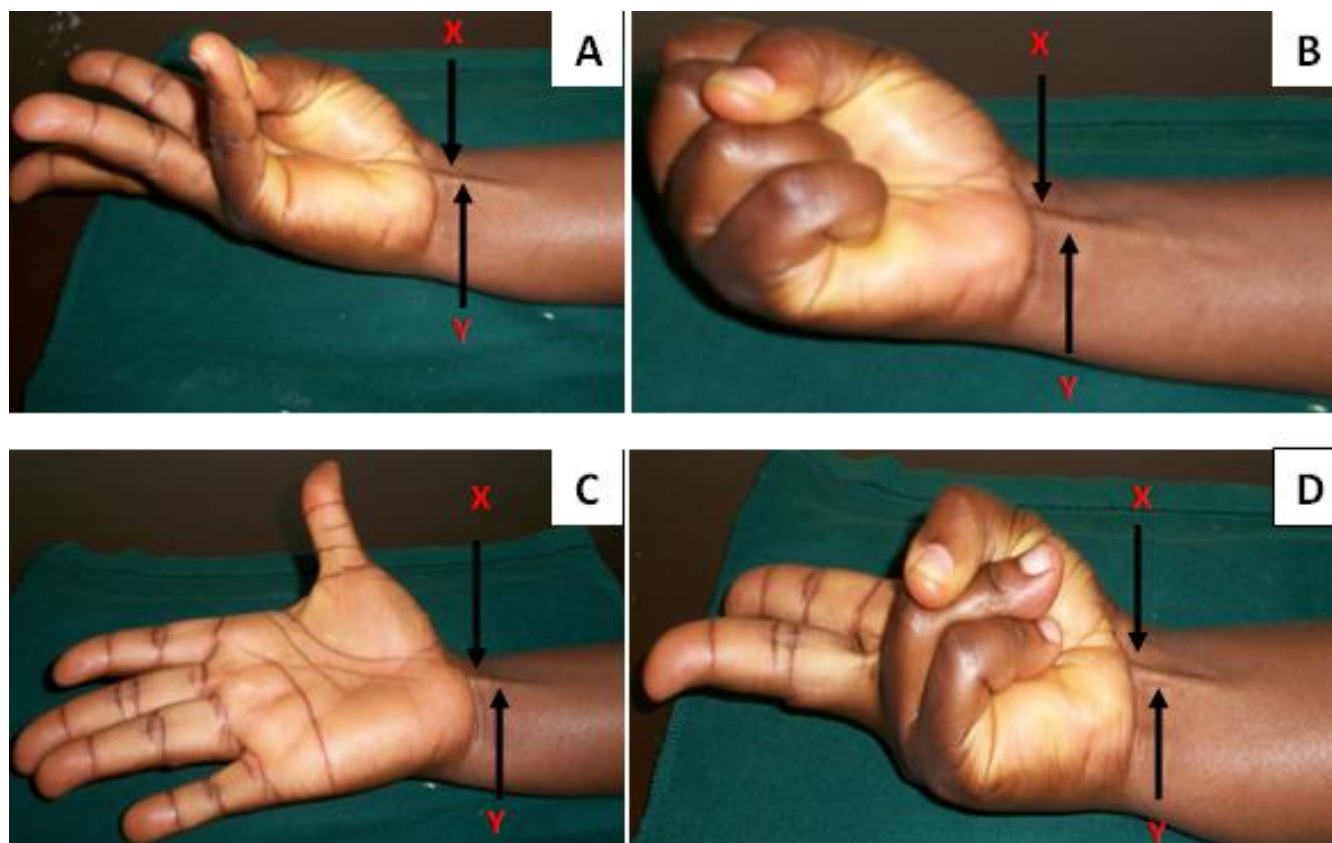


Fig. 1. Tests used in determining presence of Palmaris longus muscle tendon : A. Schaeffer's test B. Thompson's test C. Mishra's test D. Pushpakumar's "two-finger" sign method ; X – Palmaris tendon, Y – Flexor carpi radialis tendon.

Pushpakumar's "two-finger sign" method: The subjects were made to completely extend the index and middle finger while the wrist and other fingers were fully flexed with the thumb opposed and flexed (Figure 1A-D).

The standard test: Schaeffer's test was used for screening while the other three served as confirmatory tests. Each participant's age, gender, handedness and ethnicity were recorded.

Statistical analysis

The data were described in percentage values and analyzed statistically using SPSS software (version 20.0). Chi square test was used to analyze the difference between frequencies of qualitative variables (gender, geopolitical zone, dominant hand and agenesis) while the level of significance was set at $p < 0.05$

RESULTS

The overall prevalence of the absence of PLM was observed in 73 subjects constituting 35.9% of the tested population, with 51 subjects (69.9%) having bilateral absence and 22 subjects (30.1%) having unilateral absence. Among the males, PLM was found to be absent bilaterally in 15 subjects (14.6% of males) and unilaterally in 7 subjects (6.8% of males); with distribution of 4.9% on the left and 1.9% on the right (Table 1). In females, bilateral absence was seen in 36 subjects (34.6% of females) while 15 subjects (14.4%) had unilateral absence; with distribution of 4.8% on the left and 9.6% on the right. The prevalence of absence of PLM was significantly

different ($p < 0.05$) between the males and females, as the female subjects showed a higher prevalence of PLM absence (49%) than the males (21.4%).

Table 1
Absence of PLM compared to gender

Gender	Bilaterally absent PLM	Bilaterally absent PLM		Total
		Right	Left	
Male	15	2	5	22
Female	36	10	5	51
Total	51	12	10	73

Table 2
Absence of PLM vs handedness

Gender	Bilaterally absent PLM	Bilaterally absent PLM		Total
		Right	Left	
Right handed	47 (25.5%)	8 (4.3%)	10 (5.4%)	65
Left handed	3 (15%)	3 (15%)	0	6
No response	1 (20%)	1 (20%)	0	2
Total	51	12	10	73

The relation of the prevalence of absence of PLM to handedness showed that among right handed subjects, 10 (5.4%) had absence on the left hand, 8 (4.3%) on the right hand while 47 (25.5%) had bilateral absence. Among left handed

subjects, none had PLM absence on the left hand but 3 (15%) had absence on the right hand while 3 (15%) also had bilateral PLM absence. There was no significant difference between right handed and left handed subjects with regards to the prevalence and characterization of PLM absence (Table 2).

DISCUSSION

The Palmaris longus muscle (PLM) has a wide variation in prevalence of its agenesis among different age and ethnic groups (Moris et. al. 2012). It is also one of the most inconsistent muscles in the body whose morphology, nerve supply and functions have been extensively discussed. A number of authors suggest that apart from its ethnic variations, its absence is more common in women, bilateral absence is more common while unilateral absence occurs more frequently on the left hand (Troha et al. 1990; Ceyhan and Mavt, 1997; Mbaka and Ejiwunmi, 2009). While we recorded a similar higher prevalence in females and of bilateral absence, our study revealed the converse with unilateral absence slightly higher on the right side. The higher prevalence of absence recorded among females (49%) compared to males (21.4%) is in consonance with earlier reports (Troha et al. 1990; Mbaka and Ejiwunmi, 2009). The higher frequency of bilateral absence of PLM (69.9%) compared with unilateral type (30.1%) has been reported by Kose et al., (2009) and Enye et al., (2010). Other studies (Kayode et al., 2008; Mbaka and Ejiwunmi, 2009; Alves et al., 2011) had a contrary view. High values of agenesis of the PLM (63.91%) have been reported among the Turk population (Ceyhan and Mavt, 1997) as well as in Eastern Europe (42.4%) by Eric et. al. (2011). Among the Nigerian population, the reported prevalence of PLM agenesis has varied widely from 31.25%, reported by Kayode et. al. (2008), 12.6% reported by Enye et. al. (2010) to 6.7% reported by Mbaka and Ejiwunmi (2009), but our study prevalence falls more on the higher value. Eric et. al. (2011) reported on the differential absence of PLM in comparison to hand dominance, concluding that PLM absence was more likely on the non-dominant hand but bilateral absence was similar in both right and left handed respondents. This is similar to our observation in this study. Since the PLM is usually fully developed by birth (Vastamaki, 1987), even before any tendency for handedness is observed, it is interesting to see a tendency towards association with hand dominance. It is possible that the gene loci for hand dominance and PLM absence may be closely related.

In conclusion, the prevalence of agenesis of PLM in our study is in deviance to some reports in Southwestern Nigeria (Mbaka and Ejiwunmi, 2009; Enye, 2010) but similar to other reports in the same region (Kayode et. al., 2008) disagreeing with its possible racial dependency as frequently suggested by some studies. It is therefore recommended that other inherent factors like the incidence of inadequately developed tendons and occurrence of subclinical muscular neuropraxia among the population under study should be put into consideration before arriving at conclusion on the agenesis of PLM in a particular ethnic group.

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