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# The Prevalence of Palmaris longus agensis among the Ghanaian population

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## ABSTRACT

**Objective:** Background: Studies have documented the agensis of Palmaris longus muscle in different populations but none has included the Ghanaian population. **Methods:** The study involved 226 subjects (130 females and 96 males) who are students of the University of Cape Coast, Cape Coast, Ghana. The presence of the PLM was clinically determined using the Schaeffer's test. Subjects in which the tendon was not visualized or palpable, two other tests were performed to confirm the absence. **Results:** The total prevalence of absence of PLM was 3.1%; absence on the left hand was commoner than on the right hand. The frequency of PLM absence was also slightly higher in females than in males representing 1.8% and 1.3% respectively. One female had the PLM absent bilaterally while a male subject had a trifid tendon on the right forearm with a bifid on the left. **Conclusion:** The prevalence of PLM agensis in the Ghanaian population is lower compared to values coated in standard textbook on surgery. PLM is not diminishing as fast as observed in some population hence it is can be readily used as donor tendon by Ghanaian surgeons.

## 1. Introduction

Palmaris Longus muscle (PLM) is a slender, fusiform muscle that is said to be phylogenetically degenerating. Proximally attaching to the medial epicondyle of the humerus by the common flexor tendon and the adjacent intermuscular septa, it forms part of the superficial group of muscles in the anterior compartment of the forearm. A feature of this muscle is its short body which tapers to a long tendon of variable length, coursing distally towards the flexor retinaculum. A few fibers detach from the tendon and intertwine with the transverse fibers of the retinaculum. The tendon intercrosses the retinaculum, broadens as a flat plate and inserts into the palmar aponeurosis[1–4].

The action of the Palmaris longus muscle is to weakly flex the wrist and tense the palmar aponeurosis, synergized by flexor carpi radialis, flexor carpi ulnaris (to which it intervenes) and flexor digitorum superficialis muscles. It also appears to act as an anchor for the skin and fascia of

the hand, in resisting horizontal shearing forces in a distal direction[1,5,6]. It is supplied by the median nerve (C7, C8) [4]. It is considered to be a dispensable muscle since its absence does not significantly affect wrist function[1],[3],[6]. However it is of clinical importance since it is relevant in surgery for correcting ptosis, management of facial paralysis, lip augmentation, various nerve palsies, digital pulley reconstruction[5,7]. Its presence has also been identified as an independent risk factor in carpal tunnel syndrome[4,8].

PLM has been described as the commonest musculoskeletal variation in the human body[3,5]. Some of these variations in the muscle include classical, double, reverse, central and bifid[1,3,5,9]. The first report of its absence was reported in 1559 by Columbus in De Re Anatomica Libri. Standard anatomical texts place the prevalence of PLM agensis at about 15%[2,3].

Different researchers have studied the prevalence of PLM agensis in various populations and have concluded that the prevalence of PLM agensis is ethnically determined. However there is paucity of information on PLM agensis in Africa[5]. Studies documented to the best of our knowledge have not included the Ghanaian population. We attempt to determine the prevalence of PLM agensis in Ghana using students of the University of Cape Coast, Ghana as a model.

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## 2. Materials and methods

The study was a descriptive survey involving 226 students (452 upper extremities) – 130 females and 96 males– age between 18 to 30 years were recruited from the University of Cape coast, Ghana for this study. Data was obtained after oral consent was obtained from the subjects. Convenient random sampling method was used to obtain the sample size. Students were selected for the study because of higher tendency to cover various ethnic groups in Ghana<sup>[10]</sup>.

Non–Ghanaian students were excluded from the study. Individuals with physical disability (including those resulting from trauma, be it spine, lower or upper limb), any prior surgery (to upper or lower limb) and any upper limb injuries were also excluded from the study.

Three clinical tests for the presence (or absence) of the tendon were employed. Findings were recorded for both upper limbs. Age, sex and dominant hand of subjects were also recorded. The subjects were initially asked to do the standard test for the assessment of the PL tendon. If the tendon was not visualized or palpable, 2 additional tests were done to confirm the absence. These tests have been described in literature<sup>[1,2,3,5]</sup>.

1. Standard test (Schaeffer's test): The subject is asked to oppose the thumb to the little finger and then flex the wrist<sup>[1]</sup>.

2. Mishra's test I: The metacarpo–phalangeal joints of all fingers are passively hyperextended by the examiner and the subject is asked to actively flex the wrist<sup>[3]</sup>.

3. Hiz–Ediz test: This was performed by applying resistance to flexion of fingers and wrist while all fingers were at the opposite position with the wrist at slight flexion<sup>[3]</sup>.

All of the three tests were applied on all cases by the same examiner. When the PLM was not seen under the skin at the distal of the forearm on the wrist and was not palpated at the same position, the PLM was considered absent<sup>[3]</sup>.

## 3. Results

The subjects' ages ranged from 18 to 30 years with a mean age of 22.18 ±3.99 years.

The total prevalence of absence of PLM was 3.1% (PLM was present in 96.9%) in the studied population, absence on the left hand was commoner (1.77%) than on the right hand (0.89%). 1 female subject had the PL absent bilaterally (see fig. 1.1 and fig. 1.2), representing 0.44% of the studied population. The frequency of PL absence was also slightly higher in females than in males, representing 1.8% and 1.3% respectively. 4.9% of the studied population had a bifid PL (see fig 1.3); a right bifid tendon was commoner than a left bifid PL, representing 60% and 40% of the population with bifid tendons respectively. One male subject had a trifold tendon on the right upper limb (see fig 1.4), representing 0.44% of the studied population.

## 4. Discussion

The prevalence of PLM tendon agenesis has been reported to vary among ethnic groups<sup>[11]</sup>. This research was an attempt to determine the prevalence of the absence of Palmaris longus muscle in the Ghanaian population using university students as a model.

In our study PLM agenesis was detected as 3.8%. The prevalence rate we observed in our study is similar to what was observed in Zimbabwean (1.5%), Congolese (3.0%)<sup>[12]</sup>, Ugandan (1.02%)<sup>[13]</sup> and Nigerian (6.7%)<sup>[1]</sup> Populations. Other studies in China (4.6%)<sup>[11]</sup> and Korea (0.9%)<sup>[14]</sup> have also reported lower prevalence rates compared to those quoted in textbooks in surgery<sup>[15],[16]</sup>. Interestingly, a Turkish<sup>[3]</sup>, an Indian<sup>[17]</sup> and another Nigerian study<sup>[5]</sup> recorded rates (15.1%, 17.2% and 12.6% respectively) similar to what was observed in standard textbooks. Caucasian studies put the prevalence rate between 5.5%<sup>[3]</sup> and 24%<sup>[18]</sup>. The Highest prevalence rate in literature was observed to be 63.9% in another Turkish study<sup>[19]</sup>.

Unilateral agenesis was commoner than bilateral agenesis of PLM (frequently on the left upper limb). This supports work done by most researchers<sup>[17,20,21]</sup>. Also we observed that females were more likely to have agenesis of PLM than males. This again supports other published work<sup>[3],[20]</sup>, but differs with what was observed in two studies<sup>[17],[18]</sup>. These varied finding were however not statistically significant as suggested other workers<sup>[11,22]</sup>. Some reports have indicated bilateral agenesis being more common<sup>[3,19]</sup>.

A trifold tendon of PLM is uncommon but has been reported also in a cadaveric study<sup>[7]</sup>.

We agree that radiography is a definite technique in determining variations in PLM though relatively more expensive<sup>[3]</sup>. Clinical assessment of the PLM tendon has shown to be an acceptable and equally effective way to test for PLM in cases where in vitro (e.g. cadaveric) studies cannot be done<sup>[17]</sup>.

We conclude that the prevalence of Palmaris longus muscle agenesis in Ghana is lower compared to what is quoted in standard textbooks. The low prevalence rate of PLM agenesis we observed in our study suggest it is not diminishing as rapidly as other races hence it is likely be available for use as donor tendon by surgeons in Ghana.

## Conflict of interest statement

We declare that we have no conflict of interest.

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## References

- [1] Mbaka GO, Ejiwunmi AB. Prevalence of Palmaris longus absence – a study in the Yoruba population. *Ulster Med J* 2009; **78**(2): 90–93
- [2] Standring S. *Gray's anatomy*, 39th edn. Elsevier Churchill Livingstone, Edinburgh, 2005: 876–7.
- [3] Hiz O, Ediz L, Ceylan MF, Gezici E et al. Prevalence of the absence of Palmaris longus assessed by a new examination test (Hiz–Ediz test) in the population residing in the area of Van, Turkey. *Journal of Clinical and Experimental Investigations*. 2011; **2**(3): 254 – 259.
- [4] Anatomic variations in Palmaris longus muscles in Nepalese. *Journal of GMC – Nepal*. 2009; **2**(3): 39 – 44.
- [5] Enye LA, Saalu LC, Osinubi AA. The prevalence of agenesis of Palmaris longus muscle among students in two Lagos– based medical schools. *Int. J. Morphol*. 2010; **28**(3): 849–854
- [6] Pai MM, Prabhu LV, Nayak SR et al. The Palmaris longus muscle: its anatomical variation and functional morphology. 2008; **49**(2): 215–217
- [7] Georgiev GP, Jeleu L, Ovtsharoff WA. Unusual combination of muscular and arterial variations in the upper extremity: a case report of a variant Palmaris longus and additional tendinous portion of the flexor carpi ulnaris together with a persistent median artery. *International Journal of Experimental and Clinical Anatomoy*. 2009; **3**:58–61
- [8] Jafari D, Taheri H, Shariatzadeh H et al. The clinical significance of the Palmaris longus tendon and functional superficial flexor of the little finger in the pathophysiology of carpal tunnel syndrome. *Medical Journal of the Islamic Republic of Iran*. 2008; **22**(1): 8–11
- [9] Kumar V, George BM. An unusual Palmaris longus tendon; variation in the insertion and orientation at the level of wrist joint. *IJAV*. 2009; **2** 138–139
- [10] Ghana Health Service. Ghana Demographic and Health Survey. 2008
- [11] Sebastin SJ, Lim AYT, Wong HB. Clinical Assessment of Absence of Palmaris Longus and its Association with Other Anatomical Anomalies – A Chinese Population Study. *Ann Acad Med Singapore* 2006; **35**:249–53
- [12] Gangata H. 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* 2009; **22**(2): 230–5.
- [13] Igbigbi PS, Ssekitoleko HA. Incidence of agenesis of the palmaris longus muscle in Ugandans. *West African Journal of Anatomy* 1998. **6**: 21 – 23
- [14] Ahn DS, Yoon ES, Koo SH, Park SH. A prospective study of the anatomic variations of the median nerve in the carpal tunnel in Asians. *Ann Plast Surg* 2000; **44**(3): 282–7.
- [15] Smith P. Injury. In: Smith P (ed) *Lister's the hand—diagnosis and indications*. Churchill Livingstone, London, 2002: 11.
- [16] Kleinert HE, Pulvertaft RG, Smith DJ. Flexor tendon grafting in the hand. In: Jupiter JB (ed) *Flynn's hand surgery*. Williams & Wilkins, Baltimore, 1991: 285.
- [17] Kapoor SK, Tiwari A, Kumar A et al. Clinical relevance of Palmaris longus agenesis: common anatomical aberration. *Anatomical Science international*. 2008; **83**:45–48
- [18] Thompson NW, Mockford BJ, Cran GW. Absence of the palmaris longus muscle: a population study. *Ulster Med J* 2001; **70**(1): 22–4.
- [19] Ceyhan O, Mavt A. Distribution of agenesis of palmaris longus muscle in 12 to 18 years old age groups. *Indian J Med Sci* 1997; **51**(5): 156–60
- [20] Kose O, Adanir O, Cirpar M, Kurklu M, Komurcu M. The prevalence of absence of the palmaris longus: a study in Turkish population. *Arch Orthop Trauma Surg* 2009; **129**(5): 609–11
- [21] Erić M, Krivokuća D, Savović S, Leksan I, Vucinić N. Prevalence of the palmaris longus through clinical evaluation. *Surg Radiol Anat* 2010; **32**(4): 357–61
- [22] Roohi SA, Choon–Sian L, Shalimar A, Tan GH, Naicker AS. A study on the absence of palmaris longus in a multiracial population. *Malays Orthop J* 2007; **1**(1): 26–8.