

Prevalence of congenital absence of Palmaris Longus tendon in young Jizani population of Saudi Arabia: A cross sectional study

Faisal Nazeer Hussain¹, Tabinda Hasan²

ABSTRACT

Objective: Medical literature observes clear racial/demographic trends in Palmaris longus absence; with the incidence of agenesis ranging from 5 to 25% in numerous populations. The Arabs remain relatively less explored regarding this phenomenon; more so when it comes to native Saudi populace. This study reports congenital Palmaris Longus absence in young Arab adults.

Methodology: A cross-sectional study recorded the incidence of Palmaris Longus agenesis in male and female volunteers (N=400; 200 Male & 200 Female; age range 21-25yrs) of Jazan University, Jazan, Saudi Arabia. Schaffer, Pushpkumar and Thompson tests were applied to confirm Palmaris Longus absence.

Results: The incidence of Palmaris Longus absence was 24.5 % (an overall 16.7 % unilateral and 7.75% bilateral absence with Left sided absence being more common in the cohort). Gender wise, right sided agenesis was more common in males and left sided agenesis was more common in females while the prevalence of bilateral absence was analogous between the two sexes.

Conclusion: Palmaris Longus tendon is now a morphologically ebbing entity and its absence/agenesis is frequent in numerous populations. The incidence of Palmaris Longus absence in Saudi population is towards the higher limit of the range observed in other races. Interestingly, it is more akin to 'Caucasian' values rather than 'Asians'. 'Sexual' and 'limb sided' dimorphism is noted in absence trends. The knowledge of population specific incidence of Palmaris Longus absence and dimorphism trends is important for tendon grafts, reconstructive surgery and holds significant implications for anatomists, orthopedicians and biological anthropologists.

KEY WORDS: Agenesis, Palmaris Longus.

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INTRODUCTION

The Palmaris longus (PL) tendon is reminiscent of evolution where it used to enhance grip in primeval apes. It is known as musculus palmaris longus in Latin. It is frequently reported to be absent in Man despite dexterous hand function and elaborate hand muscle usage of humans. Although in the primate hand it is known to enhance palmer function and grip strength; its absence or malformation in humans does not seem to cause any maneuvering disability. The slender PL tendon lies superficial to the flexor retinaculum, is nourished by the ulnar artery and

innervated by the median nerve as it weakly flexes the wrist. It originates in the medial epicondyle of humerus (at the common flexor tendon) and inserts in the palmar aponeurosis of hand. The PL tendon occupies a narrow space between the flexor carpi radialis and flexor carpi ulnaris muscles, although it may not always be present.

Many methods are described for clinically determining the presence of PL, including Mishra, Pushpakumar, Schaffer and Thompson tests.¹ Being a superficial muscle, its absence can be easily demonstrated through these tests. Of late, PL has received a growing interest in plastic surgery for tendon transfers and free-tendon grafts. It has also been used for a wide variety of reconstructive procedures including restoration of lip and chin defects, ptosis correction, glans penis coronaplasty, eyelid defects and restorative management of facial paralysis.²

Studies on PL agenesis indicate a wide variation across racial and demographic boundaries; the range of absence varying from 6 to 25%.³ Owing to significant racial disparities in its occurrence and agenesis patterns, there is a need to investigate the native Saudi population for PL absence, since most available reports represent Caucasians and Blacks and published literature regarding Arabs is inadequate. Our study probes into the incidence of PL absence and its agenesis patterns in the relatively less explored Saudi population of Jazan region. Jazan province comprises an area of 40,000 sq km in the southwestern part of Saudi Arabia along the Red sea coast, with a population of approximately 1.2 million, including some 5,000 villages and cities. Its major city, Gizan is Saudi Arabia's third most important port. To the best of author's knowledge, no previous reports on PL trends among Saudi's are available in medical literature and representative information offered by our study will promote a better understanding of morphological features and reconstructive procedures in the Saudi population.

METHODOLOGY

This simple random sampling based cross sectional study used Thompson's, Schaeffer's and Pushpakumar's two-finger sign tests¹ for clinically determining the absence of PL among 400 young adult volunteers from the university community of Jazan. (200 Male and 200 Female students; age range 21-25 yrs; College of Medicine / Applied Health Sciences / Pharmacy and Dentistry Faculty of Jazan University, Saudi Arabia). We chose these tests because they were easy to maneuver and applicable in a large number of subjects with considerable degree of accuracy. Also, subjects belonging to this age group were physically and mentally competent of following out instructions in an efficient manner. Schaeffer's test was performed on both hands of the subjects in standing position. If PL tendon was either 'visible' or 'palpable'; the muscle was noted as present. In case of absence, Pushpakumar's and Thomson's tests were applied to re-confirm the muscle's non-existence. Cases with history of injury and surgery in the forearm/hands or paralysis of upper limbs were not included. Those unwilling, with joint stiffness, recent rheumatologic afflictions of wrist and trauma to hand were also excluded. The observation data was collected by one author (TH) and results were tabulated by another (FNH). Basic descriptive statistics using SPSS version 14 was used to analyze data with a confidence interval of 95% and a p value of less than 0.05 to indicate significance.

Ethical approval of the institutional review board was taken prior to conducting the study and voluntary informed consent of participants was obtained.

RESULTS

The overall incidence of PL tendon agenesis was noted as 24.6%. Unilateral absence was a predominant occurrence as compared to bilateral absence (16.7% cases presented with unilateral absence and 7.75% had bilateral absence; $p > 0.05$).

Table-I: Palmaris Longus tendon agenesis "Incidence and absence trends" tabulated into gender segregation. (n=400).

<i>PL tendon</i>	<i>Females n (%)</i>	<i>Males n (%)</i>	<i>Total n (%)</i>
Present	145(72.5%)	157(78.5%)	312(78%)
Absent	55(27.5%)	43(21.5%)	98(24.5%)
Unilateral absence	39(19.5%)	28(14%)	67(16.7%)
Right side absence	12(6%)	19(9.5%)	31(7.75%)
Left side absence	27(13.5%)	9(4.5%)	36(9%)
Bilateral absence	16(8%)	15(7.5%)	31(7.75%)

not significant). Sexual dimorphism was noted in agenesis trends; although the difference across genders was non-significant ($p>0.05$). Right sided absence was more common in males while left sided absence was more common in females. The overall 'right' versus 'left' sided absence showed statistically non-significant difference in the population; $p>0.05$. The detailed results are presented in Table-I.

DISCUSSION

Till date, many studies have been conducted in numerous parts of the world to elucidate the absence of PL muscle. It is a dispensable muscle with no 'active' function in hand movements which would otherwise lead to any form of functional deficiency if the muscle were absent. Despite its functionally passive role, PL is a popular agent for tendon transfers, free tendon grafts and in reconstructive procedures. On the routine operation table, it serves as a landmark to identify or lead to the palmar fascia or median nerve. It has been noted as a stabilizer of superficial structures in the palm in preparation to thumbs abduction.⁴

This study explored PL absence in native Jazani population of Saudi Arabia. All the participants of this study belonged to indigenous Arab populace and no foreigners were included to eliminate confounding bias (here, it is imperative to mention that Saudi Arabia comprises a third of its population from amongst foreigners and expatriate workers). Our observations of 24.5% absence were considerably higher than values reported in Pakistani (12%) and Indian (17%) populations (comparable Asian populations).² Our cluster exhibited an agenesis incidence lying on the upper limit of the commonly reported range (5 to 25%) in various races.³ Sexual dimorphism was observed in our study, a phenomenon that has been reported previously by Troha⁵ and Ceyhan.⁶ The difference between unilateral and bilateral absence was not marked, findings which contradicted the reports of Mokaba GO et al.³ The lower incidence observed bilaterally is consistent with previous accounts of Thompson on Caucasians⁷ and Sebastin on Chinese¹ but differed with Ceyhan's⁶ records on Turkish population. Unilateral absence was observed to be higher in females (19.5%) than males (14%) of our study group; which correlated with findings of Troha⁵; Ceyhan⁶ except for the report on Ugandans by Igbigbi and Ssekitoleko.⁸

A study on 300 Caucasian subjects by Thompson et al found that PL was absent unilaterally in

Table-II: Prevalence of congenital absence of Palmaris Longus tendon in various populations.

<i>Population</i>	<i>Authors</i>	<i>Absence (%)</i>
North Americans	Troha [5]	24%
Pennsylvania. USA	Wehbe [14]	23%
Seattle, USA	Vanderhooft [10]	12%
Germans	Gruber [15]	20.4%
European	George [16]	15.2%
Turkish	Ceyhan [6]	25%
Japanese	Adachi [17]	3.4%
Chinese	Sebastian [1]	4.6%
Ugandans(Africa)	Igbigbi [8]	1.02%
Yourbas, Nigeria	Mokba [3]	6.7%
Pakistani	Hussain FN [2,22]	12.95%
Indians	Kapoor [13]	17.2%
Malays	SA Roohi [18]	11.3%
Amazonians	Machado [19]	3.7%
Arabian Gulf region (Bahraini)	Sater [20]	36.8%
Present study	Hussain FN	24.5%

16%, bilaterally in 9% of the study sample for an overall 24% prevalence of absence.⁷ The incidence of unilateral as well as bilateral absence was more common in males, which contrasted with our results where females exhibited a higher preponderance of unilateral and bilateral absence. In a study conducted by Elizabeth O'Sullivan and Barry S Mitchell on Chinese race, 22 out of 25 hands with anomalous superficial palmar arches presented with no PL tendon.⁹ This is a significant finding and indicates noteworthy association between these two anatomical features. Some researches point to a concomitant absence of Plantaris tendon in 50% of cases where PL tendon was found missing, which is another interesting morphological correlation.¹⁰

Karatay found the agenesis frequency to be 20.5% in Turks.¹¹ Ceyhan and co-researchers stated that "Agenesis is more frequent in Whites than in Yellow and Blacks".⁶ They also suggested that PL occurrence is a dominant character in humans. According to Tahir et al, PL absence was recorded as 2.2% in Chinese, 13.2% in Indians, 3.4% in Japanese, 4.8% in American Blacks, 12.7 in Russians, 14.1% in American whites, 15.3% in European whites, 8.6% in Polish, 19.5% in Jewish and 25.4% in French.² The overall incidence for African blacks as reported by Igbigbi PS is relatively on the lower side (1.02%)⁸ except for recent reports by Enye L indicating a higher rate of prevalence(12.6%).¹² In a study on 500

Indian subjects during 2008, Kapoor et al concluded the prevalence of PL agenesis to be 17.2% (8% bilateral and 9.2% unilateral).¹³ The prevalence of unilateral agenesis was more common in female subjects (findings similar to our study where 19.5% Saudi females presented with unilateral absence as compared to 14% males); who were still more likely to have bilateral agenesis (results that contrasted with our findings of a preponderance of left sided agenesis in females). Numerous studies in the past have indicated that PL absence is more common in women and on the left side, although the observed differences were usually not significant.^{5,8,11,13-21} Our study exhibited similar findings and again, the differences were non-significant.

Thus, a wide variation of PL absence patterns exists among numerous ethnic and racial sub-groups as documented in available literature. A race specific cumulative and comparative representation of congenital absence of PL muscle has been depicted in Table-II. However, due to lack of complete access to all these studies and fundamental differences in study designs and involved variables, a conclusive inference cannot be rendered until all these studies are meta-analyzed scientifically.

Our report of an incidence of 24.5% absence among native Jizani Arabs is higher than the agenesis frequency documented in most standard anatomy text books (McMinn:15%). Interestingly, it is more akin to Caucasian rates;⁵ while it exceeds the values generally observed among Asians: Pakistani's,^{2,22} Indians,¹³ Chinese,¹ Japanese¹⁷, Malays¹⁸; therefore denying the popular assumption that "Caucasians have a considerably higher prevalence of agenesis than Asians". Also, it matches the findings of Sater et al²⁰ in 2010 on 1043 Bahraini subjects, (Arabian Gulf region) who reported similar high rates of PL absence (36.8%) in their population. This brings forth the possibility that the customary prevalence of PL absence in Asian populations may not be applied to Arab populations.

Ceyhan et al argue that the PL muscle appears to be 'increasing' in their native Gazientep population, while it is generally seen as a diminishing muscle among Turks.⁶ This elucidates an interesting possibility of PL absence frequency being a dynamic equation in races and contingent upon changing variables with time. This prospect further underlines the relevance of updated demographic records on PL incidence in different populations.

Despite being reasonably objective, our study had certain drawbacks as well; its sample size was moderate and the study area confined to a single

demographic region in the western province of Saudi Arabia. A large scale multi-centric study based on cluster sampling of native Arab population might elucidate a more realistic picture regarding this phenomenon. Also, further researches focusing on possible existence of 'PL disparities' among different tribal / ethnic subgroups of the region would be a worthwhile direction to explore.

CONCLUSIONS

The prevalence of PL absence among Arabs resembles the demographic trends observed in other races, although lying on the upper limit of the reported range and being more analogous to Caucasian values rather than Asians. This contradiction is interesting, but seems logical because PL incidence exhibits a well documented racial dependence. Comparable with certain earlier studies, unilateral absence is a more common occurrence than bilateral absence and sexual dimorphism with a female preponderance is noted among Saudi's. The knowledge of population specific incidence of PL absence, its prevalent gender trends and current morphologic status is important for tendon grafts and reconstructive surgery as well as for anatomists, orthopedicians and biological anthropologists.

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List of abbreviations:

PL- Palmaris Longus; M- Male; F- Female

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Author's contributions:

FNH was involved in conceiving the study, tabulating the data, drafting the manuscript and gave final approval of the version to be published. TH was involved in collecting the data, revising the manuscript and gave final approval of the version to be published.