Journal of Rawalpindi Medical College (JRMC); 2016;20(2):124-128

Original Article

Prevalence of Absence of Palmaris Longus Muscle in Kashmiri Population.

Muhammad Junaid khan, Muhammad Saeed Shafi, Abaidullah Shoukat, Khawaja Abrar Ahmed, Saman Azad, Muhammad Zaheer-ud-Din Ayub,ZohaibIlyas, KinzaImtiaz, Amina Kanwal, RabiaTabbsum, Nimrah Masood, Saeeda Rashid, FahimaShoukat, Amber Latif·

Department of Anatomy ,Azad Jamuuand Kashmir Medical College Muzaffarrabad.

Background: To determine prevalence of absence of Palmaris Longis (PML) in Azad Jammu and Kashmir population.

Methods: A descriptive, cross-sectional study carried out in seven districts of AJ&K. A pilot test questionnaire was used to collect demographic data by voluntary participants after an informed written consent. Master trainees were trained at AJK Medical College, Muzaffarabad, who were involved in data collection and clinical testing for the absence of PML and its effects on0 their daily activities.

Results: Out of 700 subjects,132(18.9%) had agenesis of PML; 245 (35%) were left hand dominance and 455(65%) right hand dominance. among left handed 49 (33.9%) subjects had agenesis of PML. Among 455 total right hand dominance 83 (18.2%) subjects had agenesis of PML. Overall 28 subjects had unilateral and 104 bilateral agenesis of PML.This absence of PML did not affect their routine activities. Morphologically, different tendons of PML were also found.

Conclusion:Prevalence of absence of PML in Kashmir was found in 18.9%. Its agenesis varies with body side, sex, and hand dominancy. Right hand and bilateral agenesis was greater than left hand dominance and unilateral respectively. Significance difference was observed between male and female agenesis(P< 0.05).

Key Words: Palmaris Longus muscle, Laterality, Prevalence, Agenesis.

Introduction

Palmaris longus(PML) muscle has great variability in human beings. It shows variation with sex, laterality, race and hand dominancy. [1,2]It is a slender, fusiform muscle in the flexor compartment of forearm, which arises from the medial epicondyle of the humerus. It runs parallel and in between flexor carpi radialis and flexor carpi ulnaris muscles. Its tendon passes anterior to transverse carpal ligament, and is inserted into the palmer aponeurosis, with a tendinous slip to the short muscles of the thumb. It weakly flexes hand at the wrist, tenses the palmer aponeurosis[3,4] and aids in thumb abduction.[5] Although it contribute to the thumb movements, but doesn't strengthen the gripping and pinching of hands.[6,7]

Its absence was reported for the first time by Columbus in De Re Anatomica.[8] Previous work showed that PML agenesis is more common in male with right hand dominancy. Its prevalence with sex, age, race, side of body and hand dominancy has been studied by different noninvasive clinical studies.[9] PML has been studies extensively and prevalence of its agenesis varies significantly across the different population around the world from 0.6% Korean populatio*n*, 1.02% in a Ugandan population, 2.9% in Asia*ns*, 3.4% in Japanese , 4.5% in African America*ns*, 4.6% in Chinese, 6.7% in Nigeria, 20.2% in Indians patients, 24% in North American Caucasians, 25% in Nigerian population, 26.6% in Turkish population and 38.6% in Bahraini population of Arabian region, and highest reported 63.9% in Turkish populatio*n*.[7-16] Therefore it is important for surgeons, anatomist and physicians to be aware of the prevalence of the PML agenesis in the population or ethnic group being treated.

Subjects and Methods

A Descriptive, cross-sectional study was carried out in seven districts of Azad Jammu and Kashmir (AJ&K) by convenient sampling. Study was completed in 10 months from June 2012 to March 2013. A semi structured questionnaire was used to collect demographic data from all seven districts of AJ&K. It was pilot tested in student population of Azad Jammu and Kashmir medical college (AJKMC), Muzaffarabad. Only healthy people from all fields of life, with age ranging 5-85years were included 100,000 population of each district of AJ&K. The study was approved by the institutional review board (IRB) of AJKMC. All subject were included in this study after signing an informed consent. Questionnaire included name, age, and sex, blood group of subjects, hand dominancy, profession literacy level and laterality of agenesis of PML. In case of absence of PML, the subjects were interviewed for any difficulty experienced during/ professional activities. 26 voluntary participants of (2nd year)

MBBS class were master trained for collection of demographic data and clinical testing of voluntary participants of present study. The master trainers were first trained at AJKMC, Muzaffarabad by the principal author for clinical testing of PML agenesis. Then they visited (in groups of two) district Muzaffarabad, Hatian, Sudhnoti, Bagh, Bhimber, Poonch and Haveli and clinically tested the voluntary participants for absence/agenesis of PML by five methods named: Schaeffer's test (1909), Thompson's test (1921), Mishra's test 1 (2001), Mishra's test 2 (2001), Pushpakumar's (2004) tests (Table 1 ; Figure 1-5). The trainers visited home to home in their respective district and applied all of the above five test to each participant and at the same time documented the data in questionnaire. After applying exclusion criteria, out of 1281 subjects, the data of only 700 subjects by 12 master trainers were considered correct and taken into account.

Due to anatomical variation of each subject, these five test gave different results; therefore, Schaeffer's test-1 was used as gold standard and PML agenesis was conformed when Schaeffer's test-1 was positive. The detailed description of these test are part of another article. Hand dominance was assessed by Thumb ridding traditional method. All data was transcribed and digitalized for statistical analysis by SPSS (version-21). Original survey forms were conveyed to the principal author who kept and locked them

Table 1:Tests used for clinical assessment of Palmaris longus muscle

Test name	Description
Mishra's test 1	Passively hyperextend all fingers at metacarpophalangeal joint and actively flex the wrist.
Mishra's test 2	The subject was asked to abduct the thumb against resistance with the wrist in a slight palmar flexion.
Pushpakumar's	It involves extension of the index and middle finger with flexion of the other fingers and the wrist followed by opposition and flexion of the thumb.
Schaeffer's	Object was asked to oppose the thumb to the little finger and flex the wrist.
Thompson's	Forming a fist followed by wrist flexion and finally thumbs opposition and flexion over the fingers.

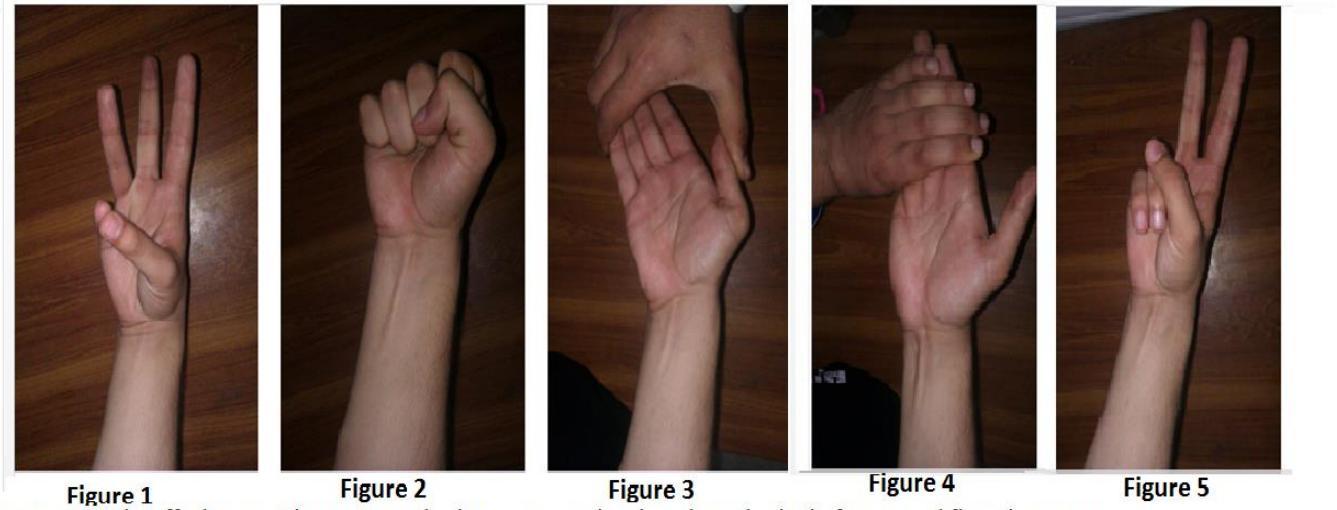

Figure 1. Schaeffer's test. Object was asked to oppose the thumb to the little finger and flex the wrist.

Figure 2.Thompson's test.Forming a fist followed by wrist flexion and finally thumbs opposition and flexion over the fingers.

Figure 3.(Mishra's test 2) Abduction of thumb against resistance with the wrist in a slight palmar flexion

Figure 4. (Mishra's test 1).Passively hyperextend all fingers at metacarpophalangeal joint and actively flex the wrist

Figure 5. (Pushpakumar's test).It involves extension of the index and middle finger with flexion of the other fingers and the wrist followed by opposition and flexion of the thumb.

Figure 1-5: Tests used to identify Palmaris longus tendon

Results

A total of seven hundred subjects,333(47.6%) males and 367(52.4%) females, from seven districts of AJ&K population were selected and examined during the survey. None of the examined subjects complained about any sort of pain or difficulty during their daily activities. Out of 700 subjects 132 subjects (18.9%), 47 males and 85 females (6.7% - 12.1% respectively) were

found to had absence of PLM. Total left hand dominant[LHD] were 245 (35%) and that of right hand dominant [RHD] were 455 (65%). In females 85(23.2% of total females & 12.1% of 700 subjects) subjects were found with absent PLM. 31 subjects with left hand dominance agenesis and 54 with right hand dominance agenesis. In 20 female subjects, PLM was absent unilaterally and in 65 bilaterally (Table 2).Among male 47(14.1% of total males &6.7 of 700 subjects%) subjects were found with absent PLM. 18 with left hand dominance agenesis and 29 with right hand agenesis. Unilaterally, it was absent in 8 male subjects and bilaterally in 39 (Table 2). Among 700 subjects, 132 (18.9%) did not have PLM: 245 (35%) were total left hand dominant subjects, among which 49 (11.4%) subjects did not have PLM. With 455 (65%) total right hand dominance, 83 (18.2%) subjects were found with absent PLM. Overall 28(4%) subjects had unilaterally agenesis of PLM and 104(14.9) bilaterally. Right hand and bilateral agenesis was greater than left hand dominance and unilateral respectively (Table 3)

Table 2.Prevalence of absent Palmaris longus muscle in gender and its association with hand dominancy and laterality

Gender	Laterally agenesis		Total agenesis in male and female	Hand dominance Agenesis		Total agenesis in male and female
	Unilateral	Bilateral		LHD	RHD	
Male 333 (47.6%)	8	39	47	28	29	47
Female 367 (52.4%)	20	65	85	31	54	85
Total cases 700 (100%)	28	104	132 (18.9%)	59	83	132 (18.9%)
	p < 0.00			*P < 0.00*		

Table 3:. Total Agenesis of PLM, laterality and hand dominancy

			Absent	Total
Total hand dominancy	LHD	196 (28%)	49 (7%)	245 (35%)
	RHD	372 (53.1%)	83 (11.9%)	+455(65%)
Total		568 (81.1%)	+132(18.9%)	=700(100%)
Total laterality	Unilateral*	00	28 (4%)	28
	Bilateral	568,(81.1%)	+104(14.9%)	+672
Total			132 (18.9%)	=700

(*) Unilaterally present PLM is considered as absent.

Discussion

Palmaris Longus Muscle is the most variant muscle of upper extremity of human body. It is considered as a phylogenetically retrogressive muscle i.e. a long tendon with short belly. Its absence almost does not affect overall action of hands. Therefore, most of hand surgeons consider it as first choice in tendon graft procedures, chronic injuries of the flexor tendons,[16,19] ligament reconstruction ocular defects, reconstruction of the ligament of the thumb and elbow, blepharoptosis and other surgical reconstruction.[3,16,19,20,21] In humans, agenesis of PML is congenital and its genetic transmission is not clear. In vertebrates it is found in mammalians only and is well developed in those where forearm is used for ambulation.[22]PML is stronger in arboreal primates and becomes weaker and rare in terrestrial one.[23]In human, it is progressively degenerating.

Table 4:. This table includes total agenesis of PML and among male and female in different racial population.

City/Country	Sampling size N	Total absence. %	Male %	Female %
Chinese[7]	329	4.6	4.2	4.8
Jordon[31]	1020	38.62	33.47	42.94
Turkey[32]	1350	26.6	20.7	32
Zimbabwe, (Black Africans)[33]	890	1.5	--	--
Novi Sad, Serbia[34]	542	42.4	--	--
Lagos, Nigeria[3]	500	12.6	9.5	14.0
East Africa[35]	800	4.4	4.9	3.9
Chilean, Brazil[36]	740	26.5	21.1	29.93
Eastern Azerbaijan[37]	1247	24.4	19.8	29.1
Jizani population, Saudi Arabia[38]	400	24.5	21.5	27.5
Egypt[39]	**386**	50.8	11.9	38.9
AJK, Pakistan	**700**	18.3.6	10.8	23.3

Present study shows that agenesis of PML is significantly higher in female (12.1%) than male (6.7%) and it is more often bilateral than unilateral in Kashmir. this is in agreement with study done in southern Iran[24] and Afghan population.[24,25] In our study, overall PML agenesis represents the one of the higher prevalence rate (18.9%) in the community of nations . PML agenesis in Kashmir is very similar to a study done in afghan population with PML prevalence rate of 18.6%,Chilean, Brazil i.e. 20% and two studies

done in Indian population with very close results .i.e. 20.2%[14] and 17.2%.[14,25,26,27] Previous studies show that PML absence/ agenesis ranges from highest 63.9% (in Turkish population) to lowest 0.6% Korean population.[10] This study reaffirms that prevalence of agenesis of PML with laterality varies with ethnicity, nation and continents of the world (Table 4).

Table 5 : Showing laterality vice agenesis of PML in different countries.

Country	Unilateral agenesis %	Bilateral agenesis %
China	3.3	1.2
Jordan	15.5	23.1
Turkey	11.5	15
Zimbabwe	0.9	0.6
Serbia	21.6	15.9
Nigeria	8	4.6
East Africa	3.3	1.1
Brazil	14.3	12.2
E. Azerbaijan	17.2	7.1
Saudi Arabia	16.7	7.75
Egypt	19.7	31.1
Bahrain	17.9	19
India	9.2	8
AJK, Pakistan	4	14.9

In many nations, PML is absent unilaterally more common than bilaterally whereas; our study resulted in bilateral absent PML as more common (14.9%) (Table 5). During this study, Y-shaped and bifurcated tendons of PML also have been found which has been mentioned in many other studies.[28-39] This also reaffirms that PML varies not only ethnically but also in its structure and this leads its importance for various type of uses in surgery.

Conclusions

1.There is no effect of absence or presence of PML on daily performance of people from different occupation. It is worth mentioning for the surgeons that PML tendon is available in 81.7% of AJ&K population for any sort of tendon graft surgery. Moreover, the clinical significance of morphologically different tendon of PLM especially "y' shaped tendon in selected plastic surgery is of great importance.

2. Palmaris Longus muscle agenesis varies with body side, gender, race and hand dominancy. However, Absence of PML is congenital so its genetic cause needs to be identified and studied. The given clinical methods gave different results for same subject.

References

1. Sankar KD, Sharmila BP, John SP. Incidence of agenesis of palmarislongus in the Andhra. Indian Journal of Plastic Surgery. 2011; 44(1): 1344-8.
2. Alves N, Ramirez D and Deana NF. Study of frequency of the palmarislongus muscle in Chilean subjects. Int. J. Morphol. 2011; 29(2):485-89.
3. Enye LA, Osinubi AA, Saal U. The prevalence of agenesis of Palmaris longus muscle amongst students in two Lagos Based. Int. J. Morphol. 2010; 28(3):849-54.
4. Gangata H. The clinical surface anatomy anomalies of the palmarislongus muscle in the Black African population of Zimbabwe and a proposed new testing technique. Clin Anat. 2009; 22(2):230-35.
5. Fahrer M. Proceedings: the role of the palmarislongus muscle in the abduction of the thumb. J Anat, 1973; 116-476.
6. Sebastin SJ, Lim AY, Bee WH, Wong TC, Methil BV. J Hand Surg Br. Does the absence of the palmarislongus affect grip and pinch strength. Aug; 2005: 30(4):406-08.
7. Sebastin SJ, Puhaindran ME, Lim AY, Lim IJ, Bee WH. The prevalence of absence of the palmarislongus--a study in a Chinese population and a review of the literature. J Hand Surg Br. 2005; 30(5):525–27.
8. Schaeffer JP. On the variations of the palmarislongus muscle. Anat. Rec.3, 1909; 275-78.
9. Ali MS, Mirna P, Francis CS. The Variation in the Absence of the Palmaris Longus in a Multiethnic Population of the United States: An Epidemiological Study. Plastic Surgery International. 2012: 4.
10. Ceyhan O, Mavt A. Distribution of agenesis of palmarislongus muscle in 12 to 18 years old age groups. Indian J. Med. Sci. 1997; (51):156-60.
11. Igbigbi PS and SekitolekoO HA. Incidence of agenesis of the palmarislongus muscle in Ugandans. West African Journal Anatomy. 1998; 6(3):21-23.
12. Adachi B. BeitragezurAnatomie der Japaner. XII. Die Statistic der MuskelvarietätenzweiteMitteilung. ZeitschriftFürMorphologieundAnthropologie.1909;12(2):261- 312.
13. Mbaka GO, Ejitwunmi AB. Prevalence of palmarislongusabsence – a study in the Yoruba population. The UlsterMedical Journal. 2009; 78, (2):90-93.
14. Agarwal P. Absence of the palmarislongus tendon in Indian population. Indian Journal of Orthopaedics.2010; 44(2):212-15.
15. Troha F, Baibak GJ, Kelleher JC. Frequency of the palmaris long us tendon in North American Caucasians. Annals of Plastic Surgery. 1990; 25(6):477-79.
16. Wehbé MA. Tendon graft donor sites. J Hand Surg Am. 1992; 17(6):1130–32.
17. Kose O, Admir O, Cirpar M, Kurklu M. Prevalence of absence of palmarislongusmuscle;a study in Turkishn population. Arch Ortop. Trauma Smg. 2009; 129:609-11.
18. Sater MS, DharapAS, Abu-Hijleh MF. The prevalence of absence of the Palmaris longus muscle in the Baharaini population. Clinical Anatomy.2010; 23(8):956-61.
19. Pulvertaft RG. Tendon grafts for flexor tendon injuries in the fingers and thumb; a study of technique and results. J Bone Joint Surg Br.1956; 38: (1)175–94.
20. Kaufmann RA and Pacek CA. Pulley reconstruction using palmarislongusautograft after repeat trigger release. J Hand Surg Br. 2006; 31(3): 285–87.
21. Lam DS, Lam TP, Chen IN, Tsang GH, Gandhi SR. Palmaris longus tendon as a new autogenous material for frontalis suspension surgery in adults. Eye (Lond). 1996;10(1):38–42.

22. Reimann AF, Daseler EH, Anson BJ, Beaton LE.The palmarislongus muscle and tendon. A study of 1600 extremities. Anat. Rec.1944; 89: 495–50 5.
23. Roqueline A G, Aversi-Ferreira MF,Bretas RV. Morphometric and Statistical Analysis of the Palmaris Longus Muscle in Human and Non-Human Primates. BioMed Research International 2014; 178906:2-6
24. Jashni K . Agenesis of palmaris longus in southern of iran: a population based study .OnLine Journal of Biological Sciences. 2014; 14 (1):8-11.
25. Yunus D, Aydıner K, Nazan S, Erdinç E, Edip U. The prevalence of the Palmaris Longus Agenesis: A study in Afghan population. TurkiyeKlinikleri J Med Sci.2010; 30(5):1561-65.
26. Alves N, Deana NF, Ramirez D. Study of frequency of the palmarislongus muscle in Chilean subjects. Int. J. Morphol.2011; 29(2):485-89.
27. Kapoor SK, Tiwari A, Kumar A, Bhatia RS. Clinical relevance of palmarislongus agenesis: common anatomical aberration. Anatomical Science International. 2008; 82(1):45-48.
28. Takanashi Y, Eda M, Kaidoh T, Inoué T. A case of the bilateral duplicate palmarislongus muscles coupled with the palmarisprofundus muscle. Yonago Acta Med. 2012; 55(4):75-80.
29. Kawashima T, Kikushima S, Yokota E, Ohkubo F. A case of an accessory palmarislongus muscle and a duplicate palmarislongus muscle with special reference to their nerve supply--morphologic significance of a common innervation trunk. Okajimas Folia AnatJpn. 2002; 79(2-3):75-81.
30. Ali A A, Paw M, Kadhim J. Anomalous V-shape Palmaris Longus Tendon: Two Cases. J Med Cases. 2010; 1(2):68-70.
31. Hassan FOA, Jabaiti SK. absence of Palmaris longus tendon in mid-easteren population. Journal of Bahrain Medical Society. 2008; 20(2):70-73.
32. Kose O, Admir O, Cirpar M, Kurklu M, Komurcu M. The prevalence of absence of the palmarislongus: a study in Turkish population. Archives of Orthopaedic and Trauma Surgery.2009; 129(5): 609-11.
33. Gangata, H., Ndou, R. and Louw, G. The contribution of the Palmaris longus muscle to the strength of thumb abduction. Clin. Anat. 2010; 431–36.
34. Eric´ M, Krivokuc'a D, Savovic' S. Prevalence of the Palmaris longus through clinical evaluation. Surg Radiol Anat.2010; 357–61.
35. Kigera JW and Mukwaya S. Frequency of agenesis Palmaris longus through clinical examination--an East African study. PLoS One. 2011; 6(12).
36. Morais MA, Gomes MS, Helrigle C, Malysz T. Prevalence of agenesis of the palmarislongus muscle in Brazil and its clinics correlation. J. Morphol. Sci. 2012; 29(4):238-42.
37. Hashemiaghdam A, Iranmehr A, Abolhasani F, Meysamie A, Ghadakchi L. Surveying the genetic factors effect to lack of palmarislongus muscle's tendon and prevalence of absence in the inhabitants of Eastern Azerbaijan. BMC Proc.2012; 6(4):34-37.
38. Hussain FN, Hasan T. Prevalence of congenital absence of Palmaris Longus tendon in young Jizani population of Saudi Arabia: A cross sectional study. Pak J Med Sci.2012; 28(5): 865-69.
39. Raouf HA, Kader GA, Jaradat A, Dharap A, Fadel R, Salem AH. Frequency of Palmaris Longus Absence and Its Association with Other Anatomical Variations in the Egyptian Population." Clin Anat.26 (5), 2013: 572-77.