

Brief Report

Prevalence of Palmaris Longus Agenesis in a Hospital in Iran

Farivar Abdolazadeh Lahiji MD¹, Keyghobad Ashoori MD¹, Mostafa Dahmardehei MD^{•2}**Abstract**

Background: The prevalence of the palmaris longus agenesi s (PLA) has been variously reported to be from 1.5% to 64% in different ethnic groups. Lack of reliable information about the state of the PLA in Iran made us to design a study on the agenesi s of the palmaris longus (PL) among a sample of Iranian population during 2009.

Materials and Methods: One thousand participants were included in this descriptive study. Subjects were patients and personnel of a major orthopedic surgery center in Iran. The *Schaeffer test* was used to detect the presence or absence of the PL. An orthopedic resident conducted the test (observer reliability 98%). The prevalence of agenesi s was determined in the sample and its actual prevalence was estimated for the whole population. The role of gender and handedness was also considered in the presence or absence of the PLA.

Results: The prevalence of the PLA was estimated to be 22.8%; 10.2% agenesi s on the right side, 5.9% on the left side, and 6.7% bilateral PLA. The relationship between PLA and gender didn't appear to be significant. Among people with PLA 43% and among people without PLA 17% were left handed ($P < 0.05$, odds ratio [OR]: 3.7).

Conclusion: The prevalence of the PLA in Iranians seems to be comparable with the average Caucasian values which is estimated to be 22.4%. Furthermore, significant relationship exists between the PLA and left hand dominance.

Keywords: Dominant hand, Iranian population, palmaris longus agenesi s (PLA), Schaeffer test

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Introduction

Palmaris longus (PL) is only present in mammals among all vertebrates and is more developed in mammals who use their upper extremity for mobilization.¹ The size of this muscle is diminished judged by its function for mobilization and the decreased power of the hand.² In the human being PL acts as a weak flexor of the wrist,² and it aids in cupping of the hand.³ It seems that this muscle has lost its function along the line of human evolution. Thus, its absence will not affect the function of the wrist.³ PL is of little functional use to the human upper limb; it assumes great importance when used as a donor tendon for transfer or transplant. Tendon grafts are frequently needed in reconstructive surgery on the hand. Many surgeons agree that the PL tendon is the first choice as a donor tendon because it has proper length, diameter, and availability, and can be used without causing any functional change.

Surgeons agree that it is the best choice for tendon grafts in tendon reconstruction, helping the function of paralyzed muscles in orthopedics especially for replacement of the long flexors of the fingers and the flexor pollicis longus tendon. It has also been used for repairing ptosis, treatment of facial paralysis, and urinary incontinence. Plastic surgeons also utilize the PL in lip augmentation and restoration of lip and chin defects. As its absence is immaterial to the function of the wrist,¹ PL has the greatest variation in the human body and its most common variation is agenesi s (PLA).

Most standard textbooks of hand surgery quote the prevalence of the absence of PL at around 15% among Caucasians. However, this figure varies considerably in reports from different ethnic

groups. The prevalence of its agenesi s has been variously reported to be from 1.5% in black people to 64% in Turkish people.⁴

One of the issues in medical research is to answer the question just how the prevalence of the PLA has shown such a difference in various studies. Likewise, it has been reported to be more common in women than in men and also on the left than on the right.⁴

To the best of our knowledge, only two other studies in the available literature have reported the prevalence of the PLA exclusively in a population of Iran; one on medical students and one on cadavers. We conducted this study and assessed a larger population for the presence or absence of the PL tendon.

Materials and Methods

We studied 1008 patients and personnel of a major orthopedic hospital (2016 hands) in Iran. People who were younger than six, people with an abnormality of the upper extremities or a previous surgery or trauma to the wrist, and also people who couldn't be judged because of excessive obesity were excluded from the study. In eight participants (0.8 %) it was impossible to test for the presence of the PL due to excessive obesity or previous scar on the forearm. Finally, one thousand subjects were included in this descriptive study. The sample size was determined based on a pilot study on 60 people, prevalence 25%, measurement error of 0.03, and confidence interval (CI) 95%, to be 1000 people. Sampling was done sequentially to reach the target sample size. This study was done by the orthopedic assistants under the supervision of attending orthopedic surgeons. After obtaining the participants' informed consent, the presence or absence of the PL was assessed by the *Schaeffer test*.

All statistical analyses were carried out using SPSS (version 11.5). The prevalence of the PLA was presented with a 95% CI. The relationship between gender and dominant hand with agenesi s was statistically analyzed using the chi-square test. Statistical significance was set at $P < 0.05$.

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Table 1. The prevalence of the PLA in different populations

Ethnic Groups	Percent of PLA	Number of Cases	Year
Black Africans ⁵ (Zimbabwe)	1.5 %	890	2009
Black Africans ⁶ (Yoruba Tribe, Nigeria)	6.7 %	600	2009
Caucasian ⁷ (Serbia)	37.5 %	800	2009
Caucasian ¹ (Northern Ireland)	25 %	300	2001
Amazon Indians ⁸	3.7 %	379	1967
Turkish ³	26.6 %	1350	2009
Turkish ⁹ (Gaziantep)	63.9 %	7000	1997
Chinese ⁴	4.6 %	329	2005
Indian ²	17.2 %	500	2007
Asian ¹⁰ (Malays, Chinese, and Indians)	9.3 %	450	2007
Malays ¹⁰	11.3 %	150	2007
Indians ¹⁰	10.7 %	150	2007
Chinese ¹⁰	6 %	150	2007
Iranian (our study)	22.8 %	1000	2009

Results

Among 1000 participants, 682 were men (68.2%) and 318 women (31.8%). Two hundred and twenty-eight subjects (22.8%) had PLA. Considering this prevalence rate among our sample, the true prevalence of the PLA in society, with 95% CI can be estimated from 20.2 % to 25.4%. The prevalence of the PLA in the right hand was estimated to be 10.2 % and in the left hand 5.9% and the prevalence of the PLA in both hands (bilateral PLA) was estimated to be 6.7 %.

Out of the 228 subjects with PLA, 151 (66.2%) were men and 77 (33.8%) were women. This difference was not statistically significant ($P = 0.47$). Out of 1000 studied subjects, 228 patients had PLA, of whom 130 (57%) were right handed and 98 (43%) were left handed. Among 772 subjects with present PL, 640 (83%) were right handed and 132 (17%) were left handed. The chi-square test showed that the relation between left handedness and PLA was statistically meaningful; people with agenesis were 3.7 times more likely to be left handed than people without agenesis and left-handed subjects were 3.7 times more likely to have agenesis ($OR = 3.7\%$). Therefore, according to our results, left handedness in people with PLA can be extrapolated.

Discussion

Studies from various ethnic populations have reported differing prevalence of the PLA (Table 1).

Kose, et al. in a study on 1350 Turkish people in Goolhan University reported 26.6% of PLA and concluded that agenesis is more common in women and that bilateral agenesis is more common than unilateral agenesis. They did not take into account handedness.³

Likewise, Tompson, et al. evaluated 300 black people for PLA and concluded that the incidence of bilateral PLA was 9%, unilateral PLA 16%, and the overall prevalence was 25%, which is similar to the present study. In their study, no meaningful relationship existed between the prevalence of the PLA in one hand and the other.¹

In a conflicting study Sebastin, et al. reported 4.6% PLA in 329 Chinese people (120 men and 209 women, aged between seven and 85 years, of whom 5% were left handed). Their results implied that the prevalence was not significantly different between left and right sides. However, subjects with the absence of the PL tendon on the right side were 52.3 times more likely to have a concomitant absence of the PL tendon on the left side ($OR: 52.3$, 95% CI 10.0 – 273.4, $P = 0.001$). The overall prevalence of an absent PL was 4.2% in men (five men) and 4.8% in women (ten women). The results revealed no significant difference in the overall prevalence of the PL tendon absence (unilateral or bilateral) and between the sexes.⁴

The present study was done on the patients and personnel of a major orthopedic hospital, which is probably not a sample of the whole of the Iranian population; however, this center is a referral hospital and patients come from around the country. Therefore, our sample may be a representative of the Iranian population. We also aimed to resolve some weak points of previous studies as inadequate sample size and lack of observer reliability test.

In summary, it seems that the prevalence of agenesis in the Iranian population is somewhere between international reports. The prevalence of the PLA has been reported between 1.5% and 64% in different ethnic groups. Although PL is of little functional use to the human upper limb, it assumes growing role as a donor tendon for transfer or transplant in various fields from orthopedic and plastic surgery to otolaryngology and ophthalmology. Thus, its absence means losing a potential otologous donor site for some surgeries. Furthermore, according to our results, the PLA is more common in the left dominant hand; we questioned whether a relationship exists between dominance of the right cerebral hemisphere and PLA in the left dominant hand.

Further studies are needed to determine whether agenesis causes left handedness or vice versa, and also whether dominance of the right hemisphere can cause agenesis in the left hand.

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