RESEARCH ARTICLE

Clinical assessment of absence of palmaris longus muscle and its association with ethnicity

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Abstract

Objective: To compare two clinical tests used for assessment of absence of palmaris longus, and to determine the prevalence of the absence of palmaris longus among ethnic groups in a cosmopolitan setting.

Method: The cross-sectional descriptive study was conducted at the Bahria University Health Sciences, Karachi, from April 2021 to May 2022, during which forearms belonging to Sindhi, Punjabi and Urdu-speaking ethnic groups were tested. Assessment of presence or absence of palmaris longus was performed using Schaeffer's and Thompson's tests. Agenesis and association of ethnicity and agenesis were compared. Data was analysed using SPSS 23.

Results: Of the 250 subjects, 152(60.8%) were females and 98(39.2%) were males. The overall mean age was 20.4±2.23 years (range: 18-23 years). In terms of ethnicity, 100(40%) subjects each were Punjabis and Urdu-speaking, while 50(20%) were Sindhis. The total forearms assessed were 500. The overall agenesis was 186(37.2%). When the two assessment tests were compared, highly significant differences were noted (p<0.000). Overall agenesis was highest among Sindhis 40%, followed by 38% in Punjabis, and 35% in Urdu-speaking. Significant differences were observed when one-sided palmaris longus absence was compared with two-sided absence (p<0.037).

Conclusion: Schaeffer's test had more accuracy compared to the Thompson's test in the determination of palmaris longus agenesis. There were variations in terms of agenesis among the ethnic groups.

Key Words: Clinical assessment, Absence, Palmaris longus, Association, Ethnicity.

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Introduction

Palmaris longus (PL) originates from the medial epicondyle of humerus. It has proximal attachment to the medial epicondyle of humerus by the help of a common tendon of humerus, and distally it has a single tendon.[1] PL has a longer tendon compared to its muscle belly.[2] Within the forearm, the muscle lies medial to the tendon of flexor carpi radialis, and lateral to the tendon of flexor digitorum superficialis.[1] Its tendon passes superficially over the flexor retinaculum and after it enters the hand blends with the fibres of palmar apponeurosis.[1] The muscle is involved in flexion of the hand at the wrist joint. Also, it helps in making the palmar aponeurosis tense.[3] The superficial position of the muscle enables it to be accessible with ease.[4] PL, because of its prime location and easy access, is a muscle of choice for various reconstructive and orthopaedic procedures.[1] The grafting techniques assist its use in chin and lip correction surgeries by the plastic surgeons.[5]

PL is among the muscles that present with distinctive variability among the individuals.[6] Globally, the agenesis of PL ranges between 1.5% and 69.3%.[4] Literature suggests that variability in terms of agenesis is not uniform globally, rather it presents with differences among races and populations around the world.[7,8] A study documented the association of PL agenesis (PLA) with that of ethnic background, gender and side of the body.[3]

There are several clinical tests that can detect the agenesis or presence of PL. Among them, the most commonly used technique worldwide is Schaeffer's test. Other test in use is Thompson's test. Although both tests are easy to perform, they differ in their ability to show the tendon of PL muscle.[9] It is postulated that in order to facilitate grafting procedures, the validity of functional tests must be ascertained.[1]

In Pakistan, to the best of our knowledge, no research has been conducted to determine the accuracy of the clinical tests used to detect PL, and, also, association of agenesis with respect to different ethnicities has not been established. The current study was planned to fill the gap by comparing the two clinical tests used for the assessment of PLA, and to determine PLA prevalence among ethnic groups in a cosmopolitan setting.

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Subjects and Methods

The cross-sectional descriptive study was conducted at the Bahria University Health Sciences (BUHS), Karachi, from April 2021 to May 2022. After approval from the institutional ethics review committee, the sample size was calculated using OpenEpi version 3 calculator10 based on population prevalence 50%[10], margin of error 5% and confidence interval (CI) 95%. Convenient sampling was used to recruit samples. The sample was raised from male and female BUHS, Karachi students aged 18-23 years from Sindh, Punjabi and Urdu-speaking ethnicities after taking consent. Those included were individuals without forearm and hand abnormalities or past surgical history. Those with forearm and hand defect or history of surgery were excluded.

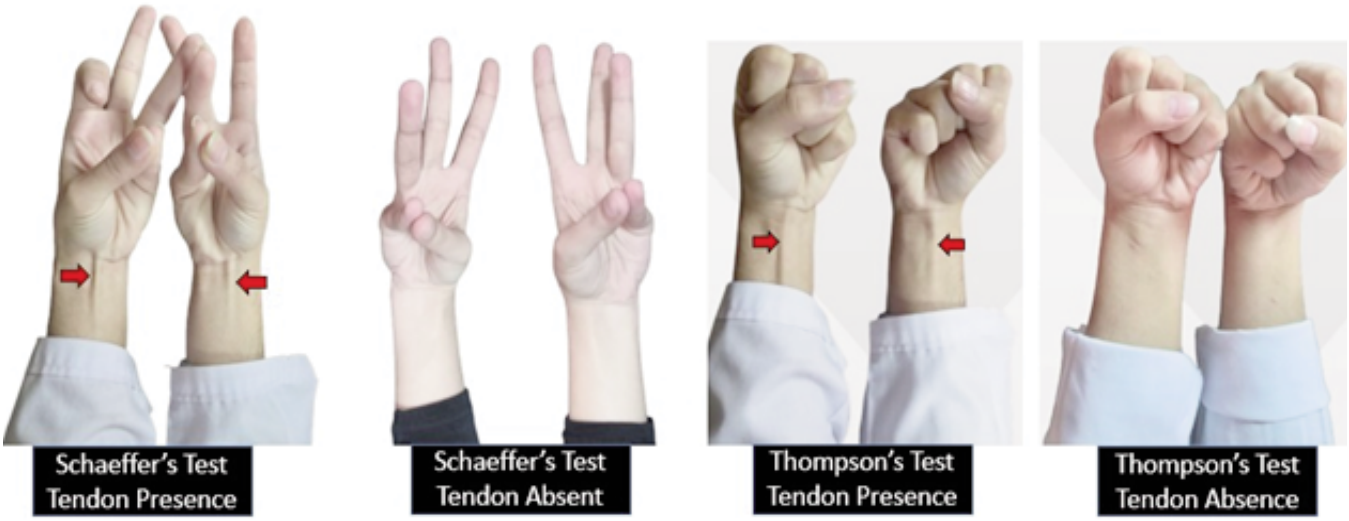

Figure-1: Assessment of palmaris longus agenesis by clinical tests..

The enrolled subjects were tested for absence or presence of PL using Thompson's and Schaeffer's test3,[11] (Figure 1).

Data was analysed using SPSS 23. Chi-square test was used to compare the two clinical tests, and to find association between ethnicity and PLA. Categorical variables were expressed as frequencies and percentages. P≤0.05 was considered statistically significant.

Results

Of the 250 subjects, 152(60.8%) were females and 98(39.2%) were males. The overall mean age was 20.4±2.23 years (range: 18-23 years). In terms of ethnicity, 100(40%) subjects each were Punjabis and Urdu-speaking, while 50(20%) were Sindhis. The total forearms assessed were 500. The overall agenesis was 186 (37.2%). When the two assessment tests were compared, highly significant differences were noted (p<0.000). Overall agenesis was highest among Sindhis 40%, followed by 38% in Punjabis, and 35% in Urdu-speaking. Significant differences were observed when one-sided palmaris longus absence was compared with two-sided absence (p<0.037).

Table-1: Comparison of clinical tests among the ethnic groups on the right forearm.

Test	Sindhi	Punjabi	Urdu speaking	
				0.037*
Only Standard test positive	12 (24%)	8 (8%)	9 (9%)	
Only Thompson's test positive	1 (2%)	9 (9%)	9 (9%)	
Both tests positive Standard test positive	25 (50%)	51 (51%)	32 (32%)	
Both tests negative	13 (26%)	32 (32%)	23 (23%)	

The right-sided agenesis differed among the three ethnic groups, with the highest prevalence among the Punjabis (p<0.05) (Table 1). Left-sided agenesis was the highest for the Sindhis (p>0.05) (Table 2). Unilateral and bilateral agenesis also show variability when the three ethnic

Table-2: Comparison of clinical tests among the ethnic groups on the left forearm..

Test	Sindhi	Punjabi	Urdu speaking	
				0.842
Only Standard test positive	7 (14%)	8 (8%)	9 (9%)	
Only Thompson's test positive	2 (4%)	9 (9%)	9 (9%)	
Both tests positive Standard test positive	26 (52%)	51 (51%)	32 (32%)	
Both tests negative	15 (30%)	32 (32%)	23 (23%)	

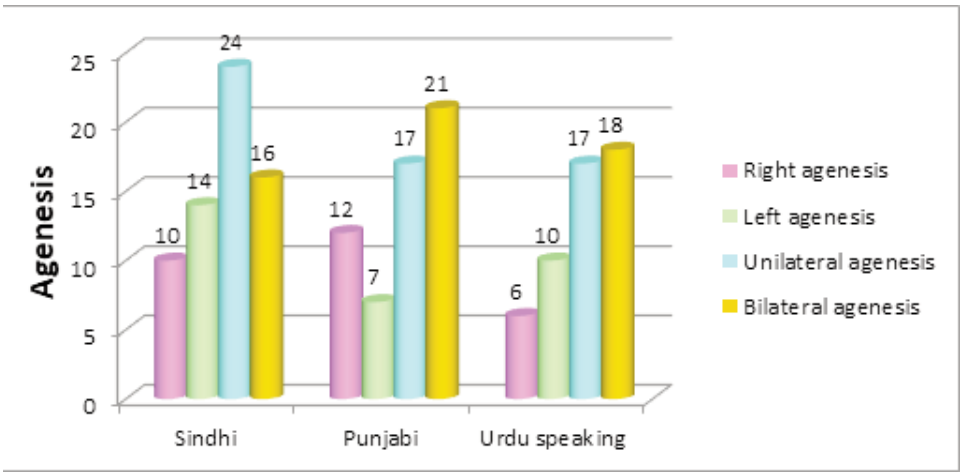

Figure-2: Comparison of agenesis of palmaris longus (PL) among the ethnic groups.

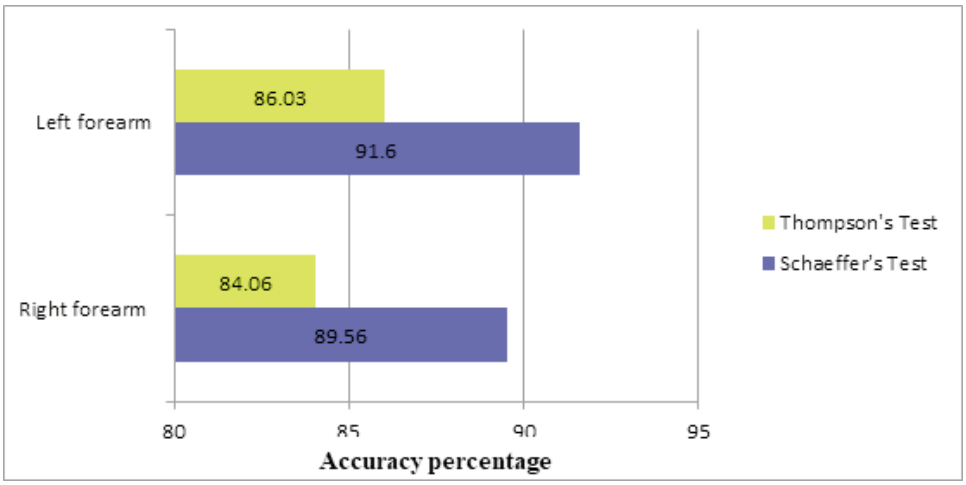

Figure-3: Accuracy of the clinical tests used to assess palmaris longus (PL) agenesis.

groups were compared (Figure 2). Two-sided PLA (18.8%) was lesser compared to one-sided absence (20.7%).

When the two tests were compared, highly significant differences were noted (p<0.001) (Table 3).

When the accuracy level of the two tests was compared in the right and left forearms, differences in levels of precision were noted (Figure 3).

Table-3: Comparison of the two clinical tests used to determine palmaris longus (PL). agenesis

Overall	Right side	Left side	p value
			0.000*
Only Standard test positive	29 (11.6%)	25 (10%)	
Only Thompson's test positive	19 (7.6%)	15 (6%)	
Both tests positive Standard test positive	134 (53.6%)	139(55.6%)	
Both tests negative	68 (27.2%)	71 (28.4%)	

p value significant < 0.05*, highly significant: < 0.001**

Discussion

When Schaeffer's and Thompson's clinical assessment tests were compared, highly significant differences were noted. On the right side, the standard test more commonly tested positive for agenesis than the Thompson's test. Parallel to the findings, a study mentioned that both Schaeffer's and Thompson's tests had precision in PLA detection, but, when compared, the Schaeffer's test was more accurate (98.7%) than Thompson's test (90.1%).[12] A study in the United States revealed that the specificity level of Thompson's test was also lower than that of the Schaeffer's test, and the sensitivity of Schaeffer's test was 94% compared to 72% for the Thompson's test.[9] A study in Iran also mentioned that Schaeffer's test was better than Thompson's test, with the kappa score for interobserver and intraobserver reliability of Schaeffer's test being 0.813 and 0.7 compared to 0.541 and 0.518, respectively, for Thompson's test.[13]

In the present study, the overall prevalence of agenesis varied among ethnic groups. Studies in Islamabad and Azad Jammu and Kashmir showed comparatively lesser prevalence of agenesis compared to the current study, while overall agenesis in Multan was recorded to be the lowest among the studies conducted in Pakistan.[8,10,14] This could be due to differences in embryological development of ethnic races.[3,15] A study in Malaysia also documented the differences in PLA among different ethnic races.[16] Another study conducted in Malaysia documented parallel results regarding the variance in PLA prevalence among three ethnic races.[17] Another study in Malaysia on ethnic races by mentioned higher PLA among Chinese and Indians, followed by Kadazantusun and Malay.[18] Studies among different ethnicities of India have also documented variability in terms of PLA, with the highest prevalence in individuals belonging to Indian

Punjab, followed by Marathwada and northern India.[19-21]

The present study demonstrated distinctive pattern of agenesis when laterality of palmaris among the subjects was compared. The right-sided agenesis was the highest among the Punjabis, followed by Sindhis and Urdu-speaking. When the left side was compared, the lowest values were for the Punjabis, the highest was for Sindhis and the Urdu-speaking subjects were sandwiched between the two. A study among different ethnic races in Nepal also mentioned variability among people living in Kathmandu, Palpa, Bhairwaha and eastern Nepal.[3,22-24] Pekala et al. reported that geographical distribution plays a role in the development of agenesis.[1]

The current research showed variable pattern of unilateral and bilateral agenesis among the subjects belonging to three ethnic groups. Unilateral values for the Punjabis was similar to that documented in the same ethnic group in a study conducted in Islamabad.[14] With regard to the association of PLA variability and ethnicity, studies conducted in various regions of Saudi Arabia reported similar findings.[5,25] Studies conducted among natives of different ethnicities of Turkey have also reported similar variability.[2,6-7] Agenesis of PL differs regionally and this could be evolutionary, as suggested by an interesting research conducted in Ukraine, which stated that PLA pattern had changed over time as there was variability in the muscles of individuals having born before and after 1945.[17]

The current study has its limitations as it was conducted at a single centre and the ethnic groups were not evenly distributed. Also, a larger sample size could have produced more generalisable results.

Conclusion

The Schaeffer's test had more accuracy compared to the Thompson's test in the determination of PLA. There were variations in terms of PLA among the ethnic groups.

Disclaimer: None.

Conflict of Interest: The person who signed the ethical review statement is also a co-author.

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