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Assessment of the Palmaris Longus among Medical Students at a Tertiary Medical College and Teaching Hospital: A Cross-Sectional Observational Study

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Abstract

Background: The palmaris longus (PL) is a superficial forearm flexor frequently harvested as a donor tendon due to its minimal functional role. Its absence varies across populations, making local prevalence data critical for surgical planning and anatomical education.

Methods: A descriptive cross-sectional study was conducted among 652 medical and dental students at KIST Medical College. Five validated clinical tests: Schaeffer's, Thompson's, Mishra I & II, and Pushpakumar's sign were used bilaterally. Data were analyzed using SPSS v26 ($p<0.05$).

Results: Overall PL absence was 23.3% (152/652). Bilateral absence (16.1%) was more common than unilateral (7.2%). Left unilateral absence (4.9%) was more frequent than right (2.3%). Absence was significantly higher in left-handed/ambidextrous participants ($p=0.0269$).

Conclusion: With nearly one-quarter of the population lacking the PL, preoperative clinical or sonographic confirmation is essential before considering it for tendon grafting in the Nepalese population.

Keywords: Ambidexterity; Anatomical variation; Palmaris longus; Prevalence; Tendon grafting

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Introduction

The palmaris longus (PL) is a slender, fusiform muscle located in the superficial flexor compartment of the forearm. It originates from the medial epicondyle via the common flexor tendon and inserts into the palmar aponeurosis.[1] While it acts as a weak flexor of the wrist and a tensor of the palmar fascia, it is considered a phylogenetically retrogressive muscle in humans, often described as functionally expendable.[2] This expendability, combined with its long, superficial tendon, makes it a premier choice for autogenous tendon grafting in reconstructive surgeries such as pulley reconstruction, ptosis correction, and management of chronic hand deformities.[3]

The clinical utility of the PL is directly impacted by its high degree of anatomical variation. The presence or absence of the muscle carries significant weight in surgical strategy. Bilateral presence offers the surgeon the luxury of two potential donor sites, which is vital for complex, multi-stage reconstructions. Conversely, unilateral presence restricts the surgeon to a single limb, necessitating a choice between the dominant or non-dominant side. In cases of complete bilateral absence, the surgical team must resort to alternative donor sites—such as the plantaris, extensor indicis propius, or synthetic materials—which may increase donor-site morbidity or offer less optimal tensile properties.[1,3]

Despite its importance in clinical practice, the prevalence of PL absence is known to vary significantly across different ethnic and geographic populations.[3] This study was conducted to assess the prevalence, laterality and demographic associations of PL absence among medical students in a central Nepalese teaching hospital, providing essential data for local surgical practice and anatomy education.

Methods

This descriptive cross-sectional study was conducted at KIST Medical College & Teaching Hospital following ethical approval from the Institutional Review Committee (IRC) of KIST MCTH. (Ref no: 19/2082/083), ensuring compliance with national ethical guidelines for research. The study population comprised MBBS and BDS students and interns after obtaining their informed consent. To ensure data accuracy, individuals with a history of prior forearm trauma, congenital upper limb anomalies, or previous tendon surgery were excluded. A total of 652 participants were recruited using census sampling.

The presence of the PL tendon was assessed through five validated clinical tests: Schaeffer's test,[16] Thompson's test,[17] Mishra I and II tests,[18] and Pushpakumar's two-finger sign.[19] A tendon was recorded as present if it was either visible or palpable while performing these tests. Demographic data, including age, sex, and hand dominance, were recorded on a structured proforma. Data analysis was performed using SPSS v26, with prevalence calculated as proportions and associations between variables assessed using chi-square tests ($p<0.05$).

Results

A total of 652 participants were assessed, with a mean age of 22.8 ± 2.39 years. The demographic characteristics of the study population are summarized in Table 1.

Table 1. Demographic Characteristics

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	356	54.6%
	Female	296	45.4%
Hand Dominance	Right	616	94.5%
	Left	27	4.1%
	Ambi-dextrous	9	1.4%

Table 2. Prevalence and Laterality of Palmaris Longus (n=652)

PL Status	Category	Frequency (n)	Percentage (%)
Present	Bilateral Presence	500	76.7%
Absent	Overall Absence	152	23.3%
	Bilateral Absence	105	16.1%
	Unilateral Absence	**47**	**7.2%**
	Left Uni-lateral	32	4.9%
	Right Unilateral	15	2.3%

Table 3. Association of PL Absence with Sex and Hand Dominance

Variable	Category	PL Present (n)	PL Absent (n)	p-value
Sex	Male	284	72	0.0509
	Female	216	80	
Hand Dominance	Right	478	138	0.0269*
	Left/Ambi-dextrous	22	14	

**Statistically significant at $p < 0.05$*

The overall prevalence of PL absence was 23.3%. The distribution of PL presence and the specific patterns of laterality are detailed in Table 2.

Statistical analysis revealed that while female participants had a higher rate of absence (27.0%) compared to males (20.2%), the difference only approached significance (p=0.0509). However, a significant association was found between PL absence and hand dominance (p=0.0269), as shown in Table 3.

Discussion

The 23.3% prevalence of palmaris longus (PL) absence observed in this study provides a critical baseline for the central Nepalese population. Our findings reveal that bilateral absence (16.1%) is more than twice as common as unilateral absence (7.2%). This pattern of bilateral predominance aligns with several South Asian and Middle Eastern studies,[14,15] but stands in contrast to certain Western cohorts where unilateral agenesis is more frequently reported.[3]

The overall prevalence of 23.3% in our study is notably higher than the 14.8% previously reported by Sharma et al. in Western Nepal,[4] suggesting that regional and ethnic subgroups within the country may exhibit distinct anatomical variations.

The wide disparity in global PL prevalence suggests that genetic and ethnic factors play a dominant role in muscle morphogenesis.[3] Our results are consistent with the ranges reported in other Asian and Middle Eastern populations. For instance, Roohi et al. found an absence rate of 22.1% in a multiracial Malaysian cohort,[14] and studies in India have reported similar ranges between 20.0% and 25.0%.[13] In contrast, Middle Eastern studies often report higher absence rates, such as 36.0% in Bahrain[8] and up to 36.0% in Iran.[5] These variations underscore the importance of local data, as textbook anatomy may not always accurately represent the Nepalese patient.

An intriguing finding in this study was the left-sided predominance (4.9%) in unilateral absence compared to the right side (2.3%). This trend of left-side agenesis has been observed in other populations.[7,8] Some researchers hypothesize that the PL may be more evolutionarily preserved on the dominant side to assist with grip strength.[6,9] This hypothesis is supported by our statistical finding that left-handed and ambidextrous individuals were significantly more likely to lack the PL (p=0.0269). This suggests a potential developmental link between hand dominance and muscle morphogenesis that warrants further investigation.

Clinical and educational implications are substantial. Given that nearly one in four individuals in this region may lack the PL, preoperative confirmation is mandatory.[3,6] While clinical tests are generally reliable, they can be confounded by subcutaneous fat; thus, ultrasonography should be considered for precise assessment in surgical cases.[6,7]

Though the article was based on clinical examination, the misclassification bias cannot be excluded. There is a need for further study with ultrasonography for the confirmation and reliability of clinical findings in this study. After confirmation, these findings can be integrated into the medical curriculum to ensure that future Nepalese surgeons are better prepared for these anatomical variations.[3,4]

Conclusion

The prevalence of Palmaris Longus absence among medical students at KIST is 23.3%, with bilateral absence being significantly more common than unilateral. The significant association between hand dominance and PL absence suggests an evolutionary developmental link. These results emphasize the necessity of routine preoperative clinical or sonographic assessment before any tendon harvesting procedure in this population.

Conflict of Interest: None

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