Assessing the Accuracy of Common Clinical Tests for Detecting Palmaris Longus: A Prospective Study in a Tertiary Center

Anand Prasath Jayachandiran[1]   Suresh Rajendran[1]   Tanuja U.S[2]
Surya Rao Rao Venkata Mahipathy[1]   Alagar Raja Durairaj[1]   Narayanamurthy Sundaramurthy[1]
Manoj Ananthappan[1]

[1] Department of Plastic & Reconstructive Surgery, Saveetha Medical College & Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Thandalam, Kanchipuram, Tamil Nadu, India

[2] Saveetha Medical College & Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Thandalam, Kanchipuram, Tamil Nadu, India

Address for correspondence Suresh Rajendran, MS (General Surgery), MCh (Plastic and Reconstructive Surgery), DrNB (Plastic Surgery), Department of Plastic & Reconstructive Surgery, Saveetha Medical College & Hospital, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Thandalam, Tamil Nadu 602105, India (e-mail: sr251087@gmail.com).

Abstract

Background   Palmaris longus (PL) is a short-bellied muscle with a long tendon that merges with the palmar aponeurosis. It is supplied by the median nerve and acts as a tensor of the palmar aponeurosis and flexes the wrist. This tendon is commonly used for tendon transfers and as a donor for tendon graft. There are numerous clinical tests to detect the presence of PL like Schaeffer's test, Thompson's test, Mishra's test I, Mishra's test II, Pushpakumar's "two-finger sign" method, and AIIMS test. The principle of all these tests is to make the tendon prominent by eliciting its flexor action and then its identification by inspection and palpation.

Objectives   The tests that are consistently easy to perform with good understandability would be easy to explain to the general population (patients). The aim of our study is to find out the accuracy and easy comprehensibility of various tests using compulsive postures for detecting PL tendon clinically.

Materials and Methods   This is a prospective study on 137 participants. All the patients were subjected to six clinical tests to detect the presence or absence of PL tendon. The results were recorded for both hands by a single observer.

Results   Of the 137 participants, 75 were males (54.74%) and 62 were females (45.26%). The mean age was 21 years. The AIIMS test showed the maximum number of tendons, that is, 113 (82.4%) in the right hand and 108 (78.8%) in the left hand. In view of the ability to comprehend the tests, 119 (86.9%) subjects understood Schaeffer's test very easily.

Conclusion   According to this study, the AIIMS test best demonstrates the PL tendon, and Schaeffer's test was the test most easily understood by the subjects.

Keywords

► palmaris longus
► Schaeffer's test
► AIIMS test
► Mishra's test
► Thompson's test
► Pushpakumar's "two-finger sign" method
► tendon transfer

Introduction

Palmaris longus (PL) is a short-bellied muscle with a long tendon that crosses superficial to the flexor retinaculum and merges with the palmar aponeurosis. It is supplied by the median nerve and acts as a tensor of the palmar aponeurosis and flexes the wrist. Unilateral absence of Palmaris longus found in 16% and bilateral absence in 9% of general population, but its actions are not missed. This tendon is often used by surgeons for tendon transfers and grafting due to its superficial location.[1] The absence of PL is likely to be in the nondominant hand. The difference could be attributed to the increased use of dominant hand for manual labor and other activities.[2] There is variability in distribution of the PL tendon in various ethnic groups and among the group themselves.[3,4] There are numerous clinical tests to detect the presence of PL like Schaeffer's test, Thompson's test, Mishra's test I, Mishra's test II, Pushpakumar's "two-finger sign" method, and AIIMS test.[1] The principle of all these tests is to make the tendon prominent by eliciting its flexor action and then its identification by inspection and palpation.[5] Although there are numerous tests to detect the presence of PL tendon, the specificity of these tests varies according to the geographical distribution, handedness, occupation, and gender. Some patients may find it difficult to comprehend the tests easily.[1]

It is time consuming to explain all the different maneuvers for detecting PL clinically and getting them rightly done. The tests that are consistently easy to perform with good understandability would be easy to explain to the general population (patients) and to get the results with less false positivity. The aim of our study is to find out the accuracy and easy comprehensibility of various tests using compulsive postures for detecting PL tendon clinically. The accuracy between all the tests will be compared to the standard test (Schaeffer's test).

Materials and Method

This prospective study was done at a tertiary care hospital from October 2021 to December 2022 among first year medical students. A total of 137 participants were selected using the random sampling method. People who gave consent were included in the study, and those with preexisting injuries to the upper limb and those with neurovascular dysfunction were excluded.

In **Thompson's test**, a fist was made, then the wrist was flexed against resistance with the thumb flexed over the fingers (►Fig. 1a).

In **Schaeffer's test**, participants were asked to flex the forearm to 90 degrees before opposing the thumb to the little finger with the wrist partially flexed[5] (►Fig. 1b).

Mishra's test I included passive hyperextension of the metacarpophalangeal joints along with active flexion of the wrist (►Fig. 1c).

In **Pushpakumar's "two-finger sign" method**, the index and middle fingers were extended, while the wrist and other fingers were fully flexed with the thumb opposed and flexed[6] (►Fig. 1d).
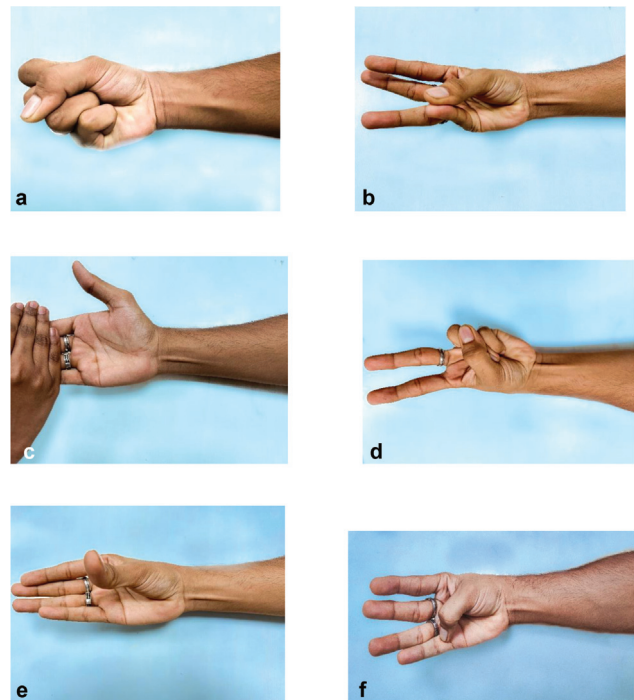
Fig. 1 Clinical pictures of various clinical tests for demonstrating palmaris longus. (**a**) Thompson's test. (**b**) Schaeffer's test. (**c**) Mishra's test I. (**d**) Pushpakumar's "two-finger sign." (**e**) Mishra's test II. (**f**) AIIMS test.

In **Mishra's test II**, the thumb was abducted against resistance with the wrist partially flexed[4] (►Fig. 1e).

In the **AIIMS test**, subjects were asked to touch the ulnar aspect of the base of the little finger with the tip of the thumb with the wrist in flexion[1] (►Fig. 1f).

All the above-mentioned tests were instructed to the participants and the presence or absence of the tendon was recorded for both hands by a single observer. The prominence of the tendon was observed and results were recorded for both right and left hands. The ability to comprehend the test was assessed on a scale of 1 to 5, with 1 being very difficult and 5 being very easy. The study was started after obtaining ethical clearance from the institutional ethical clearance board. The data collected were analyzed using SPSS software.

Results

The study included a total population of 137, of which 75 were males (54.74%) and 62 were females (45.26%). The mean age was 21 years (►Table 1).

Right hand: Schaeffer's test showed that the tendon was present in 112 (81.8%) subjects. Thompson's test showed that the tendon was present in 109 (79.6%) subjects. Mishra's test I showed that the tendon was present in 109 (79.56%) patients. Mishra's test II showed that the tendon was present in 107 (78.1%) patients. Pushpakumar's two-finger sign method showed that the tendon was present in 110 (80.3%) patients. The AIIMS test showed that the tendon was present in 113 (82.4%) patients (►Table 2; ►Fig. 2).

Table 1 Demographic characteristics

Characteristics	Overall ($N = 137$), N (%)
Mean age, y (SD)	21 (2)
Gender	
Male	75 (54.7)
Female	62 (45.3)

Left Hand: Schaeffer's test showed that the tendon was present in 106 (77.4%) subjects. Thompson's test showed that the tendon was present in 106 (77.4%) subjects. Mishra's test I showed that the tendon was present in 105 (76.6%) patients. Mishra's test II showed that the tendon was present in 104 (76%) patients. Pushpakumar's two-finger sign method showed that the tendon was present in 106 (77.4%) patients. The AIIMS test showed that the tendon was present in 108 (78.8%) patients (►Table 2).

Right Hand: Schaeffer's test showed that the tendon was present in 58 (77.3%) males and 54 (87.1%) females. Thompson's test showed that the tendon was present in 54 (72%) males and 55 (88.7%) females. Mishra's test I showed that the tendon was present in 54 (72%) males and 55 (88.7%) females. Mishra's test II showed that the tendon was present in 56 (74.6%) males and 51 (82.2%) females. Pushpakumar's two-finger sign method showed that the tendon was present in 57 (76%) males and 53 (85.5%) females. The AIIMS test showed that the tendon was present in 58 (77.3%) males and 55 (88.7%) females (►Table 3).

Left Hand: Schaeffer's test showed that the tendon was present in 57 (76%) males and 49 (79%) females. Thompson's test showed that the tendon was present in 56 (74.7%) males and 50 (80.6%) females. Mishra's test I showed that the tendon was present in 58 (77.3%) males and 47 (75.8%) females. Mishra's test II showed that the tendon was present in 57 (76%) males and 47 (75.8%) females. Pushpakumar's two-finger sign method showed that the tendon was present in 59 (78.7%) males and 47 (75.8%) females. The AIIMS test showed that the tendon was present in 60 (80%) males and 48 (77.4%) females (►Table 3).

In view of the ability to comprehend the tests, 119 (86.9%) subjects understood Schaeffer's test very easily, 107 (78.1%) subjects understood Thompson's test very easily, 102 (74.5%) subjects understood Mishra's test I very easily, 109 (79.6%) subjects understood Mishra's test II very easily, 114 (83.2%) subjects understood Pushpakumar's "two-finger sign" method very easily, 114 (83.2%) subjects understood the AIIMS test very easily (►Table 4 and ►Fig. 3).
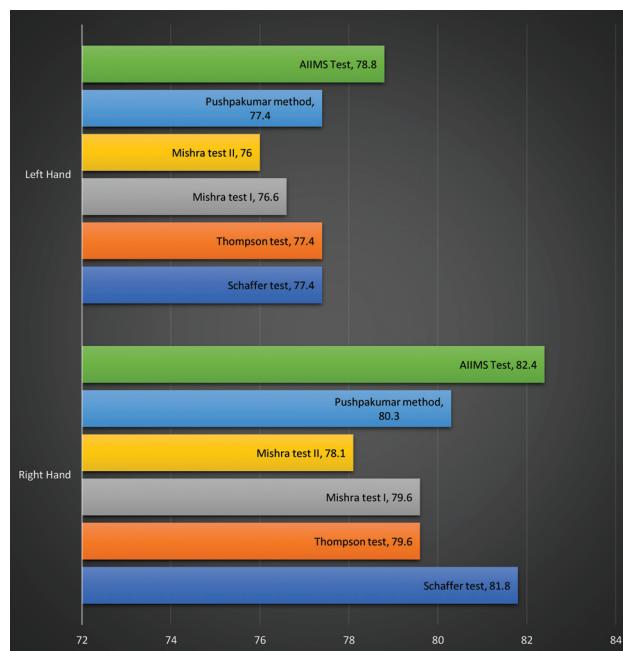
Fig. 2 Horizontal bar plot of the presence of palmaris longus percentage wise for the various tests.

Discussion

All the tests showed that the tendon was present in the right hand more than in the left hand. This can be attributed to the fact that there is increased use of the dominant hand for manual labor and other activities.[2] In this study, the AIIMS test showed the maximum number of 113 (82.4%) tendons in the right hand and 108 (78.8%) tendons in the left hand. Likewise, the prevalence of the agenesis of the PL tendon using the AIIMS test was found to be 24 (17.6%) in the right hand and 29 (21.2%) in the left hand and is comparable with the study conducted by Machhindra et al[7] where the overall prevalence of agenesis of the tendon was 20%.

Table 2 Assessment of palmaris longus (PL) in the right and left hand using various tests

TESTS	RIGHT HAND		LEFT HAND	
	PL present, N (%)	PL absent, N (%)	PL present, N (%)	PL absent, N (%)
Schaeffer's test	112 (81.8%)	25 (18.5%)	106 (77.4%)	31 (22.6%)
Thompson's test	109 (79.6%)	28 (20.4%)	106 (77.4%)	31 (22.6%)
Mishra's test I	109 (79.6%)	28 (20.4%)	105 (76.6%)	32 (23.4%)
Mishra's test II	107 (78.1%)	30 (21.9%)	104 (76%)	33 (24%)
Pushpakumar's 2-finger sign method	110 (80.3%)	27 (19.7%)	106 (77.4%)	31 (22.6%)
AIIMS test	113 (82.4%)	24 (17.6%)	108 (78.8%)	29 (21.2%)

Table 3 Association between test results and gender

Tests	Right hand		Total (N = 137), n (%)	Left hand		Total (N = 137), n (%)
	Female (N = 75), n (%)	Male (N = 62), n (%)		Female (N = 75), n (%)	Male (N = 62), n (%)	
Schaeffer's test						
Absent	17 (22.7%)	8 (12.9%)	25 (18.2%)	18 (24%)	13 (21%)	31 (22.6%)
Present	58 (77.3%)	54 (87.1%)	112 (81.8%)	57 (76%)	49 (79%)	106 (77.4%)
Thompson's test						
Absent	21 (28%)	7 (11.3%)	28 (20.4%)	19 (25.3%)	12 (19.4%)	31 (22.6%)
Present	54 (72%)	55 (88.7%)	109 (79.6%)	56 (74.7%)	50 (80.6%)	106 (77.4%)
Mishra test I						
Absent	21 (28%)	7 (11.3%)	28 (20.4%)	17 (22.6%)	15 (24.2%)	32 (23.3%)
Present	54 (72%)	55 (88.7%)	109 (79.6%)	58 (77.3%)	47 (75.8%)	105 (76.6%)
Mishra test II						
Absent	19 (25.3%)	11 (17.7%)	30 (21.8%)	18 (24%)	15 (24.2%)	33 (24%)
Present	56 (76.4%)	51 (82.2%)	107 (78.1%)	57 (76%)	47 (75.8%)	104 (75.9%)
Pushpakumar's 2-finger sign method						
Absent	18 (24%)	9 (14.5%)	27 (19.7%)	16 (21.3%)	15 (24.1%)	31 (22.6%)
Present	57 (76%)	53 (85.5%)	110 (80.3%)	59 (78.6%)	47 (75.8%)	106 (77.4%)
AIIMS Test						
Absent	17 (22.6%)	7 (11.3%)	24 (17.5%)	15 (20%)	14 (22.5%)	29 (21.1%)
Present	58 (77.3%)	55 (88.7%)	113 (82.4%)	60 (80%)	48 (77.4%)	108 (78.8%)

Table 4 Assessment of ability to comprehend the test

Test	Ability to comprehend the test				
	Very easy	Easy	Moderate	Difficult	Very difficult
Schaeffer's test	119 (86.9)	11 (8)	6 (4.4)	1 (0.7)	0 (0)
Thompson's test	107 (78.1)	27 (19.7)	3 (2.2)	0 (0)	0 (0)
Mishra's test I	102 (74.5)	31 (22.6)	3 (2.2)	1 (0.7)	0 (0)
Mishra's test II	109 (79.6)	22 (16.1)	6 (4.4)	0 (0)	0 (0)
Pushpakumar's "two-finger sign" method	114 (83.2)	19 (13.9)	4 (2.9)	0 (0)	0 (0)
AIIMS test	114 (83.2)	20 (14.6)	2 (1.5)	1 (0.7)	0 (0)

In this study, Thompson's test showed the presence of 109 (79.6%) tendons in the right hand and 106 (77.4%) tendons in the left hand. Our study varies with the studies conducted by Kigera and Mukwaya[1] and Johnson et al[8] where Thompson's test detected tendons in 90.7 and 91%, respectively, of all the participants.

In this study, Mishra's test I showed the presence of 109 (79.6%) tendons in the right hand and 105 (76.6%) tendons in the left hand. However, our study differs with the study conducted among Chilean subjects by Alves et al[9] that concluded that Mishra's test I was the most accurate test.

In this study, right agenesis was detected in 30 cases (21.9%), while left agenesis was determined in 33 cases (24%) by Mishra's test II. However, the result of our study differs from that of the study conducted by Hiz et al[10] where Mishra's test II found right agenesis in 144 cases (14.4%) and left agenesis in 151 cases (15.1%). This could be because of the small sample size in our study and the different ethnicities of the participants.

In the study conducted by Erić et al,[11] Pushpakumar's two-finger sign method detected right agenesis in 24 (5.3%) cases and left agenesis in 50 (11.1%) cases. In contrast, our study detected right agenesis in 27 (19.7%) cases and left agenesis in 31 (21.6%).

In terms of understanding the tests, none of them found it difficult. This can be attributed to the fact that they are medical students. Though all were medical students, even they could not understand all the tests equally and able to
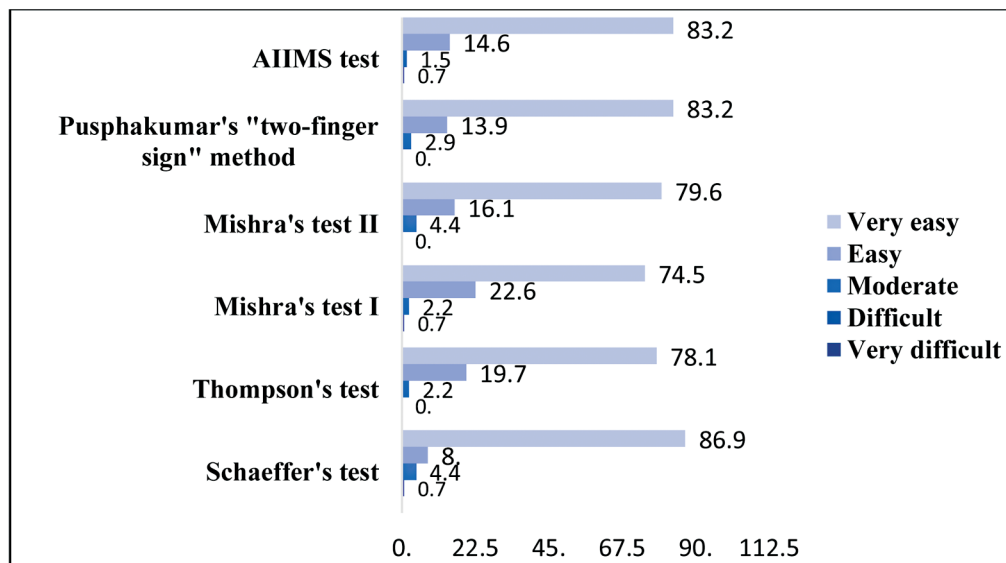
Fig. 3 Ability to comprehend the test.

deliver similar results (comprehension score-very easy: Schaeffer test 83.2% and Mishra test I 74.5%) in all the tests. So tests with high comprehension and positivity scores can be easily applied to the general population.

Of all the tests included in the study, Mishra's test I was found to be very easy in only 74.5% of the participants, meaning even the medical students found it difficult to comprehend the test. Hence, considering the variable ability of the general population in understanding things, making this test understandable to the general population will be even more difficult.

This study is not without limitations. All the participants in the study were medical students, and no objective tests/investigations were done to confirm the findings. All these clinical studies may have some limitations like difficulty in assessment of all variations of the PL muscle depending solely on physical examination. We can confirm these variations precisely using ultrasonography or magnetic resonance imaging (MRI), but it is neither cost-effective nor time-saving.

Conclusion

According to our study, the AIIMS test best demonstrates the PL tendon clinically and Schaeffer's test was the most easily understood test.

Conflict of Interest
None declared.

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