



# The palmaris longus muscle: Its prevalence and variations in humans

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## ABSTRACT

The palmaris longus is a slender muscle found in the anterior forearm of humans that helps to flex the wrist. Its functional morphology and evolution have been highlighted in various medical and anatomical studies. Anomalies of the typical expression of this muscle, including its absence (agenesis), and its role in movement of joints in the upper limb, are of particular interest to clinicians. While the palmaris longus appears anatomically redundant, due to the presence of many larger and stronger wrist muscles, it has been proven clinically important as it can be used as a graft in tendon reconstruction surgeries. This study presents data from the presence, absence, and variations of the palmaris longus muscle drawn from the dissections of 18 human cadavers in the Gross Anatomy Laboratory at the University of Indianapolis. Overall, complete agenesis in both forearms was observed in two donors, unilateral agenesis was found in three donors. Anomalies that vary from the expected morphology of a single muscle belly and tendon were found in three donors. These patterns of variation are similar to observations of other human populations.

## INTRODUCTION

**Palmaris longus (PL)** is a small flexor muscle of the forearm (see Fig. 1) and is well-documented for its variations in morphology, including number of tendons, and its occasional absence in humans. Its tendon is often used as a donor tendon by surgeons in tendon grafts [3]. Prevalence of the absence of this muscle varies widely between populations across different geographic locations.

When present, the PL can be seen from the surface of the skin. To see if it is present in yourself, make a gentle fist with each hand and flex your wrist to see if a thin tendon appears just deep to the skin.

Overall, an **average of 10% absence** has been accepted internationally, with European populations having the highest overall percentage of 25% and Asian populations with the lowest overall absence of 4% [4]. Since the population in this study is of unknown geographic origin, the main goals of this research is to assess:

1. How often is the palmaris longus absent in humans?
2. Which populations across the world are most similar to this sample?

## METHODS

- Sample consists of **18 human donors** (9 female and 9 male); aged 70–90+ years old
- Donors dissected in the Gross Anatomy Laboratory at the University of Indianapolis
- Right and left forearms were analyzed for presence or absence of palmaris longus muscle in each individual
  - When missing, it was noted if it affected both forearms (bilaterally absent) or only one forearm (unilaterally absent)
- Documented variations from the typical morphology

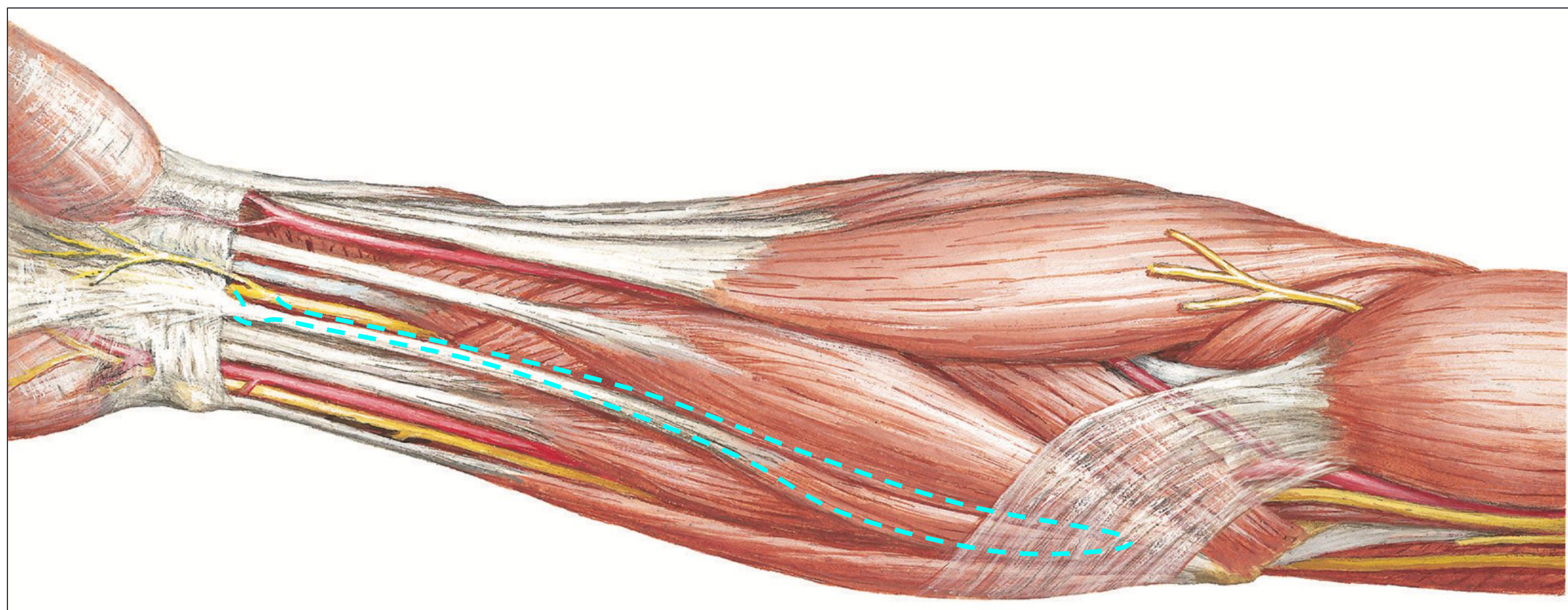


Figure 1: Illustration of palmaris longus (courtesy of Netter).

## RESULTS

### Unilateral vs. Bilateral Absence

- Overall, in this study, PL was **unilaterally or bilaterally absent in 28%** (5 of 18 donors) (see Table 1)
  - Absent unilaterally in 3 female donors (33.3%)
    - When unilaterally absent, only the left forearm was missing PL
  - Absent bilaterally in 2 male donors (22.2%)

Table 1: PL Agenesis among various populations; F = female; M = male; UNI = unilateral; BI = bilateral.

| Population           | Sample size |     |     | Absence (F) |        | Total (F) | Absence (M) |        | Total (M) | Total absence (M + F) |        |
|----------------------|-------------|-----|-----|-------------|--------|-----------|-------------|--------|-----------|-----------------------|--------|
|                      | Total       | F   | M   | UNI         | BI     |           | UNI         | BI     |           | UNI                   | BI     |
| UIndy                | 18          | 9   | 9   | 33.3%       | 0%     | 33.3%     | 0%          | 22.2%  | 22.2%     | 33.3%                 | 22.2%  |
| South Indian [6]     | 300         | 150 | 150 | 29%         | 14%    | 43%       | 16%         | 4%     | 20%       | 23%                   | 9%     |
| Chilean [5]          | 200         | 114 | 86  | 11.5%       | 10.5%  | 22%       | 10.5%       | 7%     | 17.5%     | 11%                   | 9%     |
| Bulgarian [1]        | 56          | 32  | 24  | 3.1%        | 0%     | 3.10%     | 8.33%       | 0%     | 8.33%     | 11.45%                | 0%     |
| Northern Ireland [3] | 300         | 150 | 150 | 13.3%       | 7.3%   | 20.60%    | 19.3%       | 10%    | 29.30%    | 16%                   | 9%     |
| Korean [7]           | 269         | 120 | 149 | 2.5%        | 0.83%  | 3.33%     | 1.34%       | 3.36%  | 4.7%      | 1.86%                 | 2.23%  |
| Turkish [2]          | 1,350       | 675 | 675 | 14%         | 18.37% | 32.40%    | 9.03%       | 11.70% | 20.7%     | 23.03%                | 30.07% |
| Brazilian [8]        | 740         | 461 | 279 | 16.6%       | 13.1%  | 29.7%     | 10.4%       | 10.7%  | 21.1%     | 14.3%                 | 12.2%  |

### Comparison with Other Populations

Results from this study indicate that prevalence is similar to many populations across various geographic regions including Southern Indian, Turkish, Brazilian, Chilean and Northern Ireland populations (see Table 1). The highest absence rate observed in these studies was observed to be 43%. The Korean and Bulgarian populations exhibited the lowest absence of this muscle (~3%) [1,7]. Additionally, a trend was noted in that the agenesis appeared to be generally **higher among females** compared to males.

According to absence data across different populations, when both males and females are compared, the PL is **more commonly absent unilaterally rather than bilaterally**.

## DISCUSSION

Overall, an absence of 28% observed in our sample, is higher than the universal accepted average of 10% [4].

### Clinical Significance

Because the palmaris longus is easily removable in both living persons and cadavers, it is an ideal candidate for tendon grafts. Surgeons agree that the palmaris longus is the first choice for harvesting because it fulfills the necessary requirements of length and diameter [3]. Furthermore, it can also be used without producing any deformities to the donor.

### Variations

The palmaris longus muscle is one of the most variable muscles in the human body [3]. Some of these variations, may complicate harvesting if surgeons are unaware of the different possible morphologies of this muscle. This study found several interesting variations of note, including one muscle with:

- 1.two muscle bellies and two tendons instead of one (Fig. 2)
- 2.a reversal with the thick muscle belly attaching close to the wrist (Fig. 3)



Figure 2: Variation of palmaris longus of a left forearm; note 2 long tendons and muscle bellies overlying the metal probe.

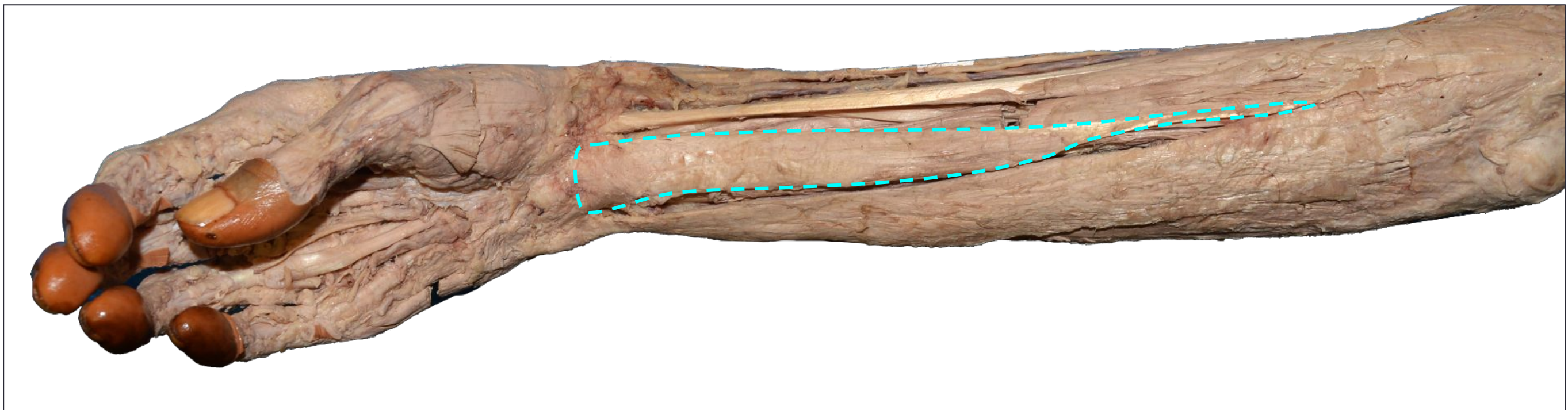


Figure 3: Variation of palmaris longus of a right forearm that is thicker toward wrist.

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