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Prevalence of the Palmaris Longus Absence in a Brazilian Population: an Observational Study

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ABSTRACT

Introduction: the tendon of long palmar muscle (TLPM) is considered functionally weak but clinically important for orthopedic tendon transfer surgery. However, its presence varies in the world population by around 15%. This variation is directly related to ethnicity / race. The objective was to measure the incidence of presence and absence of TLPM in the southeastern Brazil.

Methods and Methods: between February and November 2018 were evaluated university students aged between 18 and 35 years at the University of José do Rosario Vellano, Alfenas, MG-Brazil. A total of 384 were evaluated, 168 men and 216 women The TLPM presence was clinically determined, using the standard technique (Schaeffer's test). This test consists of asking the researched person to place the thumb and little fingers in opposition and flexing the wrist and the palmar face while maintaining isometric muscle contraction.

Results: it was observed 76.82% of bilateral presence of the TLPM and 23.18% of absence. In 4.69% of the studied population there was the presence of unilateral tendon only on the left. Separating men and women showed a bilateral prevalence of 81.54% in men and 73.15% in women.

Conclusion: this study indicated that the presence of the TLPM in the southeastern Brazil was markedly higher than the absence of the TLPM. The overall incidence of right, left, bilateral and total absence of the TLPM was not significantly different between men and women. The prevalence of the left TLPM was more common in the present study. However, a larger number of people should be studied.

Keywords: Anatomy of hand; Anatomical variation; Epicondyle; Aponeurosis; Palmaris longus muscle.

Introduction

Studied since the first Egypt - 500 BC - anatomy is one of the oldest basic medical sciences[1]. There are historical reports of the study of the structures of the human body on papyrus, long before anatomy was taught in Greece by Hippocrates (460-377 BC) and to this day the study of anatomy is fundamental, basic and extremely important for the performance of the function of every health professional, mainly doctors.

However, anatomy books for beginners describe the body structure seen in most people (approximately 70). The study of the human body in atlases can end up frustrating the professional, as it does not always correspond to what is found in cadavers in anatomy and dissection classes, since they can present anatomical variations[1]. In random groups of people, individuals differ from one another in physical appearance. The bones of the skeleton vary not only in basic form, but also in minor details of the surface structure. A wide variation is found in the shape, size and pattern of muscle insertion[2].

According to HOLLINSHEAD[3], the most common variation within the group of superficial muscles on the anterior aspect of the forearm is the absence of TLPM that has the function of flexing the wrist, elbow and distending the palmar aponeurosis[4] - that occurs in 12% or more members. For YILDIZ[5], TLPM is extremely variable in number and shape, and such changes may be related to compression of the median nerve, which is responsible for innervation of this muscle[6].

Due to the lack of statistical data on the presence of the long palmar muscle in Brazilian society, this study aims to analyze its variation in university students in the city of Alfenas-MG, through the wrist flexion test. The simple test, reported in the scientific literature, is able to accurately show anatomical variation without functional impairment.

The data were determined with sex, race, antimere, dominance, heredity and musculoskeletal injuries, and thus provided anatomical data that can serve as a basis for clinical application. In addition to analyzing whether there was impairment of motor functions when anatomical variation was detected. The presence of TLPM in both arms was analyzed, identifying dominance based on sex, race, age and motor use (right-handed or left-handed). Accurate statistical data were presented by means of graphs or tables, demonstrating the non-impairment of the

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absence of this muscle for the execution of arm, hand and forearm movements, according to other studies published previously.

The deepening of the study of certain anatomical variations is relevant to the health area, since several factors, such as environments, life habits, race, sex, age or genetics can influence anatomical structures, resulting in variations without impairing the physiological aspect of the body. In addition, the knowledge of anatomical variables can be used for studies of systemic, clinical, legal and even historical anatomy, if anatomical variations present in certain ethnic groups, or common ancestors are identified.

The objective of this study was to measure the incidence of presence and absence of TLPM in the southeastern Brazil.

Materials and Methods

The presence of TLPM was checked using a visual test: the wrist flexion test (Figure 1). Such test consists of asking the researched person to place the thumbs and little fingers in opposition (to do the number three with the hands) and to flex the wrist and palmar face of the hand keeping in isometric muscle contraction. Thus, being able to verify the presence or absence of TLPM, consequently the anatomical variation.

Figure 1. Image showing Schaeffer's Test.

Students from the José do Rosário Vellano University, campus of Alfenas/MG, were evaluated, under the approval of the Ethics Committee of that University, with the approval number: 46545815.8.0000.5143. The number of students to be tested was obtained by calculating the sample size for proportion based on the normal approximation that is presented below[7].

$$n = \frac{\left(z_{\alpha/2}\right)^2 \times p \times q}{e^2}$$

Being,

$z_{\alpha/2}$ the upper quantile $\alpha/2$ of the standardized normal distribution;

$\hat{p}$ is the parameter of the binomial distribution;

$\hat{q}$ is the proportion of failure;

e is the margin of error fixed by the researcher.

Therefore,

$$n = \frac{(1,96)^2 \times 0,5 \times 0,5}{0,05^2} = 384$$

Being,

$$z_{0,025} = 1,96\ ;\ p = 0,5\ ;\ q = 0,5\ ;\ e; = 10\% .$$

Then, cluster sampling was used to select the 384 students[7]. This technique allowed students to be selected according to the course and gender (female and male) at random. The results obtained made it possible to make statistical inference.

Subsequently, a basic questionnaire was applied with objective questions about race, sex, antimere (right-handed or left-handed), university course and level of optimization of arm, wrist and hand flexion. Data were applied in two months (March and April 2017). And the data was to be collected, organized, interpreted and presented in October 2019.

Results

In the male gender, 154 right-handed and 14 claims were analyzed. Of this total of 168 of the individuals analyzed, 137 had the TLPM in both upper limbs and 9 only on the left side. Thus, the muscle was completely absent in 22 participants. Furthermore, none of the individuals reported manual difficulties (Figure 2).

In the female gender, 202 right-handed and 14 claims were analyzed. Of this total of 216 of the individuals analyzed, 158 had the TLPM in both upper limbs and 9 only on the left side. The muscle was completely absent, therefore, in 49 participants. In addition, when asked about manual difficulties, none showed such impasses (Figure 3).

Therefore, (71) 18.48% of the total number of individuals evaluated (384) do not have the TLPM. Among the male group, 13.09% did not have the muscle and, among the female group, 22.68% of women were without the muscle. When checking the results among the total of participants with complete absence of the muscle (71), 30.98% are men and 69.01% are women. In addition, 0% had manual difficulties on the side of muscle agenesis (Figure 4).

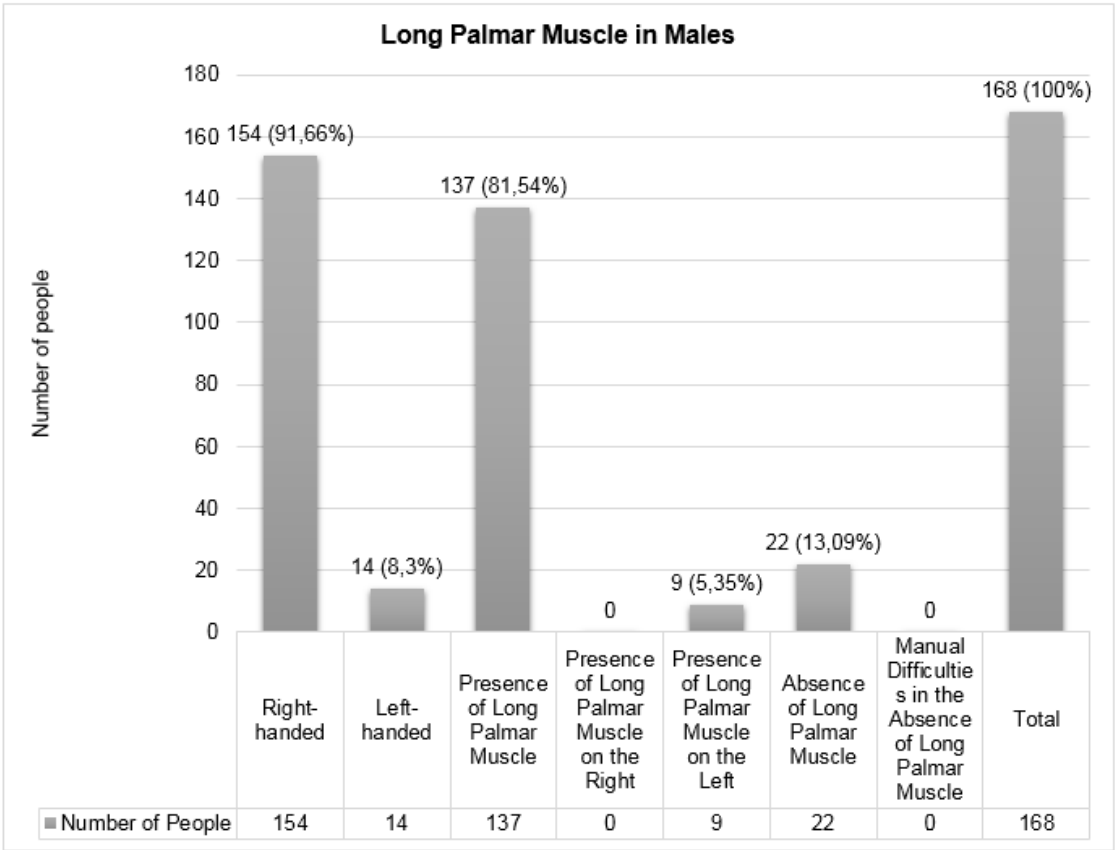

Figure 2. Presentation of the long palmar muscle in males comparing dominance, antimere in which it was present and manual difficulties on the side of agenesis.

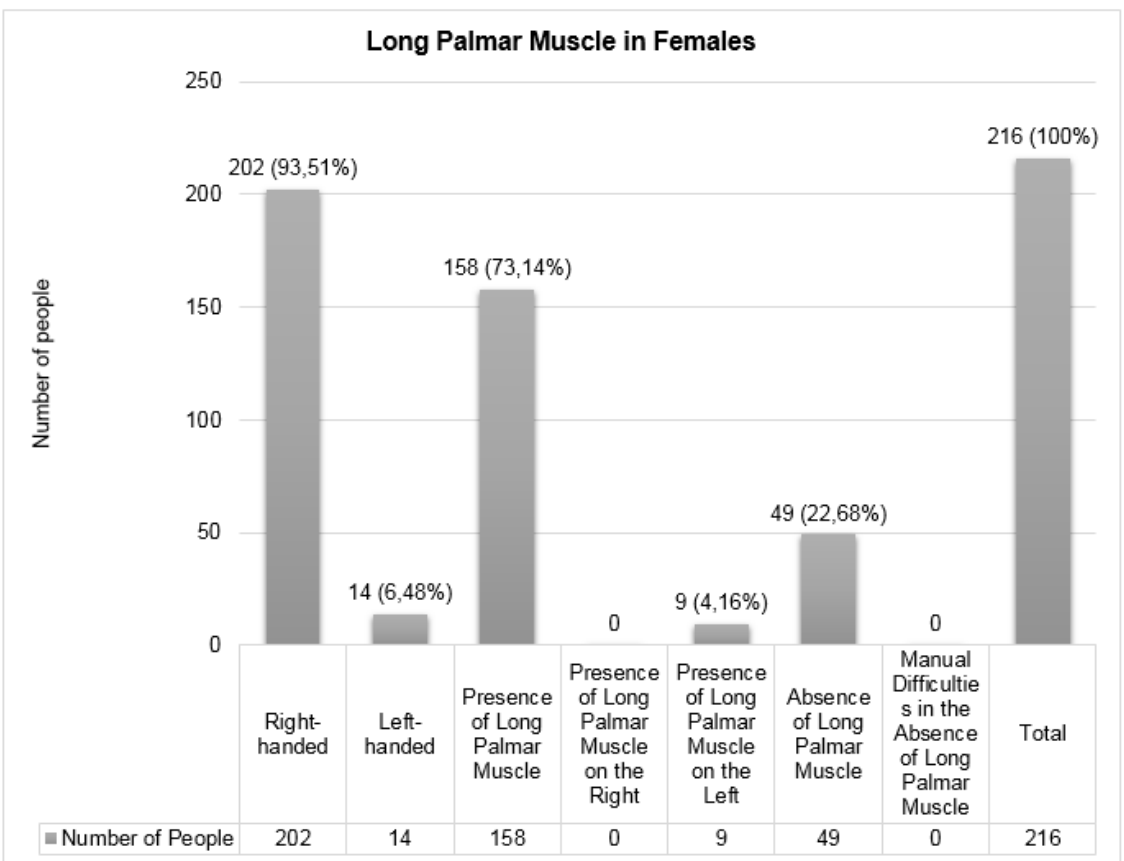

Figure 3. Presentation of the long palmar muscle in females comparing dominance, antimere in which it was present and manual difficulties on the side of agenesis.

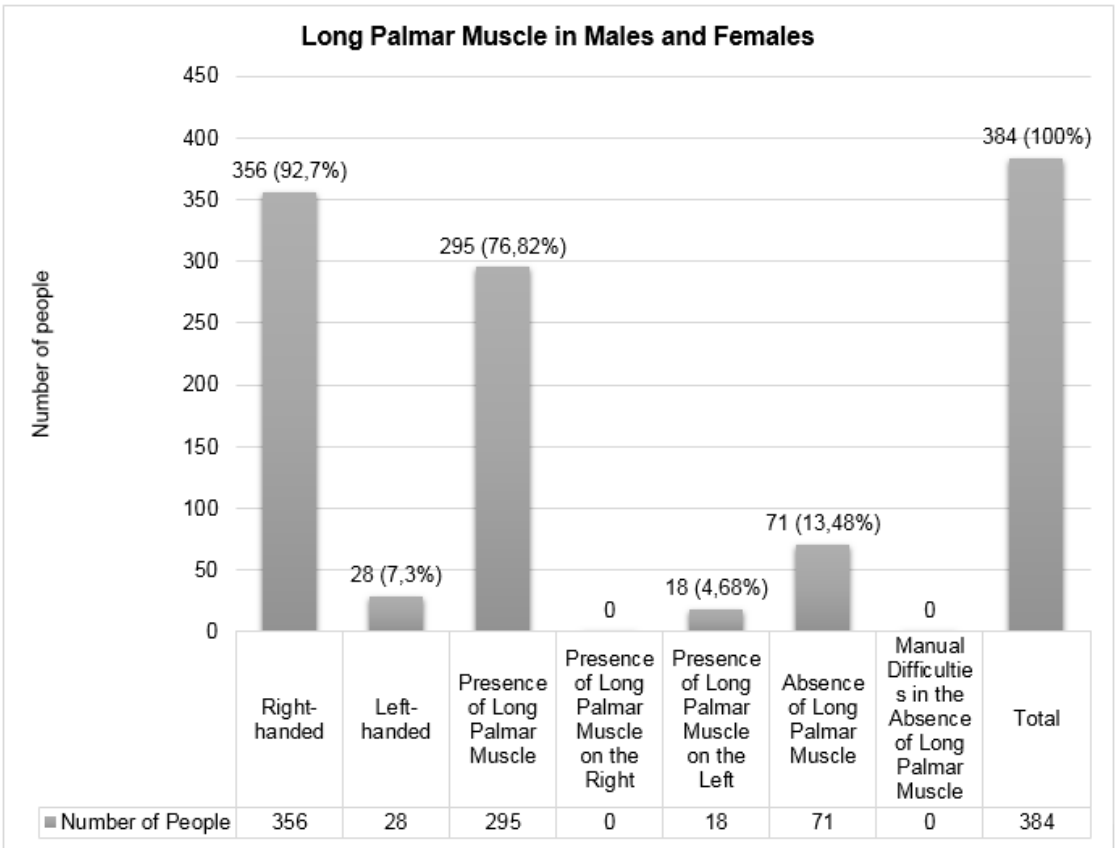

Figure 4. Presentation of the long palmar muscle in males and females comparing dominance, antimere in which it was present and manual difficulties on the side of agenesis.

Discussion

Considered one of the superficial flexors located on the forearm, the TLPM is characterized by being one of the most variable in the human body and can be compared to the plantar muscle present in the lower limbs. Furthermore, it is a muscle of extreme importance for animal species that support higher weights in the upper limbs, unlike the human species, which, in turn, has less and less used it, making it less developed and incomplete. This is due to the manual facilities that the modern world has provided us and, often, Long Palmar muscle becomes the best option for surgeons, concerning tendon grafts, since, supported by recent studies, the absence of such muscle, does not cause a reduction in the human being's ability to tension the wrist or create disturbances in the function of the hand. This alternative use for muscle has made the ability to estimate its absence in different population groups and ethnic groups become a considerable value for professional surgeons. A counterpoint to this statement was made by Erdagi[8], when he evaluated the effects of the absence of the TLPM on the muscular strength of athletes. The study concluded that the long tendon of the left hand of female athletes can have a significant effect on handgrip strength.

For that reason, it can be said that the TLPM, when compared to the others, is a great object of study because it encompasses unique characteristics in terms of its length and elevated nature. Recently, a single variation of the long palmar was found by cadaveric dissection, presenting the muscular belly with distal migration and wide tendon insertion[9].

Its absence, therefore, has been sought both in living people and in corpses, obtaining a variable result when the question becomes populations and races. In addition, other assessment methods have been introduced and complement the clinical examination. Kikano *et al.*[10] assessed the presence of Palmar Longo in the Lebanese population using magnetic resonance imaging, and Fidan *et al.*[11] used ultrasound to assess cases of congenital absence of the *palmaris longus* muscle.

In the present study, carried out in the population of the José do Rosário Vellano University, Alfenas-MG, in the south of the state, the absence of the long palmar muscle was compared between the two genders and evaluated in uni and bilateral way.

In this study, the general prevalence of absence of the *palmaris longus* muscle was 18.48% lower than three studies carried out by Karimi *et al.*[12] 18.48% vs. 30.7%, P <0.005, Ashouri *et al.*[13] 18.48% vs. 22.8%, P <0.005 and Kamrani *et al.*[14] 18.48% vs. 21%, P <0.005, in Iran. Compared to other studies, the prevalence of absence of long palmar in Serbia (22.4% and 37.5%) in two studies, America (25.0%), Turkey (26.6%), India (17.2% to 28.0%) in three studies in the Indian

population and Bahrain (36.4%) was higher than our result. Other studies showed a value lowest, such as 1.5% in Zimbabwe, 4.1% in Korea, 5.5% in Japanese, 6% in Chinese, 7.1% in Native Americans, 11.3% in Malaysia, and 11.5% in the population of South Africa[15].

Conclusion

It is possible to affirm that the absence of TLPM is dependent on several factors, such as race, ethnicity, gender, among others. Thus, it is unavoidable to consider a study from a certain population to another, since each of them has its own and distinct forms and characteristics. Furthermore, it is worth mentioning that a large part of the researchers observed a predominance in certain aspects mentioned above, such as gender (greater absence of muscle in women), as well as the side, being more absent in the left forearm. Finally, it is considered a limitation of the research carried out: the presence of a long palmar muscle (left, right and bilateral existence) was not due to cadaveric dissection, but was determined by clinical examination and, therefore, is dependent on skills and knowledge your examiner.

This study indicated that the presence of the TLPM in the southeastern Brazil was markedly higher than the absence of the TLPM. The overall incidence of right, left, bilateral and total absence of the TLPM was not significantly different between men and women. The prevalence of the left TLPM was more common in the present study. However, a larger number of people should be studied.

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