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Congenital absence of the palmaris longus muscle: A meta-analysis comparing cadaveric and functional studies

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Summary The aim of our paper was to provide comprehensive data on the prevalence of absence of palmaris longus muscle (PLM) and its anatomical characteristics and conduct two separate meta-analyses comparing cadaveric and functional studies while identifying variation among different ethnic groups. An extensive search was conducted through the major electronic databases to identify eligible articles. Data extracted included prevalence of absence of PLM among subjects, ethnicity, laterality, side, and gender. Our main findings revealed that the absence of PLM is more frequently reported in functional studies. Moreover, functional tests likely overestimated the absence of PLM and recommend future studies to assess the validity of functional tests and use an imaging assessment prior to excluding the use of a palmaris longus tendon graft in patients in whom a function test identified the absence of PLM.

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Introduction

The palmaris longus muscle (PLM) (Figure 1) is a slender fusiform muscle that originates from the medial epicondyle of the humerus by a common flexor tendon, with its long, distal tendon inserting into the ligamentous palmar aponeurosis.[1] It is a weak, superficial flexor of the wrist that is innervated by the median nerve and supplied by branches of anterior ulnar recurrent arteries.[2] There is wide variation in the reported prevalence and anatomical characteristics of PLM in different ethnic groups.

The PLM is located superficially, is easily accessible, and is fully developed at birth, making it one of the most frequently used donor material for tendon and joint reconstructive surgeries in all age groups.[1] As PLM is considered an accessory muscle, its tendon is often used as a graft for tendon transfer[1] and in other reconstructive surgeries.[3,4] Another important clinical attribute of PLM is its superficial protective role over the median nerve.[3]

To be used in the abovementioned capacities, the tendon and its anatomical features must be properly identified. The aim of our paper was to systematically analyze the prevalence of absence of PLM and its morphological characteristics by conducting two independent meta-analyses to compare cadaveric and functional studies. Furthermore, we aimed to identify variation among different ethnic groups. We hypothesize that because of variable anatomical factors in individuals, such as the amount of fat tissue and hypo/hypertrophied muscles, functional tests are fundamentally flawed. Moreover, the mere absence of a protuberance beneath the skin or absence upon palpation is considered agenesis of the tendon, which further highlights the probability of a reported overdetection of absence of PLM in functional studies.

Materials and methods

Search strategy

To identify articles eligible for inclusion in our meta-analyses, an extensive search was conducted through PubMed, CNKI, Embase, ScienceDirect, Web of Science, SciELO, and BIOSIS. The search terms employed were "palmaris longus" and "long palmar." No date limits or language restrictions were applied to the search. In addition, the references of all included articles were searched to identify any further relevant studies. Identified articles were separated into two groups based on their methodology, namely cadaveric studies and functional studies, to conduct an independent meta-analysis on each type of investigative method. During the entirety of the study, the authors strictly followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Supplement 1).

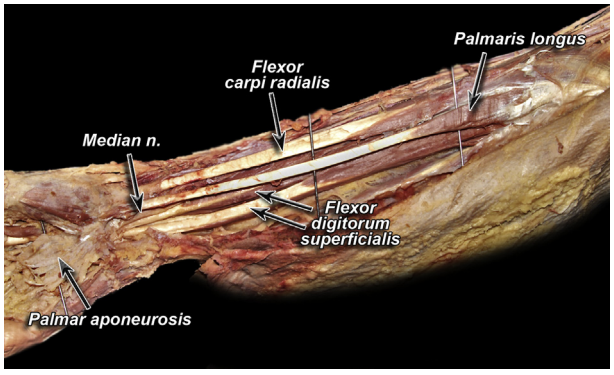

Figure 1 Dissected cadaveric forearm with present palmaris longus muscle.

Criteria for study selection

Assessment of study eligibility for inclusion in the meta-analyses was performed independently by two separate reviewers. Studies containing prevalence data concerning the absence of PLM were considered eligible for inclusion if they were a cadaveric or functional study, contained at least one clinical test or cadaveric investigation, and reported extractable data. If a clinical test had not previously been validated, a different test also had to be performed. All case reports, reviews, conference abstracts, and studies reporting incomplete information about clinical tests or no extractable data regarding agenesis were excluded. Articles in languages other than those spoken fluently by the authors were translated by medical professionals fluent in both the language of the original article and English. All differences of opinion among the reviewers concerning the eligibility of the studies were solved by consensus through consultation with the author of the respective study.

Data extraction

Data from the included studies were independently extracted by two reviewers. Data extracted included investigative method, prevalence of the absence of the PLM among subjects, ethnicity, laterality, side, and gender. If multiple functional tests were used, the lowest prevalence of PLM agenesis was extracted.[1,5–8] Any disagreement among the authors was solved by consensus through consultations with all the authors. In the event of discrepancies in the data, authors of the included studies were contacted for clarification, and further data were sought.

Statistical analysis

The extracted data were pooled into two separate meta-analyses, one for cadaveric studies (Figure 3) and one for functional studies (Figure 4), with a random-effects model using MetaXL version 5.0 (EpiGear International). The primary outcomes of the analyses were pooled prevalence estimate (PPE) of absence of PLM, while secondary outcomes were PPE of laterality, side, and gender.

The Chi-square test and the Higgins I^2 statistics were used to assess heterogeneity between the included studies. For the Chi-square test, significant heterogeneity among studies was indicated by a p-value of $<0.10^9$. The I^2 statistics was interpreted as follows: 0%–40% might not be important, 30%–60% might indicate moderate heterogeneity, 50%–90% may indicate substantial