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The palmaris longus muscle: its anatomic variations and functional morphology

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Abstract

The functional morphology and evolution of the superficial forearm flexor, the palmaris longus, have long fascinated kinesiologists, physical anthropologists and anatomists alike. The anomalies, agenesis, variations and polymorphic presentation of the muscle, coupled with its biomechanical role in the performance of flexion and supination through distal articulations in the upper limb, have formed the base for many studies found in medical literature. We present data from published sources, along with our observations on the kinetics of palmaris longus, drawn from a series of dissections done on 30 cadavers. Complete agenesis was seen in four limbs. Reversal in the muscle-tendon orientation was seen in two limbs and duplication in one limb. The functional dynamics of the muscle and the clinical implication of its modifications in humans are discussed. We believe that every surgeon must be aware of the variations, since this, otherwise unimportant muscle, provides a very useful graft in tendon surgery.

***Keywords*:** palmaris longus, tendon graft, supination, agenesis.

Introduction

Palmaris longus is often described as one of the most variable muscles in the human body and is phylogenetically classified as a retrogressive muscle i.e. a muscle with a short belly and a long tendon [1].

A primitive muscle, its fibrofascial distal component, along with the palmar aponeurosis, represents phylogenetic degeneration. Arising from the medial epicondyle of the humerus, with additional muscular inputs from intermuscular septa and antibrachial fascia, this fusiform myotendinous flexor inserts predominantly into central palmar surface of the aponeurosis. Subject to numerous variations by functional evolutionary influences, the muscle may be agenetic, double, tendinous, split, incomplete, digastric, or exhibit anomalous insertions. In higher primates the palmaris longus has been shown to be absent in higher apes such as chimpanzees and gorillas [2].

In focus, due to its evolution-induced morphometry, the muscle has also attracted the attention of clinicians; the puckering of palmar skin coupled with an obstinate limitation of digital flexion, produced by contracture of the palmar aponeurotic fibrous elements, stands as an example of structural degeneration engineering pathological processes. The tendon of the palmaris longus is the first choice donor tendon as it fulfils the necessary requirements of length, diameter and availability, and can be used without producing any functional deformity [3].

The aim of this study was to determine the incidence of unilateral and bilateral absence and variations of palmaris longus for the Dravidian population of Southern India.

Material and methods

Observations on the status and morphology of the palmaris longus made through a series of dissections performed on thirty cadavers (60 limbs) forms the base of this brief study.

Bilateral dissections, on both sexes, in adult limbs, and the data collected therefrom was noted and compared with statistics culled from other sources cited in literature.

A review of literature on biomechanics was also done to understand myokinetics of muscle function.

Results

Complete agenesis was seen in four limbs, two male and two female. On the left, the muscle was absent in two males and one female, a total of three. Palmaris longus was agenetic in one cadaver bilaterally. One limb exhibited reversed palmaris longus muscle (Figure 1).

The reversal in the muscle-tendon proximodistal orientation, and duplication, likewise, was seen in a single limb (Figure 2).

In all other dissections, the palmaris longus conformed to the textbook and classical morphology.

Figure 1 – ***Forearm of the left side of a female cadaver exhibiting the reversed tendon of palmaris longus (PL–R). PT – pronator teres, FCR – flexor carpi radialis, FCU – flexor carpi ulnaris, FDS – flexor digitorum superficialis***

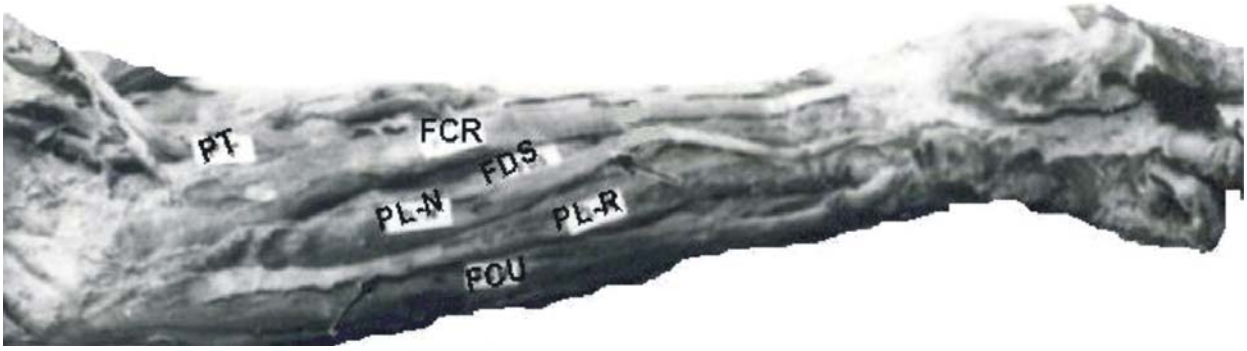

Figure 2 – ***Forearm exhibiting double palmaris longus; one normal (PL–N) and the other duplicated tendon which is reversed (PL–R). PT – pronator teres, FCR – flexor carpi radialis, FCU – flexor carpi ulnaris, FDS – flexor digitorum superficialis***

Discussions

Agenesis of the palmaris longus has been attributed to Mendelian characteristics. The absence of the muscle has been described as ranging from a high of about 25% to 16% in white Caucasians [3–5] to a low of 4% in mongoloids [6, 7]. An average of 10% absence has been universally accepted. In our series, we noted agenesis in 26%, confirming the theory that absence of the muscle shows individual variations within races, or even among ethnic groups within major populations. The increased percentage of agenesis in our series could also be cited, as confirming that dissection data represents a more accurate record than those derived from mere visual or palpatory techniques used in many larger studies [3, 4, 6, 7]. Variations and anomalous structure, was noted around 7% in our study, a small fall compared to the 9% (Reimann AF *et al.*, 1944) reported in literature [8]. Numerous anomalies of the origin, course, and insertion of the palmaris longus muscle have been described. Such variants include anomalous insertion deep to the retinaculum and distal belly of the palmaris longus muscle [9] both causing apparent compression of median nerve producing a carpal tunnel-like syndrome; accessory palmaris longus muscle that appeared to compress the ulnar nerve during repeated contractions [10]; and hypertrophy of the palmaris longus muscle seen as an pseudomass of the forearm [11]. Functionally, though the muscle is primarily a wrist flexor, acting as an adjunct to digital flexion at the metacarpophalangeal joint, our observation lend credence to the observation that the distal tendinous segments of the muscle aid in fixing the open-ended mobile end of the long axis around which supination of forearm is executed. Shifting of the distal terminus of the axis in the complex articulations of the supination-pronation kinetics, is facilitated by the proximal, middle and distal radio-ulnar joints through the divergent fibrous extensions of the aponeurosis, by the tendinous insertion of the palmaris longus muscle.

Conclusions

We believe that every surgeon must be aware of the variations, since this, otherwise unimportant muscle, provides a very useful graft in tendon surgery. With the decreasing accent on dissection and gross anatomy, coupled with paucity of cadavers, it is felt that complications such as these presented may become infrequent and sparse.

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