

Variation in flexor digitorum brevis

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Abstract: During our routine dissection we noted a variation in flexor digitorum brevis muscle of a 60-year-old male cadaver. Flexor digitorum brevis is the superficial intrinsic muscle lying in the first layer of the sole of the foot. It normally gives four tendons for the lateral four toes. We found a variation in the left foot where flexor digitorum brevis gave three tendons for middle three toes and the tendon for the little toe was absent. Knowledge of such variation may help in various surgical procedures such as tendon transfer and placement of prosthesis. Flexor digitorum brevis is often used for reconstruction of the heel pad by musculocutaneous flap transfer.

Keywords: Flexor digitorum brevis, variation, musculocutaneous flap transfer.

INTRODUCTION

Flexor digitorum brevis is the muscle of the first layer of sole lying immediately beneath the plantar aponeurosis. It originates from the central part of the plantar aponeurosis, medial tubercle of calcaneal tuberosity and from the medial and lateral intermuscular septa. It divides into four tendons for the lateral four toes. Each tendon is divided into two slips at the base of their proximal phalanges, to allow the flexor digitorum longus tendons and gets inserted on both sides of the shaft of the middle phalanx. Flexor digitorum brevis is supplied by medial plantar nerve. It flexes the proximal interphalangeal and metatarsophalangeal joints of the lateral four toes and helps to reinforce arches of the foot [1]. Due to bipedal posture the function of the little toe is minimal and has no opposition action in human. Hence, the tendon for the little toe coming from flexor digitorum brevis muscles may be absent at times. Such variation of Flexor digitorum brevis is of clinical importance because it is often used in the reconstruction of the heel pad.

MATERIALS AND METHODS

During routine dissection of 60 years old male cadaver embalmed with 10.0% formalin we noted a variation in sole of left foot. According to the guidelines given by Cunningham's manual we took longitudinal incision through the skin and superficial fascia of the sole from the heel to the root of middle toe and reflected it. Then we cut across the plantar aponeurosis 2-3cm in front of the heel. We split the distal part longitudinally away from first layer of the sole [1]. In the sole of left foot, Flexor digitorum brevis had three

tendons inserting into second, third and fourth toes, and the 4th tendon for little toe was absent.

OBSERVATION

The sole of left foot, Flexor digitorum brevis originated from the medial tubercle of calcaneum, plantar aponeurosis and intermuscular septa. The muscle divided into three tendons to the second, third and fourth toes. The fifth toe did not receive any tendon from Flexor digitorum brevis. The three tendons for second, third and fourth toe then passed through the fibrous flexor sheath of the toes and split into two parts which curved along the sides of the long flexor tendon, rejoined and were attached to the plantar surface of base of middle phalanx. There was no variation in the muscles of sole of right foot.



Fig-1: Three tendons of Flexor Digitorum Brevis

DISCUSSION

Despite of compartmental and layered arrangement, the plantar muscles function primarily as group during the support phase of stance, maintaining the arches of the foot. They basically resist forces that tend to reduce the longitudinal arch as weight is received at heel and then transferred to the ball of foot and great toe. The muscles become active in later portion of movement to stabilize foot for propulsion, when forces tend to flatten foot's transverse arch. They are also able to refine further efforts of the long muscles, enabling platform of the foot to adjust uneven ground. The muscles of the foot are less important individually because fine control of the individual toe is not important in bipedal human.

Flexor digitorum brevis is one of the superficial intrinsic muscle lying in the first layer of the sole of foot deep to the plantar aponeurosis. It flexes the proximal interphalangeal and metatarsophalangeal joints of the lateral four toes and helps to maintain arches of the foot [1]. Normally Flexor digitorum brevis gives four tendons to the lateral four toes. In the present study we noted absence of tendon to the fifth toe. Similar variation was reported by Chaney *et al* [2] and Sarrafian [3]. Compared to the little finger, the little toe has less function and due to bipedal posture opposition of little toe is absent in human beings. Darwin's disuse theory was supported by SW Lobo *et al.*[4]. They reviewed phylogenetic variation in Flexor digitorum brevis. They mentioned in their study that such variation is due to gradual reduction in the usage of the little toe as the erect posture evolved. Nathan and Gloobe [5] reported that a part of the muscle and tendon inserting into the fifth toes was absent in 23 and 3% of cases, respectively. Reeser *et a* [6] conducted electromyographic study of human foot which showed that Flexor digitorum brevis is an accessory muscle and its function may be taken over by flexor digitorum longus for any normal posture or locomotion. Surgeons and radiologists should be aware of such variations specially while doing computed tomography scans for detecting soft tissue injuries of the foot.

CONCLUSION

In our study flexor digitorum brevis gave only three tendons to the second, third and fourth toes, but fifth toe did not receive any tendon. By review of other literature we concluded that such variation may occur as phylogenetical change due to minimal use of little toe in evolved bipedal posture [4]. The action of Flexor digitorum brevis being flexion of the toes can be compensated by other long flexors of the foot.

Knowledge of such variation may help in various surgical procedures such as tendon transfer and placement of prosthesis. Flexor digitorum brevis is

often used for reconstruction of the heel pad by musculocutaneous flap transfer [7].

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