



An unusual variation of an additional plantaris originating from the soleus

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Abstract

The plantaris muscle belongs to the posterior superficial crural muscles, placed between the gastrocnemius and soleus. Its origin usually is from the inferior part of the lateral supracondylar line of the femur at a position a little superior to the origin of the lateral head of gastrocnemius. During routine dissection we came across a very interesting variation of the additional plantaris originating from the soleus. We observed that the additional muscle belly of the plantaris (actually a tendon) merged with the tendon of the main belly and inserted into the calcaneal tendon. This variation was observed in the left lower limb from a cadaver. The aim of this paper was to analyze and describe this rare and interesting finding.

We suppose that it is very important to consider the occurrence of above variation of the plantaris originating from the soleus. It would be helpful in cases of patients with an unexplained pain in lower leg and when surgical procedures are performed on this area.

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Key words [muscles of the lower leg] [plantaris muscle] [variations] [tennis leg] [surgery]

Introduction

The plantaris muscle belongs to the posterior superficial crural muscles in the anatomy of human's body, which are subdivided into two groups as superficial and deep. It is placed between the gastrocnemius and soleus. Its origin is from the inferior part of the lateral supracondylar line of the femur at a position a little superior to the origin of the lateral head of gastrocnemius [1].

In some cases the plantaris may arise from the oblique popliteal ligament. It is composed of a small fusiform belly and a long thin tendon. The tendon runs along the leg in lower medial direction alongside the medial border of the tendo calcaneus and inserts into the posterior part of the calcaneus. Occasionally the tendon of the plantaris inserts into the tendo calcaneus. Very rarely its tendon is lost in the fascia of the leg. The functions of the plantaris are to support plantar flexion in the ankle joint and flexion in the knee joint. Plantaris has minimal motor function and its long tendon can readily be harvested for reconstruction elsewhere in the human body [1].

Due to our observation in the left lower limb from a cadaver that the additional muscle belly of the plantaris merged with the tendon of the main belly and inserted into the tendo calcaneus, the aim of this paper is to analyze and describe this rare and interesting finding.

Case Report

The cadaveric material was taken during a routine autopsy at the Department of Anatomy and Morphology, in accordant to the ethical principles applying by the Sofia's Medical University. The anatomical variation was photographed using a Nikon Coolpix 995 camera, analyzed and described.

The plantaris muscle is one of the posterior superficial muscles of the calf. The muscle arose from the posterosuperior aspect of the lateral femoral condyle a little more high to the origin of lateral head of gastrocnemius (Figure 1). The plantaris muscle was composed of a small fusiform belly and a long thin tendon. Posterior to the knee joint, muscle immediately run obliquely from the lateral one to the medial side. Then in the calf, the long thin tendon of the muscle lied in between the medial head of the gastrocnemius and soleus. Finally, the tendon inserted into the posterior part of the calcaneus medially of the tendo Achilles. Sometimes the tendon of the plantaris merges with the tendo Achilles. In our case we observed a very interesting variation of the additional plantaris originating from the soleus. This additional part of the plantaris muscle (actually a tendon) merged with the tendon of the main belly and inserted into the calcaneal tendon (Figures 2, 3).

Discussion

The plantaris is a small muscle that courses along the posterior aspect of the leg as part of the posterosuperficial compartment of the calf. Some data suggest that the plantaris is a vestigial remnant of human's quadrupedal ancestry. It is believed that the muscle originally attached to the plantar aponeurosis as seen in the American bear and that the distal attachment has migrated proximally with the onset of bipedalism. It has been considered that the plantaris muscle was earlier attached to the plantar aponeurosis of the foot but with normal evolutionary process of erect posture, the insertion of the muscle got shifted to a higher position [2].

The additional medial head may arise proximally from the medial condyle of the femur or may arise from the oblique popliteal ligament [3, 4]. It continues in a short tendon that fused distally with the tendon of the lateral plantaris muscle.

In our case we observed unusual and unique variation in the anatomy of plantaris. There are some evidence in the literature showing variations of plantaris, all of them

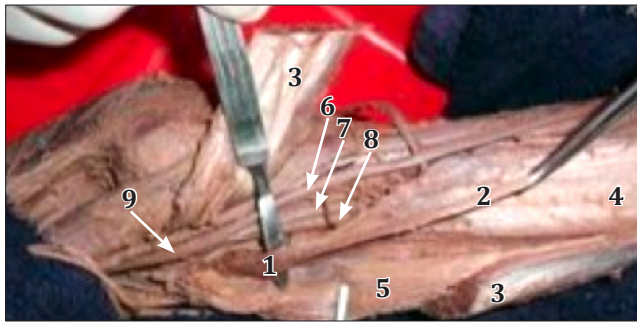


Figure 1. The origin of the main belly of plantaris is from the inferior part of the lateral supracondylar line a little superior to the origin of the lateral head of gastrocnemius. The medial head of gastrocnemius is cut. (1: *m. plantaris*; 2: *m. plantaris*, tendo; 3: *m. gastrocnemius*, caput mediale; 4: *m. soleus*; 5: *m. gastrocnemius*, caput laterale; 6: *n. fibularis communis*; 7: *v. poplitea*; 8: *a. poplitea*; 9: *n. tibialis*)

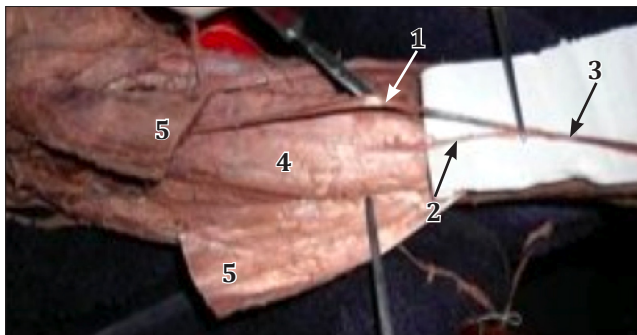


Figure 2. The thin long tendon of the main belly merges with the additional belly (actually a tendon) originating from the soleus. The substitution with the merger is caught with the upper tweezers. (1: *m. plantaris*, tendo; 2: accessory tendon; 3: common tendon; 4: *m. soleus*; 5: *m. gastrocnemius*, caput mediale)

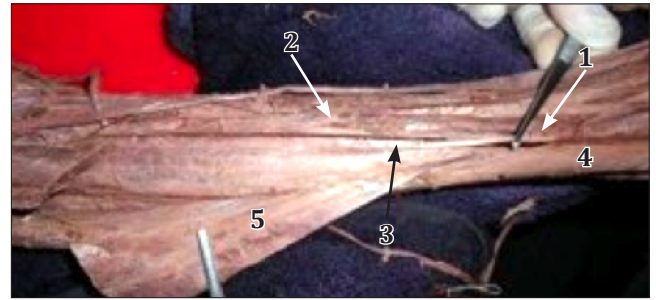


Figure 3. Two tendons merged into a long tendon runs along the calf in lower medial direction alongside the medial border of the tendo Achilles: (1: *m. plantaris*, common tendon; 2: *m. plantaris*, tendon; 3: accessory tendon; 4: calcaneal tendon; 5: *m. gastrocnemius*, caput mediale)

are unanimously that irrespective of different variations, plantaris have a common tendon inserts into the posterior part of the calcaneus separately or by merger with the calcaneal tendon. Its motor function is so minimal that its long tendon can readily be harvested for reconstruction elsewhere with little function. Although the plantaris does have little importance, there are injuries that can occur. It can be damaged in an tendon calcaneus rupture. But it has been a source of controversy in some investigations [5]. Tennis leg is a commonly known injury [6]. It is a result of eccentric loading placed on the ankle while the knee is extended, and occurs while running or jumping. It may cause a direct trauma to the calf area. Pain and swelling are common in the injury. This pain usually becomes more severe after resting or the next day. Accompanying the pain may be swelling that may extend down to the ankle and foot. Some attempt at active or passive dorsiflexion, and resisted plantar flexion with elicit severe pain [7].

However, the presence of variations should remind physicians that this unpredictable anatomy requires careful examination in cases of unexplained lower leg pain. Here the question arises whether a lifetime the man had a pain in lower leg. Clinically, the plantaris muscle is primarily of concern in the differential diagnosis of lower extremity pain as its rupture is indistinguishable from deep vein thrombosis [8].

Topographical anatomy of the plantaris muscle is important for all of orthopedic surgery intervention. In the presence of other flexors like gastrocnemius and soleus muscles, the removal of plantaris muscle may not have an effect on the normal limb function. The tendon of the plantaris muscle is considered as an extremely tensile structure and has been used successfully for flexor tendon replacement in hand and even for atrio-ventricular valve repair [9].

In conclusion, presence of an additional plantaris muscle originating from the soleus as seen in the present case may be of academic interest as a standard manual data. It may also be of surgical interest. Probably an unexplained pain in lower leg in some patients could be due to the existence of a double plantaris muscle or the existence of an additional tendon.

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