

*Case Report*

## **An Unilateral Rare Variant of Plantaris Muscle Belly and Its Entrapment: A Clinico - Anatomical Study**

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### **ABSTRACT**

The plantaris muscle is known to be one of the superficial flexors of the lower limb which is exceedingly variable in origin. Normally it has a single fusiform belly with a long narrow tendon that crosses obliquely between gastrocnemius and soleus muscle. These flexors muscles are supplied by the tibial nerve which is a branch of sciatic nerve and the tibial nerve runs superficially to the plantaris tendon. In the present case, we have observed a rare variant of plantaris muscle that comprises dual bellies sharing a common tendon instead of a single fusiform belly. Not only dual bellies of the muscle but also we have observed the muscle bellies were entrapped by the tibial nerve and its branch. So, prior knowledge of such anatomical variations should be borne in mind while conducting surgical procedures involving popliteal fossa and posterior compartment of the leg. It will also help the clinicians to diagnose muscle tears by interpreting the MRI scans and ultrasounds.

**Key words:** Plantaris muscle belly; common tendon; tibial nerve; anatomical variation; entrapment.

### **INTRODUCTION**

The plantaris muscle is known to be one of the superficial flexors of the lower limb which become vestigial as foot is evolved for long distance walking and running. [1] Though plantaris act as a weak flexor of the knee as well as ankle but also it may provide proprioceptive information regarding the position of the foot. [2] This 7 to 10 cm fusiform muscle is known to arise from lateral supracondylar line of the femur above the origin of lateral head of the gastrocnemius and oblique popliteal ligament. [1] The long narrow tendon passes

obliquely between gastrocnemius and soleus, runs distally along the medial border of calcaneal tendon or fuses with the calcaneus. [1] Standard textbooks also mention that the muscle may be absent (10%) or double. [1] The tendon of this muscle mainly serves as an excellent graft for different reconstructive surgery. [3, 4] Anatomical knowledge of this muscle is also important for clinical diagnosis of muscle rupture and interpreting the MRI scan. [5]

The muscles of the posterior compartment of the leg are innervated by the tibial nerve which is a branch of sciatic

nerve and it lies superficially to the tibial nerve. [1] But in the present case we have observed an unilateral dual bellies of the plantaris muscle and they were entrapped by the main tibial nerve and its branch to the soleus muscle. To the best of our knowledge, very few research papers have been mentioned such double bellies of plantaris muscle as well as their entrapment by the tibial nerve. So, knowledge of such anatomical variations regarding the plantaris muscle is very important for different surgical procedures in the popliteal fossa and posterior compartment of leg.

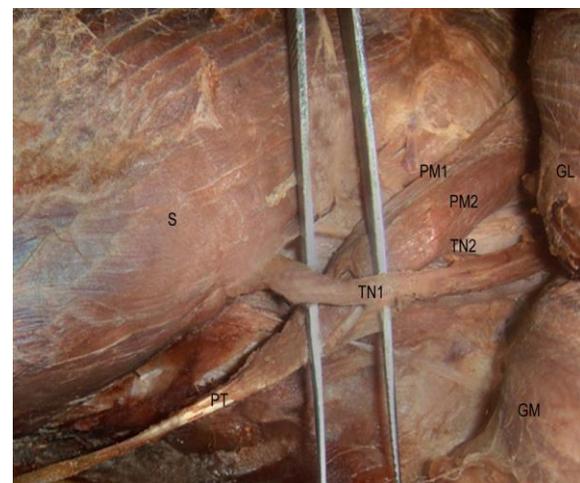
## CASE REPORT

During routine dissection of a middle aged male cadaver for undergraduate teaching program, we observed unusual features in the plantaris muscle of left lower limb. There were dual bellies of the plantaris muscle and they were entrapped by the branches of the tibial nerve. The muscle was meticulously displayed by dissection. The specimen was measured morphometrically and photography was done for proper documentation (Figure 1).

Both the bellies were sharing a common tendon and they were associated with the lateral head of gastrocnemius muscle. Among the two bellies, the outer belly was observed as a small tendinous slip which was 0.3 cm in width and 5.1 cm in length. It was arising from the lower part of the lateral extension of the linea aspera, above the origin of the lateral head of gastrocnemius muscle. The inner belly was much thicker and bulkier and arising from the fascia covering the popliteus. Some of its fibers were merging with the lateral head of gastrocnemius muscle. The thicker belly was around 1 cm in width and 7.4 cm in length. Both the bellies fused together to become a common belly and shared a single narrow tendon of the plantaris muscle which was 17.1 cm in length. The long narrow tendon

was passing between the soleus as well as reflected heads of the gastrocnemius and finally inserted into the calcaneal tendon.

It was also observed in the same limb that the tibial nerve descended to give a branch to the soleus muscle while the main tibial division was running posterior compartment of leg. Thus the bellies of the plantaris muscle were entrapped between the branches of the tibial nerve. No other neurovascular abnormalities were observed in the same limb. The right lower limb of the cadaver was found to be normal.



**Figure 1:** The illustration shows dual bellies of the plantaris muscle. Outer belly (PM1) and inner belly (PM2), both were related to lateral head of gastrocnemius (GL). They are forming a common belly and sharing a single narrow tendon (PT). The tibial nerve (TN1) is coming between the lateral head of gastrocnemius (GL) and medial head of gastrocnemius (GM). Both the bellies are entrapped between tibial nerve (TN1) and the branch to soleus (TN2) that is supplying the soleus muscle (S).

## DISCUSSION

Plantaris is one of the vestigial muscles and agenesis of the muscle was also observed by Daseler et al. in 8.2% of male legs and 5.8% of female legs. [6] According to them, the muscle was absent in 6.67% of 750 lower extremities that they examined. Though the muscle is showing many variations, but they have considered plantaris muscle is of anatomically and phylogenetically important. [6] Because of the normal evolutionary process of erect posture the insertion shifted to a higher

position which was earlier attached to the planter aponeurosis of the foot. [6] In 2011, Upasna et al. observed bicipital origin of the plantaris muscle on both lower limbs without any entrapment of the tibial nerve. [7] They have found that among the two slips of the muscle, the first slip was coming from the lower part of lateral supracondylar line and the second slip from the posterior surface of lateral condyle of femur which was a variant. [7] In another study by Rana et al. in 2006, reported an existence of double plantaris muscle without entrapment by branches tibial nerve on both lower limbs of a 45 year old male cadaver. [8] Moreover in 2009, Nayak et al. in their routine dissection observed an unilateral additional tendon of 10.2 cm length and .04 cm width of plantaris muscle arising from the fascia covering the popliteus muscle and adjoining tendon of the plantaris. [9] Both the tendons then merge together to form a single tendon that attached to the tendocalcaneus. In the same limb, the plantaris muscle was entrapped between the branches of tibial nerve. [9] The tibial nerve, a branch of sciatic nerve which supplies the muscles of posterior compartment of leg runs between the two heads of gastrocnemius muscles, also gives off a branch to the superficial surface of the soleus and may innervate the muscle by a second deeper branch. [1] Das et al. in 2006, reported an anomalous plantaris tendon that passed between the tibial nerve and its branch to the soleus muscle where the tendon was entrapped between the two nerves. [10] So the pull of the tendon may press upon the nerve to the soleus that can lead to compression neuropathy and in such cases surgical exploration of the thin tendon must be performed carefully. [10] So, the aim of presenting the unilateral existence of dual bellies of the plantaris muscle and its entrapment by the branches of the tibial nerves is an extremely rare finding which has been reported less in the standard

textbooks. That is why this interesting observation has great academic and clinical interest.

## CONCLUSIONS

Awareness of such anatomical variation regarding the plantaris muscle could be very important for the surgeons while performing reconstructive surgeries like flexor tendon replacement in hand, for atrioventricular valve repair as well as replacement of calcaneofibular ligament. It will also help the clinician for the diagnosis of tears in the plantaris muscle by interpreting the MRI scan or ultrasound.

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