

# Entrapment of plantaris tendon between the tibial nerve and its branch: a case report

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## SUMMARY

The plantaris muscle arises from the lateral supra condylar line and the long slender tendon of the muscle descends between the gastrocnemius and the soleus muscles. The tibial nerve, a branch of the sciatic nerve, is the nerve of the posterior compartment of the leg. The tibial nerve is related superficially to the plantaris tendon, but in the present case we report an anomalous plantaris tendon that passed between the tibial nerve and its branch to the soleus muscle. Such an entrapment of the plantaris tendon between the tibial nerve and its branch to the soleus is an extremely rare finding, which is neither reported in standard textbooks of anatomy nor in any other research report. The pull of the plantaris tendon may press upon the nerve to the soleus, thereby causing compression neuropathy. Also, surgical exploration of the thin plantaris tendon must be carefully performed, especially when it is trapped between the two nerves. Knowledge and awareness of such anomalies may be important for academic, clinical and surgical purposes.

**Key words:** Plantaris tendon – Entrapment – Compression – Tibial nerve – Anatomical variation

## INTRODUCTION

The plantaris muscle is known to originate from the lateral supracondylar line of the femur above the origin of the lateral head of the gastrocnemius and the oblique popliteal ligament (Rosse and Gaddem-Rosse, 1997; Standring, 2005). The long slender tendon of the muscle descends and crosses obliquely between the gastrocnemius and the soleus muscles, to insert into the medial border of the calcaneal tendon or into the calcaneus (Standring, 2005). The clinical importance of the plantaris lies in the fact that the slender tendon may often be ruptured at the mid-calf level (Leekam et al., 1999). The tendon of the plantaris also serves as an excellent graft in reconstructive surgery (Pagenstert et al., 2005).

After entering the popliteal fossa, the tibial nerve gives off branches. All the muscles of the posterior compartment of the leg are innervated by the tibial nerve (Romanes, 2000; Standring, 2005), but none of the branches has the peculiar relation of the plantaris tendon passing between it. Interestingly, in the present study we observed the plantaris muscle to pass between the tibial nerve and one of its branches: i.e. the branch to the soleus muscle. Such an anomalous position of the plantaris tendon entrapped between two

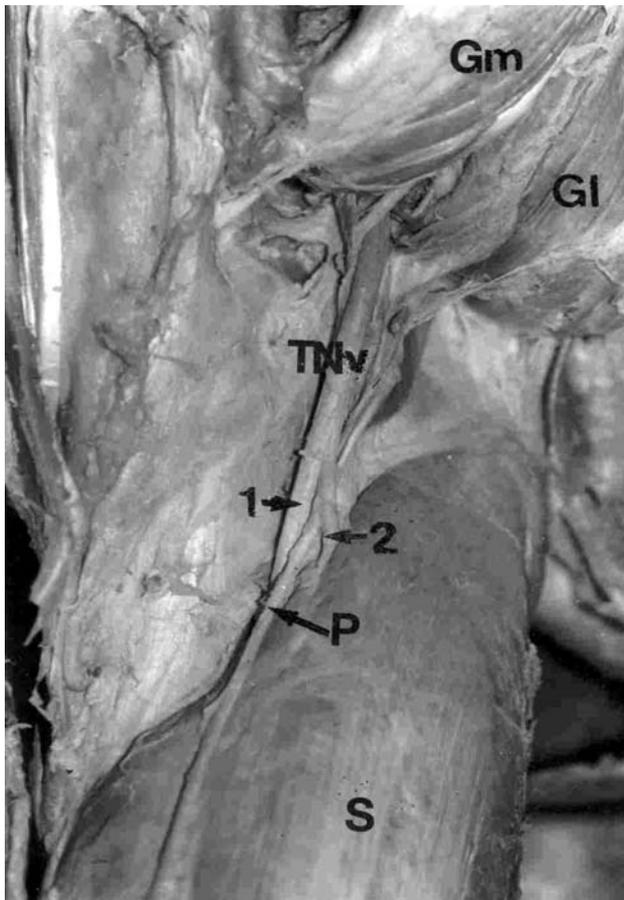
nerves has never been reported in any anatomy textbook or in any other research report.

The course of the plantaris tendon between two nerves may be of immense clinical significance. The main action of the plantaris muscle is plantar flexion (Standring, 2005). During routine running or walking movements, the role of the gastrocnemius muscle is important and the plantaris usually assists such movements. Any pull by the tendon of the plantaris may press upon the nerve, causing compressive neurological symptoms.

The aim of the present study was to highlight the peculiar entrapment of the plantaris tendon by the tibial nerve and its branch, which may be important for academic, surgical and clinical purposes.

#### CASE REPORT

During routine dissection of cadavers for undergraduate medical teaching we detected an abnormal course of the plantaris muscle in the right leg of a 54 years-old man who died



**Fig. 1.** Posterior view of the right leg. Gm: Gastrocnemius muscle, medial head (cut from below and reflected upwards); Gl: Gastrocnemius muscle, lateral head (cut from below and reflected upwards); TNv: Tibial nerve; 1: Main tibial nerve; 2: Branch to soleus; P: Plantaris tendon; S: Soleus muscle.

of pneumonia. The popliteal fossa and the posterior compartment of the leg were carefully dissected and the structures were exposed. The plantaris tendon entrapment between the nerves was studied and appropriate photographs were taken (Fig. 1).

#### Observations

In the right leg, the plantaris muscle took its origin from the lateral supracondylar line and the oblique popliteal ligament, and its long slender tendon ('P' in Fig. 1) passed between the heads of the gastrocnemius (reflected 'Gm' and 'Gl' in Fig. 1) and the soleus muscle ('S' in Fig. 1) to insert into the medial border of the calcaneal tendon. In the lower part of the popliteal fossa, the tibial nerve ('TNv' in Fig. 1) descended to give a branch to the soleus muscle ('2' in Fig. 1), while the main nerve continued into the posterior compartment of the leg ('1' in Fig. 1). The plantaris tendon ('P' in Fig. 1) was thus found to be entrapped between the tibial nerve and the nerve to the soleus (i.e. between '1' and '2' in Fig. 1). The innervation of the muscles of the posterior compartment was as usual from the tibial nerve. No other associated abnormalities were detected.

No such variations were detected in the left leg.

#### DISCUSSION

The plantaris muscle is considered to be vestigial in humans (Standring, 2005). It originates from the oblique popliteal ligament and the lateral supracondylar line of the femur, above the origin of the lateral head of the gastrocnemius muscle (Standring, 2005; Romanes, 2000), to descend below the gastrocnemius and traverse posterior to the tibial nerve and popliteal vessels (Rosse and Gadem-Rosse, 1997). The plantaris muscle originally had an earlier attachment into the plantar aponeurosis, but with evolutionary changes towards the erect posture the insertion of the muscle gradually shifted to the calcaneum. Interestingly in animals such as the American brown bear, the plantaris muscle has its attachment into the plantar aponeurosis (Daseler and Anson, 1943). In the present case, we did not find any anomalous attachment of the plantaris.

The excellent tensile property of the plantaris tendon has been utilized for flexor tendon

replacement in hands and also in atrioventricular valve repair (Shuhaiber and Shuhaiber, 2003). Mobilizing the tendon of the plantaris, which is in close contact with the nerves as seen in the present case, may require a careful approach by the surgeon.

After its entry into the popliteal fossa, the tibial nerve gives off one or more branches to the knee joint and the medial sural cutaneous nerve to the skin of the leg and foot, while in the lower part of the popliteal fossa, it gives off branches to the gastrocnemius and popliteus (Rosse and Gaddem-Rosse, 1997). The tibial nerve leaves the popliteal fossa between the two heads of the gastrocnemius muscles, gives off a branch to the superficial surface of the soleus muscle, and may innervate the soleus muscle through a second deeper branch (Rosse and Gaddem-Rosse, 1997). In the present case, we observed a branch from the tibial nerve that passed deep to the soleus muscle, innervating it ('2' in Fig. 1). Interestingly, this branch crossed the plantaris tendon. This abnormal course of the nerve to the soleus muscle passing over the plantaris tendon is a rare finding that to date has not been reported. The pull of the plantaris tendon may twist around on the nerve to the soleus, thereby causing compressive symptoms. As such, the slender tendon of the plantaris is often mistaken as a nerve.

Any tear of the plantaris muscle may also involve the nerve to the soleus, as seen in the present case. Anomalies of the vessels are usually diagnosed in interventional radiological

studies but any abnormalities pertaining to the nerve may pass undetected, thereby increasing their clinical importance. A close relationship of the plantaris tendon and the two nerves, as seen in this case, may also confuse surgeons, who are exposed to the vagaries of dissection at the operation table. Prior knowledge of such rare variations may be helpful during surgical operations involving the popliteal fossa and the posterior compartment of the leg.

#### REFERENCES

- DASELER EH and ANSON BJ (1943). The plantaris muscle. *J Bone Joint Surg*, 25: 822-827.
- LEEKAM RN, AGUR AM and MCKEE NH (1999). Using sonography to diagnose injury of plantaris muscles and tendons. *AJR Am J Roentgenol*, 172: 185-189.
- PAGENSTERT GI, VALDERRABANO V and HINTERMANN B (2005). Lateral ankle ligament reconstruction with free plantaris tendon graft. *Techniques in Foot & Ankle Surgery*, 4: 104-112.
- ROMANES GJ (2000). *Cunningham's Manual of Practical Anatomy*. Vol. 1, 15<sup>th</sup> edition. Oxford University Press, Oxford, pp 195-197.
- ROSSE C and GADDEM-ROSSE P (1997). *Hollinshead Textbook of Anatomy*. 5<sup>th</sup> edition. Lippincott-Raven, Philadelphia, pp 372-374.
- SHUHAIBER JH and SHUHAIBER HH (2003). Plantaris tendon graft for atrioventricular valve repair. A novel hypothetical technique. *Tex Heart Inst J*, 30: 42-44.
- STANDRING S (2005). *Gray's Anatomy. The Anatomical Basis of Clinical Practice*. 39<sup>th</sup> edition. Elsevier Churchill Livingstone, Philadelphia, pp 1499-1500 & 1504.

