Case Report

“Tennis leg”: gastrocnemius injury is a far more common cause than plantaris rupture

Joelle R. Harwin BS\textsuperscript{a,1}, Dr Michael L. Richardson MD\textsuperscript{b,}\textsuperscript{*}

\textsuperscript{a} School of Medicine, Rosalind Franklin University of Medicine and Science, North Chicago, IL, USA
\textsuperscript{b} Department of Radiology, University of Washington, 4245 Roosevelt Way N.E., Seattle, WA 98105, USA

\textbf{Article info}

\textbf{Article history:}
Received 19 October 2016
Received in revised form 21 October 2016
Accepted 23 October 2016
Available online 29 November 2016

\textbf{Keywords:}
Tennis leg
Plantaris tendon
Gastrocnemius
Deep vein thrombosis

\textbf{Abstract}

We report a typical case of “tennis leg”, in which the main finding was a fluid collection between the medial head of the gastrocnemius and soleus muscles. Since the first clinical description of this entity in 1883, the injury has been attributed to rupture of the plantaris tendon. However, recent studies of this condition with sonography and magnetic resonance imaging have shown that most of these cases are actually due to injury to the gastrocnemius and/or soleus muscles, and up to 10% are due to deep venous thrombosis masquerading as muscle injury. The plantaris muscle and tendon are only rarely involved in this injury.

© 2016 the Authors. Published by Elsevier Inc. under copyright license from the University of Washington. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

\textbf{Introduction}

“Tennis leg” refers to acute mid-calf pain, which is a common sports-associated injury, usually experienced by middle-aged persons, incurred with extension of the knee and forced dorsiflexion of the ankle [1]. This entity can occur during many activities, but was first described in a tennis player in 1883, where it was attributed to rupture of the plantaris tendon [2]. The plantaris tendon has continued to be implicated in this injury for many years [1,2]. However, more recent research suggests that far more common causes of tennis leg are rupture of the medial head of the gastrocnemius, fluid between the gastrocnemius and soleus muscles without evidence of muscle injury, and even deep vein thrombosis [1]. Determining the cause of symptoms affects clinical management and patient prognosis, especially in patients with deep vein thrombosis. We report a typical case of tennis leg, in which the main finding was a fluid collection between the medial head of the gastrocnemius and soleus muscles.

\textbf{Case report}

A 57-year-old male experienced acute mid-calf pain, while throwing a Frisbee. He reported hearing and feeling a “snapping” sensation posterior to his knee, followed by immediate
Fig. 1 – MRI of the right calf. (A and B) Coronal T2-weighted fat-suppressed images show a hyperintense fluid collection between the medial head of the gastrocnemius and soleus. Increased subcutaneous T2 signal is noted along the lower leg. (C and D) Axial T2-weighted fat-suppressed images show a hyperintense fluid collection between the medial head of the gastrocnemius and soleus.
swelling and an inability to bear weight. He was initially seen at an outside emergency department, where he was placed in a cam boot. The patient was seen in clinic 3 weeks after the initial injury, where he reported an improvement in pain and a decrease in swelling. During this visit, the clinician noted ecchymosis tracking down his right lower extremity associated with mild swelling. On physical examination, there was no limitation in flexion or extension of the knee, and ankle range of motion was appropriate in all planes. There was an increased pain in the mid-calf with dorsiflexion, as well as on palpation.

A magnetic resonance imaging (MRI) of the right tibia and fibula was performed, without contrast (Fig. 1). This demonstrated crescentic T1-hypointense and T2-hyperintense fluid collection, located between the medial head of the gastrocnemius and soleus. Mildly increased subcutaneous T2 signal was noted along the lower leg. There was no evidence of plantaris or gastrocnemius muscle rupture.

**Discussion**

The plantaris is an accessory muscle, absent in 7%-20% of the population [1]. It assists with plantar flexion of the calf muscle and is commonly harvested by surgeons for tendon grafts [3]. The plantaris crosses part of the posterosuperficial compartment of the calf. In association with the gastrocnemius and soleus muscles, it forms the triceps surae unit [1]. The plantaris muscle belly is approximately 7-13 cm in length [4]. It originates from the lateral supracondylar line of the femur and inserts onto the calcaneus [1]. The muscle belly originates superior to both the medial and lateral heads of the gastrocnemius and lies deep to the lateral head of the gastrocnemius [1]. The plantaris myotendinous junction occurs at the level of origin of the soleus muscle [4]. The plantaris tendon courses toward the medial aspect of the lower extremity, running between the medial head of the gastrocnemius and the soleus muscle [1]. It courses near the medial border of the Achilles tendon (in some cases fusing with it) and inserts onto the calcaneus, anteromedially to the Achilles tendon [1]. Because it spans 2 joints, the knee and the ankle, the plantaris may have an increased likelihood of injury [3].

The gastrocnemius is the most superficial muscle of the calf and is composed of 2 muscle heads. The medial head originates from the posterior medial femoral condyle and the lateral head originates from the posterior lateral femoral condyle. The 2 heads unite and form an aponeurosis, which combines with the soleus aponeurosis to form the Achilles tendon. The Achilles inserts onto the posterior calcaneus [5].

“Tennis leg” was first described by Powell in 1883 [2]. The classic presentation is acute mid-calf pain in a middle-aged person. This is most often a sports-associated injury, incurred during extension of the knee and forced dorsiflexion of the ankle. Often, a “snapping” sensation is both felt and heard by the patient [1,6]. For many years, the pathophysiology of tennis leg was attributed to rupture of the plantaris tendon [1]. Although rupture of the plantaris is possible, injury to the medial head of the gastrocnemius is much more likely to occur than rupture of the gastrocnemius-soleus aponeurosis, a finding which was confirmed by magnetic resonance imaging (MRI) in the patient’s case.

In conclusion, the classic clinical presentation of tennis leg is only rarely associated with an actual rupture of the plantaris tendon. Far more common causes are rupture of the medial head of the gastrocnemius muscle or injury to the gastrocnemius-soleus aponeurosis, without evidence of muscle rupture, as seen in our patient. Finally, up to 10% of patients presenting with tennis leg may actually have deep vein thrombosis, a potentially life-threatening condition.

**References**

[1] Delgado GJ, Chung CB, Lektrakul N, Azocar P, Botte MJ, Coria D, et al. Tennis leg: clinical US study of 141 patients and anatomic investigation of four cadavers with MR imaging and US. Radiology 2002;224:112–9.

[2] Powell RW. Lawn tennis leg. Lancet 1883;122(3123):44.

[3] Rohilla S, Jain N, Yadav R. Plantaris rupture: why is it important? BMJ Case Rep 2013;2013:1–3.

[4] Helms CA, Fritz RC, Garvin GJ. Plantaris muscle injury: evaluation with MR imaging. Radiology 1995;195:201–3.
[5] Pacheco RA, Stock H. Tennis leg: mechanism of injury and radiographic presentation. Conn Med 2013;77:427–30.

[6] Russell AS, Crowther S. Tennis leg – a new variant of an old syndrome. Clin Rheumatol 2011;30:855–7.

[7] Kwak HS, Han YM, Lee SY, Kim KN, Chung GH. Diagnosis and follow-up US evaluation of ruptures of the medial head of the gastrocnemius (‘tennis leg’). Korean J Radiol 2006;7:193–8.

[8] Kwak HS, Lee KB, Han YM. Ruptures of the medial head of the gastrocnemius (‘tennis leg’): clinical outcome and compression effect. Clin Imaging 2006;30:48–53.

[9] Tao L, Jun H, Muliang D, Deye S, Jiangdong N. Acute compartment syndrome after gastrocnemius rupture (tennis leg) in a nonathlete without trauma. J Foot Ankle Surg 2016;55(2):303–5.