Plantaris Tendon Ruptures

To the Editor:

Rupture of the plantaris muscle, whether of the muscle belly itself or the tendon, has been debated in the literature for more than 100 years. Little information has been published pertaining to the diagnosis and treatment of plantaris tendon ruptures, and the few reports that do exist describe injury not to the insertion but at the musculotendinous junction in the leg. Injury to the plantaris tendon at its insertion on the calcaneus may mimic, or coincide with, Achilles tendon pathology. Clinicians must adequately differentiate the two diagnoses, as treatment regimens may differ. We believe that isolated plantaris tendon ruptures can and do occur and are often underdiagnosed or misdiagnosed as Achilles tendon pathology.

To our knowledge, this is the first reported case of an isolated plantaris tendon rupture at its insertion on the calcaneus. This rupture was treated successfully with the conservative modalities of rest, ice, anti-inflammatory medication, and guarded weight-bearing with progressive return to full activities.

Anatomy

The plantaris muscle originates from the lateral condyle of the femur in close association with the lateral head of the gastrocnemius muscle. The plantaris muscle belly is fusiform and generally ranges from 7 to 10 cm in length. Thus the muscle belly rarely extends distal to the popliteal fossa. The plantaris tendon exits the fossa and courses obliquely across the posterior leg between the gastrocnemius and soleus muscles as it descends the superficial posterior compartment of the leg. The tendon inserts onto the posterior calcaneus along with and medial to the Achilles tendon.

Daseler and Anson, in 1943, reported that the plantaris tendon can have a variable insertion pattern in relation to the Achilles tendon and calcaneus. In their study of 150 extremities, four variations were noted, with types I and II seen in the vast majority of specimens. The most common variation, type I, was a short “fan-shaped” expansion of the tendon as it inserts onto the calcaneal tuberosity just medial to the calcaneal tendon. This type was reported to make up 47% (71 of 150) of cases. In the type II pattern, the insertion is seen 0.5 to 2.5 cm anterior to the calcaneal tendon. In addition, the insertion tends to be more expansive and can include the laciniate ligament as well as other fascial and ligamentous structures in the posteromedial heel. Type II insertions are reportedly seen 32% of the time. Types III (15%) and IV (5%) are rarely seen and include insertions directly onto the calcaneal tendon itself. Three years later, in 1946, Cummins et al corroborated the work of Daseler and Anson. In their study of 200 legs, types I and II once again were most prevalent. Types I, II, III, and IV were observed by Cummins et al to occur 47%, 36.5%, 12.5%, and 4% of the time, respectively. Occasionally, the plantaris tendon is absent altogether. Although a wide range of figures has been reported in the literature, agenesis of this tendon most likely occurs 5% to 7% of the time and is usually unilateral.

One explanation for the variable insertion pattern, according to some authors, is that the plantaris muscle is a vestige of what was once a flexor muscle of the toes. The plantaris tendon at one time was continuous with the plantar aponeurosis and is still seen today as such in some lower animals, such as the American brown bear. Over time, as man adopted a more upright, erect posture, the plantaris tendon was pulled away from the plantar aponeurosis by the developing calcaneal protuberance. This forced the plantaris tendon to find a secondary point of insertion on the os calcis itself that is evident today.

Owing to its course across both the knee and ankle joints, the plantaris tendon exerts actions at each. It is a weak knee flexor and a weak ankle plantar flexor. It receives its motor innervation from the tibial nerve.

History

Confusion about the entity of plantaris tendon rupture has existed for centuries. In 1597, Ambroise Paré coined the term *coup de fouet* (snap of the whip) to describe a rupture of the Achilles tendon, and since then some authors have erroneously applied this term to rupture of the plantaris tendon as well. In the late 1800s, the popularity of lawn tennis gave rise to the terms *lawn-tennis leg* and *tennis leg* to describe this condition. In their review of the literature, Severance and Bassett found reference to plantaris tendon rupture as early as 1726. The problem, they asserted, was that none of the early studies...
had surgical or autopsy evidence of plantaris tendon rupture. They concluded that plantaris tendon rupture is not an isolated entity but coincides with injury to the gastrocnemius muscle or its tendon. Nonetheless, rupture of the plantaris tendon has continued to be described in the literature as tennis leg or coup de fouet, among other terms. Although anecdotal reports of the entity have appeared, a review of the literature reveals only one case of documented isolated rupture of the plantaris tendon, and that rupture occurred at the musculotendinous junction. Another case, reported by Mennen in 1983, describes a rupture of the plantaris tendon seen concomitantly with a partial rupture of the soleus muscle belly. This diagnosis was confirmed later during surgery. We could find no reported case of a documented, isolated rupture of the plantaris tendon at its insertion on the calcaneus.

Today, most of the literature pertaining to the plantaris tendon centers on its availability as graft material, as many surgeons use it to repair various ligamentous and tendinous pathologies in the foot and ankle. There is little in the literature on plantaris muscle and tendon pathology. However, the clinician must be able to distinguish isolated plantaris pathology from that which accompanies Achilles tendon pathology if appropriate treatment is to be provided. The mechanism by which the plantaris musculotendinous unit is ruptured is likely a sharp, forced dorsiflexion of a plantarflexed foot. It could be argued that this action, occurring with the heel in an everted attitude, would be more likely to expose the medial structures such as the plantaris tendon to isolated trauma than would simultaneous injury to the plantaris and Achilles tendons.

Case Report

A 44-year-old active man presented to the lead author’s office with tenderness in the left Achilles region since running over a viaduct (Fig. 1). The patient stated that he felt a “snaplike” sensation behind his left ankle while climbing stairs two at a time. He described the pain as being “as if he was kicked from behind.” The patient continued his run but experienced tenderness immediately afterward. The patient noticed a painful bulge located at the medial aspect of his left heel. He stated that he took anti-inflammatory medication on his own and tried applying ice to the area. The patient was an avid runner who averaged approximately 25 miles per week. He was an otherwise healthy individual with no comorbid conditions or medication use that would place him at increased risk for this type of injury. The next morning, the patient went out for his normal run and was unable to push off without severe discomfort. After medical consultation and treatment, he began rehabilitation, which included substituting swimming for running for approximately 2 weeks, along with anti-inflammatory medication, ice, and rest. At this point, the patient felt that the area was much improved, and he went back to slow jogging for 2 days. On his second day of running, he was running uphill and felt a sting around the back of his Achilles region at the area of the original injury. The patient again reported for consultation. At this time the patient was placed in a below-the-knee walking boot for 2 weeks and told to use anti-inflammatory medication and contrast soaks. After 2 weeks, he was allowed to use swimming as his aerobic activity and progressed to using an elliptical trainer, which seemed to put no stress on the Achilles area. Magnetic resonance imaging (MRI) showed fluid surrounding a low-signal linear structure in the medial aspect of the posterior soft-tissue areas on the left Achilles region (Figs. 2 and 3). The MRI report stated that the tendon-like structure located just medial to the Achilles tendon appeared to be the plantaris tendon. This report also stated that the tendon itself became extremely thin and virtually disappeared from view as it approached the calcaneus. After 1 month, the patient was told to begin slow jogging. He was able to perform normal activity by 2 months. However, he was unable to sprint without discomfort until the third month. The patient continues to demonstrate a fusiform lump on the medial aspect of the left Achilles area measuring approximately 4 mm.

Discussion

Injury to the plantaris tendon has been described in the literature on occasion. Early contributions to the literature on the subject focused mainly on injury to
the musculotendinous junction in the leg. Little can be found regarding plantaris tendon pathology at its calcaneal insertion. This article has described a commonly underdiagnosed and misdiagnosed injury to the Achilles region that seems to respond to conservative care. The mechanism of injury appears to be severe dorsiflexion of the foot, causing the plantaris tendon to rupture. This rupture can be isolated to the plantaris tendon, can involve the plantaris tendon as well as some medial fibers of the Achilles tendon, or can present with complete rupture of both tendons. If the injury is restricted to the plantaris tendon, recovery can be expected within approximately 2 to 3 months. The patient should initially be treated with rest, with immobilization if necessary. Conservative local care should be rendered, including anti-inflammatory medication and physical therapy. We have found that swimming and elliptical trainer use have been a good postinjury routine depending on the severity of the injury and the symptoms.

**Conclusion**

Rupture of the plantaris tendon may occur at the calcaneal insertion. When this injury occurs, it may be isolated or may coincide with Achilles tendon pathology. Regardless of the presentation, the physician should evaluate the patient for the possibility of a complete tear of one or both of these tendons. Although isolated plantaris tendon ruptures respond favorably to conservative treatment, concomitant Achilles tendon pathology may require more invasive treatment. Thus the physician must have a high index of suspicion in cases of plantaris tendon rupture.

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**References**