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Treatment of Insertional Peroneus Brevis Tendinopathy by Ultrasound-Guided Percutaneous Ultrasonic Needle Tenotomy: A Case Report

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ABSTRACT

Insertional peroneus brevis tendinopathy is uncommon and treatment options for recalcitrant insertional lesions are rarely described in the literature. Ultrasound-guided percutaneous ultrasonic needle tenotomy has been described for the treatment of recalcitrant tendinopathy in the elbow, knee, and plantar fascia, but has not been described for the treatment of peroneal tendinopathy. We report a case of recalcitrant insertional peroneus brevis tendinopathy successfully treated with an ultrasound-guided percutaneous ultrasonic needle tenotomy. The treatment resulted in a rapid recovery, and the patient remained asymptomatic at the 6-month follow up. No complications were observed during follow up and the minimally invasive percutaneous procedures offers clear advantage over open techniques.

Peroneal tendon injuries have been recognized with increasing frequency, and include tenosynovitis, tendinopathy, tear, and instability. Although the incidence of peroneal brevis pathology in clinical practice is unknown, cadaveric studies suggested that the prevalence is between 11% and 37% (1,2). The majority of peroneus brevis pathology is located inframalleolar (64.1%), immediately distal to the inferior tip of the lateral malleolus (3), with the majority of peroneus brevis tears occurring at the fibular groove (4). Peroneus brevis tendinopathy at the insertion of the tendon on the fifth metatarsal is uncommon. The case presented is an insertional peroneus brevis interstitial tear, and the successful management on the patient with a percutaneous needle tenotomy.

Case

A 54-year-old female presented with more than 2 years of right lateral midfoot pain localizing to the base of the fifth metatarsal. The patient denied any trauma, and reported that the pain started insidiously a number of years ago. She had previously been treated by a podiatrist and had a magnetic resonance imaging, which showed high-grade peroneus brevis tendinopathy (Fig. 1). The symptoms were recalcitrant despite physical therapy. The patient also reported receiving a cortisone injection at the insertion of the peroneus brevis, which provided 4 months of relief.

The patient had no pain at rest, but reported pain when walking. She denied any radicular or neurologic symptoms. Medical history was significant for hypothyroid disease, hypertension, migraine headaches, and anxiety; home medications included levothyroxine, verapamil, topiramate, bupropion, and imipramine. She had an allergy to nonsteroidal anti-inflammatory drugs. On examination, there was pain at the insertion of the peroneus brevis. Resisted ankle eversion reproduced pain. Sensation and strength were normal. Ultrasonographic examination (GE Logiq E, 12L-RS Linear Array Transducer, 5–13 MHZ) demonstrated cortical irregularity at the base of the fifth metatarsal, with microcalcification of the distal peroneus brevis tendon (Fig. 2*A*). There was minimal hyperemia on power Doppler imaging (Fig. 2*B*). The decision was made to repeat the peritendinous cortisone injection. Under ultrasound guidance, a cortisone injection (dexamethasone 1 mL, lidocaine 1% 1 mL) was injected with a 25-gauge 1.5-in. needle at the insertion of the peroneus brevis, and the patient reported complete relief immediately after the injection.

The patient reported 5 months of relief, but then had recurrent pain. The decision was then made to proceed with an ultrasound percutaneous needle tenotomy using the Tenex system (Tenex Health, Lake Forest, CA) (Fig. 2*C*). The percutaneous ultrasonic needle tenotomy was performed targeting the abnormal appearing footprint and adjacent peroneus brevis tendon under ultrasound guidance. The peroneus brevis tendon sheath was anesthetized with a solution of lidocaine 1% without epinephrine (1 mL) and ropivacaine 0.5% (2 mL) with a 25-gauge 1.5-in. needle. A skin wheal was injected with lidocaine 1%

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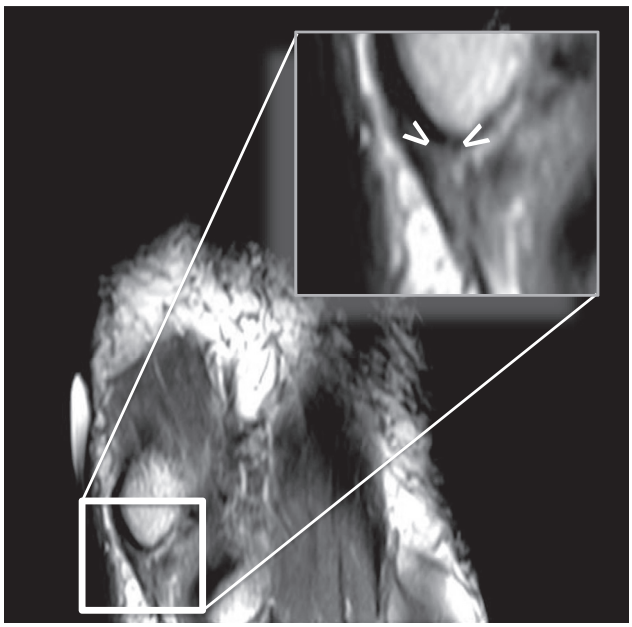

Fig. 1. Axial T2-weighted and fat-saturated image of the right foot depicting the peroneal brevis at the insertion on the fifth metatarsal. Insert shows magnified view with abnormal signal within the peroneal brevis (arrowheads).

with epinephrine (2 mL), and an 11-blade scalpel used to create a stab incision for the Tenex system probe. The probe was then introduced through the incision and the pathologic tissue target.

The stab incision was closed with a Steri-Strip (3M, St. Paul, MN). The patient was immobilized in a short pneumatic walking boot for 7 days and then allowed to return to normal activity without restrictions. At the 2-week follow up, she reported a 70% improvement in symptoms, and a progressive isometric to concentric home strengthening program was started. At 6 weeks posttreatment, she reported no significant symptoms, and at the 6- and 12-month follow ups, she remained asymptomatic.

Discussion

The peroneus brevis originates along the distal two-thirds of the fibula. The peroneus brevis becomes tendinous 2 to 3 cm proximal to the tip of the fibula, passes above the peroneal tubercle and inserts on the base of the fifth metatarsal. In some cases, the peroneus brevis can insert on the lateral hindfoot (5,6) or an extra tendon slip can extend up to the proximal phalanx (6). The majority of peroneus brevis tears occur at the fibular groove (4). Although avulsion fractures of the base of the fifth metatarsal are frequently encountered in orthopedics (7), insertional peroneal tendinopathy is uncommon.

Initially, supportive care of peroneal tendon pathology is advocated and surgical therapy indicated only after failed conservative management. There is no standard protocol for surgical management (8), but may include debridement, repair, and tenodesis. Endoscopic techniques have been developed to perform these procedures in a minimally invasive manner (9–12). Surgery has shown improved pain scores and function, with most cases showing functional improvement (8,13–16), and return to full sporting activity without limitation (87.5% to 98%) (8,14,15). Although the majority of studies report significant improvement after surgery (8,14–16), Steel et al (17) found only 46% of subjects were able to successfully return to sport at an average follow up of 31 months. Complications include scar tenderness, lateral ankle swelling, and numbness over the lateral ankle.

The majority of surgical procedures described in the literature are for midsubstance peroneal tendon tears. Squire et al (18) described the surgical strategy for complete rupture of the peroneus brevis tendon at the insertion, but the authors could not find any reports on the surgical management for partial interstitial tears of the peroneus brevis at the insertion. In this case, the injury was chronic and the interstitial changes on imaging suggested a chronic degenerative tear.

Percutaneous needle tenotomy (PNT) has been used to treat chronic refractory tendinopathy, and involves repeatedly fenestrating the affected tendon. The procedure is thought to disrupt the degenerative tissue, encourage localized bleeding, and change a chronic, recalcitrant injury into an acute injury. Bleeding introduces tissue growth factors and is thought to stimulate a healing response.

PNT has been reported for the management of chronic epicondylitis (19–22), rotator cuff disease (23), gluteal tendinopathy (24,25), patella tendinopathy (26–29), Achilles tendinopathy (30,31), and plantar

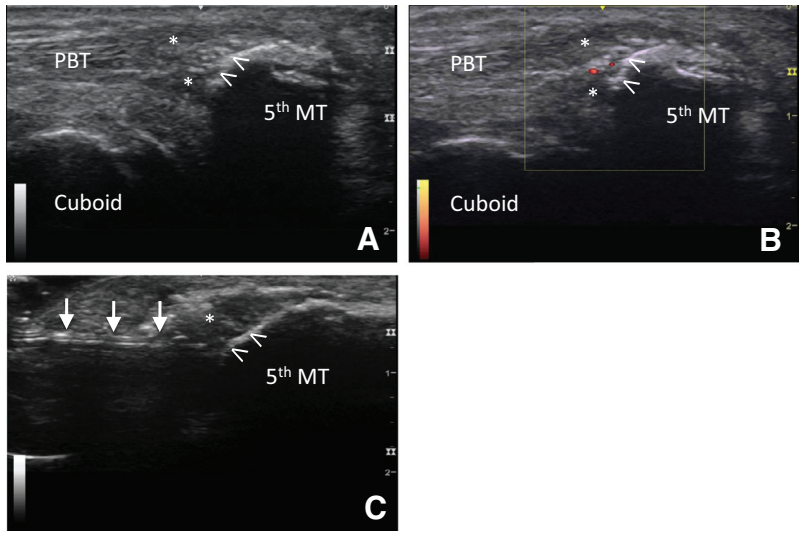

Fig. 2. (*A*) Longitudinal ultrasound of the peroneal brevis tendon (PBT) showing hypoechoic thickening of the tendon (*) and irregularity of cortex (arrowheads). (*B*) There is 2+ neovascularity on power Doppler imaging (modified Ohberg score). (*C*) Ultrasound-guided percutaneous ultrasonic needle tenotomy showing the Tenex needle (arrows) entering the abnormal appearing footprint (arrowheads) and adjacent peroneal brevis tendon (*). Acoustic shadowing from the 18-gauge needle and reverberation artifact from the movement of the Tenex device distorts the image. The cuboid and base of the fifth metatarsal (MT) serve as bony acoustic landmarks.

fasciitis (32,33). Percutaneous ultrasonic needle tenotomy was inspired by the technology used in the phacoemulsification procedure used during cataract surgery and has been approved by the US Food and Drug Administration approved for plantar fasciopathy, common extensor and flexor tendinopathy at the elbow, patellar tendinopathy, and Achilles tendinopathy. Case series have demonstrated improved pain and function with percutaneous ultrasonic needle tenotomy for the treatment of chronic lateral epicondylitis (34–37), patella tendinopathy (38), and plantar fasciitis (39).

To the authors' knowledge, percutaneous ultrasonic needle tenotomy has not been reported in the treatment of insertional peroneus brevis tendinopathy. The peroneus brevis tendon at the insertion shares a similar broad-based attachment as other tendons that are successfully treated with PNT, and the authors believed that the pathology was likely amenable to treatment with percutaneous needle tenotomy. Ultrasound can localize the pathologic tendon and allow precise targeting of the diseased tissue.

One potential limitation of a traditional percutaneous needle tenotomy is that the technique relies on the body to remove the diseased tendinopathic tissue. In contrast, the percutaneous ultrasonic needle tenotomy has the benefit of being minimally invasive, but also has the ability to debride and remove pathologic tendinopathic tissue. Removing the pathologic tendon was previously only attainable by performing an open or arthroscopic surgery. There is 1 system available using this technology, and the needle oscillates at a high frequency to emulsify the pathologic tissue and continuously irrigates and aspirates the fluid/debris through the hollow 18-gauge needle. In an animal model, after removing the pathologic tissue with percutaneous ultrasonic needle tenotomy, the evacuated space demonstrated evidence of tendon regeneration. Histologically, the tendon was repopulated with mature and immature fibroblasts, a better-aligned pattern of collagen fibers, and a more normal ratio of type I and III collagen profile (40).

In conclusion, distal peroneal pathology is rare. Surgical strategies have been reported for complete rupture of the peroneus brevis, but to the authors' knowledge no treatments have been described for chronic recalcitrant partial interstitial tears of the peroneus brevis. Percutaneous ultrasonic needle tenotomy is an innovative treatment, which is a minimally invasive alternative to open or arthroscopic surgery. In this case, percutaneous ultrasonic needle tenotomy was effective in relieving the patient's pain and disability from a chronic partial interstitial tear of the peroneus brevis.

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