

Case Report

A case of medial head of gastrocnemius muscle injury treated with ultrasound-guided percutaneous needle electrolysis

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ABSTRACT

A 44-year-old female patient presented with a complaint of soreness in the back of her right leg. The pain was located along the posteromedial part of the calf and did not extend distally toward the thigh or ankle. On examination, the patient had an antalgic gait favoring the right leg. There was also mild tissue swelling, discoloration, and bruising on the right calf extending to the posterior aspect of the calcaneus. This case report described a patient who underwent successful percutaneous needle electrolysis therapy for a gastrocnemius medialis muscle injury.

Keywords: Galvanic current, gastrocnemius medialis tear, percutaneous needle electrolysis therapy.

Tennis leg, also known as a tear of the gastrocnemius medialis (GM) muscle, is a common injury among both amateur and professional athletes, accounting for up to 13% of all muscle injuries among soccer players. However, it can be found in nonathletes as an overuse injury.^[1,2] It is frequently seen in racket sports, sprinting, jumping, and running sports or activities that require rapid starts and stops.^[3,4] Conservative treatment approaches, including rest, decreased activity, physical therapy, and the use of painkillers, are frequently used as the first line of treatment. Surgery is rarely necessary for isolated posterior calf muscle or tendon injuries that do not involve the Achilles tendon.^[5]

Percutaneous needle electrolysis therapy (PNET) is a minimally invasive procedure employed to treat musculoskeletal problems.^[6] The method involves administering a continuous electric current of microgalvanic nature to the affected region using an acupuncture needle with the assistance

of ultrasound. Galvanic current stimulates a localized inflammatory response through the flow of negatively charged ions, which promotes the engulfment of damaged cells by immune cells and the regeneration of injured tissue.^[7] Percutaneous needle electrolysis therapy was initially developed and utilized for the treatment of chronic patellar tendinopathy; however, its spectrum of applications has rapidly expanded, which has led to an increase in the number of indications for its use.^[8] The effects of this treatment on pain, tissue healing, and the speed with which function is restored in a variety of conditions have been investigated in a number of studies. These conditions include lateral epicondylalgia, carpal tunnel syndrome, hamstring tendinopathy, rectus femoris muscle injuries, Achilles tendinopathy, chronic soleus injuries, rotator cuff pathologies, and patellofemoral pain syndrome.^[9] In all of these conditions, the efficacy of PNET has been demonstrated in tendinopathy and

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myofascial pain syndrome; however, its usefulness in acute muscular injuries remains mostly unknown. Herein, we presented a patient who developed a GM tear due to overuse injury and was successfully treated with PNET.

CASE REPORT

A 44-year-old female patient presented with a complaint of soreness in the back of her right leg. The patient stated that the symptoms began a few days ago while she was in a hurry during a work session at her place of employment. She reported feeling a sudden and intense sensation in the back of her calf when extending her leg backward and planting her heel on the ground. The pain was located along the posteromedial part of the calf and did not extend distally toward the thigh or ankle. The patient reported that the pain was tight, throbbing, and tension-like. The pain generally worsened with movements of the ankle. On examination, the patient had an antalgic gait favoring the right leg. There was also mild tissue swelling, discoloration, and bruising on the right calf extending to the posterior aspect of the calcaneus. When stiffness was detected in the painful area, palpation revealed that the medial gastrocnemius muscle was not deficient. Both passive and active ankle dorsiflexion caused mild discomfort. A single-leg calf raise was challenging

to execute with the affected limb. A partial tear with seroma at the medial part of the GM adjacent to the aponeurosis was identified during an ultrasound examination of the right calf (Figure 1a). A type 2B rupture of the medial gastrocnemius muscle was identified in the patient based on the mechanism of injury, clinical symptoms, and ultrasonographic findings. Written informed consent was obtained from patient.

The patient was instructed to follow the acronym PRICE, which stands for protection, rest, ice, and compression, in the treatment of soft tissue injuries, until the symptoms subsided. To reduce pain and discomfort, the PRICE components were used throughout the first several days of treatment. The patient was recommended to restrict her activities early in the course of treatment. The patient declined to utilize a walking boot or a Canadian crutch for support.

To facilitate rapid recovery and return to work, the patient began PNET sessions at the end of the first week. Percutaneous needle electrolysis therapy was carried out at an intensity of 350 μ A for 80 sec on clinically important areas (i.e., the area most sensitive to palpation and areas with ultrasonographic muscle tears) under ultrasound guidance. The application of microgalvanic current via acupuncture needle was planned to be one

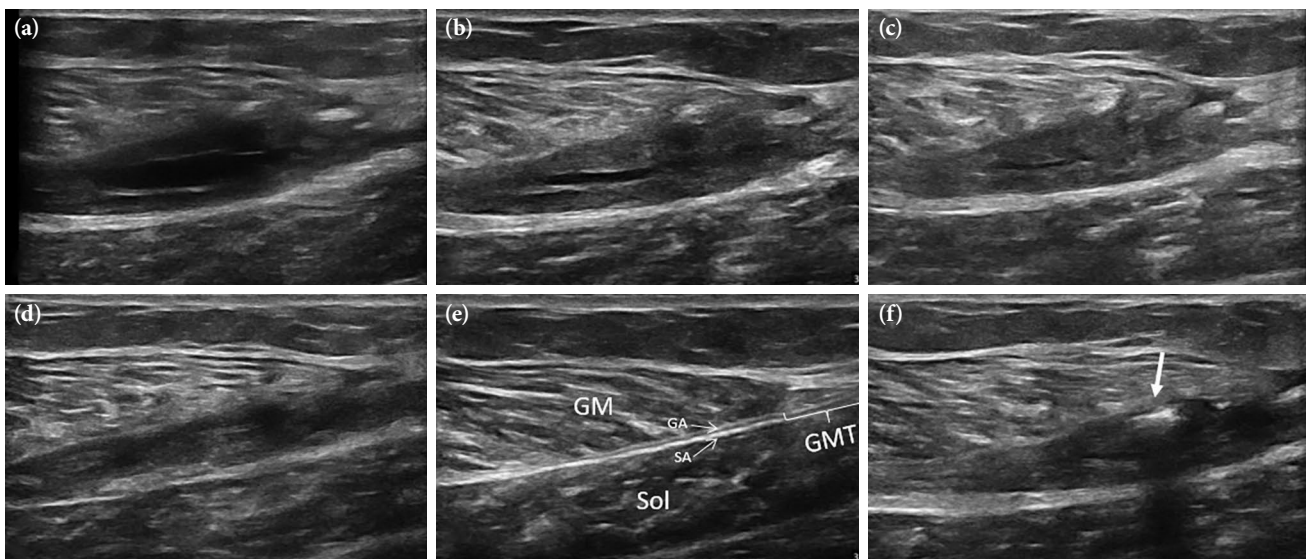


Figure 1. Percutaneous needle electrolysis therapy for GM muscle injury. (a) Longitudinal ultrasound image of the GM tear before treatment; (b) GM muscle tear after four sessions of PNET applied at one-week intervals at one week, (c) two weeks, (d) and four weeks. (e) Gastrocnemius medialis muscle image on the healthy side. (f) The white hyperechoic area (arrow) in the longitudinal ultrasound image during PNET represents hydrogen gas released during electrolysis.

GM: Gastrocnemius medialis muscle; Sol: Soleus muscle; GA: Gastrocnemius aponeurosis; SA: Soleus aponeurosis; GMT: Gastrocnemius medialis tendon; PNET: Percutaneous needle electrolysis therapy.

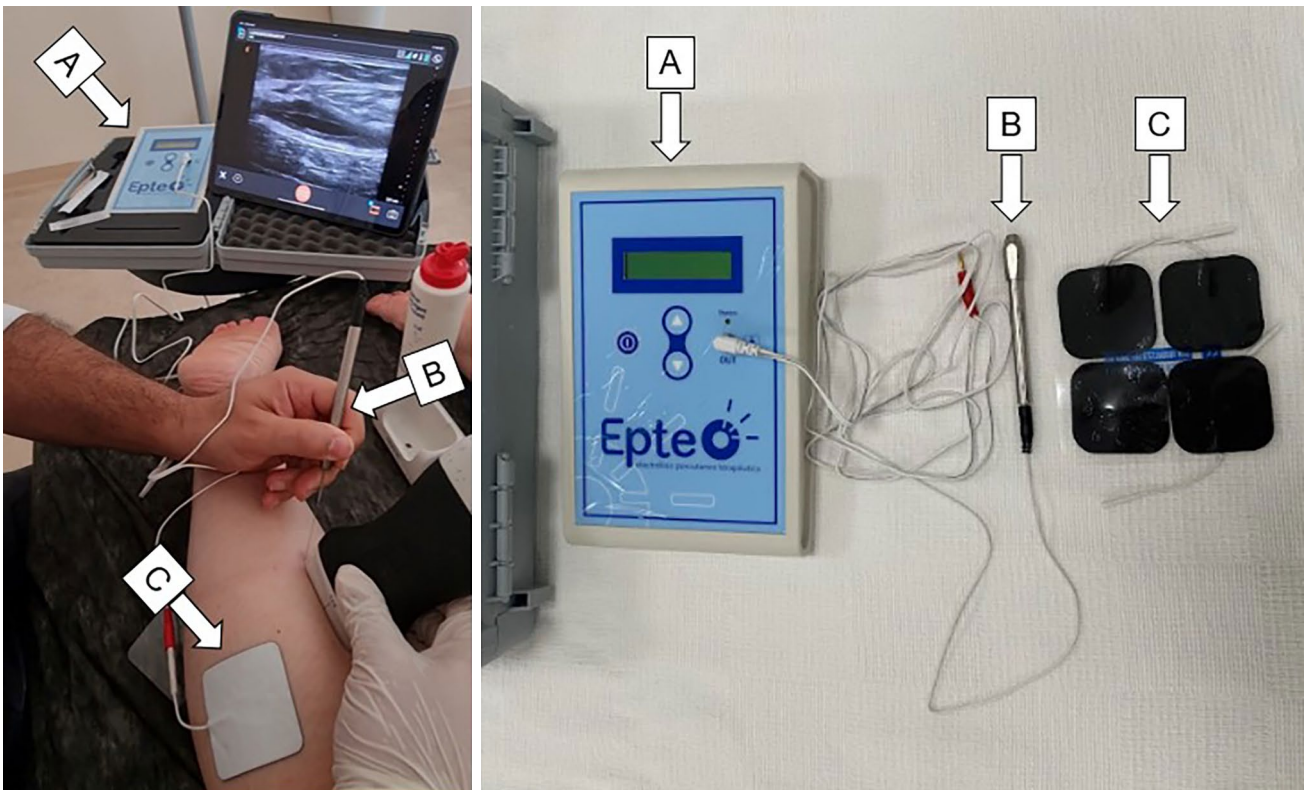


Figure 2. The image shows a medically certified device (EPTE, Ionclinics, Valencia, Spain). (a) Device; (b) cathode (needle holder to which the acupuncture needle is inserted); (c) anode (surface electrode).

session every seven to 14 days. According to the patient's treatment response, if there was not enough response, sessions were conducted once a week, and if there was enough response (<50% pain reduction), session intervals were increased. Accordingly, over four weeks, the patient underwent weekly PNET sessions and a home program of eccentric exercise and isometric strengthening, starting 24 h following each session.

No significant side effects were observed during and after the sessions. The patient felt minimal pain during the treatment and mentioned a feeling of fullness at the application site that lasted for one to two days. No medication was needed during this time. The changes in the GM muscle tear after PNET are shown in Figures 1a-d. The GM muscle on the healthy side is also shown in Figure 1e. During the PNET process, the white hyperechoic area shown in the ultrasound image corresponds to the hydrogen gas that is generated as a result of electrolysis (Figure 1f).

The technique was applied using a specifically developed medically certified device

(EPTE V01, classification IIa; Ionclinics, Valencia, Spain; Figure 2). The anode of the apparatus was placed superficially on the skin, and the cathode (a modified electrosurgical scalpel with a needle) produced a constant galvanic current through it. The ultrasound images were taken using linear Clarius transducers L15 (Clarius Mobile Health, Vancouver, British Columbia, Canada), which connected wirelessly to an iPad for visualization of images on the Clarius ultrasound application.

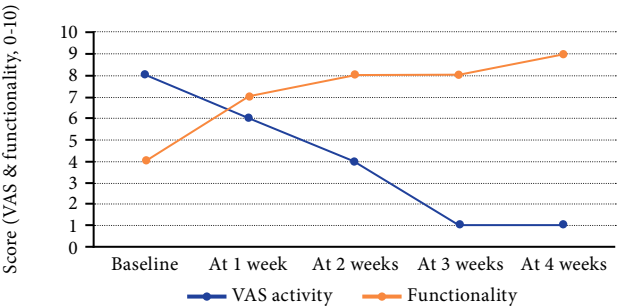


Figure 3. Change in pain and functionality at the end of the sessions.
VAS: Visual Analog Scale.

The injured leg was cleaned with isopropyl alcohol and chlorhexidine before the needle was inserted. The ultrasound transducer was then positioned in the GM and stayed there the entire time. Afterward, a long-axis technique was used to insert an acupuncture needle measuring 0.30 mm by 30 to 50 mm (EPTE needles, Spain; uncoated steel needle with rigid metal handle with guide, Korean type) at a 60° angle with the skin and progress it toward the muscle injury.

The eccentric exercise regimen involved performing three sets of eccentric exercises, with each set consisting of up to 15 repetitions. These exercises were done twice a day, at the point where the pain was felt, within the range where pain was minimal and did not interfere with normal movement. Avoiding stretching exercises was advised, as they could potentially exacerbate the injury. The patient's Visual Analog Scale scores for activity and functionality before and after the treatment sessions are given in Figure 3.

DISCUSSION

In this case report, a patient with a tear in the GM muscle who underwent four sessions of PNET was presented. The patient, who had sudden onset calf pain during daily activities, was diagnosed with a GM muscle tear by clinical and ultrasound examination, and after a short-term PRICE method, when the symptoms began to subside, PNET and eccentric exercises were given as a home program. At the end of one month, the patient was able to perform daily activities without pain, and the gait abnormalities disappeared.

Examining the literature reveals that tendinopathies are the initial condition for which PNET is employed, with patellar tendinopathy being the most common instance. Numerous articles discuss its effectiveness and reliability.^[6,8] In recent years, PNET has begun to be used in the treatment of myofascial trigger points with low intensity and duration.^[10,11] However, there are almost no studies investigating the effectiveness of PNET in the treatment of acute muscle injuries.

Percutaneous needle electrolysis therapy is a revolutionary new technique used to treat tendinopathies.^[12,13] This treatment is an invasive procedure that combines mechanical needle stimulation (with an acupuncture needle) and electrical stimulation (with galvanic current) to create controlled microtrauma to the affected

tissue. It is an easy and relatively painless procedure to perform and greatly speeds up tendon healing times.^[14] Percutaneous needle electrolysis therapy has been shown to induce an inflammatory response in the tissue it treats and a notable rise in pH at the needle's tip, which has the ability to hydrolyze scar tissue. The aim of the treatment is to stimulate the wound healing mechanisms.^[6,8] A physical reaction is induced in the tendon by stimulating the controlled inflammation necessary for healing.

Scientific evidence suggests that PNET is used in a variety of pathologies (mainly tendon-related), but there is still no consensus on therapeutic indications, doses, or application techniques. When compared to sham needling and active exercise interventions alone, PNET and other treatments (exercise, needling treatments, and passive modalities) appear to have beneficial short- to medium-term effects on pain; however, comparisons with corticosteroid injections, dry needling, and passive interventions are not conclusive. Percutaneous needle electrolysis therapy has been demonstrated to enhance function and pain, but not tissue structure.^[6]

In conclusion, according to scientific evidence, it is known that PNET is used to treat a wide variety of diseases, particularly tendinopathies. It is observed that it has positive effects on reducing pain and improving function in the acute phase. Ultrasound guidance is necessary to prevent complications such as vascular nerve injuries in PNET and to provide definitive treatment. We are evaluating the possibility that this treatment can be used to treat many other muscle tears, such as GM tears.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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