A Novel Approach to Post-Traumatic Foot and Ankle Pains using Percutaneous Ultrasound Guided Cryoneurolysis: A Case Report

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ysis, while an effective treatment for other peripheral nerves, may not be widely considered for treatment of foot and ankle pain. For instance, a four-year retrospective study showed that of 59 cryoneurolysis treatments, 10 were utilized to alleviate sural nerve pain. However, the investigators did not report the efficacy of the sural injections nor the length of symptom relief from sural injections [8]. To advance understanding regarding this potential, we present a case in which pain relief was achieved immediately following sural and superficial fibular cryoneurolysis.

Case Report

A 73-year-old woman with a past medical history significant for fibromyalgia, coronary artery disease, deep vein thrombosis, and hypertension presented for evaluation of left foot and ankle pain. Onset was 13 years prior, when a cement mixer fell onto her left foot. She reported pain in her “entire ankle”, but localized the pain to the dorsal left foot. She characterized the pain as “burning”, with radiation up her leg. Weight bearing exacerbated her pain, limiting her quality of life and physical function. She used a single point cane for offloading of her affected foot. Trials of medications included, but were not limited to: Diclofenac gel, gabapentin, pregabalin, fentanyl patches, and nortriptyline without relief of left foot pain. She could tolerate the pain in her left foot with oxycodone 10 mg 8 × per day. She completed physical therapy, but without relief. She had previously had placement of a spinal cord stimulator (2015) without relief. She reported 9 reconstructive surgeries of her affected foot and ankle. The surgeries within our hospital system included: left ankle fusion (2007), repeat left ankle fusion (2011), arthrodesis of left great toe metatarsoophalangeal joint (2016), sesamoidectomy of the first toe on the left (2016). Upon inspection and palpation, she exhibited pitting edema throughout the left foot and ankle. She could move only the 2nd, 3rd, 4th, and 5th digits of her left foot. She had zero degrees of dorsiflexion or plantar flexion of the left ankle. She was without neurologic deficits and upper motor neuron signs. She exhibited tenderness and allodynia over the entire left foot with increased tenderness over the lateral malleolus.

Our patient appeared to be suffering from post-traumatic left foot and ankle osteoarthritis likely exacerbated by failed ankle fusion syndrome. Given the patient’s lack of successful response to conventional management, we considered intervening with ultrasound-guided cryoneurolysis.

Procedural Methods and Materials

The superficial fibular and sural nerves were targeted based on the distribution of her pain. She reported pre-procedural pain severity of 8/10. The procedure was carried out under sterile technique, utilizing a sterile ultrasound transducer cover and sterile ultrasound gel. Pre-procedural scanning was performed to determine optimal needle approach for the procedure. The patient was prepared and draped in sterile fashion. The skin superficial to each nerve was prepared with sterile chlorhexidine. The skin at the site was then anesthetized subcutaneously with 5 cc of 1% lidocaine, using a 1-inch 25G needle, raising a skin wheal superficial to each nerve. After confirming local anesthesia, a cryo-probe was inserted with ultrasonographic guidance towards the sural nerve lateral to the Achilles tendon and the small saphenous vein. The sterile tip was iteratively inserted, with overlap until the entire treatment area for the sural nerve was completed. The same process was then repeated for the superficial fibular nerve, which was treated approximately 10 cm proximal to the lateral malleolus in the triangle formed by the peroneus brevis and extensor digitorum longus muscles and the overlying fascia.

Results

The patient was elated to report post-procedural pain severity of 0/10. She was instructed to follow up in five months, or sooner, if needed. Unfortunately, patient was lost to follow up. However, in a phone call which took place 11 months following the procedure, patient reported she experienced pain relief for “at least several weeks” post-intervention, but was unable to specify the exact chronicity of her relief.

Limitations

Our results are limited by a lack of distinction on the initial examination between passive and active range of motion per documentation. This information would have provided helpful data points to evaluate in order to further the understanding of the functional benefits of percutaneous ultrasound guided cryoneurolysis. Moreover, as the patient was lost to follow up, we are unable to comment on the specific chronicity of the treatment in her case beyond her immediate post-procedural pain relief.

Two years following the procedure, an EMG demonstrated evidence of a distal left peroneal and tibial neuropathy. Given her history of multiple left foot and ankle surgeries, it is reasonable to assume her neuropathies were post-op complications. While a polyneuropathy could be possible, contralateral sural response was normal. Moreover, there was no radiculopathy, plexopathy, or other abnormal process noted. While this study was not available before the procedure was done, the study may suggest that there was an underlying neuropathy contributing to her pain in conjunction with the post-traumatic left foot and ankle osteoarthritis.

Discussion

This case demonstrated reduced ankle joint pain using cryoneurolysis of the sural and superficial fibular nerves under ultrasound guidance. This treatment
has been reported to create a reversible nerve block through inducing an axonotmetic nerve injury. When sensory nerves are treated, afferent conduction temporarily ceases, immediately alleviating pain. Because the endoneurium, perineurium and epineurium remain intact, myelinated axons regenerate at a rate of 1.0-1.5 mm per day. Thus, the duration of the analgesia depends on the distance from the distal end of the terminal axon.

Based on current evidence related to the infrapatellar branches of the saphenous nerve, patients can expect a treatment effect of 120-150 days [1]. However, this Figure 1 is variable based on the peripheral nerve treated. This case is consistent with other reports in supporting that cryoneurolysis is attractive from both patient and provider standpoints - it is minimally invasive, has a favorable side-effect profile, can be offered on an outpatient basis, and has demonstrated efficacy in contexts in which other interventions have not. This case provides additional evidence that cryoneurolysis has a potential growing role in the treatment of pain due to osteoarthritis and related etiologies [1,2,7].

We demonstrated that the expansion of cryoneurolysis as a modality for treating pain is limited only by the operator’s ability to identify the sensory nerve via imaging guidance. Future efforts on this treatment modality should focus on the chronicity of pain relief for the superficial fibular and sural nerves, and on functional outcomes.

References