Promising Ultrasound-Guided Perineural Dextrose Injection for Plantar Fasciitis: A Case Report with Up to Seven Months Follow Up

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Abstract

Plantar fasciitis is a common source of heel pain, and treatment effects are often temporary. We reported 2 cases of ultrasound-guided perineural tibial nerve dextrose 5% water (D5W) injection in treating plantar fasciitis and subsequent three, five and seven-months follow up. Two middle-aged female patients with comorbidities, presented with chronic right heel pain despite of previous oral analgesics, steroid injections treatment. Physical examination, plain radiography, and musculoskeletal ultrasound confirmed the presence of plantar fasciitis. They sought for safe, effective, less painful, and more durable treatment options. After consented, two sessions a week apart of three-milliliters out-of-plane ultrasound-guided perineural tibial nerve D5W injection were performed, resulting in significant pain reduction. Three, five and seven-months evaluation revealed no recurrence of pain without any additional analgesics. Both patients reported greater satisfaction with this method and no worsening of their comorbidities. Ultrasound-guided perineural tibial nerve D5W injection serve as promising treatment option in treating plantar fasciitis. Larger studies are warranted to strongly establish the safety and effectiveness of this technique

Keywords: Plantar Fasciitis; Heel Pain; Dextrose 5% Water; Ultrasound-Guided Perineural Injection; Tibial Nerve.

Introduction

Plantar fasciitis (PF), a painful degenerative inflammatory heel condition due to biomechanical overuse, is estimated to affect one in 10 people around the world.[1] There are some treatment options; however, in some cases, they might unsatisfactory due to high recurrence rate, and risk of fat pad atrophy in steroid injection.[2] New innovative approach is therefore needed to improve the outcome. The use of dextrose 5% water (D5W) injection in musculoskeletal pain has increased significantly. It represses transient receptor potential vanilloid receptor-1 (TRPV-1) which involved in pain.[3,4] One of the injection technique is ultrasound-guided hydrodissection, reported for its safety and effectiveness in exerting pain ameliorative effect of D5W.[5] In comparison to widely used steroid injection, this technique might avoid any possible harmful side effects of steroid.[6] We reported the success of two cases of ultrasound-guided perineural tibial nerve (TN) D5W injection using hydrodissection technique in treating plantar fasciitis and follow up several months after.

Case Reports

Case one

A 42-year-diabetic-old-woman sought consult due to chronic, refractory right heel pain with no numbness for more than 5 months. There was no "stocking-glove" pattern of pain or tingling affecting her toes and fingers. She was an active house wife and the pain affected her daily activities. Several treatments during the recent 5 months including oral analgesics (non-steroid antiinflammatory drugs and tramadol), local landmark-guided corticosteroid injection, and acupuncture were conducted subsequentially without satisfactory improvement. She had diabetes mellitus (A1c was 8.4%) and hypertension for 2 years, under routine medications (metformin 500 mg TID and candesartan 16 mg OD). Her body mass index (BMI) was 26.64 kg/m^2. The Roles and Maudsley (RM) score was 4. She had tenderness at right plantar medial calcaneal tuberosity, with visual analogue score (VAS) 7/10. Tinel test was negative. Musculosketal ultrasound examination showed 5.1 mm thickness of right plantar fascia and increased hypoechogenecity (Figure 1a) supporting the diagnosis of PF. Plain radiography demonstrated right calcaneal spur (Figure 1b). Looking for novel treatment option having lesser possible side effect than corticosteroid, she consented for a three-milliliter out-of-plane ultrasound-guided D5W injection, using hydrodissection technique, using a 27-gauge half-inch needle, perineural to the TN, posterior to medial malleolus in supine position (Figure 1c). Two sessions in one week interval were performed, yielding in pain alleviation with VAS score 1/10 and RM score 1. She was advised for reducing body weight, avoiding high-heels, and intensive glucose control using combination of metformin 850 mg BID, dapaglifozin 10 mg OD, and sitagliptin 100 mg OD. She reported no recurrence of right heel pain at the 3rd and 5th months afterward without any additional pain killers (VAS 0/10, RM score 1). She could perform her daily activities well. Her A1c was improved to 5.5%. Ultrasound revealed 4.0 mm thickness of right plantar fascia (Figure 1d). During her last clinic visit at 7th months follow up, she had no recurrence of right heel pain (VAS 0/10, RM score 1).

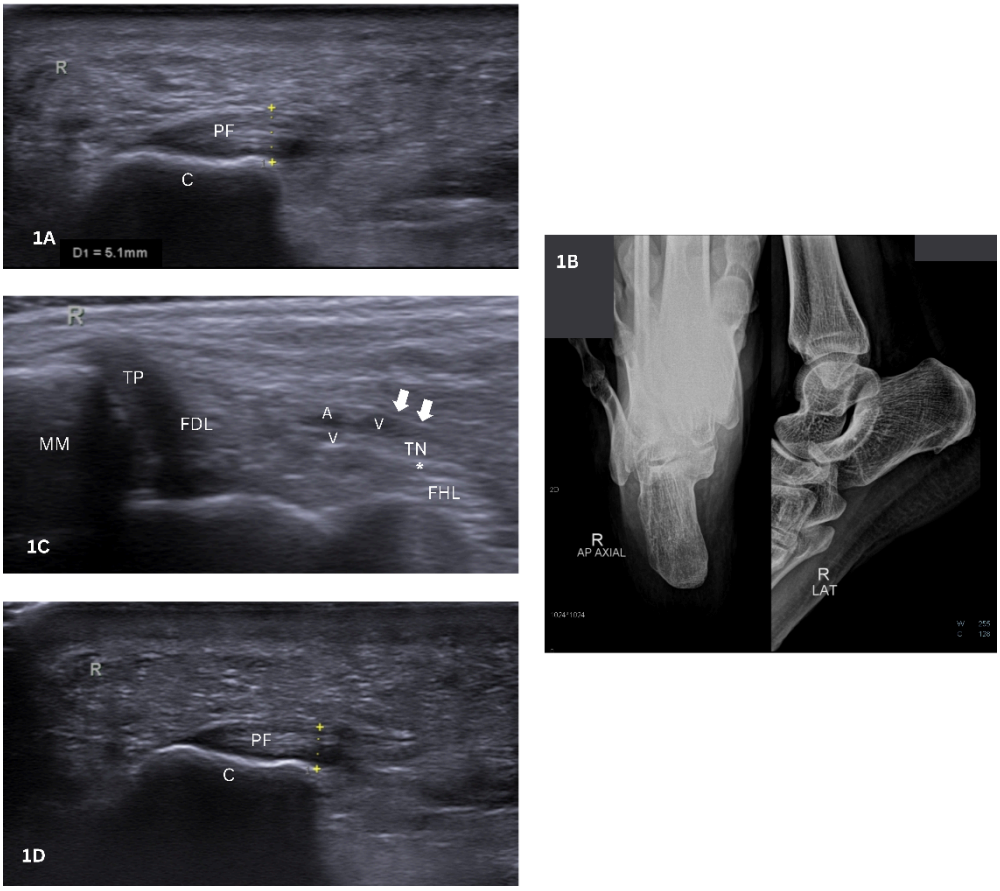

Figure 1: a. Pre-treatment ultrasound showing thickened and hypoechoic right plantar fascia: R, right; C, calcaneus; PF, plantar fascia; 1b. Plain X-Ray showing entesophyte; 1c. Out-of-plane ultrasound-guided perineural tibial nerve D5W injection: R, right; TP, tibialis posterior; FDL, flexor digitorum longus; FHL, flexor hallucis longus; A, artery; V, vein; TN, tibialis nerve; *, perineural dextrose 5% injectate; arrow, flexor retinaculum; 1d. Ultrasound of right plantar fascia at five months after the treatment: R, right; C, calcaneus; PF, plantar fascia.

Case two

A 59-year-old-woman suffering right heel pain for 6 months. She was an active business woman and house wife. Since the pain caused discomfort during her daily activities, she looked for various treatment such as physiotherapy twice a week at 6 months prior, oral non-steroid antiinflammatory drugs at 3 to 6 months prior, local landmark-guided corticosteroid injection at 3 months prior without sustained relief in pain. She had hypertesion, dyslipidemia, and took routine medications of candesartan 16 mg OD and simvastatin 10 mg OD for 4 years. She was obese with BMI 27.94 kg/m^2. Her RM score was 4. Tenderness with VAS 7/10 was perceived during palpation at her right medial heel. Tinel test was negative. Musculosketal ultrasound examination showed 7.0 mm thickness of right plantar fascia and increased hypoechogenecity (Figure 2a). Plain radiography demonstrated right calcaneal spur (Figure 2b). Seeking for less painful treatment, having more lasting effect and avoiding harmful cumulative effect of corticosteroid, she agreed to novel minimal invasive treament by injecting three-milliliter out-of-plane ultrasound-guided D5W perineural TN, using hydrodissection technique for safety purpose, posterior to medial malleolus, using a 27-gauge half-inch needle in supine position (Figure 2c). We repeated the procedure after a week, resulting pain attenuation to VAS score 2/10 and RM score 1. Wearing appropriate footwear and weight reduction was strongly advised. During her reguler visit after 3, 5, and 7 months, she reported great satisfaction in performing daily activities with no recurrence of right heel pain (VAS 0/10, RM score 1). Decreased in right plantar fascia thickness to 5.5 mm during 5-month ultrasound follow up was in coherent with clinical improvement (Figure 2d). Her last clinical visit at 7 months afterwards showed no complain of right heel pain (VAS 0/10, RM score 1).

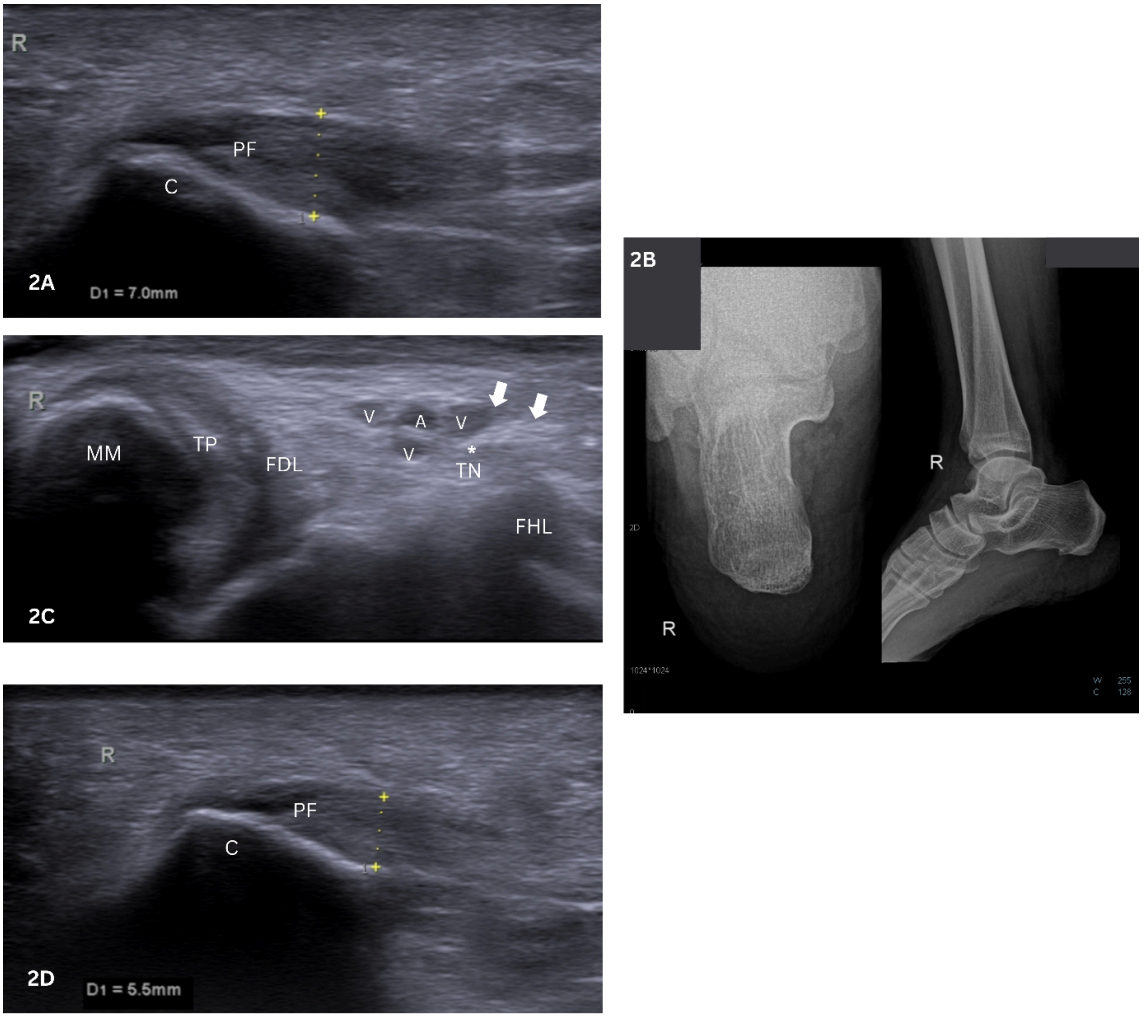

Figure 2: a. Pre-treatment ultrasound showing thickened and hypoechoic right plantar fascia: R, right; C, calcaneus; PF, plantar fascia; 2b. Plain X-Ray showing entesophyte; 2c. Out-of-plane ultrasound-guided perineural tibial nerve D5W injection: R, right; TP, tibialis posterior; FDL, flexor digitorum longus; FHL, flexor hallucis longus; A, artery; V, vein; TN, tibialis nerve; *, perineural dextrose 5% injectate; arrow, flexor retinaculum; 2d. Ultrasound of right plantar fascia at five months after the treatment: R, right; C, calcaneus; PF, plantar fascia

Discussion

To the best of our knowledge, this is the first reported novel ultrasound-guided D5W perineural TN injection using hydrodissection technique[5] for treating PF with subsequent follow up evaluation several months after. There are studies reporting the effectiveness of D5W in treating musckuloskeletal pain with various injection technique.[7-11] Two meta-analysis of randomized controlled trial (RCT) comparing dextrose injection as prolotherapy and other interventions for plantar fascia, of which one study reporting no significant pain reduction in long-term (≥ 6 months) follow up and vice versa in the other study.[12,13] Interestingly, there are 2 published studies reported effectiveness of D5W in treating PF with different injection methods. The first study evaluated the effectiveness of weekly injected landmark-guided perineural D5W to the saphenous nerve at the adductor canal and deep TN between the bifurcation of the gastrocnemius muscles, showing reduction in pain score after 8 weeks consecutive treatment.[14] The second study reported a case of ultrasound-guided perineural D5W in-plane injection to TN successfully reduced the PF pain after 2 sessions of a week apart treatment.[6] Nonetheless, no report yet on durability of pain relief after the treatment. Thus, our cases demonstrated the long-term durability of pain free result after D5W injection. We performed out-of-plane injection technique to ease the access in uneven surface and shorten the length of needle insertion.

The D5W downregulates TRPV1 and reduces pro-inflammatory substances. It also inhibits the transmission of pain from the peripheral area to the somatosensory cortex through spinal cord.[4,15-17] Moreover, D5W might preserve motor response rather than local anesthetic, which might abolish muscle twitch due to reduction of current density.[18] Our cases demonstrated some advantages of perineural TN D5W injection in treating PF. First, the effect is not temporary and may sustain to at least 7 months. Second, it is considered to be safe than traditional corticosteroid injection, even in diabetic patient as long as adequate diabetes treatment provided. This is in coherent with previous case report finding.[7] Third, less painful experience during perineural injection compare to direct plantar fascia prolotherapy injection. Fourth, although it was not directly around the inflammed area as traditional corticosteroid injection, it succesfully reduced the thickness of plantar fascia. Despite the thickness was not reduced to normal range of plantar fascia thickness, the pain was relief. This suggests that neuromodulation and inflammatory control are essential rather than the thickness of fascia itself. Our cases are limited by the small sample size (2 cases) and no control group. The contribution of managing confounding factors, such as concurrent lifestyle modifications and optimizing comorbid diseases treatment, cannot be separated from the effect of injection in pain relief and functional recovery. The subjective nature of the primary outcome might affect the result in our cases. Additionally, the inherent placebo effect cannot be discounted.

Future research should prioritize RCT comparing perineural D5W injections to placebo or more common therapies (e.g., corticosteroids, physical therapy).

Conclusion

D5W perineural TN injection has emerged as a promising safe, easily available, less painful, durable, and minimal invasive modality in treating PF. Further large scale studies with randomized control group are warranted to be conducted to provide more convincing evidence of effectiveness.

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Disclosure

The authors certify that appropriate patient consents for publication have been obtained.

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