Effect of Dry Needling in Patients with Plantar Fasciitis in Reducing Pain Compared to Ultrasound Therapy

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How to cite this article: Astha Jain, Muthukumaran Jothilingam. Effect of Dry Needling in Patients with Plantar Fasciitis in Reducing Pain Compared to Ultrasound Therapy. Indian Journal of Physiotherapy and Occupational Therapy / Volume 18, Year 2024.

Abstract

Background: Pain and discomfort below the medial calcaneal tubercle especially in the weight-bearing areas are the hallmarks of plantar fasciitis heel pain. It affects about 10% of people in the general population and affects about 83% of active working individuals between the ages of 25 and 65.

Purpose: To determine the effect of dry needling therapy on subjects with Plantar fasciitis in reducing pain and increasing Ankle Range Of Motion (ROM) when compared to Ultrasound therapy with ankle exercises.

Materials and Methods: The subjects were selected according to selection criteria. All the subjects were assessed using Numeric Pain Rating Scale (NPRS) and Ankle ROM. A sample of 50 (45 females and 5 males) was taken for the study which was further divided into two groups where the experimental group received Dry needling therapy with ankle exercises (n=25) and the control group received Ultrasound therapy with ankle exercises (n=25). The intervention was given for two weeks. The entire process was performed from November 2022 to April 2023.

Result: Statistical analysis showed that there was a significant difference obtained within the groups of pre and post-test for NPRS and ROM (p<0.0001). A significant difference was obtained between the experimental and control groups for NPRS and ROM (p<0.0001).

Conclusion: Dry needling therapy with ankle exercises was more beneficial in reducing pain than ultrasound therapy with ankle exercises in Plantar fasciitis subjects.

Keywords: Plantar fasciitis, Dry needling, Ultrasound therapy, ankle exercises, Dorsiflexion, Plantar flexion.

Introduction

Pain and discomfort below the medial calcaneal tubercle especially in a weight-bearing area are the hallmarks of plantar fasciitis heel pain, especially right after relaxation, such as keeping the first step on the floor in the morning.¹ Lower extremity tendinopathy have a prevalence between 20% and 40% and are caused by plantar heel discomfort or plantar fasciitis, which can afflict both athletes and non-athletes.²⁻⁴ The most frequent aberrant site in people with plantar fasciitis is thought to be the central band which is the origin of plantar aponeurosis. It is unclear how exactly plantar heel discomfort develops. According to earlier research, plantar fasciitis can be caused by trauma, inflammation, metabolic, degenerative, or nutritional issues.⁵⁻⁶

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Stretching of calf muscles, taping of the foot, manual therapy techniques such as joint mobilization and manipulation, soft tissue mobilization near the sites of nerve entrapment, and neural mobilization techniques which are done passively, orthoses, anti-inflammatory drugs either taken orally or as an injection and night splints are just a few of the conventional treatments currently being used to treat plantar fasciitis.\textsuperscript{7,8}

Surgery is typically only considered as a last resort if conservative treatment for at least 6 months has failed.\textsuperscript{9} Pain on the heel and many other pain disorders of the musculoskeletal system is increasingly being treated with acupuncture and dry needling.\textsuperscript{10}

To treat musculoskeletal pain issues, dry needling therapy is described as a “professional treatment employing a filiform thin needle which is passed into the skin and stimulates the trigger points, connective tissues, and muscles”.\textsuperscript{11}

Decreased dorsiflexion of the ankle, increased body mass index (BMI) and weight-bearing due to employment have all been identified as major risk factors.\textsuperscript{12} Following the failure of conventional treatment, the effectiveness of dry needling therapy was evaluated on a male subject, who experienced quick pain alleviation over 2 weeks at the age of 53.\textsuperscript{13} Based on the evidence that is currently available, they found low evidence that dry needling therapy has a good effect on short-term pain intensity reduction and moderate evidence that it has a positive long-term impact on pain and pain-associated disability in patients with Plantar fasciitis when compared to other interventions.\textsuperscript{14} For the treatment of pain caused by MTrPs, the deep method of dry needling has been demonstrated to be more successful than the superficial method.\textsuperscript{15}

In the treatment of plantar fasciitis, it was discovered that ultrasound therapy was superior to radial extracorporeal shock wave therapy.\textsuperscript{16} Even though it modestly affects the ankle joint range of motion, the study found that dry needling therapy on the trigger points can be utilized as a useful other option before advancing to more invasive therapies for plantar fasciitis.\textsuperscript{17} Chronic plantar heel discomfort is linked to obesity and pronated feet, which may also be risk factors for the syndrome.\textsuperscript{18}

Plain radiography, bone scans, magnetic resonance imaging (MRI), and ultrasound are imaging methods that can be used for this. With MRI and ultrasound, the Plantar fascia can be directly imaged. These techniques have shown that people with plantar fasciitis have thicker plantar fascia than those without plantar fasciitis.\textsuperscript{19}

**Aim**

To determine the effect of Dry needling therapy on subjects with Plantar fasciitis in reducing pain and increasing Ankle ROM when compared to Ultrasound therapy with ankle exercises.

**Materials and Methods**

It was an experimental study design with a convenient sampling technique. The 50 subjects were allocated randomly into two groups where the experimental group received Dry needling with ankle exercises and the control group received Ultrasound therapy with ankle exercises based on inclusion and exclusion criteria. The entire process was performed from November 2022 to April 2023.

**Inclusion criteria:**

- Age between 25 and 65 years.
- Females > Males.
- Windlass test positive.
- Known Plantar fasciitis cases.
- Clinical symptoms such as morning first-step pain.
- Pain more than 3 but not less than 8 in NPRS.

**Exclusion criteria:**

- Any ankle surgeries.
- Pain more than 8 in NPRS.
- Dermatological diseases in the area of dry needling.
- Known peripheral vascular diseases.

**Outcome measure:**

Pre-assessment was taken two weeks before intervention and Post assessment was taken two weeks after intervention.

- Numeric Pain Rating Scale (NPRS)
- Ankle Range Of Motion (ROM)
Procedure

The 50 subjects were allocated randomly by using a randomization method (computer-generated random numbers). All the subjects were described relating to the study. The consent form was signed by the patient before the treatment.

Experimental Group (n=25): Dry needling therapy with ankle exercises.

In this procedure, 25 subjects received Dry needling therapy with ankle exercises. Myofascial trigger points were activated by dry needling. The subjects were comfortably lying in a prone position during the procedure. After inserting the needle, it was partially pulled back and then pushed forward repeatedly to elicit the desired reaction. This method is known as the Fanning method. The needle was left in the muscle for as long as necessary to produce the desired reaction for a few seconds and as long as the participant could tolerate it. The desired reaction was determined by observing muscle twitching, and the movements of the needle were repeated until the twitching stopped. Once the twitching ceased, the needle was left in place for five minutes. Needle length: 30 mm to 50 mm. Needle diameter: 0.6 mm. Targeted muscle: Gastrocnemius and Achilles tendon. Duration: 2 sessions per week for two weeks.

Control group (n=25): Ultrasound therapy with ankle exercises.

In this procedure, 25 subjects received Ultrasound therapy with ankle exercises. The subjects were instructed to lie in a prone position on the couch or table. The treatment was provided in longitudinal strokes using a direct contact method throughout the plantar fascia. During the application, a gel was used for the transmission of ultrasonic waves between the transducer and the subject’s skin. The treatment was given for 8 minutes. Frequency: 3 MHz. Duration: 5 sessions per week for two weeks. Mode: Pulsed mode.

Ankle Exercise Program:

This program was prescribed for all the subjects. They were prescribed to do the exercises for 2 weeks 20 times per day in the morning sessions and evening sessions each by counting up to 30.

1. Standing calf stretch exercise:

The subjects were asked to Stand by holding onto a wall with their arms placed in an extension position and their toes facing forward. The subjects were asked to extend their right leg backward and to keep their right foot flat on the floor. Then the subjects were asked to tilt forward and slowly bend their left knee until they felt the stretch in the right calf muscle. The subjects were asked to hold the stretch. This procedure was repeated on the left leg.

2. Towel stretch exercise:

The subjects were asked to Sit on the floor with their legs out in front of them. They were instructed to wrap the towel around the ball of their foot just below their toes. They were asked to Gently pull on the towel, allowing their feet to slowly bend up toward their knee while keeping their knee straight. The subjects felt the stretch behind their heel or their knee. They were instructed to Hold the stretched position and were repeated on the other leg.

3. Plantar fascia stretch exercise:

The subjects were asked to sit on a chair or table as per their comfort and asked to place their painful foot on the thigh of their other leg. Subject’s one hand supported the heel and the other was placed on the toes. They were asked to pull the toes of the painful foot toward their shin bone with their hand until they felt a stretch. They were instructed to Hold the stretched position and were repeated on the other leg.

Data Analysis

Graph-1: Comparison of pre and post-test values for Dry needling therapy with ankle exercises.
Result

The paired t-test was used for Dry needling therapy with ankle exercises. The mean value of the pre-test was 7 and the post-test was 2.68 using NPRS. Meanwhile, Dorsiflexion’s pre-test and post-test mean values were 12.04 and 18.48 respectively. Also, the mean value of the pre-test was 24.72 and the post-test was 42.36 for plantar flexion. As a result, the findings were statistically significant with a p-value <0.0001 (graph 1).

The paired t-test was used to test within the group of Ultrasound therapy with ankle exercises. The mean value of the pre-test was 7.04 and the post-test was 4 using NPRS. Meanwhile, Dorsiflexion’s pre-test and post-test mean values were 11.88 and 17.96 respectively. Also, the mean value of the pre-test was 24.68 and the post-test was 41.84 for plantar flexion. As a result, the findings were statistically significant with a p-value <0.0001 (graph 2).

The Unpaired t-test was used to test post-test values of Dry needling therapy with ankle exercises and Ultrasound therapy with ankle exercises which revealed that the mean value was 2.68 using NPRS, 18.48 for Dorsiflexion and 42.36 for plantar flexion.
flexion in Dry needling therapy group whereas the mean value was 4 using NPRS, 17.96 for Dorsiflexion and 41.84 for plantar flexion in Ultrasound therapy group. As a result, the findings were statistically significant with the p-value less than <0.0001 (graph 3).

The statistical analysis revealed a statistically significant difference in values between Dry needling therapy and Ultrasound therapy with ankle exercises.

This revealed that Dry needling therapy with ankle exercises produced better functional results in reducing pain when compared to Ultrasound therapy with ankle exercises.

**Discussion**

Luis Llurda-Almuzara, et.al, suggested that in comparison to other interventions, this systematic review and meta-analysis discovered weak evidence that dry needling improves long-term pain and pain-related disability, but substantial evidence that it improves short-term pain intensity.\(^{14}\) In a 2010 study, they found that for the treatment of pain related to the Myofascial trigger point, the deep form of dry needling is more successful than the superficial one.\(^{15}\) According to Bihter Akinoglu, et.al, the sense of ankle proprioception in subjects with Plantar fasciitis can only be improved with a combination of radial extracorporeal shock wave therapy and exercise therapy; ultrasound therapy alone and exercise therapy alone were both ineffective in this regard.\(^{16}\)

The study which was conducted in 2016, concluded that despite having no impact on the range of motion of the ankle joint, trigger point dry needling can be an effective alternative treatment for plantar fasciitis since it reduces the degree of heel discomfort.\(^{17}\) According to Elizabeth A. Tough, et.al, there is insufficient evidence that, when compared to normal therapy, dry needling directly into myofascial trigger points has a general therapeutic impact.\(^{20}\)

One of the studies demonstrated that a home-based stretching exercise program was successful for patients with plantar fasciitis in terms of lowering discomfort, improving function, and increasing the strength of both extrinsic and intrinsic foot muscles.\(^{21}\) According to Renata Graciele Zanon, et.al, exercises that stretch the fascia and posterior musculature of the leg are effective for easing plantar pain and restoring function in those with persistent plantar fasciitis.\(^{22}\)

**Conclusion**

In conclusion, the study revealed that both Dry needling therapy and Ultrasound therapy affects reducing pain for Plantar fasciitis. Dry needling therapy appears to be more beneficial than Ultrasound therapy in reducing pain and increasing the range of motion at the ankle joint in subjects with Plantar Fasciitis.

**Ethical clearance:** Taken from the institutional ethical committee. ISRB number-03/ 013/ 2022/ ISRB/ SR/ SCPT.

**Funding:** Self

**Conflict of interest:** Nil.

**References**


