Effectiveness of Percutaneous Electrical Nerve Stimulation Versus Conventional Therapy in Adults with Plantar Fasciitis

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Abstract

**Background:** Plantar Fasciitis is a degenerative condition of the heel. Percutaneous electrical nerve stimulation and conventional therapy was used as intervention treatment for heel pain.

**Purpose:** The Purpose of this was to compare the efficacy of Pens and Conventional therapy in management of plantar fasciitis.

**Materials and Methods:** The experimental and control groups included 30 young males and females who were randomly assigned to each group. The experimental group patients underwent Pens and conventional group underwent ultrasound treatment, plantar stretch, and exercise. Before and after four -week sessions of therapy each participant was asked to score their morning pace using a numerical rating scale and functional foot index as outcome measures.

**Result:** The experimental group showed a substantial difference compared to the conventional group (p <0.0001), indicating a statistically significant outcome. When comparing both groups there was a statistically significant difference after intervention.

**Conclusion:** Patients treated for heel pain reacted well to the conventional strategy used in this study, but Pens followed by active stretching dramatically reduced pain severity and improved the quality of foot function.

**Keywords:** Pens, Dry needle (DN), Plantar fasciitis (PF), Foot function index (FFI), Numerical pain rating scale (NPRS).

Introduction

Plantar fasciitis is identified as a degenerative disorder by its pathogenesis. Plantar fasciitis-related heel discomfort is characterised by pain and a heel spur. Plantar fasciitis typically affects young individuals and athletes. It is distinguished by the lack of inflammatory cells. The chronic, continual stretching of the plantar fascia, which results in chronic deterioration and pain while at rest, is the pathophysiology of inflammation1.

Degenerative processes cause the plantar fascia’s root, which surrounds the perifascial components, to become inflammatory. The plantar fascia is made up of the calcaneus, which also serves as the...
proper biomechanics for the foot. The explanation is multifaceted, but due to several factors, overuse stress is the most likely culprit. The discomfort is concentrated in the heel. 10% of the population experiences plantar heel discomfort, and the patients tend to be active, working people between the ages of 25 and 65.

Some academic studies’ prevalence rates indicate that as many as 22% of people are runners. The patient frequently reports medial and inferior heel discomfort that has worsened over time describes severe morning pain as being intense and getting worse with the first few steps out of bed. Percutaneous electrical nerve stimulation is the term used to describe electrical stimulation with dry needling. “Skilled intervention using a thin filiform needle to penetrate the skin that stimulates myofascial trigger point musculature and connective tissue for the management of neuromuscular disorders’ defined by American Physical Therapy Association of dry needling. Regional twitch reaction, the most common type of trigger point needling is fast-in, fast-out needling. A taut band contracts quickly and abruptly in response to a local twitch. The spinal cord is where this reflex begins, and it is linked to the broken motor endplate.

Regardless of the type of Pens therapy used for treatment, the dry needle should be seen as an extension of the clinician’s finger. The subjects were asked to list any negative side effects they had experienced throughout the clinical trial. Any symptom that the patient found disturbing and required further care was regarded as an undesirable event if it persisted for more than a week. Invasive interventional groups getting percutaneous electrical nerve stimulation have received special attention. Traditional management of PF is proper stretching to the plantar fascia. Constant stretching of plantar fascia causes chronic degeneration which causes pain while resting.

### Aim

To compare the effects of percutaneous electrical nerve stimulation and conventional therapy in treatment of plantar fasciitis based upon NPRS and FFI outcome scale used for evaluating pain and foot mobility.

### Material and Methods

30 patients were included in this study conducted at Saveetha medical college and hospital, SIMATS Chennai. Both gender patients were included. Initial examination was performed by an experienced physiotherapist. Patients were provided with a consent form with assurance of treatment. This study was done from April 2023 till May 2023 with random sample technique.

#### Inclusion criteria:
- Age group 25-40 years.
- Trigger point present in the calf muscle.
- Unilateral symptomatic heel pain.
- Severe heel pain in the morning.
- Heel spur.
- Sedentary working with a high sitting position.
- Prolonged standing.
- Patient actively willing for treatment.

#### Exclusion criteria:
- Hypersensitivity to needles.
- Needle phobia.
- Presence of coagulopathy.
- Dermatological disease in foot.
- H/o recent fracture and surgery.
- Peripheral arterial disease.
- Systemic inflammatory disorder.

### Outcome Measure

As a primary outcome NPRS is a valid and accurate tool for determining the pain intensity. At baseline one week after the start of treatment and later it was measured four weeks after intervention. Patients were asked to rate the average intensity of pain in the morning using a 10-point scale ranging from 0 (No pain) to 10 (worst pain). In comparison to visual analogue scale, NPRS has higher rate and better responsiveness, more convenient to use and enables fewer challenges.

Secondary outcome includes the foot function index (FFI) which was collected at baseline 1st week and 4th week. To assess indicates lower level of function and worse quality of life connected to foot mobility.
The subscale ranged from 0% to 100% and an average of three subscale scores was used to divide the overall score to bring out the effects of the study procedures.

**Procedures**

**Conventional group** Conventional received the therapeutic effects of ultrasound for 15 minutes. Adductor hallucis, Quadratus plantae, Gastrocnemius and Soleus muscle stretching for 8 sec hold and relax. Patients received treatment twice a week for a total of four weeks.

**Experimental group** Patient was evaluated for joint flexibility and palpate at the calf muscles for taut band. Specific invasive intervention was carried out with patients. Pens included the Tens modality and dry needle of 0.25-0.35 mm range was used based on patient requirement for treatment. Pens were given for 15 minutes followed by active or passive stretching at the calf muscle and home advice for ice packs is followed by soreness at the treatment area. Treatment was carried twice weekly for a total of four weeks.

**Data Analysis**

**Graph 1: Group A & Group B Paired T-test**

**Graph 2: Group A & Group B Paired T-test**

**Result**

The acquired data were tabulated and analysed using descriptive and inferential statistics. Mean and standard deviation were applied to all parameters. A paired t-test was used to check for significant differences between pre and post measurement. An unpaired t-test was used to compare the performance between the groups. While the analysis cut-off was the significance level chosen as alpha p < 0.0001. The pre-and post-test scores of the Experimental group and the Conventional group are being compared using the Foot Function Index and Numerical pain rating scale.

In this study the data indicates that there is a statistically significant difference between the Conventional group and the Experimental group both before and after the intervention.

Based on this data analysis, it appears that the Experimental group B had a lower mean value in the outcome measure compared to the Conventional group A, and this difference is statistically significant.
Discussion

The effectiveness of PENS is much higher than that of the traditional therapies. Physical activity of the heel, such as stretching and strengthening exercises, the therapeutic effects of ultrasound, cryotherapy, and electrical stimulation have been utilized to improve induced pain and prevent difficulty. To normalise heel pain, appropriate footwear with an insole cushion is utilized. This short-term study advances our knowledge and helps us to understand the short-term effectiveness of PENS versus standard therapy in patients with PF.

James Dunning et al. examined the efficacy of electrical dry needling in combination with manual therapy, exercise, and ultrasonography in heel pain. The difference in effect size for the primary outcome of morning discomfort was medium at four weeks. Furthermore, the FFI disability scale measures the quality of life of individuals with feet. Finally, the study suggests PF patients are significant.

According to Butts et al., several studies have shown that focusing on trigger points can reduce pain and disability. There are no well-designed long-term studies that support the use of the in-and-out needle technique. The literature on myofascial pain syndrome supports the placement of needles in asymptomatic locations close to and far from the primary source, which causes pain. Hertz et al. reported fasciitis affects both male and female athletes and sedentary people alike. The identification of the main causes is complicated. The most frequent cause of heel pain is lower extremity radiculopathy. This leads to severe pain that causes significant disability and affects daily life.

Ibon et al. conducted a systematic review on Percutaneous electrical nerve stimulation in neuromusculoskeletal injuries to restore the functional activities of daily living. After evaluation the study showed a subjective improvement in plantar fascia disability and decreased pain modulatory system based on myofascial pain.

According to Lara-Paloma et al.’s trials, physiotherapists with dry needling and electrical dry needling have demonstrated positive effects on persistent low back pain. Therefore, more studies are needed to assess the treatment components of physical therapists. A study compared a control group that received sham treatment for plantar fasciitis to a group that underwent dry needling with electrical stimulation. Comparing the active treatment group to the sham group, the study indicated that the active treatment group had much less pain and better foot function. The limitations of this study include its small sample size and absence of long-term follow-up. Attention has been paid to dry needling combined with electrical stimulation as a potential treatment for plantar fasciitis. By adding more sensory stimulation, electrical stimulation was thought to enhance the benefits of dry needling. The idea behind using dry needling along with electrical stimulation to treat plantar fasciitis is to reduce discomfort. Data currently available on the application of plantar fasciitis were examined in a systematic review published in 2019.

According to a review, combination therapy may help individuals with plantar fasciitis experience temporary pain relief and enhance functional outcomes. The authors pointed out that the review papers were generally of low quality and that further rigorous studies are required to support these conclusions. It is important to remember that dry needling with electrical stimulation carries potential hazards and adverse effects like any medical intervention. Temporary pain at the sites of needle insertion, bruising, and in extremely rare circumstances, infection or nerve injury are some of these. As a result, it is essential to guarantee that the treatment is carried out by a qualified and licensed healthcare practitioner who adheres to the necessary safety procedures. It is recommended to consult a qualified healthcare professional, such as a physiotherapist or sports medicine specialist, who is experienced in performing dry needling techniques, as evidence supporting the use of dry needling with electrical stimulation for plantar fasciitis is still developing.

In order to evaluate pain and functional impairment in patients with plantar fasciitis, NPRS and FFI were used as outcome measures in clinical practice and research. NPRS provides a straightforward and easy-to-administer assessment of pain intensity, which allows clinicians and researchers to quantify pain levels and track changes.
over time. NPRS provides a straightforward and easy-to-administer assessment of pain intensity, allowing clinicians and researchers to quantify pain levels and track changes over time.\(^{20}\)

FFI provides a more thorough assessment of foot function and its effect on daily activities. In addition to discomfort, it evaluates various functional impairments such as difficulties in walking or climbing stairs.\(^{18}\) The patient’s condition and the impact of plantar fasciitis on total foot function are better understood through this comprehensive approach. Both have been utilized in several research projects to investigate treatment options for plantar fasciitis. These measurements have proven sensitive to changes in pain and function following a range of treatments such as physical therapy, orthotics, corticosteroid injections, and surgical procedures.\(^ {21}\) The NPRS and FFI are useful instruments for evaluating pain and functional impairment in patients with plantar fasciitis. While the NPRS offers a straightforward and consistent way to gauge pain severity, the FFI offers a more thorough assessment of foot function and its effect on daily activities. Both metrics have been frequently used to assess treatment outcomes and direct patient care in research studies and clinical practice.\(^ {22}\)

**Conclusion**

This study concluded that patients with plantar fasciitis who received percutaneous electrical nerve stimulation improved significantly compared with those who received conventional therapy in terms of morning heel pain, foot health quality, and risk factors for heel pain. Additional research with a long-term follow-up should be conducted to increase the therapeutic effects of Pens in musculoskeletal conditions. Pens appears to be a promising therapeutic option for plantar fasciitis, further investigation is required to determine its optimal long-term efficacy.

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