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Research Article

The Effectiveness of Dry Needling with Adjuvant Therapy for the Management of Plantar Fasciitis: A Systematic Review of Randomized Controlled Trials

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Abstract

Introduction: Plantar fasciitis (PF), also known as planter heel pain (PHP), is a common cause of heel pain that negatively affects mobility and quality of life. Dry needling (DN) has emerged as a potential conservative treatment option, either alone or in combination with other therapies. This systematic review evaluates the effectiveness of DN with adjuvant therapies in improving pain and function in individuals with PF.

Methods: A systematic review of randomized controlled trials (RCTs) investigating DN for PF was conducted. Studies comparing DN alone with combined were included. Outcomes such as pain intensity, functional improvement, plantar fascia thickness, and echogenicity were assessed.

Results: The findings suggest that DN significantly reduces first-step pain, overall pain levels, and disability scores. DN, when combined with stretching exercises, extracorporeal shock wave therapy (ESWT), or manual therapy, demonstrated superior outcomes compared to individual treatments. Reductions in plantar fascia thickness and improvements in echogenicity were also reported. Minor adverse effects, including transient pain, soreness, and mild bruising, were observed.

Conclusion: Adjuvant therapies with DN appear to be an effective intervention for PF, providing pain relief and functional improvement. However, variability in study protocols and follow-up durations suggests the need for further high-quality research with standardized methodologies and long-term outcome assessments. The combined therapies remain a promising treatment option that warrant further clinical exploration.

Keywords: Plantar Fasciitis; Dry Needling; Pain Management; Functional Improvement; Extracorporeal Shock Wave Therapy; Manual Therapy; Rehabilitation; Randomized Controlled Trial

Introduction

Plantar fasciitis is inflammation in the plantar fascia [1]. The degenerative irritation of the plantar fascia origin at the medial calcaneal tuberosity of the heel and its accompanying perifascial tissues causes plantar fasciitis, a common and frequently frustrating ailment. The three segments of the plantar fascia, which emerge from the calcaneus, are crucial for preserving the foot's natural biomechanics, supporting the arch, and acting as a shock absorber. Despite its name, this illness is characterised by a lack of inflammatory cells [2]. Planter fasciitis or fasciopathy, also known as planter heel pain (PHP), causes an estimated 11–15% of all foot symptoms in adults that require professional care [3]. In addition to being common in middle-aged (40–60 years) ladies who are overweight, plantar heel discomfort also affects persons who are very physically active, such as runners [4-6]. Studies on the prevalence of PHP in particular athletic and occupational groups, such runners and soldiers, have shown mixed results (2.7–17.5%) [4,7-10].

PHP is thought to have a good clinical outcome since, within 12 to 24 months of diagnosis, 60 to 80% of patients' report that their problems have subsided. [11, 12]. However, because their heel discomfort makes their daily and athletic activities more difficult, people with PHP frequently report having a terrible quality of life [13]. The most often recommended therapies are cortisone injections, orthoses, anti-inflammatory drugs, footwear and activity modification, taping, stretching exercises, and extracorporeal shock wave therapy (ESWT) [12,14,15]. Multiple treatments are frequently used during the course due to patient complaints, even if the clinical course is generally positive [12,15].

The American Physical Therapy Association (APTA) defines dry needling as a skilled intervention that uses a thin filiform needle to penetrate the skin and stimulate underlying myofascial trigger points, muscular, and connective tissues to manage neuromusculoskeletal pain and movement impairments [16]. Trigger points (TrPs) are

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hyperirritable spots in taut bands of skeletal muscle that hurt when the tissue is compressed, stretched, overloaded, or contracted. Usually, the tissue reacts by producing referred pain that is felt far away from the site [17,18].

Acupuncture and dry needling are less invasive alternatives that activate myofascial trigger points (MTPs) [19,20,21]. It has been demonstrated that dry needling changes the metabolic milieu around an MTP and lowers spontaneous electrical activity in the skeletal muscle MTP area [22,23]. This approach is one of the most popular and has few adverse effects for treating chronic pain. There are a few published research [24-27] with some methodological constraints that assess the effectiveness of trigger point needling in treating plantar heel pain. Furthermore, according to current reporting standards [28], one of the studies is a case report, and the other studies lack scientific rigour for both study design and outcome measurement. We came to the conclusion that more research is required to determine whether dry needling is effective for heel pain.

This study was conducted to examine the effects of dry needling alone and in combination with other treatment options in patients with chronic heel pain due to the plantar fasciitis.

Methods

A primary literature search was conducted using PubMed, Google Scholar, Embase, Scopus, Cochrane Library, PsycINFO and Web of Science. The search terms used were "[Dry needling], [Planter fasciitis], [Planter heel pain], [Dry needling monotherapy], [Dry needling combination therapy], [Acupuncture]". Only randomized control trials judging the efficacy of dry needling alone or in combination with other therapies were included. Inclusion criteria were studies involving at least one treatment group with dry needling and a combined other intervention, inclusion of results regarding efficacy of the combination therapy, and the use of in vivo treatment only. Excluded studies included those that were not written in English, involved treatment with dry needling only, and those that addressed only the mechanism of dry needling. Included studies were graded using the Oxford Center for Evidence-Based Medicine 2011 Levels of Evidence.

Results

12 articles were found using the methodology outlined above. Of these, 8 records were identified by title, and further narrowed to four records after inclusion criteria were applied and duplicates were removed. Of these, three were published in the last five years, while one was published in the last 10 years. All of them were randomized control trials. All of the studies use a combination of dry needling plus other interventions, with differences in the application of the other intervention. A total of 278 human subjects were studied (Figure 1).

Assessing the Efficacy of Dry Needling Combined with Other Interventions

Our first study was conducted by Dunning et al. in October 2018. It was a multi-center randomized clinical trial that investigated the effectiveness of adding electrical dry needling to a standard treatment regimen of manual therapy, exercise, and ultrasound for plantar fasciitis. A total of 111 participants were randomized into two groups: one receiving electrical dry needling alongside the standard treatment

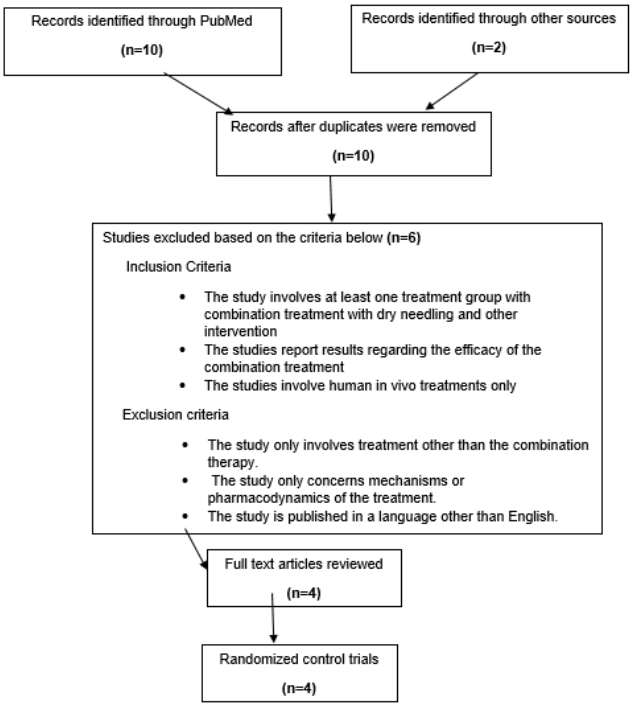

Figure 1: Selecting clinically relevant articles regarding combination therapy with dry needling and other interventions.

(n = 58) and the other receiving only the standard treatment (n = 53). Both groups underwent six treatment sessions over four weeks, with assessments at baseline, 1 week, 4 weeks, and 3 months. The results showed that the dry needling group experienced significantly greater improvements in first-step morning pain, resting foot pain, pain during activity, functional outcomes (LEFS, FFI pain, and disability subscales), and medication reduction at the 3-month follow-up. Additionally, 78% of participants in the dry needling group reported a successful outcome (GROC ≥ +5) compared to only 21% in the standard treatment group. These findings suggest that electrical dry needling, when combined with manual therapy, exercise, and ultrasound, leads to superior mid-term pain relief and functional improvement in individuals with plantar fasciitis.

The study conducted by Bagcier et al. between July and August of 2020 evaluated the effectiveness of combining extracorporeal shock wave therapy (ESWT) and dry needling (DN) for treating plantar fasciitis. Forty patients were randomly assigned to either an ESWT-DN group, which received both treatments, or an ESWT-only group. Pain was assessed using a visual analog scale (VAS), and functionality was measured with the Foot Function Index (FFI), pressure pain threshold, maximum painless standing time, and walking distance. Both groups showed significant improvements in all measures after one month ($p \leq .001$). However, the ESWT-DN group demonstrated superior outcomes in pain reduction (VAS), maximum painless standing time ($p = .002$), walking distance ($p \leq .001$), and FFI pain scores ($p = .034$). No significant differences were observed between the groups in pressure pain threshold ($p = .132$), FFI disability ($p = .081$), or activity limitation ($p = .226$). The study suggests that combining ESWT with DN may be more effective for pain relief in plantar fasciitis, but further research with larger sample sizes and long-term follow-up is needed (Table 1).

Table 1: Summarizing the results of the studies.

Study	Study design	Sample size	Intervention	Placebo/comparison group	Outcome measures	Duration of treatment	Key findings	Adverse effects
Dunning et al. [29]	RCT	111	electrical dry needling, manual therapy, exercise and ultrasound (n = 58)	Manual therapy, exercise and ultrasound (n = 53).	The primary outcome was first-step pain in the morning as measured by the Numeric Pain Rating Scale (NPRS). Secondary outcomes included resting foot pain (NPRS), pain during activity (NPRS), the Lower Extremity Functional Scale (LEFS), the Foot Functional Index (FFI), medication intake, and the Global Rating of Change (GROC).	The treatment period was 4 weeks with follow-up assessments at 1 week, 4 weeks, and 3 months after the first treatment session	Electrical dry needling combined with manual therapy, exercise, and ultrasound significantly improved pain, function, and disability in plantar fasciitis patients compared to therapy without dry needling.	Post-needling soreness and transient pain at the treatment site.
Bagcier et al. [30]	RCT	40	DN + ESWT	ESWT Alone	VAS pain, Pressure Algometer, Foot Function Index, Maximum Painless Standing/Walking	Assessments were repeated twice; first, pretreatment and second 1 month after the treatment.	DN + ESWT showed greater pain reduction and function improvement than ESWT alone	Local discomfort, transient bruising
Wheeler at al. [31]	RCT	90	Autologous Blood Injection (ABI) vs DN	Sham DN	VAS pain, Foot Function Index, EQ-5D-5L, Oswestry Disability Index	Followed up at 2, 6, 12, and 26 weeks.	No significant differences between ABI and DN, both improved pain by 50% at 6 months	Mild pain at injection site
Salehi et al. [32]	RCT	37 participants (40 feet)	DN + Stretching Exercises (6 weeks)	Stretching Exercises (6 weeks)	First-step pain, FAOS pain and ADL subscales, plantar fascia thickness, echogenicity	interventions lasted six weeks and both groups were followed for two weeks	Significant improvement in first-step pain, pain, and ADL subscales; Decreased plantar fascia thickness and increased echogenicity in DN group	Transient pain, soreness, mild bruising

Our next study was conducted by Wheeler et al. in May of 2022. This double-blinded randomized controlled trial investigated whether autologous blood injection (ABI) provided additional benefits over dry-needle fenestration alone for chronic plantar fasciitis. Ninety patients (mean age 49.5 years, 67% female) with symptoms lasting at least eight months were randomized to receive either ABI or an identical dry-needling procedure without blood injection. Both groups underwent a structured rehabilitation program and were assessed at 2, 6, 12, and 26 weeks. Results showed no significant differences between the two groups at any time point. However, both groups experienced significant within-group improvements in local foot pain and function, with pain levels decreasing by 25% at six weeks and 50% at six months. While some markers of general function improved, physical activity levels remained unchanged, indicating that pain reduction did not necessarily lead to increased activity. Overall, the study concluded that ABI provided no additional benefit over dry needling alone for patients with chronic plantar fasciitis.

Salehi et al conducted our last Randomized control trial in March of 2023. This randomized controlled trial investigated the effects of adding dry needling to a stretching exercise program for plantar fasciitis. A total of 37 participants (40 feet) completed the intervention, with no significant baseline differences between the two groups. The results showed that both groups experienced significant improvements in first-step pain, overall pain, and activities of daily living (ADL) function (FAOS questionnaire) following treatment and at follow-up. However, the experimental group (dry needling + stretching) showed significantly greater improvements than the control group (stretching alone), with effect sizes exceeding 0.8, indicating high efficacy.

Between-group analyses demonstrated that the experimental group had significantly reduced plantar fascia thickness at insertion and increased echogenicity in two regions of interest (ROI1 and ROI2) compared to the control group. However, no significant differences were found in plantar fascia thickness at 1 cm and 3 cm from insertion. Within-group analysis further confirmed that the experimental group experienced greater improvements, with reductions of 71% in first-step pain, 78% in pain scores, and 43% in ADL function scores, compared to 45%, 25%, and 15% in the control group, respectively. While the control group showed no significant changes in plantar fascia thickness or echogenicity in ROI1, the experimental group demonstrated significant improvements in all key measures. These findings suggest that combining dry needling with stretching exercises is a highly effective conservative treatment for plantar fasciitis, yielding superior pain relief and functional benefits compared to stretching alone.

Discussion

Research on the combined effectiveness of dry needling with other interventions in the treatment of planter fasciitis is still in its early stages and is restricted to a few prospective studies, randomized-

controlled trials, and retrospective reviews of medical records. Overall findings from research examining the safety and effectiveness in planter fasciitis indicate encouraging outcomes and non-inferiority when compared to monotherapy.

Across the reviewed studies, dry needling (DN) for plantar fasciitis was generally safe, with only minor and transient side effects reported. The most common adverse effect was localized pain and discomfort at the needle insertion site, which typically lasted between one to three days. Some patients experienced mild aching or soreness post-treatment, and a few reported a temporary increase in pain before improvement. Bruising and minimal bleeding were also observed, particularly in individuals with sensitive skin or clotting tendencies. Temporary swelling and inflammation in the treated area were noted but usually resolved within 48 hours. A small number of participants experienced mild dizziness or lightheadedness after the procedure, and occasional fatigue was reported. Rare side effects included temporary numbness or tingling in the foot and mild headaches. Despite these minor adverse effects, there were no reports of serious complications such as infections, nerve damage, or long-term pain. Overall, DN was well-tolerated, with side effects being self-limiting and resolving within a short period.

These findings suggest that dry needling (DN) is an effective intervention for reducing pain and improving function in patients with plantar fasciitis (PF), either as a standalone treatment or in combination with other modalities such as extracorporeal shock wave therapy (ESWT), stretching exercises, manual therapy, and ultrasound therapy. Several studies reported statistically significant improvements in first-step pain, overall pain levels, and functional outcomes, with some highlighting the superiority of DN over ESWT in specific measures like pain during activity and functional disability. Additionally, DN has been associated with physiological benefits, including a reduction in plantar fascia thickness and improved echogenicity, suggesting potential tissue remodeling effects.

Despite these promising findings, the heterogeneity of study protocols, sample sizes, follow-up durations, and treatment dosages presents challenges in generalizing the results to broader populations. Moreover, while DN has shown significant short- to mid-term benefits, there remains a lack of long-term data on its sustained efficacy and potential recurrence rates. Future research should focus on large-scale, high-quality randomized controlled trials with standardized treatment protocols, longer follow-up periods, and direct comparisons between DN and other widely used conservative interventions. Furthermore, assessing the cost-effectiveness of DN in comparison to alternative treatments would provide valuable insights for clinical decision-making. Despite these limitations, DN remains a promising therapeutic option for PF, demonstrating notable benefits in pain reduction, functional improvement, and potential tissue healing, warranting further investigation and broader clinical application.

Conclusion

This systematic review suggests that DN is an effective and safe treatment for plantar fasciitis, demonstrating significant improvements in pain relief, function, and plantar fascia thickness. DN alone or in combination with ESWT and stretching exercises may offer superior outcomes compared to single interventions. While further high-quality research is required to refine treatment protocols and confirm long-term effectiveness, DN represents a promising therapeutic option for clinicians managing plantar fasciitis. Its non-invasive nature and favorable safety profile make it a compelling choice for patients seeking conservative management strategies.

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