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Original Research Article

Dry Needling Versus Steroid Injections in Plantar Fascitis: A Meta-analysis

Lal Bahadur Prasad[1], Vasudha Gupta[2], D P Bhushan[3]

[1]Senior Resident, Department of Orthopedics, SNMMCH, Dhanbad
[2]FIPM, Department of Anaesthesia, AIIMS New Delhi
[3]Head of Department, Department of Orthopedics, SNMMCH, Dhanbad

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Corresponding Author: Dr. Vasudha Gupta
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Abstract:

Introduction: Plantar fasciitis is a prevalent condition causing heel pain in adults, particularly affecting individuals in the age group of 40-60 years, and stands as a significant contributor to occupational impairment. Treatment options can be broadly categorized into non-invasive and invasive modalities. Invasive modalities, such as local injections and surgical interventions, are recommended for individuals who do not respond to non-invasive conservative treatments. Local Steroid Injection (LSI) is the prevalent invasive treatment method, while Dry Needling (DN) has emerged as a novel treatment modality more recently.

Aim: The aim of this systematic review is to critically analyze the literature to find the effect of dry needling when compared with corticosteroid injection in treating Plantar Fascitis.

Method: This systematic review was directed according to "Preferred Reporting Items for Systematic Reviews and Meta-analysis"

Guidelines: The principal research question that was studied "Is dry needling better than corticosteroid injections in treating plantar fascitis?" Various different electronic databases were used to search relevant articles using different keywords. Articles were collected altogether and selected on the basis of eligibility criteria. The closing sets of articles were selected after complete screening.

Result: Both dry needling and corticosteroid injections are effective in treating tendinopathy for both short term whereas dry needling is more significantly effective in long-term use.

Conclusion: Dry needling is superior to corticosteroid injection in treating plantar fascitis.

Keywords: Dry needling, corticosteroid injection, plantar fascitis, VAS.

Introduction

Corticosteroid injections (CSI) are commonly employed to manage plantar fascitis, aiming to alleviate inflammation, pain, and disability [1]. These exogenous drugs emulate the actions of endogenous steroid hormones, participating in essential physiological processes like metabolic regulation, skeletal growth, and immune function [2].

The anti-inflammatory effects of corticosteroids are thought to result from the suppression of pro-inflammatory cytokines and genes [2]. Given the association between inflammation and pain mechanisms, corticosteroid injections play a valuable role in pain reduction and subsequent disability management.

Despite some studies reporting positive outcomes of corticosteroid injections for plantar fascitis, others have found no significant improvements compared to placebo injections [3–5]. Moreover, corticosteroid injections can lead to adverse effects [6, 7]. Research indicates that local inflammation may increase up to three days after corticosteroid application, along with issues like adrenal suppression and cartilage damage [6]. In a randomized clinical trial (RCT), it was observed that intra-articular corticosteroid injections resulted in cartilage loss without providing pain relief at the two-year follow-up [7]. These findings underscore the importance of exercising caution when considering the use of corticosteroid injections.

An alternative to utilizing corticosteroid injections is dry needling (DN), a procedure involving needling stimulation without the use of drugs. This technique can be applied to various body areas with the goal of mitigating pain and disability. While the exact mechanisms of DN are not completely understood, it is proposed that the induction of a local twitch response during dry needling may generate neural inputs to the brain, potentially interrupting the pain-spasm-pain cycle [8, 9].

Dry needling is believed to diminish nociceptive output in different tissues by enhancing blood flow, increasing fibroblastic activity, and modulating

central mechanisms [8]. A previous meta-analysis has indicated that dry needling surpasses control/sham dry needling in terms of pain and functional outcomes for individuals with musculoskeletal conditions [11]. However, the observed differences were not deemed clinically significant for pain outcomes. While the mean difference in pain scores for dry needling was 1.27 points, a clinically meaningful change on the Visual Analogue Scale (VAS) is typically considered superior to a 2-point shift [11].

In comparison to other treatments like soft tissue manual therapy interventions, dry needling demonstrated greater improvements in pain intensity and pain pressure threshold at a 12-week follow-up [11]. Despite its clinical effects, there have been reports of side effects associated with dry needling therapy. However, surveys among physiotherapists have only identified mild adverse events such as bruising, bleeding, and pain during/after treatment [12]. Symptoms like aggravation, fatigue, nausea, and numbness were uncommon, with major adverse events being extremely rare (<0.1%) [13].

The effectiveness of corticosteroid injections and dry needling in treating musculoskeletal conditions varies across different time points [3, 5, 8, 11]. Most studies have reported positive outcomes for both interventions in the short term. It has been proposed that corticosteroid injections show greater effectiveness in the short term due to the association with the short half-life of the injected corticosteroids [14]. Consequently, it is suggested that dry needling may exhibit greater effectiveness compared to corticosteroid injections in longer-term follow-up assessments. While the impact of corticosteroid injections and dry needling on pain and disability outcomes in individuals with musculoskeletal conditions is established [3, 5, 8, 11], there is a lack of previous systematic reviews summarizing and comparing the effects of these interventions at different follow-up periods.

Investigating the effects of dry needling and corticosteroid injections for musculoskeletal conditions is crucial, especially considering their routine use in primary care, despite recommendations from evidence-based clinical practice guidelines. A survey in the United States revealed that over 50% of physiotherapists incorporate dry needling into their clinical practice [15].

Additionally, a previous study found that steroid injections are the second most commonly used therapy for managing shoulder pain among Australian general practitioners [16]. Despite the widespread use of these therapies, clinical practice guidelines for musculoskeletal conditions typically do not designate dry needling or corticosteroid injections as first-line treatments [17–21]. While some guidelines recommend these interventions as adjunct treatments for specific musculoskeletal conditions like plantar fasciitis and Achilles pain, caution is advised [18, 19, 21]. Given that both corticosteroid injections and dry needling are extensively utilized, their efficacy and safety warrant careful consideration.

Methods Protocol: This systematic review adhered to the guidelines outlined in the "Preferred Reporting Items for Systematic Reviews and Meta-analysis". The primary research question addressed was, "Does dry needling offer superior outcomes compared to corticosteroid injections in the treatment of plantar fascitis?" Various medical electronic databases were systematically searched for relevant articles using distinct keywords.

The collected articles were then screened for eligibility, and duplicates were removed. The final selection of articles was made after a comprehensive screening process. In addition, a basic search strategy was employed, utilizing the following keywords: Dry needling OR Corticosteroids injection OR plantar fascitis OR fascitis OR Dry needling AND Corticosteroids injections OR Dry needling AND plantar fascitis OR Corticosteroids AND plantar fascitis.

Selection of studies and data extraction: The criteria for including studies in this review were as follows: (1) articles must be in the English language, (2) studies must fall into the category of randomized controlled trials, (3) subjects included in the studies were of any age or gender, (4) the samples discussed in the papers must have a diagnosis of plantar fasciitis, and (5) the treatments employed in the studies must involve either dry needling or corticosteroid injections. On the other hand, the exclusion criteria encompassed: (1) articles that have not been published and (2) research abstracts from meeting proceedings or theses.

Quality assessment of the study: The assessment of study quality was conducted using the PEDro scale [22]. This scale comprises 11 items, each with a binary response of "Yes" or "No." A score of "1" is assigned if the item is present in the study, and "0" if it is not. Based on the PEDro scale, studies are categorized as having "poor, fair, good, or excellent" quality. A score less than 4 indicate poor quality, a score between 4 and 5 signifies fair quality, a score between 6 and 8 suggests good quality, and a score exceeding 9 reflects excellent quality.

Result

Study selection: The selections of studies were shown in a flowchart (Fig. 1). Initially 121 articles were selected for review, which included dry needling or corticosteroid injections as their treatment protocol and any type of plantar fascitis as a condition. After the first screening, 90 articles were re-

moved due to duplication as they were taken from the references of a few selected articles. Forty-three articles were removed as they did not have interventions; after the second screening phase, that is abstract analysis, 15 were not related to physiotherapy, 22 articles used different interventions 3 articles were not related to plantar fascitis, and 3 articles were not randomized controlled trials. Based on the eligibility criteria and availability of full-text articles, 3 articles were selected.

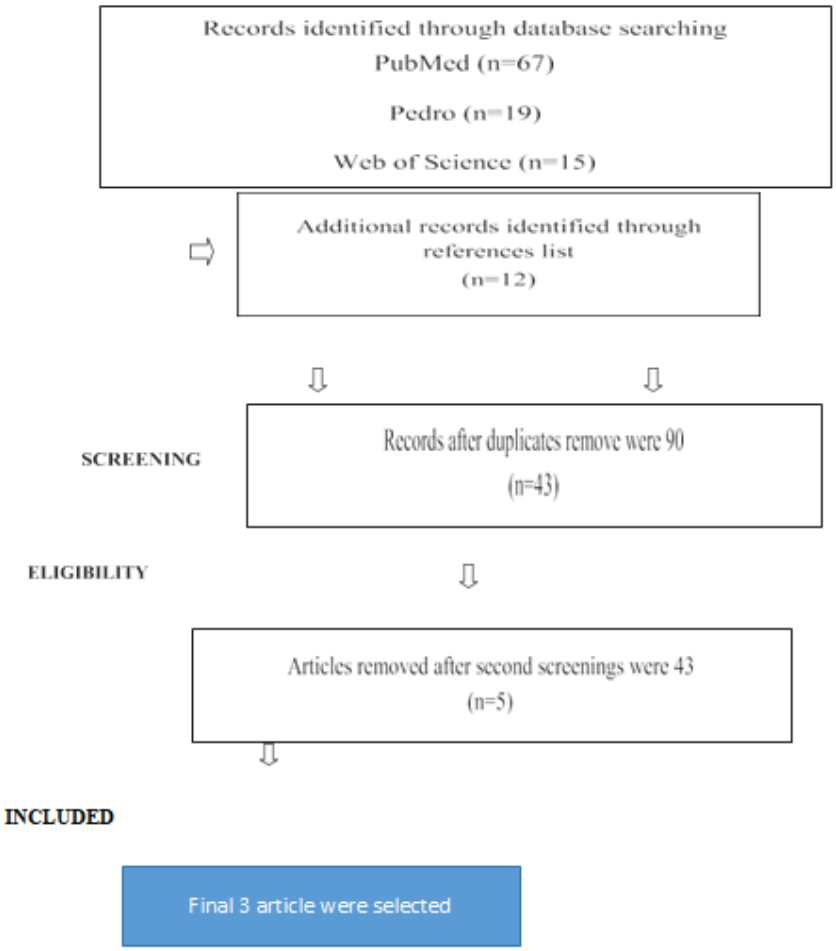

Chart 1:

Study characteristics: Table 1 outlines the characteristics of three studies focusing on patients with plantar fasciitis: Shirvan et al (2018) [23], Uygur et al (2019) [24], and Dr. Rahool et al (2022) [25]. These studies allocated subjects to either a dry needling group or a corticosteroid group, with varying sample sizes of 50, 66, and 98 patients, respectively. For plantar fasciitis, Uygur et al (2019) [24] conducted a follow-up at 3 weeks and 6 months, while Shirvan et al (2018) [23] had follow-ups at 3 weeks, 6 months, and 1 year. Dr. Rahool et al (2022) [25] conducted follow-ups at 2 weeks and 4 weeks.

Quality assessment of the study: The assessment of study quality was conducted using the PEDro Scale [22]. All three studies received high ratings, ranging between 7 and 10 out of 10, indicating a classification of "good" to "excellent" quality.

Intervention: The studies were grouped into 2 main interventions: (1) dry needling group and (2) corticosteroid group.

Dry needling: In the study by Shirvan et al (2018) [23], they employed advanced Dry Needling (DN) around the area affected by plantar fasciitis for a duration of 30 seconds. Follow-ups were conducted at 3 weeks, 6 months, and 1 year.

Uygur and colleagues (2019) [24] utilized DN on the plantar fascia around its origin at the calcaneal for a period of 10 minutes. The dry needling procedure involved 3–4 rotations in a single session, repeated twice per session over a span of 5 weeks. Follow-up assessments were carried out at 3 weeks and 6 months. In the study conducted by Dr. Rahool et al (2022) [25], the Dry Needling group, patients in a prone position, where a tender point in the plantar foot muscles was identified and marked. The skin was cleaned with povidone-iodine, and a

28-gauge needle was used for the procedure. The needle was directed through the skin and inserted into the fascia origin at the calcaneus, which is recognized as the most painful area in plantar fasciitis. The needle underwent multiple rotations and in-out movements around the area through reciprocating motions. Upon removal of the needle, the insertion site was firmly compressed to prevent bleeding

Corticosteroid injection: Patients in the studies by Shirvan et al (2018) [23], Uygur and colleagues (2019) [24], and Dr. Rahool et al (2022) [25] received a single-dose corticosteroid injection of methylprednisolone acetate at the affected site around the plantar fascia. Follow-up assessments were conducted at various intervals: 2 weeks in the study by Dr. Rahool et al (2022) [25], and at 3 weeks, 4 weeks (Dr. Rahool et al 2022) [25], 6 months (Uygur and colleagues, 2019 [24]; Shirvan et al, 2018 [23]), and 1 year (Shirvan et al, 2018[23]).

Table 1:

Study et al [26]	Udgyur et al [24]	Shirvan et al [23]	Rahool et al [25]
Eligibility criteria were specified	Yes	Yes	Yes
Subjects were randomly allotted to groups	1	1	1
Allocation was concealed	1	1	1
The groups were similar at the baseline regarding the most important prognostic indicator	1	1	1
There was blinding of all subjects	1	1	0
There was blinding of a therapist who administered the 1 therapy	1	0	0
There was blinding of all assessors who measured at least one key outcome	1	1	0
Measures of at least one key outcome were obtained from than 85% of subjects initially allocated to groups	1	1	1
All subjects for whom outcome measures were available received the treatment or control condition as allocated or where this was	1	1	1
The results of between-group statistical comparisons are reported for at least one key outcome	1	1	1
The study provides both point measures and measures of variability for at least one key outcome	1	1	1
Score	10	9	7

Outcome measures: The studies utilized various outcome measures, including the Visual Analog Scale, Numerical Pain Rating Scale, Patellofemoral Pain Syndrome, and Foot Function Index. These measures were employed to assess and compare the effects of both dry needling and corticosteroid interventions, aiming to discern any significant impacts on the outcomes.

Table 2:

Study	Year	Population	Intervention	Outcome Measures	Result
Shirvan et al [23]	2018	66 patients with plantar fasciitis were randomly divided into 2 groups: group I (corticosteroid) and group II (dry needling)	Group I patients received corticosteroid injections (single dose). Group II patients undergo advanced DN 30 s. Follow-up of patients was done at 3 wk and then repeated at 6 mo and 1 y	VAS	The corticosteroid (CS) group demonstrated a swift decrease in the Visual Analog Scale (VAS) score at 3 weeks, with a significant difference ($P < 0.0001$) compared to the Dry Needling (DN) group. However, at the 6-month and 1-year follow-ups, participants in the DN group exhibited significantly lower VAS scores ($P < 0.004$; $P < 0.001$) in comparison to the CS group. This suggests that Dry Needling yields more satisfactory and superior results, surpassing cor-

					ticosteroid treatment.
Uygur et al [24]	2019	98 participants with plantar fasciitis were randomly divided into 2 groups: dry needling (group I) and corticosteroid injection (group II)	Group 1 patients receive 15 stainless dry needles at the calcaneus around the origin of the plantar fascia. Needles were placed for 10 min and rotated 3–4 times in each session. DN was given twice a week for 5 wk. Group II: patients received a single dose of corticosteroid injection at the plantar fascia. Follow-up was done at 3 wk and then repeated after 6 mo	FFI	The DN group has shown a significant effect ($P < 0.001$) at both 3 wk and 6 mo in reducing pain, activity limitation, and disability, whereas the CS group has shown a significant effect at 3 wk but there is a reduction in effectiveness at 6 mo. Thus, the DN group shows significant and promising results when compared with the CS group
Dr. Rahool. S et al [25]	2022	Fifty patients who were clinically and radiologically (USG) confirmed to have idiopathic plantar fasciitis were enrolled in the study.	Patients were randomized and assigned into 2 groups of 25 patients each. Group I was managed by Local Steroid Injection (LSI) and Group II were managed by Dry Needling (DN). Patients were followed every 4 weeks up to 12 weeks. They were assessed clinically and functionally based on short form of FFI-R	FFI	While corticosteroid injection is acknowledged as the most effective treatment for providing short-term symptomatic relief, particularly at the 4-week mark, it has been observed that the outcomes of Dry Needling are comparable to the efficacy of corticosteroid injection in the medium-term follow-up, specifically at 12 weeks. Dry Needling is noted for having greater physiological compatibility than corticosteroid injection, as it has the potential to induce a healing process in plantar fasciitis without the presence of any long-term complications associated with corticosteroid injection.

Discussion

This systematic review focuses on randomized control studies that compare the efficacy of dry needling versus corticosteroid injection in treating tendinopathy. However, the study is constrained by a limited number of available articles. The classification of plantar fasciitis as tendinopathy or not poses a dilemma, with differing opinions among authors. While some view it as a ligament, others recognize it as tendinopathy, specifically as plantar intrinsic tendinopathy, resulting from repetitive loading during gait and weight-bearing activities. [26]. Uygur and colleagues' study highlights the significant effectiveness of dry needling over corticosteroid injection in addressing plantar fasciitis. Despite both treatments demonstrating positive effects, the results of corticosteroid injections are not long-lasting.

The study challenges the notion that plantar fasciitis is an inflammatory and self-limiting condition, suggesting that dry needling may be equally beneficial as corticosteroid injection, offering greater physiological compatibility and potentially longer-lasting effects [27]. A similar study on lateral epicondylitis yielded comparable results, where both corticosteroid and dry needling showed significant effects. While corticosteroid injections are simpler with a single injection, dry needling involves multiple sessions. However, due to fewer complications associated with dry needling compared to corticosteroids, it is considered a safer option with long-lasting effects. [23].

In a comparison between dry needling and corticosteroids for the treatment of greater trochanteric pain syndrome, a study with fifty participants randomly divided into two groups revealed that dry needling (Group I) outperformed corticosteroid injections (Group II) in treating the syndrome. Measurements based on the Numerical Pain Rating Scale and Patellofemoral Pain Syndrome scales were taken at baseline, as well as the first, third, and sixth weeks post-treatment [28].

The efficacy of dry needling in reducing pain and enhancing function is not fully understood, but researchers have found that the technique induces biomechanical, vascular, neurological, and clinical changes [29]. Similarly, Ga and colleagues reported superior outcomes with acupuncture needling compared to cortisone injections in a randomized study involving 39 participants with myofascial pain syndrome of the upper trapezius. Although improvements were noted in pain score, cervical spine range of motion, pressure pain threshold, and depression level, none of these findings reached statistical significance [30].

Corticosteroid injections have a short-term inflammatory effect, with reported benefits over placebo injections at 6 weeks that are maintained until 12 weeks. However, they are effective in pain reduction only in the short term compared to a placebo, and their effects diminish over a longer period. Corticosteroid injections may present complications such as pain, skin atrophy, pigment loss, tissue degeneration, fat pad atrophy, nerve injury, and delayed healing. Although they are considered simpler than dry needling with a single-session return to work, the effects of corticosteroid injections decrease over time, and caution is advised due to potential complications. [31]

Dry needling, on the other hand, is considered safe with minor complications like transient pain, localized soreness, and local hemorrhage. In comparison to corticosteroid injections, dry needling is deemed safe, cost-effective, low-risk, less invasive, and easy to perform. The primary drawback of dry needling is its time-consuming nature, as participants require multiple sessions, whereas cortisone injection entails only one session.

Limitation

The only limitation of this study is that fewer randomized control trial studies were selected, which compared dry needling with corticosteroid injection for the treatment of tendinopathy. Thus more studies are required for further research.

Conclusion

Based on the gathered data, the conclusion is drawn that both dry needling and corticosteroid injections exhibit significant efficacy for short-term use. However, for long-term use, dry needling emerges as significantly superior to corticosteroid injections due to the absence or reduced occurrence of adverse effects associated with dry needling compared to corticosteroid injections. Prolonged use of corticosteroid injections is noted to lead to skin atrophy and skin whitening. In summary, the findings support the superiority of dry needling over corticosteroid injections.

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