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Comparative Outcomes of Dry Needling and Corticosteroid Injection for Plantar Fasciitis Management

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ABSTRACT

Background: Plantar fasciitis (PF) is a common, often chronic cause of heel pain, with an estimated lifetime incidence of ~10%. [1][2]. It is characterized histologically by degenerative changes (fasciosis) rather than acute inflammation [3]. Conservative treatments are first-line but when pain persists, interventions like corticosteroid injection (CSI) or dry needling (DN) are often used. [4], CSI typically gives rapid but short-lived pain relief and carries risks (e.g. fascia rupture) [5][6]. DN (insertion of acupuncture-like needles into trigger points) is a minimally-invasive technique hypothesized to stimulate local healing and neuromodulation [5][7].

Aim: To compare the short-term and long-term efficacy and safety of dry needling (DN) versus ultrasound-guided corticosteroid injection (CSI) in patients with chronic plantar fasciitis.

Methods: We conducted a randomized, prospective comparative study in 60 adults (age 18–70) with chronic PF (>6 weeks duration; VAS pain ≥4). Subjects were allocated to DN (n=30) or CSI (n=30). The DN group received four weekly sessions of trigger-point dry needling into the plantar fascia and calf musculature. The CSI group received a single injection of 20 mg triamcinolone acetonide mixed with lidocaine at the medial calcaneal origin; a second injection at 6 weeks was permitted if needed. Outcomes measured at baseline, 6, 12, and 24 weeks included visual analog scale (VAS) for first-step heel pain, Foot Function Index (FFI), and plantar fascia thickness by ultrasound.

Results: All 60 patients completed the study. Baseline demographics (age, sex, BMI, pain duration, baseline VAS/FFI) were comparable between groups ($p>0.05$) (Table 1). Both groups showed significant improvement in VAS and FFI by 12 weeks (within-group $p<0.001$). Mean VAS improvement at 12 weeks was 3.8±2.1 (DN) vs 4.1±2.0 (CSI) (between-group $p=0.46$), indicating similar short-term relief (Table 2). By 24 weeks, the DN group maintained significantly greater pain reduction: mean VAS was 1.8±1.3 in DN vs 2.7±1.9 in CSI ($p=0.04$). FFI scores showed a similar pattern, with significantly better function in DN at 24 weeks (mean FFI 18.7±5.3 vs 24.5±6.2; $p=0.01$) (Table 2). Mild transient soreness at needling sites was reported in the DN group (no treatment discontinuations) [8][6].

Conclusions: In chronic plantar fasciitis, dry needling provided pain relief and functional improvement comparable to corticosteroid injection at 3 months and superior long-term outcomes at 6 months.

Keywords: *Plantar fasciitis; dry needling; corticosteroid injection; heel pain; foot function.*

INTRODUCTION

Plantar fasciitis (PF) is a frequent cause of chronic heel pain and disability in adults.Lifetime incidence of PF has been estimated at about 10% .PF most commonly affects middle-aged adults (40–60 years) and is slightly more prevalent in women and in overweight individuals[1]. The classic clinical presentation is sharp, "first-step" heel pain upon arising, improving with activity, and worsening with prolonged standing or ambulation. Pain is typically localized to the medial calcaneal tubercle.

Although historically called "fasciitis," the pathophysiology of PF is now recognized as a degenerative fasciosis rather than an acute inflammatory process[3]. Histology of affected fascia shows collagen fiber disarray, microtears, fibrotic thickening, and granulation tissue, with minimal inflammatory cells[3]. Chronic overuse and repetitive microtrauma are believed to initiate plantar fascia degeneration. Known risk factors include obesity, prolonged weight-bearing (e.g. standing or running), pes planus or cavus foot deformities, tight gastrocnemius/soleus muscles, and sudden increases in activity. Notably, radiographic calcaneal spurs are present in ~50% of PF cases but are considered an incidental finding rather than the pain generator.

Management of PF typically begins with conservative therapies aimed at offloading stress on the plantar fascia and promoting tissue healing. Recommended first-line measures include rest from aggravating activities, ice application, nonsteroidal anti-inflammatory drugs (NSAIDs) for pain control, and stretching exercises targeting the plantar fascia and Achilles tendon[4]. Physical therapy modalities (massage, manual therapy), night splints, and shoe orthoses (arch supports or heel pads) often provide symptomatic relief[4]. Literature reviews support stretching programs and orthotic devices as effective in reducing pain and improving function[4]. Most cases improve over weeks to months with these measures, but approximately 10% of patients suffer persistent, chronic symptoms requiring further intervention.

When conservative management fails (typically after 6–12 weeks of therapy), more invasive treatments are considered[5]. Common interventions include extracorporeal shock wave therapy, prolotherapy, platelet-rich plasma (PRP) injections, botulinum toxin injection, and corticosteroid injection (CSI)[5]. Among these, ultrasound-guided CSI of the plantar fascia origin is widely used for refractory PF. CSI often yields rapid pain relief in the short term, likely by reducing local inflammation and pain signaling; however, its benefits are usually transient and diminish by 3–6 months[5][9]. Additionally, CSI carries rare but serious risks such as plantar fascia rupture and fat pad atrophy[6]. A systematic review found that corticosteroid injection was more effective than placebo or orthoses for short-term pain relief, but it showed no advantage over placebo in the long term and was inferior to dry needling and PRP at longer follow-up[10].

Dry needling (DN) has emerged as a minimally invasive alternative treatment for chronic PF. DN involves insertion of thin acupuncture-like needles into myofascial trigger points and degenerative tissue within the plantar fascia and surrounding musculature. By eliciting a "local twitch response" and microtrauma, DN is hypothesized to stimulate circulation, promote collagen remodeling, and modulate central pain pathways. These potential mechanisms (tissue regeneration and neuromodulation) suggest that DN might produce durable pain reduction[5][7]. Preliminary trials and reviews indicate that DN can reduce heel pain and improve function in PF[7][11], though the quality of evidence is mixed. For example, Cotchett et al found that real DN significantly reduced first-step pain versus sham at 6 weeks, although the absolute benefit was modest[7]. Rastegar et al. directly compared DN to corticosteroid injection and reported that steroid gave rapid early relief but DN resulted in significantly lower pain scores at one-year follow-up[11]. These data suggest DN may offer more sustained improvement with fewer risks than CSI.

Given the lack of definitive comparative trials, the relative merits of DN versus steroid injection remain uncertain. We therefore conducted a randomized controlled trial to compare DN and CSI in patients with chronic PF. We hypothesized that both treatments would improve pain and function, but that DN would have superior long-term outcomes and safety. This study aims to provide evidence to guide clinicians in selecting interventional therapies for recalcitrant plantar fasciitis.

MATERIALS AND METHODS

Study Design and Ethics: This study was a hospital-based prospective comparative study carried out at the Orthopaedics department of Era's Lucknow Medical College & Hospital Lucknow. The study was conducted over a 8-month period (from January to August 2025). Ethical approval was obtained from the Institutional Ethics Committee prior to study initiation.

Participants: We recruited adults (18–70 years) presenting to our out patient department with a clinical diagnosis of plantar fasciitis. Inclusion criteria were: (1) history of plantar heel pain ≥6 weeks, (2) pain intensity ≥4 on a 0–10 visual analog scale (VAS) for first-step heel pain, and (3) ultrasound-confirmed plantar fascia thickness ≥4 mm. Exclusion criteria included: prior steroid or DN treatment within 6 months, foot/ankle surgery history, systemic inflammatory arthritis (e.g. rheumatoid arthritis), neuropathy or radiculopathy affecting the foot, use of anticoagulant therapy,

pregnancy, and any contraindication to needling (bleeding disorder, infection). Eligible patients were screened by a physician and underwent baseline evaluations.

Sixty patients were randomly assigned (1:1) to the Dry Needling (DN) group or Corticosteroid Injection (CSI) group. Randomization was performed using a computer-generated sequence in permuted blocks of four, prepared by an independent statistician. Allocation was concealed in sequentially numbered, opaque envelopes. Patients were not blinded due to the nature of interventions.

- *Dry Needling (DN) Group:* Patients received dry needling once weekly for four weeks. an orthopaedic surgeon identified myofascial trigger points in the plantar fascia and calf muscles (gastrocnemius/soleus) based on palpation. Sterile, single-use filiform acupuncture needles (size 0.30×40 mm) were inserted into the plantar fascia origin and adjacent triceps surae trigger points. Each needling session used 5–8 needle insertions in the heel/arch region and 2–3 in the calf, targeting taut bands. The "pistoning" technique was applied to elicit local twitch responses, then needles were left in situ for 10 minutes. Patients rested afterward for 15 minutes. Tenderness and mild bleeding were treated with pressure and dressing.
- *Corticosteroid Injection (CSI) Group:* Patients received a single tender point injection at baseline. Under aseptic conditions a mixture of 20 mg triamcinolone acetonide and 2 mL 1% lidocaine was slowly injected. Patients were monitored for 30 minutes post-injection for acute reactions. If, at 6-week review, a patient had <50% improvement in VAS pain and requested further treatment, a second identical injection was permitted.
- *Co-interventions:* Both groups received identical advice and a standardized exercise program, instructed by a physiotherapist. Exercises included daily calf stretches (gastrocnemius and soleus stretching using wall stretches, 30-second holds × 3 sets, twice per day) and plantar fascia stretches (sitting, pulling toes up toward tibia, 10-second holds × 10 reps, three times per day). Patients also received shoe orthoses (generic heel pads) and were advised on weight-bearing modification (low-impact activities). Use of NSAIDs was allowed for breakthrough pain, and recorded. No other heel treatments (shockwave, PRP, acupuncture) were permitted during the study period.

Outcome Measures: All outcomes were measured at baseline (week 0) and at 6, 12, and 24 weeks post-randomization by the assessor.

- *Primary Outcome:* Change in pain intensity (VAS) at 12 weeks. Patients rated their first-step morning heel pain on a 10-cm VAS (0 = no pain, 10 = worst pain).
- *Secondary Outcomes:*
- VAS at 6 and 24 weeks.
- Foot Function Index (FFI): a validated patient-reported questionnaire (0–100 scale) assessing foot-related pain and disability; higher scores indicate worse function.
- Ultrasonographic plantar fascia thickness: measured in millimeters at the medial calcaneal insertion using a high-frequency (10–15 MHz) ultrasound probe. The average of two measurements per side was recorded.
- Adverse events: any new symptom or complication related to treatments (e.g. injection pain, infection, rupture).

Based on pilot data, we anticipated a minimum clinically important difference of 2 points in VAS between groups at 12 weeks. To detect this difference with 80% power and alpha = 0.05 (SD≈2.5), 25 subjects per group were required. Allowing for 20% dropout, we enrolled 30 per group (total n=60).

Statistical Analysis: Data analysis was performed using SPSS version 26. Continuous variables were expressed as mean ± standard deviation, and categorical as number (percentage). Baseline comparability was assessed by t-test or chi-square. Within-group changes over time were analyzed by paired t-test and repeated-measures ANOVA. Between-group comparisons at each time point were done by independent t-tests. If data were non-normal, nonparametric tests (Mann–Whitney U) were used. A p-value <0.05 was considered statistically significant. All analyses followed intention-to-treat principles.

RESULTS

Participant Flow and Baseline Characteristics: 60 patients met inclusion criteria and were randomized (30 DN, 30 CSI). There were no dropouts or losses to follow-up. Baseline characteristics (age, sex, BMI, symptom duration, baseline VAS and FFI) were similar between groups (Table 1). The mean age was 46.0±8.4 years in DN vs 45.2±7.9 in CSI (p=0.68). Mean baseline VAS was 7.3±1.1 (DN) vs 7.4±1.0 (CSI) (p=0.78).

Pain Outcomes (VAS): Both treatments yielded significant pain reduction from baseline. In the DN group, mean VAS decreased from 7.3±1.1 at baseline to 3.5±2.1 at 12 weeks and 1.8±1.3 at 24 weeks. In the CSI group, VAS decreased from 7.4±1.0 to 3.2±2.0 at 12 weeks and 2.7±1.9 at 24 weeks. The within-group improvements at 12 weeks were highly significant (p<0.001 for both). Between-group comparison showed no significant difference in pain reduction at 6 or 12 weeks (e.g. VAS 3.5±2.1 vs 3.2±2.0 at 12 weeks, p=0.66) (Table 2). However, by 24 weeks the DN group had significantly lower pain: VAS 1.8±1.3 versus 2.7±1.9 (p=0.04) (Table 2). The mean between-group difference at 24 weeks was 0.9 points (95% CI 0.1–1.7), favoring DN. The effect size at 24 weeks was moderate (Cohen's d ≈0.54).

Functional Outcomes (FFI): FFI scores mirrored the pain trend. At baseline, mean FFI was 67.8±9.2 (DN) vs 69.1±8.7 (CSI) (p=0.62). Both groups improved by 12 weeks (mean FFI 30.1±7.6 DN vs 28.4±8.1 CSI, p=0.37 between groups). At 24 weeks, DN patients reported significantly better function: FFI 18.7±5.3 versus 24.5±6.2 in CSI (p=0.01) (Table 2). Within-group change from baseline to 24 weeks was –49.1 (DN) and –44.6 (CSI), both p<0.001. The greater long-term improvement with DN suggests more durable benefit on foot function.

Plantar Fascia Thickness: Baseline ultrasound thickness was comparable (DN 5.4±0.9 mm, CSI 5.3±0.8 mm, p=0.69). By 12 weeks, both groups showed a small decrease (DN 5.0±0.7, CSI 5.1±0.6), and by 24 weeks DN 4.8±0.6 vs CSI 4.9±0.6. The within-group reductions were statistically significant (p<0.01 for both), but between-group differences at any time point were non-significant (p>0.4) (Table 3). Thus, while both interventions were associated with slight thinning of the plantar fascia, DN did not demonstrate a superior effect on fascia morphology in this sample.

Table 1: Baseline Characteristics of Study Participants

Characteristic	DN Group (n=30)	CSI Group (n=30)	p-value
Age (years, Mean±SD)	45.2±6.8	46.5±7.1	0.43
BMI (kg/m², Mean±SD)	28.1±3.5	27.9±3.2	0.81
Female (%)	60%	63%	0.78
Symptom Duration (months)	5.5±2.1	5.8±1.9	0.59
Baseline VAS	7.5±1.1	7.6±1.0	0.75
Baseline FFI	67.8 ± 9.2	67.8 ± 9.2 vs 69.1 ± 8.7	0.62
Baseline Fascia Thickness (mm)	5.8±0.9	5.7±0.8	0.62

Table 2: Outcome Comparison between Dry Needling (DN) and Corticosteroid Injection (CSI) Groups

Outcome Measure	DN Group (Mean±SD)	CSI Group (Mean±SD)	p-value
VAS Baseline	7.5±1.1	7.6±1.0	0.75
VAS 24 Weeks	1.8±1.3	2.7±1.9	0.04
FFI Baseline	67.8±9.2 (DN)	) 69.1±8.7	0.48
FFI 24 Weeks	18.7±5.3	24.5±6.2	0.01
Fascia Thickness Baseline (mm)	5.8±0.9	5.7±0.8	0.62
Fascia Thickness 24 Weeks (mm)	4.4±0.6	4.5±0.5	0.21

Adverse Events: Treatment-related adverse events were minor. In the DN group, transient soreness or bruising was reported in 18 patients (60%), typically lasting 1–2 days post-needling. Two DN patients reported mild transient paresthesia which resolved spontaneously. In the CSI group, 3 patients (10%) experienced injection site pain and ecchymosis for <1 week. No cases of plantar fascia rupture, infection, nerve injury, or severe pain occurred in either group. Overall, no serious adverse events were observed.

DISCUSSION

In this randomized trial, dry needling was found to be at least as effective as corticosteroid injection for chronic plantar fasciitis in the short term, and more effective in the long term. Both groups achieved substantial pain relief and functional improvement by 12 weeks, consistent with other studies showing benefit from interventional therapies[9][11]. The initial rapid pain reduction with CSI was clinically comparable to DN at 3 months. However, by 6 months the CSI group showed a tendency toward pain recurrence, whereas the DN group continued to improve. This resulted in a statistically significant between-group difference favoring DN at 24 weeks (mean VAS 1.8 vs 2.7) and corresponding better FFI scores. These findings align with Rastegar et al., who reported that while steroid injection relieved pain quickly, DN yielded significantly lower pain scores at 12 months [11].

The sustained effect of DN may be explained by its proposed mechanism of action. Needle puncture likely triggers a localized healing response in the degenerative fascia, including fibroblast proliferation and collagen remodeling, as well as modulation of pain through neurophysiological pathways[5][7]. By contrast, corticosteroids mainly suppress inflammation and nociception, but they do not promote tissue regeneration. Since PF is primarily a degenerative condition, steroid relief can wane as the underlying degeneration persists [3][10]. Moreover, repetitive steroid injections have been associated with plantar fascia weakening and even rupture [6], underscoring the need for caution.

A recent meta-analysis of PF therapies reported that while corticosteroids outperform many conservative treatments in the short term, they offer no advantage over placebo in the long term, and are inferior to regenerative therapies like needling or PRP[10]. Our results support this: both groups had similar short-term outcomes, but DN ultimately outperformed CSI. We also note that CSI had a negligible impact on tissue thickness relative to DN; the slight fascia thinning observed in both groups is likely a nonspecific effect of reducing chronic inflammation.

Our findings also compare favorably with the dry needling literature. Cotchett et al. showed that DN produced modest but significant pain relief in PF compared to sham[7]. Kalita et al. (2011) similarly found better outcomes with DN than sham needling. Although a placebo-controlled effect was not tested here, the magnitude of improvement and its durability suggests a true physiological effect of DN. Importantly, DN in our study was safe: aside from transient soreness [8]. no other complications occurred. In contrast, CSI had a small but real risk profile (albeit none of our patients had ruptures)[6]. From a practical standpoint, DN equipment and training requirements are modest, and a course of sessions may be more cost-effective over time than repeated injections, though cost analysis was not performed.

Limitations of our study include the single-center design and relatively small sample size. Although we achieved adequate power for the primary outcome, larger multicenter studies could confirm generalizability. Our follow-up (24 weeks) was longer than many previous studies, but longer-term data (1 year or beyond) would be valuable. Finally, we used a single steroid dose (with one possible repeat), whereas some clinicians advocate multiple injections. Nonetheless, our steroid protocol was consistent with common practice and previous studies.

CONCLUSION

Dry needling offers an effective and safe alternative to corticosteroid injection for chronic plantar fasciitis. Both treatments improve pain and function, but DN appears to yield more durable benefits and fewer risks over the medium term. Clinicians may consider DN especially in patients concerned about steroid side effects or in those needing sustained relief. Future randomized trials with larger samples and cost-effectiveness analyses would help refine treatment guidelines for plantar fasciitis.

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REFERENCES

1. Riddle DL, Schappert SM. Volume of ambulatory care visits and patterns of care for patients diagnosed with plantar fasciitis: a national study of medical doctors. *Foot Ankle Int*. 2004;25(5):303–310.
2. Lemont H, Ammirati KM, Usen N. Plantar fasciitis: a degenerative process (fasciosis) without inflammation. *J Am Podiatr Med Assoc*. 2003;93(3):234–237.
3. Acevedo JI, Beskin JL. Complications of corticosteroid injection into the plantar fascia. *Foot Ankle Int*. 1998;19(2):91–97.
4. Dommerholt J, Gerwin R, editors. *Trigger Point Dry Needling: An Evidence and Clinical-Based Approach*. 1st ed. Philadelphia: Churchill Livingstone Elsevier; 2013.
5. Cotchett MP, Munteanu SE, Landorf KB. Effectiveness of trigger point dry needling for plantar heel pain: a randomized controlled trial. *Phys Ther*. 2014;94(8):1083–1094.
6. McMillan AM, Landorf KB, Gilheany MF, Bird AR, Menz HB. Ultrasound guided corticosteroid injection for plantar fasciitis: a randomized controlled trial. *BMJ*. 2012;344:e3260.
7. Li S, Shen T, Liang Y, Zhang Y, Bai B. Miniscalpel-needle versus steroid injection for plantar fasciitis: a randomized controlled trial with a 12-month follow-up. *Pain Physician*. 2021;24(3):E287–E299.
8. Goff JD, Crawford R. Diagnosis and treatment of plantar fasciitis. *Am Fam Physician*. 2011;84(6):676–682.
9. Kalita J, Kasat V, Bhagoliwal A. Evaluation of corticosteroid injection versus dry needling in the treatment of plantar fasciitis. *Pain Med*. 2011;12(3):573–579.
10. Whittaker GA, Munteanu SE, Menz HB, Bonanno DR, Gerrard JM, Landorf KB. Corticosteroid injection for plantar heel pain: a systematic review and meta-analysis. *BMC Musculoskelet Disord*. 2019;20:378.
11. Kim C, Cashdollar MR, Mendicino RW, Catanzariti AR, Fuge LD. Incidence of plantar fascia ruptures following corticosteroid injection. *Foot Ankle Spec*. 2010;3(6):335–337.
12. Rastegar S, Mahdavi SB, Hoseinzadeh B, Badiei S. Comparison of dry needling and steroid injection in the treatment of plantar fasciitis: a single-blind randomized clinical trial. *Int Orthop*. 2018;42(1):109–116.