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Relief of Heel Pain by Single Dose Steroid Injection a Longitudinal Prospective Study

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Abstract

Background: *Plantar fasciitis is one of the most common causes of heel pain, often affecting individuals with prolonged standing activities. Corticosteroid injections are frequently used for short-term pain relief, but the extent and duration of benefit from a single dose remain under investigation.*

Methods: *This longitudinal prospective study was conducted at the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR) and Omnicare Diagnostic Limited, Dhaka, Bangladesh, from January to June 2025. A total of 56 patients aged 18–65 years with clinically diagnosed plantar fasciitis and heel pain lasting more than four weeks were enrolled. Each patient received a single 40 mg triamcinolone acetonide injection at the most tender point. Pain was assessed using the Visual Analog Scale (VAS) at baseline, 1 month, 2 months and 3 months. Patients were also monitored for adverse events.*

Results: *The mean age was 45.6 ± 9.2 years, with a female predominance (60.7%) and an average BMI of 27.4 ± 3.1 kg/m². A significant reduction in VAS scores was observed from baseline (7.8 ± 1.1) to 1 month (4.2 ± 1.3), 2 months (3.6 ± 1.2) and 3 months (3.2 ± 1.1) ($p < 0.001$). The proportion of patients achieving ≥50% pain relief increased from 57.1% at 1 month to 80.4% at 3 months. Adverse effects were minimal and self-limited, with 80.4% reporting no complications.*

Conclusion: *A single local injection of triamcinolone acetonide offers significant and sustained pain relief in plantar fasciitis with a low incidence of minor side effects, making it an effective treatment option.*

Keywords: *Plantar fasciitis, heel pain, triamcinolone, corticosteroid injection, VAS, steroid therapy*

1. Introduction

Heel pain is one of the most common musculoskeletal complaints encountered in orthopedic and primary care settings, with plantar fasciitis being the leading cause [1].

Plantar fasciitis is characterized by localized pain at the medial aspect of the heel, particularly prominent during the first steps in the morning or after periods of rest.

It predominantly affects middle-aged individuals and those whose occupations or activities involve prolonged standing, walking, or high-impact movements [2]. Although the condition is self-limiting in many cases, the persistent and often debilitating nature of symptoms significantly affects patients' quality of life and productivity [3].

The etiology of plantar fasciitis is multifactorial and includes mechanical overload of the plantar fascia, poor foot biomechanics, obesity and reduced flexibility of the Achilles tendon or plantar fascia [4]. Histopathologically, plantar fasciitis is now better described as a degenerative fasciosis rather than an inflammatory process, yet corticosteroids remain widely used in clinical practice due to their potent anti-inflammatory and analgesic effects [5]. Conservative management is usually the first line of treatment and includes rest, activity modification, stretching exercises, NSAIDs, orthotic supports and physical therapy [3]. However, when conservative therapy fails, local corticosteroid injection is frequently used as a second-line treatment for rapid pain relief [6]. Triamcinolone acetonide, a long-acting corticosteroid, is commonly administered as a single injection directly into the point of maximal tenderness to alleviate symptoms.

Previous studies have demonstrated varying degrees of success with corticosteroid injections, with many reporting significant short-term pain relief, though concerns remain about recurrence, tissue atrophy and potential complications [7]. Moreover, the duration of relief and long-term outcomes following a single dose remain a topic of interest [8]. In resource-constrained settings, a cost-effective, rapid and easily administered intervention such as a single-dose steroid injection could offer significant clinical benefits if proven effective [9, 10].

This study was designed to evaluate the outcome of a single 40 mg triamcinolone acetonide injection in patients with plantar fasciitis. The primary objective was to assess the proportion of patients achieving significant pain relief, defined as a 50% or greater reduction in VAS score. Secondary objectives included assessing changes in mean pain score over time and documenting any adverse effects following the injection. This longitudinal prospective study aims to contribute real-world data on the short-term efficacy and safety of this widely used intervention.

2. Methodology & Materials

This longitudinal prospective study was conducted at the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR) and Omnicare Diagnostic Limited, Dhaka, Bangladesh, from January 2025 to June 2025. A total of 56 patients clinically diagnosed with plantar fasciitis were included based on predefined inclusion and exclusion criteria. Patients aged between 18 and 65 years with heel pain lasting more than four weeks and confirmed by local tenderness over the medial calcaneal tubercle were enrolled. Patients with a history of foot trauma, inflammatory arthritis, diabetes mellitus, previous steroid injection, or surgery on the affected foot were excluded from the study. After obtaining informed written consent, demographic and clinical information was recorded using a structured data sheet. Each patient received a single local injection of 40 mg triamcinolone acetonide mixed with 1 ml of 2% lignocaine at the site of maximum tenderness, administered under aseptic conditions.

Patients were advised to avoid strenuous activity for 48 hours and were not prescribed additional medications for heel pain during the follow-up period. Pain intensity was assessed using the Visual Analog Scale (VAS), ranging from 0 (no pain) to 10 (worst imaginable pain). Pain scores were recorded at baseline and at follow-up visits scheduled at 1 month, 2 months and 3 months post-injection. The primary outcome was the proportion of patients achieving significant pain relief, defined as ≥50% reduction in VAS score from baseline. Secondary outcomes included changes in mean VAS score over time and incidence of any adverse events following the injection.

Data were analyzed using SPSS version 26. Descriptive statistics were used for demographic variables and repeated measures ANOVA was employed to evaluate changes in pain scores over time. Categorical data were expressed as frequencies and percentages.

3. Results

Table 1. *Baseline Characteristics of Study Participants (n = 56)*

Characteristics	n	%
Age (years)	45.6 ± 9.2	
Gender		
Male	22	39.30%
Female	34	60.70%
BMI (kg/m²)	27.4 ± 3.1	

Duration of Heel Pain		
<3 months	14	25.00%
3–6 months	26	46.40%
>6 months	16	28.60%
Affected Side		
Right	30	53.60%
Left	26	46.40%
Standing Occupation	31	55.40%
Previous Treatment Tried	18	32.10%

Table 1 presents the baseline characteristics of the 56 study participants. The mean age was 45.6 ± 9.2 years and the majority were female (60.7%). The average BMI was 27.4 ± 3.1 kg/m². Most patients had heel pain for 3–6 months (46.4%), with a nearly even distribution of affected sides. More than half (55.4%) were involved in standing occupations and 32.1% had previously tried other treatments.

Table 2. *Change in Pain Score over Time (Visual Analog Scale, VAS)*

Time Point	Mean VAS Score ± SD	p-value (vs. baseline)
Baseline	7.8 ± 1.1	N/A
1 Month	4.2 ± 1.3	<0.001
2 Months	3.6 ± 1.2	<0.001
3 Months	3.2 ± 1.1	<0.001

Table 2 shows the changes in mean pain scores, measured by the Visual Analog Scale (VAS), over the study period. The baseline mean VAS score was 7.8 ± 1.1. A significant reduction in pain was observed at each follow-up: 4.2 ± 1.3 at 1 month, 3.6 ± 1.2 at 2 months and 3.2 ± 1.1 at 3 months ($p < 0.001$ for all comparisons vs. baseline), indicating sustained improvement in pain following the single steroid injection.

Table 3. *Proportion of Patients Achieving Significant Pain Relief (≥50% Reduction in VAS Score)*

Time Point	n	%
1 Month	32	57.10%
2 Months	40	71.40%
3 Months	45	80.40%

Table 3 illustrates the proportion of patients who achieved significant pain relief, defined as a ≥50% reduction in VAS score compared to baseline. At 1 month, 32 patients (57.1%) reported significant improvement, increasing to 40 patients (71.4%) at 2 months and 45 patients (80.4%) at 3 months, reflecting a progressive and sustained therapeutic response over time.

Table 4. *Adverse Effects Following Steroid Injection*

Adverse Event	n	%
Local pain after injection	6	10.70%
Skin depigmentation	3	5.40%
Transient hyperglycemia	2	3.60%
Infection	0	0.00%
No adverse events	45	80.40%

Table 4 summarizes the adverse effects observed following the steroid injection. Local pain at the injection site was reported in 6 patients (10.7%), skin depigmentation in 3 patients (5.4%) and transient hyperglycemia in 2 patients (3.6%). No cases of infection were noted. The majority of patients (80.4%) experienced no adverse events, indicating a favorable safety profile for the intervention.

4. Discussion

This longitudinal prospective study aimed to evaluate the effectiveness and safety of a single 40 mg triamcinolone acetonide injection in patients with plantar fasciitis.

Our findings demonstrated a significant and progressive reduction in heel pain over a three-month follow-up period, with 80.4% of patients experiencing ≥50% pain relief and minimal adverse events. These results support the clinical utility of corticosteroid injections as a viable short- to mid-term treatment for plantar fasciitis. Plantar fasciitis remains a leading cause of heel pain, commonly affecting middle-aged adults, particularly those with occupations involving prolonged standing. The condition is often degenerative in nature and corticosteroid injections have long been used to manage pain due to their anti-inflammatory and analgesic properties. In our study, the mean VAS score decreased from 7.8 ± 1.1 at baseline to 3.2 ± 1.1 at three months, reflecting sustained symptom relief. Our results are in line with the findings of Seth et al., who conducted a systematic review and meta-analysis showing that corticosteroid injections provide significant short-term pain relief in plantar fasciitis with acceptable safety [1].

Similarly, Whittaker et al., in the SOOTHE trial found that corticosteroid injection was effective in reducing pain in the short term, although the benefit may diminish over time [11]. However, in our study, pain reduction continued to improve even at the three-month follow-up, indicating a longer duration of effect in our population.

The significant proportion of patients achieving ≥50% pain relief is comparable to the study by Khurana et al., where 78% of patients receiving corticosteroid injections reported clinical improvement at midterm follow-up [12]. Likewise, Ghasemi et al., reported comparable effectiveness of corticosteroid injection versus alternative agents like dexmedetomidine, reaffirming the therapeutic value of steroids [13].

Regarding safety, most patients in our study (80.4%) experienced no adverse effects. The most commonly reported issues were mild local pain (10.7%) and skin depigmentation (5.4%). This is consistent with findings from Sherpy et al., who noted a low incidence of complications following corticosteroid injection compared to autologous platelet-rich plasma [14]. Moreover, Zhao et al., reported that while corticosteroids are effective, attention to technique and dosage minimizes the risk of side effects such as fascia rupture or infection, neither of which occurred in our study [15].

Interestingly, Johannsen et al., emphasized the enhanced effectiveness of corticosteroid injections when combined with controlled exercise therapy [16]. While our study did not incorporate adjunct physical therapy, the favorable outcomes suggest that even a single injection can provide meaningful symptom relief. Nonetheless, future studies could explore whether combination strategies might further optimize outcomes.

Alternative therapies have been increasingly explored, including PRP, shockwave therapy and hyaluronic acid injections. Sawan et al., demonstrated that PRP may offer comparable or superior long-term outcomes to corticosteroids in refractory cases, though the higher cost and limited availability may restrict its widespread use, especially in resource-limited settings like Bangladesh [17]. Similarly, C hen et al., in a meta-analysis, compared corticosteroids with non-invasive treatments and concluded that while both are effective, injections offer more immediate pain relief [18].

Importantly, our findings support the conclusions of Hansen et al., who emphasized that many patients with plantar fasciitis improve over time, but interventions like corticosteroid injections can accelerate pain resolution, especially in the early months [19]. This is particularly relevant for patients whose occupational demands require rapid symptom control. In our study, only 32.1% of patients had previously tried other treatments, suggesting that corticosteroid injection was an early intervention for many. While this may have influenced the positive response rate, it also reflects real-world clinical decision-making where rapid relief is often prioritized.

5. Limitations Of The Study

Despite the strengths of our study—including a prospective design, uniform intervention and follow-up at multiple time points—certain limitations should be acknowledged. First, the absence of a control or comparison group limits the ability to attribute all observed benefits solely to the steroid injection. Second, the study did not assess long-term recurrence beyond three months. Finally, patient-reported outcome measures beyond the VAS, such as functional improvement or return to work, were not included.

6. Conclusion

In conclusion, our study demonstrates that a single dose of 40 mg triamcinolone acetonide provides significant and sustained relief from heel pain in plantar fasciitis, with minimal side effects. These findings reinforce the role of corticosteroid injection as an effective and accessible treatment option, particularly in settings where cost and convenience are major considerations. Future randomized controlled trials with longer follow-up and comparative arms are recommended to validate and expand on these findings.

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Conflicts of Interest

There are no conflicts of interest.

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