



COMPARATIVE ANALYSIS OF CORTICOSTEROID INJECTION VERSUS PERCUTANEOUS FASCIOTOMY IN THE MANAGEMENT OF CHRONIC PLANTAR FASCIITIS

Orthopaedics

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ABSTRACT

Background: Plantar fasciitis is a common cause of heel pain in adults, often affecting individuals aged between 40 and 60 years. While most cases resolve with conservative treatment, a subset becomes chronic and requires interventional management. This study compares the functional outcomes of corticosteroid injection and percutaneous fasciotomy in chronic plantar fasciitis. **Methods:** A prospective, randomized, interventional study was conducted over 18 months at K.D. Medical College, Mathura. A total of 60 patients with ultrasound-confirmed plantar fasciitis of more than six months' duration were enrolled and randomly divided into two groups: Group A (n=30) received corticosteroid injections, and Group B (n=30) underwent percutaneous fasciotomy. Functional outcomes were assessed using the Visual Analog Scale (VAS) for pain and the American Orthopaedic Foot and Ankle Society (AOFAS) score at baseline, 2 weeks, 4 weeks, 6 weeks, and 3 months. **Results:** Both groups showed significant improvement over time. However, Group A demonstrated superior outcomes in terms of pain relief and functional improvement at earlier follow-up intervals. Statistically significant differences were observed at 2 weeks ($p=0.041$), 4 weeks ($p=0.042$), 6 weeks ($p=0.005$), and 3 months ($p<0.001$) for VAS scores. AOFAS scores also showed significant improvement in Group A at similar time points. **Conclusion:** Corticosteroid injections are more effective than percutaneous fasciotomy in the short-term management of chronic plantar fasciitis. However, percutaneous fasciotomy remains a valuable alternative, especially for patients contraindicated for corticosteroid use.

KEYWORDS

Plantar fasciitis, corticosteroid injection, percutaneous fasciotomy, VAS, AOFAS, heel pain

INTRODUCTION

Plantar fasciitis (PF) is a degenerative condition of the plantar fascia, the thick connective tissue that runs along the bottom of the foot. It commonly presents as heel pain, especially with the first steps in the morning or after periods of inactivity. It accounts for 11% to 15% of all foot complaints requiring medical attention in adults and is most prevalent between 40 and 60 years of age.

The etiology of plantar fasciitis is multifactorial, involving mechanical overuse, poor biomechanics, obesity, and prolonged standing. Although typically self-limiting, chronic cases that persist beyond six months often require more aggressive management. Interventions such as corticosteroid injections and surgical options like percutaneous fasciotomy have been employed when conservative treatments fail.

Despite the common use of corticosteroids and surgical interventions, there remains no universally accepted standard of care for chronic plantar fasciitis. This study aims to provide a comparative analysis of corticosteroid injection and percutaneous fasciotomy in terms of pain relief and functional outcomes. In doing so, it addresses a clinical gap where consensus is lacking and aims to guide clinicians in selecting optimal treatment strategies for persistent cases.

MATERIALS AND METHODS

Study Design: Prospective, randomized, comparative, and interventional.

Setting and Duration: K.D. Medical College, Mathura, from April 2023 to September 2024.

Sample Size and Selection: A total of 60 patients with chronic plantar fasciitis were included. The sample size was determined using power analysis based on preliminary data. Participants were randomly assigned into two equal groups using a computer-generated sequence.

Inclusion Criteria

- Age 20–60 years
- Diagnosis confirmed by ultrasonography
- Chronic symptoms >6 months
- No response to conservative treatment

Exclusion Criteria

- Prior steroid injection within 6 months
- Diabetes mellitus
- Recent trauma or foot surgery
- Connective tissue or neurological disorders

Clinical Criteria

Patients presented with the following:

1. Early morning stiffness
2. Post-rest stiffness
3. Tenderness on palpation of the heel
4. Limp while walking
5. Positive windlass test (A positive result is heel pain reproduced by forced dorsiflexion of the toes at the metatarsophalangeal joints with the ankle stabilized).

Imaging Criteria: Ultrasound: Plantar fascia thickness >4.5 mm with hypoechoic changes

Diagnosis of Plantar Fascia was made when all of the clinical criteria were present along with confirmation by Ultrasound.

Procedures:

Group A received 2 ml of triamcinolone acetonide (Kenacort) mixed with 1 ml of 2% lignocaine injected into the most tender point under sterile conditions.

Group B underwent percutaneous fasciotomy using a No. 15 blade to release the medial one-third of the plantar fascia under local anesthesia. A crepe bandage was applied post-operatively.

Group A: Corticosteroid Injection

- Patients were placed in supine position with the affected limb flexed at the hip & knee, externally rotated to expose the medial plantar surface.
- The medial band of plantar fascia was Marked & most tender point of plantar fascia was identified.
- Heel was scrubbed with povidone-iodine & draped. Using a 22G needle, 2 ml of Kenacort with 1ml of 2% lignocaine was injected into the most tender point of the plantar fascia near the medial heel region.
- Needle was inserted medially & directed laterally on plantar surface, just superior & anterior to calcaneus.
- Small aseptic dressing was applied after the corticosteroid injection which was removed after 1 day.

Group (A) Corticosteroid Injection in Plantar Fasciitis



The Medial Band of plantar fascia was marked & most Tender Point of Plantar Fascia was identify.



Application of Corticosteroid injection with 1ml of 2%Lignocaine in most tender Point of Plantar Fascia

Group B: Percutaneous Plantar Fasciotomy

- Patients were placed in supine position.
- After scrubbing with povidone-iodine and draping, the medial band of the plantar fascia was marked. The area was infiltrated with 2% Lignocaine.
- The foot was dorsiflexed, and a stab incision was made with No. 15 blade over the plantar aspect of the foot to access the plantar tuberosity of the calcaneus.
- The medial one-third of the plantar fascia was incised and released from its calcaneal attachment; a click was heard on complete release.
- An aseptic pressure dressing was applied after the procedure & after 5 days dressing was removed.



Follow-up and Outcome Measures:

- VAS (0–10) for pain
- AOFAS (0–100) for function
- Recorded at baseline, 2, 4, 6 weeks, and 3 months

Statistical Analysis

Data were analyzed using SPSS v26. Continuous variables were compared using the t-test; categorical data were analyzed with Chi-square. $P < 0.05$ was considered statistically significant.

RESULTS

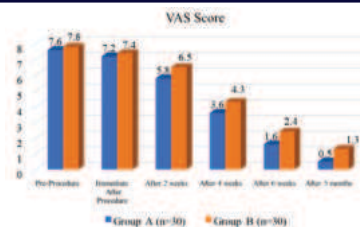
Demographics: Mean age: Group A – 41.63 ± 9.99 years; Group B – 42.28 ± 11.98 years. Gender distribution and BMI were statistically similar.

VAS Score Analysis:

Pain scores decreased over time in both groups, but Group A showed a more significant reduction. At pre-procedure, there was non-significant difference in pain scores between 2 groups ($p=0.444$). However, at subsequent time points, Group A consistently showed lower pain scores than Group B, with significant differences observed at 2 weeks ($p=0.041$), 4 weeks ($p=0.042$), 6 weeks ($p=0.005$), & 3 months ($p<0.001$) post-procedure.

- Pre-procedure scores were similar between groups ($p=0.444$)
- Post-treatment, Group A showed consistently lower scores at all time points:
 - 2 weeks: Group A – 5.8, Group B – 6.5 ($p=0.041$)
 - 4 weeks: Group A – 3.6, Group B – 4.3 ($p=0.042$)
 - 6 weeks: Group A – 1.6, Group B – 2.4 ($p=0.005$)
 - 3 months: Group A – 0.53, Group B – 1.3 ($p<0.001$)

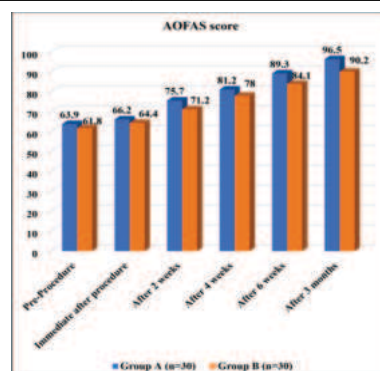
Intervals	Group A (n=30)	Group B (n=30)	p-value
Pre-Procedure	7.6±0.9	7.8±1.1	0.444
Immediate after procedure	7.2±0.78	7.4±0.81	0.122
After 2 weeks	5.8±1.2	6.5±1.5	0.041
After 4 weeks	3.6±1.4	4.3±1.2	0.042
After 6 weeks	1.6±1.0	2.4±1.1	0.005
After 3 months	0.53±0.7	1.3±0.9	<0.001



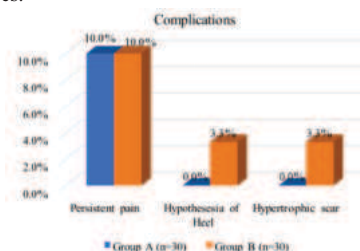
AOFAS Score Analysis

- Baseline scores were not significantly different
- At 3 months, Group A reached 94.3 vs Group B at 87.9 ($p<0.001$)

Intervals	Group A (n=30)	Group B (n=30)	p-value
Pre-Procedure	63.9±13.2	61.8±14.5	0.559
Immediately after the procedure	66.2±12.4	64.4±13.3	0.528
After 2 weeks	75.7±8.5	71.2±10.4	0.072
After 4 weeks	81.2±6.1	78.0±7.2	0.048
After 6 weeks	89.3±5.8	84.1±7.8	0.005
After 3 months	96.5±4.5	90.2±5.4	<0.001
p-value	<0.001	<0.001	



Complications: Minimal complications were reported. Group B had minor wound irritation in 2 cases, while Group A had transient local pain in 3 cases.



DISCUSSION

Even though plantar fasciitis is a frequent clinical disease and the most common cause of foot and heel pain, its genesis and treatment are still up for debate. The majority of studies that included patients who had been complaining for at least six months and those who had failed or resisted conservative measures confirmed that the diagnosis is primarily based on the patient's history regarding the typical pain time and location as well as physical signs that have persisted for at least six months.¹⁷

From an etiological perspective, a number of conditions could be linked to plantar fasciopathy, such as being overweight (having a high body mass index), working in jobs that require prolonged standing or marching, like in athletes and military personnel, having diabetes, taking medications like chemotherapeutic agents, and infrequently having bacterial and viral infections.¹⁸

Given the controversial pathophysiology of plantar fasciitis in the literature, one theory proposes an origin similar to tendinosis, in which overuse causes recurrent microtrauma that results in significant tissue microtears until a microtear appears.¹⁹ Lemont et al. proposed that the plantar fascia and the underlying foot muscles were implicated at the onset of a degenerative process rather than an inflammatory one, characterized by microtears and necrosis.²⁰ The findings from the resected plantar fascia specimens thus supported the idea that it is

better known as plantar fasciosis²¹, as well by the histological analysis of surgical biopsies of the affected tendons by no cytological evidences of anti-inflammatory response were proved.²²

Although real-time ultrasound (B-mode US) can provide characteristic signs of plantar fasciitis, ultrasound is currently the preferred initial imaging modality for confirmation of the clinical diagnosis. The most reliable and reproducible findings are the increased fascia thickness and altered echogenicity pattern, specifically the hypoechoic pattern, rather than the less reproducible blurring of the plantar fascia borders.²³

With a small age difference, the mean age of the two groups in this study is comparable (Group A (corticosteroid injection): 41.63 years, Group B (corticosteroid injection): 42.28 years). Although there is no discernible gender difference, Group B has a slightly greater percentage of men (43.3%) than Group A (36.7%), indicating a fairly balanced gender distribution. With Group A's BMI of 26.18 kg/m² and Group B's BMI of 26.93 kg/m², there is no discernible difference between the two groups. 53.3% of Group A's members are housewives, 6.7% are students, 13.3% are company owners, and 26.7% are employed. In a similar vein, Group B comprises 56.7% housewives, 16.7% company owners, 3.3% students, and 23.3% employed individuals; the difference was not statistically significant ($p>0.05$). 53.3% of Group A had the illness for 9–13 months, whereas 46.7% did so for 6–8 months. 56.7% of Group B's members experienced the illness for 9–13 months, whereas 43.3% had it for 6–8 months. Group A and Group B experienced an average illness duration of 8.28 months (range 6–13 months) and 8.94 months (range 5–14 months), respectively, with no discernible difference ($p>0.05$).

Our findings were in accordance with the finding of Kalia RB et al² who stated that the research cohort's age ranged from 20 to 55 years old, with a mean age of 39 years (SD 8.8 years). The females were predominantly affected and right foot was more commonly involved. The duration of symptoms was 19 weeks on average (SD 4.9 weeks). Khan SH et al²⁴ revealed there were 22 (52.4%) females and 20 (47.6%) males. The patients' average age was 42.6 ± 9.5 SD. Twenty-four (45.2%) of the patients were in the 20–42 age group, and twenty-three (54.8%) were in the 43–70 age group. Twenty-three (54.8%) patients had a BMI greater than 25 kg/m², whereas 19 (45.2%) had a BMI less than 25 kg/m². According to Atzmon R et al⁵⁶ two equal-sized groups of patients were randomly selected. They comprised 18 patients in the Platelet Rich Plasma (PRP) group and 18 patients in the Partial Plantar Fasciotomy (PPF) group. Patients in the PPF and PRP groups had mean ages of 47.1 ± 14.4 and 54.7 ± 14 years, respectively, with no discernible difference ($p=0.156$). Both groups had the same number of days on average between their initial clinic visit and therapy (23.00 vs. 23.75). Elsayy AGS and Abdelaouf HS²⁵ revealed that the average age of all patients in the population under study was 38.11 ± 8 years. In terms of patient gender, the majority of patients (60.8%) were female, and 39.2% were male, which was consistent with Johal H et al⁷¹, Babaei-Gazania A et al,⁷² and Bahrami MH et al.²⁶

Both groups' pain scores in the current research reduced with time, although Group A's decline was more pronounced. The two groups' pre-procedure pain levels did not significantly vary from one another ($p=0.444$). But at later intervals, Group A continuously reported less pain than Group B; at two weeks ($p=0.041$), four weeks ($p=0.042$), six weeks ($p=0.005$), and three months ($p<0.001$) after the surgery, there were notable differences.

Ilka S et al²⁷ examined the effectiveness of corticosteroid versus steroid plus ercutaneous needle release of plantar fascia in treating fasciitis heel pain. The results showed no significant difference between the two groups in T1 (3rd week), T2 (6th week), or T3 (12th week), but there was a significant difference in T4 (24 weeks after the injection) ($p\text{-value}=0.05$).

In study of Shokouh KH²⁸ corticosteroid injections were administered to individuals who did not react to treatment, comparing oral nonsteroid medication, medical shoes, and local injectable steroid drugs. According to their findings, both groups' responses to medical therapy with corticosteroids were successful and effective in lowering the patients' symptoms. The findings of the systematic review-meta-analysis of Whittaker GA et al⁵⁸ demonstrated that using foot orthoses and PRP injections are less effective in reducing pain than corticosteroid injections. Xiong Y et al²⁹ compared 3 months following

the intervention, the same results were observed for shock wave therapy and corticosteroid injection in terms of pain reduction.

According to the study's mean AOFAS score, there was no discernible difference between the two groups' pre-procedure scores ($p=0.559$). Group A, however, had considerably superior functional results than Group B at later time periods, with the differences being more noticeable with time ($p=0.048$ at 4 weeks, $p=0.005$ at 6 weeks, and $p<0.001$ at 3 months). Mahindra P et al³⁰ compared PRP injection, corticosteroid injection, and placebo were the three therapies tested. The PRP and corticosteroid injection group showed a substantial improvement in their VAS and AOFAS scores three weeks and three months later when compared to the placebo group. A study by Maes R et al³⁰ on twenty-two individuals who had surgery for subcutaneous plantar fasciotomy. The AOFAS ankle score improved incrementally from 42.8 to 89.9 after 15 days, 6 weeks, and 3 months, according to the study's results, which is in line with our own. Ilka S et al³⁰ studied effectiveness of corticosteroid against steroid plus percutaneous needle release of plantar fascia in fasciitis heel pain, AOFAS scores dramatically improved throughout the course of the study ($P<0.001$). The T2, T3, and T4 results show a substantial difference ($p<0.001$) between the two research groups.

In the present study, with a mean rise of 309.3m (from 240.9m to 550.2m), Group A had a more significant improvement than Group B, which had a mean increase of 100.4m (from 250.4m to 350.8m). The difference between the two groups was significant ($p<0.05$). These were new discoveries that had never been covered in a study paper previously. According to the findings, three patients (10.0%) in each group experienced chronic discomfort, indicating that the incidence of this consequence were comparable in the two groups. Other problems were somewhat more common in Group B, too, with one patient (3.3%) having a hypertrophic scar and another patient (3.3%) reporting heel hypoesthesia. On the other hand, neither hypoesthesia nor hypertrophic scarring were seen in Group A.

Limitations of the Study

The major limitation of our study was small sample size and short follow up. Similar studies must be carried out in the future in a multi-centered approach with a bigger sample size and long-term follow-up.

Strengths of the Study

- The study had a well-defined study population of patients with plantar fasciitis, which helps to ensure that the results are generalizable to this specific population.
- The study compared two different treatments, corticosteroid injection and percutaneous fasciotomy, which helps to provide comprehensive understanding of effectiveness of each treatment.
- Study used validated outcome measures, such as AOFAS score & Visual Analog Scale (VAS), which helps to ensure that results are reliable and valid.

CONCLUSION

The present study provides valuable insights into functional outcomes of corticosteroid injections versus percutaneous fasciotomy in the management of plantar fasciitis. Both treatment modalities demonstrated efficacy in alleviating pain, and improving functional mobility. However, corticosteroid injections consistently outperformed percutaneous fasciotomy across multiple key parameters and time points.

Group A (corticosteroid injection) showed significantly lower pain scores compared to Group B (percutaneous fasciotomy) at 1 week, 1 month, 3 months, & 6 months post-procedure. This emphasizes the rapid and sustained pain relief achievable with corticosteroid injections, a critical consideration for patients seeking early resolution of symptoms.

In terms of gait abnormality and walking surface difficulty, corticosteroid injections demonstrated more substantial improvements than percutaneous fasciotomy. Enhanced mobility and reduced discomfort allow for better patient functionality in daily activities, making corticosteroid injections a more effective option in promoting functional recovery.

The study also highlighted superior outcomes in AOFAS Scoring in the corticosteroid group. These results are indicative of improved biomechanical function and support use of corticosteroid injections as

therapeutic intervention for optimizing foot mechanics in plantar fasciitis patients.

While corticosteroid injections offer pronounced benefits in terms of pain relief, functional recovery, and biomechanical correction, clinicians must remain vigilant about potential complications, like as heel pad atrophy & tendon rupture. Conversely, percutaneous fasciotomy, though less effective in the short term, serves as a viable alternative for patients who may be contraindicated for corticosteroid therapy or prefer minimally invasive approaches. In conclusion, corticosteroid injections are effective & reliable treatment for plantar fasciitis, providing rapid and sustained symptom relief and superior functional outcomes. Percutaneous fasciotomy, while less efficacious, may still play important role in individualized treatment plans.

Future Scope

Future research should focus on:

- Comparing long-term outcomes beyond 12 months
- Evaluating cost-effectiveness of various interventions
- Assessing combined approaches (e.g., PRP + fasciotomy)
- Analysing biomechanical corrections post-intervention

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