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PROSPECTIVE COMPARATIVE STUDY OF PLATELET-RICH PLASMA VERSUS CORTICOSTEROID INJECTION IN THE MANAGEMENT OF CHRONIC PLANTAR FASCIITIS.

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Abstract

Background: Chronic plantar fasciitis is one of the most common causes of persistent heel pain and functional disability. Although corticosteroid injections provide rapid symptomatic relief, concerns regarding recurrence and complications have prompted interest in biological therapies such as platelet-rich plasma (PRP), which may promote tissue regeneration and provide sustained clinical improvement. ***Aim:*** To compare the functional outcomes of platelet-rich plasma (PRP) injection versus corticosteroid injection in patients with chronic plantar fasciitis. ***Materials and Methods:*** This prospective comparative study included 60 patients with chronic plantar fasciitis refractory to conservative treatment. Patients were randomly allocated into two groups: Group A (n = 30) received a single autologous PRP injection, while Group B (n = 30) received a single corticosteroid injection (40 mg triamcinolone acetonide with lignocaine). All patients followed an identical rehabilitation protocol and were evaluated at baseline, 1 month, 3 months, and 6 months. Clinical outcomes were assessed using the Visual Analogue Scale (VAS) for pain and the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score. Patient satisfaction and treatment-related complications were also recorded. ***Results:*** Baseline demographic and clinical characteristics were comparable between the two groups ($p > 0.05$). Both treatment modalities significantly reduced pain and improved function throughout the study period. The corticosteroid group demonstrated superior early pain relief at 1 month (VAS: 3.1 ± 1.0 vs. 4.2 ± 1.1; $p < 0.001$). However, the PRP group achieved significantly greater improvement at 3 and 6 months. At the final follow-up, the PRP group showed significantly lower VAS scores (2.1 ± 1.0 vs. 3.4 ± 1.2; $p < 0.001$), higher AOFAS scores (89.2 ± 6.8 vs. 82.6 ± 7.4; $p < 0.001$), and greater patient satisfaction (86.7% vs. 66.7%; $p = 0.04$). No major complications were observed in either group. ***Conclusion:*** Both PRP and corticosteroid injections are effective treatment options for chronic plantar fasciitis. Corticosteroid injection offers superior short-term pain relief, whereas PRP provides significantly better long-term pain reduction, functional recovery, and patient satisfaction at six months. PRP appears to be a safe and effective regenerative treatment and may be preferred in patients seeking sustained clinical improvement.

Keywords: Platelet-rich plasma; Corticosteroid injection; Chronic plantar fasciitis; Heel pain; Visual Analogue Scale; AOFAS Ankle-Hindfoot Score; Functional outcome; Regenerative therapy.

INTRODUCTION

Plantar fasciitis is the most common cause of chronic plantar heel pain, accounting for approximately 80% of cases encountered in clinical practice. It affects nearly 10% of the general population during their lifetime and is particularly prevalent among individuals aged 40–60 years, athletes, military personnel, and those whose occupations involve prolonged standing or walking. The condition imposes a substantial socioeconomic burden by causing pain, impaired mobility, reduced work productivity, and diminished quality of life.[1,2]

The plantar fascia is a thick fibrous aponeurosis extending from the medial tubercle of the calcaneus to the proximal phalanges, where it plays a critical role in maintaining the medial longitudinal arch of the foot and facilitating the windlass mechanism during gait. Repetitive mechanical loading, microtrauma, obesity, pes planus, pes cavus, tight Achilles tendon, prolonged standing, and excessive running are recognized risk factors for plantar fasciitis. Although traditionally regarded as an inflammatory condition, histopathological studies have demonstrated collagen degeneration, fibroblast proliferation,

angiofibroblastic hyperplasia, and disorganized collagen fibers with minimal inflammatory cell infiltration. Consequently, plantar fasciitis is increasingly considered a degenerative fasciosis rather than a purely inflammatory disorder.[3–5]

Patients typically present with sharp pain over the medial plantar aspect of the heel, which is most severe during the first steps taken in the morning or after prolonged periods of rest. The pain often improves temporarily with activity but worsens following prolonged weight-bearing. Diagnosis is primarily clinical and is based on a detailed history and localized tenderness over the medial calcaneal tubercle. Imaging modalities such as ultrasonography and magnetic resonance imaging (MRI) are reserved for atypical cases, recalcitrant symptoms, or to exclude alternative diagnoses. Ultrasonography commonly demonstrates plantar fascia thickening greater than 4 mm, hypoechogenicity, and perifascial edema.[6,7]

Conservative treatment remains the cornerstone of management and includes activity modification, stretching exercises for the plantar fascia and Achilles tendon, nonsteroidal anti-inflammatory drugs (NSAIDs), orthotic devices, heel pads, night splints, weight reduction, and physiotherapy. Approximately 80–90% of patients experience symptom resolution within one year with non-operative treatment. However, a significant proportion continue to have persistent pain despite comprehensive conservative measures and require more advanced interventions.[8,9]

Among injectable therapies, corticosteroid injection has long been considered an effective treatment for refractory plantar fasciitis. Corticosteroids suppress inflammatory mediators, reduce pain rapidly, and improve short-term function. Nevertheless, several studies have reported recurrence of symptoms and potential complications including plantar fascia rupture, heel fat pad atrophy, infection, skin depigmentation, and injury to surrounding neurovascular structures. These limitations have prompted the search for safer and more durable biological treatment options.[10–12]

Platelet-rich plasma (PRP) has emerged as a promising regenerative therapy in musculoskeletal medicine. PRP is an autologous blood product obtained by centrifugation, resulting in a platelet concentration several times higher than baseline. Activated platelets release numerous growth factors, including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), insulin-like growth factor-1 (IGF-1), epidermal growth factor (EGF), and fibroblast growth factor (FGF). These bioactive molecules stimulate angiogenesis, fibroblast proliferation, collagen synthesis, extracellular matrix remodeling, and tissue repair. Because plantar fasciitis is primarily a degenerative process, PRP offers a biological rationale by targeting the underlying pathology rather than merely suppressing symptoms.[13–15]

Over the past decade, numerous randomized controlled trials and systematic reviews have compared PRP with corticosteroid injections for chronic plantar fasciitis. While corticosteroid injections generally provide superior short-term pain relief, PRP has demonstrated greater improvement in pain scores, functional outcomes, and patient satisfaction during intermediate- and long-term follow-up, with fewer treatment-related complications. However, variations in PRP preparation methods, injection techniques, rehabilitation protocols, and outcome measures have resulted in inconsistent findings across studies, necessitating further prospective comparative investigations.[16–19]

Considering the increasing use of biological therapies in orthopaedic practice and the need for evidence-based treatment strategies, this prospective comparative study was designed to evaluate and compare the clinical effectiveness of corticosteroid and platelet-rich plasma injections in patients with chronic plantar fasciitis. The study aims to assess pain relief, functional improvement, and overall treatment outcomes, thereby contributing to the growing body of literature regarding the optimal injectable therapy for chronic plantar fasciitis.

MATERIALS AND METHODS

This prospective comparative clinical study was conducted at a tertiary care hospital for a period of one year from September 2023 to February 2024, to evaluate and compare the clinical effectiveness of platelet-rich plasma (PRP) injection and corticosteroid injection in the treatment of patients with chronic plantar fasciitis. A total of 60 consecutive patients diagnosed with chronic plantar fasciitis were enrolled in the study and followed prospectively for a period of six months. Patients were randomly allocated into two equal groups using a computer-generated randomization sequence. Group A consisted of 30 patients who received a single ultrasound-guided injection of autologous platelet-rich plasma, whereas Group B consisted of 30 patients who received a single ultrasound-guided corticosteroid injection. All patients underwent detailed clinical evaluation before treatment and were followed at predetermined intervals throughout the study period.

Patients aged more than 18 years with clinically diagnosed chronic plantar fasciitis of more than three months duration, localized tenderness over the medial calcaneal tubercle, characteristic heel pain during the first steps in the morning or after prolonged rest, and failure of conservative treatment including activity modification, stretching exercises, footwear modification, physiotherapy, and analgesics for at least four weeks were included in the study. Patients who had received previous injection therapy within the preceding six months, had a history of calcaneal fracture, foot trauma or surgery,

other causes of heel pain such as tarsal tunnel syndrome, calcaneal stress fracture or inflammatory arthropathy, systemic inflammatory or connective tissue disorders, poorly controlled diabetes mellitus, bleeding disorders or anticoagulant therapy, local infection at the injection site, pregnancy, or inability to comply with follow-up were excluded.

Baseline evaluation included detailed demographic data such as age, sex, occupation, duration of symptoms, affected side, body mass index, and relevant medical history. Clinical outcomes were assessed using the Visual Analogue Scale (VAS) for pain and the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score. Pain intensity was assessed on a 10-point VAS, where 0 represented no pain and 10 represented the worst imaginable pain. Functional outcome was assessed using the AOFAS Ankle-Hindfoot Score, which evaluates pain (40 points), function (50 points), and alignment (10 points), with a maximum possible score of 100 indicating optimal function.

For patients in the PRP group, approximately 20 mL of peripheral venous blood was collected under strict aseptic precautions into sterile tubes containing acid citrate dextrose (ACD-A) as an anticoagulant and processed immediately using a standardized double-spin centrifugation technique. The first centrifugation (soft spin) was performed at 1,500 rpm for 10 minutes to separate the plasma and platelet components from the red blood cells. The plasma fraction was then transferred to another sterile tube and subjected to a second centrifugation (hard spin) at 3,500 rpm for 10 minutes to obtain concentrated platelet-rich plasma. Approximately 3–5 mL of PRP was prepared and used immediately without exogenous activation. Posterior tibial nerve block was performed prior to plantar fascia injection.

All injections in both groups were performed under real-time ultrasound guidance using a high-frequency linear transducer (6–13 MHz) under strict aseptic precautions. Patients were positioned prone with the affected foot extending beyond the edge of the examination table and the ankle maintained in a neutral position. After skin preparation with povidone-iodine solution and sterile draping, the plantar fascia was identified in longitudinal and transverse planes. The thickened hypoechoic portion at the medial calcaneal origin of the plantar fascia was localized. Using an in-plane medial approach in transverse plane, a 23-gauge spinal needle was advanced medial to lateral under continuous ultrasound visualization until the needle tip reached the diseased portion of the plantar fascia near its calcaneal attachment. In the PRP group, approximately 3–5 mL of PRP was injected slowly while observing uniform distribution of the injectate within the degenerative plantar fascia.

Patients in the corticosteroid group received a single ultrasound-guided injection consisting of 40 mg (1 mL) of triamcinolone acetonide mixed with 4 mL of 2% lignocaine. Using the same ultrasound-guided technique, the needle was advanced to the perifascial region adjacent to the plantar fascia at its calcaneal origin, and the corticosteroid solution was injected slowly under direct visualization while avoiding intravascular injection and injury to adjacent neurovascular structures.

Following the injection procedure, all patients were observed for approximately 30 minutes for any immediate adverse reactions before discharge. Patients in both groups were advised to avoid strenuous activities, prolonged standing, running, and jumping for 72 hours. A standardized rehabilitation protocol consisting of plantar fascia stretching exercises, Achilles tendon stretching, calf muscle strengthening exercises, use of cushioned footwear or silicone heel pads, and gradual return to normal activities was prescribed for all participants. Patients in the PRP group were specifically instructed to avoid non-steroidal anti-inflammatory drugs (NSAIDs) for two weeks following the injection to prevent interference with platelet activation and tissue healing, whereas paracetamol was permitted as rescue analgesia in both groups.

Patients were followed up at baseline, one month, three months, and six months after the intervention. At each follow-up visit, pain intensity was assessed using the VAS, and functional outcome was evaluated using the AOFAS Ankle-Hindfoot Score. Patient satisfaction, duration of symptom relief, and treatment-related complications, including persistent pain, infection, skin changes, plantar fascia rupture, fat pad atrophy, allergic reactions, and neurovascular injury, were also documented.

The primary outcome measure of the study was improvement in pain as assessed by the Visual Analogue Scale. Secondary outcome measures included improvement in AOFAS Ankle-Hindfoot Score, patient satisfaction, duration of symptom relief, and occurrence of treatment-related complications.

Statistical analysis was performed using IBM SPSS Statistics software (Version XX.X; IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were expressed as frequencies and percentages. Comparisons between groups were performed using the independent-samples t-test, while within-group comparisons were analyzed using the paired t-test. Categorical variables were analyzed using the Chi-square test or Fisher's exact test, and repeated-measures analysis of variance (ANOVA) was used to assess changes in outcome measures over the follow-up period. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Patient Demographics and Baseline Characteristics

A total of 60 patients diagnosed with chronic plantar fasciitis were included in the study and were divided into two groups of 30 patients each. Group A received platelet-rich plasma (PRP) injection, while Group B received corticosteroid injection. The mean age of patients in the PRP group was 46.8 ± 8.7 years, while the corticosteroid group had a mean age of 47.3 ± 9.2 years. The difference in age distribution between the two groups was not statistically significant (p = 0.82). There was a female predominance in both groups. The PRP group consisted of 18 females (60%) and 12 males (40%), whereas the corticosteroid group included 17 females (56.7%) and 13 males (43.3%). The difference in gender distribution was statistically insignificant (p = 0.79). The mean duration of symptoms was 8.2 ± 2.6 months in the PRP group and 8.5 ± 2.9 months in the corticosteroid group, with no statistically significant difference between groups (p = 0.67).

Table 1: Baseline Demographic Characteristics

Parameter	PRP Group (n=30)	Corticosteroid Group (n=30)	p-value
Mean age (years)	46.8 ± 8.7	47.3 ± 9.2	0.82
Male/Female	12/18	13/17	0.79
Duration of symptoms (months)	8.2 ± 2.6	8.5 ± 2.9	0.67

Clinical Outcome Assessment

Visual Analogue Scale (VAS) Score

Both groups demonstrated significant improvement in pain scores following injection therapy. In the PRP group, the mean VAS score improved from 7.8 ± 0.9 at baseline to 2.1 ± 1.0 at 6 months. In the corticosteroid group, the mean VAS score improved from 7.7 ± 1.0 at baseline to 3.4 ± 1.2 at 6 months. Although corticosteroid injection demonstrated greater early pain relief at 1 month, the PRP group showed superior improvement at 3 and 6 months. The difference in VAS scores at 6 months was statistically significant (p < 0.001).

Table 2: Comparison of VAS Scores Between Groups

Follow-up	PRP Group	Corticosteroid Group	p-value
Baseline	7.8 ± 0.9	7.7 ± 1.0	0.68
1 month	4.2 ± 1.1	3.1 ± 1.0	<0.001
3 months	2.8 ± 1.0	3.5 ± 1.1	0.01
6 months	2.1 ± 1.0	3.4 ± 1.2	<0.001

AOFAS Ankle-Hindfoot Score

Both groups showed significant improvement in functional outcome scores after treatment.

The mean AOFAS score in the PRP group improved from 54.6 ± 7.5 pre-treatment to 89.2 ± 6.8 at 6 months. The corticosteroid group improved from 55.1 ± 7.2 pre-treatment to 82.6 ± 7.4 at 6 months.The improvement in AOFAS score was significantly higher in the PRP group at the final follow-up (p < 0.001).

Table 3: Comparison of AOFAS Scores Between Groups

Follow-up	PRP Group	Corticosteroid Group	p-value
Baseline	54.6 ± 7.5	55.1 ± 7.2	0.79
1 month	70.4 ± 6.9	74.5 ± 7.1	0.03
3 months	82.6 ± 7.2	78.4 ± 7.5	0.03
6 months	89.2 ± 6.8	82.6 ± 7.4	<0.001

Patient Satisfaction

At 6 months follow-up, patient satisfaction was assessed. In the PRP group, 26 patients (86.7%) reported excellent or good outcomes compared to 20 patients (66.7%) in the corticosteroid group. The difference in patient satisfaction was statistically significant (p = 0.04).

Table 4: Patient Satisfaction at 6 Months

Outcome	PRP Group	Corticosteroid Group
Excellent/Good	26 (86.7%)	20 (66.7%)
Fair/Poor	4 (13.3%)	10 (33.3%)

Complications

No major complications were observed in either group. In the corticosteroid group, **2 patients (6.7%)** reported transient post-injection pain, which resolved within a few days.

In the PRP group, **3 patients (10%)** experienced temporary discomfort at the injection site during the initial week following injection. No cases of infection, plantar fascia rupture, or fat pad atrophy were observed during the 6-month follow-up period.

Summary of Results

Both PRP and corticosteroid injections were effective in reducing pain and improving functional outcomes in patients with chronic plantar fasciitis. Corticosteroid injection provided faster short-term pain relief, particularly during the first month after treatment. However, PRP demonstrated significantly better pain reduction and functional improvement at 3 and 6 months, suggesting a more sustained therapeutic effect.

DISCUSSION

Plantar fasciitis is one of the most common causes of chronic heel pain and significantly affects mobility, daily activities, and quality of life. Although most patients improve with conservative management, a subset of patients with persistent symptoms require injectable therapies. Corticosteroid injection has traditionally been used because of its rapid analgesic and anti-inflammatory effects; however, concerns regarding recurrence and potential complications have resulted in increasing interest in regenerative therapies such as platelet-rich plasma (PRP). The present prospective comparative study evaluated the clinical effectiveness of PRP and corticosteroid injections in patients with chronic plantar fasciitis over a 6-month follow-up period.

In the present study, both PRP and corticosteroid injections resulted in significant improvement in pain and functional outcomes compared with baseline values. However, PRP demonstrated superior improvement in Visual Analogue Scale (VAS) pain scores and AOFAS ankle-hindfoot scores at the final follow-up of 6 months. These findings suggest that corticosteroid injections provide rapid symptom relief, whereas PRP offers a more sustained therapeutic effect due to its regenerative properties.

The demographic characteristics of both groups were comparable, with no statistically significant differences in age, sex distribution, or duration of symptoms. Plantar fasciitis commonly affects middle-aged adults, particularly women, due to factors such as altered foot biomechanics, increased mechanical loading, obesity, and degenerative changes within the plantar fascia. Previous epidemiological studies have reported similar demographic patterns among patients presenting with chronic plantar heel pain.[20],[21]

The understanding of plantar fasciitis has evolved from an inflammatory disorder to a degenerative condition characterized by collagen disorganization, fibroblast proliferation, myxoid degeneration, and impaired tissue remodeling. Histopathological studies have demonstrated minimal inflammatory cell infiltration, suggesting that the condition represents plantar fasciosis rather than true inflammation.[22],[23] This concept provides a rationale for regenerative treatments such as PRP, which target tissue healing mechanisms rather than only suppressing inflammation.

In the present study, corticosteroid injection demonstrated significant early improvement in pain scores at the 1-month follow-up. Similar findings have been reported by Tsai et al., who demonstrated significant short-term pain reduction following corticosteroid injection in patients with plantar fasciitis.[24] Corticosteroids reduce inflammatory mediators, decrease local edema, and suppress nociceptive activity, resulting in rapid symptomatic improvement. However, their effect may diminish over time because they do not stimulate structural repair of the degenerated plantar fascia.

At 3 and 6 months follow-up, the PRP group showed significantly greater improvement in VAS and AOFAS scores compared with the corticosteroid group. The superior long-term outcome of PRP may be explained by its biological mechanism. Platelets release several growth factors including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), and insulin-like growth factor-1 (IGF-1), which promote fibroblast proliferation, collagen synthesis, angiogenesis, and extracellular matrix remodeling.[25],[26]

The findings of the present study are consistent with Monto, who compared PRP and corticosteroid injections for chronic plantar fasciitis and reported that corticosteroids provided better short-term pain relief, whereas PRP demonstrated significantly better outcomes at longer follow-up periods.[27] The author suggested that PRP may provide improved healing by addressing the underlying degenerative pathology.

Similarly, Shetty et al. reported significantly improved functional outcomes with PRP compared with corticosteroid injection in chronic plantar fasciitis patients. Their randomized controlled trial demonstrated that PRP resulted in superior pain relief and functional recovery at longer follow-up intervals, supporting the role of PRP as a regenerative treatment modality.[28]

A systematic review and meta-analysis by Franceschi et al. concluded that PRP injections provide significant improvement in pain and functional outcomes in chronic plantar fasciopathy, particularly during intermediate and long-term follow-up.[29] The findings of the present study are in agreement with these observations, showing that PRP may require more time to achieve maximum benefit but provides sustained improvement.

The present study demonstrated higher patient satisfaction rates in the PRP group at 6 months. This may be attributed to prolonged pain reduction and improved functional recovery. Additionally, PRP is an autologous treatment with a favorable safety profile. In contrast, corticosteroid injections, especially repeated injections, have been associated with complications including plantar fascia rupture, fat pad atrophy, skin depigmentation, and weakening of connective tissues.[30]

Although PRP showed superior long-term results, corticosteroid injection remains a useful treatment option because of its rapid onset of action, low cost and easy availability. Therefore, corticosteroids may be appropriate for patients requiring immediate symptom relief, whereas PRP may be preferred in patients seeking longer-lasting improvement and biological healing.

The present study has certain limitations. The sample size was limited to 60 patients, and the follow-up period was restricted to 6 months. Long-term recurrence rates and structural changes were not evaluated. Additionally, variations in PRP preparation techniques, platelet concentration, and injection protocols may influence outcomes. Further multicentric randomized controlled trials with larger sample sizes and longer follow-up are required to establish standardized PRP protocols.

Despite these limitations, the present study demonstrates that both PRP and corticosteroid injections are effective in the treatment of chronic plantar fasciitis. Corticosteroid injection provides faster short-term pain relief, whereas PRP provides superior and sustained improvement in pain and functional outcomes at 6 months.

CONCLUSION

Both platelet-rich plasma (PRP) and corticosteroid injections were found to be effective treatment modalities for patients with chronic plantar fasciitis, resulting in significant improvement in pain and functional outcomes.

Corticosteroid injection provided faster short-term pain relief, particularly during the early follow-up period, due to its potent anti-inflammatory and analgesic effects. However, its benefits were less sustained over time.

PRP injection demonstrated superior long-term clinical outcomes, with greater improvement in Visual Analogue Scale (VAS) pain scores and AOFAS ankle-hindfoot functional scores at 6 months follow-up. The regenerative potential of PRP, through the release of multiple growth factors promoting collagen synthesis, tissue repair, and remodeling, may account for its sustained effectiveness.

Therefore, PRP can be considered a safe and effective biological treatment option for chronic plantar fasciitis, particularly in patients who require prolonged symptom relief and functional improvement. Corticosteroid injection remains a valuable option when rapid short-term pain reduction is desired.

Further large-scale randomized controlled studies with longer follow-up periods are required to establish standardized PRP protocols and determine its long-term efficacy compared with corticosteroid therapy.

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