

Effect of Intralesional Platelet-Rich-Plasma versus Corticosteroid Injection on Pain in Patients with Plantar Fasciitis

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ABSTRACT

Objectives: To compare the efficacy of intralesional platelet-rich-plasma versus corticosteroid injection in patients with plantar fasciitis for reduction in pain intensity.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of Physical Medicine and Rehabilitation, Armed Forces Institute of Rehabilitation Medicine, Rawalpindi, Pakistan Mar 2024 to Oct 2024.

Methodology: One hundred patients divided into two equal groups were studied, with one group receiving platelet-rich plasma (PRP) and the other group triamcinolone. Patients aged 18 and 65 years with plantar fasciitis were included, while patients with prior foot surgery/trauma, lumbar radiculopathy, systemic corticosteroid use, autoimmune diseases, or diabetes mellitus were excluded. All patients were assessed at baseline, and 1 month, 3 months, and 6 months post-injection for pain using the Visual Analog Scale (VAS) and functionally with the American Orthopaedic Foot & Ankle Society (AOFAS) score. Patients were also evaluated for plantar fascia thickness at these time intervals.

Results: The median age of the patients was 39.0 (IQR: 18.0) years. Females were in majority, accounting for 64.0% of the cases. Both VAS ($p=0.004$) and AOFAS ($p=0.021$) were significantly improved with PRP versus Triamcinolone at six months, with no difference between the two arms at earlier time intervals, ($p>0.050$). There was no difference between the two arms with regards to plantar fascia thickness at any time interval, ($p=0.050$)

Conclusion: Platelet-Rich-Plasma is associated with a greater improvement in pain scores and functionality when compared to triamcinolone for plantar fasciitis.

Keywords: Corticosteroids, Intralesional Injection, Plantar Fasciitis, Platelet Rich Plasma.

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INTRODUCTION

Plantar fasciitis is a common condition causing heel pain, marked by inflammation of the plantar fascia, a thick tissue band linking the calcaneus to the phalanges.¹ It is a leading cause of heel pain, especially in athletes and those standing or walking for long periods. Chronic stress and tension at the plantar fascia's enthesis can cause microtears, resulting in persistent inflammation.² Affecting about 10% of the population, plantar fasciitis leads to approximately one million patient visits annually.³ Standard treatments include physical therapy, orthotics, and pain management, with corticosteroid injections widely used to reduce inflammation and pain. However, concerns over side effects and symptom recurrence have spurred interest in alternative therapies, and the search for the ideal treatment is on-

going.^{4,5}

Platelet-rich plasma (PRP) therapy has emerged as a potential treatment for musculoskeletal conditions, including plantar fasciitis.⁶ PRP, derived from the patient's blood, contains concentrated growth factors, cytokines, chemokines, and autologous platelets believed to promote healing and reduce inflammation.^{7,8} Unlike corticosteroids, which primarily suppress inflammation, PRP aims to stimulate the body's natural healing, potentially offering longer-lasting relief.⁹ This regenerative approach has garnered interest for treating conditions traditionally managed with corticosteroids, which are associated with significant side-effects.¹⁰

This study aimed to compare the effects of intralesional PRP and corticosteroid injections on pain reduction in plantar fasciitis. It sought to determine whether PRP is a viable and superior alternative for managing pain in this condition. With plantar fasciitis' high prevalence and the limitations of current

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treatments, understanding the comparative effectiveness of these interventions is crucial for clinicians in choosing the optimal modality for managing their patients. As PRP continues to gain traction in regenerative medicine, this research provides insights into its role in plantar fasciitis management, aiding patients and healthcare providers in making informed treatment decisions based on current evidence.

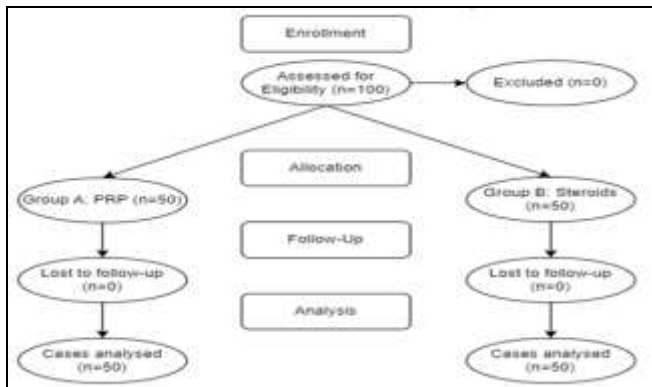


Figure: Patient Flow Diagram

METHODOLOGY

This research protocol was formatted as a quasi-experimental study, which was conducted in the Armed Forces Institute of Rehabilitation Medicine, which is a specialized care center situated in Rawalpindi, Pakistan. The study period spanned from Mar 2024 to Oct 2024. The study sample was based on 100 patients suffering from plantar fasciitis. All participants gave their informed consent, and the study adhered to the ethical guidelines outlined in the Declaration of Helsinki and those established by our institution. Participants were recruited through a consecutive, non-random sampling process. The WHO sample size calculator was used to calculate the sample size keeping a level of significance (α) of 5%, power of the test ($1-\beta$) of 95%, population standard deviation (σ) of 1.035, population variance (σ^2) of 1.071225, test value of the population mean (μ_0) of 1.97 and an anticipated population mean (μ_a) of 2.71, the latter two variables being the mean visual analog scale (VAS) pain score at six months with PRP and corticosteroid injections, respectively, for plantar fasciitis, from Sharma *et al.*¹¹ The sample size was calculated to 43 per group, which was increased to 50.

Inclusion Criteria: All patients aged between 18 and 65 years of age with a clinical (heel

pain of more than six weeks duration with tenderness over the medial calcaneal tuberosity) and ultrasound (increased fascial thickness >4.5 mm with hypoechogenicity)-confirmed diagnosis of plantar fasciitis were included for study.

Exclusion Criteria: Patients with a history of prior foot surgery or trauma, lumbar radiculopathy, systemic corticosteroid use within the past three months, receiving anti-platelet therapy, bleeding diathesis, autoimmune diseases, diabetes mellitus, pregnancy, or known hypersensitivity to corticosteroids or PRP components were excluded.

Upon enrollment, each participant underwent a thorough assessment, which included a complete medical history review and a physical examination. Patients were assigned to each treatment arm in an alternating fashion. Patients in the steroid group received triamcinolone acetonide 20 mg in combination with 2 mL of 0.25% lignocaine in a 5 cm³ syringe which were then injected into the medial calcaneal tuberosity at the point of maximum tenderness using sterile techniques. In the PRP group, a phlebotomy of 30 mL was done with the sample placed in an acid citrate dextrose tube under sterile conditions. Subsequently, the blood was centrifuged at 2000 rpm, and the resulting plasma supernatant and buffy coat layers were collected and subjected to a second centrifugation at 3000 rpm. The upper two-thirds of platelet-poor plasma was discarded, while the lower one-third, containing concentrated platelet-rich plasma and the superficial buffy coat, was injected into the medial calcaneal tuberosity at the site of greatest tenderness. The primary outcome measure was pain, assessed using the Visual Analog Scale (VAS) for pain, with scores ranging from 0 (no pain) to 10 (worst pain imaginable). Secondary outcome included functional improvement as measured by the American Orthopaedic Foot & Ankle Society (AOFAS) score. Baseline measurements were recorded before the intervention, and follow-up assessments were conducted at 1 month, 3 months, and 6 months post-injection. Plantar fascial thickness was also measured via ultrasonography at the aforementioned time periods. All patients were observed for the development of complications (Figure). Data analysis was performed using version 27.0 of the Statistical Package for the Social Sciences (SPSS). The Shapiro-Wilk test was used to assess the normality of the data. For quantitative variables, results were presented as either mean with standard deviation or median with

interquartile range (IQR), depending on normality, while qualitative variables were summarized as frequencies and percentages. The Chi-Square or Fisher's Exact test was employed for comparing qualitative data between groups. Quantitative data were analyzed using either the independent samples t-test or the Mann-Whitney U test. A p -value of ≤ 0.05 was considered statistically significant.

RESULTS

Our study was based on 100 patients with plantar fasciitis divided into two equal groups based on the treatment received. The median age of the sample at the time of enrollment in the study was 39.0 (IQR: 18.0) years. Females were in majority, accounting for 64(64.0%) of the cases. There was a higher frequency of right foot involvement: a total of 58(58.0%) patients had affected right feet. A total of 36(36.0%) patients had developed calcaneal spurs at the time of enrollment. Table-I shows the patient characteristics distributed according to treatment group at the time of enrollment in the study.

Table-I: Patient Characteristics at Enrollment According to Treatment Group (n=100)

Variables	Platelet-Rich-Plasma (n=50)	Triamcinolone (n=50)	p-value
Age (years)	35.5 (IQR: 20.0)	40.5 (IQR: 16.0)	0.277
Gender			
Male	17(34.0%)	19(38.0%)	0.677
Female	33(66.9%)	31(62.0%)	
Side Affected			
Left	23(46.0%)	19(38.0%)	0.418
Right	27(54.0%)	31(62.0%)	
Presence of Calcaneal Spur			
Yes	22(44.0%)	14(28.0%)	0.960
No	28(66.0%)	36(72.0%)	

Table-II shows the outcomes of the study in terms of VAS score, AOFAS score and fascial thickness measured at baseline, and then at one-, three- and six months post-treatment in each treatment arm. Both VAS and AOFAS were significantly improved with PRP versus Triamcinolone at six months, while there was no statistical difference between the two treatment modalities with regards to plantar fascial thickness measured at the different time intervals. No complications were seen in our study.

DISCUSSION

This study sought to compare the effectiveness of intralesional PRP versus corticosteroid (triamcinolone) injections in alleviating pain and improving functionality in patients suffering from plantar fasciitis. Both treatment modalities are widely utilized for managing this condition, but our results indicate

that PRP offers superior long-term outcomes concerning pain relief and functional improvement, as evidenced by the VAS and AOFAS scores.

Our findings align with previous studies that highlight PRP's regenerative properties. At the six-month follow-up, patients in the PRP group experienced significantly greater pain reduction compared to the triamcinolone group, ($p=0.004$). Shafaat et al compared PRP to methylprednisolone, as opposed to triamcinolone used in the current study, and found that the former had better outcomes in terms of pain relief, as measured by VAS score, ($p<0.001$).¹² This indicates that PRP maintains its benefit despite the type of corticosteroid used. Furthermore, Ashraf et al also compared PRP to triamcinolone and reported that the benefit in pain relief (as interpreted by VAS score) of PRP was greater than corticosteroids even post-twelve months of treatment, ($p<0.05$), indicating that the benefit if PRP can last for periods even longer than six months, as seen in the present study.¹³ Additionally, Das et al reported in their study that while corticosteroids were associated with a better initial response in terms of pain, the improvement was short-lived, and PRP offered better control in the long-term.¹⁴ Conversely, Rahman et al reported that there was no difference between the two modalities in terms of improvement of pain scores and return of function.¹⁵ This difference between results could have possibly occurred due to the inclusion of previously heavily treated cases in the latter study. The improvement in pain can be attributed to PRP's biological mechanism, which promotes tissue healing by releasing growth factors and promoting angiogenesis at the site of injection. In contrast, corticosteroids provide only symptomatic relief by reducing inflammation but do not facilitate long-term healing. This distinction in the mechanism of action likely explains the sustained improvement seen with PRP over time.¹⁶

In the present study, functional outcomes, measured via the AOFAS score, also favoured PRP, specifically at the six-month mark ($p=0.021$). Hurley et al, in their study, also reported that benefit of PRP over corticosteroids was seen six months after treatment, and continued up to twelve months post-injection, while no difference was seen between the two treatments in the first three months,¹⁷ a conclusion that was also shared by Khurana et al and Kumar et al.^{18,19} The improvement in AOFAS scores with PRP correlates with the better pain outcomes and supports

Table-II: Baseline Visual Analogue Scale, American Orthopaedic Foot & Ankle Society Scale and Plantar Fascial Thickness and outcomes of Treatment at One, Three And Six months (n=100)

Variables	PRP (n=50)	Triamcinolone (n=50)	p-value
Visual Analogue Scale at Baseline	8.0 (IQR: 3.0)	8.0 (IQR: 2.0)	0.207
Visual Analogue Scale at One Month	6.0 (IQR: 3.0)	7.0 (IQR: 3.0)	0.191
Visual Analogue Scale at Three Months	4.0 (IQR: 4.0)	5.0 (IQR: 2.0)	0.056
Visual Analogue Scale at Six Months	2.0 (IQR: 3.0)	3.0 (IQR: 4.0)	0.004
American Orthopaedic Foot & Ankle Society Scale at Baseline	63.0 (IQR: 22.0)	65.0 (IQR: 24.0)	0.434
American Orthopaedic Foot & Ankle Society Scale at One Month	58.0 (IQR: 22.0)	54.0 (IQR: 18.0)	0.607
American Orthopaedic Foot & Ankle Society Scale at Three Months	34.0 (IQR: 31.0)	39.5 (IQR: 21.0)	0.191
American Orthopaedic Foot & Ankle Society Scale at Six Month	16.5 (IQR: 27.0)	23.0 (IQR: 29.0)	0.021
Plantar Fascial Thickness (mm) at Baseline	4.75 (IQR: 0.60)	4.90 (IQR: 1.10)	1.000
Plantar Fascial Thickness (mm) at One Month	4.00 (IQR: 0.90)	4.10 (IQR: 1.20)	0.473
Plantar Fascial Thickness (mm) at Three Months	2.95 (IQR: 1.00)	3.15 (IQR: 1.20)	0.684
Plantar Fascial Thickness (mm) at Six Months	2.70 (IQR: 0.60)	2.90 (IQR: 1.10)	0.321

the hypothesis that PRP not only reduces pain but also aids in restoring mobility and overall foot function. Although the differences between the groups at one and three months were not statistically significant, the trend of gradual improvement with PRP suggests its longer-lasting benefits compared to corticosteroids. The slight lag in functional recovery may be explained by the time required for PRP-induced tissue regeneration to manifest fully, as compared to the more immediate but short-lived effects of corticosteroids.²⁰

Interestingly, no significant difference was found between the two treatment groups in terms of plantar fascial thickness at any of the follow-up points, however, the thickness was lower with PRP than with triamcinolone, with the difference increasing as follow-up time increased. This finding suggests that while both treatments reduce plantar fascial thickness, the difference increases only over a longer follow-up period, and it may be more appropriate to observe the patients over a longer follow-up period, to see if this difference achieves statistical significance. Studies such as Sharma et al have previously noted that there was a greater reduction in plantar fascial thickness with PRP than corticosteroids, ($p<0.050$).¹¹ More research is required on this aspect of our study before concrete conclusions can be drawn.

While PRP injections represent a promising modality for management of cases of plantar fasciitis, it should be noted that the procedure is not without limitations. It is a comparatively expensive treatment modality, with the possibility of occurrence of local side-effects such as pain and infection, albeit no complications were seen in our study.^{21,22}

LIMITATION OF STUDY

The study has several limitations. First, the non-randomized allocation of patients to the treatment arms could have introduced selection bias. Second, the follow-up duration of six months, while sufficient for assessing

medium-term outcomes, does not provide insight into the long-term durability of the effects of PRP or corticosteroid injections. Additionally, the study was conducted at a single center, which may limit the generalizability of the results to other populations or settings. Finally, the subjective nature of VAS and AOFAS scoring, though widely accepted, introduces a degree of patient-reported bias, which could influence the outcome data.

CONCLUSION

PRP injections provide better long-term pain relief and functional improvement than corticosteroid injections in patients with plantar fasciitis, with PRP showing superior outcomes concerning pain and functionality at the six-month follow-up. Future randomized controlled trials with longer follow-up periods are recommended to confirm these findings and further explore the long-term efficacy and safety of PRP in managing plantar fasciitis.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

WL & OJK: Data acquisition, data analysis, critical review, approval of the final version to be published.

MAK & MZN: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SAA & AAA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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