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Platelet-Rich Plasma (PRP) Injections for Chronic Plantar Fasciitis: A Study on Efficacy and Functional Improvement

Tribhuwan Narayan Singh[1], Tarun Singh Thakur[2], Himanshy Rai[3], Mayank Pratap Singh[3]*, Ranjeet Singh Dohare[4], Jagmohan Singh Dhakar[5]

[1]Prof and Head, Dept of Orthopedics, Government Medical College, Datia, India
[2]Assistant Professor, Dept of Orthopedics, CIMS Bilaspur, India
[3]Senior Resident, Dept of Obstetrics and Gynecology, Government Medical College, Datia, India
[4]PG 1, Dept of Orthopedics, Government Medical College, Datia, India
[5]Assistant Professor (Statistics), Department of Community Medicine, Virendra Kumar Sakhlecha Govt Medical College, Neemuch, India

***Address for Correspondence:** Dr. Mayank Pratap Singh, Senior Resident, Dept of Orthopedics, Government Medical College, Datia, India
E-mail: mayanksingh686@gmail.com

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ABSTRACT

Background: Plantar fasciitis (PF), a common cause of heel pain, often resists conservative treatments and poses risks with surgery. Platelet-rich plasma (PRP) injections offer a regenerative, promising alternative, but more evidence is needed to confirm their effectiveness.

Methods: This prospective study was conducted within the Orthopedics Department of a tertiary-level hospital. A total of 50 patients, aged 50–65 years, presenting with unilateral chronic plantar fasciitis who had not responded to conservative treatments, were included. PRP injections were administered under aseptic conditions. Pain and functional outcomes were evaluated using the Visual Analog Scale (VAS) and the Functional Activity Disability Index (FADI) at baseline, 1 week, 2 weeks, 1 month, 3 months, and 6 months post-injection.

Results: PRP injections demonstrated a statistically significant reduction in VAS scores, with a 73% decrease in pain levels noted by the six-month follow-up ($p<0.001$). FADI scores exhibited significant improvement at all follow-up time points ($p<0.001$), with sustained enhancements observed at the six-month evaluation. No significant differences were detected between the one-month and three-month follow-ups for both VAS and FADI scores ($p=0.520$).

Conclusion: PRP injections are associated with significant pain relief and functional improvement in patients suffering from chronic plantar fasciitis. These findings support the use of PRP as an effective non-surgical treatment alternative, particularly for patients who do not respond adequately to conservative therapies. Further studies employing standardized protocols are necessary to validate the long-term efficacy and safety of this treatment modality.

Key-words: VAS, Planter Fasciitis, Functional Activity Disability Index (FADI), Plantar heel pain

INTRODUCTION

Plantar heel pain, often linked to plantar fasciitis, is a prevalent source of foot discomfort affecting individuals across various age groups and activity levels.

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The condition is marked by pain localized at the insertion of the plantar fascia on the calcaneus, which can significantly impair daily activities and reduce quality of life [1,2]. Studies demonstrate that plantar fasciitis accounts for a substantial proportion of heel pain cases, with risk factors including obesity, prolonged standing, and specific biomechanical abnormalities [3].

The economic burden of managing plantar fasciitis in the United States is substantial, with costs stemming from both conservative and interventional treatments [4]. Chronic plantar heel pain adversely affects health-

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related quality of life, influencing mobility, occupational productivity, and mental well-being [5]. Although conservative treatments such as stretching exercises, orthotics, and physical therapy are commonly employed, many cases necessitate advanced interventions [6].

Surgical release of the plantar fascia is occasionally indicated for refractory cases; however, computational studies suggest that both partial and total releases may alter foot biomechanics, potentially resulting in adverse outcomes [7]. While corticosteroid injections are frequently used for symptom relief, they carry risks such as plantar fascia rupture and fat pad atrophy, warranting careful consideration [8]. Emerging therapies, including autologous blood injections, have shown promise as safer alternatives, with studies indicating favorable outcomes compared to corticosteroids [9].

MATERIALS AND METHODS

Study Design- This was a prospective study conducted in the Orthopedics Department of a tertiary-level hospital after obtaining ethical clearance at govt medical college datia. The study aimed to evaluate the efficacy of Platelet-Rich Plasma (PRP) injections in patients with unilateral plantar fasciitis.

Inclusion and Exclusion Criteria- Patients aged between 50–65 years with unilateral plantar fasciitis who had failed prolonged conservative treatment and provided informed consent were included. Patients were excluded if they had a history of steroid injection within the last 3 months, prior foot surgery, any foot deformity, bilateral disease, neuropathy, body mass index (BMI)>30, gout, infection, cardiovascular, renal, or hepatic diseases, pregnancy or breastfeeding, spondyloarthropathy, complex regional pain syndrome, or if they declined to participate.

Sample Size and Recruitment- Eighty patients were initially enrolled, but 25 declined participation, and 5 were lost to follow-up. A total of 50 patients who met the inclusion criteria and provided informed consent completed the study.

Intervention- All patients received a single dose of PRP injection into the plantar fascia under aseptic conditions. PRP was prepared by collecting blood in acidified citrate dextrose vials, followed by a two-phase centrifugation process. During the soft spin phase, plasma was separated and transferred to a plain vial. The hard spin phase involved discarding the upper two-thirds of the plasma, with the remaining platelet-rich plasma collected in a sterile vial for injection. After the injection, patients were prescribed a 3-day course of antibiotics and analgesics and followed a structured physiotherapy regimen.

Outcome Measures and Follow-Up- Pain and functional activity were assessed using the Visual Analog Scale (VAS) and the Functional Activity Disability Index (FADI) at baseline (pre-injection) and at 1 week, 2 weeks, 6 weeks, 1 month, 3 months, and 6 months post-injection. Patients were observed in the daycare facility following the procedure and systematically followed up for 6 months.

Statistical Analysis- Data collected were statistically analyzed using Jamovi v2.3.28 software. Quantitative data were expressed as mean and standard deviation. The Shapiro-Wilk test was used to test the assumption of normality. The Friedman test was applied to assess differences in VAS and FADI scores across time points, and significant differences ($p<0.05$) were noted.

RESULTS

The average age of participants was 59.7 years, with a standard deviation of 9.67 years. The data deviated from a normal distribution, violating the assumptions of normality ($W=0.953$, $p=0.047$).

Fig. 1: After soft spin plasma is collected

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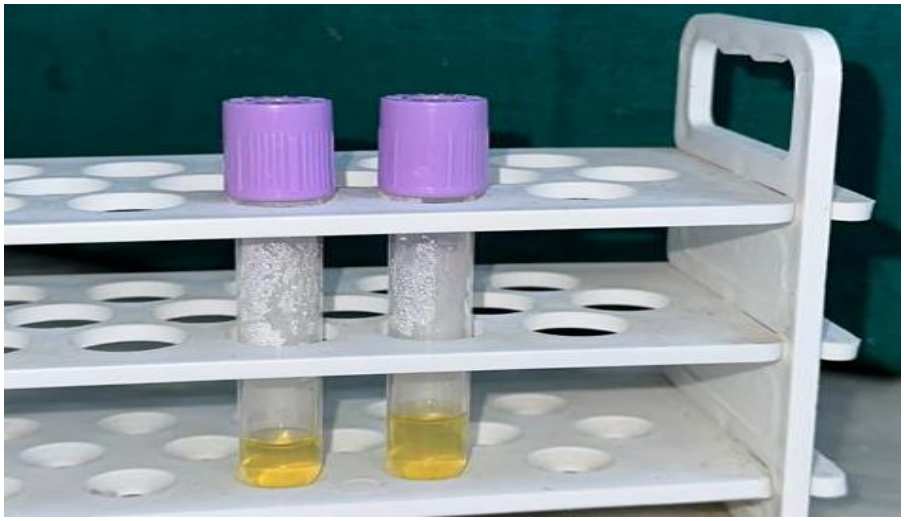

Fig. 2: Platelet-Rich Plasma (PRP) is collected

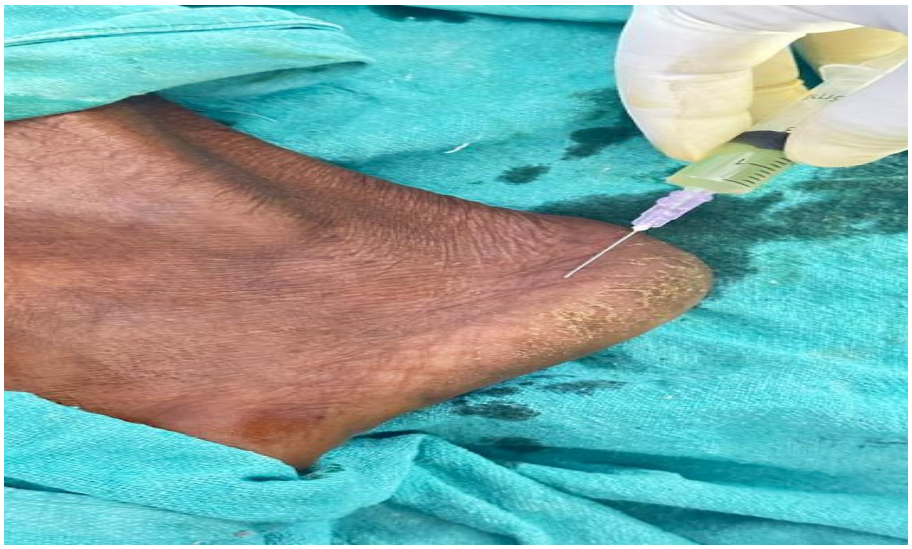

Fig. 3: PRP is injected in plater fascia

As observed in Table 1, VAS scores showed a noticeable decline at every post-injection time point when compared to the pre-injection scores (Pre-Injection: 6.38±1.30, 1 Week: 5.38±1.26, 2 Weeks: 4.40±1.45, 1 Month: 3.58±1.41, 3 Months: 3.56±1.43, 6 Months: 2.58±1.50), suggesting that the pain relief was particularly significant in the weeks following the intervention. However, there was no notable difference between the one-month and three-month VAS scores (p=0.520), indicating that the pain relief remained stable during this period. VAS scores varied considerably over time, with clear changes observed across the different time points (χ^2=246, df=5, p<0.001).

Table 1: Repeated measures ANOVA for VAS Scores

Time Points Comparison	Mean±SD	X^2	p-value
Pre-Injection vs 1 Week	6.38±1.30	21.674	< 0.001
Pre-Injection vs 2 Weeks	6.38±1.30	46.568	< 0.001
Pre-Injection vs 1 Month	6.38±1.30	72.964	< 0.001
Pre-Injection vs 3 Months	6.38±1.30	73.607	< 0.001
Pre-Injection vs 6 Months	6.38±1.30	107.085	< 0.001

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1 Week vs 2 Weeks	5.38±1.26	24.893	< 0.001
1 Week vs 1 Month	5.38±1.26	51.289	< 0.001
2 Weeks vs 1 Month	4.40±1.45	26.396	< 0.001
1 Month vs 3 Months	3.58±1.41	0.644	< 0.520
3 Months vs 6 Months	3.56±1.43	33.477	< 0.001

Table compares the VAS scores across different time intervals: pre-injection, 1 week, 2 weeks, 1 month, 3 months, and 6 months.
X^2 values represent the chi-square statistic for each comparison.
p-value <0.05 was considered to be statistically significant

Table 2 reflects a consistent improvement of FADI scores at each post-injection time point compared to pre-injection scores (Pre-Injection: 77.4±10.9, 1 Week: 82.4±9.2, 2 Weeks: 86.1±8.0, 1 Month: 89.2±7.5, 3 Months: 91.2±6.6, 6 Months: 92.6±5.9). This improvement in functional activity appeared to continue steadily throughout the study, with no significant difference between the three-month and six-month FADI scores (p=0.520), suggesting that the benefits in functionality were sustained over the long term. FADI scores also exhibited noticeable changes over time, with significant improvements observed across the various time points (χ^2=231, df=5, p<0.001).

Table 2: Repeated measures ANOVA for FADI Scores

Time Points Comparison	**Mean±SD**	**X^2**	**p-value**
Pre-Injection vs 1 Week	77.4±10.9	9.50	< 0.001
Pre-Injection vs 2 Weeks	77.4±10.9	19.18	< 0.001
Pre-Injection vs 1 Month	77.4±10.9	28.68	< 0.001
Pre-Injection vs 3 Months	77.4±10.9	38.18	< 0.001
Pre-Injection vs 6 Months	77.4±10.9	44.63	< 0.001
1 Week vs 2 Weeks	82.4±9.2	9.69	< 0.001
1 Week vs 1 Month	82.4±9.2	19.18	< 0.001
1 Week vs 3 Months	82.4±9.2	28.68	< 0.001
1 Week vs 6 Months	82.4±9.2	35.14	< 0.001
2 Weeks vs 1 Month	86.1±8.0	9.50	< 0.001
2 Weeks vs 3 Months	86.1±8.0	18.99	< 0.001
2 Weeks vs 6 Months	86.1±8.0	25.45	< 0.001
1 Month vs 3 Months	89.2±7.5	9.50	< 0.001
1 Month vs 6 Months	89.2±7.5	15.95	< 0.001
3 Months vs 6 Months	91.2±6.6	6.46	< 0.001

Shows the results of the repeated measures analysis of variance (ANOVA) for the Functional Activity Disability Index (FADI) scores at different time points
It compares the FADI scores before and after the intervention, at one week, 2 weeks, one month, 3 months, and 6 months.
X^2 value represents the chi-square statistic for each comparison
p<0.05 was considered to be statistically significant

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DISCUSSION

Plantar fasciitis (PF) is a common and challenging condition that significantly impacts daily activities and quality of life. While conservative treatments such as physical therapy, NSAIDs, and corticosteroid injections offer short-term relief, their efficacy in chronic cases is often limited. PRP, a biologically enriched serum containing concentrated platelets and growth factors, has emerged as a promising alternative due to its ability to promote tissue repair and healing [10-14].

The results of this study demonstrate that PRP therapy provides substantial and sustained pain relief in PF. Visual Analog Scale (VAS) scores significantly decreased at all post-injection time points compared to baseline, with the most substantial improvements observed in the first month after treatment (χ^2=246, p<0.001). These findings align with Mohammed *et al*. who reported that PRP injections were superior to corticosteroid injections in reducing pain and improving function at 3- and 6-month follow-ups [15]. While our study observed no significant differences in pain scores between the first and third months (p=0.520), the six-month scores indicated lasting relief, supporting PRP's long-term efficacy.

Functional outcomes, measured by the Functional Activity Disability Index (FADI), also improved significantly over time (χ^2=231, p<0.001). The most rapid improvements were noted in the initial weeks post-treatment, consistent with findings by Kothari *et al*. who reported a 73% reduction in VAS scores and significant increases in functional scores six months after a single PRP dose [16]. In our study, no significant differences were observed between three- and six-month FADI scores (p=0.520), suggesting that PRP's benefits stabilize after three months.

Comparatively, Atzmon *et al.* found that PRP provided shorter recovery times and fewer complications than Partial Plantar Fasciotomy (PPF), making it a safer, non-surgical alternative. While PPF yielded slightly better Roles-Maudsley Scale (RM) scores at one year, PRP demonstrated equivalent pain relief with fewer adverse effects [17]. Similarly, Huang *et al.* [18] highlighted PRP's long-term superiority over corticosteroids in treating PF and elbow epicondylitis, though evidence quality remains low due to methodological inconsistencies across studies [19].

Despite these promising findings, the lack of standardized PRP preparation protocols and variable study designs limits the comparability of results across trials. Toy *et al.* emphasized similar limitations in their comparison of PRP, corticosteroid, and ozone injections for sinus tarsi syndrome, noting no significant differences between treatments at six months [19]. Additionally, recent literature highlights PRP's potential benefits for related conditions like Achilles tendinopathy and diabetic foot ulcers but underscores the need for higher-quality evidence to confirm its efficacy [20,21].

CONCLUSIONS

The study demonstrates that Platelet-Rich Plasma is an effective treatment for chronic plantar fasciitis (PF), offering significant pain reduction and functional improvement, particularly in the initial months following treatment. The results showed a substantial decrease in Visual Analog Scale (VAS) pain scores and significant enhancements in Functional Activity Disability Index (FADI) scores over the six-month follow-up period. Notably, the improvements in pain and function were sustained at six months, highlighting the long-term efficacy of PRP in managing chronic PF. Although PRP demonstrated promising results in this study, the lack of standardized protocols for PRP preparation and injection limits its broader application and comparison with other treatment modalities. Therefore, further research is necessary to standardize PRP protocols and validate their long-term safety and effectiveness in larger, diverse populations, ultimately establishing PRP as a primary treatment option for chronic PF, particularly in patients unresponsive to conservative therapies.

CONTRIBUTION OF AUTHORS

Research concept- Mayank Pratap Singh, Ranjeet Singh Dohare

Research design- Tarun Singh Thakur, Himanshy Rai

Supervision- Tribhuwan Narayan Singh

Materials-Tarun Singh Thakur, Himanshy Rai

Data collection-Mayank Pratap Singh, Ranjeet Singh Dohare

Data analysis and Interpretation- Jagmohan Singh Dhakar

Literature search- Mayank Pratap Singh, Ranjeet Singh Dohare

Writing article-Tarun Singh Thakur, Himanshy Rai

Critical review- Tribhuwan Narayan Singh
Article editing-Mayank Pratap Singh, Ranjeet Singh Dohare
Final approval- Tribhuwan Narayan Singh

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