



COMPARATIVE PROSPECTIVE STUDY OF FUNCTIONAL OUTCOME OF PLANTAR FASCIITIS MANAGED BY MULTIPLE PUNCTURE TECHNIQUE AND LOCAL PLATELET RICH PLASMA INJECTION

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ABSTRACT

Background: Plantar fasciitis is the leading cause of plantar heel pain and is now understood as a degenerative fasciosis rather than an inflammatory condition, marked by collagen disruption and fascial thickening. It affects 1–3% of the population, particularly middle-aged adults, females, individuals with high BMI, and those with prolonged standing or mechanical overload. Although most cases respond to conservative therapy, some patients develop chronic symptoms requiring minimally invasive interventions. Techniques such as corticosteroid injections, platelet-rich plasma (PRP), and Multiple puncture aim to stimulate tissue repair, but evidence regarding the multiple puncture technique remains limited. This study compares the therapeutic outcomes of the multiple puncture technique with PRP in chronic plantar fasciitis. **Methodology:** Statistical Analysis: Data was analysed using IBM SPSS Software Version 26.0. Independent t-test was used for comparison of means between groups and Chi-Square test for categorical variables. A p-value <0.05 was considered statistically significant. A prospective study was conducted at the Department of Orthopaedics, N.S.C.B. Medical College & Hospital, Jabalpur, from April 2023 to March 2025. Eighty-nine patients with chronic plantar fasciitis were randomised to receive either the multiple puncture technique or PRP injection. All patients began plantar fascia stretching exercises the day after treatment. Pain (VAS) and function (AOFAS) were assessed at 1 week, 1 month, and 3 months. Changes within and between groups were analysed using paired and comparative statistical tests. **Results:** Of the 89 patients, 74.2% were female. The two groups were comparable at baseline in demographic features, fascia thickness, initial VAS scores, occupation type, and calcaneal spur presence. Both treatments produced significant improvement, but PRP showed consistently superior outcomes. A higher proportion of PRP recipients achieved complete pain relief, and mean AOFAS scores at 3 months were significantly higher in the PRP group (100 vs 90; $p = 0.001$). Ultrasound demonstrated greater reduction in plantar fascia thickness with PRP (0.98 mm vs 0.56 mm; $p = 0.001$). Treatment response was influenced by age, occupation, and calcaneal spur status, with spurs correlating strongly with delayed improvement. Multivariate analysis showed PRP to be associated with higher odds of sustained recovery and lower recurrence rates. **Conclusion:** PRP provided better clinical and radiological outcomes than the multiple puncture technique in chronic plantar fasciitis, with greater reductions in pain, better functional recovery, and more pronounced fascial healing. Patients aged 36–50 years and those with physically demanding occupations responded more favourably, while calcaneal spurs predicted poorer outcomes. Despite limitations such as short follow-up and single-centre design, PRP appears to be a safe and effective minimally invasive option, offering both symptomatic and structural benefits when conservative treatments fail.

KEYWORDS : Platelet Rich Plasma, Plantar Fasciitis.

INTRODUCTION:

Plantar fasciitis is the most frequent cause of plantar heel pain and is now regarded primarily as a degenerative fasciosis[1]. At the medial calcaneal origin of the plantar fascia rather than a purely inflammatory disorder. It commonly affects middle-aged individuals, especially women and those with high body mass index or occupations involving prolonged standing, with mechanical overload, inappropriate footwear, and gastrocnemius–Achilles tightness acting as important risk factors. The plantar fascia plays a central role in maintaining the medial longitudinal arch and participates in the windlass mechanism; repetitive tensile stress can lead to collagen disruption, fascial thickening, and persistent pain[2].

Diagnosis is usually clinical, based on typical “first-step” pain and point tenderness at the medial calcaneal tuberosity, while imaging is reserved for atypical cases or to exclude alternative causes such as fat pad atrophy, stress fracture, bursitis, or fascia rupture. Most patients respond to conservative measures including activity modification, analgesics, stretching exercises, orthoses, and physiotherapy[3]. However, a proportion develop chronic symptoms requiring minimally invasive interventions. Biologic and needling-based techniques-such as corticosteroid injection, platelet-rich plasma (PRP), prolotherapy, and fascial fenestration-aim to modulate

degeneration and stimulate repair. The multiple puncture technique is proposed to relieve mechanical tension and induce microvascular and growth-factor-mediated healing, but clinical data remain limited[4].

In this context, the present study was designed to evaluate the clinical and ultrasonographic efficacy of the multiple puncture technique in chronic plantar fasciitis and to compare its results with PRP injection as an established minimally invasive treatment option.

Patients And Methods

Procedure Of Preparation Of PRP-

The method by which autologous PRP is formed is called differential centrifugation. 20ml of autologous venous blood is taken in test tubes containing sodium citrate and first centrifugation done at 3000rpm for 15 minutes, then resultant plasma containing platelets is taken in plain test tubes and second centrifugation done at 5000 rpm. The resultant solution contains upper 2/3 of platelet poor plasma and lower 1/3 of platelet rich plasma. 20ml of autologous venous blood yield 3-4ml platelet rich plasma. 5 ml syringe with 22G needle[5].

Preparation of Multiple Puncture Technique-

- 2% lignocaine injection – 2ml
- 18G needle

• Sterile Gauze Bandage



Fig.1 Centrifugation machine



Fig.2 Showing sterile syringe and lignocaine solution 2%

Surgical Technique

For platelet rich plasma- The foot was prepared with standard sterile scrubbing, painting, and draping. With the patient in the lateral decubitus position, the medial malleolus and medial calcaneal tuberosity were palpated, and a 22G needle was introduced just distal to the tuberosity into the plantar fascia. On feeling the typical gritty resistance, the needle was withdrawn slightly and platelet-rich plasma was injected. After needle removal, bleeding was controlled with sterile gauze, and the site was covered with a sterile dressing.

For multiple puncture technique-The foot was scrubbed, painted, and draped under sterile conditions. Using a 5 ml syringe, 2 ml of 2% lignocaine was infiltrated into the tender medial heel region. With the patient in the lateral decubitus position, the medial malleolus was identified and the plantar fascia insertion on the medial calcaneal tuberosity was palpated. An 18G needle was introduced just distal to this point until a characteristic gritty resistance indicated entry into the fascia, after which the needle was slightly withdrawn and Local Anesthesia injected. Multiple punctures (4-5), spaced 3-5 mm apart within a 1 cm area around the insertion, were then performed. The needle was removed, bleeding controlled, and the site dressed with a sterile dressing.



Fig.3 Infiltration Of Platelet Rich Plasma



Fig.4 Multiple Puncture Technique

After the injection and multiple puncture, patients were sent home with instructions to restrict weight bearing for 24 hours. Analgesics (paracetamol) were given to all patients for 3 days. All the patients were advised to use soft sole slippers, and to do daily physiotherapy (plantar fascia stretching exercises, log roll and calf stretching exercises). Adverse effects like pain, swelling, redness and infections were watched for and recorded at each follow up. First follow-up in first week then subsequent follow-ups at 1 month and 3 month .

Statistical Analysis

Data was analysed using IBM SPSS Software Version 26.0. Independent t-test was used for comparison of means between groups and Chi-Square test for categorical variables. A p-value <0.05 was considered statistically significant.

RESULT

A total of 89 patients were included, mostly females (74.2%), with comparable baseline demographics between the PRP and Multiple Puncture groups. Baseline plantar fascia thickness (mean 4.93 mm), VAS scores, and calcaneal spur prevalence (75.3%) were similar across groups.

Both treatments yielded significant pain and functional improvement, but PRP produced consistently superior outcomes. Complete pain relief was higher with PRP (52.9% vs 47.1%; $p = 0.048$), and PRP showed significantly better AOFAS scores at 1 and 3 months (final mean 100 vs 90; $p = 0.001$). Plantar fascia thickness also decreased more with PRP (0.98 mm vs 0.56 mm; $p = 0.001$ [7].

Age, occupation, and calcaneal spur presence influenced results, with spurs showing the strongest predictive effect ($p = 0.001$). Multivariate analysis indicated that PRP increased the likelihood of successful long-term recovery (OR 2.4; $p = 0.003$) and reduced recurrence. Pain reduction, functional improvement, and fascia healing scores, and calcaneal spur prevalence (75.3%) were similar across groups [8].

Parameter	Multiple Puncture (Mean $\pm$ SD)	PRP Injection (Mean $\pm$ SD)	p-value
VAS Score (3 Months)	2.1 $\pm$ 1.3	0.8 $\pm$ 1.1	0.001 (S)
AOFAS Score (3 Months)	90 $\pm$ 6.2	100 $\pm$ 4.5	0.001 (S)
Fascia Thickness Reduction	0.56 $\pm$ 0.18 mm	0.98 $\pm$ 0.21 mm	0.001 (S)
Complete Pain Relief %	47.1%	52.9%	0.048 (S)

DISCUSSION

This study found Platelet-Rich Plasma (PRP) to be more effective than the Multiple Puncture Technique in chronic plantar fasciitis. PRP produced greater and more durable pain relief, faster functional recovery, and a significantly larger reduction in plantar fascia thickness. Its superiority is likely due to growth-factor- driven tissue regeneration, whereas microtrauma alone provides a more limited healing response [6]. Patients aged 36-50 years and those without calcaneal spurs showed better outcomes. Predictive

modelling confirmed PRP as the strongest independent factor for treatment success, with lower recurrence rates compared to Multiple Puncture. Strong correlations between symptomatic improvement and ultrasonographic healing further support the regenerative advantage of PRP. Overall, PRP offers a more comprehensive and sustained therapeutic benefit and should be preferred when conservative measures fail.

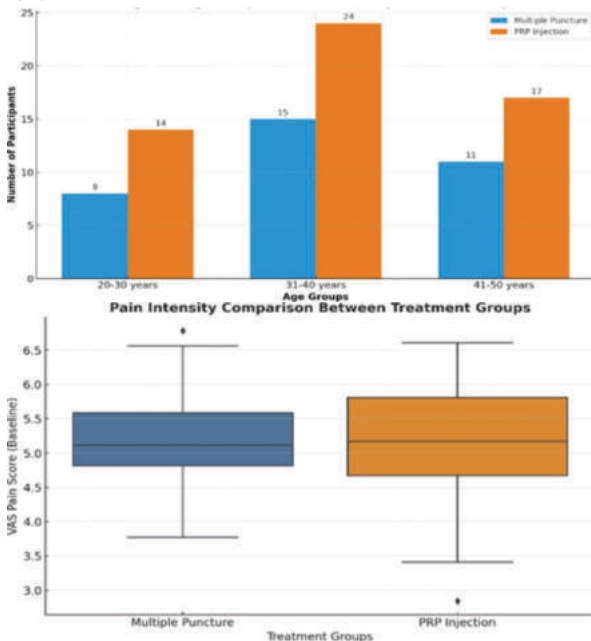


Fig.6- The plot shows that both groups started with very similar baseline pain scores, centered around 5.2–5.3, with slight variability. The overlap in interquartile ranges confirms that there was no statistically significant difference in baseline pain intensity between the two groups.

CONCLUSION

This prospective comparative study shows that Platelet-Rich Plasma provides superior clinical benefit over the Multiple Puncture Technique in chronic plantar fasciitis. Both treatments reduced pain and improved function, but PRP produced earlier and more sustained improvement regenerative effect on the degenerative fascia[9].

Outcomes were influenced by patient factors: individuals aged 36–50 years and those with physically demanding occupations responded better, while calcaneal spur presence was associated with slower recovery. PRP was also associated with higher overall success and lower recurrence. The study's limitations include short follow-up and single-centre design, with possible confounding from variations in rehabilitation and footwear practices. Larger, longer-term studies comparing PRP with other regenerative modalities are needed[10].

Demographic characteristics					
Characteristics	Category	Multiple puncture	PRP Injection	Total	P-value
Age Group	20-30 years	8(23.5%)	14(25.5%)	22	0.764
	31-40 years	15(44.1%)	24(43.6%)	39	0.952
	41-50 years	11(32.4%)	17(30.9%)	28	0.843
Gender	Male	9(26.5%)	14 (25.5%)	23	0.912
	Female	25(73.5%)	41(74.5%)	66	0.912

Overall, PRP appears to be a safe and effective minimally invasive option that promotes both symptomatic and structural recovery, and may be preferred when conservative management fails.

Declaration by Authors

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