

## PROSPECTIVE STUDY ON THE EFFECTIVENESS OF PLATELET-RICH PLASMA IN MANAGING CHRONIC PLANTAR FASCIITIS

A. M. ILIAS BASHA<sup>1</sup>, SHAIK RASOOL<sup>1</sup>, K. ANUSHA\*<sup>1</sup>

Department of Orthopaedics, Kurnool Medical College, Kurnool, Andhra Pradesh, India.

\*Corresponding author: Dr. K. Anusha; Email: anushumbbs@gmail.com

Received: 21 December 2023, Revised and Accepted: 05 February 2024

### ABSTRACT

**Objectives:** The objectives of this study were as follows: (1) Assess the impact of a single dose of platelet-rich plasma (PRP) injection on visual analog scale (VAS) scores for heel pain. (2) Evaluate the functional outcome scores following PRP treatment for chronic plantar fasciitis. (3) Measure and confirm the restoration of plantar fascia thickness through ultrasound (USG) assessments. (4) Determine the safety and viability of local PRP injection as a treatment option for individuals with chronic plantar fasciitis.

**Methods:** This hospital-based prospective case series, spanning January 2019 to January 2020, enrolled 40 participants aged 25–65 with unilateral, persistent plantar fasciitis resistant to conservative treatment. Exclusion criteria included BMI  $\geq 30$ , various pathologies, and recent injections. Ethical clearance was obtained, and participants received autologous PRP injections, with ultrasound measuring plantar fascia thickness. Post-injection, patients were monitored for adverse reactions, initiated stretching exercises, and progressed to weight-bearing activities after 6 weeks.

**Results:** The study cohort, averaging 45 years (standard deviation [SD] 7.7), primarily comprised females with the right-foot prevalence. Symptom duration averaged 20 weeks (SD 4.5). Pre-injection VAS scores ( $6.7 \pm 1.2$ ) significantly improved at 6 weeks ( $2.9 \pm 0.6$ ) and 12 weeks ( $2.0 \pm 0.9$ ) post-PRP injection ( $p < 0.001$ ). Plantar fascia thickness reduced from 5.1 mm (SD 0.6) to 4.1 mm (SD 0.5) at 12 weeks ( $p < 0.001$ ) and regular foot thickness: 3.7 mm (SD 0.5).

**Conclusion:** The study reveals that a singular PRP injection brings about substantial and clinically meaningful enhancements in heel pain, functional outcomes, and the restoration of plantar fascia thickness, supported by ultrasound measurements. This underscores local PRP injection as a viable and safe therapeutic choice for those grappling with chronic plantar fasciitis.

**Keywords:** Platelet-rich plasma, Chronic plantar fasciitis, Growth factors.

© 2024 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>) DOI: <http://dx.doi.org/10.22159/ajpcr.2024v17i5.50195>. Journal homepage: <https://innovareacademics.in/journals/index.php/ajpcr>

### INTRODUCTION

Plantar fasciitis, a common cause of foot and heel pain in adults, often affects individuals bilaterally. While the condition is most prevalent between the ages of 40 and 60, athletes [1] may experience an earlier peak. The focal point of pain is at the origin of the plantar fascia on the medial calcaneal tuberosity. The etiology of plantar fasciitis is complex and not fully understood, with recognized risk factors including obesity, poor foot and ankle biomechanics, flat feet, prolonged standing, jumping, running, and inappropriate footwear. In addition, plantar fasciitis can manifest independently or be linked to systemic diseases such as seronegative spondyloarthropathies [2-6].

Numerous therapeutic approaches exist, but the available evidence lacks consensus on a definitive management strategy for plantar fasciitis. While corticosteroid injections have demonstrated short-term efficacy, they come with various local and systemic adverse effects [7,8], prompting a search for alternative treatments.

One such alternative is the injection of autologous platelet-rich plasma (PRP), based on its growth factors and cytokines content, that could potentially enhance the local healing process [9]. Notably, PRP injections are considered safer than steroid injections due to the absence of significant side effects. Existing studies have shown promising results, prompting the need for further investigation.

This prospective case series adopts the visual analog scale (VAS) for heel pain, functional outcome scores, and ultrasonographic (USG) measurement of plantar fascia thickness as outcome measures to

evaluate the efficacy of a single local injection of PRP in treating plantar fasciitis. The uniqueness of this study lies in its utilization of USG measurements of plantar fascia thickness as an outcome measure, an aspect scarcely explored in existing literature. The null hypothesis under examination is that PRP injection does not significantly impact the outcome of plantar fasciitis management.

### METHODS

This study, conducted at a hospital, employed a prospective case series design spanning from January 2019 to January 2020. The inclusion criteria encompassed individuals aged 25–65 who presented with unilateral heel pain or morning pain on the first step, alleviated by unloading. Participants were diagnosed with unilateral plantar fasciitis, persisting for at least 6 months, with symptoms showing resistance to improvement despite conservative treatment.

Exclusion criteria were defined to exclude individuals with a BMI of 30 or higher, bilateral plantar fasciitis, nerve-related pathologies, Achilles tendinitis or tendinosis, rheumatoid arthritis, ankylosing spondylitis, local infection, gout, pregnancy or breastfeeding, metastatic disease, complex regional pain syndrome, bony spurs evident on plain radiographs, a history of intralesional injection in the past 6 months for the same condition, prior foot surgery, and those unwilling to provide consent or participate in follow-up.

After ensuring that patients met the specified inclusion and exclusion criteria, 40 participants were enrolled in the study. After obtaining ethical clearance, a comprehensive explanation of the methodology

was provided to all patients, and their informed, written consent was obtained. The evaluation of patients included assessing foot pain and disability using questionnaires such as the visual analog pain score; these assessments were conducted before the PRP injection and at 6 and 12 weeks post-injection to track changes in functional status.

To evaluate the response of the plantar fascia to the PRP injection, the thickness of the plantar fascia at its origin was measured using ultrasound (USG) at 2-time points: pre-injection and at 12 weeks post-injection. The PRP used in the study was prepared by centrifuging 30–35 mL of the patient's blood collected through sterile venipuncture with the specific method. Under aseptic precautions, all patients received a three cc autologous PRP injection into the origin of the plantar fascia using the peppering technique for an expansive zone of delivery. Following the injection, patients were monitored for 30 minutes for adverse reactions and then allowed weight-bearing as tolerated. Plantar fascia stretching exercises commenced after 1 week, and foot inversion exercises, tip-toe, and heel walking were permitted after 6 weeks.

## RESULTS

The mean age of the study cohort was 45 years (SD 7.7 years), with a range of 25–65 years. Females were predominantly affected, and the right foot was more commonly involved. The mean symptom duration was 20 weeks (SD 4.5 weeks).

The pre-injection VAS score for heel pain was  $6.7 \pm 1.2$ , which improved to  $2.9 \pm 0.6$  and  $2.0 \pm 0.9$  at 6 and 12 weeks, respectively, which was statistically significant ( $p < 0.001$ ). The improvement in the scores was statistically significant at both 6 weeks and 12 weeks post-PRP injection ( $p < 0.001$ ), as shown in Table 2.

The mean thickness of plantar fascia of the affected foot assessed by USG at baseline was 5.1 mm with a SD of 0.6 mm, which was significantly ( $p < 0.001$  by the paired *t*-test) reduced to a mean of 4.1 mm and SD of 0.5 mm at 12 weeks post-PRP injection. The study also showed that the average foot's mean thickness of plantar fascia was 3.7 mm, with an SD of 0.5 mm. USG images showing the thickness of plantar fascia of normal and affected feet.

## DISCUSSION

Plantar fasciitis, though often self-limiting, can become a chronic condition affecting daily activities and quality of life in a subset of patients. The etiology and management of plantar fasciitis still need to be completed. Despite its name, plantar fasciitis is characterized as a degenerative rather than an inflammatory pathology resulting from repetitive microtrauma leading to wear of the plantar fascia at its origin [10,11].

Conservative therapies, including activity modification, NSAIDs, ice application, arch support, splinting, deep tissue massage, plantar fascia stretching exercises, and physical therapy, are commonly used to alleviate symptoms [12,13]. However, symptoms persist in about 10% of patients, leading to chronic plantar fasciitis. Local corticosteroid injections are a standard treatment, providing satisfactory short-term outcomes due to their anti-inflammatory properties [14,15]. However, these injections come with risks and may necessitate multiple administrations.

The introduction of local PRP injections has gained attention as a treatment for plantar fasciitis. PRP, rich in growth factors, cytokines, and interleukins [16], is thought to initiate the healing process at the site of plantar fascia degeneration. Several case series and randomized controlled trials (RCTs) have reported the effectiveness of PRP injections in reducing pain and improving functional outcomes in plantar fasciitis patients.

For instance, the case series by Martinelli *et al.* [17], Ragab and Othman [18], and Kumar *et al.* [19] demonstrated significant reductions

Table 1:

Demographic profile	Mean±SD
Age	45.0±7.7 years (range 25–65 years)
Symptom duration	20±4.5 weeks (range 10–30 weeks)
Gender	Male=8; female=32
Side affected	Right=26; left=14

Table 2: The baseline and post-intervention outcome measures

	before-injection median (range)	At 6 weeks median (range)	At 12 weeks median (range)	p-value	
				6 weeks	12 weeks
VAS score	6.7±1.2	2.9±0.6	2.0±0.9	p<0.001	p<0.001

in VAS scores and improvements in functional scores following PRP injections. RCTs by Jain *et al.* [20], Say *et al.* [21], and Shetty *et al.* [22] compared PRP with steroid injections and consistently found that PRP yielded better patient-related outcome measures, including lower VAS scores and improved AOFAS scores.

The present study aligns with these findings, showing that PRP injections significantly reduced pain, as indicated by lower VAS scores, and improved functional scores, as evidenced by higher scores at 6 and 12 weeks post-injection. This study contributes to the growing body of evidence supporting the efficacy of PRP injections in treating plantar fasciitis. The results, further, emphasize the potential of PRP as a promising alternative to corticosteroid injections, offering improved patient outcomes in terms of pain relief and functional improvement.

Plantar fasciitis is commonly associated with abnormal thickening of the plantar fascia, often exceeding 4.0 mm [23]. Ultrasonography (USG) provides a convenient way of assessing plantar fascia thickness changes and can serve as a valuable tool for monitoring treatment response. Studies have indicated that corticosteroid and PRP injections effectively reduce plantar fascia thickness [14,21,22]. For example, Jain *et al.* [20] found that corticosteroid injections led to a more rapid reduction in plantar fascia thickness in the first 3 months compared to PRP injections. However, by the 6-month follow-up, the thickness reduction differences were insignificant.

In the present study, the thickness of the plantar fascia was significantly reduced from  $5.1 \pm 0.6$  mm to  $4.1 \pm 0.5$  mm at the 12-week follow-up after PRP injection. This reduction was statistically significant ( $p < 0.001$ ), suggesting that PRP injections positively impact plantar fascia thickness.

Notably, all patients in the study tolerated the local PRP injections without encountering significant local or systemic adverse events. While the study has several strengths, such as demonstrating the efficacy of PRP injections in reducing plantar fascia thickness and providing a safety profile, it is essential to acknowledge its limitations. These include a small study population, a relatively short follow-up duration, and a control group's absence. Future research should address these limitations and gain a more comprehensive understanding of the long-term benefits and efficacy of PRP injections in chronic plantar fasciitis management. This approach would contribute to a more robust evaluation of the treatment's effectiveness and provide valuable insights for clinical practice.

## CONCLUSION

The findings from this study indicate that a single dose of PRP injection yields significant and clinically relevant improvements in VAS for heel pain, functional outcome scores, and the restoration of plantar fascia thickness, as confirmed by USG measurements. This study suggests that local PRP injection is a viable and safe treatment option for individuals with chronic plantar fasciitis.

**ACKNOWLEDGMENT**

We thank the Orthopedic Department at the Government General Hospital Kurnool for their valuable support throughout the study.

**AUTHORS' CONTRIBUTIONS**

All authors participated in every aspect of the study, including conceptualization, design, data collection, data analysis, interpretation, manuscript preparation, critical review, and approval of the final version to be published.

**CONFLICTS OF INTERESTS**

The authors confirm no conflicts of interest related to this research, authorship, and article publication.

**FUNDING**

This study received no funding from public, commercial, or non-profit organizations.

**REFERENCES**

- Nahin RL. Prevalence and pharmaceutical treatment of plantar fasciitis in United States adults. *J Pain*. 2018;19(8):885-96. doi: 10.1016/j.jpain.2018.03.003, PMID 29597082
- Taunton JE, Ryan MB, Clement DB, McKenzie DC, Lloyd-Smith DR, Zumbo BD. A retrospective case-control analysis of 2002 running injuries. *Br J Sports Med*. 2002;36(2):95-101. doi: 10.1136/bjsm.36.2.95, PMID 11916889
- Riddle DL, Pulisic M, Pidcoe P, Johnson RE. Risk factors for plantar fasciitis: A matched case-control study. *J Bone Joint Surg Am*. 2003;85(5):872-7. doi: 10.2106/00004623-200305000-00015, PMID 12728038
- Rano JA, Fallat LM, Savoy-Moore RT. Correlation of heel pain with body mass index and other characteristics of heel pain. *J Foot Ankle Surg*. 2001;40(6):351-6. doi: 10.1016/s1067-2516(01)80002-8, PMID 11777230
- Weiler A, Helling HJ, Kirch U, Zirbes TK, Rehm KE. Foreign-body reaction and the course of osteolysis after polyglycolide implants for fracture fixation: An experimental study in sheep. *J Bone Joint Surg Br*. 1996;78(3):369-76. doi: 10.1302/0301-620X.78B3.0780369, PMID 8636168
- Gupta R, Malhotra A, Masih GD, Khanna T, Kaur H, Gupta P, et al. Comparing the role of different treatment modalities for plantar fasciitis: A double-blind randomized controlled trial. *Indian J Orthop*. 2020;54(1):31-7. doi: 10.1007/s43465-019-00038-w, PMID 32257015
- Buccilli TA Jr., Hall HR, Solmen JD. Sterile abscess formation following a corticosteroid injection for the treatment of plantar fasciitis. *J Foot Ankle Surg*. 2005;44(6):466-8. doi: 10.1053/j.jfas.2005.07.020, PMID 16257677
- Acevedo JI, Beskin JL. Complications of plantar fascia rupture associated with corticosteroid injection. *Foot Ankle Int*. 1998;19(2):91-7. doi: 10.1177/107110079801900207, PMID 9498581
- Lee TG, Ahmad TS. Intralesional autologous blood injection compared to corticosteroid injection for treatment of chronic plantar fasciitis. A prospective, randomized, controlled trial. *Foot Ankle Int*. 2007;28(9):984-90. doi: 10.3113/FAI.2007.0984, PMID 17880872
- Buchbinder R. Clinical practice. Plantar fasciitis. *N Engl J Med*. 2004;350(21):2159-66. doi: 10.1056/NEJMcp032745, PMID 15152061
- Lemont H, Ammirati KM, Usen N. Plantar fasciitis: A degenerative process (fasciosis) without inflammation. *J Am Podiatr Med Assoc*. 2003;93(3):234-7. doi: 10.7547/87507315-93-3-234, PMID 12756315
- Cornwall MW, McPoil TG. Plantar fasciitis: Aetiology and treatment. *J Orthop Sports Phys Ther*. 1999;29(12):756-60. doi: 10.2519/jospt.1999.29.12.756, PMID 10612073
- Toomey EP. Plantar heel pain. *Foot Ankle Clin*. 2009;14(2):229-45. doi: 10.1016/j.fcl.2009.02.001, PMID 19501805
- Genc H, Saracoglu M, Nacir B, Erdem HR, Kacar M. Long-term ultrasonographic follow-up of plantar fasciitis patients treated with steroid injection. *Joint Bone Spine*. 2005;72(1):61-5. doi: 10.1016/j.jbspin.2004.03.006, PMID 15681250
- Kiter E, Celikbas E, Akkaya S, Demirkan F, Kiliç BA. Comparison of injection modalities in treating plantar heel pain: A randomized controlled trial. *J Am Podiatr Med Assoc*. 2006;96(4):293-6. doi: 10.7547/0960293, PMID 16868321
- Molloy T, Wang Y, Murrell G. The roles of growth factors in tendon and ligament healing. *Sports Med*. 2003;33(5):381-94. doi: 10.2165/00007256-200333050-00004, PMID 12696985
- Martinelli N, Marinozzi A, Carni S, Trovato U, Bianchi A, Denaro V. Platelet-rich plasma injections for chronic plantar fasciitis. *Int Orthop*. 2013;37(5):839-42. doi: 10.1007/s00264-012-1741-0, PMID 23250352
- Ragab EM, Othman AM. Platelets-rich plasma for treatment of chronic plantar fasciitis. *Arch Orthop Trauma Surg*. 2012;132(8):1065-70. doi: 10.1007/s00402-012-1505-8, PMID 22555761
- Kumar V, Millar T, Murphy PN, Clough T. The treatment of intractable plantar fasciitis with platelet-rich plasma injection. *Foot (Edinb)*. 2013;23(2-3):74-7. doi: 10.1016/j.foot.2013.06.002, PMID 23906977
- Jain K, Murphy PN, Clough TM. Platelet-rich plasma versus corticosteroid injection for plantar fasciitis: A comparative study. *Foot (Edinb)*. 2015;25(4):235-7. doi: 10.1016/j.foot.2015.08.006, PMID 26362235
- Say F, Gürlür D, İnkaya E, Bülbül M. Comparison of platelet-rich plasma and steroid injection in the treatment of plantar fasciitis. *Acta Orthop Traumatol Turc*. 2014;48(6):667-72. doi: 10.3944/AOTT.2014.13.0142, PMID 25637732
- Shetty VD, Dhillon M, Hegde C, Jagtap P, Shetty S. A study to compare the efficacy of corticosteroid therapy with platelet-rich plasma therapy in recalcitrant plantar fasciitis: A preliminary report. *Foot Ankle Surg*. 2014;20(1):10-3. doi: 10.1016/j.fas.2013.08.002, PMID 24480492
- McMillan AM, Landorf KB, Barrett JT, Menz HB, Bird AR. Diagnostic imaging for chronic plantar heel pain: A systematic review and meta-analysis. *J Foot Ankle Res*. 2009;13(2):32. doi: 10.1186/1757-1146-2-32, PMID:19912628