

Efficacy of Autologous Platelet-Rich Plasma in the Management of Chronic Plantar Fasciitis: A Clinical Study**Vikas¹, Man Mohan Sharma², Raju Lal Yadav³, Gautam Jain⁴**¹Senior Resident, Department of Orthopaedics, ESIC Medical College, Alwar, Rajasthan, India²Professor, Department of Orthopaedics, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India³Assistant Professor, Department of Orthopaedics, ESIC Medical College, Alwar, Rajasthan, India⁴Senior Resident, Department of Orthopaedics, All India Institute of Medical Sciences (AIIMS), Bathinda, Punjab, India

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Abstract:**Background:** Plantar fasciitis is one of the most common causes of chronic heel pain, often leading to significant discomfort and functional disability. While conventional therapies such as physiotherapy, stretching, and NSAIDs provide relief in most cases, some patients remain symptomatic. Platelet-rich plasma (PRP) has emerged as a promising biological therapy due to its regenerative properties.**Objectives:** To evaluate the treatment outcomes of autologous PRP injection in patients with chronic plantar fasciitis unresponsive to conservative management, with specific focus on pain relief and functional improvement.**Methods:** This prospective non-randomized study was conducted over 18 months (November 2022–April 2024) in the Department of Orthopedics, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, India. A total of 60 patients aged 18–75 years fulfilling inclusion and exclusion criteria were enrolled. After informed consent, each patient received a 3 ml autologous PRP injection in the affected heel under aseptic conditions. Pain and functional outcomes were assessed using the Visual Analogue Scale (VAS) and Roles and Maudsley scores at baseline and at 1-, 2-, and 3-months post-injection.**Results:** The mean age of participants was 39.1 years, with nearly equal gender distribution (51.7% males, 48.3% females). Median VAS scores improved significantly from 8 pre-injection to 6 at 1 month, 3 at 2 months, and 1 at 3 months. Functional outcomes showed parallel improvements, with Roles and Maudsley scores decreasing from 3.4 at baseline to 2.4, 2.0, and 1.1 at 1, 2, and 3 months, respectively. Younger patients (<40 years) showed slightly better responses, though differences were not statistically significant. No major complications were observed.**Conclusion:** Autologous PRP injection is a safe and effective treatment modality for chronic plantar fasciitis refractory to conventional management. It provides progressive pain relief and functional improvement, supporting its role as a superior alternative to corticosteroid injections.**Keywords:** Plantar Fasciitis, Platelet-Rich Plasma, Heel Pain, Regenerative Therapy, Chronic Foot Pain.

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Introduction

Plantar fasciitis is a common cause of heel pain, resulting from constant stretching and degenerative irritation of the plantar fascia at its attachment to the calcaneal tuberosity. [1,2] It typically presents as localized pain at the medial process of the calcaneal tuberosity and is the leading reason for adult foot discomfort. [1,2] The condition most frequently occurs between the ages of 40 and 60 years and is particularly prevalent among athletes, elderly runners, military recruits, and individuals whose occupations involve prolonged standing or walking. [2,3] Heel pain is estimated to affect nearly one in ten individuals at some point in their lifetime. [4]

The plantar fascia is a strong triangular band of connective tissue that originates from the medial process of the calcaneal tuberosity and divides into five slips at the level of the metatarsal heads. [5] These slips provide attachments to the plantar skin, plantar plates, collateral ligaments, and deep transverse metatarsal ligaments, playing a vital role in foot biomechanics. Nerve entrapment, such as compression of the medial calcaneal nerve or Baxter's nerve, may also contribute to heel pain in certain cases. [6,7]

Although about 90% of cases respond to conservative measures within weeks, plantar

fasciitis can be severely disabling when persistent. [8] Current treatment strategies include rest, stretching exercises, orthotic support, nonsteroidal anti-inflammatory drugs (NSAIDs), night splints, extracorporeal shockwave therapy, corticosteroid injections, and, more recently, platelet-rich plasma (PRP) injections. [9,10] Despite a wide range of treatment modalities, there is no consensus on the most effective approach, and chronic cases remain a therapeutic challenge.

Over the past three decades, PRP has emerged as a regenerative treatment option in orthopaedics and sports medicine. It has shown promising results in the management of soft tissue disorders such as plantar fasciitis and tendinopathies, as well as in cartilage and bone healing. [3] PRP is derived from autologous blood, with platelets concentrated in plasma, and is rich in growth factors such as PDGF, TGF- β , VEGF, IGF, and FGF, which play a crucial role in cellular proliferation, angiogenesis, collagen synthesis, and tissue regeneration. [8,11,12,13,14,15] These biological properties make PRP a potential therapeutic alternative in conditions where conventional treatments fail.

Considering the recurrent microtrauma and limited healing capacity of chronic plantar fasciitis, PRP offers a biological approach to enhance recovery and minimize recurrence. The aim of the present study was to evaluate the treatment outcome of chronic plantar fasciitis managed with intralesional injection of autologous platelet-rich plasma. The specific objectives were to identify patients with chronic plantar fasciitis, determine those suitable for PRP therapy, and assess the clinical results of PRP injection in improving pain and function.

Materials and Methods

Duration and Place of Study: The present study was conducted over a period of 18 months, from November 2022 to April 2024, in the Department of Orthopaedics, Teerthanker Mahaveer Medical College and Research Centre (TMMC&RC), Moradabad, Uttar Pradesh, India.

Study Design: This was a non-randomized, prospective before-and-after comparison study without a control group. The study design allowed evaluation of the clinical outcome of platelet-rich plasma (PRP) injection in patients with chronic plantar fasciitis by comparing pre-treatment and post-treatment results.

Source of Data: The study population consisted of patients with chronic plantar fasciitis presenting to the Department of Orthopaedics during the study period. Patients who fulfilled the inclusion and exclusion criteria were enrolled after obtaining informed and written consent.

Inclusion Criteria: Patients of either gender between 18 and 75 years of age, who were clinically diagnosed with chronic plantar fasciitis, were included in the study.

Exclusion Criteria: Patients were excluded if they had any wound or skin lesion at the injection site, were pregnant, had severe infection, a known malignancy, bleeding disorders, or a history of previous heel surgery.

Sample Size Calculation: A total of 60 patients were included in the study. The sample size was calculated using a standard statistical formula based on a prevalence rate of 10%, an allowable error of 10%, and a 99% confidence level, which yielded a minimum required sample size of 60 cases.

Methodology: All eligible patients underwent baseline evaluation, including assessment of pain using the Visual Analogue Scale (VAS) and functional outcome using the Roles and Maudsley score. Under strict aseptic precautions, a single intralesional injection of 3 ml autologous PRP was administered into the affected heel using a 22G needle. No local anaesthesia was used during the procedure. Post-injection care was given as per protocol, and patients were followed up at one month, two months, and three months. At each follow-up, both VAS and Roles and Maudsley scores were recorded and compared with baseline values.

PRP Preparation Method: For PRP preparation, a volume of 28–42.5 ml of venous blood was collected from the antecubital vein into acid citrate dextrose (ACD) tubes. The blood was first centrifuged at 3000 rpm for three minutes to separate the plasma. The plasma containing platelets was carefully transferred into sterile tubes without anticoagulant and subjected to a second centrifugation at 4000 rpm for fifteen minutes. This process yielded two layers: the upper platelet-poor plasma (PPP) and the lower platelet-rich plasma (PRP). The PPP was discarded, and the PRP was gently resuspended in approximately 2 ml of plasma to achieve the final preparation. A total of 3 ml freshly prepared PRP was injected within two hours of preparation.

Procedure Protocol: The injection was administered at the most tender point of the plantar fascia under aseptic precautions. After the injection, patients were kept under observation for 15–20 minutes before being discharged. They were instructed to perform ankle and toe range-of-motion exercises regularly, apply cold packs for 10 minutes three to four times daily for 72 hours, and were prescribed tablet Tramadol 50 mg as needed for pain relief.

Follow-Up and Outcome Assessment: Patients were reviewed at one month, two months, and three months following the injection. At each follow-up

visit, pain intensity was assessed using the Visual Analogue Scale (VAS), and functional outcome was assessed using the Roles and Maudsley score. All clinical findings and outcomes were documented in a pre-designed case record form (CRF).

Results

Patient Characteristics: A total of 60 patients with chronic plantar fasciitis were included in the study. The mean age was 39.1 ± 12.2 years, with the

majority concentrated in the 31–40 year age group (40.0%). Patients aged 18–30 years accounted for 25.0%, while 20.0% were over 50 years. The gender distribution was nearly equal, with 51.7% males ($n = 31$) and 48.3% females ($n = 29$). Side involvement was also almost balanced, with the left side affected in 51.7% and the right side in 48.3% of cases (Table 1).

Table 1: Baseline Demographic Characteristics of Patients (n = 60)

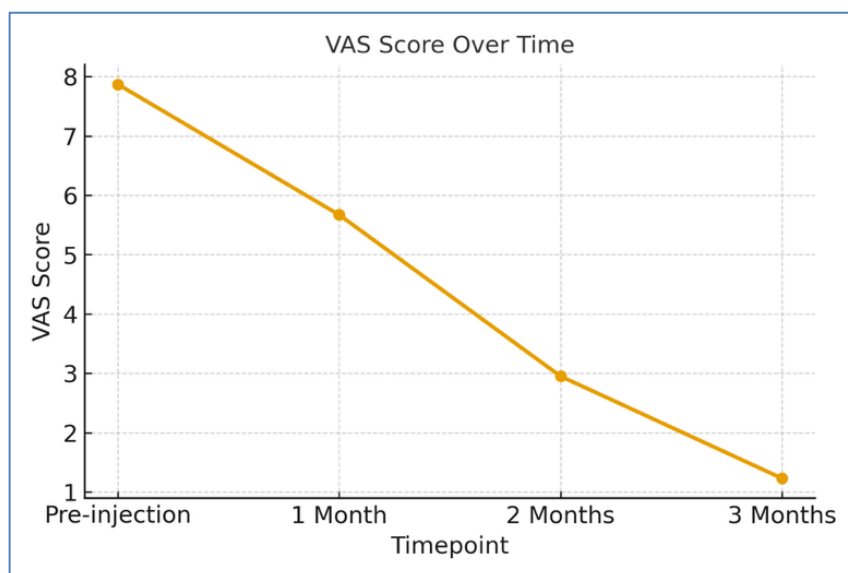
Variable	Category	n (%)
Age group (years)	18–30	15 (25.0)
	31–40	24 (40.0)
	41–50	9 (15.0)
	>50	12 (20.0)
Gender	Male	31 (51.7)
	Female	29 (48.3)
Side involved	Left	31 (51.7)
	Right	29 (48.3)

Pain Outcomes (VAS): The mean baseline Visual Analogue Scale (VAS) score was 7.87 ± 0.83 . At one month, pain reduced significantly to 5.67 ± 0.73 . Continued improvement was seen at two months

(2.95 ± 0.72) and three months (1.23 ± 0.43). The reduction from baseline was statistically significant at all follow-up points ($p < 0.0001$), demonstrating progressive pain relief (Table 2).

Table 2: Pain Outcomes Over Time (VAS Scores, n = 60)

Timepoint	Mean $\pm$ SD	Median (IQR)	Range	p-value
Baseline	7.87 ± 0.83	8 (7–9)	7–9	–
1 Month	5.67 ± 0.73	6 (5–6)	5–7	<0.0001
2 Months	2.95 ± 0.72	3 (2–3)	2–4	<0.0001
3 Months	1.23 ± 0.43	1 (1–1)	1–2	<0.0001

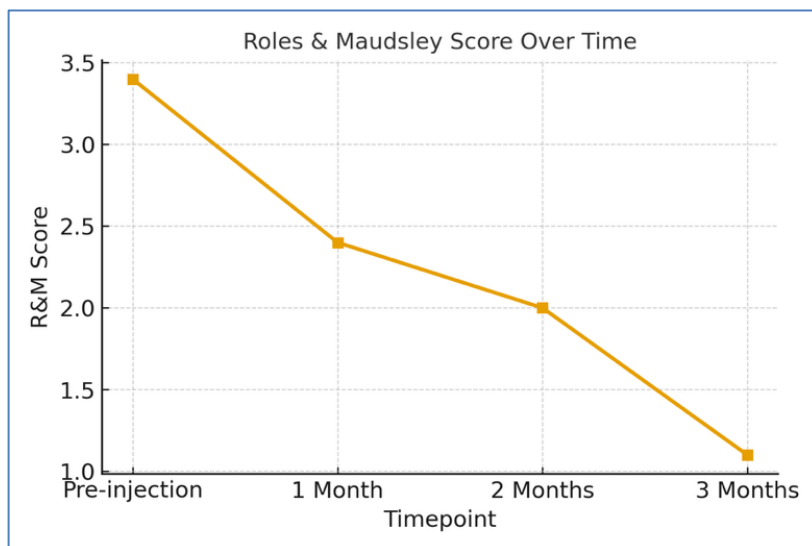


Functional Outcomes (Roles & Maudsley Score): At baseline, the mean Roles and Maudsley (R&M) score was 3.40 ± 0.49 , indicating poor function. A notable improvement was observed at one month (2.40 ± 0.49), which further improved to 2.00 ± 0.00

at two months. By the three-month follow-up, the mean score had reached 1.10 ± 0.30 , reflecting excellent functional outcomes. The improvement at each stage was statistically significant (Table 3).

Table 3: Functional Outcomes Over Time (Roles & Maudsley Scores, n = 60)

Timepoint	Mean $\pm$ SD	Median (IQR)	Range	p-value
Baseline	3.40 $\pm$ 0.49	3 (3–4)	3–4	–
1 Month	2.40 $\pm$ 0.49	2 (2–3)	2–3	<0.0001
2 Months	2.00 $\pm$ 0.00	2 (2–2)	2–2	<0.0001
3 Months	1.10 $\pm$ 0.30	1 (1–1)	1–2	<0.0001

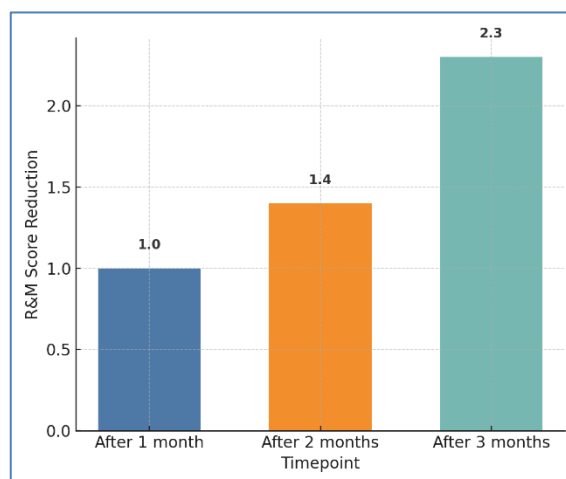
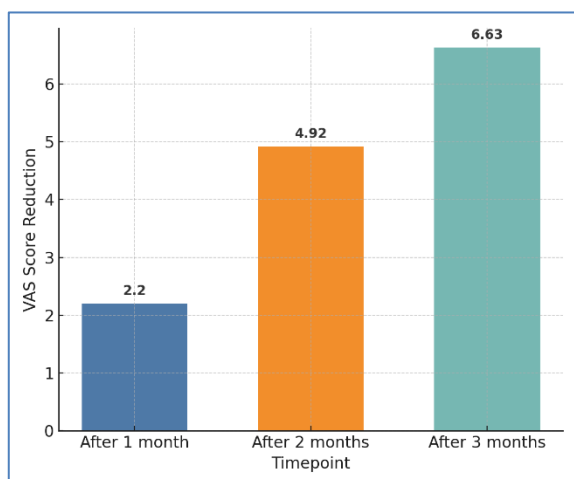


Overall Reduction in Pain and Functional Scores: The mean reduction in VAS was 2.20 at one month, 4.92 at two months, and 6.63 at three months. Similarly, the Roles and Maudsley score improved

by 1.00 at one month, 1.40 at two months, and 2.30 at three months compared to baseline. These findings indicate progressive and consistent benefits of PRP therapy (Table 4).

Table 4: Reduction in Pain and Functional Scores Over Time (n = 60)

Timepoint	Δ VAS (Mean $\pm$ SD)	Δ R&M (Mean $\pm$ SD)
1 Month	2.20 $\pm$ 0.51	1.00 $\pm$ 0.00
2 Months	4.92 $\pm$ 0.72	1.40 $\pm$ 0.49
3 Months	6.63 $\pm$ 0.96	2.30 $\pm$ 0.46



Subgroup Analysis by Age: Patients were stratified into four age groups. Younger patients (18–30 years and 31–40 years) showed slightly better long-term outcomes than older patients. At three months, mean

VAS scores were lowest in the 18–30 year group (1.0 $\pm$ 0.0), while patients over 50 years had slightly higher scores (1.5 $\pm$ 0.5). However, improvement was significant in all age groups (Table 5).

Table 5: Pain and Functional Outcomes by Age Group (n = 60)

Age group	Pre-VAS	3-mo VAS	Pre R&M	3-mo R&M
18–30 yrs (n=15)	7.8 ± 0.9	1.0 ± 0.0	3.4 ± 0.5	1.2 ± 0.4
31–40 yrs (n=24)	8.1 ± 0.8	1.2 ± 0.4	3.5 ± 0.5	1.1 ± 0.3
41–50 yrs (n=9)	7.2 ± 0.4	1.3 ± 0.5	3.1 ± 0.3	1.1 ± 0.3
>50 yrs (n=12)	8.0 ± 0.9	1.5 ± 0.5	3.3 ± 0.5	1.0 ± 0.0

Subgroup Analysis by Gender: Outcomes were comparable between male and female patients. At baseline, both genders had similar mean VAS and Roles & Maudsley scores. At three months, mean VAS scores were 1.19 ± 0.40 in males and $1.28 \pm$

0.45 in females, while functional scores were 1.13 ± 0.34 and 1.07 ± 0.26 , respectively. No statistically significant differences were observed between genders (Table 6).

Table 6: Pain and Functional Outcomes by Gender (n = 60)

Gender	Pre-VAS	3-mo VAS	Pre R&M	3-mo R&M
Male (n=31)	7.87 ± 0.85	1.19 ± 0.40	3.42 ± 0.50	1.13 ± 0.34
Female (n=29)	7.86 ± 0.83	1.28 ± 0.45	3.38 ± 0.49	1.07 ± 0.26

Discussion

Chronic heel pain due to plantar fasciitis is one of the most common causes of foot-related morbidity. Although often considered a self-limiting condition, it can result in persistent discomfort and significant disability in daily activities. Conventional therapies such as physiotherapy, stretching exercises, and NSAIDs are effective in most cases; however, a subset of patients remains symptomatic and requires advanced modalities such as corticosteroid or platelet-rich plasma (PRP) injection. PRP has emerged as a promising option owing to its regenerative properties, as it induces a local healing response through the release of multiple growth factors. The present study was designed to evaluate the efficacy of autologous PRP injection in chronic plantar fasciitis within an Indian population.

In our study, the mean age of participants was 39.1 years, with the majority (40.0%) between 31 and 40 years. The gender distribution was nearly equal, with 51.7% males and 48.3% females, and both sides were equally affected. This profile aligns with previous studies reporting peak prevalence of plantar fasciitis in middle age and no consistent sex predisposition.

Pain assessment using the Visual Analogue Scale (VAS) showed a significant and progressive reduction over the three-month follow-up period. Median pre-injection pain scores decreased from 8 to 6 at one month, 3 at two months, and 1 at three months, indicating cumulative and sustained improvement. These findings are consistent with the work of Siddiqui et al. [16] who reported significant VAS reductions after PRP therapy, and with Upadhyay et al. [17] who demonstrated pain reduction from 7.0 pre-procedure to 2.2 at six months. Similarly, Mohammad et al. [18] documented a decrease in mean VAS from 8.03 to 2.28 following PRP injection, further confirming its analgesic efficacy.

Functional evaluation using the Roles and Maudsley score showed parallel improvements. The mean score decreased from 3.4 at baseline to 2.4 at one month, 2.0 at two months, and 1.1 at three months, reflecting improved mobility and activity tolerance. These results corroborate findings from Mohammed et al. [18] who also reported significant functional gains following PRP injection in refractory plantar fasciitis. Martin et al. [19] reported comparable improvements using SF-12 and Roles and Maudsley scoring, while Siddiqui et al. [16] demonstrated functional enhancement with AOFAS scores rising from 53.6 to 86.2 within six weeks of injection.

The progressive decrease in both VAS and Roles and Maudsley scores suggests that PRP exerts a cumulative effect over time, likely due to ongoing tissue repair mediated by growth factors such as PDGF, VEGF, and TGF- β . This biological healing mechanism distinguishes PRP from steroids, which act primarily as anti-inflammatory agents and provide only temporary relief.

Age-stratified analysis revealed that younger patients (<40 years) experienced slightly greater improvements in VAS and functional scores compared to older patients, though the differences were not clinically significant. This trend may reflect greater regenerative capacity in younger individuals. Gender-wise analysis showed no significant differences in outcomes, suggesting that PRP efficacy is consistent across male and female patients.

Taken together, these findings strongly support the role of PRP injection as an effective treatment for chronic plantar fasciitis unresponsive to conservative management. The therapy provided substantial pain relief and functional improvement over three months without reported complications in our cohort. Compared with corticosteroid injections, PRP offers the advantage of promoting tissue regeneration with a lower risk of recurrence.

Limitations

The study, while promising, has certain limitations. Firstly, the sample size of 60 patients, though adequate for preliminary evaluation, may limit the generalizability of findings. Secondly, the absence of a control group receiving placebo or corticosteroid injection prevents direct comparison of outcomes and may introduce bias. Thirdly, the follow-up period of three months was relatively short, and longer-term outcomes, including recurrence rates, could not be assessed. Additionally, advanced imaging techniques such as MRI or ultrasound were not utilized to objectively measure structural changes in the plantar fascia after PRP injection.

Future Scope

Future research should focus on larger, multicentric randomized controlled trials comparing PRP with corticosteroid injections, physiotherapy, and other regenerative modalities. Longer follow-up periods are needed to evaluate the durability of pain relief and functional recovery, as well as recurrence rates. The role of imaging-based outcome measures should also be explored to better understand the biological healing mechanisms of PRP. Furthermore, studies stratifying outcomes based on patient comorbidities, body mass index, and activity levels may help identify subgroups that derive the greatest benefit from PRP therapy.

Conclusion

The present study establishes autologous platelet-rich plasma (PRP) injection as a safe and effective therapeutic modality for chronic plantar fasciitis unresponsive to conventional management. Patients experienced a significant and progressive reduction in pain as measured by VAS scores, alongside substantial improvements in functional status reflected in Roles and Maudsley scores. These benefits were observed consistently across genders and were slightly more pronounced in younger patients, suggesting PRP promotes sustained tissue healing and functional recovery. By leveraging the regenerative potential of growth factors, PRP offers a distinct advantage over corticosteroid injections, which primarily provide short-term symptomatic relief.

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References

1. 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.
2. Riddle DL, Schappert SM. Volume of ambulatory care visits and patterns of care for patients diagnosed with plantar fasciitis: a national study of medical doctors. *Foot Ankle Int.* 2004;25(5):303-10.
3. Scher DL, Belmont PJ Jr, Bear R, Mountcastle SB, Orr JD, Owens BD. The incidence of plantar fasciitis in the United States military. *J Bone Joint Surg Am.* 2009;91(12):2867-72.
4. Lee TH, Maurus PB. Plantar heel pain. In: Coughlin MJ, Saltzman CL, Anderson RB, editors. *Mann's surgery of the foot and ankle.* 9th ed. Philadelphia: Elsevier Saunders; 2014. p. 689-705.
5. Rosenbaum AJ, DiPreta J, Misener D. Plantar heel pain. *Med Clin North Am.* 2014;98(2):339-52. doi:10.1016/j.mcna.2013.10.009.
6. Hossain M, Makwana N. "Not plantar fasciitis": The differential diagnosis and management of heel pain syndrome. *Orthop Trauma.* 2011;25(3):198-206.
7. Chundru U, Liebeskind A, Seidelmann F, Fogel J, Franklin P, Beltran J. Plantar fasciitis and calcaneal spur formation are associated with abductor digiti minimi atrophy on MRI of the foot. *Skeletal Radiol.* 2008;37(6):505-10.
8. Tong KB, Furia J. Economic burden of plantar fasciitis in the United States. *Am J Orthop (Belle Mead NJ).* 2010;39(5):227-31.
9. Gill LH, Kiebzak GM. Outcome of nonsurgical treatment for plantar fasciitis. *Foot Ankle Int.* 1996;17(9):527-32.
10. Wapner KI, Sharkey PF. The use of night splints for treatment of recalcitrant plantar fasciitis. *Foot Ankle.* 1991;12(3):135-7.
11. Scioli MW. Platelet-rich plasma injection for proximal plantar fasciitis. *Tech Foot Ankle Surg.* 2011;10(1):7-10.
12. Jain AK, editor. *Turek's orthopaedics: Principles and their applications.* 7th ed. Haryana: Wolters Kluwer; 2016.
13. Orchard J. Plantar fasciitis. *BMJ.* 2012;345:e6603.
14. Toomey EP. Plantar heel pain. *Foot Ankle Clin.* 2009;14(2):229-45.
15. Xu Y, Murrell GA. The basic science of tendinopathy. *Clin Orthop Relat Res.* 2008;466(7):1528-38.
16. Siddiqui IA, Azam M, Sabir AB, Khan AQ, Iqbal MA. Platelet-rich plasma in the treatment of chronic plantar fasciitis. *Rawal Med J.* 2020;45:123-6.
17. Upadhyay S, Jha AK, Kumar V, Yadav CS, Kumar A. The outcome of platelet-rich plasma injection therapy in chronic plantar fasciitis. *Int J Med Res Rev.* 2021;9(2):104-8.
18. Mohammed M, El-Sherif A, Elghazaly H, El-Shafey K, Elhussein A. The use of platelet-rich plasma in chronic plantar fasciitis. *Med J Cairo Univ.* 2019;87:4255-62.

19. Martin J, Vosseller JT, Hankins T, O'Malley MJ. Successful use of platelet-rich plasma for chronic plantar fasciitis. HSS J. 2012;8(2):99-103.