

# Ultrasonography-guided Platelet-rich Plasma Injection in Chronic Plantar Fasciitis

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## ABSTRACT

**Introduction:** Heel pain is a very common problem. The most common cause of heel pain is plantar fasciitis, and this often refractory to conservative treatment leads to disability. Platelet-rich plasma (PRP) derived from autologous blood containing high concentration of growth factors helps in tissue healing, so it is postulated to promote native tissue regeneration. The purpose of this work was to study the effectiveness of PRP in the treatment of chronic plantar fasciitis.

**Materials and methods:** The study was conducted in Orthopedic Department in collaboration with Radiodiagnosis Department at People's College of Medical Sciences and Research Centre, Bhopal, Madhya Pradesh, India. In this study, there were 44 patients, with 48 feet affected by plantar fasciitis.

**Results:** All patients were evaluated preinjection and postinjection by visual analog score. There was significant improvement after injection and no adverse reaction was seen.

**Conclusion:** Platelet-rich plasma is considered as a safe therapeutic option. It also effectively decreases heel pain in chronic plantar fasciitis.

**Keywords:** Plantar-fasciitis, Platelet-rich plasma, Ultrasonography.

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## INTRODUCTION

Plantar fasciopathy or plantar fasciitis is a leading cause of heel pain. It is estimated that 10% of the population will be affected by this condition at some point of time during their lifetime.<sup>1</sup> Plantar fascia is a thick ligament that originates from the medial calcaneal tuberosity

and divides distally into five slips, one for each toe. Plantar fasciitis is dynamic shock absorber during weight-bearing physical activity.<sup>2</sup> Risk factors for the development of plantar fasciitis include reduced ankle dorsiflexion, obesity, and prolonged weight-bearing.<sup>3</sup>

There are various treatments for plantar fasciitis that include orthotic treatment, nonsteroidal antiinflammatory drugs (NSAIDs), more invasive treatment that includes steroid injection, botulinum toxin injection, shockwave therapy, and plantar fasciotomy.<sup>4</sup> Despite early intervention, 10% patients fail to improve and develop chronic debilitating heel pain.<sup>5</sup> Persons with bilateral heel pain and who are obese are more likely to develop chronic refractory plantar fasciitis.<sup>6</sup>

## PATHOPHYSIOLOGY

Peak incidence of plantar fasciitis occurs between the age of 40 and 60 years.<sup>3</sup> Incidence in both male and female sex is equal. The underlying cause of chronic plantar fasciitis is degenerative tissue condition at the place where the plantar fasciitis originates at the medial tuberosity of calcaneum. In the acute form, the diseases are characterized by signs of inflammation, which include swelling and loss of function.

Destruction and repair involve immature fibrosis and vascularization. The normal facial tissue is replaced by angiofibroblastic hyperplastic tissue which spreads itself through the surrounding area. This causes viscous cycle of cystic degeneration and pain.<sup>7</sup>

Corticosteroid injection is effective in treating chronic plantar fasciitis when conservative methods fail, but its long-term results are inferior and associated with high recurrence rate. Complication of corticosteroid injection includes fat pad atrophy, iatrogenic plantar fasciitis rupture, and rarely calcaneum osteomyelitis.<sup>8</sup>

## MATERIALS AND METHODS

This study was conducted at People's College of Medical Science and Research Centre, Bhopal, Madhya Pradesh, India, between November 2013 and February 2015. A total of 44 patients and 48 feet (four patients have bilateral involvement) were selected from the orthopedics outpatient department for study. Follow-up of patient was evaluated with visual analog score (VAS).

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Fig. 1: Centrifugation



Fig. 2: Fractionated blood

**Inclusion Criteria**

Patients 20 to 60 years of age with plantar fasciitis of more than 3 months duration and refractory to conservative treatment.

**Exclusion Criteria**

Patients were excluded if they received steroid injection in past 3 weeks and did not use NSAIDs 1 week prior to injection and 4 weeks after injection. Patients with diabetes and any comorbid conditions were excluded from the study.

**Platelet-rich Plasma Preparation**

15 mL of blood was collected from phlebotomy technique and placed in a container with 5 mL of sodium citrate. A peripheral blood count was also sent at this time. The blood was placed in centrifuge (Fig. 1) for 10 minutes at 2,000 rpm. Tubes are placed opposite to each other for balancing. Blood was fractionated with platelet-rich plasma (PRP) on top, and red cells at the bottom (Fig. 2). The platelet-poor plasma was discarded. Concentrated platelets were collected in a sterile syringe, being careful not to draw up the red blood cells. The PRP was ready to be injected.

**Injection Technique**

Injection site was located clinically by the tenderness and with the help of ultrasonography (USG) to detect the region of fascial thickening (Fig. 3).<sup>9</sup> Then xylocaine 2% was infiltrated into skin and subcutaneous tissue of heel as a field block. Then 5 cc PRP was injected into the predetermined area with single skin portal and five penetrations of plantar fasciitis were done.<sup>10</sup>

Patients were instructed to follow postinjection standard protocol reference. Patients were instructed to sit in resting position without mobilizing the foot for initial 30 minutes. Then the patient was sent to do stretching exercise at physiotherapy department.

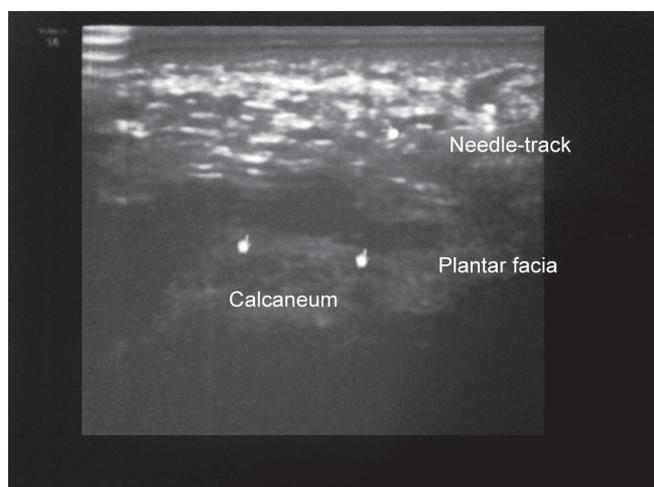


Fig. 3: Ultrasonography-guided injection

Stretching exercise continued for 2 weeks followed by strengthening exercise. Patients were advised not to take NSAIDs or any type of orthosis. At 4 weeks, patients were allowed to do usual sport and recreational activity.

**OBSERVATION**

Pain was evaluated using a VAS at all time points. The VAS score of foot function index was used. The scale recorded the patients' complaint of pain using a scale of 0 to 10, where 0 is pain free and 10 is worst possible pain. The scale was 10 cm line beginning with 0 and ending with 10. The scale was marked at the line that corresponded with the patient response (Table 1).

Table 1: Visual analog score

Score	Rating
0	No pain
1-3	Mild pain, little interference with activities of daily living (ADL)
4-6	Moderate pain, pain interference with ADL
7-10	Severe pain, unable to perform ADL

**Table 2:** Patient demographic data and baseline characteristics

Total patients	44
Total plantar fasciitis	48
Age in years, mean (range)	44 (20–60)
Duration of symptoms in months	6.2
Gender	Male – 20 (45.4%), female – 24 (54.6%)
Involved foot	Right – 24 (50%), left – 24 (50%)

**Table 3:** VAS before injection and after PRP injection

VAS (number of patients) before injection	VAS (number of patients) after injection			
	4 weeks	8 weeks	12 weeks	24 weeks
4 (6)	7 (2)	6 (1)	8 (1)	8 (1)
5 (11)	4 (7)	3 (18)	3 (4)	3 (1)
6 (14)	3 (14)	0 (28)	0 (42)	0 (44)
7 (9)	0 (24)	47	47	46
8 (5)	47			
9 (3)				
48				

## RESULTS

Patients were followed at 4, 8, 12, and 24 weeks (Tables 2 and 3). Average VAS score before injection was 6.10, 35% patients were severely disabled before injection. The average VAS score after injection was 1.78 (4 weeks), 1.27 (8 weeks), 0.64 (12 weeks), and 0.23 (24 weeks). Two patients were lost during follow-up, and in one patient pain increased after initial relief. Patient satisfaction, i.e., VAS score, was 0 in 51% (4 weeks), 59% (8 weeks), 89% (12 weeks), 95% (24 weeks) (Graph 1). A total of 44 patients were fully satisfied, 1 patient was moderately satisfied, and 1 patient was not satisfied at the end of 24 weeks. We did not see any adverse event during the entire follow-up.

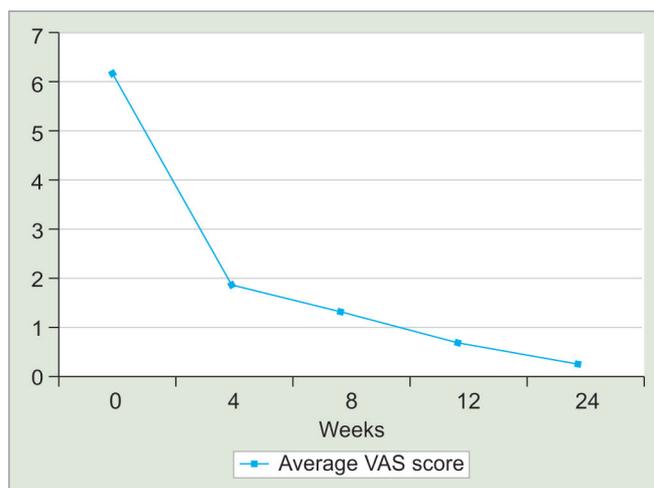
## DISCUSSION

After PRP injection, significant improvement in pain and function of patient in chronic plantar fasciitis was seen, which was refractory to conservative treatment. Platelet-rich plasma injection was well tolerated without significant adverse reaction.

The use of PRP is emerging as a safe alternative therapy to surgery and steroid injection for various chronic tendinopathies, including chronic plantar fasciitis. Unlike other treatment modalities, PRP offers healing effects due to its unique potential to native tissue regeneration at the cellular level by the release of growth factor from the platelets.<sup>11</sup>

Barrett and Erredge<sup>12</sup> reported a small case series in which six out of nine patients demonstrated complete resolution of symptoms in 2 months after receiving single injection of PRP. Another study conducted by Wilson et al<sup>9</sup> in 24 patients with chronic plantar fasciitis with USG-guided PRP injection demonstrated statistically significant improvement after 32 weeks. Bhattacharya et al<sup>10</sup> also found significant improvement after PRP injection in chronic plantar fasciitis.

Our results further supported the findings of Barrett and Erredge<sup>12</sup> and Wilson et al<sup>9</sup> such that patients receiving single USG-guided PRP injection showed significant improvement in pain and disability.

**Graph 1:** Relation of VAS score to duration after treatment

Injection of PRP was found to be safe and did not affect any biomechanical function of foot and may become a very common and safe treatment modality for chronic plantar fasciitis.

We recommend routine use of USG in heel PRP injection for accuracy of localization and precision of delivery of PRP.

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