# Comparative analysis between platelet rich plasma and corticosteroid injection in plantar fasciitis

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## Abstract

**Introduction:** Plantar fasciitis is a disorder resulting in pain in the heel and bottom of the foot. Risk factors include increased exercise, obesity, long periods of standing and heel spur. Non-operative treatment includes rest, contrast bath, sole inserts, stretching exercise, NSAIDS and steroidal medications. Invasive interventions are steroid injections, autologous blood, PRP application and open, endoscopic or percutaneous fascial surgical release of plantar fascia.

**Aims and Objectives:** The aim of this study was to determine the effects on pain and function of PRP obtained manually as a cheap and easy method in the treatment of plantar fasciitis and to compare this data with that of steroid injection which is often used in clinical practice. The hypothesis was that a single dose of manually prepared PRP would reduce pain in plantar fasciitis and this effect is superior to the steroid injection.

**Materials and Methods:** The present study was conduct at our institute during August 2016 to September 2018; 80 consecutive patients with chronic plantar fasciitis were enrolled and randomized in two groups: One group receives the Platelet rich plasma (PRP) therapy and another group receiving corticosteroid injection. The outcomes in both groups were observed and compared by The Foot and Ankle Disability Index (FADI) and Visual Analogue Scale (VAS) at 1st week, 4th week and 12th week post injection. The level of significance was set at $p<0.05$.

**Results:** Prospective data was collected of 40 patients. The average follow up duration was about 12 weeks. The score on VAS Scale and FADI improved from the baseline for both the groups but the patients who received PRP therapy had a statistically significant ($p<0.05$) reduction in pain and improved at last follow up. No adverse complications were reported.

**Conclusion:** The application of PRP appears to be more effective than steroid injection in terms of pain and functional results in the treatment of chronic plantar fasciitis.

**Keywords:** Steroid injection, PRP, Plantar fasciitis, FADI score, VAS scale.

## Introduction

Plantar fasciitis is a disorder that results in pain in the heel and bottom of the foot. Heel pain is the most common reason for presentation.[1] Approximately 10% of the population will experience heel pain in their life.[2] The pain is generally localized in the medial calcaneal tubercle. In the acute phase, the pain is sharp and typically on the first step of the day or after a period of rest. In the chronic phase, pain is continuous and of a duller nature.[3] Risk factors include overuse such as from long periods of standing, an increase in exercise, and obesity and heel spur.[4] Heel spurs have been implicated a risk factor for plantar fasciitis but it is unclear if they have a role in disease process. Plantar fasciitis is generally a self-limiting condition. Symptoms in 80 to 90% of cases recover within 10 months.[5] Non-operative approaches include rest, contrast bath, sole inserts, stretching and strengthening exercises, braces, night splints, non-steroidal and steroidal anti-inflammatory medication, and physical therapy.[6] Invasive interventions are steroid injections, autologous blood, PRP application and open, endoscopic or percutaneous fascial surgical release of plantar fascia, which have shown variable success in literature.[7-9]

Recently, PRP has shown encouraging outcomes in the treatment of tennis elbow, osteoarthritis of the knee and various other musculoskeletal problems. PRP is a concentrate of platelets (7 to 10 times) from the whole blood pre by ultracentrifugation of the blood sample from the patient.[10] PRP is a rich source of cytokines and growth factors that attract reparative cells.[11]

These agents include Fibroblast Growth Factor (FBGF), Platelet Derived Growth Factor (PDGF), Epidermal Growth Factor (EGF), Transforming Growth Factor- beta 1 (TGFB-1), Insulin-like Growth Factor (IGF) and Vascular Endothelial Growth Factor (VEGF) etc. which modulate neovascularization and angiogenesis, promote mitogenesis, improve local collagen production, and have anti-inflammatory effects by blocking COX-2 enzyme production.

The aim of this study was to determine the effects on pain and function of PRP obtained manually as a cheap and easy method in the treatment of plantar fasciitis and to compare this data with that of steroid injection which is often used in clinical practice. The hypothesis was that a single dose of manually prepared PRP would reduce pain in plantar fasciitis and increase function and that this effect would be superior to the frequently used steroid injection.

## Materials and Methods

A clinical interventional study was conducted in the Orthopaedics department, Santosh Medical College and Hospital, Ghaziabad, during August 2016 to September 2018. Ethical clearance was obtained from the Institutional Ethical Committee. As per the sample size a total of 80

patients were included in the study. Patients were randomly divided into 2 Groups- of 40 cases each and the Group - A cases were treated with PRP therapy and Group - B case were treated with corticosteroid therapy. Patients informed about the treatment options and those who accepted were included in the PRP group (16 males, 24 females; mean age: 44) and the others in the steroid group (14 males, 26 females; mean age: 46.6). All the patients from the age 35 – 62 years of both sexes, who had heel pain for more than 4 months and / or have been diagnosed as having Chronic Planter Fascitis, ability to walk, with the understanding of the risk and benefits of the study and available for the entire duration of study were included in study. The patients who had traumatic heel pain for less than 4 months, inflammatory disorder like Gout, Rheumatic Arthritis, Ankylosing Spondylosis, abnormal Liver Function and Kidney function Tests, Haematological disorders, any history of coagulopathies, Diabetes Mallitus, Cancer, hypersensitivity to NSAIDs, Compressive neuropathies, skin disorders, severe infections, pregnant women, breast feeding mother or planning to become pregnant were excluded from the study.

## Procedure

Platelet Rich Plasma (PRP) was prepared and applied under the same conditions using the method as described by Anitua et al. (2005). A total of 30 cc peripheral blood was taken from the ante-cubital region vein and mixed with 3.2% sodium citrate. Samples were centrifuged at 1800 rpm for 8 minutes at room temperature. From the 3.5 ml PRP obtained, 1 ml was sent to the laboratory for bacteriological testing and platelet count. After activation, 2.5 ml of PRP containing 5.5% calcium chloride ($CaCl_2$) (50 µl of $CaCl_2$ in 1 ml of PRP) was administered to the foot from the medial side to maximal tenderness area with palpation under sterile conditions. The patient was kept in the supine position for 20 minutes following administration. In the steroid group, 40 mg Depomedrol solution injected in a similar manner. The peppering injection technique was used in both groups and the fascia was injected in 4 to 5 different locations. Standard Achilles and plantar fascia stretching and strengthening exercises were applied to all patients. Patients were advised to rest and not stand for the first day after the injection. No NSAID, orthosis or splint was given to any patient. Clinical evaluation was performed before treatment and at 1st week, 4th week and 12th week follow-ups. The visual analog scale (VAS) and the Foot and Ankle Disability Index (FADI) Score and were used in the clinical evaluation. The FADI evaluation covered pain, function, maximum walking distance, walking surfaces, gait abnormality, sagittal motion, hind foot motion, alignment, and ankle-hind foot stability. Patients were question with regard to any side effects and subjective satisfaction.

### Statistical Analysis

The data was collected and entered in MS Excel spread sheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0 using appropriate statistical methods as- Quantitative variables were analyzed using Independent T test / Mann-Whitney Test (when the data sets were not normally distributed) between the two groups. Qualitative variables were correlated using Chi-Square test. P value of $< 0.05$ was consider statistically significant.

## Result and Discussion

At the initial visit before injection therapy, Group A (PRP) patients and Group B (Corticosteroid) patients had a mean VAS Score of 7.9 and 8 respectively and the mean FADI Score was 25 for Group A (PRP) and 20.6 for Group B (Corticosteroid) patients. (Table 1)

At 1st week, the mean VAS and FADI Score showed better results in Group B (Corticosteroid) patients as compared to Group A (PRP) patients. The mean VAS score showed better results in Corticosteroid group (4.45) as compared to PRP group (5.45) and the same was seen with FADI Score in Corticosteroid group (58.55) and PRP Group (48.55). (Table 1)

At 4th week, the mean VAS and FADI Scores showed almost equal results in Group A (PRP) and Group B (Corticosteroid) patients. The mean VAS Score in Group A (PRP) was 4.2 and in Group B (Corticosteroid) was 4.1 and the mean FADI Score in Group A (PRP) was 62.6 and in Group B (Corticosteroid) was 62.8 respectively. (Table 1)

However, at 12th week of post injection therapy, the group A (PRP) showed significant improvement in mean VAS as well as FADI Scores scores than Group B (Corticosteroid). The mean VAS score at 12th week in Group A (PRP) and Group B (Corticosteroid) was 1.85 and 3.4 respectively. The mean FADI score at 12th week in Group A (PRP) and Group B (Corticosteroid) was 84.05 and 68.9 respectively. Steroids failed to show long term decrease in VAS score and increase in FADI score ($p<0.05$) as shown in fig. 1 and 2 respectively. (Table 2)

In the present study, it was found that the improvement in VAS score at 1 week was statistically significant in the steroid group (4.45) as compared to PRP group (5.45). It was observed in the first week that the patients treated with corticosteroid injection (Group B) showed better results as compared to the patients injected with PRP (Group A). Patients treated by PRP can be mostly attributed to a possible anti-inflammatory effect due to the inhibition of cyclo-oxygenase-2 (COX-2) enzymes by the cytokines in PRP.[12] However, better early improvement in the steroid group implies that the anti-inflammatory effect of PRP due to COX 2 inhibition is less as compared to steroid.

In the present study, we observed that at 4th week follow up the VAS Scores were insignificant in both the groups (VAS Score 4.2 and 4.1 in PRP and steroid group respectively). Akashin et al.[13] in a prospective study divided 60 patients in 2 non-randomized consecutive groups of 30 and treated them by either 40 mg methylprednisolone or 3 cc of PRP. They followed them for 6 months. The mean VAS scores decreased from 6.2 to 3.2 in the steroid group and from 7.33 to 3.93 in the PRP group at 6 months follow

up. The results were found to be statistically insignificant. This is in tune with the observations in our study.

In the present study, the long term follow up results at 12th week were encouraging in the PRP (VAS score 1.85) group and it appeared to be more beneficial than steroid injection (VAS Score 3.4). The possible mechanism of long term clinical improvement is the release of growth factors and chemo-attractants from the highly concentrated platelets which improved collagen upregulation and neovascularization.[14,15] Ragab and Othman followed a group of 25 PRP treated patients with chronic plantar fasciitis for around 10.3 months and reported VAS score improvement from 9.1 to 1.6.[16] Ninety two percent of their patients had little or no noticeable limitations at the end of the study. Similar results were also observed by Jain et al, Shetty et al and Say et al.[17-19] Martinelli et al used 3 weekly injections of PRP for chronic plantar fasciitis and observed that the average VAS scores decreased from 7.1 to 2.1 after 12 months.[20] This study advocates use of multiple injections of PRP instead of one with no potential complications and excellent long term pain. In the Indian sitting cost and compliance with multiple injections is a major concern, hence we resorted to single PRP injection.

Both methods were effective and successful in treating plantar fasciitis. Although there is no complication related to steroids was observed, when the potential risks of corticosteroid such as fat pad atrophy, osteomyelitis of the calcaneus, and iatrogenic rupture of the plantar fascia are taken into consideration, PRP injection seems to be safer while being just as effective in the treatment of plantar fasciitis. Taking the possible regenerative effect of PRP into consideration, the results of the PRP injection group were expected to be more satisfactory in cases of plantar fasciitis as shown in Table 1 and 2, since it is believed to be a degenerative process rather than an inflammatory reaction.

**Table 1:** Showing VAS and FADI Score at 0, 1, 4 and 12 weeks in both groups.

| S. No. | Test | Week | PRP | Steroid |
|---|---|---|---|---|
| 1 | VAS Score | 0 | 7.9 | 8 |
| | | 1 | 5.45 | 4.45 |
| | | 4 | 4.2 | 4.1 |
| | | 12 | 1.85 | 3.4 |
| 2 | FADI Score | 0 | 25 | 20.6 |
| | | 1 | 48.55 | 58.55 |
| | | 4 | 62.6 | 62.8 |
| | | 12 | 84.05 | 68.9 |

**Table 2:** Showing VAS and FADI Scores in PRP and Steroid at 0, 1, 4 and 12 weeks with statistical tests

| S. No. | Particulars | PRP | Steroid |
|---|---|---|---|
| 1 | **Age** | | |
| | Sample size | 40 | 40 |
| | Mean ± SD | 47.45 ± 7.05 | 51.55 ± 6.77 |
| | Median | 47 | 50.5 |
| | Min-Max | 39-60 | 40-62 |
| | Inter quartile Range | 40.500 – 52 | 47 – 58.500 |
| | P value | 0.068 | |
| 2 | **VAS Score at 0 WK** | | |
| | Sample size | 40 | 40 |
| | Mean ± SD | 7.9 ± 0.72 | 8 ± 0.73 |
| | Median | 8 | 8 |
| | Min-Max | 7-9 | 7-9 |
| | Inter quartile Range | 7 – 8 | 7.500 – 8.500 |
| | P value | 0.659 | |
| 3 | **VAS Score at 1st WK** | | |
| | Sample size | 40 | 40 |
| | Mean ± SD | 5.45 ± 0.6 | 4.45 ± 0.51 |
| | Median | 5.5 | 4 |
| | Min-Max | 4-6 | 4-5 |
| | Inter quartile Range | 5 – 6 | 4 – 5 |
| | P value | < 0.0001 | |

| | | | |
|---|---|---|---|
| 4 | **VAS Score at 4th WK** | | |
| | Sample size | 40 | 40 |
| | Mean ± SD | 4.2 ± 0.77 | 4.1 ± 0.31 |
| | Median | 4 | 4 |
| | Min-Max | 3-5 | 4-5 |
| | Inter quartile Range | 4 – 5 | 4 – 4 |
| | P value | 0.441 | |
| 5 | **VAS Score at 12th WK** | | |
| | Sample size | 40 | 40 |
| | Mean ± SD | 1.85 ± 0.75 | 3.4 ± 0.5 |
| | Median | 2 | 3 |
| | Min-Max | 1-3 | 3-4 |
| | Inter quartile Range | 1 – 2 | 3 – 4 |
| | P value | < 0.0001 | |
| 6 | **FADI Score at 0 WK** | | |
| | Sample size | 40 | 40 |
| | Mean ± SD | 25 ± 7.23 | 20.6 ± 6.7 |
| | Median | 26.5 | 21 |
| | Min-Max | 10-33 | 11-32 |
| | Inter quartile Range | 21.500 – 31.500 | 14.500 – 22.500 |
| | P value | 0.053 | |
| 7 | **FADI Score at 1st WK** | | |
| | Sample size | 40 | 40 |
| | Mean ± SD | 48.55 ± 4.88 | 58.55 ± 5.14 |
| | Median | 48 | 61 |
| | Min-Max | 41-56 | 51-66 |
| | Inter quartile Range | 44.500 – 52.500 | 53.500 – 62 |
| | P value | < 0.0001 | |
| 8 | **FADI Score at 4th WK** | | |
| | Sample size | 40 | 40 |
| | Mean ± SD | 62.6 ± 5.56 | 62.8 ± 3.53 |
| | Median | 62 | 62 |
| | Min-Max | 56-72 | 54-69 |
| | Inter quartile Range | 58 – 66 | 61 – 65.500 |
| | P value | 0.713 | |
| 9 | **FADI Score at 12th WK** | | |
| | Sample size | 40 | 40 |
| | Mean ± SD | 84.05 ± 6.05 | 68.9 ± 4.33 |
| | Median | 84 | 71 |
| | Min-Max | 72-94 | 61-74 |
| | Inter quartile Range | 80.500 – 88.500 | 65 – 72 |
| | P value | < 0.0001 | |

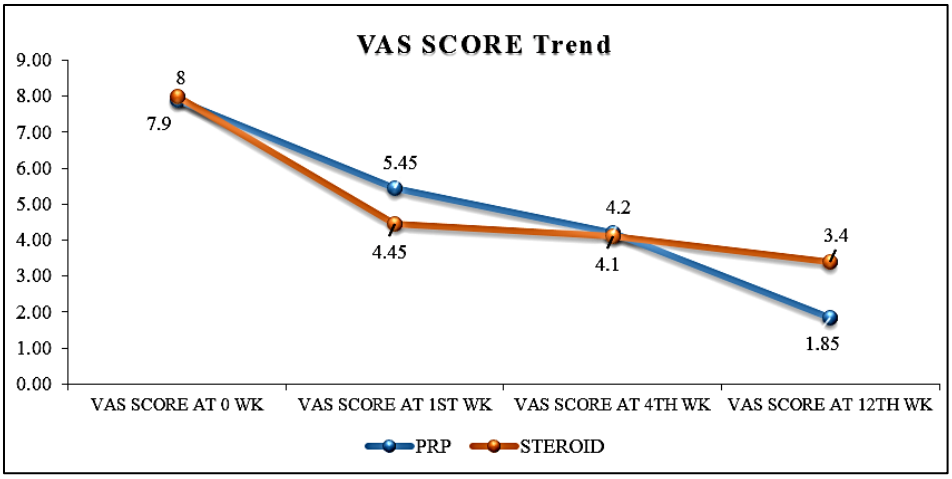


**Fig. 1:** VAS Score trend at 0, 1, 4 and 12 weeks

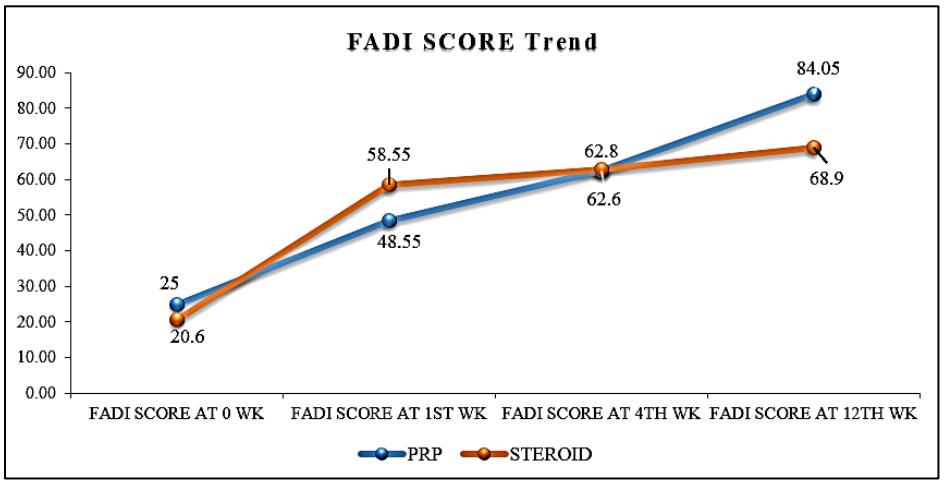


**Fig. 2:** FADI Score trend at 0, 1, 4 and 12 weeks

## Conclusion

The use of PRP in chronic cases of plantar fasciitis seems more efficacious in long term than the traditional treatment of steroid injection. Although steroid possibly leads to a better short term outcome it fails to sustain its effect in the longer run. Also despite the long-term benefit of PRP injection in chronic plantar fasciitis, it is advisable to stick to the fundamental treatment paradigm of conservative measures, as they suffice in majority of the cases. The PRP local injection is a new, readily available and well tolerated, with prolonged effect and safe choice of therapy for chronic pf. We can conclude that the use of PRP is an effective treatment method for patients with plantar fasciitis, which do not respond to conservative treatment. The PRP injection is better than steroid injection in relieving the pain of planar fasciitis and in improvement of the function of the patient foot.

**Conflict of Interest:** None.

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