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A comparative prospective study of platelet rich plasma versus corticosteroid injection in chronic plantar fasciitis

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ABSTRACT

Background: The Plantar fasciitis is a common reason for heel pain which manifests as pain at medial process of calcaneal tuberosity. Patients are mostly diagnosed clinically on the basis of history. Conservative treatment in the form of stretching, non-steroidal anti-inflammatories, night splinting, ice packs, strapping, orthosis, and shoe modifications have been in use traditionally. Recently, the use of injectables like corticosteroids and platelet rich plasma (PRPs) has increased. This study aims at comparing the clinic-radiological outcomes of the two injectables in the treatment of chronic plantar fasciitis.
Methods: This was a Prospective, Comparative, Randomized, Hospital-based clinical case study conducted in the Department of Orthopaedics, Sawai Man Singh Medical College, Jaipur, Rajasthan. 60 patients of chronic plantar fasciitis were taken and divided randomly into group A (PRP) and group B (corticosteroids) and the results were assessed based on the visual analogue scale (VAS), American Orthopaedic Foot and Ankle Society (AOFAS) score, and the plantar fascia thickness.
Results: Mean VAS in Group A decreased from 8.07 before injection to 2.9 after injection and in Group B decreased from before 8.33 injection to 3.13 after injection, at the final follow-up. Mean AOFAS score improved from 54.06 to 90.60 and from 54.86 to 75.13 in the respective groups at the 6-months follow-up. Plantar fascia thickness (as measured using ultrasonography) decreased from 5.77 to 3.32 and from 5.6 to 3.73 in the respective groups. The improvements observed were statistically significant.
Conclusions: Local injection of platelet rich plasma is an effective treatment option for chronic plantar fasciitis when compared with steroid injection with long lasting beneficial effects.

Keywords: AOFAS, Corticosteroid, Plantar fasciitis, Platelet rich plasma

INTRODUCTION

The Plantar Fasciitis (PF) is one of the commonest reasons of heel pain and manifest as pain originating from the insertion of Plantar Fascia near the medial process of the calcaneal tuberosity. It is worse at the first step in the morning and on getting up from sitting position or on long standing.[1] The prevalence of heel pain is 3.6% to 7% in the general population and it accounts for about 8% in athletics. [2]

The diagnosis of the condition is clinical; it is diagnosed on the basis of patient history and tenderness at the insertion site of the plantar fascia (on the medial process of calcaneal tubercle) elicited by palpation.[3]

Conservative treatment for plantar fasciitis in the form of stretching, non-steroidal anti-inflammatories, night splinting, ice packs, strapping, orthosis, and shoe modifications are effective for some cases. For recalcitrant cases treatment includes injection therapy, extra corporeal

shock wave therapy (ESWT) and in some instances surgical release of the origin of the plantar fascia.[4]

Corticosteroid injection is a mainstay of early treatment. However, conflicting evidence exists to support the use of steroid injection. Platelet rich plasma (PRP) therapy is a revolutionary novel modality that relieves pain by stimulating long lasting healing of musculoskeletal conditions.[5-7]

Recently, promising results were reported with the use of platelet-rich- plasma (PRP) injections for treating muscle and tendon injuries and degeneration.[8-13] The use of autologous PRP was first used in 1987 by Ferrari, et al.[14]

Platelet rich plasma consists of increased platelet concentration which promotes bone and muscle healing. PRP is used for tissue repair which is mediated by different types of cytokines and growth factors. PRP increases tendon regenerative abilities with a high content of cytokines and cells, in hyper physiologic doses, which promotes cellular chemotaxis, matrix synthesis, and proliferation.[15]

Degranulation of the alpha granules in platelets releases many different growth factors that can play a role in tissue regeneration processes. PRP represents a treatment option for many foot and ankle pathologies, including tendinopathy (achilles, peroneal, posterior tibial, flexor hallucis longus, anterior tibial) and chronic ligamentous injury, such as plantar fasciitis.[16]

In this study we compared the local corticosteroid (methyl prednisolone) injection and platelet-rich-plasma in terms of patient outcome in chronic plantar fasciitis.

METHODS

This was a Prospective, Comparative, Randomized, Hospital-based clinical case study conducted in the Department of Orthopaedics, Sawai Man Singh Medical College, Jaipur, Rajasthan from March 2021 to October 2022 after approval by the hospital ethics committee. The study included patients of either sex, age more than 18 years, with history of plantar fasciitis for at least more than 6 months which has not responded to 6 weeks of conservative therapy, gave written informed consent for the participation in the study, and were available for 6 months of post-intervention follow-up. While those patients who have had repeated corticosteroid injections within the past 3 months or have taken a non-steroid anti-inflammatory drug during the 1 week prior to receiving an intervention, those with a previous foot deformity or those patients who have had previous foot surgery, pregnant females, those with cardiovascular, renal or hepatic disease, or those with confirmed diagnosis of neuropathy were excluded from the study.

The study included a total of 60 cases of plantar fasciitis divided into 2 groups of 30 subjects each from the outdoor department of orthopaedics.

Randomization

Participants were randomly assigned following a simple randomization procedure (computerized random numbers) to 1 of 2 treatment groups. Those in group A were administered local autologous platelet rich plasma injection while those in group B were administered with single injection of 1ml local methyl-prednisolone (40mg/ml) with local anaesthesia.

PRP Preparation method

Under aseptic precautions, 20 ml blood was withdrawn from antecubital vein using 10 cc syringe into sterile anticoagulant-coated disposable tubes. The whole blood was initially centrifuged by placing the test tube directly into the centrifuge. This first spin is called ‘soft spin’ at 3000rpm for 3 minutes. This causes separation of the blood into RBC, buffy coat and platelets and top Platelet Poor Plasma. The upper layer of plasma including the platelets and buffy coat is drawn into another test tube using long bore sterile micropipette. This is subjected to the second centrifugation called the ‘hard spin’ at 4500rpm for 15 minutes. This causes separation of the platelet poor plasma and platelet rich plasma (Figure 1). PPP layer was discarded with the help of a long bore sterile micropipette and around 4-5ml of PRP collected and ready to use.

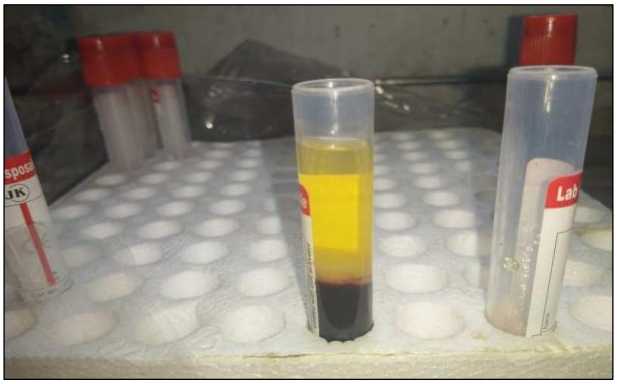

Figure 1: Supernatant PRP after centrifugation.

After thorough scrubbing, painting with betadine followed by surgical spirit and sterile draping, the patients of both groups were administered the respective injections (PRP or corticosteroids). Patient in supine position with the leg externally rotated and the injection is given at the point of maximum tenderness in the heel (Figure 2).

Follow-up and evaluation

The patients were evaluated with visual analogue scale (VAS) and AOFAS at the time of getting the injection (0 weeks), at the end of 6th week, 12th week and 6 months of

follow up and plantar fascia thickness using USG at 0 week and 6 months of follow-up.

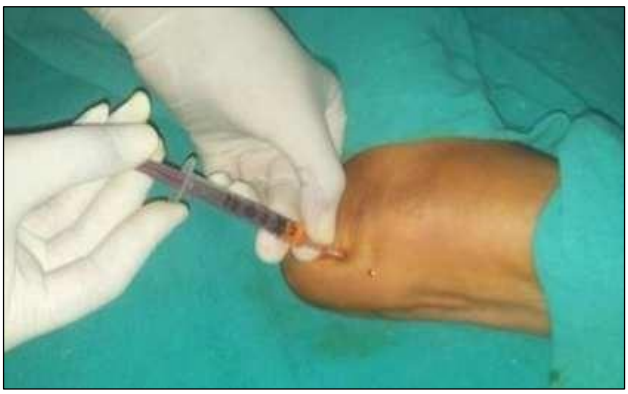

Figure 2: Treatment infuse method.

Statistical analysis

Descriptive statistics will be used for baseline parameters of the data. Qualitative variables will be presented as mean and standard deviations and qualitative variables in counts and percentages. As the sample size is less than equal to 30, we use Shapiro ilk test for the assessment of normality.

For the pre post comparison of quantitative outcome measures either a paired T test or Wilcoxon signed ran test will be used as per the normality of the data. A "p" value lesser than 0.05 shows statistical significance. All data entered in Microsoft excel and analyzed using SPSS version 26.00.

RESULTS

A total of 60 patients were analyzed in this study ranging from 22 to 64 years of age. In both groups, females outnumbered males, right sided involvement was more than the left side. The average duration of symptoms at the time of presentation was observed to be 21.03±14.5 (Table 1).

Table 1: Demographic details of patients at the time of presentation.

Parameters	Group A (PRP)	Group B (steroid)
Sex (M/F)	14/16	12/18
Age	42±12.98	39.4±10.09
Side(bilateral/left/right)	3/11/16	3/10/17
Duration of symptoms (weeks)	22.16±13.46	19.9±15.54

All the patients were followed-up at 6 weeks, 12 weeks, and 6 months and were analyzed clinically and radiographically. The clinical improvement in chronic plantar fasciitis in this study was evaluated by comparing the values of functional outcome indices (i.e. AOFAS score, VAS scale and plantar fascia thickness) at 6th month follow-up (AOFAS: 90.6±1.47/ 75.13±2.01; VAS: 2.90±1.07/ 4.46±0.96; PFT: 3.32±0.44/ 3.73±0.65) with the baseline values (AOFAS: 54.06±3.29/54.86±3.01; VAS: 8.07±0.63/ 8.33±0.66; PFT: 5.77±0.65/ 5.60±0.68) recorded prior to administration of injection. The patients showed a statistically significant improvement in both groups with respect to AOFAS Score, VAS scores and plantar fascia thickness (Figure 3) and this improvement was significantly more in Group A (PRP) (Table 2).

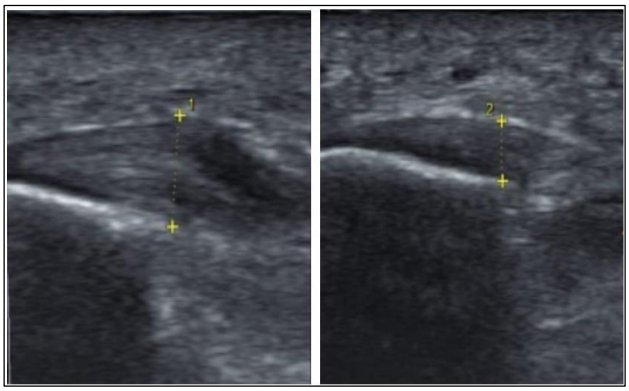

Figure 3: Pre-injection and post-injection plantar fascia thickness as seen under ultrasonography.

Table 2: Functional and radiological outcome analysis between the two groups.

Parameters	Follow-up	Group-A (PRP)	Group-B (steroids)	Significance (p-value)
AOFAS	Baseline	54.06±3.29	54.86±3.01	0.33 (NS)
	6 weeks	80.76±1.75	86±2.23	0.0001 (HS)
	12 weeks	86.36±2.21	78.63±2.47	0.0001 (HS)
	6 months	90.60±1.47	75.13±2.01	0.0001 (HS)
VAS	Baseline	8.07±0.54	8.33±0.66	0.118 (NS)
	6 weeks	7.06±0.73	4.96±1.03	0.0001 (HS)
	12 weeks	6.23±0.87	4.06±0.77	0.0004 (HS)
	6 months	2.9±1.07	4.46±0.96	0.0001 (HS)
Plantar fascia thickness	Baseline	5.77±0.65	5.60±0.68	0.32 (NS)
	6 months	3.32±0.44	3.73±0.65	0.005 (HS)
[AOFAS: American Orthopaedics Foot and Ankle Society; VAS: visual analogue score; HS: highly significant; NS: no significant difference (p>0.05)]				

DISCUSSION

Plantar fasciitis is commonly diagnosed inferior heel pain in adults and have a dramatic impact on physical mobility.[17] It continues to baffle doctors, since there are no definite combinations of clinical, biomechanical, or training variables, or causativefactors in the development of chronic plantar fasciitis have been found.[18] Though corticosteroid injections are considered as one of the treatment modalitiesbut unfortunately it has short term results and is associated with complications like rupture of plantar fascia and fat atropy.[19] Recently, regenerative medicine therapies platelet rich plasma (PRP) have been used as an alternative therapy for chronic plantar fasciitis and were associated with improved pain and function scores.

The mean age in the Group A (PRP) was 42.0±12.98 and in the Group B (corticosteroid) was 39.4±10.09. This result was similar to the study conducted by Shetty et al wherein the mean patient age in the PRP Group and steroid group was 34.0±9.15 and 39.2±9.35 respectively.[20] The gender distribution observed in our study was similar to Monto et al that included 8 males and 12 females in the PRP Group, and 9 males and 11 females in the steroid Group.[21] In our study 3 patients in each group had bilateral involvement and that the right sided involvement was more than the left. Reddy et al study showed 60 cases with right side (n=31, 52%), left side (n=21,35%) and bilateral (n=8,13%).[22] While another study by Kukreja et al included 40 cases out of which there were 18 cases (45%) with unilateral plantar fasciitis, and 12 cases (30%) with bilateral involvement.[23] There was statistically significant difference of mean VAS scores AOFAS score and plantar fascia thickness between the Groups A and Group B at the end of follow up. Mahindra et al assessed the visual analog scale for pain and with the American orthopaedic foot and ankle society (AOFAS) ankle and hindfoot score before injection, at 3 weeks, and at 3-month follow-up.[24] Mean visual analog scale score in the platelet-rich plasma and corticosteroid groups decreased from 7.44 and 7.72 pre-injection to 2.52 and 3.64 at final follow-up, respectively. Mean AOFAS score in the platelet-rich plasma and corticosteroid groups improved from 51.56 and 55.72 pre-injection to 88.24 and 81.32 at final follow-up, respectively. In another study by Tank et al, within group comparison in PRP group the results were statistically significant ($p<0.05$).[25] The mean VAS score decreased from baseline continuously at 4, 8, 12, and up to 24 weeks. The VAS score was statistically significant in comparison with baseline at all durations. W ithin group comparison for steroid group, the results were also statistically significant. The mean VAS score decreased from baseline continuously at 4, 8, andup to 12 weeks. But at the end of 24 weeks, there was rise in VAS score when compared to score at 12 weeks.

Shetty et al conducted a comparative study using PRP and methyl prednisolone.[26] They studied both groups of patients before and after the injections using VAS, FADI and AOFAS. There was significant clinical improvement in PRP group at three months after the injection. In the study conducted by Dagar et al, the outcomes in both groups were observed and compared by FADI and VAS at 1st week, 4th week and 12th week post injection.[27] The score on VAS Scale and FADI improved from the baseline forboth the groups. The improvement of FADI scores from baseline to follow up PRP (25±7.23 to 84.05±6.05), steroid (20.6±6.7 to 68.9±4.33). Reddy et al conducted a study on PRP injection in the management of plantar fasciitis.[28] Subjects were reviewed at 4 weeks 8 weeks 3 months and 6 months. The result assessed using baseline VAS, FADI score. There was highly significant improvement in the VAS and FADI score on each successive visit, when compared with baseline scores.

In the study conducted by Anandkumar et al, 3 ml of the extracted PRP or 40 mg of methyl prednisolone was injected into the heel area.[29] Post-intervention, pain and functional assessment were done at 2 weeks, 6 weeks, 3 months and 6 months with VAS and FADI score. In both the groups there was significant difference in the VAS scores $p<0.001$ from the time of presentation to the first follow up and improved atthe second follow up significant difference $p<0.001$ after which it remained constant. Between the two groups there was no difference. He concluded that PRP reduces pain for longer duration as compared to steroid but the difference is not statistically significant.

CONCLUSION

This study concluded that both PRP and corticosteroid (methyl prednisolone) injections provide symptomatic relief in the treatment of chronic plantar fasciitis. Though the corticosteroid (methyl prednisolone) injection was effective for immediate pain relief, PRP injections are more effective than corticosteroid (methyl prednisolone) injections on long term basis. But limitations of the study like a small sample size, short duration of follow-up, irregularities in follow-ups, single center study could not be addressed to validate the study globally.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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