ORIGINAL RESEARCH

Comparative evaluation of PRP vs Corticosteroid in management of plantar fasciitis

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ABSTRACT

Introduction: Plantar fasciitis accounts for 15% of all foot disorders affecting 10% of world population.PF causes are not clearly known but it is most probably started by overuse injury. Most commonly presents with symptom of acute, insidious onset of pain with maximum sensitivity near the anterior midline of calcaneus.Many methods are advocated to treat PF, which includes rest, NSAIDs, splints during night, foot orthosis, stretching protocols, and ESW therapy.Locally injected steroids have traditionally been widely used to treat chronic plantar fasciitis. Recently Platelet-rich plasma (PRP) has been successfully used to treat a variety of chronic tendonitis, including chronic Planter fasciitis. **Materials and Methods:**Hundred patients were studied between 2019 and 2021. Patients were randomized in 2 groups. Group 1: patients were given a single 3 mL autologous PRP injection through local injection.Group 2: The patients received one 3 cc dose of 80 mg of methylprednisolone acetate locally and followed up at 6 weeks, 3rd and 6 months. Pain and functional outcome assessment was done using visual analog scale (VAS) and American Orthopedic Foot and Ankle Society (AOFAS) score. **Results**: Mean VAS reduced from 7.24 before injection to 1.42 after injection in Group 1, and from 7.31 before injection to 3.64 after injection in Group 2, at final follow-up. At 6 months' follow-up, the mean AOFAS score for Group 1 improved from 56.2 to 89.65 and for Group 2 from 55.13 to 75.63. There was a statistically significant improvement in VAS and AOFAS. A statistically significant difference was observed in plantar fascia thickness between groups at six months (5.86 mm to 3.46 mm in Group 1 and 5.74 to 3.83 mm in Group 2). **Conclusion:** Compared to steroid injections, injections of platelet-rich plasma have a longer-lasting beneficial effect than local injections of steroid.

Keywords: Planter fasciitis,PRP, Corticosteroid

INTRODUCTION

Plantar fasciitis accounts for 15% of all foot disorder. Total affected population is more than 10% in the world. PF causes are not clearly known but it is most probably started by overuse injury. Pathological changes are usually degenerative in nature and histological changes e.g. collagen necrosis, Angio-fibroblastic hyperplasia, chondroid metaplasia, matrix calcification.

PF commonly presents with acute, insidious onset of pain with maximum sensitivity near the anterior midline of calcaneus.[1] This pain is severe in morning with first steps and sitting to first step or prolonged inactivity, on examining, there is tenderness (moderate to severe) on the median tuberosity of calceneum or lateral most aspect of the heel. Noninvasive treatment for PF, which includes Rest, NSAIDs, splints, orthosis, stretching protocols, and ESW therapy.[2-5]

As there is no proven gold standard treatment for chronic plantar fasciitis, combination of various treatment modalities may be necessary instead of administering only one treatment at one time.Locally injected steroids have traditionally been widely used to treat chronic PF. The Cochrane review of use of corticosteroid for plantar fasciitis did show an improvement of symptoms by a month, but it did not last long.[4]Recently PRP has been successfully used to treat a variety of chronic tendonitis, including chronic PF. The initial response of using PRP to treat PF were

positive, but there are few literatures where the efficacy of steroid injection is compared with PRP in the treatment of chronic PF. In this study effectiveness of PRP and steroid injections in treating chronic PF as well as analysed their effects on thickened plantar fascia.

MATERIALS AND METHODS

This study was done in the Department of Orthopedics from 2019 to 2021.Based on history, clinical examination, and ultrasonography, PF can be diagnosed with reasonable certainty. Hundred patients visited our hospital's outpatient department (OPD) between 2019 and 2021.The study was conducted with the informed consent of all patients.We included patients who had heel pain over the planter aspect for at least 6 months and were over 18 years of age.

THE FOLLOWING CRITERIA WERE EXCLUDED

- Prior surgery for pain in heel
- Neuropathic symptoms like tarsal tunnel syndrome, tarsi sinus syndrome, radiculopathy
- Patient suffering from complex regional pain syndrome or with metastatic cancer
- Systemic diseases such as inflammatory or degenerative polyarthritis,diabetes mellitus, metabolic disease, such as gout, anticoagulation therapy and coagulation disorder
- Pregnant female
- Local Corticosteroid injection during last 6 months or NSAIDS intake during the last 7 days
- Patients were randomized in 2 groups.
- Group 1: The patients were given a single 3 mL autologous PRP injection through local injection.
- Group 2: The patients received one 3 cc dose of 2ml (40mg/ml) of kenacort locally.

PRP PREPARATION

In pre-sterilized centrifuge vials, around 20 mL of venous blood were collected. Anticoagulant acid citrate dextrose was preloaded into these centrifuge vials. The blood was then centrifuged for 15 minutes at 3200 rpm. Platelet-poor plasma is separated from platelet-rich plasma (PRP). Extracted PPP is discarded. As a result, the platelets concentrate is approximately 6–8 times more concentrated than baseline whole blood. At different intervals, pathology labs analyzed the PRP samples to determine platelet concentrations.6-7 (standard deviation * 1.2) times the baseline level was found to be the average platelet concentration in our sample.

INJECTION TECHNIQUE

An outpatient procedure was performed under complete aseptic conditions. A sterile marker was used to mark the sites of maximum tenderness. A 3 cc PRP injection was administered to patients in Group 1 at the site of maximum tenderness in the plantar fascia. Before injection, 2 cc of 2% Lidocaine were injected. With a single skin portal, the peppering technique was used to achieve a more extensive zone of delivery. Before starting the procedure, lidocaine sensitivity was tested. After 15 minutes of rest, patients are made to walk.

Patients in group 2 received a 2 mL of kenacort(80 mg corticosteroid) locally. 2 mL of 2% lignocaine was given before this same as in Group 1. All patients were kept under observation for 30 minutes. They were instructed to reduce use of their feet for approximately 2-3 days and were allowed to use opioid for pain. After 2-3days, every patient received a stretching exercise and were instructed to follow for 2 weeks. A strengtheningexercise was started after stretching. At 4 Weeks follow up, patients were allowed to normal activities as tolerated.

FOLLOW-UP

Patients were followed up at 6 weeks, 3rd and 6 months. Pain and functional outcome assessment was done using VAS andAOFAS score. In the pre-treatment and 6-month post-treatment ultrasounds, the thickness of the plantar fascia was measured.

STATISTICAL ANALYSIS

SPSS 11 software was used for the statistical analysis. The mean difference between the two groups was compared with an independent t-test, and the mean difference between pre and post paired data was compared with a paired t-test. For chronic plantar fasciitis, the efficacy of intralesional corticosteroids and autologous platelet-rich plasma injections was compared using continuous variables

RESULTS

In the final group, there were 57 female patients and 43 male patients. A mean age of 42.34 years was reported in group 1, and a mean age of 41.36 years in group 2. These demographics are summarized in table 1

Table 1: Characteristics of two groups compared

	PRP Group (n=50)	Steroid Group (n=50)
Age (years)	42.34±9.21	41.36±11.64
Male	23 (46%)	20 (40%)
Female	27 (54%)	30 (60%)
Right Side	24 (48%)	27 (54%)

	PRP Group (n=50)	**Steroid Group (n=50)**
Left Side	26 (52%)	23 (46%)

Before injection, Group 1 and Group 2scored 7.24 and 7.31 respectively on the visual analog scale. After 6 weeks, 3 months, and 6 months, Group 1's scores improved to 2.54, 1.86, and 1.42, respectively. Following 6 weeks, VAS improved to 1.98 in Group 2, but regressed to 2.73 at 3 months and 3.64 at 6 months (Fig. 1). Both groups had comparable VAS scores at pretreatment, but differences became statistically significant at 6 weeks, 3rd and 6 months (p 0.001) (Table 2).

Table 2: Mean VAS scores between the two groups

VAS	**Group 1 (PRP)**		**Group 2(Steroid)**		**P value**
	Mean	**S.D.**	**Mean**	**S.D.**	
Pre-Treatment	7.24	1.1	7.31	0.95	0.73
6 Weeks	2.54	0.68	1.98	0.45	<0.001
3 Months	1.86	0.54	2.73	0.95	<0.001
6 Months	1.42	0.48	3.64	0.87	<0.001

In Group 1, AOFAS scores before injection were 56.2 while in Group B, they were 55.13, which is comparable. After 6 weeks,3 months and 6 months follow- up, Group 1's AOFAS score improved to 77.3, 84.72, and 89.65, and Group 2 to 86.26, 77.58, and 75.63, respectively. Initially, Group 2 showed a significant increase, but the score declined at the 3-month and 6-month visits, whereas Group 1 showed an increase on follow up visit (Fig 2). After 6 months of follow-up, there was a statistically significant difference between the two groups (p< 0.001).

Table 3: AOFAS (mean) in both groups

PARAMETER	**Group 1 (PRP)**		**Group 2(Steroid)**		**P value (at end of 6 months follow-up)**
	Mean	**S.D.**	**Mean**	**S.D.**	
AOFASBefore injection	56.2	4.23	55.13	3.76	0.18
6th Week	77.3	2.65	86.26	2.89	<0.001
3rd Month	84.72	2.38	77.58	2.42	<0.001
6th Month	89.65	3.41	75.63	3.68	<0.001

In pre assessment average thickness of PF, using ultrasonography was comparable in both the groups 5.86mm in Group 1 and 5.74mm in Group 2, respectively. In the post-assessment at 6 months following the injection, Group 1 had significant reduction (mean 3.46mm) in the thickness of PF as compared to Group 2(mean 3.83mm), (Table 4). The difference between the two groups was statistically significant at 6 months (p < 0.001).

Table 4: Plantar fascia thickness before and after treatment for 6 months

	Average thickness of planter fascia				**P value**
	Group 1 (PRP)		**Group 2(Steroid)**		
	Mean	**S.D.**	**Mean**	**S.D.**	
Before injection	5.86	0.68	5.74	0.59	0.35
6th month post-injection	3.46	0.45	3.83	0.42	< 0.001

DISCUSSION

The purpose of this study aims to analyse the efficacy of corticosteroid therapy versus PRP therapy for chronic PF. The number of platelets in PRP is higher than that in whole blood. There are many growth factors found in PRP, including vascular endothelial growth factor, transforming growth factor and platelet-derived growth factor, as well as cytokines and interleukins, such as interleukin 4, 8, 13, interferon-α, and tumor necrosis factor-α7. Hypo vascularity and hypocellularity result in low concentrations of these factors in the plantar fascia. In PRP treatment growth factors and platelets are particularly directed toward lesional site thus contributing to the healing pathway that is required to revert back chronic PF [6] When platelets are stimulated, alpha particles release platelet-derived growth factors. It promotes angiogenesis and fiber

repair by increasing fibroblast migration and proliferation as well as collagen deposition.[6] The platelet alpha-granules have been observed to increase fibroblast movement and increase in their number, balance vascularization, and increase collagen deposition. It has been observed that many of these cytokines work in a dose-dependent manner. A synergetic response is initiated by the concentrated growth factors. Type I collagen is significantly produced by tendon sheath fibroblasts when transformed growth factor b1 is applied. Chronic PF probably exhibits the same mechanism. The age range of our patients ranges between 20 and 60 years old. According to the age variation of subjects, planter fasciitis pain affects adults, especially those in middle age and older.

The literature on chronic plantar fasciitis treatment options shows variable outcomes with PRP and steroid injections. Studies have found that PRP is more effective in some cases, but not in others.[7-9] Monte et al inferred that a one shot of PRP improved pain and function more than steroid injections for failed non-surgical treatment of plantar fasciitis and that the benefits lasted for a longer period of time.[9] Jain et aldid not find any difference in functional outcome between groups at 6 months after injecting PRP versus steroid injection in chronic plantar fasciitis.[10] Omar et al observed greatdifference in mean VAS between the 2 groups was found at 1.5 months (p 0.05).[11] Kumar et al compared the efficacy of corticosteroid and PF based on VAS score where PRP improved significantly at 1 month and remained the same at 6 months, in contrast corticosteroid group too improved significantly at 1 month and declined at 6 months, matched with their AOFAS scores where PRP scores improved constantly at each assessmentand decreasefor steroid group at long term ($p < 0.001$).[12]

VAS and AOFAS scores improved after one injection in both PRP and steroid injection groups. At first follow-up, steroid group AOFAS score was higher than PRP group. Statistically significant improvement in scores was seen in the PRP group at the end of 6 months compared to the steroid group. After 6 weeks, the pain and function scores of the steroid group declined, suggesting steroid injections are only effective for short-term pain relief. PRP injections reduce pain and improve function, but the mechanism is unclear. Along with other growth factors, PRP contains hepatocyte growth factor (HGF). HGF inhibits COX-1 and COX-2 expression by inhibiting nuclear factor kappa B (NF-kB) transactivating activity. Inflammatory damage is prevented by this action of HGF. Thus, PRP acts as an anti-inflammatory agent via HGF. PRP injections result in a reduction in pain and an improvement in VAS score.[13]

LIMITATIONS OF THE STUDY

Among the patients in this study, platelet concentrations varied from one another. Platelet preparation, concentration, and dosage were not standardized, which made critical evaluation difficult. For a complete understanding of the mechanism of action of PRP, further basic research is needed in this field. As a biological treatment modality for orthopedic conditions, PRP injection has shown encouraging results.

CONCLUSION

One and two months after first injection, PRP is just as effective as corticosteroid injections for treating PF, but unlike corticosteroid injections, its effect doesn't wear off over time. The effects of PRP are significantly greater than those of corticosteroid injections at 6 months after the first injection, which makes it a better and more durable treatment than corticosteroid injections. Injections of PRP are better at treating planter fasciitis for the long term.

Any complications in association with corticosteroids were not observed in this study e.g. fat pad atrophy, infection of the calcaneum, or iatrogenic ruptures. A bigger sample sizewith continual follow-up is needed to check the safety of corticosteroid injections in the treating of PF given the complications mentioned in the literature.

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