



## PLATELET RICH PLASMA VERSUS CORTICOSTEROID INJECTION FOR PLANTAR FASCIITIS: A COMPARATIVE STUDY

### Orthopaedics

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### ABSTRACT

**Background:** Chronic plantar fasciitis (PF) is a universal orthopedic problem that can prove difficult to successfully treat. In this study we compared the short term and long term overall efficacy of Platelet rich plasma (PRP) and Corticosteroid (CS) in the treatment of chronic PF.

**Material and methods:** The present study was conducted at the Department of Orthopedics at SAMC and PGI, Indore from July 2015 to October 2017. In this series, Out of 96 patients 84 patients were included in the study and 12 were lost during follow-up period. All patients were divided into two groups (CS and PRP) alternately. Functional outcome was evaluated on the basis of roles-maudsley (RM) score and visual analog scale (VAS) pre-and post-injection at different time intervals.

**Results:** The mean RM Score and VAS decreased from baseline continuously at 3 months and 6 months and up to 12 months it was statistically significant ( $p=0.001$ ) in comparison with the baseline at all durations respectively. But, when both the treatment methods were compared, it was observed that maximum effect of PRP on RM Score and VAS was between 3 to 6 months, whereas in CS group, it was at 6 months RM Score and VAS is significantly low correlation ( $r=0.537^* \text{ RM Score}$ ) and ( $r=0.495^* \text{ VAS}$ )  $p=0.015$  had significantly low correlation at 12 month in CS group as compare to PRP group respectively.

**Conclusion:** The treatment of local injection of corticosteroid (CS) or platelet-rich plasma (PRP) is an effective treatment option for chronic plantar fasciitis (PF) and this study confirms that, PRP injection has faster onset of action and although comparable long term results can be observed, it has slight overall superiority than CS injection in treating chronic PF patients.

### KEYWORDS

Platelet-rich plasma (PRP), Corticosteroid (CS), Plantar fasciitis (PF)

### Introduction

Plantar fasciitis (PF) is the commonest cause of heel pain [1]. While the pathophysiology is not understood well, it is considered similar to that of Achilles tendinopathy with microscopic degenerative injury and local disruption of the collagen matrix and micro-tears, rather than a failed healing response [2]. The specialized soft tissue at the heel carries out the function a shock absorber. The subcutaneous structure consists of fibrous lamellae arranged in a complex whorl containing adipose tissues that get attached with vertical fibres to the dermis and the plantar aponeurosis.[3]

The heel pain may also be of a neurologic basis. The course of the tibial nerve, along with nerve roots from L4-5 and S2-4, starts in the medial aspect of the hind foot, through the tarsal tunnel, under the flexor retinaculum, and over the medial surface of the calcaneum. The calcaneal branch, arising directly from the tibial nerve, carries sensation from the medial and plantar heel dermis.

Conservative treatment options available include rest, heel cups, eccentric stretching exercises, night splints, orthotics, immobilization, nonsteroidal anti-inflammatory medication, which can resolve around 80% of cases [4]. In a minority of patients who develop intractable PF, corticosteroid (CS) injection, platelet rich plasma (PRP) injection and shockwave therapy can be given [5, 6]. Surgical release of PF is rarely now used, with results showing variable efficacy [7]. PRP, derived by centrifuging whole blood, has a platelet concentration higher than that of whole blood, and is thought to stimulate the natural healing process through growth factors contained in the platelets such as platelet derived growth factor, transforming growth factor beta, fibroblast growth factor and insulin like growth factor, initiating and accelerating the natural physiological tissue healing process [8]. In this prospective randomized study, autologous PRP was compared to traditional CS injection in the treatment of chronic cases of PF resistant to traditional non-operative management.

### Material and Methods

In this prospective cohort study, included 96 patients with intractable PF who have failed conservative treatment were randomized to receive either PRP or CS injection. All patients admitted to SAMC & PGI Hospital between July 2015 and October 2017 and assessed with the roles-maudsley (RM) score and visual analog scale (VAS) were enrolled in this study. Institutional review board approval was

obtained, and all patients provided informed consent.

### Study Design

Patients of PF, who had not responded to cushioned soft-soles or soft-sole footwear, a full course of eccentric stretching exercises, physiotherapy and alternate hot-cold fomentation courses, were included in the study. All patients had symptoms for at least 12 months. In total 96 heels in 84 patients were assessed with follow up period. The patients were selected into one of the two treatment groups (CS vs. PRP) alternately. All patients were assessed with the RM Score and VAS.

### Injection Technique

Patients in the CS group underwent Triamcinolone (Kenacort) 40mg and 2% Lox injection. PRP was harvested. Twenty-seven millilitres (ml) of blood was withdrawn from the patient and added to 3ml of sodium citrate (anticoagulant). This was placed in the centrifuge machine and spun for 15 min at 3200 revolutions per minute. The plasma portion of the centrifuged mixture was discarded. Since the anticoagulant introduced to the whole blood used to produce the platelet concentrate is acidic, the PRP portion harvested is buffered with 8.4% sodium bicarbonate, to increase the pH to normal physiological levels. From the initial 27ml blood harvest, around 2.5ml of buffered PRP was obtained. The CS and PRP were injected under aseptic technique in the operation theatre, directly into the area of maximal tenderness at the heel, via a peppering technique (single skin entry, partially withdrawing the needle, redirecting and making multiple penetrations to the fascia). All patients were advised to continue cushioned soft-soles or soft-sole footwear, eccentric calf stretching exercises, physiotherapy along with alternate hot-cold fomentation locally following the injection.

### Follow up

Follow up data was collected prospectively on the pre-treatment, at 3, 6 and 12 months post injection and the results were compared statistically.

### Statistical analysis

Statistical analysis was done by using Statistical Package for the Social Sciences (20.0 version) software. The comparison of means $\pm$ SD between the two groups tested was done by using unpaired student's t-test. For repeated measure, paired t-test correlations were also used.

The p-value <0.05 is considered as significant.

## Results

For this cohort comparative we enrolled a total of 96 patients of PF of which 12 were lost during follow-up period. Thus, we had 84 patients for final assessment. Out of 84 patients, 42 were from Group-I (CS Group) and 42 were from Group-II (PRP Group). The mean patient age was  $48.40 \pm 13.414$  years in CS group with minimum age of 42 and maximum age of 54 years and for PRP group, it is  $49.60 \pm 13.562$  years with minimum age of 43 years and maximum age of 55 years which was comparable ( $p = 0.780$ ). There were 32 males (38.1%) and 52 females (61.9%) with total of 84 patients. Patients in CS group, 19 (22.6%) were males and 23 (27.4%) were females. Patients in PRP group, 13 (15.5%) were male and 29 (34.5%) were females.

## Roles-Maudsley (RM) Score and Visual Analog Scale (VAS)

When we calculated the difference between mean RM Score at the pre-injection stage i.e., baseline period mean and RM Score and VAS after-injection at different time intervals (3 months, 6 months and 12 months) respectively, it was found that RM Score and VAS difference continued in 3 to 6 months and after that at 12 months there was a significant difference (Table 1&2). For comparison within both groups, the results were statistically significant ( $p < 0.05$ ). Maximum effect of PRP on RM Score and VAS was between 3 to 6 months, whereas in CS group, it was after 6 months (Fig.1 &2). The means RM Score and VAS decreased from baseline continuously at 3 months and 6 months and up to 12 months. The RM Score and VAS was found to be statistically significant in comparison with baseline at all durations respectively.

We have seen that, paired correlations between the time intervals from baseline in both groups were also statistically significant ( $p=0.001$ ) significant (Fig.3). But, when both treatment methods were compared, it was observed that RM Score and VAS is significantly low correlation ( $r=0.537^*$  RM Score) and ( $r=0.495^*$  VAS)  $p=0.015$  at 12 month in CS group as compare to PRP group (Table 3).

## Discussion

Chronic heel pain is a difficult condition to treat. Traditionally it has been treated by Physiotherapy, use of soft heel foot wear local hot and cold fomentation and local CS injections. It is well known that pain does not subside quickly, but can persist for several weeks and may result in significant disability. There are reports in literature that injection of PRP may be effective in this condition.

Our study was conducted for a 2 year period, and 84 patients were followed up at 3, 6 and 12 months. After 12 months, the complication subsided in many patients. A few who complied were called but to keep the study uniform, we kept 12 months follow-up.

Although there are various techniques to produce PRP from whole blood, this study was done at our medical college and hospital, and this particular technique for the preparation of PRP is used at the Central Research Lab, SAMC & PGI, Indore.

Lee E. et al [9], conducted a prospective randomised, controlled study of 64 patients for a period of 6 months by comparing PRP with corticosteroid injection. The authors found that there is significant reduction in VAS for both the groups over a time. At 6 weeks and 3 months, the corticosteroid group had significantly lower VAS than the PRP group, but the difference was not significant at 6 months. But in our study, we found a significant reduction in VAS score at 4 weeks, 6 weeks and 3 months with corticosteroid group, whereas at 6 months there was significant reduction in VAS with PRP group compared to corticosteroid group.

In a similar study, Barrett S. et al [10], applied single injection of PRP in 9 patients and reported 78% symptomatic relief for a short term follow up of 2 months. However direct comparison with our study is difficult because of shorter duration of follow up, single injection and different methodology. Another retrospective review of 23 consecutive patients treated with PRP by Malley M. et al [11] showed that the mean VAS score improved from 7 to 4. But our study in contrast showed reduction in RM Score mean from 2.6 to 1.1 and VAS improved from 3.2 to 1.3.

In a similar study by Tiwari M. et al [12], the VAS score significantly reduced in both PRP and corticosteroid groups at one month, but at 3

months following treatment, it increased in corticosteroid group and remained constant in PRP group till 6 months. In contrast, our study showed a lower VAS scores with corticosteroid till 3 months and with PRP at the end of 6 months.

In our study, patients were more frequently females 52 females (62.0%), and their mean age was 49 years. We have also got similar results in our study, the mean RM Score decreased from baseline continuously at 3 months and 6 months and up to 12 months it was statistically significant ( $p=0.001$ ) in comparison with baseline at all durations respectively. But, when both the treatment methods were compared, it was observed that maximum effect of PRP on RM Score was between 3 to 6 months, whereas in CS group, it was after 6 months and RM Score and VAS has significantly low correlation ( $r=0.537^*$  RM Score) and ( $r=0.495^*$  VAS)  $p=0.015$  at 12 month in CS group as compare to PRP group respectively.

## Conclusion

PRP injection is an efficient and safe therapeutic option for the treatment of chronic patients of PF. However, there is need for both long-term follow up, prospective, multicenter and larger series studies to verify the effectiveness of PRP for the treatment of PF patients. In this study, we observed that 42 patients who received the PRP injection said the results were excellent at the end of the treatment and about 42 patients who received CS injection said the results were acceptable. PRP injection has faster onset of action and although comparable long term results can be observed, it has slight overall superiority than CS injection in treating chronic PF patients. On the basis of the results in our study, we suggest that PRP injection can be a successful procedure for the management of patients of chronic PF.

## Acknowledgments

We thank all the colleagues working in our different departments helping us to gain such promising results for our patients.

## Informed Consent

Written and informed consent was obtained from patients who participated in this study.

## Ethical Approval

The study was approved by the Institutional Ethics Committee

## Conflict of Interest

No conflict of interest was declared by the authors.

## Financial Disclosure

The authors declared that this study has received no financial support.

**Table 1: Comparison of effect of treatment methods (CS vs. PRP) on RM Score**

Group Statistics	Groups	Mean± SD	95% Confidence Interval		p-value
			Lower Bound	Upper Bound	
RM Score @ baseline	CS	2.7± 0.71	2.432	3.068	0.962
	PRP	2.5± 0.68	2.232	2.868	
RM Score @ 3 month	CS	1.9± 0.82	1.620	2.280	0.172
	PRP	1.8± 0.61	1.470	2.130	
RM Score @ 6 month	CS	1.7± 0.78	1.432	2.068	0.203
	PRP	1.5± 0.60	1.232	1.868	
RM Score @ 12 month	CS	1.3± 0.41	0.987	1.413	0.847
	PRP	1.1± 0.52	0.987	1.413	

**Table 2: Comparison of effect of treatment methods (CS vs. PRP) on VAS**

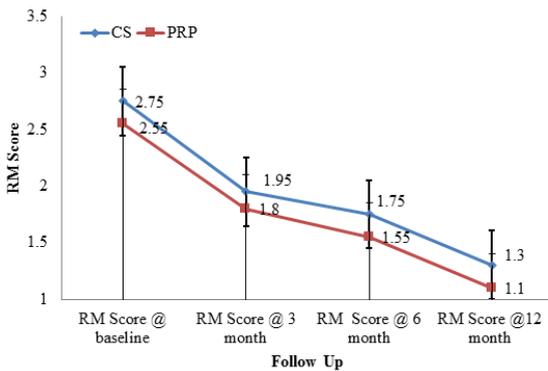
Group Statistics	Groups	Mean± SD	95% Confidence Interval		p-value
			Lower Bound	Upper Bound	
VAS @ baseline	CS	3.2± 0.61	2.421	3.308	0.954
	PRP	3.2± 0.66	2.212	3.368	
VAS @ 3 month	CS	2.8± 0.62	1.524	2.820	0.182
	PRP	2.1± 0.66	1.321	2.310	
VAS @ 6 month	CS	1.9± 0.86	1.457	2.133	0.197

	PRP	1.5± 0.65	1.221	1.810	
VAS @ 12 month	CS	1.5± 0.40	0.994	1.616	0.924
	PRP	1.2± 0.53	0.981	1.303	

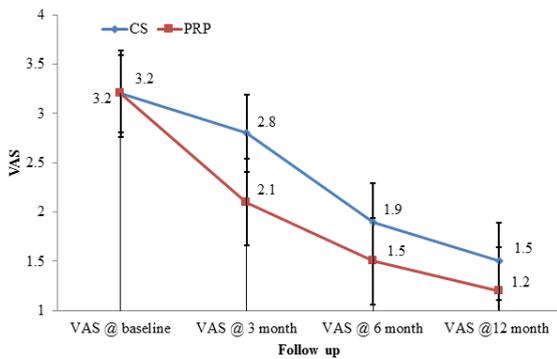
**Table 3: Paired samples correlations of treatment methods (CS vs. PRP) on RM Score from baseline to different time intervals**

Groups		N	Correlation		Sig.
CS	Pre-Injection & 3 Months	84	0.779**	0.711**	0.000
	Pre-Injection & 6 Months	84	0.817**	0.832**	0.000
	Pre-Injection & 12 Months	84	0.537*	0.495*	0.015
PRP	Pre-Injection & 3 Months	84	0.648**	0.765**	0.002
	Pre-Injection & 6 Months	84	0.628**	0.724**	0.003
	Pre-Injection & 12 Months	84	0.704**	0.824**	0.001

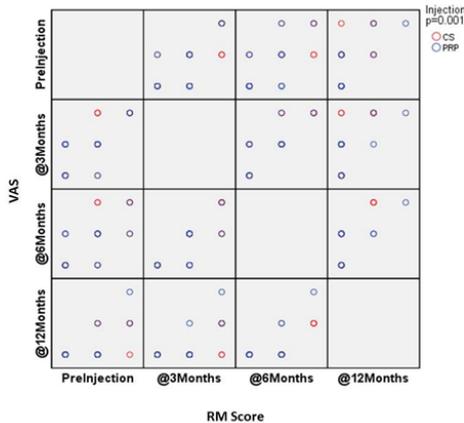
\*\*Correlation is significant at the 0.01 level (2-tailed).  
\*Correlation is significant at the 0.05 level (2-tailed).



**Figure 1: Graphic presentation of effect of treatment methods (CS vs. PRP) on RM Score at different time intervals**



**Figure 2: Graphic presentation of effect of treatment methods (CS vs. PRP) on VAS at different time intervals.**



**Figure 3: Scatter Plot (Matrix) of paired correlations of both treatment methods at different time intervals**

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