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A comparative study of effectiveness of local injection of autologous platelet rich plasma and injection corticosteroid solution in treatment of plantar fasciitis

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ABSTRACT

Background: The heel pain is the most common problem worldwide and it was associated with plantar fasciitis (PF). The condition of treatment is very complex. Platelet-rich plasma (PRP) and injection of corticosteroids is the treatment of PF. This study was designed to access the effect of local PRP and local corticosteroid injection in PF patients.
Methods: Sixty patients (between 29 to 60 years of age) with chronic PF were randomized prospectively in single tertiary care center in India. The study conducted from December 2013 to December 2015. All the patients were enrolled according to inclusion criteria and divided into two groups randomized. In group A (n=30) received PRP and group B (n=30) received corticosteroids injections. Visual analog scales (VAS) were filled by all the included patients. The follow-up scheduled at one and six months after complete enrolment of patients.
Results: Between both the groups the significantly different observed at one and six months follow-up from the baseline. At one month follow-up significantly improvement in mean VAS score were observed in group B ($p<0.001$). At six months follow-up significantly improvement in mean VAS score were observed in group A ($p<0.001$).
Conclusions: The present study concluded from the significance difference between both the groups proved promising form of treatment in chronic PF patients. Both the treatment was safe and effective in relieving pain improving function at different time period.

Keywords: Plantar fasciitis, Platelet-rich plasma, Corticosteroids, Visual analog scales

INTRODUCTION

In the foot and ankle practice the heel pain is a common presenting complaint, and also, the medical practitioner known that the most common cause of heel pain is plantar fasciitis (PF).[1] It is a very usual condition and can be complex to treat, if not looked after properly. PF commonly occurred in obese human, middle aged, women, athletes and military recruits.[2] A history of repetitive activity aggravating the extensor tendons of the forearm typically, affects at tennis elbow individuals more than age 40 years of human. On the other hand, chronic PF is the most common root of foot complaints and, making up 11–15% of the foot warning sign requiring expert care among adults.[3]

Injections of corticosteroid are used for treatment of cases with PF refractory to conformist treatment and have been associated with effective modality for pain relief.[4] However, the effects of corticosteroids seems to be limited and short-lived and only to a small degree.[5,6] Furthermore, many factors associated with PF, which

includes; heel spurs have commonly been implicated as a factor for PF, decreased ankle dorsiflexion.[7,8] According to literature, the incidence of PF peaks in human between 40–60 years of age with no bias towards either sex.[9] The new approach to treat PF has been gaining popularity were platelet-rich plasma (PRP). Injection of PRP is consideration to be safe, and not to obstruct with the biomechanical function of the foot.[10] It is a part of whole blood that is centrifuged to a determined state, injected into the affected area and treated with an activating agent.[11]

In addition, for the analysis of treatment effect of PRP and corticosteroid this study was conducted. To date most of the previous studies in this field have either assessed local autologous PRP injection alone clinically, or compared PRP with steroid injections only clinically and sonographically. The objective of this study was to study the effect of local PRP injection in PF patients, for pain reduction used visual analogue scale (VAS) score. Another objective was to study the effect of local corticosteroid injection in PF patients for pain reduction used visual analogue scale (VAS) score.

METHODS

This was a prospective, single-center, randomized study, conducted from December 2013 to December 2015 in tertiary care center of India. A total 60 patients with chronic PF were included in this study. The inclusion criteria of this study were both male and female patient age between 18 to 60 years of PF who did not respond to conservative treatment. The exclusion criteria were the patients with systemic diseases like rheumatoid arthritis, gout, degenerative arthritis, or neural injury and patients with calcaneodynia secondary to neural injury or fracture and who have neural entrapment or earlier surgery including endoscopic PF release or open plantar fascial release and who received local steroid injection and/or PRP injection within six months and who received NSAIDS within 1 week and patients with diabetes mellitus were excluded from the study.

Preparation of platelet rich plasma (PRP)

For the preparation of PRP, 15 ml of patients own blood is collected in 20 ml BD syringe. It is then transfer to sterile plastic tube which is pre filled with 1.5 ml anti-coagulant (sodium citrate) at operation theatre of tertiary care center in India under sterile condition. Whole blood then centrifuge at the rate of 1800 revolutions per minute for duration of 15 to 20 minutes. This will allow the blood components to separate into three main layers as follows: plasma, buffy coat (leukocytes and platelets), red blood cells, red blood cells along with buffy coat is then separated, remaining part is plasma with platelets. We get a 4 to 5 times concentrated platelets with plasma of approximately 1 to 2 ml above the buffy coat. The chronic PF patients were assigning randomly using a simple method of randomization (odd for PRP and even for corticosteroid) into two equal groups (30 patients each) by one of the researchers who introduce the patients with either steroids or PRP injection (not guided by ultrasound) and did not share in clinical nor in ultrasonographic assessments: Group A PRP was injected 1-2 ml PRP in supine position with 22 gauge needle. In group B (corticosteroid) was injected 2 ml. The Visual analogue scale (VAS) score for pain was used for evaluate the clinical result. VAS score calculated at the time of baseline, one month and six months follow-up visit.

Statistical analysis

The data was entered in Microsoft excel sheet for analysis and tested statistically on SPSS for windows version 17 software. Quantitative variable were described in descriptive statistical analysis was done for continuous variables, frequency distribution, mean±SD and their percentages for categorical variables were calculated. T-test was used for normal distributed data. Unpaired t-test was used to see results in intergroup (between PRP and steroid group). P value <0.05 is considered as significant.

RESULTS

In this study, enrolled aged between 29-56 years of patients with PF. A total sixty-five patients were enrolled in this study; out of this 5 patients were excluded from the study due to screen failure. Distributions of patients were according to gender shown in Table 1. Selected patients allocated into group A and group B by randomization. All sixty patients successfully completed six months follow-up. In group A 18 (60%) male and 12 (40%) were female patients. In group B 15 (50%) male and 15 (50%) were female patients. The calculated p value was 0.436 (p>0.05). It shows that gender does not affect the result.

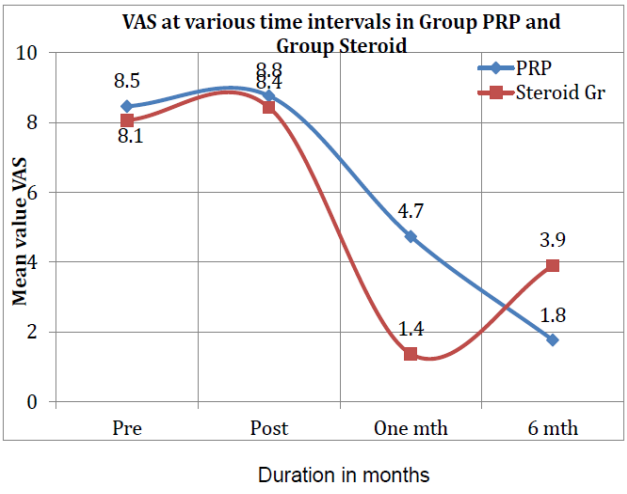

Figure 1: Comparison of VAS score between two study groups at various time intervals (pre-injection, post-injection, one month after and six month after injection).

Improvement in pain

Visual analogue score (VAS)

At baseline and immediate after injection there were no statistically difference (p>0.05) in the mean VAS scores between two groups. Furthermore, at 1 month follow up, statistically significant improvement (p<0.001) in mean VAS scores was seen in both the groups from baseline and when VAS scores were compared between two groups, group B had statistically (p<0.001) better mean scores.

Table 1: Gender wise distribution of selected patients in group A and group B.

Gender	PRP (group- A) (%)	Corticosteroid (group- B) (%)	Total (%)	X^2 value, P value
Male	18 (60)	15 (50)	33 (55)	X^2=0.606
Female	12 (40)	15 (50)	27 (45)	d.f.=1
Total	30 (100)	30 (100)	60 (100)	p=0.436

Table 2: VAS score between study groups.

Study parameter	PRP (Group A)		Corticosteroid (Group B)		Unpaired T test	P value
	Mean	SD	Mean	SD		
Pre-injection VAS	8.47	0.973	8.07	1.048	1.532	0.131
Post-injection VAS	8.77	0.898	8.43	1.006	1.354	0.181
After one Month VAS	4.73	1.741	1.37	1.326	8.428	<0.001
After six Months VAS	1.77	1.278	3.90	1.269	-6.488	<0.001

In addition, at 6 months follow up, statistically significant improvement (p<0.001) was noticed in mean VAS scores in both the groups, however group A had statistically better improvement (p<0.001) in mean VAS scores than group B. The VAS score analogue depicted in Table 2 and Figure 1.

DISCUSSION

The plantar fasciitis (PF) is the most common cause of injury of the PF and heel pain in human.[12] This study was design to compare the effect of VAS score between two groups PRP injection and corticosteroid injection at one month and six months follow-up. The result of this study shows good clinical results to PRP injections at the end of one and three months follow-up to support by several previous studies on PRP in chronic PF.[13-15]

Critical reviews of injected cortisone therapy have acquiesce equivocal short-term results and unsatisfactory long-term results.[16,17] As a result, most clinicians still alternative to an investigative collection of traditional conservative healing regimens that have limited clinical support in the literatures. A recent study by Ling Y et al, shows that PRP was as effective treatment as compare to other corticosteroid treatment with reducing pain and improving function in patients with PF.[18]

In the present study we found that the improvements in VAS score at 1-month were statistically significant in the steroid group (1.37) as compared to PRP group (4.73). Early improvement in the first month in our patients treated by PRP can be mostly attributed to a possible anti-inflammatory effect due to the inhibition of cyclooxygenase-2 (COX-2) enzymes by the cytokines in PRP.[19,20] 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 a study by Tiwari et al, the VAS score significantly reduced in both PRP and corticosteroid groups at 1-month, but at 3-month following treatment it increased in corticosteroid group and remained constant in PRP group till 6-month follow-up.[21] In our study however, steroid group showed better VAS Score values at 1-month follow-up.

In the present study, we observed that 6-month follow up the VAS Scores were significant in both the groups (VAS Score 3.90 and 1.77 in steroid and PRP group respectively). Akashin et al, in a prospective study divided 60 patients in 2 non randomized consecutive groups of 30 and treated them by either 40 mg steroid or 3 cc of PRP.[22] 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. This study is in contrast with the observations in our study.

In previous study, Lee et al conducted prospective, randomized, controlled, observer-blinded study over a period of 6 months. In their study 64 patients were randomly allocated to either the autologous blood or corticosteroid treatment group. The authors reported that the reduction in VAS for both groups was significant over time (p<0.0001). At 6 weeks and 3 months, the corticosteroid group had significantly lower VAS than the PRP group (p<0.011 and p<0.005, respectively), but the difference was not significant at 6 months. The authors concluded that intralesional autologous blood injection is efficacious in lowering pain and tenderness in

chronic PF, but corticosteroid is more superior in terms of speed which agreed with our study results.[23]

Our study having few limitations, there was no control or comparison group and the sample size was relatively small in this study. Since this study period was not enough to comment on long term relief and long term complications due to PRP injection, studies with the longer duration are required to know more about the effects of this useful treatment modality.

CONCLUSION

In conclusion, the use of PRP in chronic cases of plantar fasciitis seems more effective in long term than the traditional treatment of steroid injection. Plantar fasciitis has a female predominance. Although steroid had better pain relief at 1 month while, PRP provided better pain relief at 6 month follow up. 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 strengths of this study are its randomized and prospective nature, the long length of follow-up, and its high subject retention rate.

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