

Comparison of Local Injection of Corticosteroid and Platelet Rich Plasma in Patients with Plantar Fasciitis

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ABSTRACT

Aim: To compare the mean visual analogue score for pain between local injection of corticosteroid and platelet rich plasma in patients with plantar fasciitis.

Design: It was a randomized controlled trial.

Study Settings: This study was carried at Department of Orthopedic Surgery, Sir Ganga Ram Hospital Lahore over 1 year from March 2018 to February 2019.

Methods: Total 78 patients from both genders with plantar fasciitis were involved in this study and their ages ranged 18-70 years. Two treatment groups were made by random allocation of these patients. Patients in Group-A were given local injection of PRP while patients in Group-B were given local injection of corticosteroid. Outcome variable was mean VAS score for pain after 1, 3 and 6 months of treatment. From all the patients, informed written consents were taken.

Results: The patients had mean age 38.3 ± 8.8 years. The study group had 28 (35.9%) male and 50 (64.1%) female patients. At first follow-up visit, VAS score for heel improved in both the groups; steroids (8.21 ± 1.34 vs. 2.33 ± 1.13 ; p -value < 0.001) and PRP (8.28 ± 1.38 vs. 4.23 ± 1.35 ; p -value < 0.001) but was significantly lesser in patients receiving steroids as compared to PRP (2.33 ± 1.13 vs. 4.23 ± 1.35 ; p -value < 0.0001). However, the effect of steroids was short lived evident from significantly increased VAS score for pain on subsequent visits at 3 (6.26 ± 1.33 vs. 3.13 ± 1.49 ; p -value < 0.0001) and 6 (6.31 ± 1.34 vs. 1.92 ± 0.77 ; p -value < 0.0001) months as compared to PRP where the VAS score dropped further from the first follow-up visit.

Conclusion: In the present study, we observed that both the steroids and PRP were effective in alleviating pain in plantar fasciitis patients. However, the effect of steroids was early in onset and short-lived while the effect of PRP was slow to develop but persistent which along with its safety considering side effects of steroids advocate the preferred use of PRP in the management of such cases in future practice.

Keywords: Plantar Fasciitis, Corticosteroids, Platelet-Rich Plasma

INTRODUCTION

In adults most common cause of heel pain is plantar fasciitis. Along medial aspect of heel, sharp pain with gradual onset is its main characteristics and with the first step taken in morning it worsens and with warming up it lessens¹. When conservative noninvasive interventions fail, routine prescription consists of corticosteroids. The pain relieving process is hastened by potent anti-inflammatory effects of corticosteroids^{1,2}. They may inhibit fibroblast proliferation and ground substance proteins as well.¹ But, for treating plantar fasciitis, using corticosteroid injections have been related with infection, muscle damage, change in skin pigmentation, post-injection flare, rupture of plantar fascia, peripheral nerve injury and fat pad atrophy¹⁻⁴. Concentrate of platelets is PRP (platelet-rich plasma) that is a source of analogous growth factors proved for enhancing fibroblast migration and proliferation, upregulate visualization and increased collagen deposition in various settings. On the basis of these properties, healing is promoted upon PRP injection into affected tissues and degenerative process occurring in plantar fascia origin is reversed^{2,3}.

Shetty et al⁵ (2013) reported that local injection of PRP was associated with significantly lower mean VAS score for pain as compared to steroids in Indian patients with plantar fasciitis (1.8 ± 1.13 vs 4.27 ± 1.41 ; p -value < 0.001)

Similar results were reported later by Say et al⁶ in 2014 who reported that local injection of PRP was superior to steroids in terms of significantly lower mean VAS score for pain in Turkish patients with plantar fasciitis (2.4 ± 0.8 vs. 4 ± 1.1 ; p -value < 0.001).

In the light of this evidence local injection of PRP appears better than steroids as it leads to more symptomatic improvement in patients with plantar fasciitis. Also it eludes the side effects of steroid therapy. But before leaving a conventional practice and adopting PRP in routine, it's worth mentioning that there are studies which observed better results with steroids. Upadhyay et al⁴ (2018) reported that local injection of steroid was superior to PRP in terms of significantly lower mean VAS score for pain in Indian patients with plantar fasciitis (2.46 ± 0.742 vs. 4.52 ± 0.779 ; p -value ≤ 0.05). Patil et al⁷ in another Indian study reported similar results in 2017 (1.26 ± 1.31 vs. 3.83 ± 0.79 ; p -value ≤ 0.05). Jain et al⁸ (2015) in UK reported similar significantly lower mean VAS score for pain with local injection of steroid as compared to PRP in patients with plantar fasciitis (2.83 ± 3.44 vs. 3.50 ± 3.30 ; p -value < 0.001). Steroids also seem superior as these are already in routine practice and don't need special hardware as required for PRP extraction so can be done in routine outpatient department.

The situation gets more complicated as Jain et al.⁹ in 2018 (6.5 ± 1.7 vs. 5.7 ± 2.7 ; p -value = 0.106) and Akoahin et al¹⁰ in 2012 (5.6 ± 1.64 vs. 4.4 ± 2.09 ; p -value > 0.05) didn't

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observe any significant difference in post-treatment VAS score between PRP and steroids.

Keeping in view these conflicting results in already published research and lack of local such published material; further confirmation of results was made by repetition of this trial that is main purpose of the study as well, with a hope that the results of the present study would enable selection of more appropriate treatment option for patients presenting with plantar fasciitis in future practice.

MATERIAL AND METHODS

Conducted at Department of Orthopedic Surgery, Sir Ganga Ram Hospital Lahore over 1 year from March 2018 to February 2019, it was a randomized controlled trial. Each group had a sample size of 39 cases (total 78 cases), calculated with 95% confidence interval (2-sided) and 80% power of test while expected mean VAS score was taken to be 4.4 ± 2.09 with steroids and 5.6 ± 1.64 with PRP in patients with plantar fasciitis.¹⁰ Patients of both genders, aged between 18-70 years presenting with plantar fasciitis were included in this study. Plantar fasciitis was diagnosed in patients presenting with pain; visual analogue score ≥ 6 (Appendix-I, from 0 to 10, 0 no pain and 10 maximum pain) over the medial (inner) half of heel in the morning which improves on activity (≥ 15 minutes after wake up) for ≥ 4 weeks. Patients with history of trauma in the preceding 4 weeks before the onset of heel pain, those with active local infection and raised serum uric acid level ≥ 8 mg/dl were excluded from study. Pregnant women and diabetics were also not included in the study. Two treatment groups were made by random allocation of participants of the study with the help of lottery method. Patients in Group-A were given local injection of PRP while patients in Group-B were given local injection of corticosteroid. Under aseptic precautions 1% lidocaine (Xylocaine) 2-3mL of local anesthesia (AST) was delivered to the point of maximum tenderness. Gentle massage was done. Dry needling was used to locally "injure" the soft tissue to excite the inflammatory response. After contacting the hard bony end, the needle was gently and partially withdrawn then advanced in a fan-like wheel, peppering the area 7 to 10 times; simultaneously injecting 0.2-0.3 ml of either steroid or PRP. All patients were advised to refrain from vigorous/sportive activities for at-least 3days post-procedure. Tab. Augmentin 1gm x Bid and Tab. Synflex 550mg x Bid for three days was prescribed to patients. All the patients were encouraged for physiotherapy once the procedural pain had subsided. Visual analogue scale was evaluated 1, 3 and 6 months after treatment and heel pain on first footstep after waking up in the morning was recorded. All the injections and all the pre and post-operative care as well as patient's evaluation of pain was performed by a single consultant to eliminate bias. Confounding variables were controlled by exclusion. For analysis, all collected data was entered in Statistical Package for the Social Sciences (SPSS) version 17. Numerical variables i-e age and pre-treatment visual analogue score and visual analogue score after 1, 3 and 6 months of treatment have been presented by mean \pm SD. For comparing the mean of visual analogue scale after 4 weeks of treatment between the two groups taking $p \leq 0.05$ as significant, independent sample t-test has been used.

Categorical variables i-e gender has been shown as percentage and frequency. To address effect modifiers, data stratification was made for gender and age. Taking p value ≤ 0.05 as significant, post stratification independent sample t-test was applied.

RESULTS

Patients had age in the range of 24 years to 56 years with a mean of 38.3 ± 8.8 years. The study group had 28 (35.9%) male and 50 (64.1%) female patients having a male to female ratio of 1:1.8. Both the study groups were comparable in terms of mean age (p -value=0.732) and gender distribution (p -value=0.637) as shown in Table 1.

The mean VAS score for heel pain was comparable between the groups at presentation (p -value=0.803). At first follow-up visit, it improved in both the groups but was significantly lesser in patients receiving steroids as compared to PRP (2.33 ± 1.13 vs. 4.23 ± 1.35 ; p -value <0.0001). However, the effect of steroids was short lived evident from significantly increased VAS score for pain on subsequent visits at 3 (6.26 ± 1.33 vs. 3.13 ± 1.49 ; p -value <0.0001) and 6 (6.31 ± 1.34 vs. 1.92 ± 0.77 ; p -value <0.0001) months as compared to PRP where the VAS score dropped further from the first follow-up visit. PRP group showed consistent improved and had significantly lesser pain compared to Group-B receiving steroids at 3 and 6 months after the treatment as shown in Table 2. Similar pattern was observed across various subgroups of patients based on patient's age and gender.

Table 1: Demographic characteristics of study groups

Characteristics	VAS Score for Heel Pain (mean \pm sd)		P value
	PRP	Steroids	
Age (years)	38.64 \pm 8.56	37.95 \pm 9.18	0.732
Male	13 (33.3%)	15 (38.5%)	0.637
Female	26 (66.7%)	24 (61.5%)	

Difference was statistically insignificant as observed through chi-square test and independent sample t-test.

Table 2: Comparison of various outcome measures (n=78)

Time stamp	VAS Score for Heel Pain (mean \pm sd)		P value
	PRP	Steroids	
Baseline	8.28 \pm 1.38	8.21 \pm 1.34	0.803
1 month	4.23 \pm 1.35	2.33 \pm 1.13	$<0.001^*$
3 months	3.13 \pm 1.49	6.26 \pm 1.33	$<0.001^*$
6 months	1.92 \pm 0.77	6.31 \pm 1.34	$<0.001^*$

*Difference was observed statistically significant, Independent sample t-test.

DISCUSSION

A common lesion occurring in heel is plantar fasciitis (PF) with approximate 11-15% appearance in foets of adult and it needs professional care¹¹. Intensity of pain is increased by weight bearing, obesity and increased activity gradually. It has been held that about heel pain is faced by one in ten people at some point^{11,12}. Though, plantar fasciitis is highly common cause behind heel pain, yet its treatment and etiologic has not been fully explored and understood. It is common believe that due to overuse repeated micro-trauma results into plantar fasciitis due to micro tears of its

substance till appearance of macro injury¹³. Clinical examination and patient's history are main determinants of PF and there is rare need of further investigations. For treating PF, various treatment methods are in practice that includes corticosteroid injections and non-steroidal anti-inflammatory drugs (NSAIDs) besides nondrug approaches like extracorporeal shock wave therapy, shoe inserts, ice packs, plantar fascia stretching exercises and surgical treatments as well¹⁴.

Recently, PRP has shown promising outcomes in dermatology^{15,16}, gynecology¹⁷ and orthopedics¹⁸. PRP is a concentrate of platelets (7 to 10 times) from the whole blood prepared by ultracentrifugation of the blood sample from the patient. PRP is a rich source of a number of cytokines and growth factors that attract reparative cells¹⁹. Transforming growth factor- beta 1 (TGFB-1), epidermal growth factor (EGF), insulin-like growth factor(IGF), vascular endothelial growth factor (VEGF) and platelet derived growth factor (PDGF) are included in these agents that modulates angiogenesis and neovascularization, improves production of local collagen, promotes mitogenesis and given anti-inflammatory effect by blocking production of cyclo-oxygenase-2 (COX-2) enzyme^{19,20}.

Healing is promoted by PRP injection into affected tissues on the basis of these proteins and degenerative processes occurring in the origin of plantar fascia are reversed^{2,3}. Based on this hypothesis, a number of studies reported conflicting results and that is why present study is necessary.

In current study, mean age of patients was 38.3±8.8 years. Females were predominate with a male to female ratio of 1:1.8. Observations of current study were matching with that of Shetty et al.⁵ (2014) who in a similar study involving Indian population reported the mean age of 39.2±9.4 years and with male to female ratio of 1:1.7, females were predominant. Jain et al.⁹ (2018), Tank et al.²¹ (2017) and Patil et al.⁷ (2017) in similar Indian studies reported mean age of 38.9±9.5 years, 40.9±9.4 years and 41.4±6.2 years with male to female ratio of 1:1.8, 1:1.8 and 1:2.1 respectively among plantar fasciitis patients. Likewise, Sherpy et al.²² (2016) reported mean age of 37.5±8.8 in Egyptian patients with plantar fasciitis. But predominance ratio of female was observed very high as male to female ratio of 1:11.

In the present study, we observed that both the steroids and PRP were effective in alleviating pain in plantar fasciitis patients. However, the effect of steroids was early in onset and short-lived while the effect of PRP was slow to develop but persistent. Our results are in line with those of Upadhyay et al.⁴ (2018) who reported similar significant difference in the mean VAS score for pain in Indian patients with plantar fasciitis treated with steroids versus. PRP at 1 month (2.46±0.74 vs. 4.52±0.78; p-value≤0.05), 3 months (6.46±0.91 vs. 3.06±0.86; p-value≤0.05) and 6 months (6.88±0.68 vs. 1.41±0.50; p-value≤0.05) follow-up. They too observed a slow but persistent resolution of pain with PRP as compared to steroids where the effect was early in onset but was temporary. Similar conclusion has also been drawn in another Indian study by Patil et al.⁷ who observed similar difference in VAS score for heel pain at 6 weeks (1.26±1.31 vs. 3.83±0.79; p-value≤0.05), 3 months (0.90±1.53 vs.

0.76±0.85; p-value≤0.05) and 6 months (1.03±1.77 vs. 0.33±0.71; p-value≤0.05) follow-up. Similar observation was made in another Indian study by Jain et al.⁹.

The early improvement with PRP is most probably mediated by the excessive amount of growth factors and cytokines that creates an inflammatory response that subsequently restarts the cycle of tendon repair interrupting the stagnant healing environment leading to subsequent and persistent improve in patient's condition. While steroid injection only serve as an anti-inflammatory agent that ceases the inflammation early within days leading to rapid but temporary improvement and has a negligible effects on remodeling, regeneration and maturation phase resulting in subsequent recurrence of problem and worsening of patients condition²⁰. This also explains the controversy on comparison of PRP with steroids in existing literature where different researchers followed the patients at difference time intervals reporting superiority of steroids (short-follow up) and PRP (long term follow-up).

The strengths of the present study were fairly large sample size of 78 cases and randomization of groups to control bias. We also stratified the results for age and gender to address affect modifiers. A very strong limitation to the present study was that we didn't consider recurrence which is also very important when treating patients with plantar fasciitis. Knowing the frequency of recurrence and treatment response of patients with recurrence disease would further help in the management planning of patients with plantar fasciitis. Such a study is highly recommended in future research.

CONCLUSION

In the present study, we observed that both the steroids and PRP were effective in alleviating pain in plantar fasciitis patients. However, the effect of steroids was early in onset and short-lived while the effect of PRP was slow to develop but persistent which along with its safety considering side effects of steroids advocate the preferred use of PRP in the management of such cases in future practice.

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