COMPARISON OF PLATELET RICH PLASMA WITH LOCAL STEROID INJECTION IN THE MANAGEMENT OF CHRONIC PLANTAR FASCIITIS

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ABSTRACT

Objective: To compare platelet rich plasma against local steroid injection in patients with chronic plantar fasciitis in terms of mean pain and functional scores.

Study Design: Quasi-experimental study.

Place and Duration of study: Armed Forces Institute of Rehabilitation Medicine (AFIRM) Rawalpindi, from May 2016 to Apr 2018.

Methodology: A total of 120 patients having chronic plantar fasciitis were included in the study and were split into 2 groups. The group "A" (n=60) patients were injected with a single dose of autologous platelet rich plasma. The group "B" (n=60) patients received a single dose of methylprednisolone added with a local anesthetic agent. Functional and symptomatic evaluation was done using the American foot and ankle score and the visual analog scale respectively at baseline and at 6 months follow-up.

Results: Mean visual analogue score was 7.83 ± 0.99 at baseline and 3.43 ± 1.30 at 6 months follow-up in group "A" and 7.90 ± 1.06 and 4.97 ± 1.16, respectively, in group "B" (p<0.001). Mean American Foot and Ankle Score was 39.37 ± 5.93 at baseline and 88.73 ± 5.02 at 6 months follow-up in group "A" and 39.03 ± 5.97 and 80.30 ± 8.03, respectively, in group "B" (p<0.001). Changes in the scores of both the evaluation tools were significantly higher in the group "A" (p<0.001).

Conclusion: Platelet rich plasma turns out to be more efficacious compared to steroid injection in terms of pain relief and functional outcome in the management of chronic plantar fasciitis in long term.

Keywords: Autologous blood, Growth factors, Non-steroidal anti-inflammatory drugs, Plantar fasciitis, Platelet rich plasma, Steroid injections.

INTRODUCTION

Plantar fasciitis (PF) can be defined as a localized chronic inflammatory degenerative condition of the plantar aponeuroses that usually manifests as gradual onset of heel pain mostly along the medial aspect that is usually worse in the morning or after prolonged periods of immobility[1]. It has been estimated to affect approximately 2 million Americans each year and approximately 10% of the population is expected to be affected by it in their lifetime[2]. Amongst various associated risk factors include limited dorsiflexion of ankles, standing for extended lengths of time, obesity, female sex, advanced age, poor foot-wear, and some of the pre-existing foot deformities as pesplanus/pes cavus and a shortened Achilles tendon[3,4].

Pathophysiology the condition is marked by signs of inflammation only in the acute form of the disease while in the more common chronic PF the underlying process is characterized by chronic degenerative processes in the plantar fascia along with proliferation of fibroblasts and only little inflammatory changes in the tissue[5]. Repeated/recurring accumulative trauma is thought to result in micro-tears in the plantar fascia which causes an over all biomechanical dysfunction. Various other causes implicated in etiology of chronic PF include some infectious, neoplastic, and arthritic cinditions[4].

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Currently a large number of conservative treatment modalities are being employed to treat the chronic PF, which include physical therapy, plantar fascia stretching exercises, local ice packs, pre-fabricated and custom-made shoe inserts/ night splints, foot-wear modifications, non-steroidal anti-inflammatory drugs (NSAIDs) and extracorporeal shock-wave therapy[6]. Local corticosteroid injections are often employed where afore mentioned treatment options fail but this treatment modality is not always successful, especially in long term, and is also associated with various devastating complications like disruption of plantar fascia and atrophy of plantar fat pad, especially with repeated injections[7]. Platelet-rich plasma (PRP) injection has emerged as a potential treatment option recently with promising results in chronic muscle and tendon injuries including chronic PF[8].

PRP is the plasma part of the autologous blood that contains a platelet count way high up the individual's baseline, along with numerous growth factors that are thought to be involved in a wide range of bio-synthetic pathways[9,10]. The mechanism of action of PRP is the result of degranulation of alpha granules of platelets which causes release of various growth factors that play a key role in tissue healing and regenerative processes[11,12]. When concentrated PRP is injected into a localized tissue, the abundant growth factors are expected to give way to regenerative processes. In chronic degenerative conditions like PF, PRP triggers a resumption of the inflammatory processes that had stopped after unsuccessful conventional treatment, consequently effectively remodeling the chronic degenerative condition into a new acute inflammatory condition with plenty of growth factors like transforming growth factor beta, vascular endothelial growth factor, fibroblast growth factor, epidermal growth factor and insulin like growth factor-1 etc. These growth factors interact in a complex way with adhesive protein factors such as fibronectin and vitronectin resulting in an over all healing response that gives way to the regenerative processes resulting in clinical improvement[13,14].

To our knowledge studies in Pakistan are scarce regarding use of PRP in PF. Our study aims to compare the effectiveness of PRP with local steroid injections not only in terms of pain score but also evaluating the functional improvement thus assisting the treating physicians to choose wisely amongst the two when treating this difficult condition.

METHODOLOGY

This study was conducted at Armed Forces Institute of Rehabilitation Medicine (AFIRM) Rawalpindi from May 2016 to April 2018. After obtaining permission from the institutional ethical committee, 120 patients with chronic PF between 18 to 50 years of age belonging to either gender from outdoor department of AFIRM were included, through non-probability consecutive sampling, who had willingly accepted to participate in the study. The sample size was calculated using WHO sample size calculator with level of significance being five percent and power of the test being eighty percent[5]. Excluded from the study were the patients with systemic illnesses like diabetes mellitus/hypertension and/or active infections, those having history of heel/ foot trauma, Achilles tendonitis, fracture of calcaneus, fat pad atrophy, past history of PRP/ steroid injections or any surgical procedure for heel pain, and those on NSAIDs within last 2 weeks.

After explaining the objectives and benefits of the study, informed consent was taken from all the participants and they then underwent interview for detailed clinical history and relevant physical examination followed by basic investigations to exclude systemic illnesses and/or active infections. Sixty patients were assigned each to group "A" and "B" randomly by lottery method. All participants were advised against use of NSAIDs two weeks preceding to the injection procedure. For preparation of PRP, 20 milliliters of autologous venous blood was obtained from the antecubital vein with 18/19

gauge needle under asepsis. The collected blood sample was then mixed with 7 milliliters of anticoagulant citrate dextrose-A, and was then centrifuged for 15 minutes at 3,200 revolutions per minute. After the blood sample had segregated into PRP and platelet poor plasma, the later was discarded and the PRP was checked for platelets count to ensure a final platelet concentration of 3 fold above that of baseline. All patients in group "A" received a local intra-lesional PRP injection of 3 milliliters under sterile conditions. The group "B" patients received a local intra-lesional injection containing a mixture of methylprednisolone acetate 40 milligrams/1 milliliter and 1 ml of bupivacaine. All injections were made at the area of maximum tenderness on the medial side of heel by a single physician on an outpatient basis using blind injection technique in both the groups. Following the injection procedure, all the participants were allowed to walk immediately but were told to abstain from weight-bearing and high impact sport related activities, such as running or jumping for a minimum of 4 weeks after the injection procedure. Following injection procedure, the participants were detained in the outpatient clinic until the patients considered their pain to be tolerable and were followed in the outpatient clinic at 6 months after the injection. NSAIDs were discouraged and prescribed only for three days after injection at most, although ice packs were allowed. No physical therapy treatments were prescribed during the period of recovery from the injections.

Patients' pain scores on visual analogue scale (VAS) were recorded at initiation of management and then at 6 months. Similarly patients' functional assessment was done using American Foot and Ankle Score (AFAS) at baseline and then at 6 months follow-up. Data were recorded on an especially designed form and were analyzed with the help of SPSS version 17. Qualitative variables like gender were measured by frequency and percentages. Mean and standard deviations (SD) were calculated for quantitative variables like pain score on VAS and functional score on AFAS. Independent samples t-test was used to compare pain and function scores for both the groups considering a *p*-value less than or equal to 0.05 as significant.

Table-I: Comparison of the patients' characteristics at baseline (n=60).

	Group A		Group B		*p*-value*
	n (%)	Mean ± SD	n (%)	Mean ± SD	
Age (years)		38.43 ± 7.57		39.67 ± 6.82	0.512
Female	40 (66.6)		42 (70)		0.347
Male	20 (33.3)		18 (30)		
Right side	23 (38.3)		21 (35)		0.295
Left side	37 (61.6)		39 (65)		
VAS		7.83 ± 0.99		7.90 ± 1.06	0.351
AFAS		39.37 ± 5.93		39.03 ± 5.97	0.246

*$p \leq 0.05$ is statistically significant *Independent samples t test.

Table-II: Comparison of AFAS and VAS scores of the groups at baseline and 6 months (n=60).

	Group A (Mean ± SD)	Group B (Mean ± SD)	*p*-value*
VAS			
Baseline	7.83 ± 0.99	7.90 ± 1.06	0.581
6 months	3.43 ± 1.30	4.97 ± 1.16	<0.001
AFAS			
Baseline	39.37 ± 5.93	39.03 ± 5.97	0.726
6 months	88.73 ± 5.02	80.30 ± 8.03	<0.001

*$p \leq 0.05$ is statistically significant *Independent samples t-test.

RESULTS

None of the patients developed any local or systemic complication at the time of injection

procedure or at follow-up. All 120 patients completed the study with no drop out. Basic characteristics of the patients are given in table-I. Out of 120 patients 82 (68.33%) were females and 38 (31.66%) were males with male to female ratio of 1:2.16. Mean VAS score was 7.83 ± 0.99 at baseline and 3.43 ± 1.30 at 6 months in group "A" whereas it was 7.90 ± 1.06 at baseline and 4.97 ± 1.16 at 6 months in group "B". Mean AFAS was 39.37 ± 5.93 at baseline and 88.73 ± 5.02 at 6 months in group "A" whereas it was 39.03 ± 5.97 at baseline and 80.30 ± 8.03 at 6 months in group "B". Statistically significant improvements in mean VAS score and AFAS at 6 months follow-up were seen in both the groups with the PRP group "A" having significantly higher mean VAS and AFAS statistical scores at 6 months follow-up compared to the steroid group "B" (p<0.001) as shown in table-II.

DISCUSSION

Chronic PF is one of the most confusing disorders of the conditions affecting the musculoskeletal system[11-14]. Although a multitude of conservative/non-surgical treatment options are available for its management with variable outcomes, the best possible treatment modality for PF has not been established thus far[6]. In comparison to steroid injections, use of PRP has begun to increase in the management of chronic degenerative soft-tissue muscle and tendon conditions including chronic PF mainly because the overall pathophysiology is more of a chronic degenerative process, rather than an acute inflammatory one[10]. The mechanism of action of PRP is linked to the degranulation of alpha granules of platelets resulting in release of various growth factors which play a key role in tissue healing and regenerative process[11]. These include platelet derived growth factor, transforming growth factor beta, vascular endothelial growth factor, epithelial growth factor, hepatocyte growth factor and insulin like growth factor[12]. In turn these growth factors interact with adhesive protein factors like fibronectin and vitronectin in a complex way which results in initiation of a healing response that culminates into a regenerative process resulting in symptomatic improvement[13,14].

The therapeutic effects of steroid injection, on the other hand, remain obscure at large and at best are thought to result from the hemorrhage induced by pushing fluid through tissue substance at high pressures[9]. Thus PRP is expected to be more beneficial logically and technically. Our study was conceived to weigh up the effects of a single dose of PRP and steroid injection in the management of chronic PF and we concluded that the PRP is more efficacious compared to steroid injection in terms of pain relief and functional outcome in the management of chronic PF at 6 months follow-up. These results are generally in accordance with a number of international studies. A meta-analysis, which was based on the results of nine randomized controlled trials, concluded that the PRP was superior to steroid treatment for long-term pain relief in chronic PF[14]. Similarly another systemic review and meta-analysis also concluded that the PRP injections resulted in improved pain and functional scores at three months follow-up when compared with corticosteroid injections[15]. Jain K and colleagues concluded that the beneficial effects of PRP in chronic plantar fasciitis, unlike those of steroid injections, did not wear off with passage of time and resulted in sustained beneficial effects[16]. Two other studies found the PRP treatment to be at least as effective as the steroid injections[17,18].

RECOMMENDATIONS

For patients who continue to be affected by persistent heel pain because of chronic PF, the PRP injection should be opted as a preferred treatment modality for superior pain relief and improved functional outcome in long term.

Disclosure

This is an FCPS dissertation based article.

CONCLUSION

To sum up, the use of PRP in chronic PF, compared to steroid injection, proves to be a more efficacious treatment modality for the

reduction of pain and provides superior functional outcome at 6 months follow-up.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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