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Original Research Article

Management of Chronic Plantar Fasciitis: A Comparative Study

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Abstract

Aim: The aim of the present study was to assess the efficacy of autologous PRP injection and to compare it with corticosteroid injection in treatment of plantar fasciitis (PF).

Methods: The study was conducted in the Department of Orthopaedics for the period of 2 years. 150 patients were included in the study and divided into two groups. Group I (75 patients) received PRP injection and group II (75 patients) were given steroid injection.

Results: A total of 150 patients were analyzed in this study ranging from 21 to 65 years of age. In both groups, females outnumbered males, right sided involvement was more than the left side. The average duration of symptoms at the time of presentation was observed to be 21.19±11.39 and 17.3±13.37 in group A and group B respectively. The clinical improvement in chronic plantar fasciitis in this study was evaluated by comparing the values of functional outcome indices at 6th month follow-up with the baseline values recorded prior to administration of injection. The patients showed a statistically significant improvement in both groups with respect to AOFAS Score, VAS scores and plantar fascia thickness and this improvement was significantly more in Group A (PRP). Both the groups do not differ significantly at baseline and posttreatment at 6 months ($p > 0.05$).

Conclusion: This study concluded that both PRP and corticosteroid (methyl prednisolone) injections provide symptomatic relief in the treatment of chronic plantar fasciitis. Though the corticosteroid (methyl prednisolone) injection was effective for immediate pain relief, PRP injections are more effective than corticosteroid (methyl prednisolone) injections on long term basis.

Keywords: AOFAS, Corticosteroid, Plantar fasciitis, Platelet rich plasma

Introduction

Plantar fasciitis (PF), better termed as plantar fasciosis [1,2], is a degeneration of plantar fascia leading to an inflammatory reaction. [3] It occurs mostly due to the biomechanical stress on the plantar fascia. [4] The plantar fascia is a thin elastic fibrous band of connective tissue aligned in a longitudinal orientation with a rich extracellular matrix predominantly in the Hyaluronan. [5] Fasciacytes, a new cell found in the plantar fascia, first termed by Stecco et al., 2018 is devoted to the production of hyaluronan, which promotes the gliding function between the deep fascia and muscle. [6] Plantar fascia lies in close connectivity to the para tendon of Achilles through the heel periosteum. Therefore, any degenerative or inflammatory process within the para tendon of Achilles can hinder normal foot kinematics rendering plantar fascia thickness increment leading to plantar fasciitis. [7]

The Plantar Fasciitis (PF) is one of the commonest reasons of heel pain and manifest as pain originating from the insertion of Plantar Fascia near the medial process of the calcaneal tuberosity. It is worse at the first step in the morning and on getting up from sitting position or on long standing. [8] The prevalence of heel pain is 3.6% to 7% in the general population and it accounts for about 8% in athletics. [9] The diagnosis of the condition is clinical; it is diagnosed on the basis of patient history and tenderness at the insertion site of the plantar fascia (on the medial process of calcaneal tubercle) elicited by palpation. [10]

Corticosteroid injection is a mainstay of early treatment. However, conflicting evidence exists to support the use of steroid injection. Platelet rich plasma (PRP) therapy is a revolutionary novel modality that relieves pain by stimulating long lasting healing of musculoskeletal conditions. [11-13] Platelet rich plasma consists of increased platelet concentration which promotes bone and muscle healing. PRP is used for tissue repair which is mediated by different types of cytokines and growth factors. PRP increases tendon regenerative abilities

with a high content of cytokines and cells, in hyper physiologic doses, which promotes cellular chemotaxis, matrix synthesis, and proliferation. [14] Degranulation of the alpha granules in platelets releases many different growth factors that can play a role in tissue regeneration processes. PRP represents a treatment option for many foot and ankle pathologies, including tendinopathy (achilles, peroneal, posterior tibial, flexor hallucis longus, anterior tibial) and chronic ligamentous injury, such as plantar fasciitis. [15]

The aim of the present study was to assess the efficacy of autologous PRP injection and to compare it with corticosteroid injection in treatment of plantar fasciitis (PF).

Materials and Methods

The study was conducted in the Department of Orthopaedics, Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India for the period of 2 years. 150 patients were included in the study and divided into two groups. Group I (75 patients) received PRP injection and group II (75 patients) were given steroid injection. The diagnosis of PF is made with a reasonable level of certainty on the basis of history, clinical, and radiological assessment.

Inclusion Criteria

- Patients between age group of 18 to 60 years presenting with complaints of plantar heel pain, worse with rising in morning and/or after periods of sitting or lying presenting for 4 weeks or more
- Patients with maximal tenderness at the attachment of the plantar fascia on the medial tubercle of the calcaneus
- Willingness to participate in an investigational technique and follow-up with written consent
- Willingness to forgo any other concomitant conservative treatment modality; NSAIDS and orthotic devices during the study period.

Exclusion Criteria

- Previous surgery for heel pain
- Patient with neuropathic symptoms (radiculopathy, tarsal tunnel syndrome, tarsi sinus syndrome)
- Patient with complex regional pain syndrome or with metastatic cancer
- Achilles tendon pathology
- Systemic diseases like inflammatory or degenerative polyarthritis, diabetes mellitus, local or systemic infection, peripheral vascular diseases, metabolic disease, such as gout, clotting disorder, anticoagulation therapy
- Pregnant or breastfeeding female patients
- Dysfunction of the knee, ankle, or foot
- Work-related or compensable injury
- Previous treatment: Corticosteroid injection in the last 6 months or NSAIDs treatment within the last 7 day.

Method

After taking clearance from ethical committee, patients were selected according to inclusion and exclusion criteria. Informed written consent was taken from every patient who agreed to follow instructions and recommendations given by the clinician. Patient biography, detailed history, and clinical examination were done along with ultrasonographic evaluation of plantar fascia thickness of both feet. All the fresh cases were initially treated with contrast bath, foot-stretching exercise, and silicon heel pad for 4 weeks. The patients, who were not improved with initial treatment, were explained about the autologous PRP injection and steroid injection.

Patients were randomly allocated into two groups

- Group I: These patients were treated with single injection of 3 mL autologous PRP injection locally.
- Group II: These patients were treated with single injection of 3 cc, i.e., 80 mg methylprednisolone acetate locally.

Platelet-rich Plasma Preperation Method

A total of 20 mL of a patient's own venous blood was withdrawn from antecubital vein under aseptic conditions and was collected in presterilized centrifuge vials. These centrifuge vials were preloaded with anticoagulant acid citrate dextrose. This blood was then centrifuged at 3200 rpm for 15 minutes. The blood is then separated in to platelet-poor plasma (PPP) and PRP. The PPP is extracted and discarded. The resulting platelets concentrate contains approximately 6 to 8 times the concentration of platelets compared to baseline whole blood. The PRP samples were sent to pathology lab at different intervals to know the concentration of platelets. The average platelet concentration in our sample was found to be 6.4 (SD ± 1.2) times the baseline level.

Injection Technique

The procedure was done on an outpatient basis and under complete aseptic conditions. Sites of maximum tender- ness were pre-marked with a sterile marker. Patients of group I received a 3 cc PRP injection into the origin of the plantar fascia at

the site of maximum tenderness. 2 cc of 2% Lidocaine was infiltrated prior to injection. A peppering technique, i.e., spreading in clockwise manner was used to achieve a more extensive zone of delivery, with a single skin portal and four to five passes through the fascia itself. Lidocaine sensitivity was done before starting the procedure. Patients are rested for 15 minutes and then they are allowed to walk.

Group II patients received 2 mL of depomedrol (80 mg methylprednisolone) locally. About 2 mL of 2% lidocaine was infiltrated prior to this as in group I. The patients were monitored for 20 minutes for adverse reactions and then sent home with instructions to limit their use of the feet for approximately 48 hours and use opioid for pain. After 48 hours, patients were given a standardized stretching protocol to follow for 2 weeks. A formal strengthening program is initiated after this stretching. At 4 weeks after the procedure, patients were allowed to proceed with normal sporting or recreational activities as tolerated. Any types of foot orthoses were not advised.

Follow-up

The patients were evaluated with visual analogue scale (VAS) and AOFAS at the time of getting the injection (0 weeks), at the end of 6th week, 12th week and 6 months of follow up and plantar fascia thickness using USG at 0 week and 6 months of follow-up.

Statistical Analysis

Descriptive statistics were used for baseline parameters of the data. Qualitative variables were presented as mean and standard deviations and qualitative variables in counts and percentages. As the sample size is less than equal to 30, we use Shapiro ilk test for the assessment of normality. For the pre post comparison of quantitative outcome measures either a paired T test or Wilcoxon signed ran test was used as per the normality of the data. A "p" value lesser than 0.05 showed statistical significance. All data entered in Microsoft excel and analyzed using SPSS version 26.00.

Results

Table 1: Demographic details

Parameters	Group A(PRP)	Group B(steroid)
Sex (M/F)	39/36	40/35
Age	46±10.70	36.4±12.08
Side(bilateral/left/right)	10/30/35	8/33/34
Duration of symptoms(weeks)	21.19±11.39	17.3±13.37

A total of 150 patients were analyzed in this study ranging from 21 to 65 years of age. In both groups, females outnumbered males, right sided involvement was more than the left side. The average duration of symptoms at the time of presentation was observed to be 21.19±11.39 and 17.3±13.37 in group A and group B respectively.

Table 2: Functional and radiological outcome analysis between the two groups

Parameters	Follow-up	Group-A (PRP)	Group-B (steroids)	P-value
	Baseline	54.06±3.14	51.79±3.06	0.38
AOFAS	6 weeks	78.72±1.75	82±2.28	0.0001
	12 weeks	82.38±2.26	78.62±2.48	0.0001
	6 months	86.64±1.48	75.15±2.02	0.0001
	Baseline	8.08±0.52	8.32±0.64	0.130
VAS	6 weeks	7.05±0.72	4.86±1.02	0.0001
	12 weeks	6.34±0.82	4.08±0.72	0.0005
	6 months	2.9±1.07	4.46±0.96	0.0001
Plantar fascia	Baseline	5.76±0.65	5.65±0.62	0.36
thickness	6 months	3.32±0.44	3.73±0.65	0.007

The clinical improvement in chronic plantar fasciitis in this study was evaluated by comparing the values of functional outcome indices at 6th month follow-up with the baseline values recorded prior to administration of injection. The patients showed a statistically significant improvement in both groups with respect to AOFAS Score, VAS scores and plantar fascia thickness and this improvement was significantly more in Group A (PRP).

Table 3: Test of significance of plantar fascia thickness in groups I and II

Groups	Mean plantar fascia thickness pretreatment	Mean plantar fascia thickness posttreatment	p-value
A	6.100	3.910	<0.001
B	5.830	4.158	<0.001

Both the groups do not differ significantly at baseline and posttreatment at 6 months ($p > 0.05$).

Discussion

Plantar fasciitis (PF) accounts for 15% of all foot disorders. More than 10% of the population is affected by it over their lifetime. [16-18] Although etiology of PF remains ill-understood, but there are evidences to suggest that it is probably initiated by repeated microtrauma. Pathological changes are degenerative in nature (although partially reversible) and histologically changes, such as, collagen necrosis, angiofibroblastic hyperplasia, chondroid metaplasia and matrix calcification are seen. [19-22] The most common presenting symptom of PF is a sharp pain of insidious onset with maximal tenderness at the anterior medial border of the calcaneus.8 The pain is typically worst on the first few steps in the morning and with initial steps after prolonged sitting or inactivity, and on examination, there is mild to severe tenderness on medial calcaneal tubercle and sometimes, on lateral aspect of heel. [23]

A total of 150 patients were analyzed in this study ranging from 21 to 65 years of age. In both groups, females outnumbered males, right sided involvement was more than the left side. The average duration of symptoms at the time of presentation was observed to be 21.19±11.39 and 17.3±13.37 in group A and group B respectively. This result was similar to the study conducted by Shetty et al [24] wherein the mean patient age in the PRP Group and steroid group was 34.0±9.15 and 39.2±9.35 respectively. The gender distribution observed in our study was similar to Monto et al [25] that included 8 males and 12 females in the PRP Group, and 9 males and 11 females in the steroid Group. Plantar fasciitis is commonly diagnosed inferior heel pain in adults and have a dramatic impact on physical mobility. [26] It continues to baffle doctors, since there are no definite combinations of clinical, biomechanical, or training variables, or causative factors in the development of chronic plantar fasciitis have been found. [27] Though corticosteroid injections are considered as one of the treatment modalities but unfortunately it has short term results and is associated with complications like rupture of plantar fascia and fat atropy. [28]

The clinical improvement in chronic plantar fasciitis in this study was evaluated by comparing the values of functional outcome indices at 6th month follow-up with the baseline values recorded prior to administration of injection. The patients showed a statistically significant improvement in both groups with respect to AOFAS Score, VAS scores and plantar fascia thickness and this improvement was significantly more in Group A (PRP). Mahindra et al assessed the visual analog scale for pain and with the American orthopaedic foot and ankle society (AOFAS) ankle and hindfoot score before injection, at 3 weeks, and at 3-month follow-up. [29] Mean visual analog scale score in the platelet-rich plasma and corticosteroid groups decreased from 7.44 and 7.72 pre-injection to 2.52 and 3.64 at final follow-up, respectively. Mean AOFAS score in the platelet-rich plasma and corticosteroid groups improved from 51.56 and 55.72 pre-injection to 88.24 and 81.32 at final follow-up, respectively. In another study by Tank et al, within group comparison in PRP group the results were statistically significant ($p<0.05$). [30] Both the groups do not differ significantly at baseline and posttreatment at 6 months ($p > 0.05$). A study performed by Aksahin et al [31] compared the effects of corticosteroid injections and PRP injections to treat PF. Their study consisted of 60 patients who did not respond to conservative treatment for at least 3 months prior to either injection. The patients were placed into two groups in which 30 patients were treated with a corticosteroid injection and 30 patients were treated with a PRP injection. They found no significant difference in pain or patient satisfaction, thus demonstrating that PRP injections are as effective as corticosteroid injections.

Conclusion

This study concluded that both PRP and corticosteroid (methyl prednisolone) injections provide symptomatic relief in the treatment of chronic plantar fasciitis. Though the corticosteroid (methyl prednisolone) injection was effective for immediate pain relief, PRP injections are more effective than corticosteroid (methyl prednisolone) injections on long term basis.

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