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Treatment for Plantar Fasciitis using Platelet Rich Plasma (PRP)

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Abstract

Objective: Case series aimed to evaluate clinical outcome of patients who underwent treatment for plantar fasciitis using Platelet rich plasma (PRP).

Method: Patients were diagnosed clinically who presented with plantar inferio-medial heel pain longer than 6 weeks. All patients were injected with freshly prepared 2ml of PRP injection at heel medial entry point with direction towards the tendor point. The patients were followed up clinically and functionally at 2 weeks, 4 weeks, 3 months and 6 months. VAS score and American orthopaedic foot ankle score was used to assess the patients.

Result: Total 60 patients were included in the study (39 female and 21 male).The average age in the series was 43.07 years ± 6.73.Mean VAS scoring at 6 months of follow up was 1.9(SD1.5).The mean AOFAS scoring at the end of 6 month of follow up was 90(SD7.54).

Conclusion: Platelet Rich Plasma Injection technique for plantar fasciitis offers a better treatment with (1) its application is minimally traumatic,(2) it has a reduced risk for immune mediated rejection, devoid of potential complications such as hypoglycemia, skin atrophy, tendon tears associated with corticosteroid injection, (3) it is simple to acquire and prep are,easy to carry out as out patient procedure and(4) it is inexpensive,(5) better relief of pain,(6) lower currencerate

Keywords: VAS, AOFAS, orthopaedic

Introduction

Plantar fasciitis (PF) is mainly a clinical diagnosis characterised by infero-medial heel pain, which is worse in the morning.(1,2)

It is common in the obese, in those standing for prolonged periods at work, and in those whose jobs involve walking on hard surfaces.

Peak age incidence is between 40-60 years(3) . Repititivemicrotrauma arising from heel strike leads to traction periostitis and results in inhibition of normal repair process that leads to chronic inflammation of fascia.(4,5)

It remains the commonest cause of plantar heel pain. The tissue is characterized histologically by infiltration with macrophages, lymphocytes, and plasma cells; tissue destruction; and repair involving immature vascularization and fibrosis. The normal fascia tissue is replaced by an angiofibroblastic hyperplastic tissue which spreads itself throughout the surrounding tissue creating a self-perpetuating cycle of degeneration.(1,7)

In over 80% of cases, symptoms can be resolved with simple non-operative measures of eccentric

stretching exercises to the Achilles tendon and plantar fascia. To correct biomechanical factors, activity modification and useof simple analgesics. Nonsurgical treatment options include nonsteroidal anti-inflammatory drugs (NSAIDs), night splints, ice packs, plantar fascia stretching exercises, corticosteroid injections, and extracorporeal shock wave therapy(6). Surgical release of the fascia can also be done but results have been variable in efficacy. Platelet rich plasma (PRP) is recently being recommended for treatment of plantar fasciitis .

Patients and Methods

Institutional review board approval was obtained and all sixty patients were studied in this. Patients provides controlled study conducted from December 2017 to November 2019 at Govt. Medical College, Kota, Rajasthan.

All patients were diagnosed clinically and radiologically who presented with plantar inferio-medial heel pain longer than 6 weeks.

Patients with history of severe anaemia, trauma, operative history of foot, with blood disorders (thrombocytopenia etc) , patients receiving immunosuppressive therapy or on steroid injection and patients not willing to participate were excluded from study.

PRP (PLAELET RICH PLASMA) preparation and administration

PRP has been prepared and administered differently by different investigators. Most investigators have used specialized kits for separating PRP from whole blood along with an anticoagulant and centrifugation(8-15), while some have simply centrifuged whole blood with an anticoagulant and manually collected PRP after centrifugation(16-20). There is currently no evidence that preparing PRP with a particular kit yields superior PRP compared to any other kit, or by centrifuging and extracting manually.(21)

Two trials have used calcium chloride for platelet activation, with the goal of stimulating growth-factor release, while most have not(13,16). It has been hypothesized that external platelet activation is not necessary for effective PRP treatment, as platelets are activated endogenously once injected. Also, while differing methods may be used to prepare PRP, it has been suggested that attaining a platelet concentration 4 to 6-times that of whole blood is the most important factor for achieving favorable treatment results(9).

The present study developed and characterized the following two-step method to obtain PRP, maximizing platelet purity, recovery and yield:-

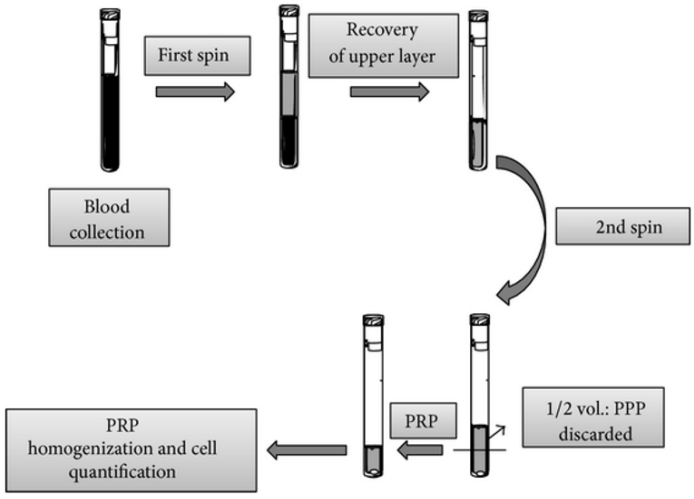


Figure 1: Flow chart describing the general preparation process of PRP.

Centrifused at 1500 RPM for 10 minutes in every spin.

Whole Blood is initially collected in tubes that contain anticoagulants. The first spin step is performed at constant acceleration to separate RBCs from the remaining Whole Blood volume. After the first spin step, the Whole Blood separates into three layers: an upper layer that contains mostly platelets and WBC, an intermediate layer that is known as the buffy coat and that is rich in WBCs, and a bottom layer that consists mostly of RBCs. The upper layer plus buffy coat is transferred to an empty tube. The second spin step is then performed. The upper portion of the volume that is composed mostly of PPP (platelet-poor plasma) is removed to create the PRP (Platelet-Rich Plasma). The concentrations of platelets and WBC in each of the various layers are measured to characterize the quality of PRP.

METHOD OF PRP PREPARATION AND INFILTRATION

PRP is derived from the centrifugication of autologous blood, resulting in higher platelet concentrations than that of the original sample.

1 ml CDPA (citric acid, sodium citrate, dextrose, monobasic sodium phosphate, adenine) mixed with 9ml autologous peripheral venous blood was collected from non diseased upper limb of patient into sterile test tube. This was centrifuged at 1500 rpm for 10 minutes in first spin. As a result of spin, three layers i.e upper layer (mostly platelets and WBC), intermediate layer (buffy coat which is rich in WBC) and bottom layer (mostly RBCs) were obtained. Upper two layers were recovered in another sterile test tube for second spin at same rpm and time. . The upper portion of the volume that is composed mostly of PPP (platelet-poor plasma) is removed to create the PRP (Platelet-Rich Plasma). PRP was collected taking care to avoid contamination with the buffy coat containing the leukocytes.PRP was kept at room temperature until intervention; delay between blood extraction & plasma administration would not be >4 hours. Two samples i.e whole blood and PRP were sent for quantitative analysis of platelets.

PRP INFILTRATION- All patients were injected with freshly prepared 2ml of PRP injection at heel medial entry point with direction owards the tendorpoint . For bilateral case only one foot in injected at a time and another after 2 weeks.

Procedure was explained to the patient . Patient lie in supine position . Foot cleaned and prepared with spirit and povidoneiodine . All PRP injected at maximum tendorpoint , at medial aspect of foot at marked entry point on skin. Partially withdrawing the needle , redirecting and marking multiple to the fascia.All patients were adviced strengthening exercise following the injection.

Centrifuge Machine

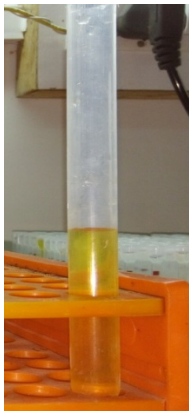
Blood Collection Bag with Anticoagulant [CDPA]

Sterile test tube with 1ml Anticoagulant [CDPA]

Anticoagulated whole blood

Result of first spin

Isolation of plasma & buffy coat layer



Plasma & buffy coat to be subjected for second spin

PRP to be Injected after Second Spin

Post Injection Care

Post injection patient was rested for 10 min. Patient was adviced to avoid NSAIDS , rest and ice fomentation for 1-2 days . Patient was informed of exaggeration of pain symptoms for 2-3 days, physio exercises. Patient was allowed to start routine activites after 48 hours.

FOLLOW UP

The patients were followed up clinically and functionally at regular intervals, initially 2nd week, 4th week and then at 3rd month & 6th month for the progress of effect.

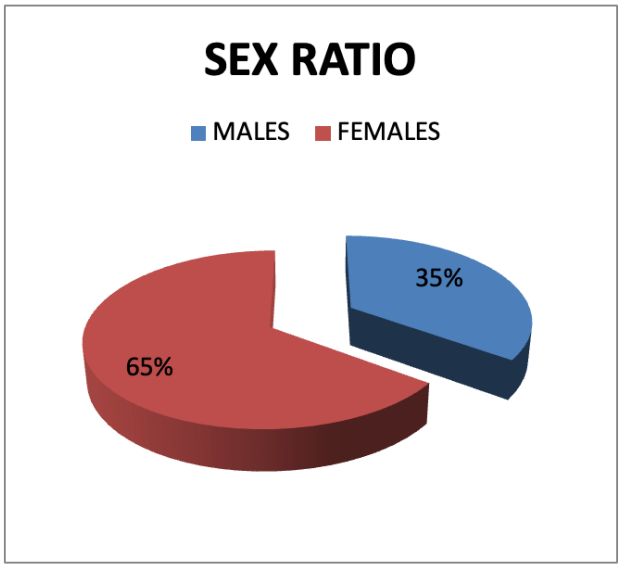
Patients were assessed using VAS score and American orthopaedic foot ankle score, all recorded before treatment and at subsequent visits.

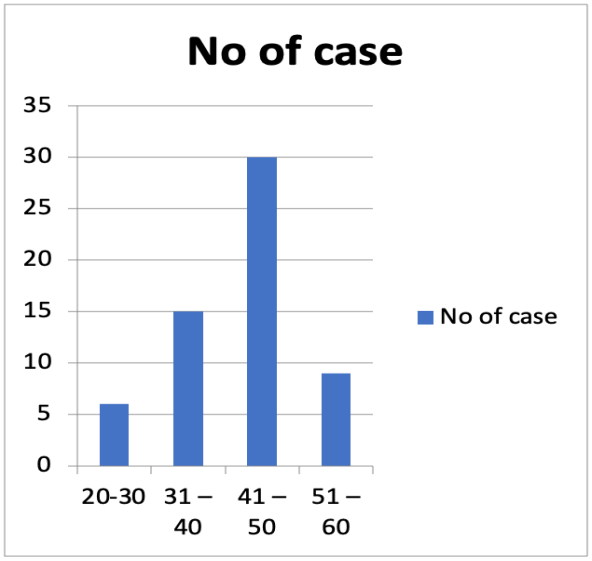
RESULTS

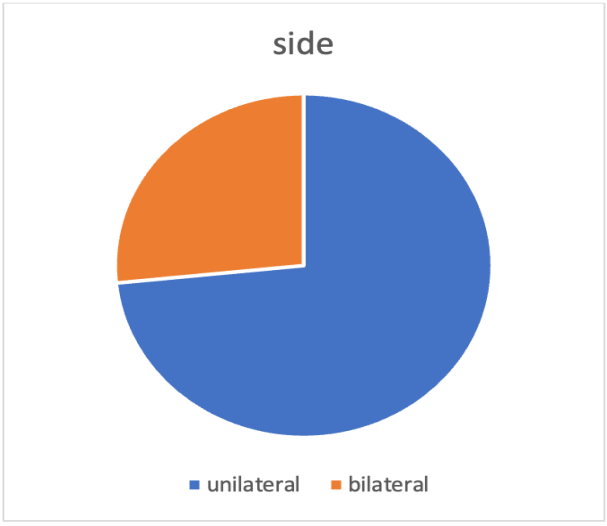
This study was conducted in the Department Of Orthopaedics, Government Medical College and Associated Hospitals, Kota during the year

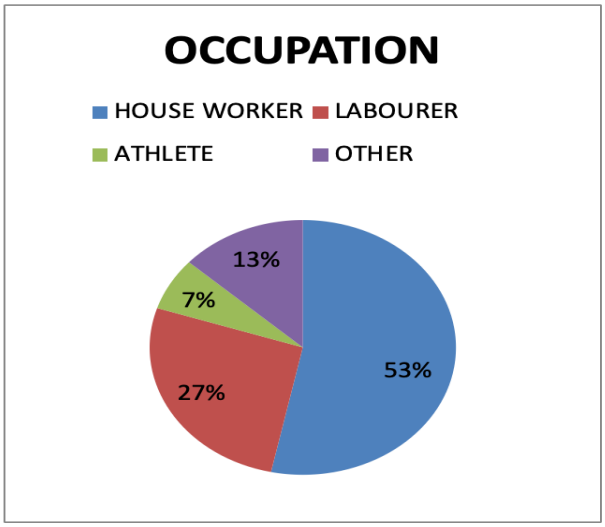
December 2017-November 2019. 60 patients with plantar fasciitis were treated by platelet rich plasma therapy.

All the cases were observed during follow up and final outcome was evaluated based on VAS for pain and AOFASfor pain and functional outcome

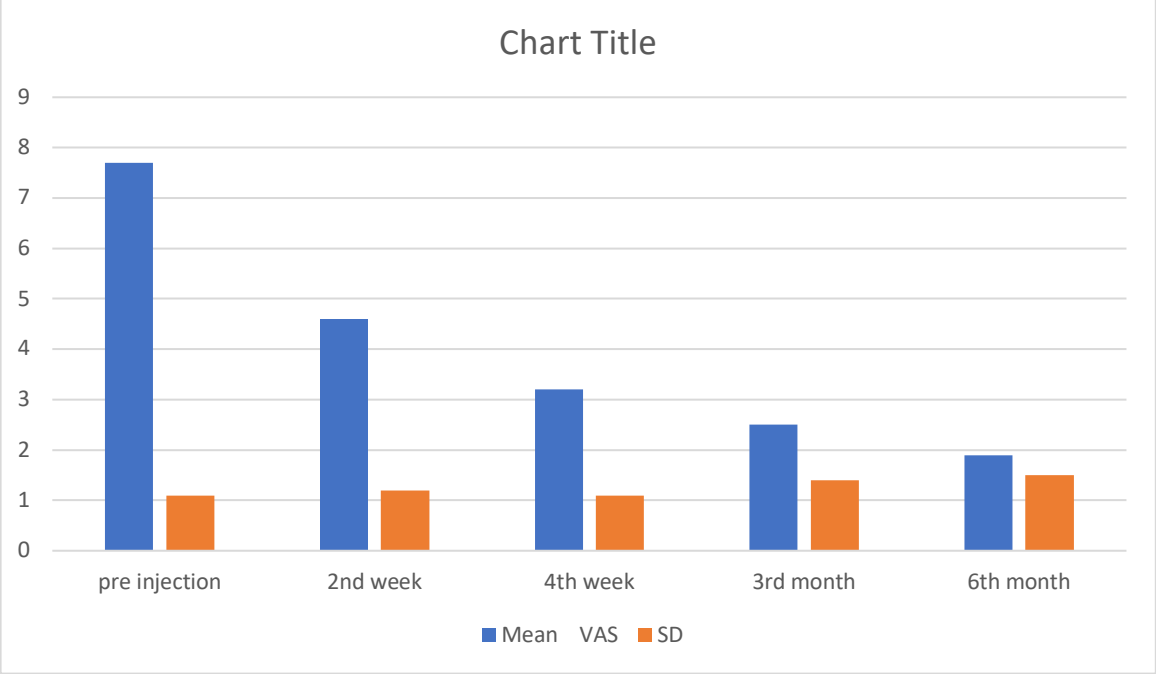








Most of the patients were in the age group 30-50(75%)
The youngest in the series at the time of study was 26 years and the oldest patient was 56 years. The average age in the series was 43.07 years ± 6.73.
In our study, Out of 60 patients 39(65%) were female and 21(35%) were male.
Most of the patients involved in our study were house workers (53.4%), Labourer (26.7%) athlete(6.7%) and others including football players , teachers (13.3) by occupation .
Unilateral side was involved in 48 cases (80%) while bilateral side was involved in 12 cases (20%).



Mean VAS score at 3 month follow up was 2.5(SD1.4)which was excellent as it decreased from pre – injection mean VAS score of 7.7(SD1.1). 9(15%) patients had no pain while 51 patients (85%) had mild a pain at the 3month follow up in our series. In 2 patients, there was some benefit but desired benefit not achieved as one patient was runner and another one was football player due to continuation of repetitive movements of ankle & foot. There was consistent improvement in mean score during each follow up and each score was statistically significant when compared to previous follow up.

Mean VAS scoring at 6 months of follow up was 1.9(SD1.5)which was excellent as it dropped down from pre – injection mean VAS score of 7.7(SD1.1). 36(60%) patients had no pain while 24 patients (40%) had mild a pain at the final follow up in our series.. There was consistent improvement in mean score during each follow up and each score was statistically significant when compared to previous follow up.

TABLE 1: AOFAS

	Pre injection	**2nd wks**	**4th wks**	**3rd mths**	**6th mths**
Mean	**44.12**	**61**	**79**	**88.12**	**90**
SD	**3.12**	**5.23**	**8.30**	**9.27**	**7.54**

In our study, functional and pain scoring system used was AOFAS scoring system. Mean AOFAS score at 1 month follow up was79(SD8.30) which was good as it increased from pre injection mean AOFAS score 44(SD3.12).

The mean AOFAS scoring at the end of 6 month of follow up was 90(SD7.54) which was excellent. There was consistent improvement in mean score during each follow up and each score was statistically significant when compared to previous follow up.

This was observed that there was increase in pain at local site after injection for few days in 42 patients(70%) that was treated with rest and ice fomentation for few days.

In our study mean platelet concentration in CBC was 241.25x 10^3/µl and in PRP was 808.03x 10^3/µl that was approximate 3-4 times to mean platelet concentration in CBC, required for effectiveness of PRP.

Discussion

Medical literature has sufficient studies to prove definitive role of PRP (Platelet rich plasma) in healing of injured tissue. Cellular response to injury progresses through four general stages: haemostasis, inflammation, proliferation and finally remodelling. Each phase is characterized by enhanced cellular or molecular activity, all of which involve platelets. Activated platelets and leucocytes mediate inflammation while various growth factors derived from platelets alfa granules influence tissue regeneration. Specifically angiogenic and mitogenic growth factor concentrations are believed to aid tissue regeneration. Both the precise composition and formulation of PRP affect the cellular environment in which it is placed and determine its overall effect on tissue repair.

In this currentstudy, the meanageen countered was 43 years (Range:30 to 56 years); the peak incidence was seen from 30 to 50 years. This was seen similar in two separate studies which observed manage of 45 .71 Snehashishmukherjee and D.ktanejajune 2019 (22) and mean age of 42 Chandreshekhar & Alamgirjhan oct2017(23) In this current study, out of the 60 participants, female patients were 39 (65%) and 21(35%) were male patients. Near similar observation(male-40% and female 60%) seen in study Chandreshekhar & Alamgirjhan oct2017{204,205} and (male 35.71% and female-64.29%) in Nciolomartinelli oct 2012 (22,23). In our study the mean VAS scoreand AOFAS score before injection were comparable. Mean VAS score was 7.7(SD1.1) comparable with a study (vishwajeet Kumar & tim miller Elsevier jan 2013)[24]and mean AOFAS score was 44.12(SD3.12)-Snehashishmukherjee and D.ktaneja june2019[22]

At 2 weeks followup, statistically significant difference inVASscoringand AOFAS was seen. Mean VAS score was 4.6(SD1.2)which was comparable with a study (Abdel moneim & Hussein helal 2019)[25] showed statistically significant decrease in VAS score. and Mean AOFAS score was significant increase 61(SD5.23) .

At 4th week followup, there was statistically significant decrease in VAS score and significant increase AOFAS score. Mean VAS score was 3.2(SD1.1)which was comparable mean vas 3.8 with a study (Chandreshekhar & Alamgirjhan oct2017{22,23}. and Mean AOFAS score was significant increase 79(SD8.30) .

At 3 months followup, mean VAS score was 2.5(1.4) which was comparable(2.52+_1.71) with a study (pankajmahindra april-2017)[26] and mean AOFAS score was 88.12(SD9.27)comparable (mean AOFAS88.25)Snehashish & taneja june2017[22], showed statistically significant decrease in VAS score and significant increase AOFAS . 9 patients (15%) were completely free from pain ,VAS score was 0. AOFAS score was 100 in 6 (10%) patients. At the end of 6 months there was no recurrence.

At the end of 6 months, 38 patients (63.34%) were completely relieved of pain and functional disability. 22 patients (36.6%) have mild pain. mean VAS score Was 1.9 which was comparable (1.9+-1.5)Nciolomartinellioct 2012[27] and mean AOFAS score was 90 which was comparable with study 90.78 (Snehashish & taneja june2017[22]. mean VAS and AOFAS score were 1.9 and 90 respectively. no patients follow up were lost at 6 month.

It was seen that there was a significant increase in postintervention pain for few days in Platelet Rich Plasma Injection. 42 participants (70%) complained of increase of pain after local

injection. This was also seen in other PRP studies- Peerboom et al 2010,krogh et al 2013[28].

In this current study it was seen that mean platelet concentration in whole blood was about 241.25 x 10^3/µl (SD-58.01) and mean platelet concentration in PRP was about 808.03 x 10^3/µl (SD-138.82). Another study had shown that clinical efficacy can be expected with a minimum increase in platelet concentration of 4 to 6 fold from whole blood baseline (200 x 10^3/µl platelets/µl)[29]. By our method we achieved average 3-4 fold increase in platelet concentration over baseline platelet count.

And these patients had to be managed with oral analgesics for varying period of days (2 to 5 days) for pain relief.

In our study the number of mean PRP injection was 2.8(approximate 3). Minimum 2 injection and maximum 3 injection were given.

To conclude, Platelet Rich Plasma Injection was beneficial both in short term and long term for the treatment of plantar fasciitis not responding to conservative methods. Advantages of Platelet Rich Plasma Injectionare-highly acceptable, efficacious, economic, easy to carryout as outpatient procedure, devoid of potential complications such as hypoglycemia, skin atrophy, tendontears associated with corticosteroid injection and lower currence rate.

Conclusion

- It was a prospective randomized study to know the efficacy of Platelet Rich Plasma Infiltration at local site in patients of plantar fasciitis.
- Total 60caseswereselected.
- All patients were clinically evaluated and the severity of pain and functional disability was recorded using VAS and AOFAS Scoring.
- Participants were followed-up for total of 6 months. Followup period was divided in to intervals of 2ndweek, 4th week,3rd month and 6months.
- Mean age was 43 year (SD6.7) in our study.
- In our study females were 65% and males were 35%.
- In our study unilateral side affected in 80% patients and bilateral side affected 20% patients.
- Outcome was measure dusing 'Visual Analogscore' and 'AOFAS SCORE for plantar fasciitis
- A t 3rd monthand6thmonthsfollowup, there was statistically significant decrease in pain.
- At the end of 6 months 63 % were completely relieved of pain. 37% had mild pain that was significantly decreased from mean VAS(7.7) to mean VAS(1.9) and mean AOFAS was significantly increase from (44.12) to mean AOFAS(90)
- It was seen that there was a significant increase inpost intervention pain for few days in 70% patients.
- Recurrence rate of 0 % was noted at the end of 6 months.
- Average 3 injections were given in 48 patients out of 60.
- Platelet Rich Plasma Injection technique for plantar fasciitis offers a better treatment with (1) its application is minimally traumatic, (2) it has a reduced risk for immune-mediated rejection, devoid of potential complications such as hypoglycemia, skin atrophy, tendon tears associated with corticosteroid injection, (3) it is simple to acquireandprepare, easy to carry out as out patient procedure end (4) It Is inexpensive, (5) better relief of pain ,(6) lowr ecurrencerate
- This study of fersencouraging results of an alternative treatment that addresses the pathophysiology of later plantar fasciitis that has failed traditional non surgical modalities.

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