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Local injection of Platelet Rich Plasma for Plantar Fasciitis

Vishwas Sharad Phadke[1], Vaibhav Vinayak Antrolikar[2], Ajaykumar Ramlu Allamwar[3]

[1]Associate Professor, [2,3]Assistant Professor, Department of Orthopedics, SSPM Medical College and Lifetime Hospital, A.P. Padve, Kasal - Malvan Rd, Ranbambuli, Maharashtra, India 416534

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ABSTRACT

Background: Plantar fasciitis can be defined as inflammation at the insertion of plantar fascia and is thought most commonly due to overuse injury. It usually presents as sharp shooting heel pain which is worse in the morning. The location of pain is usually plantar surface of the foot and pain may radiate proximally in long standing and severe cases. In mild cases of plantar fasciitis non steroidal anti-inflammatory drugs and activity modification may be sufficient. Severe cases may require interventions such as night splints and orthotic devices which works by reducing loading of plantar fascia. Recently local injection of autologous platelet rich plasma is used by many researchers with promising results. **Aims and Objectives:** This prospective cohort study was undertaken to analyze the functional and clinical outcome in patients with plantar fasciitis who were treated by autologous injection of platelet rich plasma. **Materials and Methods:** This was a prospective cohort study conducted in department of orthopedics of a tertiary care medical college located in an urban area. The patients diagnosed to be having plantar fasciitis were included in this study on the basis of a predefined inclusion and exclusion criteria. Patients were assessed for severity of pain by the Visual Analogue Score for pain and American orthopedic foot and ankle score (AOFAS). A VAS score of 0-3 was taken as pain relief and VAS score of 4-10 was considered as no pain relief. Whereas AOFAS scores of 90-100, 80-89, 60-79 and less than 60 were taken as excellent, good, fair and poor outcome respectively. All patients were treated by local injection of autologous platelet rich plasma. The patients were followed up at 4 weeks, 8 weeks and 12 weeks. During follow up visits the pain relief was assessed by VAS and AOFAS scores. For statistical purposed SSPS 21.0 software was used and p value less than 0.05 was taken as statistically significant. **Results:** A total of 60 patients were included in this study out of which there were 22 (36.67%) males and 38 (63.33%) females with a M:F ratio of 1:1.72. The most common affected age group was between the age of 41-50 years (35%) followed by 51-60 years (21.67%) and 31-40 years (20%). Twenty-seven (45%) patients were either overweight or obese. A statistically significant reduction in pain was documented at the time of follow up of 4 weeks. At the end of 12 weeks 58 (96.67%) patients experienced significant pain relief and only 2 (3.33%) patients had significant pain. Also, there was statistically significant difference between AOFAS scores at the time of presentation and at 4 weeks, 8 weeks and 12 weeks follow up visits. **Conclusion:** Injection of autologous platelet rich plasma for chronic plantar fasciitis is found to have promising results in terms of pain relief (reduced VAS score) and functional outcome (Improvement in AOFAS score).

Key words: Plantar fasciitis; Platelet rich plasma; VAS score; AOFAS Score

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INTRODUCTION

Plantar fasciitis is defined as inflammation at the insertion of plantar fascia and is thought most commonly due to overuse injury.[1] It is one of the common causes of heel pain for which orthopedic consultations are made. Though the exact mechanism of heel pain in plantar fasciitis remain elusive repetitive microtrauma to plantar fascia is generally

Address for Correspondence:
Dr. Vishwas Sharad Phadke, Associate Professor, Department of Orthopedics, SSPM Medical College and Lifetime hospital, A.P. Padve, Kasal - Malvan Rd, Ranbambuli, Maharashtra, India 416534. **Mobile No:** +91-9822080128. **E-mail:** phadkevs@gmail.com

accepted by researchers as the cause of plantar fasciitis. This theory of repetitive trauma as the cause of plantar fasciitis is further substantiated by the fact that plantar fasciitis is commonly seen in individuals involved in sports and athletic activities.[2] Various risk factors for occurrence of plantar fasciitis include obesity, pesplanus, heel pad atrophy, aging, leg- length discrepancy and individuals involved in occupations requiring prolonged standing. The other factors which may cause plantar fasciitis include running on uneven ground, prolonged walking and sudden increase in walking speed.[3]

It is seen more commonly in females as compared to males and individuals are usually affected in 3rd or 4th decade of life. It usually presents as sharp shooting heel pain which is worse during initial steps. The location of pain is usually plantar surface of the foot and pain may radiate proximally in long standing and severe cases. In untreated cases the pain may be so severe as to compel the patient to walk on toes so as to avoid severe pain caused by normal walking. The diagnosis of plantar fasciitis is usually clinical.[4] The patient present with sharpshooting pain in plantar surface of foot which is worse in morning hour. The characteristic toe walking may further substantiate the possibility of plantar fasciitis. Though the diagnosis of plantar fasciitis on ultrasound is difficult with advent of high frequency probes many researchers consider thickness of plantar fascia more than 4 mm to be abnormal.[5] Further imaging by computed tomography or magnetic resonance imaging mainly have a role in ruling out other pathologies as cause of chronic pain in calcaneal region such as avascular necrosis of calcaneum.[6]

The management of plantar fasciitis depends upon severity of pain and functional disability it is causing to the patient. While in patients who have mild pain non steroidal anti-inflammatory drugs and activity modification (cycling in place of walking) may be sufficient severe cases may require interventions such as night splints and orthotic devices which works by reducing loading of plantar fascia.[7] In cases causing functional disability the interventions such as extracorporeal shockwave therapy and local injection of steroids have been tried with variable results. Though the local injection of steroids are associated with significant reduction in pain in plantar fasciitis, this pain relief is usually temporary and may require repeated injections of steroid which is known to cause plantar fat pad atrophy and plantar fascia rupture.[8] Therefore local steroid injections have fallen out of favor and Platelet- rich plasma injection was tried by researchers as an alternative to local steroid injection with promising results.[9] Autologous platelet rich plasma is thought to act by tissue repair due to presence of various growth factors including platelet-derived growth factor (PDGF) and transforming growth factor-beta (TGF-beta).[10]

We conducted this study to know the clinical outcome in patients of plantar fasciitis treated with autologous Platelet-rich plasma injection.

MATERIALS AND METHODS

This was a prospective cohort study conducted in department of orthopedics of a tertiary care medical college located in an urban area. The patients diagnosed to be having plantar fasciitis were included in this study on the basis of a predefined inclusion and exclusion criteria. An informed written consent was obtained from all the participants after explaining to them in detail about the procedure and study. Demographic details of all the patients were noted. Presence of any chronic illness such as diabetes mellitus, hypertension, immunocompromised state, autoimmune disorders or arthropathies was noted. Basic investigations like complete blood count, C-Reactive protein levels (CRP), erythrocyte sedimentation rate (ESR) and rheumatoid factor was done in all the cases. X-Ray foot was done in all the cases to rule out presence of other pathologies such as fracture or arthritis. The severity of pain was assessed in all the cases by visual analogue score and Patients were explained in detail about the treatment modality and a written informed consent was taken fromall the patients. Demographic details like age, sex, area of residence was noted in all the cases. Presence of any systemic illness such as diabetes, hypertension, autoimmune disorders or arthopathies was noted.

Basic investigations such as Complete blood count, ESR, CRP and rheumatoid factor were done in all the cases. All patients underwent ultrasound examination a thickness more than 4.5 mm was taken as diagnostic of plantar fasciitis. After the patient was diagnosed with plantar fasciitis and consent was taken patients were assessed for severity of pain by the Visual Analogue Score for pain and American orthopedic foot and ankle score (AOFAS).[11] A VAS score of 0-3 was taken as pain relief and VAS score of 4-10 was considered as no pain relief. Whereas AOFAS scores of 90-100, 80-89, 60-79 and less than 60 were taken as excellent, good, fair and poor outcome respectively.

Method of local injection

Ten ml of patient's venous blood was collected in EDTA bulb with syringe maintaining all aseptic precautions. The blood was centrifuged at a rate of 3000 rpm

for 15 minutes. This centrifugation resulted in separation of blood into 3 layers upper layer that contains platelets and white blood cells whereas an intermediate thin layer (buffy coat) rich in white blood cells and a bottom layer mostly consisting of erythrocytes. The buffy coat then was transferred to another tube and was once again centrifuged at a rate of 2000 rpm for 10 minutes resulting into formation of platelet pallets in the lower 1/3rd portion. The upper 2/3rd portion were then discarded thereby obtaining platelet rich plasma. Three ml of this platelet rich plasma then was locally injected by peppering technique (single skin puncture and then penetration of fascia)at the site of maximum tenderness after giving local lidocaine (after sensitivity test). After the injection of platelet rich plasma patients were discharged with instruction to limit use of affected foot to minimum required level. Analgesics were prescribed to be used if required.

The patients were followed up at 4 weeks, 8 weeks and 12 weeks. During follow up visits the pain relief was assessed by VAS and AOFAS scores. For statistical purposed SSPS 21.0 software was used and p value <0.05 was taken as statistically significant.

Inclusion criteria

1. Those who gave informed written consent.
2. All patients (18-60 year of age) having heel pain due to plantar fasciitis.
3. Those who have not responded to conservative methods for more than 3 months.

Exclusion criteria

1. Those who refused consent.
2. Pain associated with causes other than plantar fasciitis such as fractures, arthropathies, rheumatoid arthritis or osteomyelitis etc.
3. Any local intervention in last 6 months such as local steroid injection or surgery.
4. Patients having uncorrected congenital anomalies of foot and ankle.
5. Conditions likely to affect perception of pain such as peripheral neuropathy etc.

RESULTS

This study was conducted to assess clinical and functional outcome of patients with plantar fasciitis treated by autologous platelet rich plasma injection. A total of 60 patients were included in this study out of which there were 22 (36.67%) males and 38 (63.33%) females with a M:F ratio of 1:1.72.The mean age of males as well as females were found to be comparable with no statistically significant difference in the age group of males and females (P=0.0633) (Tables 1 and 2).

The analysis of the duration of the pain in patients showed that in majority of the patients it was between 6-12 months (45%) followed by 3-6 months (42%). Only 9 (9%) and 3 (3%) patients belonged to duration of pain more than 9 months and less than 3 months respectively. Patients having symptoms since less than 3 months were excluded from study (Table 3).

Twenty-seven (45%) patients were either overweight or obese. Remaining 33 (45%) patients had a normal BMI. 11 patients were obese (BMI =/> 30) and 16 patients were overweight (BMI=\> 25 but < 30).

At the time of presentation all patients were having severe heal pain. The mean VAS score at the time of presentation was found to be 7.8 ±0.74. After the platelet rich plasma injection the patients were followed up for 4,8 and 12

Table 1: Comparison of gender wise age distribution

Age Groups	Males	Females	Total
	No of cases	No of cases	No of cases
30 years or less	2	6	8
31- 40 years	3	9	12
41-50 years	7	14	21
51-60 years	6	7	13
> 60 years	4	2	6
Total	22	38	60

Table 2: Gender wise distribution of the age groups of the patients

Gender	Mean age	Std deviation	Test of significance
Males	47.72	11.15	P=0.0633
Females	42.42	10.03	Not Significant

Table 3: Duration of pain in studied cases

Duration of pain	No of patients
3-6 months	16
6-12 months	42
Above 1 year	2
Total	60

Table 4: Mean VAS Scores at 0,4,8, and 12 weeks

VAS Scores	Mean	Standard deviation
At Presentation	7.80	0.74
4 weeks	2.80	1.41
8 weeks	2.01	2.09
12 weeks	0.77	1.56

weeks. A statistically significant reduction in pain was documented at the time of follow up of 4 weeks. At the end of 12 weeks 58 (96.67%) patients experienced significant pain relief and only 2 (3.33%) patients had significant pain (Tables 4 and 5).

There was a statistically significant reduction in pain after injection of platelet rich plasma and significantly reduced mean VAS scores were found at the time of 4,8 and 12 weeks follow up visits.

Functional outcome of the patients was assessed by American Orthopedic Foot & Ankle Society (AOFAS) scores. Pre-injection AOFAS scores were determined in all the cases. All the patients (100%) had a poor (< 60) AOFAS score at the time of presentation. Mean AOFAS Scores at the time of presentation was found to be 34.66±8.70. There was statistically significant difference between AOFAS scores at the time of presentation and at 1 week, 4 weeks, 8 weeks and 12 weeks follow up visits (Tables 6 and 7).

Table 5: Test of significance between VAS scores at follow up

Difference in VAS scores	P value	95% CI	Test of significance
At presentation and at 4weeks	P<0.0001	-5.4071 to -4.5929	Highly Significant
4 week and 8 weeks	P=0.0167	0.1455 to 1.4345	Not Significant
8 weeks and 12 weeks	P=0.0003	-1.9067 to 0.5733	Significant
At presentation and at 12 weeks follow up	P<0.0001	-7.4714 to -6.5886	Highly Significant

Table 6: Mean AOFAS Scores at 0,4,8, and 12 weeks

AOFAS Scores	Mean	Std deviation
At Presentation	34.66	8.70
4 weeks	79.32	10.31
8 weeks	91.02	7.68
12 weeks	93.56	6.02

Table 7: Test of significance between AOFAS scores at follow up

Difference in VAS scores	P value	95% CI	Test of significance
At Presentation and at 4 weeks	P<0.0001	41.211 to 48.108	Highly Significant
4 weeks and 8 weeks	P<0.0001	-14.9867 to -8.4133	Highly Significant
8 weeks and 12 weeks	P=0.0460	0.0453 to 5.0347	Significant
Preoperative and at 12 weeks follow up	P<0.0001	56.1953 to -61.6047	Highly Significant

There were no significant complications in any of the studied cases.

DISCUSSION

Our study comprised of 60 patients of plantar fasciitis who had symptoms for more than 3 months. In our study we found that there was a statistically significant difference in the gender distribution of affected cases and females were found to be predominantly affected with a M:F ratio being 1:1.72. Kirmani TT et al conducted a prospective study in which 55 patients were included. In this study also the authors found that females were more commonly affected as compared to male patients (males=25, females=30).[12] Similar female preponderance was reported by the authors such as Palomo-López P et al[13]. Though the exact cause of this female preponderance is not known some authors have pointed towards hormonal influences.[14]

The most common affected age group was between the age of 41-50 years (35%) followed by 51 – 60 years (21.67%) and 31-40 years (20%). The mean age of male as well as female patients was found to be comparable and there was no statistically significant difference in the age groups of males and females. Hansen L et al conducted a prospective study of patients with symptomatic as well as asymptomatic plantar fasciitis.[15] In this study 174 patients (91 women, 83 men) were interviewed, and 137 underwent a US examination. The mean follow-up was 9.7 years from the onset of symptoms and 8.9 years from baseline. The mean age of asymptomatic and symptomatic patients in this study was found to be 48.5 (21.8-79.4) years and 44.5 (20.7-67.8) years respectively. The mean age of affected patients in this study was found to be similar to our study. Similar age distribution was also reported by Samant PD et al.[16]

Being overweight and obese is one of the common risk factors seen in patients with plantar fasciitis. In our study 27 (45%) patients were either overweight or obese. Agirman M et al conducted a study of 50 patients with clinical diagnosed plantar fasciitis. Patients were evaluated using the visual analog scale (VAS) for pain. The analysis of body mass index of patients with plantar fasciitis showed that they had a higher BMI as compared to control group.[17]

In our study the mean VAS score at the time of presentation was found to be 7.8 +/- 0.74. At the end of 12 weeks 58 (96.67%) patients experienced significant pain relief and only 2 (3.33%) patients had significant

pain. Similarly All the patients (100%) had a poor (< 60) AOFAS score at the time of presentation. Mean AOFAS Scores at the time of presentation was found to be 34.43±2.17. At 12 weeks follow up there was a significant improvement in AOFAS score which was 93.56± .02. Kadam R et al[18] conducted a prospective study of 40 patients with plantar fasciitis. The patients were treated by local injection of platelet rich plasma and were followed up for 3 months with regular interval and at each visit VAS score was evaluated and noted. The mean VAS score at time of follow up after 6 weeks was 5.62 (Male – 5.66 Female – 5.70). The mean VAS score at time of follow up after 3 months was 3.20 (Male – 3.13 Female – 3.29). The difference in mean VAS scores at presentation and at 3 months was found to be statistically significant hence signifying the efficacy of platelet rich plasma injection in reducing pain in studied. The mechanism by which platelet rich plasma injection cause tissue repair is thought to be due to presence of growth factors including platelet- derived growth factor (PDGF) and transforming growth factor-beta (TGF-beta).[19]

Similar improvements in VAS and AOFAS scores following local injection of platelet rich plasma was also reported by authors such as Ling Y et al.[20]

CONCLUSION

Autologous Platelets rich plasma is effective for patients with chronic plantar fasciitis who failed to respond to conservative management. There is considerable reduction in pain and improvement in functional capacity in patients treated by platelet rich plasma as seen by reduction in VAS scores and improvement in AOFAS score.

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Author's Contribution:
VP - Concept and design of the study; prepared first draft of manuscript; **VA -** Interpreted the results; reviewed the literature and manuscript preparation; **HS -** Concept, coordination, review of literature and manuscript preparation; **AA -** Statistically analyzed and interpreted, preparation of manuscript and revision of the manuscript.

Work attributed to:
SSPM Medical College and Lifetime hospital, A.P. Padve, Kasal - Malvan Rd, Ranbambuli, Maharashtra, India.

Orcid ID:
Dr Vishwas Sharad Phadke - https://orcid.org/0000-0002-4672-4608
Dr. Vaibhav Vinayak Antrolikar - https://orcid.org/0000-0002-3429-3644
Dr. Ajaykumar Ramlu Allamwar - https://orcid.org/0000-0001-6193-7209

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