Original Article

Outcome of Platelets Rich Plasma (PRP) in Treatment of Plantar Fasciitis

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ABSTRACT

OBJECTIVE: To determine the effectiveness of Platelet-rich plasma (PRP) in the treatment of Plantar fasciitis.

METHODOLOGY: A Quasi-experimental study was conducted at the Department of Orthopedics, Ward-17, JPMC, Karachi, from July 2018 to June 2019. Diagnosed cases of plantar fasciitis, age ranging from 20-60 years, both genders, with failed conservative treatment of 3 months willing to undergo treatment with PRP injection were included. Patients with a previous history of calcaneal fractures, infection, osteoarthritis of currently affected limbs, skin wounds or lesions, diabetes mellitus and other causes of heel pain were excluded. The selection was made from the outdoor department, and intervention was done as a daycare procedure. Two-three ml of centrifuged PRP was injected into the heel. Patients were followed up at 1, 3 and 6-month intervals post-procedure. Findings were recorded on a predesigned proforma VAS, and Roles and Maudsley scoring was done. Data analysis was done using SPSS version 21.

RESULTS: Two hundred and ninety-five patients were enrolled in the study. There were 5 (1.69%) males and 290 (98.3%) females. 100 (33.89%) patients were between 20-40 years. 195 (66.10%) patients were between 41-60 years. By 3rd follow-up visit, i.e., six months post-intervention, excellent results were obtained in 149 (50.5%) patients. 136 (46.1%) showed good (VAS = 1 to 4) results, 07 (2.37%) had acceptable (VAS = 4 to 6) results and 03 (1.01%) had poor (VAS ≥ 7) results.

CONCLUSION: The present study reported that Platelet-rich plasma (PRP) injection successfully improved pain symptoms in most patients, with at least half of the population reporting excellent outcomes.

KEYWORDS: Inflammation, Platelet-rich plasma, Plantar fasciitis.

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INTRODUCTION

Plantar fasciitis is a common cause of heel pain in 11-15 % of adults in the age group between 40-60 years, requiring professional care[1]. It is believed to result primarily from repetitive microtrauma and excessive strain on the plantar fascia[2]. It is a non-inflammatory, degenerative process[3]. Risk factors are tightness of Tendo Achilles or gastrocnemius muscle, obesity, weight-bearing professions, advanced age, poor footwear, overtraining and reduced subtalar joint mobility[4]. It is a problematic condition treat. Non-surgical management includes rest, structured physical therapy, home stretching exercises, heel cushions, orthoses, ice, NSAIDs, weight loss, night splinting and periods of immobilization[5,6]. Invasive techniques include corticosteroid injection, PRP injection, botulinum toxin injection and Extracorporeal Shock Wave Therapy (ESWT). Surgical procedures include plantar fasciotomy and gastrocnemius recession[6-8].

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Platelet-rich plasma (PRP) is an autologous concentration of human platelets in a small plasma volume[9]. It can be seen as a small fluffy or cloudy layer between the top clear plasma and bottom red cell layers. Concentrating seven fundamental protein growth factors enhances tendon and ligament healing by initiating the body's natural healing response[10]. PRP use in treating plantar fasciitis is a relatively recent and evolving concept. There are inconsistencies in the current literature. Furthermore, there is not enough literature available from local regions. Demographics and ethnic components can significantly impact patients' responses to specific treatments and alter disease course.

Therefore, the current study was conducted to evaluate the efficacy of Platelet-rich plasma (PRP) in improving the pain in patients with plantar fasciitis presenting to a tertiary care centre in Sindh, Pakistan.

METHODOLOGY

A prospective observational study was conducted in the Department of Orthopedics, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from July 2018 to June 2019. A non-probability convenience sampling

technique was used to enroll the participants in the study.

Patients included were aged between 20-60 years, of both genders, with a symptomatic Plantar Fasciitis of at least three months duration, willing to undergo intervention, failed conservative treatment, and never had PRP injection. Those with previous calcaneum fracture, inflammatory arthritis, osteoarthritis around the ankle, wound or skin in the ankle, nerve-related symptoms, and patients with diabetes mellitus, and hypertension, were excluded.

Approval from the JPMC ethics committee was taken for the study, and the proforma was prepared. Patients were selected from the outdoor patient department for the procedure. The procedure was performed at a daycare. Patients were explained the study's purpose, and the procedure's pros and cons were discussed. Informed consent was taken.

A consultant and senior resident performed the entire procedure using the standard technique of 20 ml of venous blood drawn from each patient. Drawn blood was put in a centrifuge container with citrate dextrose anticoagulant. Blood was centrifuged in a centrifuge machine at 3200 revolutions per minute. 2-3 ml PRP layer was obtained from 20 ml blood and separated in a 10-cc Syringe, and PRP was prepared as per the latest guidelines and instructions[11]. PRP was obtained after taking the informed consent of the participant. 3 to 5 ml of blood was procured after checking for baseline platelet counts of the patient. Citrate dextrose was added to the blood drawn to prevent platelet activation. We used a tabletop cold centrifuge device to perform differential centrifugation.

All patients taking NSAIDs were requested to cease the treatment at least one week before. Using all aseptic measures, PRP was injected from the medial side into the point of maximum tenderness at the base of the plantar fascia origin from the calcaneus tubercle. Every patient received a single injection of PRP.

Patients were sent home with the necessary instructions and medications. They were advised to avoid strenuous activity for at least four weeks and followed up at one-month, three-month and six-month intervals. Per visit, the pain was recorded using the Visual Analogue Scale (VAS).

The final outcome was obtained by using Roles and Maudsley scores. Modified criteria of the Roles and Maudsley scoring is, Excellent: No pain (VAS = 0, patient satisfied with the treatment outcome and unlimited walking without pain), Good: Symptoms substantially decreased (VAS = 1-4, patient satisfied with the treatment outcome and ability to walk without pain for greater than one hour), Acceptable: Symptoms somewhat decreased (VAS = 5-6, patient slightly satisfied with the treatment outcome), Poor: Symptoms identical (VAS > 7, patient not satisfied with treatment outcome). Findings and data were recorded on a predesigned proforma. Bias and confounders (e.g., comorbidities such as hypertension, diabetes, etc.) were controlled by strictly following the inclusion and exclusion criteria as these may impact the patient outcome.

Statistical package of social sciences version 21 was used for data compilation and analysis. Frequency and percentage were computed for qualitative variables like gender, obesity, socioeconomic status, education, side involved and outcome. Quantitative variables were presented as mean ± SD like age, disease duration, height, weight, BMI, and pre and post-treatment pain scores. Effect modifiers like gender, age, BMI, obesity, disease duration, socioeconomic status, education, and side involved were controlled through stratification. Post-stratification Chi-square test was applied, and P-value $\leq$ 0.05 was considered significant.

RESULTS

Two hundred ninety-five patients were included in the study, 05 (1.7%) were males, and 290 (98.3%) were females with a mean age of 45.39±12.49 years. 171 (57.96%) patients had bilateral plantar fasciitis. In 70 (23.72%) patients' the right heel was involved and in 54 (18.3%) patients, left heel plantar fasciitis was involved (**Table I**).

TABLE I: BASELINE DEMOGRAPHICS

Parameters		n=295
Age (Years)		45.39±12.49
Height (cm)		153.00±9.16
Weight (Kg)		73.16±12.21
BMI (kg/m2)		31.46±5.55
Duration of Procedure (minutes)		37.68±10.16
Gender	Male	5 (1.7)
	Female	290 (98.3)
Obesity	Yes	250 (84.7)
	No	45 (15.3)
Socioeconomic status (PKR)	10,000-24,000	95 (32.2)
	25,000-50,000	150 (50.8)
	> 50,000	50 (16.9)
Education status	Not Educated	98 (33.2)
	Primary to Secondary	143 (48.5)
	Intermediate to Graduate	44 (14.9)
	More than graduate	10 (3.4)
Site involved	Right	70 (23.7)
	Left	54 (18.3)
	Bilateral	171 (58.0)

Visual analogue score	**Baseline**	Mild (1-3)	67 (22.7)
		Moderate (4-6)	106 (35.9)
		Severe(>=7)	122 (41.4)
	1st follow up	No Pain (VAS=0)	45 (15.3)
		Mild (1-3)	63 (21.4)
		Moderate (4-6)	107 (36.3)
		Severe(>=7)	80 (27.1)
	2nd follow up	No Pain (VAS=0)	75 (25.4)
		Mild (1-3)	83 (28.1)
		Moderate (4-6)	95 (32.2)
		Severe(>=7)	42 (14.2)
	3rd follow up	No Pain (VAS=0)	149 (50.5)
		Mild (1-3)	136 (46.1)
		Moderate (4-6)	7 (2.4)
		Severe(>=7)	3 (1.0)
Outcome score		Acceptable	7 (2.4)
		Excellent	149 (50.5)
		Good	136 (46.1)
		Poor	3 (1.0)

According to the Visual analogue score, at 1 month follow-up 45 (15.3 %) patients showed excellent (VAS = 0) results to platelet rich plasma therapy. 63 (21.4%) patients showed good (VAS = 1 to 4) results, 107 (36.3%) patients showed acceptable (VAS = 4 to 6) results and 80 (27.1%) patients showed poor (VAS ≥ 7) results. At 6 months follow up, 149 (50.5%) patients showed excellent (VAS = 0) results to platelet rich plasma therapy. 136 (46.1%) patients showed good (VAS = 1 to 4) results, 07 (2.37%) patients showed acceptable (VAS = 4 to 6) results and 03 (1.01%) patients showed poor (VAS ≥ 7) results (**Table I**).

FIGURE I: CHANGE IN VAS SCORE FROM BASELINE AND UP TO 6 MONTHS (3RD FOLLOW-UP VISIT)

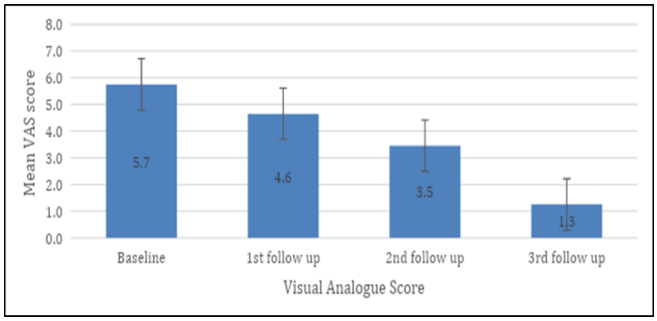

TABLE II: ASSOCIATION OF DEMOGRAPHICS AND PATIENT OUTCOME

		Outcome score				P-value
		Acceptable	**Excellent**	**Good**	**Poor**	
Age years	<= 30	0 (0.0%)	28 (57.1%)	19 (38.8%)	2 (4.1%)	0.172
	31 - 40	2 (3.9%)	29 (56.9%)	20 (39.2%)	0 (0.0%)	
	41 years - 50	3 (4.4%)	30 (44.1%)	34 (50.0%)	1 (1.5%)	
	51 years & above	2 (1.6%)	62 (48.8%)	63 (49.6%)	0 (0.0%)	
Gender	Female	7 (2.4%)	146 (50.3%)	134 (46.2%)	3 (1.0%)	0.959
	Male	0 (0.0%)	3 (60.0%)	2 (40.0%)	0 (0.0%)	
BMI categories	< 18.5	0 (0.0%)	8 (53.3%)	7 (46.7%)	0 (0.0%)	0.009*
	18.5 to < 25	3 (13.6%)	9 (40.9%)	10 (45.5%)	0 (0.0%)	
	25 to < 30	0 (0.0%)	5 (50.0%)	4 (40.0%)	1 (10.0%)	
	30 & above	4 (1.6%)	127 (51.2%)	115 (46.4%)	2 (0.8%)	
Obesity	Yes	4 (1.6%)	128 (51.2%)	116 (46.4%)	2 (0.8%)	0.167
	No	3 (6.7%)	21 (46.7%)	20 (44.4%)	1 (2.2%)	
Educational status	Intermediate to Graduate	0 (0.0%)	9 (20.5%)	35 (79.5%)	0 (0.0%)	0.001*
	More than graduate	0 (0.0%)	9 (90.0%)	1 (10.0%)	0 (0.0%)	
	Not Educated	2 (2.0%)	55 (56.1%)	40 (40.8%)	1 (1.0%)	
	Primary to Secondary	5 (3.5%)	76 (53.1%)	60 (42.0%)	2 (1.4%)	
Socioeconomic status	10,000- 24,000	1 (1.1%)	52 (54.7%)	40 (42.1%)	2 (2.1%)	0.451
	25,000-50,000	4 (2.7%)	69 (46.0%)	76 (50.7%)	1 (0.7%)	
	> 50,000	2 (4.0%)	28 (56.0%)	20 (40.0%)	0 (0.0%)	
Site involve	Bilateral	4 (2.3%)	77 (45.0%)	88 (51.5%)	2 (1.2%)	0.254
	Left	2 (3.7%)	28 (51.9%)	23 (42.6%)	1 (1.9%)	
	Right	1 (1.4%)	44 (62.9%)	25 (35.7%)	0 (0.0%)	

TABLE III: COMPARISON BETWEEN BASELINE, 1ST, 2ND AND 3RD FOLLOW-UP REGARDING VISUAL ANALOGUE SCORE (VAS) SCORE

		Mean	Std. Deviation	Minimum	Maximum	P-value
Visual analogue score (VAS)	Baseline	5.75	2.54	1	10	0.001*
	1st follow up	4.65	3.03	.0	10.0	
	2nd follow up	3.45	2.86	.0	10.0	
	3rd follow up	1.25	1.51	.0	8.0	

Results were more satisfactory in educated patients than non-educated ones, as shown by their compliance with the therapy. Similarly, body mass index also affected the efficacy of PRP. Patients' outcomes did not differ significantly (p=0.172) in different age groups, thus indicating that age did not impact the patient outcome. (**Table II**).

Figure I illustrate the change in VAS from baseline to the last follow-up. The difference was most significant at first follow-up, and gradually the change decreased because the baseline pain subsided with time. Pain score when compared from baseline to last follow-up, there was a statistically significant difference P-Value < 0.05. **Table III**.

DISCUSSION

After trying different treatment options for plantar fasciitis, researchers attempted to explore treatments which could be safe, cost-effective, noninvasive and give satisfactory early and long-term results. Their attention was drawn towards Platelet-rich plasma (PRP) when its role in the healing of various problems of tendons and fasciae gradually started getting proven [6]. PRP use in plantar fasciitis has satisfactory results without any severe side effects, as it is autologous[6,8]. The present study indicated that PRP injection resulted in reduced pain among patients with plantar fasciitis. The study observed no side effects, including vomiting, infection, skin discoloration, allergic reaction, etc., were observed in the study. Furthermore, we also observed decreasing VAS on subsequent follow-ups (**Table III**). In line with the current study, a study by Acosta-Olivoet et al.[12] revealed the change in mean VAS at three months of PRP treatment from 2.42 ±1.45 to 0.62 ±0.73.

A study by Gonnade N et al[13] had similar findings as our study that PRP injection in plantar fasciitis has better long-term efficacy. Chiew SK 2016[7] showed that PRP injection had a better outcome than conservative treatment. Jain K 2015[14] had better long-term effects of PRP injection than other treatments. Shetty SH 2019[15] in their research, showed better long-term results and lesser reinjections of PRP in plantar fasciitis than conservative and other forms of invasive treatment. Jimenez-Perez AE 2019[16] revealed that PRP is efficient, safe and has a long-standing effect on plantar fasciitis when injected compared to other injections.

Ling Y 2018[17] in their study showed that PRP injection has a better effect and is more durable in the long term than other invasive methods. Singh P 2017[18] revealed that PRP injection has better improvement in pain and function than other modalities used for plantar fasciitis treatment. Vahdatpour B 2016[19] showed that PRP injection in the heel improved pain and functional limitation due to plantar fasciitis. Acosto -Olivo C et al[12] showed that PRP injection was very effective and produced results comparable to corticosteroid injection. Monto RR 2014[20] showed better results with PRP injection compared to other forms of invasive procedures. Wilson JJ 2014[21] & Shetty VD 2014[22] in their studies showed promising results of PRP injection in plantar fasciitis. A recent meta-analysis found that even though PRP revealed more substantial improvement in VAS than other treatments, it did not affect the Roles–Maudsley score (RMS)[17]. Therefore, we remain unclear on whether PRP treatment is durable for long-term or not and large-scale, multicenter studies are needed to confirm the current claims. The outcome of PRP can also alter the quality and purity of PRP depending upon the technique used for preparing PRP[11].

One limitation of our study is that it did not have a comparative group to assess the PRP modality with other treatment regimes. Therefore, we cannot judge whether PRP treatment is better than corticosteroids or not. Further research is indeed warranted. However, our research showed similar findings to all the above studies that PRP injection in plantar fasciitis shows good results, improving pain and functions.

CONCLUSION

Platelet-rich plasma (PRP) injection in treating plantar fasciitis is very effective in the short-term and long-term modalities for relieving symptoms. The present study reported that Platelet-rich plasma (PRP) injection successfully improved pain symptoms in most patients, with at least half of the population reporting excellent outcomes. Further research is indeed warranted to explore the subject in depth.

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AUTHOR CONTRIBUTIONS

Saleem F: Data collection
Khan KM: Data interpretation
Memon IA: Manuscript drafting and writing
Ali P: Data interpretation
Ali Z: Critical review of manuscript
Junejo S: Data collection

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