



COMPARISON BETWEEN PLATELET RICH PLASMA INJECTION VERSUS CORTICOSTEROID INJECTION IN THE MANAGEMENT OF PAIN AND IMPROVING FUNCTIONAL OUTCOME IN PATIENTS SUFFERING FROM PLANTAR FASCIITIS AND NOT RESPONDING TO 6 WEEKS OF CONSERVATIVE TREATMENT : COMPARATIVE PROSPECTIVE STUDY

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ABSTRACT

Introduction: One of the most common cause of heel pain is plantar fasciitis and is a challenging clinical condition to treat¹. The conservative treatment modalities available includes- orthotics, night splints, ultrasound therapy, eswt, casting etc². In case of failure of conservative treatment one of the effective treatment modality is corticosteroid injection over the medial tuberosity. In recent times use of PRP(platelet rich plasma) a component of blood containing platelet in concentration 2-5 times the baseline count of the patient has been effective in treatment of plantar fasciitis³. PRP acts by attracting inflammatory and cytokines which helps in deposition of collagen, collagen maturation and remodelling⁴.

In our study we have compared two treatment modalities-PRP injections and corticosteroid injections in patients suffering from plantar fasciitis and not responding to conservative treatment for 6 weeks.

Aims And Objects: To study and compare the results of PRP injection versus corticosteroid injection in the management of pain and improving functional outcome in patients suffering from plantar fasciitis and not responding to 6 weeks conservative treatment.

Materials And Methods:

Study Type: Comparative prospective study

Source: All patients attending PMR OPD RIMS imphal suffering from plantar fasciitis not responding to 6 weeks conservative treatment from August 2018 to October 2019 were included in the study after explaining the procedure and informed consent was taken.

Outcome measures: All the patients were assessed according to the VAS and the AOFAS score. The scores were taken before injection and during follow up at 3 weeks, 6 weeks, 6 months.

Sample size: With 25 patients in each group a total of 50 patients were selected

Sample selection: Method of treatment is decided by the patient after they were explained both the procedures.

Statistical analysis: Intragroup comparison by Paired T test and student T test for Inter-group comparison.

Results: Both PRP and corticosteroid injections provided symptomatic relief both functionally and subjectively, but results at 6 months showed that PRP yielded better functional results.

KEYWORDS :**INTRODUCTION**

One of the most common causes of heel pain that a doctor faces in the outpatient department is plantar fasciitis¹. Plantar fasciitis is a degenerative pathology rather than an inflammatory process and can be quite difficult to treat⁵. Tears which are microscopic in nature occur in plantar fascia due to the windlass mechanism. There is a combination of repeated opposing force that act on plantar fascia due to the action of tendoachilles and forefoot resulting in a cellular damage which is exaggerated by chaotic vascularity due to which there is development of zones of hypoplasia and hyperplasia in the plantar fascia⁶. There are various modalities used for treating plantar fasciitis conservatively like night splinting, orthotics, stretching exercise and extracorporeal shockwave therapy². Corticosteroid injection is an effective treatment modality in relieving plantar fasciitis pain but literature has shown complications associated with corticosteroid injections such as fascial rupture^{7,8}. Owing to autologous nature PRP is considered to be a safer alternative and has less effect on biological functions of foot⁹.

This study will tell us which among the two treatment modalities is more effective both functionally and subjectively.

AIMS AND OBJECTS

To study and compare the results of PRP injection versus corticosteroid injection in the management of pain and improving functional outcome in patients suffering from plantar fasciitis and not responding to 6 weeks conservative treatment.

REVIEW OF LITERATURE

Plantar fasciitis presents as severe pain in the heel after a period of rest or with first few steps of the day which alleviates with movement of the foot¹⁰.

The exact etiology of the condition is not known but it is postulated that it is mainly caused due to overload on plantar foot muscles which include the adductor hallucis, flexor digitorum brevis, abductor digiti minimi originating from medial calcaneal tuberosity¹¹.

Obesity, limb length discrepancy, overuse, tightness of tendoachilles, improper footwear all are proven risk factors for development of plantar fasciitis¹².

In contact phase of gait cycle plantar fascia becomes tense due to shortening of foot and elevation of longitudinal arch.

This is similar to windlass mechanism where plantar fascia is the cable ,metatarsal head is the drum and proximal phalanx is the handle^{12,13}. High calcaneal pressure, repeated opposing traction force of tendoachilles along with the windlass effect produce micro-tears in plantar fascia¹⁴. This micro-tears in the fascia causes breakdown of collagen and scarring in plantar fascia¹⁵.

X-ray helps in the diagnosis of plantar fasciitis as lateral radiograph of ankle helps us to know the thickness of plantar fascia, rule out stress fracture, bone cysts and giant cell tumors.

Ultrasonography(USG) is a non-invasive and cheaper investigation which helps in diagnosis of chronic tendinopathy. Though it depends on sonologist's experience and ability¹⁶. USG will show thickened plantar fascia ,however, normal thickness of plantar fascia as 2-4mm.

Initial treatment consists of rest and non-steroidal anti-inflammatory drugs and is effective in majority of the case of plantar fascia, in case of conservative treatment failure other treatment modalities may be employed².

Ball, et al. described a study of 65 patients treated with corticosteroids versus a placebo. They concluded that subjective score in corticosteroid group showed a clear benefit as compared to the placebo group at 6 weeks and proved to be effective till 12 weeks¹⁷.

Genc, et al. used USG in the follow up of 60 patients with similar age , sex , BMI with plantar fasciitis versus a control group without plantar fasciitis. They were assessed with subjective VAS scores and their results showed that steroid injection could be used in the long term treatment of plantar fasciitis and the study also showed reduction in the thickness of plantar fascia¹⁸.

Plantar fascia rupture has been reported in the literature. Acevedo JI, et al. concluded that among 768 patients 44 had plantar fascia rupture¹⁹.

John Selman conducted a study on 37 patients with heel pain and observed that one third of the patients had a sudden tearing episode and changes in symptoms of the patients. This was confirmed by MRI showing attenuation of plantar fascial fibers⁸.

PRP has a role in inflammatory, coagulation process and in immunity modulation. Platelet degranulation leads to release of cytokines and growth factors like insulin like growth factor, vascular endothelial derived growth factor-1, platelet derived growth factor which leads to angiogenesis, tissue remodeling and wound healing. Depending on the amount of proteases release there can be pain relieving analgesic effect.²⁰

Ragab EM, et al. conducted a study on 25 patients with plantar fasciitis out of which 22 patients had subjective improvement and 15 patients had improvement in functional outcome on receiving PRP injections. USG showed significant changes in plantar fascia thickness and also changes in signal intensity in the region of PRP injection⁹.

Martinelli N, et al. conducted a study to see the effectiveness of PRP in 14 patients with chronic plantar fasciitis. The patients received PRP injections and were followed up at 12 months and 11 patients showed decrease in VAS score which substantiates the fact that PRP was a safe alternative and effective in reducing pain in plantar fasciitis²¹.

Shetty VD, et al. conducted a subjective and objective study to compare the efficacy of corticosteroid injection and PRP

injection in recalcitrant plantar fasciitis and concluded that PRP can be a safe alternative in the management of disabling and recalcitrant plantar fasciitis²².

Aksahin Ertugrul, et al compared VAS and modified Roles and Maudsley score and noted a decrease in scores in both the groups. At 3 weeks and 6 months the two treatments showed no difference in VAS and Maudsley scores ($p > 0.05$)²³.

Raymond Rocco Monto performed a study on PRP versus corticosteroid injections in the treatment of plantar fasciitis. AOFAS score initially showed a initial improvement in pain scores in steroid group but after 6 months relapse occurred. In PRP group AOFAS scores were persistently high on follow ups concluding that PRP was better than steroids in the treatment of plantar fasciitis²⁴.

Materials and Methods

Study type: Comparative prospective study

Source: All patients attending PMR OPD RIMS Imphal suffering from plantar fasciitis not responding to 6 weeks conservative treatment from August 2018 to October 2019 were included in the study after explaining the procedure and informed consent was taken.

Inclusion criteria

- 1) Patients suffering from plantar fasciitis for 6 months and not responding to 6 weeks of conservative treatment
- 2) Patients aged 18+
- 3) Patients willing to undergo follow up

Exclusion criteria

- 1) Patients who had received repeated corticosteroid injections in last 3 months
- 2) Patients who had foot deformity
- 3) Patients who had undergone previous foot surgery
- 4) BMI > 40
- 5) Confirmed diagnosis of neuropathy
- 6) Anemia (Hb < 7)
- 7) Significant cardiovascular, hepatic or renal impairment

Procedure

Corticosteroid injection procedure

With a 5cc syringe 2ml of inj. Depo-Medrol 80mg (methylprednisolone) mixed with 1ml of lignocaine (0.25%) was injected into medial calcaneal tubercle at the point of maximum tenderness under aseptic technique.

PRP injection technique

20 ml of venous blood was drawn from patient's cubital vein under aseptic condition and was mixed with 3ml of citrate phosphate dextrose acetate solution (CPDA), then the mixture was divided into 4 vacutainers equally. The mixture was then placed in a centrifuge and spun at 3500rpm for 7 minutes. After that the supernatant layer was removed leaving behind the red and white cell components of the blood.

The collected sample was then equally divided in two more vacutainers and spun at 3000rpm for 5 minutes and the buffy coat was injected into medial calcaneal tubercle at the point of maximum tenderness.

ASSESSMENT OF OUTCOME

Functional outcome for pain, muscle power, motion and function were assessed using AOFAS and VAS scoring system.

Patients were evaluated at discharge , 6 weeks, 3 months and 6 months.

RESULTS

Table 1- Intragroup comparison paired T test with corticosteroid injection

		Mean	N	Std.Deviation	Paired		T	df	P value
					Differences				
					Mean difference	Std deviation			
Pair 1	1st visit VAS score	7.16	25	.374	2.56	0.87	14.715	24	<0.001
	3 weeks VAS score	4.6	25	.957					
Pair 2	1st week visit VAS score	7.16	25	0.374	3.24	1.165	13.908	24	<0.001
	6 weeks VAS score	3.92	25	1.187					
Pair 3	1st week VAS score	7.16	25	0.374	4.24	1.091	19.434	24	<0.001
	6 months VAS score	2.92	25	1.115					
Pair 4	3 weeks VAS score	4.6	25	0.957	0.68	1.03	3.302	24	<0.003
	6 weeks VAS score	3.92	25	1.187					
Pair 5	3 weeks VAS score	4.6	25	0.957	1.68	1.108	7.584	24	<0.001
	6 months VAS score	2.92	25	1.115					
Pair 6	6 weeks VAS score	3.92	25	1.187	1	1.118	4.472	24	<0.001
	6 months VAS score	2.92	25	1.115					
Pair 7	1st visit AOFAS score	67.08	25	0.4	19.12	4.746	20.14	24	<0.001
	3 weeks AOFAS score	86.2	25	4.743					
Pair 8	1st visit AOFAS score	67.08	25	0.4	19.8	4.664	21.23	24	<0.001
	6 weeks AOFAS score	86.88	25	4.649					
Pair 9	1st visit AOFAS score	67.08	25	0.4	21.24	3.7	28.7	24	<0.001
	6 months AOFAS score	88.32	25	3.648					
Pair 10	3 weeks AOFAS score	86.2	25	4.743	0.68	5.367	0.633	24	0.532
	6 weeks AOFAS score	86.88	25	4.649					
Pair 11	3 weeks AOFAS score	86.2	25	4.743	2.12	4.969	2.133	24	<0.043
	6 months AOFAS score	88.32	25	3.648					
Pair 12	6 weeks AOFAS score	86.88	25	4.649	1.44	4.629	1.556	24	0.133
	6 months AOFAS score	88.32	25	3.648					

Table 2: Intragroup comparison paired t test with PRP injection

		Mean	N	Std deviation	Paired differences		t	df	P value
					Mean	Std deviation			
Pair 1	1 st visit VAS score	7.24	25	0.436	1.48	0.82	8.996	24	<0.001
	3 weeks VAS score	5.76	25	0.723					
Pair 2	1 st week visit VAS score	7.24	25	0.436	2.76	1.27	10.887	24	<0.001
	6 weeks VAS score	4.48	25	1.194					
Pair 3	1 st visit VAS score	7.24	25	0.436	5.64	1.32	21.378	24	<0.001
	6 months VAS score	1.6	25	1.119					
Pair 4	3 weeks VAS score	5.76	25	0.723	1.28	0.98	6.532	24	<0.001
	6 weeks VAS score	4.48	25	1.194					
Pair 5	3 weeks VAS score	5.76	25	0.723	4.16	1.14	18.196	24	<0.001
	6 months VAS score	1.6	25	1.19					
Pair 6	6 weeks VAS score	4.48	25	1.194	2.88	1.39	10.33	24	<0.001
	6 months VAS score	1.6	25	1.19					
Pair 7	1 st visit AOFAS score	67.48	25	0.872	15.52	6.18	12.559	24	<0.001
	3 weeks AOFAS score	83	25	6.344					
Pair 8	1 st visit AOFAS score	67.48	25	0.872	-21.84	1.46	-74.648	24	<0.001
	6 weeks AOFAS score	89.32	25	1.435					
Pair 9	1 st visit AOFAS score	67.48	25	0.872	-25.56	5.67	-22.56	24	<0.001
	6 months AOFAS score	93.04	25	5.77					
Pair 10	3 weeks AOFAS score	83	25	6.344	-6.32	6.3	-5.019	24	<0.001
	6 weeks AOFAS score	89.32	25	1.435					
Pair 11	3 weeks AOFAS score	83	25	6.344	-10.04	7.06	-7.108	24	<0.001
	6 months AOFAS score	93.04	25	5.77					
Pair 12	6 weeks AOFAS score	89.32	25	1.435	-3.72	6.08	-3.059	24	<0.005
	6 months AOFAS score	93.04	25	5.77					

Table 3- Intergroup comparison: Independent student t test for VAS score

Group		N	Mean	Std deviation	t	df	P Value
Difference in VAS 3 weeks to 1 st visit	Corticosteroids	25	2.56	0.87	4.51	48	<0.001
	PRP	25	1.48	0.823			
Difference in VAS 6 weeks to 1 st visit	Corticosteroids	25	3.24	1.165	1.394	48	0.17
	PRP	25	2.76	1.268			
Difference in VAS 6 months to 1 st visit	Corticosteroids	25	4.24	1.091	-4.089	48	<0.001
	PRP	25	5.64	1.319			

Table 4- Intergroup comparison- Independent student t test for AOFAS score

	GROUP	N	MEAN	Std deviation	t	df	P VALUE
Difference in AOFAS 3 weeks to 1 st visit	Corticosteroids	25	19.12	4.746	2.31	48	0.025
	PRP	25	15.52	6.179			
Difference in AOFAS 6 weeks to 1 st visit	Corticosteroids	25	19.8	4.664	-2.087	28.677	0.046
	PRP	25	21.84	1.463			
Difference in AOFAS 6 months to 1 st visit	Corticosteroids	25	21.24	3.7	-3.192	41.324	0.003
	PRP	25	25.56	5.665			

RESULTS

VAS score differences between pre-injection scores and scores at 3 weeks, 6 weeks and 6 months showed a decrease with mean difference of 2.56, 3.24, 4.24 which are statistically significant respectively where p value < 0.001. (Table-1)

AOFAS scores between pre-injection group and scores at 3 weeks, 6 weeks and 6 months showed a mean differences of 19.12, 19.4, 21.42 respectively which are statistically significant increase where p value < 0.001.

AOFAS score between 3 weeks and at 6 weeks showed an increase with mean difference of 0.68 which is statistically not significant where p value = 0.532.

AOFAS score between 3 weeks and 6 months showed an increase with mean difference of 2.12 which is a statistically significant increase where p value = 0.043

AOFAS score between 6 weeks and at 6 months AOFAS showed an increase with a mean difference of 1.44 and was not statistically significant where p value = 0.133

VAS scores at pre-injection and at 3 weeks showed a decrease at 3 weeks with a mean difference of 1.48 which was statistically significant where p value < 0.001 (Table 2)

VAS scores at pre-injection and at 6 weeks showed a decrease at 6 weeks with a mean difference of 2.76 which was statistically significant where p value < 0.001

VAS scores at pre-injection and at 6 months showed a decrease at 6 months with a mean difference of 5.64 which was statistically significant where p value < 0.001

VAS at 3 weeks and 6 weeks showed that values at 3 weeks was higher with a mean difference of 1.28 which was statistically significant where p value < 0.001

VAS at 6 weeks and 6 months showed that values at 6 weeks was higher with a mean difference of 2.88 which was statistically significant with a p value < 0.001

AOFAS score between pre-injection and 3 weeks, 6 weeks and 6 months showed increase at 3 weeks, 6 weeks and 6 months with a mean difference of 15.52, 21.84 and 25.56 respectively which were statistically significant with a p value < 0.001

AOFAS score between 3 weeks and 6 weeks and 6 months showed increase at 6 weeks and 6 months with a mean difference of 6.32 and 10.04 respectively which were statistically significant with a p value < 0.001

AOFAS score between 6 weeks and 6 months showed increase at 6 months with a mean difference of 3.72 which is statistically significant with a p value = 0.005

VAS score compared between pre-injection and at 3 weeks which was higher in corticosteroids with a t value of 4.51 and was statistically significant with a p value of < 0.001

VAS was compared between pre-injection and at 6 weeks which was higher in corticosteroids group with a t value of

1.394 and was statistically not significant with a p value = 0.17 VAS score was compared between pre-injection and at 6 months which was higher in PRP group with a t value of -4.089 which was statistically significant with a p value < 0.001

AOFAS score was compared between pre-injection and 3 weeks, 6 weeks and 6 months. Score at 3 weeks was higher in corticosteroid with a t value of 2.31 and is statistically significant with a p value = 0.025. Score at 6 weeks and 6 months were higher in PRP group with a t value of -2.087 and -3.192 respectively and these values are statistically significant with p values 0.046 and 0.003 respectively (Table-4)

DISCUSSION

In this study 50 patients were selected 25 patients in each group, VAS and AOFAS scores were compared in each group and was found that both in corticosteroid and PRP group there was significant decrease in pain and increase in function from their first visit and their consecutive visits at 3 weeks, 6 weeks and 6 months. This was observed by decreasing VAS and increasing AOFAS score in both groups which was statistically significant p < 0.001.

In corticosteroid group VAS and AOFAS scores compared between 3 weeks and 6 weeks, 3 weeks and 6 months and 6 weeks and 6 months we observed that there was a decrease in pain but AOFAS score between 3 weeks and 6 weeks ; 6 weeks and 6 months showed an increase in functionality but was not of any statistical significance with p = 0.53 and p = 0.13 respectively.

When both groups were compared there was a higher VAS in corticosteroid group at 3 weeks (p < 0.001) and at 6 weeks VAS was better in corticosteroid group but with no statistical significance (p = 0.17) and VAS was lower in the PRP group (p < 0.001)

The AOFAS score showed that there was an increase in function in the corticosteroid group at 3 weeks but at 6 weeks and 6 months there was increase in function seen in PRP group.

CONCLUSION

PRP proved to be safe and effective modality in the treatment of plantar fasciitis with a better functional outcome at the end of follow-up when compared to patients who received corticosteroids

SUMMARY

PRP and Corticosteroid injections are common treatment modalities in the treatment of plantar fasciitis. This study was conducted on 50 patients with 25 patients in each group. The patients who were given PRP had a longer duration of pain compared to corticosteroid group patients who had early respite from pain. Functionality improved in both groups but patients with PRP showed better improvement in functionality as compared to steroids.

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