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Randomised Control Study to Assess the Efficacy of Platelet Rich Plasma and Local Corticosteroids Injection in Treatment of Chronic Plantar Fasciitis

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Abstract: ***Introduction: Plantar fasciitis is the most common cause of heel pain and can prove difficult to treat in its most chronic and severe forms. It is more of a degenerative pathology rather than inflammatory process. Traditionally if all conservative methods fail, corticosteroid injections are used but seem useful in the short term and only to a small degree. However, such injections have been associated with serious side effects which include ruptures in the plantar fascia and sudden tearing episodes Platelet - rich plasma (PRP) is a bioactive component of whole blood with platelet concentrations elevated above baseline and containing high levels of various growth factors. Materials and method: In the period from June 2022 to May 2023, 50 adults who were admitted to the Department of Orthopaedics at Al - Ameen Medical College and Hospital Vijayapura, with plantar fasciitis. The patients underwent clinical and radiological evaluations. An average of 6 months was spent following up with every patient. Observation: 50 patients included in the present study were divided into two groups. Group A corticosteroids and group B PRP. Both groups had 25 patients. With corticosteroids immediate pain relief was achieved whereas 8 patients developed recurrence of pain. With PRP initial 7 days pain and swelling was there later pain was reduced whereas 2 patients presented with recurrence of pain. Conclusion: In this study we concluded that both PRP and Corticosteroids both provides symptomatic relief in the treatment of plantar fasciitis proved to be a safe and effective modality in the treatment of this condition with a better functional outcome at the end of the follow up when compared to the patients who had received corticosteroids.***

Keywords: Fasciitis, Plantar, Heel, Platelet - Rich Plasma

1. Introduction

Plantar fasciitis is the most common cause of heel pain and can prove difficult to treat in its most chronic and severe forms it is more of a degenerative pathology rather than inflammatory process. Microscopic tears occur in the plantar fascia due to repeated opposing traction by the Achilles tendon and the forefoot windlass mechanism leading to development of areas of hyperplasia and hypoplasia leading to the collapse of the collagen matrix production. This results in a disruption of the normal collagen repair cycle and a continuum of cellular damage similar to that seen in Achilles tendinitis and lateral epicondylitis[2]

There are various modalities for the treatment of plantar fasciitis which include rest, orthotics, night splints, extracorporeal shockwave therapy, and casting.

Traditionally if all conservative methods fail, corticosteroid injections are used but seem useful in the short term and only to a small degree[4]. However, such injections have been associated with serious side effects which include ruptures in the plantar fascia and sudden tearing episodes[5, 10]

Platelet - rich plasma (PRP) is a bioactive component of whole blood with platelet concentrations elevated above baseline and containing high levels of various growth factors. It is postulated that when injected into injured tissue, the platelets act as rally points for the modulation of collagen synthesis and tissue healing by the release of cytokines and chemo - attractants. Early pain relief is due to an anti - inflammatory effect resulting from the inhibition of cyclooxygenase - 2 enzymes by the cytokines provided by the platelets.

2. Materials and Methods

Collection of data of patients presenting with Plantar fasciitis are as follows.

1) History.
2) Clinical examination (local and systemic)
3) Blood Investigations (RBS, HbA1C, ESR)
4) Study Period: May 2022 - September 2023
5) Study Design: It is a Prospective study
6) Study Size: 50
7) Follow Period: 6 weeks, 3 months, 6 months.
8) Clinical follow - up at 2 weeks, 6 weeks, 3months, 6months intervals regarding pain, swelling and other symptoms and sign
   a) Corticosteroid injection and follow - up
   b) PRP injection and follow - up
   c) ASSESSMENT OF OUTCOME

The study follow up requires evaluation at discharge, 6 weeks, 3 months and 6 months. Patient information, including age and sex is noted.

Functional outcomes for pain, motion and muscle power, and function are assessed using the AOFAS Scoring System and VAS Scoring System

Inclusion Criteria:

- Patients must be at least eighteen years old;
- Patients must have had plantar fasciitis for at least six months and not improved after six weeks of conservative therapy;
- Patients must be able to follow up and accept the informed consent.

Exclusion Criteria

- Patients with a history of anemia (Hb < 7),
- Patients with a foot deformity,
- Patients who have had previous foot surgery,
- Patients who have had repeated corticosteroid injections within the last three months, or who have taken a non - steroid anti - inflammatory medication during the week before receiving an intervention,
- BMI of >40,
- Patients with a confirmed diagnosis of neuropathy,
- Patients with a previous foot deformity,
- Patients who have undergone previous foot surgery

Procedure:

Corticosteroid Injection Technique: Using a 5cc syringe, a combination of 2 mL of Depo - Medrol 80mg (methylprednisolone) and 1 ml of lignocaine is injected into the medial calcaneal tubercle at the point of maximum tenderness. This procedure follows aseptic techniques.

PRP Injection Technique: A 20 ml venous blood sample is drawn from the patient's cubital vein under sterile precautions. The sample is mixed with 3ml of citrate phosphate dextrose solution (CPDA) and divided equally into 4 vacutainers. After centrifugation at 3500pm for 7 minutes, the buffy coat supernatant layer (containing platelets) is separated. This layer is then aspirated and injected into the medial calcaneal tubercle at the point of maximum tenderness.

Assessment of Outcome

Patients are evaluated at discharge, 6 weeks, 3 months, and 6 months post - treatment. The assessment includes patient information (age, sex) and functional outcomes.

The AOFAS Scoring System and VAS Scoring System are used.

The VAS assesses pain on a scale of 0 to 10.

The AOFAS system grades pain, function, and alignment on a total score of 100, with specific points assigned to each category

3. Results

Table 1: Paired Samples Statistics – Corticosteroids

		Mean	N	Std. Deviation	Mean Difference	T	df	P - value
Pair 1	1st visit VAS score	7.16	25	.374	.075	11.616	24	.000
	6 weeks followup VAS	4.64	25	.995	.199			
Pair 2	1st visit VAS score	7.16	25	.374	.075	13.168	24	.000
	3 Months followup VAS	3.76	25	1.300	.260			
Pair 3	1st visit VAS score	7.16	25	.374	.075	17.202	24	.000
	6 months followup VAS	2.60	25	1.354	.271			
Pair 4	6 weeks followup VAS	4.64	25	.995	.199	2.815	24	.010
	3 Months followup VAS	3.76	25	1.300	.260			
Pair 5	6 weeks followup VAS	4.64	25	.995	.199	5.298	24	.000
	6 months followup VAS	2.60	25	1.354	.271			
Pair 6	3 Months followup VAS	3.76	25	1.300	.260	4.649	24	.000
	6 months followup VAS	2.60	25	1.354	.271			
Pair 7	1st visit AOFAS score	67.08	25	.400	.080	- 17.878	24	.000
	6 weeks follow up AOFAS	85.32	25	4.981	.996			
Pair 8	1st visit AOFAS score	67.08	25	.400	.080	- 17.114	24	.000
	3 Months followup AOFAS	85.00	25	5.123	1.025			
Pair 9	1st visit AOFAS score	67.08	25	.400	.080	- 25.691	24	.000
	6 months followup AOFAS	88.00	25	4.093	.819			
Pair 10	6 weeks follow up AOFAS	85.32	25	4.981	.996	0.272	24	.788
	3 Months followup AOFAS	85.00	25	5.123	1.025			
Pair 11	6 weeks follow up AOFAS	85.32	25	4.981	.996	- 2.050	24	.051
	6 months followup AOFAS	88.00	25	4.093	.819			
Pair 12	3 Months followup AOFAS	85.00	25	5.123	1.025	- 2.869	24	.006
	6 months followup AOFAS	88.00	25	4.093	.819			

Table 1 presents the paired samples analysis evaluated the effects of corticosteroid treatment on Visual Analog Scale (VAS) scores across multiple time points.

- For Pair 1, comparing initial visit VAS scores (Mean = 7.16, SD = 0.374) with scores at 6 weeks follow - up (Mean = 4.64, SD = 0.995) revealed a significant mean difference of 0.075 (t = 11.616, df = 24, p < 0.001).
- Pair 2 similarly showed significant improvement, with initial VAS scores (Mean = 7.16, SD = 0.374) compared to scores at 3 months follow - up (Mean = 3.76, SD = 1.300), yielding a mean difference of 0.260 (t = 13.168, df = 24, p < 0.001).
- Pair 3 demonstrated further significant improvement from initial VAS scores (Mean = 7.16, SD = 0.374) to 6 months

follow - up (Mean = 2.60, SD = 1.354), with a mean difference of 0.271 (t = 17.202, df = 24, p < 0.001).

- Pair 4 indicated a significant change between 6 weeks (Mean = 4.64, SD = 0.995) and 3 months follow - up (Mean = 3.76, SD = 1.300), with a mean difference of 0.260 (t = 2.815, df = 24, p = 0.010). .
- Pair 5 showed a significant decrease in Visual Analog Scale (VAS) scores from 6 weeks (Mean = 4.64, SD = 0.995) to 6 months follow - up (Mean = 2.60, SD = 1.354), with a mean difference of 0.199 (t = 5.298, df = 24, p < 0.001).
- Pair 6 indicated a significant reduction in VAS scores between 3 months (Mean = 3.76, SD = 1.300) and 6 months follow - up (Mean = 2.60, SD = 1.354), with a mean difference of 0.260 (t = 4.649, df = 24, p < 0.001).
- Pair 7 demonstrated a significant improvement from 1st visit AOFAS score (Mean = 67.08, SD = 0.400) to 6 weeks follow - up (Mean = 85.32, SD = 4.981), with a mean difference of 0.080 (t = - 17.878, df = 24, p < 0.001).
- Pair 8 showed a similar improvement from 1st visit AOFAS score to 3 months follow - up (Mean = 85.00, SD = 5.123), with a mean difference of 0.080 (t = - 17.114, df = 24, p < 0.001).
- Pair 9 revealed significant improvement from 1st visit AOFAS score to 6 months follow - up (Mean = 88.00, SD = 4.093), with a mean difference of 0.080 (t = - 25.691, df = 24, p < 0.001).

Table 2 presents paired samples statistics for Platelet - Rich Plasma (PRP) treatments, examining changes in Visual Analog Scale (VAS) scores and American Orthopaedic Foot & Ankle Society (AOFAS) scores over different time intervals. Each pair compares scores between initial visits and subsequent follow - up periods:

- Pairs 1 to 6 focus on VAS scores, while Pairs 7 to 12 analyze AOFAS scores.
- Significant improvements in VAS scores were observed from initial visits to 6 weeks (mean difference = 0.092, t = 6.608, df = 24, p < 0.001), 3 months (mean difference = 0.108, t = 14.462, df = 24, p < 0.001), and 6 months follow - up (mean difference = 0.214, t = 27.128, df = 24, p < 0.001)

Table 2: Paired Samples Statistics - PRP

		Mean	N	Std. Deviation	Mean Difference	T	df	P - value
Pair 1	1st visit VAS score	7.28	25	.458	.092	6.608	24	.000
	6 weeks followup VAS	6.40	25	.500	.100			
Pair 2	1st visit VAS score	7.28	25	.458	.092	14.462	24	.000
	3 Months followup VAS	4.96	25	.539	.108			
Pair 3	1st visit VAS score	7.28	25	.458	.092	27.128	24	.000
	6 months followup VAS	1.32	25	1.069	.214			
Pair 4	6 weeks followup VAS	6.40	25	.500	.100	10.115	24	.000
	3 Months followup VAS	4.96	25	.539	.108			
Pair 5	6 weeks followup VAS	6.40	25	.500	.100	20.229	24	.000
	6 months followup VAS	1.32	25	1.069	.214			
Pair 6	3 Months followup VAS	4.96	25	.539	.108	14.510	24	.000
	6 months followup VAS	1.32	25	1.069	.214			
Pair 7	1st visit AOFAS score	67.88	25	1.013	.203	- 12.204	24	.000
	6 weeks follow up AOFAS	79.96	25	5.200	1.040			
Pair 8	1st visit AOFAS score	67.88	25	1.013	.203	- 85.066	24	.000
	3 Months followup AOFAS	89.80	25	1.000	.200			
Pair 9	1st visit AOFAS score	67.88	25	1.013	.203	- 20.238	24	.000
	6 months followup AOFAS	95.20	25	6.364	1.273			
Pair 10	6 weeks follow up AOFAS	79.96	25	5.200	1.040	- 9.358	24	.000
	3 Months followup AOFAS	89.80	25	1.000	.200			
Pair 11	6 weeks follow up AOFAS	79.96	25	5.200	1.040	- 9.682	24	.000
	6 months followup AOFAS	95.20	25	6.364	1.273			
Pair 12	3 Months followup AOFAS	89.80	25	1.000	.200	- 4.094	24	.000
	6 months followup AOFAS	95.20	25	6.364	1.273			

- Similarly, significant enhancements in AOFAS scores were noted between initial visits and 6 weeks (mean difference = 1.040, t = - 12.204, df = 24, p < 0.001), 3 months (mean difference = 0.200, t = - 85.066, df = 24, p < 0.001), and 6 months follow - up (mean difference = 1.273, t = - 20.238, df = 24, p < 0.001).

Table 3: Intergroup VAS score

	Modality of treatment	N	Mean	Std. Deviation	t	df	P - Value
6 Weeks followup VAS	Corticosteroids	25	4.64	.995	- 7.903	48	.000
	PRP	25	6.40	.500			
3 Months followup VAS	Corticosteroids	25	3.76	1.300	- 4.264	48	.000
	PRP	25	4.96	.539			
6 months followup VAS	Corticosteroids	25	2.60	1.354	3.709	48	.001
	PRP	25	1.32	1.069			

- The above table (Table 3) compares the Visual Analog Scale (VAS) scores between two treatment modalities, corticosteroids, and platelet - rich plasma (PRP), at different follow - up intervals (6 weeks, 3 months, and 6 months).

- For the corticosteroid group, the mean VAS scores decreased significantly from baseline to 6 weeks (4.64 vs.6.40, t = - 7.903, p <.001), 3 months (3.76 vs.4.96, t = - 4.264, p <.001), and 6 months (2.60 vs.1.32, t = 3.709, p =.001).
- Similarly, in the PRP group, mean VAS scores also showed reductions from baseline to 6 weeks (6.40), 3 months (4.96), and 6 months (1.32).

Table 4: Intergroup AOFAS Score

	Modality of treatment	N	Mean	Std. Deviation	t	df	P - Value
6 Weeks follow up AOFAS	Corticosteroids	25	85.32	4.981	3.722	48	.001
	PRP	25	79.96	5.200			
3 Months followup AOFAS	Corticosteroids	25	85.00	5.123	- 4.598	48	.000
	PRP	25	89.80	1.000			
6 months followup AOFAS	Corticosteroids	25	88.00	4.093	- 4.758	48	.000
	PRP	25	95.20	6.364			

- The above (Table 4) table compares the American Orthopaedic Foot & Ankle Society (AOFAS) scores between two treatment modalities, corticosteroids, and platelet - rich plasma (PRP), at different follow - up intervals (6 weeks, 3 months, and 6 months).
- For the corticosteroid group, mean AOFAS scores showed significant improvements compared to baseline at 6 weeks (85.32 vs.79.96, t = 3.722, p =.001), 3 months (85.00 vs.89.80, t = - 4.598, p <.001), and 6 months (88.00 vs.95.20, t = - 4.758, p <.001).
- In contrast, the PRP group also demonstrated improvements in AOFAS scores over time (79.96 at 6 weeks, 89.80 at 3 months, and 95.20 at 6 months),

4. Discussion

In our study, 50 patients were divided into two groups: one receiving corticosteroid treatment and the other receiving platelet - rich plasma (PRP) treatment. Here are the main observations:

1) VAS and AOFAS Scores:
- Both the corticosteroid and PRP groups showed a significant decrease in pain and an increase in function over time.
- The VAS (Visual Analog Scale) scores decreased, and the AOFAS (American Orthopaedic Foot & Ankle Society) scores increased in both groups.
- These changes were statistically significant (p<0.001).

2) Comparison Within Corticosteroid Group:
- Pain decreased over time (6 weeks to 3 months, 6 weeks to 6 months).
- AOFAS scores increased, but without statistical significance (p=0.788 and p=0.006, respectively).

3) Comparison Within PRP Group:
- Function improved as time progressed (p<0.001).

4) Comparison Between Groups:
- Corticosteroid group had higher VAS scores at 3 weeks (p<0.001).
- At 6 months, VAS scores were better in the corticosteroid group, while PRP group had lower VAS scores.

5) Consistent with Previous Studies:
- Other studies by Say et al and Shetty VD also found decreased pain in PRP - treated patients.
- AOFAS scores showed better function in the PRP group at 3 months and 6 months, similar to Monto et al's findings.

6) PRP Considerations:
- PRP has advantages (fewer complications) but requires expensive centrifuging equipment.
- Cost of PRP is significantly higher (at least 10 times) than corticosteroids.

7) Study Limitations:
- Lack of diagnostic tools (e. g., USG scan or MRI) for confirming the diagnosis.
- No control arm in the study.

5. Conclusion

The study led us to the conclusion that PRP and corticosteroids are equally effective at relieving plantar fasciitis symptoms.
When compared to patients who had received corticosteroids, PRP proved to be a safe and effective method in the treatment of this condition, with a better functional outcome at the conclusion of the follow - up.

6. Summary

- When conservative treatment for plantar fasciitis fails, PRP and corticosteroids are frequently used. Both the advantages and the drawbacks of each of these therapeutic approaches have been discussed in the literature. The pain and functional outcomes of participants receiving any of these therapy regimens were compared in our study. We conducted a study including 50 patients, 25 participants in each group.
- As time went on, both groups' levels of pain decreased, and no one in the group experienced any complications. PRP patients had pain for a longer period of time compared to patients receiving corticosteroids, who noticed pain relief faster.

Conflict of Interest:
Authors declare no conflict of interests

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