Section: Orthopaedics

Original Research Article

COMPARATIVE STUDY OF EFFICACY OF CORTICOSTEROID VERSUS ANALOGUES PLATELET RICH PLASMA INJECTION IN THE MANAGEMENT OF PLANTAR FASCIITIS

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ABSTRACT

Background: Chronic plantar fasciitis is a common pathological condition due to degeneration of plantar fascia, caused by repeated trauma at its origin. **Materials and Methods:** Out of 80 patients, 40 patients were injected corticosteroid 2ml (8 mg) along with 0.5 ml of plain 2% xylocaine using a 2 G wide-bore needle. PRP (platelet-rich plasma) was prepared from the blood drawn from the cubital vein with the help of a BD Vacutainer Eclipse in three BD Vacutainer tubes, which are 2.7 ml tubes that contain 0.35 ml of 3.2% sodium citrate as an anticoagulant. Blood was centrifuged twice, the first time at 1200/rpm, second time at 2400 rpm. The platelets were checked randomly by a pathologist using a Neubauer chamber or autoanalyzer. PRP was injected at the tenderness site after injecting 2% of xylocaine with 20 G. Gauze needle and follow-up were done for a week, the 6th week, the 3rd month, and the 6th month, and outcomes of results were noted. **Result:** Clinical manifestations were VAS Baseline score—7.15 in the PRP group, 7.31 in the steroid group. The baseline AOFAS was 52 (SD ± 4.6) in the PRP group and 54.2 (SD ± 3.24) in the steroid group. The VAS score at the 6th week was 2.60 in the PRP group and 1.90 in the steroid group; at the 3rd month, it was 1.92 in the PRP group and 2.82 in the steroid group; and at the 6th month, it was 1.40 in the PRP group and 3.78 in the steroid group. AOFS scores were highly significant ($p<0.001$) at 6 weeks, 3 months, and 6 months. **Conclusion:** The corticosteroid therapy is more effective for short-duration relief, but PRP therapy is more effective for long-term relief.

INTRODUCTION

Plantar fasciitis is a common cause of heel pain and the result of a degenerative process of the plantar fascia at its calcaneal attachment.[1] As it is a common pathological condition of the foot, it can often be a challenge for clinicians to treat such degenerative pathology successfully.[2] Surgical and non-surgical techniques have been used in the treatment of plantar fasciitis.

Plantar fasciitis is classified as a syndrome that results from repeated trauma to the plantar fascia at its origin on the calcaneus.[3] The resulting pain and dysfunction can often become a source of frustration to both the patient and clinician.

The methods of treatment are the use of insoles, modifications of shoes, stretching, physiotherapy, ice or cold, NSAID analgesics, shock wave therapy, and immobilization.[4] If not responding to local corticosteroids and/or analogous platelet-rich plasma injected locally in the management of chronic plantar fasciitis. It is suggested that platelet-rich plasma given locally was more effective than corticosteroids, but this study has become debatable; hence, an attempt is made to compare platelet-rich plasma (PRP) and corticosteroids to treat chronic plantar fasciitis, and their pros and cons are evaluated.

MATERIALS AND METHODS

80 (eighty) patients aged between 25 to 60 years visited the orthopedic Department of Government Medical College, Mahabubnagar, Telangana-509001 was studied.

Inclusive Criteria

The patients diagnosed with plantar fasciitis by clinical and radiological evaluation presenting a complaint of plantar heel pain for more than 6 weeks (>6 weeks) and plantar fascia thickness of > 4 mm at the area of maximum tenderness (USG of heel for plantar fascia) were selected for study.

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Exclusion Criteria

Patients with severe anemia, thrombocytopenia, or immune compromise, and non-cooperative patients were excluded from the study.

Method: Out of 80, 40 patients were given corticosteroid 2 ml (8 mg) and 40 patients PRP. Depomedrol was injected along with 0.5 ml of plain 2% xylocaine using 20 G wide-bore needles into the point of maximum tenderness. Post injection, patients were asked to take a rest for 15 minutes and then allowed to walk.

PRP preparation and administration: For the preparation of PRP, blood was withdrawn from the cubital vein with the help of a BD Vacutainer Eclipse in three BD Vacutainer tubes, which are 2.7 ml tubes that contain 0.5 ml of 3.2% sodium citrate, an anticoagulant, and a volume of approximately 2.35 ml for whole blood. It was prepared using a 2-spin technique; in the 1st low-spin step, blood is centrifuged at 1200 rpm for 10 minutes in a Routine 380 R centrifuge model (Hettich, Zentrifugen). After the formation of three layers (a bottom layer of RBC, an upper layer composed of plasma, platelets, and some WBC, and an intermediate layer, or buffy coat, composed mostly of WBC). The upper layer just above the Buffy coat was collected with a 10 ml syringe; this collection was performed carefully to avoid disturbing the bottom layer of RBC and the Buffy coat layer. Depending upon the centrifugal force of the spin, the collected volume ranged from 0.75 ml to 1.25 ml in each BD Vacutainer. Approximately 1 ml of the upper layer of the sample that underwent the first spin step was collected and transferred to one empty tube (approximately 3 ml). The tube was centrifuged again for 10 minutes at 2400 rpm. The upper half of the plasma volume, platelet-poor plasma (PPP), was removed. The remaining volume of PPRP was used for injection. Platelet count was estimated by the pathologist. The PRP was randomly checked for the number of platelets by Neubauer's chamber or autoanalyzer. Most of the sample had a platelet count more than 1,000,000/µl in 5 ml volume; that is 5 times the baseline. After this, the PRP is shaken by just turning the tube 2 to 3 times to mix the platelets.

PRP injection technique: patients were asked to resume the supine position, and the involved foot was cleaned and prepared with spirit and povidone iodine. The site of maximum tenderness, i.e., the medial aspect of the foot at the origin of the plantar fascia, was marked using a marker. One ml of 2% plain xylocaine was infiltrated into the skin and subcutaneous tissue. Dry needling, also called peppering, was used to locally "injure" the soft tissue to stimulate the inflammatory response; concomitant delivery of the PRP then modulates (enhances) the healing response. Each masking point of tenderness is penetrated with a 20-gauge needle until the underlying periosteum is touched. A gristly, crunchy texture is audibly and palpably noted as the needle is advanced. After contacting the periosteum, the needle was gently partially withdrawn and then advanced in a fan-like wheel (peppering) the area 7 to 10 times. Next, 1 ml of the PRP is injected as this peppering maneuver is continued. This process is then carried out at each marked site.

Post-injection care—post-injection patients were asked to rest for 15 minutes and then allowed to walk. As PRP effectively induces an inflammatory response, some patients experienced minimal to moderate discomfort following the injection, which usually lasted for up to 1 week. They are instructed to ice the injected area if needed for pain control and modify activity as tolerated. Acetaminophen was the optimal analgesic, and NSAIDs were avoided. After 48 hours, patients were given a standardized stretching protocol to follow for 2 weeks. Patients were advised to avoid strenuous activities and rest for 2 weeks. No aggressive running or jumping activities were allowed for 2 weeks. After 4 weeks of the procedure, patients were allowed to proceed with normal sporting or recreational activities as tolerated. Any type of foot orthosis was not allowed. Each patient was assessed functionally using the American Orthopaedic Foot and Ankle Score (AOFAS), visual analogue scale (VAS) scores, and radiologically by ultrasound thickness of plantar fascia. The AOFS and VAS scores were recorded before treatment and at follow-up visits at 6 weeks, 3 months, and 6 months.

The duration of the study was from June 2023 to May 2025.

Statistical analysis: clinical manifestations comparison VAS, AOFAS, and pain severity were studied by using a t-test and percentage. The statistical analysis was done in SPSS software. The ratio of male and female was 2:1.

RESULTS

[Table 1] Study of clinical manifestations

- Right heel: 23 (57.5%) PRP group, 24 (60%) corticosteroid group,
- Left heel: 17 (42.5%) PRP group, 16 (40%) corticosteroid group
- VAS Baseline score: 7.15 in PRP group, 7.31 in corticosteroid group,
- Baseline of AOFAS: 52 (±4.6) in PRP group, 54.2 (±3.24) in corticosteroid group.
- Thickness of plantar fascia (in mm): 5.70 in PRP group, 5.58 in corticosteroid group.

[Table 2] Comparative of visual analogue score (VAS) in both group

- Pre-treatment: VAS score in 7.12 in PRP group, 7.20 in corticosteroid group.
- After 6th weeks: 2.60 in PRP group, 1.99 in corticosteroid group.
- At 3rd months: 1.92 in PRP group, 2.82 in corticosteroid group.
- At 6th months: 1.40 in PRP group, 3.73 in corticosteroid group.

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[Table 3] Comparison of pain sensitivity in different duration of treatment in 6th week, 3rd month and 6th months PRP has significantly reduced VAS score as compared to corticosteroid group.

[Table 4] Comparison of AOFAS score in both groups at different interval of duration pre-treatment, 6 weeks, 3 months, 6 months have significant p value (p<0.001).

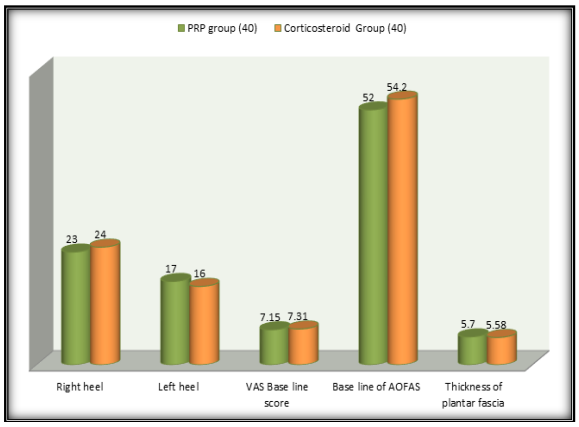

Figure 1: Clinical Manifestations of patients with chronic plantar fasciitis

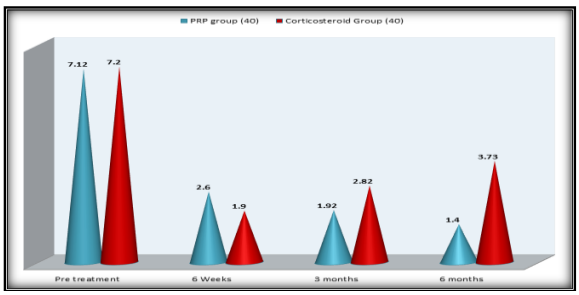

Figure 2: Comparison of VAS (Visual Analogue score) in both groups

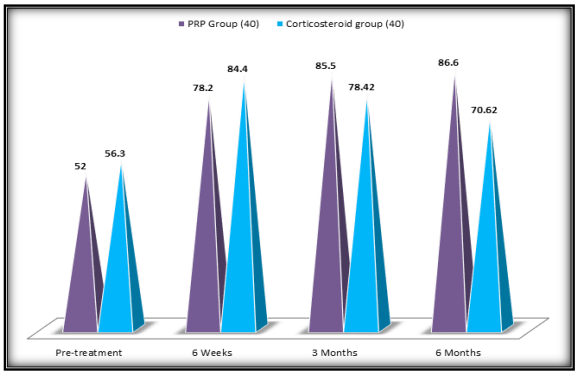

Figure 3: Comparison of AOFAS score in both groups

Table 1: Clinical Manifestations of patients with chronic plantar fasciitis

Sl No	Manifestations	PRP group (40)	Corticosteroid Group (40)
1	Right heel	23 (57.5%)	24 (60%)
2	Left heel	17 (42.3%)	16 (40%)
3	VAS Base line score	7.15	7.31
4	Base line of AOFAS	52 (±4.6)	54.2 (±3.24)
5	Thickness of plantar fascia (in mm)	5.70	5.58

AOFS = American orthopaedic Foot and ankle score, PRP = Platelet rich plasma, VAS = visual analogue scale.

Table 2: Comparison of VAS (Visual Analogue score) in both groups.

Visual score	PRP group (40)	Corticosteroid Group (40)
Pre treatment	7.12	7.20
6 Weeks	2.60	1.90
3 months	1.92	2.82
6 months	1.40	3.73

Table 3: Comparison of pain severity in both groups

VAS	Pre treatment		6th week		3rd month		6th month	
	Steroid (%)	PRP (%)	Steroid (%)	PRP (%)	Steroid (%)	PRP (%)	PRP	Steroid
No pain VAS-0	0	0	0	0	0	0	7 (17.5%)	0
Mild pain VAS 1, 2 3	0	0	19 (47.5%)	33 (82.5%)	27 (67.5%)	15 (37.5%)	26 (65%)	8 (20%)
Moderate pain VAS 4, 5 6	11 (27.5%)	8 (20%)	21 (52.5%)	7 (17.5%)	7 (17.5%)	25 (62.5%)	6 (15%)	31 (77.1%)
Severe pain VAS- 7 8, 9	25 (62.5%)	31 (77.5%)	0	0	0	0	0	0
Worst pain VAS – 10	0	0	0	0	0	0	0	0

PRP = Platelet Rich Plasma, VAS = Visual Analogue Scale.

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Table 4: Comparison of AOFAS score in both groups

AOFAS score	PRP Group (40)	Corticosteroid group (40)	t test	p value
Pre-treatment	52 (SD±4.78)	56.3 (SD±3.18)	4.73	P<0.001
6 Weeks	78.2 (SD±2.36)	84.4 (SD±1.53)	13.9	P<0.001
3 Months	85.5 (SD±2.13)	78.42 (SD±1.80)	16.1	P<0.001
6 Months	86.6 (SD±3.12)	70.62 (SD±3.8)	20.5	P<0.001

AOFAS = American Orthopaedic Foot and Ankle Society Score
PRP = Platelets Rich Plasma
P<0.001 = p value is highly significant.

DISCUSSION

In the present comparative study of the efficacy of corticosteroid versus analogue PRP injection in the management of clinical manifestations of patients with chronic plantar fasciitis: Right heel: 23 (57.5%) PRP, 24 (60%) steroid; left heel: 17 (42.5%) by PRP group, 16 (40%) in steroid. VAS Baseline 7.15 in the PRP group, 7.31 in the corticosteroid group, a baseline of AOFAS 52 (±4.6) in the PRP group, and 54.2 (±3.24) in the steroid group. Thickness of plantar fascia (mm): 5.70 in PRP group, 5.58 in steroids [Table 1]. In comparison of VAS in both groups, pre-treatment was 7.12 in PRP and 7.20 in steroids. At 6 weeks, 2.60 in the PRP group and 1.90 in the steroid group. At the 3rd month, 1.92 in the PRP group and 2.82 in the steroid group. At 6 months, 1.40 in the PRP group and 3.73 in the steroid group [Table 2]. VAS was higher in the PRP group than in the steroid group [Table 3]. Comparison of AOFS scores in both groups at different intervals of duration had a significant p-value ($p < 0.001$) (Table 4). These findings are more or less in agreement with previous studies.[5-7)]

Plantar fasciitis is considered an overuse injury, and such a patient's history will typically reveal some combination of either intrinsic or extrinsic factors that contribute to the development of the injury. Extrinsic factors are due to unyielding surfaces during exercise (movement) and improper and excessively worn footwear.[8] Intrinsic factors include obesity, foot structure, reduced plantar flexion strength, reduced flexibility of the plantar flexor muscles, and tensional malalignment of the lower extremity.[9] The most common cause of plantar fasciitis is excessive pronation (inversion) of the foot. Increased tension placed arch lowering during standing and walking.

The non-surgical management for the treatment of the symptoms and discomfort associated with plantar fasciitis are (1) reducing pain and inflammation, (2) reducing stress to a tolerable level, and (3) restoring muscle strength and flexibility in involved tissue. Corticosteroid local injection gives sudden relief for pain and inflammation, but to reduce stress, to tolerate, and to restore muscle strength PRP proved to be efficient because it enables cell proliferation, angiogenesis, and cell migration, resulting in tissue regeneration. Platelets secrete antimicrobial peptides, suggesting an antibiotic effect.[10] Moreover, PRP has anti-inflammatory and analgesic effects also. It is also reported that PRP is superior to hyaluronic acid, viscosupplementation, because PRP is a biological product.[11] Hence, PRP is a multi-potential application in orthopedics, sports medicine, and repetitive surgery. While corticosteroids have many side effects on prolonged usage, like osteoporosis and loss of immunity, even addiction to steroids is also recorded.

CONCLUSION

The present comparative study of PRP and corticosteroids in the management of chronic fasciitis confirmed that PRP injection is an efficient and safe therapeutic option for the treatment of chronic plantar fasciitis, but long-duration treatment has to be the protocol to get satisfactory results. But this study demands further histopathological, nutritional, genetic, and musculoskeletal study. Because despite many contributing factors, none of these factors have proven to be predictive of clinical outcome, plantar fasciitis occurs at any age in both sexes and in many occupations.

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