Section: Orthopaedics

Original Research Article

COMPARATIVE EVALUATION OF PLATELET-RICH PLASMA AND CORTICOSTEROID INJECTION FOR PLANTAR FASCIITIS

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ABSTRACT

Background: Plantar fasciitis is a common overuse disorder characterized by inflammation at the origin of the plantar fascia, leading to heel pain on the plantar aspect of the foot, especially during the first few steps in the morning. Various treatment modalities are available, including stretching exercises, taping, analgesics, orthotic support, corticosteroid injections, platelet-rich plasma (PRP) therapy, and surgical interventions such as plantar fasciotomy and distal tarsal tunnel decompression. Although PRP therapy has shown promising results, further clinical evidence is required to establish its efficacy and safety. The present study was conducted to evaluate the effectiveness of PRP therapy in plantar fasciitis and to compare the outcomes of a single- dose PRP injection with corticosteroid injection.

Materials and Methods: Forty patients diagnosed with plantar fasciitis and fulfilling the inclusion and exclusion criteria were enrolled after obtaining institutional ethical clearance. Patients were randomly allocated into two groups using the lottery method. Group A consisted of 20 patients who received 3 mL of autologous platelet-rich plasma injection, while Group B included 20 patients who received 40 mg corticosteroid injection. Post-treatment evaluation was performed using the Visual Analog Scale (VAS) and Foot Function Index (FFI) during follow-up.

Results: The study compared the clinical outcomes of single-dose PRP therapy and corticosteroid injection in patients with plantar fasciitis. The most common presenting symptom in both groups was heel pain during the first step in the morning. Both treatment groups showed significant improvement in VAS and FFI scores following treatment. However, patients treated with PRP demonstrated superior improvement in pain relief, disability reduction, and activity limitation scores at the end of 6 months of follow-up compared to the corticosteroid group.

Conclusion: Plantar fasciitis is a painful condition that significantly affects daily functional activities. A single injection of platelet-rich plasma provided better and longer-lasting pain relief and functional improvement compared to corticosteroid injection. PRP therapy appears to be an effective and safe treatment option for plantar fasciitis.

Keywords: Plantar fasciitis, platelet rich plasma, Corticosteroid, visual analog scale, foot function index.

INTRODUCTION

Plantar fasciitis is one of the most common causes of heel pain and is characterized by inflammation and degeneration of the plantar fascia at its origin from the medial tubercle of the calcaneus. It is considered an enthesopathy, referring to pathology occurring at the site where a tendon or ligament attaches to bone. Several terms such as painful heel syndrome, jogger's heel, subcalcaneal pain, plantar heel pain,

and plantar fasciopathy are commonly used to describe this condition.[1] The incidence of plantar fasciitis has been reported to be approximately 10 per 1000 individuals during their lifetime.[1,4,5]

Clinically, plantar fasciitis typically presents with heel pain during the first few steps in the morning or after periods of rest. The pain often decreases with activity initially but may recur after prolonged standing, walking, or sitting.[3] Although the condition is generally self-limiting, symptoms can significantly impair daily activities and quality of life.

The exact etiology of plantar fasciitis is multifactorial. Repeated microtrauma and excessive loading at the origin of the plantar fascia result in microscopic tears either at the fascia-bone interface or within the fascia itself. The plantar fascia lies superficial and plantar to the origin of the flexor digitorum brevis muscle.[4] Various intrinsic and extrinsic factors contribute to the development of plantar fasciitis. Extrinsic factors include inappropriate footwear, excessive physical training, prolonged weight-bearing activities, and repetitive stress. Intrinsic factors include obesity, abnormal foot arches, tight or weak musculature, heel spur, and systemic conditions such as diabetes mellitus, thyroid disorders, and pregnancy.[4] Adults between 20 and 65 years of age are most commonly affected, and the condition is frequently observed among athletes, pregnant women, and diabetic patients.[4,6]

In the acute phase, the pain is usually sharp and severe, especially during the first step after rest, whereas chronic cases present with a dull and persistent ache. The pain generally does not interfere with sleep and is not progressively aggravated by continued activity.[5] Conservative treatment remains the first-line approach and includes analgesics, physiotherapy, stretching exercises, taping, splints, and foot orthoses.[7] Surgical interventions such as plantar fasciotomy and distal tarsal tunnel decompression, performed either through open or arthroscopic techniques, are reserved for refractory cases.[8] The primary objective of treatment is pain relief and restoration of functional activity.

Among the various treatment modalities, corticosteroid injections are widely used because of their anti-inflammatory effect and rapid pain relief. However, concerns regarding recurrence and complications such as plantar fascia rupture have limited their long-term use.[9] Platelet-rich plasma (PRP) therapy has recently gained attention because of its regenerative potential and ability to promote tissue healing through growth factors released by activated platelets.[10,11]

The present study was undertaken to evaluate and compare the efficacy of a single-dose platelet-rich plasma injection with corticosteroid injection in patients with plantar fasciitis who failed conservative management for at least three months.

MATERIALS AND METHODS

Study Design and Duration

This prospective observational study was conducted in the Department of Orthopaedics, Krishnanagar institute of medical science, Krishna Nagar over a period of 2 years [January 2024 to December 2025]. Forty eligible patients diagnosed with unilateral plantar fasciitis were randomly divided into two groups using the lottery method.

- Group A (n = 20): Treated with a single-dose platelet-rich plasma (PRP) injection
- Group B (n = 20): Treated with a single-dose corticosteroid injection

Inclusion Criteria

- Patients aged between 21 and 50 years
- Unilateral plantar fasciitis with heel pain during the first step in the morning or after rest
- Tenderness over the medial plantar aspect of the heel
- Failure of conservative treatment for at least 3 months
- Willingness to participate in the study

Exclusion Criteria

- Diabetes mellitus, rheumatoid arthritis, gout, vascular disorders, tumors, skin lesions, or posterior tibial tendon dysfunction
- Bilateral plantar fasciitis
- Tarsal tunnel syndrome, metatarsalgia, sciatica, and other neurological disorders
- Previous fractures or surgery involving the foot and ankle
- Foot and ankle deformities
- Pregnant women, malignancy, and patients with low cognitive status

Data Collection and Evaluation

Patients underwent detailed clinical evaluation including history, local examination, and routine laboratory investigations before treatment. Pain assessment was performed using the Visual Analog Scale (VAS), and functional outcome was assessed using the Foot Function Index (FFI).

Patients were followed up at 3 weeks, 6 weeks, 12 weeks, and 6 months after intervention. Improvement was assessed based on reduction in pain, disability, and activity limitation scores.

Diagnosis was primarily clinical, based on characteristic heel pain and tenderness. Imaging studies such as plain radiographs, ultrasonography, and MRI were used selectively to exclude other causes of heel pain when necessary.

Figure 1: Plain radiograph lateral view foot showing heel SPUR

Study Tools

The following assessment tools were used in the study:

1. Visual Analog Scale (VAS) – for assessment of pain intensity
2. Foot Function Index (FFI) – for evaluation of functional improvement

Pain assessment using the VAS score was performed before treatment and during follow- up at 3 weeks, 6 weeks, 12 weeks, and 6 months. Based on the recorded scores, pain severity was categorized as no pain, mild pain, or severe pain.

Foot Function Index (FFI)

The Foot Function Index (FFI) is a self-administered questionnaire used to assess the impact of foot pathology on pain, disability, and activity limitation. It consists of 23 items divided into three subscales:

- Pain
- Disability
- Activity limitation

Each item is scored on a scale from 0 to 10, where:

- 0 indicates no pain or disability
- 10 indicates the worst possible pain or maximum disability

FFI scores were recorded before treatment and during follow-up visits to evaluate functional improvement following intervention.

Table: Foot Function Index

No.	Scale	Questions	Scoring
1.	**Pain Scale**	Pain in the morning upon taking your first step Pain standing barefoot Pain walking barefoot Pain standing with shoes Pain walking with shoes Pain standing with orthotics Pain walking with orthotics How is your pain at the end of the day? How severe is your pain at its worst?	0/90
2.	**Disability Scale**	Difficulty when walking in the house Difficulty when walking outside Difficulty when walking four blocks Difficulty when climbing stairs Difficulty when descending stairs Difficulty when getting out of a chair Difficulty when standing tiptoe Difficulty when climbing curbs Difficulty when running or fast walking	0/90
3.	**Activity Limitation**	Stay all day indoors due to feet Stay in bed all day due to feet Use an assistive device (stick, walker, crutches frame) indoors Use an assistive device outdoors Limit physica activity	0/50

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Data Analysis

The collected data were entered into Microsoft Excel spreadsheets and analyzed systematically. Results were presented in the form of tables and figures. Quantitative variables were analyzed using the Independent t-test, while qualitative variables were assessed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Methodology

A total of 40 patients diagnosed with plantar fasciitis were randomly divided into two groups:

- Group A: Received a single dose of autologous platelet-rich plasma (PRP) injection
- Group B: Received a single dose of corticosteroid injection (Triamcinolone acetonide)

Group A: PRP Therapy

Preparation of Platelet-Rich Plasma

Preparation of PRP was carried out in three stages:

1. Collection of autologous venous blood
2. Separation and extraction of platelet-rich plasma
3. Injection of PRP at the affected site

Venous Blood Collection

Patients were positioned comfortably in either sitting or supine posture. A tourniquet was applied over the arm to facilitate venous prominence. Under strict aseptic precautions, the median cubital vein was identified and cleaned with antiseptic solution. Using a sterile 18-gauge needle, approximately 27 mL of venous blood was collected from the cubital vein. Following blood collection, pressure was applied over the puncture site with a sterile swab.

Separation and Extraction of PRP

The collected blood sample was mixed with Acid Citrate Dextrose-A (ACD-A) as an anticoagulant. PRP preparation involved a two-step centrifugation process:

- First centrifugation (light spin): Performed at 1500 rpm for 15 minutes to separate plasma and platelets from red blood cells.
- Second centrifugation (heavy spin): Performed at 3500 rpm for 7 minutes to concentrate platelets at the bottom of the tube.

The upper platelet-poor plasma layer was discarded, and the remaining platelet concentrate was used as PRP. The PRP was buffered with 8.4% sodium bicarbonate to maintain physiological pH. Approximately 2.5–3 mL of PRP was obtained from the initial 27 mL blood sample for therapeutic injection.

Evacuating into sterile syringe

PRP is injected under aseptic conditions, patient in a supine or prone position with the affected side plantar side facing up. After palpating the point of maximal tenderness. An antiseptic agent is used to clean the area before injecting from the site of injection to outwards. PRP is then injected directly into the area of maximal tenderness at the heel via peppering technique (with single skin entry, partially withdrawing the needle, redirecting, and making multiple penetrations to the fascia). Sterile gauze applied after the injection.

PRP Injection Technique

Platelet-rich plasma was injected under strict aseptic precautions with the patient positioned comfortably in either supine or prone position, exposing the plantar aspect of the affected foot. The point of maximal tenderness over the heel was identified by palpation. The injection site was cleaned thoroughly with an antiseptic solution in a circular manner from the center outward.

The prepared PRP was injected directly into the area of maximal tenderness using the peppering technique. This involved a single skin entry followed by partial withdrawal and redirection of the needle to create multiple penetrations into the plantar fascia. After completion of the procedure, sterile gauze was applied over the injection site.

Injected PRP at point of maximal tenderness under sterile precautions.

Group-B: Corticosteroid

40mg/1ml Triamcinolone acetonide was taken into a 5ml sterile syringe, and then 2 ml local anesthesia drug is taken into the same syringe. Shake gently and under strict aseptic conditions; after cleaning the area with antiseptic, this mixture is injected at the point of maximum tenderness. In this study, intermediate-acting, Triamcinolone acetonide was used by palpatory method at the maximum point of tenderness through medial approach by peppering technique, and a sterile dressing applied.

The peppering technique is repeatedly inserting and withdrawing the needle without complete emergence from the skin. This leads to multiple small punctures in the degenerated tissue, causing bleeding and initiating the healing process.

Injected corticosteroid atpoint of maximal tenderness under sterile precautions

Rehabilitation

Once the patient receives the treatment either with PRP platelet-rich plasma therapy or corticosteroid injection, they are advised physical therapy under supervision. After educating them about physical therapy, patients will get discharged.

Self-stretching exercises for plantar fascia and tendon Achilles were taught. Plantar fascia stretching exercise was to done in sitting. Subjects in both the groups will sit in a high sitting position with the leg

crossed over the opposite knee. With one hand heel is held and the other over the metatarsals. Then subjects were asked to stretch the plantar fascia, and they have to repeat this for ten repetitions. Tendon Achilles stretching done with the help of a towel. Patients sit with legs stretched out in front, and a towel is placed around the affected forefoot. Then towel is pulled towards the patient until a stretch felt across the bottom of the foot. They were asked to maintain the stretch for about 30 seconds and then relax; these exercises to be done for around ten repetitions.

Strengthening exercises like towel curl up and active ankle exercises were advised. The patients were followed up regularly at 3weeks, 6weeks, 12weeks, 6months follow up, and the following observations are made.

RESULTS

In this study of forty patients, ten are in the age group of 21-30 (25%), 22 are in the age group of 31-40 (55%), 8 are in the age group of 41-50 (20%). The youngest patient of this study is 21 years, and the oldest is 48 years; the average age is 34.5 years. There were about 20 subjects in each group. The maximum number of subjects were in range of 31-40 Years in both groups. Twenty-two are in the age group of 31-40 in both the groups.

Group A consists of 20 patients comprising 8 males and 12 females with a mean age and standard deviation of 36.5±7.29 years,

Group B consists of 20 patients comprising ten males and ten females with a mean age and standard deviation of 33.4±5.24.

Table 1: Gender wise distribution of group A and group B

		Group-A		Group-B	
GENDER	MALE	COUNT	8	10	18
		% WITHIN SEX	44.4%	55.6%	100.0%
		% WITHIN GRP	40.0%	50.0%	45.0%
	FEMALE	COUNT	12	10	22
		% WITHIN SEX	54.5%	45.5%	100.0%
		% WITHIN GRP	60.0%	50.0%	55.0%
TOTAL		COUNT	20	20	40
		% WITHIN SEX	50.0%	50.0%	100.0%
		% WITHIN GRP	100.0%	100.0%	100.0%

In this study, 22 (55%) are female patients in both the groups, and 18(45%) are male patients. In Group A, 8 (40%) are male patients, and 12 (60%) are female patients. In Group B, 10 (50%) are male patients, and 10 (50%) are female patients. The incidence is more in females. Each group has 20 subjects with 12 females & 8 male in group A and 10 female and 10male in group B respectively.

Table 2: Comparison of VAS score between group A and group B

VAS SCALE	PRP GRP (MEAN±S.D)	CS GRP (MEAN±S.D)
VAS PRE	2.0±0.64	7.6±1.095
VAS 3WK	5.7±1.83	6.4±1.095
VAS 6WK	3.85±1.59	5.3±0.93
VAS 12WK	2.55±1.50	4.6±0.75
VAS 6M	2±0.64	4.05±0.88

There was no statistic significant association for VAS at 3weeks with t value -1.463, df of 38 showing P value 0.152. But the association of VAS at 6 weeks, 12 weeks and 6 months after applying independent t test with t values as -3.624, -5.451, -8.342 and df of 38 showing P values as 0.001, 0.000, 0.0001 respectively shows statistically significant association. After applying independent sample t test between PRP group and CS group for VAS score at 6th month follow up after treatment showed mean VAS score average with standard deviation in PRP group was 2±0.69 which was less than mean VAS score average with standard deviation in CS group was 4.05±0.88 and the mean difference is 2.050. This association is statistically significant with a P value <0.0001 which is <0.05and t value is 8.34 with a difference of 38 concluding that PRP has good recovery at 6th month follow up than Corticosteroid group.

Table 3: Comparison of pain score between group A and group B

PAIN (FFI)	PRP GRP (MEAN±S.D)	CS GRP (MEAN±S.D)
PRE	34.55±3.23	38.55±4.76
3WEEKS	29.5±3.72	33.6±4.28
6WEEKS	21.4±4.30	29.3±4.16
12WEEKS	14±2.42	26.3±4.34
6 MONTHS	10.5±1.50	24.7±4.59

At 6th month follow up after treatment showed mean pain score average with standard deviation in PRP group was 10.5±1.50 which was less than mean pain score average with standard deviation in CS group

was 24.7±4.59 and the mean difference is14.250. There was a statistically significant association in Pain score at 3weeks, 6 weeks, 12 weeks and 6 months after applying independent t test with t values as-3.231, -5.893, -11.098, -13.172 and df of 38 showing P values as 0.003, <0.001, <0.0001, 0.000 respectively implies that PRP has good recovery at 6th month follow up than Corticosteroid group.

Table 4: Comparison of disability score between group A and group B

DISABILITY	PRP GRP (MEAN±S.D	CS GRP (MEAN±S.D)
PRE	70±10.84	54.1±6.97
3WK	62.35±8.45	45.55±6.78
6WK	32.55±5.07	43.8±7.21
12WK	19.5±4.04	38.35±6.77
6M	14.3±3.19	42.95±6.89

Table 5: Activity Limitation in Foot Function Index Between two treatment Groups

ACTIVITY LIMITATION	PRP GRP (MEAN±S.D	CS GRP (MEAN±S.D)
PRE	10.2±1.93	11.6±2.62
3WEEKS	8.8±1.88	7.45±1.90
6WEEKS	7.90±1.88	7.75±1.74
12WEEKS	4.55±1.79	8.55±1.79
6MONTHS	1.65±0.74	9.3±2.02

After applying independent t test there was a statistically significant association in activity limitation at 3weeks, 12 weeks and 6 months with t values as 2.255, -7.062, -15.830 and df of 38 showing P values as 0.030, <0.001, 0.000 respectively. No statistic significant association found for activity limitation at 6weeks with t value.0.269, df of 38 showing P value 0.796. In the Corticosteroid group we observed that there was rise in mean activity limitation after 3 weeks follow up till the end of follow up whereas in PRP group there was a significant mean difference of 7.650 for a mean activity limitation score with standard deviation in PRP and CS group as 1.65±0.74 and 9.3±2.02 respectively. This concludes that concluding that PRP has good recovery at 6th month follow up than Corticosteroid group.

Table 6: within group A comparison of pre treatement and post treatment score

GROUP A	PRE	POST
VAS	6.75	2
PAIN	34.5	10.5
DISABILITY	70	14.3
ACTIVITY LIMITATION	10.2	1.6
TOTAL	95.35	28.32

In paired sample correlation of Group-A pair 9 Disability pre and Disability 3weeks correlation values 0.933 shows very high statistical significance almost equal to +1 representing a positive correlation followed by vas pre& vas 3weeks, activity limitation pre &activity limitation6weeks, activity limitation pre& activity limitation 3weeks, vas pre &vas 6weeks, pain pre& pain 3week.

Table 7: within group b comparison of pre treatement and post treatment score

GROUP B	PRE	POST
VAS	7.6	4.05
PAIN	38.55	24.75
DISABILITY	54.1	42.95
ACTIVITY LIMITATION	11.6	9.3
TOTAL	104.25	48.15

In paired sample correlation of Group-B pair 8 Pain pre and pain 6months correlation values 0.917 shows very high statistical significance almost equal to +1 representing a positive correlation followed by pain pre& pain 3weeks, vas pre &vas 3weeks, vas pre& vas 6weeks, pain pre and pain6 weeks.

The pre-treatment mean scores of both PRP groups and CS groups are compared in a graph presentation. The Post-treatment mean scores of both PRP groups and CS groups are compared in a graph presentation. The mean value and standard deviation and statistical significance represented by P- value at final follow up at 6 months for Visual analog scale (VAS) and components in foot function index (FFI) individually in both groups Platelet rich plasma therapy (Group-A) and corticosteroid group (Group-B).

Table 8: Significance of Study in P-Value at the end of Final Follow Up

SCALE	Mean ± SD (PRP)	Mean ± SD (CS)	P-value
VAS	2.0 ± 0.64	4.05 ± 0.88	<0.0001
Pain Scale	10.50 ± 1.50	24.75 ± 4.59	<0.001
Disability Scale	14.3 ± 3.1	42.0 ± 9.9	<0.001
Activity Limitation Scale	1.69 ± 0.745	9.03 ± 2.02	0.000

DISCUSSION

Plantar fasciitis is the footpad's deep fascia; a thick connective tissue in the plantar aspect of feet extends from the calcaneal tuberosity to metatarsal heads. It forms deep fascia of the sole of the foot, thick in the Centre and thin at the sides. It acts as the primary stabilizer of the foot as it maintains the foot's arch and as an anti- pronator. The plantar fascia function is to provide static support to the longitudinal arch and dynamic shock absorption.

Plantar fascia prevents the foot collapse by its anatomical orientation and its tensile strength. Stretch tension from the PF prevents the spreading of the calcaneum and the metatarsals that maintains the medial arch. A higher-arch foot is deficit in the mobility that is needed to assist in absorbing the ground reaction forces. Consequently, from heel strike to midstance increased load is applied to the plantar fascia, like a stretch on a bowstring. Lower arched will have conditions that resulting from too much motion. People with different types of foot will experience plantar fascia pain resulting from different biomechanical stress. Historically, plantar fasciitis was due to faulty biomechanics like excessive pronation. Structural deformities like forefoot varus may result in excessive pronation during gait.

Overpronation contributes to excessive foot mobility, which can increase the level of stresses applied to the musculofascial and soft tissue structures through plantar fascial elongation and increased tissue stress. Pronation does not necessarily lead to lower extremity problems. During pronation of foot, the talus slides anteriorly, forms an anterior break in the Cyma line, and places the talonavicular joint distal to the calcaneocuboid joint. In supination, the talus moves posteriorly into the ankle mortise. This translation forms a posterior break in the Cyma line because the talonavicular joint is now proximal to the calcaneocuboid joint. These radiographic data depict the stress placed on the plantar fascia in the pronated and supinated positions.

Plain radiograph's showing intact cyma line as compared to disrupted cyma lines. Yellow line represents the cyma line.

The windlass mechanism describes the manner by which the plantar fascia supports the foot during weight- bearing activities and provides information regarding the biomechanical stresses placed on the plantar fascia. A "windlass" is a tightening of a cable. Plantar fascia gets simulated like a cable attached to the calcaneum and the metatarsophalangeal joints in the plantar aspect. Dorsiflexion of the MTP joints during the propulsive phase of gait winds the plantar fascia around the head of the metatarsals. This winding of the plantar fascia shortens the distance between the calcaneum and the metatarsals will lift the medial longitudinal arch. This shortening of plantar fascia results from hallux dorsiflexion is the essence of the windlass mechanism principle.

Plantar fasciitis is one most commonly diagnosed heel pain in adults and has an impact on physical mobility. It continues to confuse doctors since there are no particular combinations of clinical, mechanical, or causative factors in the development of chronic plantar fasciitis, have been found. Hence, the optimal or preferred treatment is inadequate or even conflicting, especially when conservative measures had been exhausted and surgical intervention was not warranted. Though steroid injections are considered as one of the treatment modalities, unfortunately, it has short term results and is associated with complications.

This current study is analyzed with few relevant studies in the management of plantar fasciitis to know the efficacy, duration of relief of pain and improvement in functional activity, recurrence of symptoms, complications among Platelet-rich plasma therapy.

(Group-A) and Corticosteroid (Group-B) in terms of sample size, study period, age and gender distribution, mean scores, comparison groups in each study to observe whether the current study is similar or contrast to understand the efficacy each method and effectiveness over the other group.

Few studies which are similar to our current study are shown in the table includes a study by Mahindra et al. in 2016, Shetty et al. in 2014, Wilson et al. in 2013, Aksahin et al. in 2012.[12,13,14]

Martinelli,[15] in the year 2012, conducted a study without comparison that includes nine females and five males who were admitted between 2008 and 2009. He included patients of age ≥18 years and patients in whom heel pain felt maximally over the plantar aspect for about at least six months and with radiographic evidence showing the presence of the calcaneal spur. Martinelli initially treated the patients for three months before the start of the study with conservative therapies, like icepacks, Achilles tendon stretching, and NSAID medication, that have provided inadequate relief of pain and improvement in functionality. Excluded ankylosing spondylitis, Reiter syndrome, Rheumatoid arthritis, any wound or skin lesion in the plantar aspect of the foot, pregnancy, infection, any malignancy; bleeding disorders, previous history of surgery, ESWT or local corticosteroid injection into the heel, nerve-related symptoms like radiculopathy, tarsal tunnel syndrome, osteoarthritis of foot and ankle. Roles and

Maudsley score used at the end of follow-up at 12 months, and the results were represented as excellent in nine (64.3 %), good in two (14.3 %), acceptable in two (14.3 %), and poor in one (7.1 %) patient. The Visual analog scale score was decreased significantly from 7.1±1.1 prior to treatment to 1.9±1.5 at the end of follow- up ($p<0.01$).

Shetty et al. in 2014 in sex distribution includes 13 and 11 males respectively in corticosteroid group and PRP group. The study includes 17 and 19 females in the corticosteroid group and PRP group, respectively. In our study, 22 (55%) are female patients in both groups, and 18(45%) are male patients. In Group A, 8 (40%) are male patients, and 12 (60%) are female patients. In Group B, 10 (50%) are male patients, and 10 (50%) are female patients. The incidence is more in females. Each group has 20 subjects with 12 females and 8 male in group A and ten females and 10male in group B, respectively.

In this study, we observed that 20 patients who received the PRP injection said the results were excellent at the end of the treatment and the other 20 patients who received corticosteroid injection said the results were acceptable and short term. Pre-treatment percentage in VAS scale 84.21% of corticosteroid therapy was decreased to 69.74%, 60.53%, 53.29% respectively at regular follow ups at three weeks, six weeks, 12 weeks, and at 6th month whereas 84.44% pre-treatment score in PRP therapy group was decreased to 57.04%, 37.78%, 29.63% respectively regular follow ups.

The foot function index scores pre-treatment and post-treatment in Platelet-rich plasma therapy (Group-A) and Corticosteroid injection (Group-B) decreased from 114.8 to 27 (23.52%) at the end of follow-up and 104.25 to 48.15 (46.19%) at the end of follow-up respectively.

There was a gradual and sustained decrease in PRP therapy (Group-A), which was similar to studies done by Sahoo PK et al,[16] Shetty et al., Ferhat Say et al., which were done in comparison with Steroid injection.

The PRP action on the regeneration of plantar fascia, pain relief, and functional improvement has been described by different authors in different ways. A degenerative mechanism in Plantar fasciitis is established with histological findings such as collagen necrosis, chondroid metaplasia, and calcification Injection of PRP directly delivers platelets into the lesion, which releases platelet-derived growth factor, transforming growth factor-beta, and endothelial growth factor that accelerates tissue healing mechanism. The anti-inflammatory and antinociceptive effects of Platelet-rich plasma are well established.

The meta-analysis by Chen et al,[17] has shown that there is a significant pain relief at one and a half and three months in the CS group, but there is sustained pain relief in the PRP group at twelve weeks, which is also reflected in the current study.

Platelet Rich Plasma use in the Management of Plantar Fasciitis: A Systematic Review by Shetty et al, in their study at the end of 6 months of follow-up showed that there is no significant difference in subjects treated with PRP and corticosteroid. Whereas Wilson et Al. Conducted a study and at the end of 1 year follow up the effectiveness of PRP over corticosteroid was stated indicating more evaluation is required.

This current study was evaluated for up to the 6th-month following, which still shows results relevant to the above studies stating the effectiveness of Platelet-rich plasma therapy (PRP) over Corticosteroid (CS) injection.

A comparative study between PRP and CS revealed initial pain and function scores at three months improved in the CS group, which is followed by a drop- down to the baseline at the12 months follow-up. In contrast, improvement in the PRP group showed a sustained improvement beyond 24 months.

Rupture of plantar fascia following the repeated Corticosteroid injections is a rare but an investigated issue. In one retrospective study conducted on 120 Plantar fasciitis patients, 2.4% of cases reported plantar fascia rupture after an average of 2.67 injections.

Suzue et al. reported a case of plantar fascia rupture after 2nd dose of CS injection in a young professional player.[18]

Though in our present study, a single dose of CS injection was given in Group B patients, clinical evaluation was done at each follow-up to rule out rupture of the plantar fascia.

Plantar fasciitis patients with associated comorbidities such as uncontrolled diabetes and rheumatoid arthritis were not included in the current study. Hence, we did not face any such complications in our study groups.

In our study, almost all the patients have shown improvement clinically with pain relief following injection with Platelet-rich plasma and local corticosteroid. Patients exhibited improved functionality in daily life activities significantly within the PRP therapy group (Group-A) over the corticosteroid group (Group-B), and the effect is sustained for a longer duration. It implies that the effectiveness of a single dose of platelet-rich plasma therapy over corticosteroid injection, and it is relatively similar to the studies in the table.

Initiation of ligament and tendon healing depends on the blood clot formation and penetration of the inflammatory cytokines from the surrounding tissue. In normal healing, as inflammatory cells are recruited to the site of injury, and damaged tissues are removed, fibroblast cells begin to proliferate, and a new extracellular matrix is produced with collagen type III and the proteoglycans. Over a period, the number of inflammatory cells, proteoglycans, and type III collagen begin to decrease, which marks the beginning of the remodeling phase, which is important for restoring function to the damaged tissue. Tensile strength is increased as cross-linked type I collagen replaces type III collagen and as the

collagen fibrils change their orientation parallel to the axis of mechanical stress.[19]

Biological adjuncts like PRP could potentially aid in the initiation and propagation of the healing cascade by providing the growth factors required for regeneration. Ultrasonography evidenced significant changes in fascial thickness and signal intensity after PRP injection. Aksahin et al. examined this further and compared PRP treatment to corticosteroid treatment of chronic plantar fasciitis. 30 patients were treated with a methyl prednisone/prilocaine injection, while another 30 were treated with a PRP injection following prilocaine injection. Pain scores in both groups were significantly reduced from 6.2 to 3.4 and 7.33 to 3.93 in the steroid and PRP groups, respectively. They concluded that both methods were effective and successful in treating plantar fasciitis. When the potential complication of corticosteroid treatment was taken into consideration, PRP injection seems to be safer and at least having the same effectivity in the treatment of plantar fasciitis. When taking into consideration the potential complications of corticosteroid treatment such as spontaneous rupture, Platelet-rich plasma may provide a safer alternative.

CONCLUSION

In this study, we observed that 20 patients who received the PRP injection said the results were statistically significant at the end of the treatment at the 6th month follow up and the other 20 patients who received corticosteroid injection said the results were acceptable but are not long term. It implies that a single dose of Platelet-rich plasma injection is an efficient treatment for plantar fasciitis over local corticosteroid injections, which is sustainable over a long period for pain relief and improving the pathology of plantar fasciitis; thereby, functional activity is improved.

Limitations of the Study

Despite the improvement in function and relief of pain, there are few limitations that were encountered during the study are need for a larger size as generalization cannot be made; long-term studies that are needed to verify the effectiveness. Corticosteroid group patient's pre-test VAS and FFI are higher compared to PRP therapy group. As the Visual analog scale is subjective, there can be a visual bias. Compliance with the home rehabilitation of physical therapy is not measured, which may also give a difference in the results.

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