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A Comparative Study Between Platelet-Rich Plasma And Corticosteroid Injection For Plantar Fasciitis.

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ABSTRACT

This study aims to treat intractable plantar fasciitis with platelet-rich plasma (PRP) or corticosteroid and compare the two treatments' efficacy at 12 and 24 weeks. Plantar fasciitis is a condition that causes many people a great deal of pain and makes it difficult for them to carry out their daily activities. This research is being carried out because plantar fasciitis is a disorder that affects many people worldwide. In this study, 120 patients with chronic plantar fasciitis who were not responding to the conventional conservative treatment were randomly assigned to receive either platelet-rich plasma (PRP), steroids, or normal saline (NS). The American Orthopedic Foot and Ankle Society (AOFAS) score and the Visual Analogue Scale (VAS) were both used to gauge each patient's level of pain. A comparison was made between the outcomes of prospective pre-treatment and post-treatment analyses of the data gathered at 12 and 24 weeks. Before the beginning of the therapy, the patient's levels of pain were examined using the VAS and AOFAS scales. The results indicated no statistically significant differences between the three groups of patients regarding their degrees of pain. After 12 weeks, the groups who got PRP injections, corticosteroid injections, and PRP injections all experienced statistically significant improvements in their FAOS and VAS ratings compared to those who received NS injections. After 24 weeks, there is a statistically significant difference between the improvements in FAOS and VAS scores in the group that received PRP injections and the groups that received corticosteroid injections and NS injections, respectively. This difference is seen in the group that received PRP injections. According to the results of our study, a single injection of platelet-rich plasma is more effective than either triamcinolone or NS at easing the pain associated with chronic plantar fasciitis over a brief follow-up period. This was determined by comparing the three treatments to one another.

Keywords: Plantar Fasciitis, Corticosteroid, platelet-rich plasma, PRP.

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INTRODUCTION

Plantar fasciitis (PF) is the most frequent cause of plantar heel problems reported to the orthopedic department [1]. PF is a severely painful and crippling illness with a well-known clinical appearance. Typical findings of this condition include: however, the patient will experience discomfort and palpable soreness in the region of the medial calcaneal tuberosity, severe pain when taking the first few steps after waking up in the morning, and increasing pain with extended weight-bearing. There is no diagnostic test that is considered to be the gold standard that can confirm the diagnosis of PF [2].

The pathophysiology of PF appears to be analogous to that of Achilles tendinopathy, with microscopic degenerative abnormalities, local disruption of the collagen matrix, and microtears rather than a poor healing response [1]. Some of the numerous conservative therapy options that may effectively treat 80% of cases include rest, silicone heel cups, eccentric stretching exercises, night splints, orthotics, immobilization, and nonsteroidal anti-inflammatory drugs. These are just a few examples of the numerous conservative therapy options available [3]. Other treatment options for a small percentage of individuals with persistent plantar fasciitis include injections of platelet-rich plasma (PRP) and corticosteroids. Today, surgical release of the plantar fascia is rarely performed due to its varied effectiveness. Although a heel spur (exostosis) is frequently linked to plantar fasciitis, many patients do not have a spur. Instead, they have bony heel spurs [4-7]..

PRP contains an abundance of growth factors and cytokines, including but not limited to the following: platelet-derived growth factor (PDGF), transforming growth factor (TGF) beta, insulin growth factor (IGF)-1, insulin growth factor (IGF)-2, fibroblast growth factor (FGF), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF). Connective tissue growth factors and keratinocyte growth factors are more recent approaches to treating this excruciating and incapacitating condition. In multiple clinical trials, it has been shown to have more tremendous potential for success than other kinds of conservative treatment, such as steroid injections [8]. According to the findings of multiple studies, the use of platelet-rich plasma (PRP) as a therapy for chronic cases of plantar fasciitis that have not responded to cortisone injections is more effective and long-lasting [9].

It is generally accepted that surgery should only be used as a last resort for treating plantar fasciitis. Although there is no time restriction on making this choice, surgery is usually taken into account if symptoms do not dramatically subside within 4-6 months. Either an open or an endoscopic partial plantar fasciotomy is used for surgical treatment. [10] This study compared and contrasted the effectiveness of autologous platelet-rich plasma injection vs. local corticosteroid injection for treating plantar fasciitis.

MATERIALS AND METHODS

After receiving approval from MVJ Ethical and Scientific committee vide letter number MVJ/10/118, the trial was conducted in a tertiary care facility in southern India from April to September 2022. The study comprised 120 individuals with clinical symptoms consistent with plantar fasciitis between the ages of 20 and 60, of either sex. Patients who had previously undergone any sort of therapy, including local steroid injections and other procedures, were not included in the research.

The study did not include people with gout or rheumatoid arthritis, calcaneal spurs, calcaneal osteomyelitis, previous calcaneal fractures, compression neuropathies such as tarsal tunnel syndrome or impingement of the medial calcaneal nerve, or calcaneal spurs.

After ruling out all other potential reasons for heel pain, patients clinically determined to have plantar fasciitis had an ultrasonographic examination of the affected foot to identify the condition. Plantar fasciitis is characterized by a hypoechoic signal at the origin of the plantar fascia, which may be observed on ultrasound. This signal may suggest degeneration of the plantar fascia insertion.

The patients were randomly separated into three groups using a computer-generated sequence constructed alphabetically. This sequence was generated using the randomization program.

Patients in the first group received therapy in the form of autologous platelet-rich plasma; patients in the second group received treatment in the form of triamcinolone; and patients in the third group received a saline injection as a placebo. Both the VAS and the FAOS documented the results. The scores

were entered into the prepared proforma on the day the injection was administered, before the administration of the injection, then after 12 weeks, and finally after 24 weeks. An analysis of variance (ANOVA), a Chi-square test, and Fisher's exact test were utilized to conduct the data analysis. When comparing three or more patient groups, analysis of variance (ANOVA) has been used to determine the significance of the research parameters. In addition to that, the Chi-square test and Fisher's exact test were used. In non-parametric qualitative data analysis, the exact test has been applied to determine the relevance of research parameters on a categorical scale between two or more groups. This has been done by comparing the groups in question. Patients in all three groups were given a mixture of paracetamol and tramadol to alleviate any acute discomfort that the injections may have brought on. After receiving the injection, patients were instructed to conduct plantar fascia stretching activities, undergo heat fomentation, and wear MCR footwear.

To reduce turbulence, a scalp vein catheter extracted about 15 mL of the patient's blood for PRP preparation. Platelet-rich plasma is produced by using a differential centrifugation process with two spins. Four citrate tubes with 0.9% sodium citrate as an anticoagulant collect the blood. A lab centrifuge performed the initial spin for 15 minutes at 1500 rpm. This spin separated the RBCs from the other components. The supernatant's upper part was discarded. For the second spin, the bottom half of the supernatant from all four tubes was placed into an additional plain tube. The second spin took place for ten minutes at 2500 rpm. The top half of the second spin sample's supernatant was discarded. The lower half was removed, and 1 mL was put into a syringe with 0.1 mL of calcium chloride.

Triamcinolone was given to the members of the second group. In contrast, the members of the third group received a placebo in the form of normal saline-the anterior-posterior region of the heel, which was the area where the pain was the worst. Ethyl alcohol and a betadine solution with a 7.5% concentration were utilized to paint the skin. After administering the test dosage, 1 mL of 2% lignocaine was administered at the injection site. The suggested dose was administered after 10 minutes. The injection was administered close to the plantar fascia insertion using the peppering method. If there is any resistance during the injection, the needle is slightly withdrawn and repeated.

Regarding after-injection care, patients received instructions. For 24 to 48 hours, patients were warned not to overuse their lower limbs. After four weeks, total activity resumed if tolerated.

RESULTS

In this study, 120 patients were included. They underwent clinical evaluation, and baseline VAS and FAOS scores were collected. Following randomization, cases were treated with PRP, corticosteroids, and NS injections. Patients were asked to follow up at 12 and 24 weeks after the operation. 46 (38.3%) of the 120 participants were men, while 74 (61.7%) were women. The majority of the patients in our research, 93 (77.5%), were between the ages of 30 and 50, with an average age of 42.94 years. As a result, the age distribution in each group was similar across all groups. Out of the 120 participants, 67 (55.8%) reported a problem with their right heel, and 53 (44.2%) had a problem with their left heel. P=0.789 is not statistically significant. So, in terms of heel-side involvement, all three groups were comparable. Table 1 shows demographics and table 2 shows the side involved.

Table 1: Demographic Characteristics of Study Participants

Characteristic	Total	Men	Women
Total Participants	120	46	74
Age (years)	42.94	-	-
Age Range	30-50	-	-

Table 2: Distribution of Heel-Side Involvement

Heel-Side Involvement	Right Heel (%)
Total Participants	120
Right Heel	67 (55.8%)
Left Heel	53 (44.2%)

In this study, the three groups' mean VAS scores during the presentation were comparable (8.25±0.63 vs. 8.23±0.53 vs. 8.08±0.57; p = 0.347). At 12 weeks, these scores reduced significantly in group B (4.03±1.21) and group A (4.18±1.05) compared to group C (5.53±0.85) with a p-value <0.001. Further, at six months, the mean VAS scores in group A significantly reduced to 0.36±0.58 compared to group B and group C with 2.70±1.90 and 5.20±1.77, respectively (p<0.001). The p-value for the FAOS score at the outset is 0.682, which is statistically insignificant. As a result, the results before the injection are comparable.

At 12 weeks, the mean FAOS score of group A is 77.70±6.23, group B is 73.48±13.48, and group C is 67.83±7.18 with a p-value <0.001, which is statistically significant. Therefore, when comparing the PRP and the corticosteroid injection groups to the NS injection groups, the FAOS score improvement at 12 weeks is statistically significant in both groups.

At six months, the FAOS score of group A is 95.08±1.37, group B is 80.23±16.95, and group C is 67.15±12.54 with a p-value <0.001, which is statistically significant. Therefore, compared to the corticosteroid and NS injection groups after six months, the FAOS score improvement in the PRP injection group is statistically significant. Out of 120 participants, four patients (10%) in the corticosteroid injection group experienced skin hypopigmentation and local skin atrophy. In contrast, none of the patients in the PRP injection group did, yielding a non-significant p-value of 0.125. Regarding post-intervention local skin atrophy, there was no statistically significant difference.

At the 6-month follow-up, one patient in Group B reported experiencing discomfort again. In the group receiving corticosteroid injections, the recurrence rate was 2.5%. In the group receiving PRP injections, there were no reported recurrences.

DISCUSSION

Plantar fasciitis is the most prevalent cause of heel pain that calls for medical treatment, and it is also one of the most common causes of heel pain in general. It is more accurate to refer to plantar fasciitis as plantar fasciitis because it involves degenerative alterations in the foot fascia. Even though plantar fasciitis is usually referred to as an inflammatory ailment, the correct term is plantar fasciitis. It is thought that younger male athletes and middle-aged female athletes have a greater risk of developing plantar fasciitis than athletes of any other age group [1]. The current study also demonstrates that this issue is more common in females. Most of the patients in our study had jobs requiring extended standing and weight bearing, which is consistent with research by Daniel L. Riddle that suggests that weight-bearing at work may be a separate risk factor for plantar fasciitis [11].

Instead of a spur or other mechanical force, irritation that develops due to the disease process is the leading cause of discomfort. Traditional medical treatments have focused on reducing the alleged inflammation. Ice, nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections, rest and activity modification, botulinum toxin type A injections, night splinting, shoe adjustments, taping, and orthoses are only some of the available treatments.

Other therapy approaches have centered on the degradation that the illness process brings about. These methods aim to start the healing process again by inducing an acute inflammatory response. These methods include surgical treatments, extracorporeal shock-wave therapy (ESWT), nitroglycerin patches, PRP injection, autologous blood injection, and surgical procedures. Formal physical therapy components may target both of these objectives.

The goal of the current study was to compare the effectiveness and role of autologous PRP injection with local corticosteroid injection and NS-Placebo injection in treating plantar fasciitis. Most of the patients

in groups A (80%), B (77.5%), and C (75%) were aged between 30 and 50 years. The mean age in group A was 43.60±8.02 years; in group B, it was 41.48±9.14; in group C, the mean age was 43.75±9.03 years, suggesting all three groups were comparable concerning age (p = 0.431). All patients' mean age was 42.94 +/- 8.73 years. In their study, Ertufrul Akoahin et al. observed that the mean age of all patients was 46.03 +/- 8.96 years [1, 9].

In this study, the male-to-female ratio was 1:1.66 in Group A, 1:1.47 in Group B, and 1:1.72 in Group C, with a modest female majority in each group (62.5%, 57.5, and 65%). This distinction, however, was not statistically significant (P = 0.104). Similar findings were found in the study by Riddle et al., which indicated that middle-aged women and athletically inclined young men were more likely to get plantar fasciitis [1, 12].

In the current study, most patients in groups A, B, and C had proper foot involvement (52.5, 60, and 55%, respectively). However, p=0.138 indicates that this was not statistically significant.

The mean duration of symptoms in groups A, B, and C was 6.80±2.94, 6.68±2.82, and 7.10±2.89 months, respectively. Thus, all the groups were comparable in terms of the duration of symptoms (p-value = 0.795).
At presentation, the mean VAS scores were comparable in all three groups (8.25±0.63 vs. 8.23±0.53 vs. 8.08±0.57; P = 0.347), statistically insignificant. As a result, every demographic and clinical factor was comparable across all groups. The pre-treatment VAS scores in the Monto RR trial were similar [13].

At 12 weeks, these scores reduced significantly in group B (4.03±1.21) and group A (4.18±1.05) compared to group C (5.53±0.85) with a p-value <0.001. Further, at six months, the mean VAS scores in group A significantly reduced to 0.36±0.58 compared to group B and group C with 2.70±1.90 and 5.20±1.77, respectively (p<0.001). The p-value for the FAOS score at the outset is 0.682, which is statistically insignificant. values are depicted in table number 3

Table 3: VAS Score distribution in three groups of patients studied

VAS Score	Before	12 weeks	6 months	% Difference
Group A (n=40)				
0	0(0%)	0(0%)	28(70%)	70%
1-3	0(0%)	18(45%)	12(30%)	30%
4-6	0(0%)	22(55%)	0(0%)	0.0%
7-10	40(100%)	0(0%)	0(0%)	-100.0%
Group B (n=40)				
0	0(0%)	0(0%)	10(25%)	25.0%
1-3	0(0%)	16(40%)	15(37.5%)	37.5%
4-6	0(0%)	22(55%)	15(37.5%)	35.5%
7-10	40(100%)	2(5%)	0(0%)	-100.0%
Group C (n=40)				
0	0(0%)	0(0%)	0(0%)	0.0%
1-3	0(0%)	0(0%)	8(20%)	20.0%
4-6	0(0%)	35(87.5%)	22(55%)	55.0%
7-10	40(100%)	5(12.5%)	10(25%)	-75.0%
P value	1.000	<0.001	<0.001	-

Hence, the outcome values before the injection are comparable. At 12 weeks, the mean FAOS scores of groups A and B improved to 77.70±6.23 and 73.48±13.48 compared to group C's 67.83±7.18, which is statistically significant (p-value <0.001). Therefore, when comparing the PRP and the corticosteroid injection groups to the NS injection groups, the FAOS score improvement at 12 weeks is statistically significant in both groups.

At six months, FAOS scores in group A are 95.08±1.37, group B is 80.23±16.95, and group C is 67.15±12.54 with a p-value <0.001. In contrast to the corticosteroid injection group and the NS injection group, the improvement in the PRP injection group is statistically significant. values are depicted in table number 4.

Table 4: FAOS distribution in three groups of patients studied

FAOS	Before	12 weeks	6 months	% Difference
Group A (n=40)				
1-25	0(0%)	0(0%)	0(0%)	0.0%
26-50	22(55%)	0(0%)	0(0%)	-55.0%
51-75	18(45%)	15(37.5%)	0(0%)	-45.0%
76-100	0(0%)	25(62.5%)	40(100%)	100.0%
Group B (n=40)				
1-25	1(2.5%)	1(2.5%)	1(2.5%)	0.0%
26-50	19(47.5%)	0(0%)	1(2.5%)	-45.0%
51-75	20(50%)	20(50%)	8(20%)	-30.0%
76-100	0(0%)	19(47.5%)	30(75%)	75.0%
Group C (n=40)				
1-25	0(0%)	0(0%)	0(0%)	0.0%
26-50	18(45%)	0(0%)	0(0%)	-45.0%
51-75	22(55%)	33(82.5%)	29(72.5%)	17.5%
76-100	0(0%)	7(17.5%)	11(27.5%)	27.5%
P value	0.682	<0.001	<0.001	-

Four patients (10%) exhibited skin hypopigmentation and local skin atrophy in the corticosteroid injection group. However, none of the patients in the PRP injection group had this issue. Post-intervention, local skin atrophy was not statistically significant (p-value = 0.125). Both treatments effectively treated plantar fasciitis in the research by Ertufrul Akoahin et al., who found that the corticosteroid injection was connected to the same adverse effects as the other approach. In light of the potential risks associated with corticosteroid treatment, platelet-rich plasma (PRP) injection appears to be a more prudent and, at the very least, equally effective option for treating plantar fasciitis [9].

In the current study, patients in group A did not have pain recurrence, but 2.5% of patients in group B did, indicating considerably lower recurrence rates (p = 0.003, statistically significant). At six months of follow-up, significantly more patients (92.50%) in Group A were utterly relieved of pain. In contrast, more than half (77.5%) of patients in Group B and up to 92.5% in Group C were not completely relieved of pain (p = 0.001).

The results of the current investigation were comparable to those of a similar study that Pankaj Mahindra and colleagues conducted in 2016. According to the findings of that study, a local injection of platelet-rich plasma (PRP) or corticosteroid is a promising treatment option for patients who suffer from chronic plantar fasciitis. The results of the most recent inquiry were comparable to the study's conclusions in 2016. Following a monitoring period of three months, the authors concluded that PRP injection is either just as successful as corticosteroid injection or even more successful than it is [14]. In our study, the platelet-rich group saw considerable pain alleviation and an improvement in FAOS at six months compared to the steroid group. Table *5* summarizes the previous studies.

Table 5: Summary of Previous Studies on PRP Treatment in Chronic Plantar Fasciitis

Study	Design	Doses of PRP	Assessment Method	Follow-up	Conclusion
Pankaj et al (2016) [14]	Comparison BW PRP-TRICORT-NS	1	VAS, AOFAS	0w, 3w, 3m	PRP is as effective as or more effective than steroid in chronic plantar fasciitis.
Monto RR (2014) [15]	Comparison between PRP and corticosteroid injection	1	AOFAS score	0, 3, 6, 12, 24 mo	PRP more effective and durable than corticosteroid injection. Limitation: Lack of comparison with other studies.
Martinelli et al (2013) [16]	PRP injection in 14 patients	3	VAS score, Roles and Maudsley score	12 mo	PRP injection effective in treatment.
Kumar et al (2013) [17]	PRP injection in 44 patients (50 heels)	1	VAS score, AOFAS score, Roles and Maudsley score	6 mo	PRP injection effective in treatment.
Aksahin et al (2012) [18]	Comparison between PRP injection and steroid injection (60 patients)	1	VAS score, Modified Roles and Maudsley score	3 wk, 6 mo	PRP injection as effective as corticosteroid injection.
Current Study	RCT between PRP-TRICORT-NS	1	VAS score, FAOS	0, 3, 6 mo	PRP more effective and durable than steroid injection and NS.

Limitations

As a single Centre study, it will need a more extensive multicentric analysis to get a clearer picture. Long-term follow-up is needed for assessment of the effect of the treatment.

CONCLUSIONS

Platelet-rich plasma is superior to triamcinolone and saline in terms of its potential to treat the pain associated with recurrent plantar fasciitis throughout a short follow-up period, as indicated by our research findings. Saline was also found to be effective in this regard. However, multicenter randomized controlled trials are required to demonstrate that Platelet Rich Plasma is helpful over an extended follow-up period and to establish further evidence-based therapy in managing recurrent plantar fasciitis.

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