Section: Orthopaedics

Original Research Article

A COMPARATIVE PROSPECTIVE STUDY OF FUNCTIONAL OUTCOME IN PLANTAR FASCIITIS TREATED WITH LOCAL STEROID INJECTION VERSUS LOCAL PLATELET RICH PLASMA INJECTION

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Abstract

Background: Plantar fasciitis is one of the most common causes of heel pain encountered in orthopaedic practice, affecting individuals across diverse age groups and lifestyles. We conducted a study aimed to evaluate the functional outcomes of intralesional corticosteroid versus Platelet-Rich Plasma injection in the treatment of plantar fasciitis. **Materials and Methods:** This Interventional study was conducted at the Department of Orthopaedics, N.S.C.B. Medical College, Jabalpur (M.P.) from September 2022 to June 2024. A total of 64 patients (Feet) suffering from plantar fasciitis were included in the study. The subjects were randomized with corticosteroid injection given to left foot and PRP injected in right foot. Follow-up assessment was done at 1 week, 1 month, and 3 months with Visual Analog Scale and American Orthopaedic Foot & Ankle Society (AOFAS) Hindfoot Score. **Result:** The results of this study reveal distinct patterns of improvement over time between PRP and corticosteroid injections. Initially, at the 1-week follow-up, corticosteroid injections demonstrated a significant improvement in both VAS and AOFAS scores compared to PRP injections. By the 1-month follow-up, both treatment groups showed significant improvements compared to their pre-procedural baseline values. At the 3-month evaluation, PRP injections showed a significant improvement in both VAS and AOFAS scores compared to corticosteroid injections. **Conclusion:** There is a rapid reduction in pain and enhancement in functional outcomes with corticosteroids. There was no significant difference observed between PRP and corticosteroid injections at 1-month follow-up, indicating comparable effectiveness in the medium term. While corticosteroids may provide initial relief, PRP injections might offer superior long-term benefits in terms of pain reduction and functional recovery in plantar fasciitis patients.

INTRODUCTION

Plantar fasciitis is a common musculoskeletal disorder characterized by pain involving the inferomedial aspect of the heel that is exacerbated following periods of non-weightbearing.[1] Plantar fasciitis is the leading cause of heel discomfort, affecting approximately 1 in 10 individuals during their lifetime, with about 2,000,000 Americans affected each year. Females are 2.5 times more likely to experience this condition, and it predominantly affects individuals aged 40-50 years. Moreover, a higher body mass index (BMI) is associated with an increased risk of developing plantar fasciitis.[2] Over time, the condition has been referred to by numerous names including heel spur syndrome, runner's heel, subcalcaneal pain, calcaneodynia, calcaneal periostitis, painful heel syndrome, medial arch sprain, and stone bruise.[3] The suffix "itis" in plantar fasciitis suggests inflammation from repetitive microtrauma, but Lemont et al found no evidence of inflammation and described the condition as fasciosis.[4,5] It is diagnosed based on history and clinical findings, including heel pain most severe with the first steps in the morning, tenderness at the

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medial calcaneal tuberosity, and normal X-rays, while >4 mm thickness in USG is considered diagnostic.

Heel pain often resolves within a year for many patients, but it can impact daily activities, leading them to seek medical help sooner. Conservative treatments alone help 70-80% of patients, but some require additional therapies. Treatment aims to reduce pain, improve healing, restore motion, and address any foot abnormalities. Initially, treatments include NSAIDs, foot orthoses, night splints, and physiotherapy for about six weeks. If pain continues, options like corticosteroid injections, prolotherapy, platelet-rich plasma (PRP), Low-Level Laser Therapy (LLLT), extracorporeal shock wave therapy and other methods may be considered. Short leg casts, manual therapies (e.g., massage, joint mobilizations), and mechanical treatments (e.g., insoles, night splints, Kinesiotaping) are also used. Needling therapies, such as acupuncture and dry needling, target trigger points. NSAIDs/paracetamol is used for pain control and recovery. Corticosteroids, though commonly used, might not address the degenerative nature of plantar fasciitis. Dextrose prolotherapy and PRP focus on healing through growth factors and cell repair.[6-9] Surgical release of the plantar fascia, typically a partial or endoscopic procedure, is considered for 5-10% of patients who do not respond to several months of conservative treatment, aiming to alleviate symptoms with reduced complications and recovery time.[10] Today it is accepted that plantar fasciitis is a degenerative pathology rather than an inflammatory process. Operative specimens show the histological evidence of degenerative changes in the plantar fascia and chronic inflammatory changes with or without fibroblastic proliferation.[4,11] On the basis of these findings, we hypothesized that the treatment of plantar fasciitis with PRP, which includes many growth factors that play a role in the regeneration process, should be more effective than steroid injection. In this study, the results of local injection of PRP and corticosteroids in the treatment of plantar fasciitis were compared.

MATERIALS AND METHODS

Patients aged more than 18 years who were diagnosed with plantar fasciitis and treated conservatively for at least 3 months but had no response to conservative treatment modalities were involved in this study. The exclusion criteria were history of any previous injection treatment or surgery for heel pain, having any other associated pathology involving the lower limb, such as a history of tarsal tunnel syndrome or effusion around the ankle indicating an intra-articular disease, calcaneal fracture, calcaneal bone cysts, bone tumor, osteomyelitis, achilles tendinopathy abnormal erythrocyte sedimentation rate or C-reactive protein level, history of any other disease capable of inducing pain or sensitivity to foot like seronegative arthritis, fibromyalgia, Vitamin D deficiency, Vitamin B12 deficiency, Hypo- or Hyperthyroidism, any systemic disorders such as diabetes, rheumatoid arthritis, haematological diseases, diabetes mellitus, gout and pregnancy.

The research was done on an outpatient basis. Total 49 patients (64 feet) were taken for study. The subjects were assigned to corticosteroid group in whom left foot is involved and PRP is injected in patients with right foot involvement. Patients with bilateral plantar fasciitis were counted as two cases and assigned to both groups with left foot receiving corticosteroid and the other receiving PRP injection.

Figure 1: Injection of PRP (Right) & Steroid (Left)

Drug preparation and application

We used a double spin technique to concentrate platelets from autologous blood. 20 ml venous blood is collected and divided into two equal tubes containing EDTA as anticoagulant. The tubes were centrifuged at 3000 rpm for 10 min to separate erythrocytes (SOFT SPIN), and at 5000 rpm for 10 min to concentrate platelets (HARD SPIN) after which around 2-3 ml PRP is yielded12, 13, 14. For corticosteroid combination of 40mg (1ml) of Inj. Triamcinolone acetonide and 1ml of 2% xylocaine is made. Injection was performed by the same investigator with patients positioned in lateral decubitus position with affected limb down. Injections were performed by palpating the maximally tender point with a medial approach which usually coincides at the intersection of line drawn along posterior border of medial malleoli extending inferiorly and another line at the junction of thick and thin skin of the foot.

Figure 2: Plantar Fascia Stretching Physiotherapy

After the procedure, patients were prescribed acetaminophen for 3 days in addition to elevation of the limb. They were advised to wear comfortable

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shoes and avoid all running and other high impact activities for 10 days. A standardized stretching program for the Achilles tendon and the plantar fascia was given to all patients.

Follow up and outcome evaluation

Patients were followed up at 1 week, 1 month and 3 months and evaluated using American Orthopaedic Foot and Ankle Society (AOFAS) Hindfoot score and Visual Analogue Scale (VAS) score.

Statistical analysis: All the records and data were rechecked for their completeness and consistencies. Non numeric entries were coded numerically into nominal /ordinal distribution before analysis. Key for numerical coding was prepared. The data obtained was analyzed using the Statistical Package for the Social Sciences (SPSS) 21.0 version. All continuous data was expressed in terms of the mean and the standard deviation of the mean. To assess the differences in the mean of the two groups, T-test was performed. The non-parametric Pearson's Chi-square test was performed to investigate the relationships between grouping variables. For all these tests, $p < 0.05$ was considered significant.

RESULTS

No local or systemic complications were seen in any patient during the application or follow-up. Mean age of patients suffering from plantar fasciitis was 40.68 ± 12.38(range 19-73). Out of 64 cases, 38 cases (59%) were between 30-49 years of age.

In our study, a total of 49 patients (64 feet) of plantar fasciitis were included of which 34 (53%) were males and 30(47%) were females. Female predominance could be seen in most of the studies but in our study we found that male predominance is more than female15, 16, 17, 18.

The mean BMI in our study subjects was 24.32 ± 3.34 ranging from 17.6 to 30.1. The mean BMI varies in various studies but is on the higher side of the spectrum (overweight) for most of the studies15, 17, 19. This signifies that higher BMI is seen in patients with plantar fasciitis.

Out of 49 cases (64 feet) in our study 34 were unilateral while 15 cases were bilateral. Intralesional PRP injection group showed significant increase in AOFAS score at all 3 follow ups. The mean AOFAS score pre injection was 50.75 ± 12.65, at 1 week was 72.25 ± 10.22, at 1 month was 88.59 ±5.57 and at 3 months was 90.56 ± 7.31. There was a statistically significant increase in AOFAS score at all three follow ups (p=0.001) and the mean difference at 3 months was 39.81. (Table.1)

It also showed significant reduction in VAS score at all 3 follow ups. The mean VAS score pre injection was 7.50 ± 1.31, at 1 week was 5.91 ± 1.22, at 1 month was 3.93 ± 1.18 and at 3 months was 3.18 ± 1.65. There was a statistically significant decrease in VAS score at all three follow ups (p=0.001) and the mean difference at 3 months was 4.32. (Table.1)

In corticosteroid group with significant improvements in outcomes measured at all three follow up compared to pre procedural values with maximum effect in 1 month of follow up. (Table.2)

When the two groups were compared, the outcomes were statistically significant showing that intralesional corticosteroids has better action in reducing pain and increasing the AOFAS score in patients with plantar fasciitis at 1 week of follow up. At 1 month follow up it is found that both have insignificant difference in improvement of symptoms. When compared at 3 months of follow up Intralesional PRP injection has better results compared to Intralesional steroid injection. (Table.3)

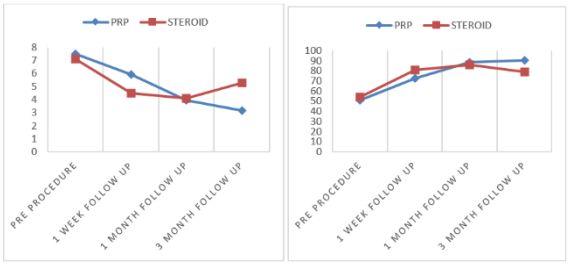

Figure 3: Baseline, 1st week, 6th weeks & 3rd months VAS (Right) and AOFAS (Left) of both groups.

Table 1: Pre-procedural values vs Values at 1 wk, 1 month, 3 months follow up in PRP group.

AOFAS Score	Paired Difference of Mean	p-value
Pre Injection v/s 1 Week Follow Up	-21.50	.001
Pre Injection v/s 1 Month Follow Up	-37.84	.001
Pre Injection v/s 3 Month Follow Up	-39.8	.001
VAS Score	Paired Difference of Mean	p-value
Pre Injection v/s 1 Week Follow Up	1.59	.001
Pre Injection v/s 1 Month Follow Up	3.56	.001
Pre Injection v/s 3 Month Follow Up	4.31	.001

Table 2: Preprocedural values vs Values at 1 wk, 1 month, 3 months follow up in Steroid group

AOFAS Score	Paired Difference of Mean	p-value
Pre Injection v/s 1 Week Follow Up	-26.56	.001
Pre Injection v/s 1 Month Follow Up	-31.63	.001
Pre Injection v/s 3 Month Follow Up	-24.47	.001
VAS Score	Paired Difference of Mean	p-value
Pre Injection v/s 1 Week Follow Up	2.59	.001
Pre Injection v/s 1 Month Follow Up	3.00	.001
Pre Injection v/s 3 Month Follow Up	1.81	.001

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Table 3: Comparative Statistics at Pre-procedure and all follow up (PRP vs Steroid)

	Mean AOFAS Score			Mean VAS Score		
	PRP	**STEROID**	**p-Value**	**PRP**	**STEROID**	**p-Value**
Pre Procedure	50.75	54.16	.286	7.50	7.09	.231
1 Week Follow Up	72.25	80.72	.001	5.91	4.50	.001
1 Month Follow Up	88.59	85.78	.113	3.93	4.09	.516
3 Months Follow Up	90.56	78.63	.001	3.19	5.28	.001

DISCUSSION

The term 'Plantar Fasciitis' is synonymous with inflammation of the plantar fascia. Earlier plantar fasciitis was considered to be caused due to inflammatory processes at the insertion of plantar fascia. Histological studies and Electron microscopy has now shown that there are no inflammatory changes in plantar fasciitis. Instead, we've now found out that in plantar fasciitis there is presence of degenerative non inflammatory pathologic changes in the fascia near its insertion at the medial calcaneal tuberosity.[12,13] This change in understanding of the etiopathogenesis has led to a change in the treatment modalities being considered for plantar fasciitis. Intralesional corticosteroids which act by reducing inflammation was the most sought after treatment earlier.[14] But nowadays, studies have shown that prolotherapy and platelet rich plasma are also effective modalities. Multiple different forms of treatment are now being used to treat plantar fasciitis including botulinum toxin, extracorporeal shock wave therapy, multiple puncture technique, dry needling etc. Percutaneous, endoscopic and open plantar fascia releases are considered for recalcitrant cases. The role of nonsteroidal antiinflammatory drugs (NSAIDs), foot orthoses, night splints and physiotherapy has stayed vital in initial days of treatment and as an adjunct to local procedures.[15,16]

In our study, we compared intalesional PRP injection for plantar fasciitis and compare its therapeutic effect with Intralesional corticosteroids, the age old treatment of plantar fasciitis.[17]

The use of autologous PRP is not a novel treatment method. The healing process, which is the body's natural response to injury or surgery, is extensively documented. It relies on proteins carried to the site of injury by platelets and white blood cells, as well as proteins present in plasma. Successful tissue healing and regeneration require a scaffold or matrix, undifferentiated cells, and signal proteins such as growth factors and adhesion molecules. Platelets are known to influence the mitogenic activity of cells like osteoblasts, chondroblasts, or tenoblasts. Injecting PRP into affected tissues targets the stages of healing necessary to reverse the degenerative processes occurring at the base of the plantar fascia. PRP contains four to six times the normal concentration of growth factors, promoting the migration of fibrocytes and stimulating the growth of neurovascular tissues. The individual cytokines present in the platelet granules have been shown to enhance fibroblast migration and proliferation, up-regulate vascularization, and increase collagen deposition. The cytokines present in platelet granules have been shown to affect the healing stages necessary to reverse a chronic plantar fasciitis. Transforming growth factor1 is shown to signficantly increase type I collagen production by tendon sheath fibroblast. Additionally, many of these cytokines have been thought to work in a dose dependent manner.[18-20]

One of the greatest benefits to this treatment is that the patient uses his or her own blood for the procedures. This eliminates all kinds of potential problems including disease transmission and tissue rejection.[21]

Corticosteroids, on the other hand act by inhibition of synthesis of arachidonic acid from membrane phospholipids to reduce inflammation and pain. It has also been shown to inhibit fibroblast proliferation and expression of ground substance proteins, decreasing the degenerative changes in the plantar fascia.

No severe side effects were noted in any patient in both the groups. The most common complaint was increased pain immediately after procedure which lasted 2-3 days for which analgesics (paracetamol) were given for 3 days post injection. In two patients of corticosteroid group bluish discoloration of skin was seen near the injection site for which antibiotics were given for a week and the complaint was resolved.

CONCLUSION

At 1 week, corticosteroids led to greater improvements in pain and function compared to PRP. By 1 month, both treatments showed significant progress from baseline, with no major difference between them. However, by 3 months, PRP injections were significantly more effective than corticosteroids in improving pain and function, suggesting that PRP may provide better long-term benefits.

While the study shows promising results, it has limitations such as a small sample size, short follow-up duration, and the natural tendency of plantar fasciitis to improve on its own. It also did not consider the impact of physiotherapy and lifestyle changes, which are recommended after injections. Future research should address these issues by using larger sample sizes, longer follow-up periods, and including adjunct therapies. Additionally, studying individual patient factors and responses could help improve treatment protocols and outcomes.

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