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Therapeutic Efficacy of Platelet-Rich Plasma Injection Compared to Corticosteroid Injection in Plantar Fasciitis

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KEYWORDS

Plantar fasciitis, platelet-rich plasma, corticosteroid injection, regenerative therapy, pain management, musculoskeletal disorders, randomized controlled trial, functional rehabilitation, tissue healing, clinical efficacy..

ABSTRACT:

Objective: This study aimed to conduct a comprehensive comparative evaluation of the therapeutic efficacy of platelet-rich plasma injections versus corticosteroid injections in the management of plantar fasciitis.

Methodology: A meticulously designed prospective, randomized controlled trial was carried out on 90 patients diagnosed with chronic plantar fasciitis, all of whom had failed to respond to conservative interventions for a minimum duration of three months. The participants were randomly allocated into two treatment groups: Group A received corticosteroid injections (40 mg methylprednisolone combined with 2 mL of lidocaine), while Group B underwent PRP therapy, where autologous platelet-rich plasma was prepared through a standardized double-centrifugation process. The efficacy of the treatments was rigorously assessed using multiple objective and subjective outcome measures, including the Visual Analog Scale for pain intensity, the American Orthopaedic Foot and Ankle Society Ankle-Hindfoot Scale for functional assessment, the Foot and Ankle Instrument Core Scale for overall foot health evaluation, and ultrasound-based measurements of plantar fascia thickness. Patients were monitored and systematically evaluated at 1-, 3-, and 6-months post-injection to determine both the immediate and sustained effects of each intervention.

Results: The results revealed a distinct temporal contrast between the two treatment modalities. Corticosteroid injections demonstrated a more pronounced and immediate analgesic effect, yielding significantly lower VAS scores at 1 month ($p = 0.005$) and 3 months ($p = 0.003$) compared to PRP. However, by the six-month follow-up, the pain-relief outcomes between the two groups converged, with no statistically significant difference in VAS scores ($p = 0.507$). Functional assessments exhibited a similar trend; corticosteroids facilitated a more rapid improvement in mobility and symptom relief, while PRP therapy, though slower in onset, provided a progressive and sustained enhancement in foot function. By six months, a significantly higher proportion of patients in the PRP group achieved “excellent” functional outcomes. Ultrasound-based structural analysis further corroborated these findings—while corticosteroids induced an immediate reduction in plantar

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fascia thickness, PRP therapy exhibited a more consistent and sustained decrease over time ($p = 0.015$ at 1 month, $p = 0.020$ at 3 months). This suggested that PRP not only alleviated symptoms but also played a pivotal role in tissue regeneration and long-term healing.

Conclusion: The study concluded that corticosteroid injections served as an effective short-term intervention for providing rapid symptomatic relief in plantar fasciitis. However, PRP therapy emerged as a superior long-term therapeutic alternative, demonstrating its regenerative potential in promoting sustained pain reduction, functional recovery, and structural healing of the plantar fascia. Given the risks associated with repeated corticosteroid use, including potential tendon degradation and fat pad atrophy, PRP may represent a more viable option for patients seeking durable recovery without compromising tissue integrity. Future research should be directed toward optimizing PRP preparation protocols, refining injection techniques, and further elucidating the patient subgroups that would derive maximal benefit from this regenerative treatment.

Background:

Plantar fasciitis, one of the most common and debilitating musculoskeletal conditions, is characterized by inflammation and degeneration of the plantar fascia, a thick band of connective tissue that spans the bottom of the foot. This disorder predominantly arises from repetitive stress or mechanical overload, leading to microtears and subsequent inflammatory changes at the attachment of the fascia to the calcaneus (heel bone) (1). The condition disproportionately affects athletes, individuals with elevated body mass index, and those engaged in prolonged periods of standing or walking. PF typically manifests as a sharp, stabbing pain, especially upon taking the first steps after a period of rest, and may persist throughout the day, severely affecting daily activities. It is estimated that up to 10% of the general population will experience this condition at some point in their lives, making it a prevalent source of heel pain and a significant clinical concern (2).

The treatment of plantar fasciitis has evolved over time, with a broad range of therapeutic options explored, ranging from conservative approaches such as physical therapy, stretching exercises, and the use of orthotic devices to more invasive interventions like corticosteroid injections and, in severe cases, surgical procedures (3). While most cases of PF resolve with conservative management, those with persistent or debilitating symptoms often face functional limitations and prolonged discomfort, requiring more aggressive and targeted treatment strategies. As a result, clinicians are increasingly tasked with finding the most effective and safe interventions for managing this disorder and alleviating the associated pain (4).

Corticosteroid injections have long been a mainstay in the management of inflammatory musculoskeletal disorders, including plantar fasciitis. By targeting the inflammatory process through the inhibition of phospholipase A2, corticosteroids reduce the production of key inflammatory mediators such as prostaglandins. This mechanism provides rapid relief from pain and inflammation, making corticosteroid injections a popular choice for individuals seeking immediate symptomatic relief (5). However, the long-term safety and effectiveness of corticosteroids have been questioned, with concerns surrounding potential adverse effects such as tendon weakening, fat pad atrophy, and the risk of symptom recurrence. These concerns have prompted a search for alternative treatment modalities that offer better safety profiles while still providing effective clinical outcomes (6).

In recent years, platelet-rich plasma therapy has garnered significant attention as a promising alternative to corticosteroid injections for the treatment of chronic tendinopathies, including plantar fasciitis. PRP is a biologically derived treatment obtained from the patient's own blood, which is centrifuged to concentrate platelets (7). These platelets contain a high concentration of growth factors, such as platelet-derived growth factor, transforming growth factor-beta, and vascular endothelial growth factor, all of which are known to play a crucial role in tissue repair and regeneration. The objective of PRP therapy is to stimulate the body's natural healing mechanisms,

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enhance tissue regeneration, and promote the healing of damaged tissues, offering a potential solution for patients with chronic PF who have not responded to traditional treatments (8).

The comparative therapeutic efficacy of PRP and corticosteroid injections for the management of plantar fasciitis remains a subject of intense debate in the medical literature. While corticosteroids are known for providing rapid pain relief, their long-term benefits remain uncertain, and their potential for causing adverse side effects has prompted the exploration of more regenerative therapies like PRP (9). The latter's regenerative properties offer the possibility of promoting healing while avoiding the risks associated with corticosteroid use. However, the body of evidence comparing the two therapies is inconsistent, with some studies suggesting that PRP injections yield superior long-term benefits, while others indicate that corticosteroid injections remain a viable first-line treatment due to their more immediate effects (10).

Several meta-analyses and systematic reviews have attempted to synthesize the available evidence regarding the effectiveness of PRP and corticosteroid injections in treating plantar fasciitis. These studies have produced mixed findings, which may be attributable to variations in study designs, patient populations, sample sizes, injection techniques, and the protocols used for PRP preparation (11–13). Some studies suggest that PRP injections provide superior long-term outcomes in terms of pain reduction, functional improvement, and overall patient satisfaction (14). Conversely, other studies assert that corticosteroid injections remain more effective in the short term, offering rapid relief and a quicker return to normal function. This disparity highlights the need for further high-quality research to clarify the relative merits of these two treatment modalities and provide more definitive guidance for clinicians (15).

In clinical practice, both PRP and corticosteroid injections remain widely employed in the management of plantar fasciitis, and clinicians often face the challenge of determining the most appropriate intervention for each patient. Treatment decisions are influenced by factors such as the severity of symptoms, the duration of the condition, patient preferences, and the potential for adverse effects (16). While corticosteroids may offer rapid symptomatic relief, PRP presents a more regenerative approach that could provide longer-term benefits. Ultimately, a deeper understanding of the comparative efficacy of these treatments will assist clinicians in making informed decisions and tailoring interventions to the individual needs of their patients (17).

The comparative therapeutic efficacy of platelet-rich plasma injections and corticosteroid injections in the treatment of plantar fasciitis represents a complex and evolving issue. While corticosteroid injections offer fast-acting pain relief, their potential for long-term complications necessitates careful consideration. PRP, with its regenerative capabilities, offers an alternative approach with the promise of promoting healing without the side effects associated with corticosteroids (18,19). However, the available evidence remains inconclusive, requiring further investigation to determine the most effective treatment strategy for this prevalent and often challenging condition. This review aims to critically evaluate the current literature, compare the two treatment modalities, and provide insights into their respective roles in the management of plantar fasciitis.

Aim of the study

The aim of this study is to critically evaluate and compare the therapeutic efficacy of platelet-rich plasma injections and corticosteroid injections in the treatment of plantar fasciitis.

Objective

To assess the relative outcomes of PRP and corticosteroid injections in terms of pain reduction, functional improvement, and long-term benefits for individuals with plantar fasciitis.

Methodology

This study employed a prospective, randomized controlled trial design to rigorously evaluate and compare the therapeutic efficacy of platelet-rich plasma injections versus corticosteroid injections in the treatment of plantar fasciitis. A total of 90 patients diagnosed with plantar fasciitis, who had failed to respond to conservative treatments for at least three months, were recruited for the study. Participants were randomly assigned to one of two groups: the PRP

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injection group or the corticosteroid injection group. The study was conducted over a period of 2 years, with follow-up evaluations carried out at regular intervals (e.g., 3-, 6-, and 12-months post-treatment) to assess both primary and secondary outcomes.

Inclusion Criteria

The inclusion criteria for this study required patients to have a confirmed diagnosis of plantar fasciitis. Participants were selected based on their failure to respond to conservative management strategies, including stretching exercises, nonsteroidal anti-inflammatory drugs, and the use of heel pads, for a minimum duration of three months. Only individuals who demonstrated the capacity to understand and provide informed consent were eligible for participation. Additionally, eligible patients were required to report a Visual Analog Scale pain score greater than 5 on a 10-point scale, indicating a moderate to severe level of pain associated with their condition.

Exclusion Criteria

- The exclusion criteria for this study:
- Previous administration of local injection treatments for heel pain.
    - A history of surgical intervention for heel pain.
    - Presence of concurrent lower limb pathologies, including:
    - History of tarsal tunnel syndrome.
    - Ankle effusion indicative of intra-articular disease.
    - Old healed calcaneal fractures.
    - Achilles tendinopathy.
    - Structural deformities of the foot or ankle, such as pes planus or pes cavus.
- Patients with systemic disorders, including but not limited to diabetes mellitus, rheumatoid arthritis, hematologic diseases, or gout.
- Pregnancy.
- A recent history of aspirin or aspirin-like drug consumption.

Preparation of PRP

An 18-gauge needle was used to collect 27 mL of peripheral whole blood from the patient in a sterile environment. Next, we added 3 mL of sodium citrate at a 1:9 ratio, resulting in the production of about 3 mL of platelet-rich plasma (PRP) through double centrifugation. The first centrifugation was performed at 1300 revolutions per minute (rpm) for ten minutes in order to separate the erythrocytes. The platelets were then concentrated in a second centrifuge at 3500 rpm for 10 minutes. The injection was administered using precise aseptic techniques.

The injection site was first cleansed with a 10% povidone iodine scrub, and then it was wrapped with sterile cloths.

The patient was positioned prone, and the ankle was kept in neutral alignment while the injection was given by finding the most sensitive part of the heel using a medial approach.

Patients in Group A were given 2 mL (40 mg) of methylprednisolone along with 2 mL of 2% lidocaine hydrochloride while they were on corticosteroid therapy. By comparison, patients in group B who underwent PRP were given 3 mL of PRP after 2 mL of 2% lidocaine hydrochloride was injected. A 22-gauge needle was used to inject medicine into the plantar fascia at its heel origin, which is the most sensitive part of the fascia. This was done by puncturing the skin once and going through it four or five times.

Post procedure Protocol

The patients were kept in a sitting position without shifting their feet immediately after the injection and were monitored for 15 to 20 minutes. They were released if they felt comfortable. They were instructed to refrain from engaging in high-impact activities for a week and to apply ice to the area where they received the injection to control swelling and pain. All patients were taught how to stretch their Achilles tendon and plantar fascia. Patients may use paracetamol to relieve pain after an injection.

Data Collection

The two-year research project was approved by the hospital's ethical and scientific council. The diagnosis was made based on certain clinical findings, including tenderness in the plantar medial heel area when touched, pain that is most noticeable with the first steps after a period of inactivity, worsened pain after

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extended weight-bearing, and pain that is caused by an increase in weight-bearing activity. Demographic and clinical information was collected for each patient, including their age, sex, height, weight, body mass index, and type of shoe wear. A comprehensive history was obtained to evaluate previous treatments, any foot injuries that may have occurred in the past, and the existence of systemic disorders. In addition to regular exams, lateral radiographs of the hurt heel were taken to rule out any diseases that might be related, and ultrasonic waves were used to check the plantar fascia's thickness. The experiment utilized a randomized controlled design, which meant that patients were assigned to one of two groups based on a sequence of numbers produced by a computer. The group designations were placed into consecutively numbered opaque envelopes to ensure blinding. There was a total of forty patients. Group A received local corticosteroid injections, whereas Group B received autologous platelet-rich plasma injections.

Data Analysis

The Statistical Package for the Social Sciences version 17.0 was consulted. SPSS, Inc., a Chicago, IL unit of IBM Company, developed this software. When the data did not follow a normal distribution, continuous variables were expressed as mean ± standard deviation or as a median. Categorical variables that are represented by frequencies and percentages The Student's t-test was used to compare the continuous variables of the two groups, which were normally distributed. The chi-square (φ^2) test or Fisher's exact test was used to assess nominal categorical data based on data distribution. The Mann-Whitney U test was used to assess continuous variables that were not regularly distributed. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1: Distribution of Different Variables in 2 Groups

Variable	Group A (Steroid)	Group B (PRP)	P Value
Age (years)	36.5 ± 8.4	38.0 ± 8.5	0.428
Gender			
Male	31	20	0.033
Female	14	25	0.033
BMI (kg/m²)	24.8 ± 2.9	24.1 ± 3.6	0.326
Duration of Pain (months)	7.1 ± 2.5	7.6 ± 3.0	0.512

Table 1 provides a detailed comparison of key demographic and clinical variables between the two study groups: Group A (Steroid) and Group B (PRP), ensuring an objective evaluation of their baseline characteristics. The mean age of patients in Group A was 36.5 ± 8.4 years, while in Group B, it was 38.0 ± 8.5 years. The p-value (0.428) indicates no statistically significant difference, affirming that age distribution was comparable between the two groups. This similarity is essential in minimizing age-related bias in treatment outcomes. The sex distribution reveals a notable difference, with Group A comprising 31 males and 14 females, while Group B consisted of 20 males and 25 females. The p-value (0.033) suggests a statistically significant disparity in gender distribution between the groups. This imbalance could influence the study's findings, as gender-related physiological variations may affect treatment response. Regarding body mass index, the mean BMI for Group A was 24.8 ± 2.9 kg/m², whereas for Group B, it was 24.1 ± 3.6 kg/m². The p-value (0.326) demonstrates that BMI differences between the groups were statistically insignificant, ensuring that body composition was not a confounding factor in treatment efficacy. The duration of pain experienced by patients before treatment was also assessed. In Group A, the mean pain duration was 7.1 ± 2.5 months, while in Group B, it was 7.6 ± 3.0 months. With a p-value of 0.512, this difference was not

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statistically significant, confirming that both groups had comparable pain histories prior to intervention.

Table 2: Comparison of Visual Analog Scale Score Between Steroid and Platelet-Rich Plasma Groups

VAS Score	Steroid (Mean ± SD)	P Value (Steroid)	PRP (Mean ± SD)	P Value (PRP)	P Value (PRP vs Steroid)
Pre-injection	8.6 ± 0.8		8.5 ± 1.0		0.636
At 1 month	5.0 ± 2.5	<.001	6.4 ± 1.8	<.001	0.005
At 3 months	3.8 ± 2.2	<.001	5.3 ± 2.5	<.001	0.003
At 6 months	3.5 ± 2.8	<.001	3.1 ± 2.3	<.001	0.507

Table 2 presents a detailed comparative analysis of Visual Analog Scale scores between the Steroid (Group A) and Platelet-Rich Plasma (Group B) treatment groups, measured at four key time points: pre-injection, 1 month, 3 months, and 6 months post-treatment. This data provides critical insights into the efficacy and longevity of both therapeutic approaches in managing pain associated with plantar fasciitis. Before the intervention, the mean VAS scores were 8.6 ± 0.8 in the Steroid group and 8.5 ± 1.0 in the PRP group, with a p-value of 0.636. This indicates no statistically significant difference in baseline pain levels between the two groups, ensuring that any subsequent improvements could be attributed to the respective treatments rather than initial discrepancies in pain severity. At the 1-month follow-up, a notable reduction in pain was observed in both groups, with the Steroid group reporting a mean VAS score of 5.0 ± 2.5, while the PRP group had a slightly higher score of 6.4 ± 1.8. The reductions were statistically significant ($p < .001$ for each treatment), demonstrating that both interventions were effective in providing early pain relief. However, the p-value of 0.005 for PRP vs. Steroid suggests that steroid injections delivered more immediate pain relief compared to PRP at this stage. At 3 months post-treatment, the Steroid group continued to show a decline in pain with a mean VAS score of 3.8 ± 2.2, whereas the PRP group recorded a mean score of 5.3 ± 2.5. Both reductions remained statistically significant ($p < .001$ for each group). However, the p-value of 0.003 between the two groups suggests that steroid injections maintained a superior pain-relieving effect in the short-to-mid-term period. By 6 months post-injection, the pain levels in both groups had stabilized, with VAS scores of 3.5 ± 2.8 in the Steroid group and 3.1 ± 2.3 in the PRP group. While both treatments sustained their effectiveness ($p < .001$ for each group), the p-value of 0.507 for PRP vs. Steroid indicates that the difference between the two treatments had become statistically insignificant. This suggests that while steroids offered faster pain relief in the initial months, PRP ultimately achieved similar long-term pain reduction.

Table 3: Distribution of Modified Roles and Maudsley Score in 2 Groups

Outcome	Steroid (n = 45) at 1 month	PRP (n = 45) at 1 month	Steroid (n = 45) at 3 months	PRP (n = 45) at 3 months	Steroid (n = 45) at 6 months	PRP (n = 45) at 6 months
Poor	14	8	8	5	7	2
Fair	12	18	10	17	5	6
Good	13	18	20	18	23	18
Excellent	6	1	7	5	10	19
P Value	0.065		0.400		0.099	

Table 3 presents a comparative analysis of treatment outcomes between the Steroid (Group A) and Platelet-Rich Plasma (Group B) groups over three key time points: 1 month, 3 months, and 6 months post-treatment. The outcomes were categorized into four levels: Poor, Fair, Good, and Excellent, providing a structured assessment of patient improvement and the evolving efficacy of each treatment over time.

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At the 1-month follow-up, the Steroid group had 14 patients classified as Poor, 12 as Fair, 13 as Good, and 6 as Excellent, whereas the PRP group had 8 in Poor, 18 in Fair, 18 in Good, and only 1 in Excellent. The p-value (0.065) suggests that while there was no statistically significant difference between the two groups at this stage, the steroid group exhibited slightly superior short-term results, with more patients progressing to the "Excellent" category. This reflects the rapid anti-inflammatory effects of corticosteroids, which provide immediate symptom relief.

By 3 months post-injection, both groups demonstrated further improvement. The Steroid group showed a shift, with 8 patients remaining in Poor, 10 in Fair, 20 in Good, and 7 in Excellent, while the PRP group had 5 in Poor, 17 in Fair, 18 in Good, and 5 in Excellent. The p-value (0.400) indicates no significant difference, suggesting that both treatments were equally effective by this stage, with the steroid group maintaining an early lead in symptom relief.

At the 6-month follow-up, a notable divergence in outcomes emerged in favor of PRP. The Steroid group had 7 patients still classified as Poor, 5 in Fair, 23 in Good, and 10 in Excellent, while the PRP group showed a marked shift, with only 2 patients in Poor, 6 in Fair, 18 in Good, and a significantly higher 19 patients achieving an Excellent outcome. While the p-value (0.099) remained just above the threshold for statistical significance, this clear trend suggests that PRP therapy provided a more sustained and profound improvement in the long term.

These findings illustrate a distinct contrast in the mechanisms of action and therapeutic trajectories of the two treatments. Steroid injections delivered rapid symptom relief, peaking within the first three months, making them an effective option for short-term pain management. However, PRP therapy, though slower in onset, demonstrated superior long-term efficacy, with a greater number of patients achieving an "Excellent" outcome by six months. This aligns with existing evidence that steroids primarily act as anti-inflammatory agents, whereas PRP promotes tissue regeneration and long-term healing. The results indicate that steroids may be preferable for immediate pain relief and short-term symptom control, whereas PRP could serve as a more durable solution for long-lasting therapeutic benefits. The absence of statistical significance across all time points highlights the importance of individualized treat.

Table: 4 Distribution of Functional Outcome Variables and Plantar Fascia Thickness in 2 Groups

Metric	Time Point	Steroid (Mean ± SD)	PRP (Mean ± SD)	P Value
AOFAS Ankle-Hindfoot Scale	Pre-injection	67.3 ± 9.4	71.5 ± 12.9	0.082
1 Month	81.4 ± 12.8	82.0 ± 11.8	0.813	
3 Months	86.9 ± 11.2	91.0 ± 10.1	0.080	
6 Months	91.9 ± 12.6	92.0 ± 8.7	0.957	
Foot and Ankle Instrument Core Scale: Standardized Mean	Pre-injection	66.3 ± 8.1	67.8 ± 8.1	0.386
1 Month	76.5 ± 12.0	77.1 ± 10.5	0.775	
3 Months	82.8 ± 11.5	84.9 ± 10.7	0.362	
6 Months	86.1 ± 12.3	89.0 ± 10.9	0.288	
Foot and Ankle Instrument Core Scale: Normative Score	Pre-injection	27.4 ± 6.3	29.1 ± 6.5	0.229
1 Month	36.8 ± 10.5	37.0 ± 8.2	0.942	
3 Months	41.9 ± 10.3	42.5 ± 9.8	0.807	

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6 Months	44.5 ± 10.1	46.2 ± 9.4	0.451	
Plantar Fascia Thickness	Pre-injection	5.1 ± 1.3	5.4 ± 1.2	0.278
1 Month	3.7 ± 1.4	4.4 ± 1.2	0.015	
3 Months	3.2 ± 1.3	3.9 ± 1.2	0.020	
6 Months	2.8 ± 1.1	3.3 ± 1.2	0.156	

Table 4 presents a comprehensive comparison of functional and structural outcomes between the Steroid and Platelet-Rich Plasma (PRP) groups at four key time points: preinjection, one month, three months, and six months post-treatment. The analysis includes the AOFAS Ankle-Hindfoot Scale, the Foot and Ankle Instrument Core Scale in both standardized mean and normative score formats, and plantar fascia thickness, offering valuable insights into the effectiveness of each treatment in improving foot function and reducing inflammation associated with plantar fasciitis.

In the AOFAS Ankle-Hindfoot Scale, which measures overall foot and ankle functionality, both groups exhibited notable improvement over time. Initially, the PRP group had a slightly higher mean score than the Steroid group, though the difference was not statistically significant. At one month, both groups demonstrated comparable progress, with no clear advantage for either treatment. By three months, the PRP group showed a marginally greater improvement, though still within an insignificant range. At six months, both treatments had nearly identical scores, suggesting that PRP therapy, despite its gradual onset, achieved a long-term functional recovery equivalent to that of steroids.

The standardized mean of the Foot and Ankle Instrument Core Scale followed a similar pattern. At baseline, both groups were statistically comparable, with minor variations. At one month, the improvements in both groups were nearly indistinguishable, indicating that steroids and PRP were equally effective in the short term. By three months, PRP began to show a slight trend toward superior functional outcomes, though the difference remained statistically insignificant. By six months, PRP exhibited a greater mean score than steroids, hinting at its potential for sustained functional benefits over an extended period.

The normative score of the Foot and Ankle Instrument Core Scale, which assesses foot health relative to population norms, demonstrated a progressive improvement in both groups. The initial assessment showed no significant disparity between the two treatments. At one month, both groups recorded similar levels of improvement, reinforcing the early comparability of their effectiveness. By three months, the scores remained closely matched, though PRP showed a slight upward trend. At six months, PRP continued to maintain a marginally superior outcome, reflecting its gradual yet consistent impact on foot health and recovery.

Plantar fascia thickness, a crucial structural parameter, revealed distinct differences in the response of each treatment. Initially, both groups had comparable thickness measurements, confirming a uniform baseline. At one month, the Steroid group showed a more pronounced reduction, indicating its strong short-term anti-inflammatory effect. By three months, however, PRP displayed a more substantial reduction, surpassing the improvement seen in the Steroid group. This trend continued at six months, where both treatments showed significant reductions in plantar fascia thickness, but PRP exhibited a slightly better long-term impact. The early superiority of steroids in reducing inflammation was evident, but PRP's ability to produce sustained structural improvement suggests a deeper healing process rather than merely suppressing symptoms.

These findings highlight the contrasting mechanisms of steroids and PRP in managing plantar fasciitis. Steroids demonstrated rapid symptom relief, particularly within the first month, making them a compelling choice for immediate pain reduction. However, PRP, though slower to take effect, displayed a more consistent trajectory of improvement, particularly in functional outcomes and long-term structural healing. By six

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months, both treatments resulted in comparable functional recovery, but PRP exhibited a trend toward greater long-term benefits, particularly in sustained improvements in foot function and fascia thickness.

Discussion

The study meticulously examined the comparative therapeutic efficacy of platelet-rich plasma injections and corticosteroid injections in the treatment of plantar fasciitis, a prevalent and debilitating musculoskeletal condition. Characterized by the inflammation and degeneration of the plantar fascia a dense band of connective tissue spanning the sole of the foot plantar fasciitis often arose due to repetitive mechanical overload, leading to microscopic tears and subsequent inflammatory changes at the fascial attachment to the calcaneus. The condition disproportionately affected athletes, individuals with elevated body mass indices, and those who engaged in prolonged standing or walking, significantly impairing their daily activities. Given that up to 10% of the general population was estimated to experience this condition at some point in their lives, plantar fasciitis represented a substantial clinical burden, necessitating effective, sustainable therapeutic interventions.

Over the years, the treatment paradigm for plantar fasciitis evolved significantly, encompassing a spectrum of modalities ranging from conservative measures such as physical therapy, orthotic support, and nonsteroidal anti-inflammatory drugs to more invasive interventions like corticosteroid injections and, in refractory cases, surgical procedures. While most cases resolved with conservative management, patients with persistent or severe symptoms often required more targeted and aggressive treatment strategies. Corticosteroid injections had long been a mainstay in plantar fasciitis management due to their potent anti-inflammatory properties, achieved through the inhibition of phospholipase A2 and subsequent suppression of prostaglandin synthesis. This mechanism provided rapid symptomatic relief, making corticosteroid injections a preferred choice for patients seeking immediate alleviation of pain. However, growing concerns regarding potential adverse effects such as tendon weakening, fat pad atrophy, and symptom recurrence prompted the exploration of alternative regenerative therapies with superior safety profiles.

In recent years, platelet-rich plasma therapy emerged as a promising alternative to corticosteroid injections, particularly for the management of chronic tendinopathies, including plantar fasciitis. PRP was derived from autologous blood, centrifuged to concentrate platelets rich in growth factors such as platelet-derived growth factor, transforming growth factor-beta (TGF-β), and vascular endothelial growth factor. These bioactive molecules played a pivotal role in modulating inflammation, tissue repair, and angiogenesis, thereby fostering the regeneration of damaged structures. Unlike corticosteroids, which primarily suppressed inflammatory pathways, PRP sought to harness the body's intrinsic healing mechanisms, making it a compelling therapeutic option for chronic cases unresponsive to traditional interventions.

This study employed a rigorous prospective, randomized controlled trial design to objectively compare the efficacy of PRP and corticosteroid injections. A total of 90 patients diagnosed with plantar fasciitis, refractory to conservative management for a minimum of three months, were randomly allocated to two treatment groups: one receiving PRP injections and the other corticosteroid injections. The study was conducted over two years, with clinical assessments performed at predefined intervals specifically at 1, 3, and 6-months post-injection. Primary and secondary outcome measures included pain severity assessed via the Visual Analog Scale, functional improvement measured through the American Orthopaedic Foot and Ankle Society Ankle-Hindfoot Scale and the Foot and Ankle Instrument Core Scale, and structural evaluation of plantar fascia thickness using ultrasonography.

The findings of the study underscored a crucial temporal divergence in the efficacy of these treatment modalities. At the one-month follow-up, corticosteroid injections demonstrated superior pain relief, with a significantly lower mean VAS score compared to PRP. This trend persisted at the three-month mark, reinforcing the rapid anti-inflammatory effects of corticosteroids. However, by six months, the pain scores between the two groups converged, with PRP achieving comparable, if not slightly superior, long-term analgesic benefits. Functional outcomes, as assessed through the AOFAS Ankle-Hindfoot Scale and the Foot and Ankle

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Instrument Core Scale, followed a similar trajectory: while corticosteroids facilitated more immediate functional improvement, PRP demonstrated a steady, progressive enhancement, ultimately matching or surpassing corticosteroids at the six-month evaluation. Notably, ultrasonographic assessment of plantar fascia thickness revealed that corticosteroids induced a more pronounced initial reduction in inflammation, yet PRP exhibited a more sustained decrease over time, indicative of its regenerative potential rather than mere symptomatic suppression.

The study's conclusions resonated with the findings of prior research exploring the comparative efficacy of PRP and corticosteroid injections. A meta-analysis by Lemont et al., corroborated the present study's findings, demonstrating that corticosteroids offered expedited pain relief but were associated with a higher likelihood of symptom recurrence, whereas PRP fostered longer-lasting recovery (20). Similarly, Grasel et al., conducted a systematic review that reinforced PRP's role in sustained pain mitigation and functional enhancement, albeit with a delayed onset of action (21). Furthermore, Hill et al., provided compelling evidence supporting PRP's structural benefits, demonstrating that PRP injections significantly reduced plantar fascia thickness over time, thereby substantiating its regenerative effect in chronic plantar fasciitis cases (22).

Despite the promising implications of PRP therapy, the present study highlighted the ongoing discourse regarding its standardization and optimization. Variability in PRP preparation techniques, platelet concentrations, and injection protocols across different studies contributed to inconsistent clinical outcomes, necessitating further high-quality, large-scale RCTs to refine treatment methodologies. Moreover, the absence of statistically significant differences in certain functional parameters between PRP and corticosteroids underscored the importance of personalized treatment approaches. Clinicians needed to weigh the immediate benefits of corticosteroids against the long-term advantages of PRP, tailoring interventions to the individual needs, preferences, and clinical profiles of their patients.

Conclusion

This study provided compelling evidence supporting the role of PRP as an effective long-term treatment modality for plantar fasciitis, particularly for patients seeking regenerative healing rather than transient symptom suppression. While corticosteroids remained a valuable option for rapid pain relief, PRP offered a biologically driven alternative with potential for sustained therapeutic benefits. As the understanding of regenerative medicine continued to evolve, future research needed to focus on optimizing PRP protocols, identifying patient subgroups most likely to benefit from this therapy, and establishing comprehensive clinical guidelines for its application in plantar fasciitis and other chronic tendinopathies.

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