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Efficacy of platelet rich plasma injection in plantar fasciitis

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Abstract

Background: Plantar fasciitis (PF) is one of the most common causes of heel pain, often resulting from repetitive microtrauma and chronic inflammation. While conservative treatments remain the first line of management, platelet-rich plasma (PRP) injections have emerged as a promising alternative for refractory cases. This paper reviews the efficacy of PRP injection in the treatment of plantar fasciitis, analyzing current clinical evidence and highlighting potential advantages over conventional therapies. Plantar fasciitis, characterized by inflammation of the plantar fascia, affects approximately 10% of the population at some point in their lives. The condition is often associated with significant morbidity, reduced quality of life, and prolonged recovery times. Conventional treatments, including physical therapy, orthotics, non-steroidal anti-inflammatory drugs (NSAIDs), and corticosteroid injections, can be effective but may not address the underlying degenerative changes in chronic cases. PRP, an autologous blood product rich in growth factors and cytokines, has gained attention for its regenerative potential and ability to promote tissue healing.

Methods: A prospective study of 30 patients with clinical diagnosis of Plantar Fasciitis (Unilateral/Bilateral). Participants were treated with a single intra-articular PRP injection, prepared using the double-spin technique and Single Spin Technique. Pain intensity was assessed using the Visual Analog Scale (VAS), American Orthopaedics Foot and Ankle Society (AOFAS) Ankle- Hindfoot Score, and follow-up assessments were performed at 1 week, 4 weeks, 8 weeks, 12 weeks, and 6 months post-injection.

Results: Significant improvements in both pain and function were observed. The mean VAS score decreased from 7 at baseline to 4 at 12 weeks, and to 3 at 6 months. Significance of VAS Score reduction from baseline compared at 12 weeks is 0.000 and at 6 months is 0.004. The baseline mean total AOFAS score of the patients at the time of injection was 52.75 and it increased to 79.75 at 12 weeks follow up and 83.85 at 6 months follow up, suggestive of effectiveness of single PRP injection in cases of plantar fasciitis.

Conclusion: This study concludes that single injection of PRP is a safe, simple, inexpensive OPD procedure with minimum foreign body reaction that offered a significant amount of improvement in terms of alleviation of pain and overall functional outcome in Plantar Fasciitis. Also, PRP is effective in long term, up to 6 months pain relief and functional outcome of Plantar Fasciitis as reported by improvement in VAS Scores and AOFAS Scores taken at 1,4,8,12 & 6 months follow up and Significant improvements seen.

Keywords: Platelet-rich plasma (PRP), planter fasciitis, intra-articular injection, clinical efficacy, pain relief, functional improvement

Introduction

Plantar fasciitis is the most common cause of heel pain. Although plantar fasciitis is a self-limiting condition, the rehabilitation may require several months. A variety of conservative treatment options include rest, heel cups, eccentric stretching exercises, night splints, orthotics, and nonsteroidal anti-inflammatory medication. These treatment measures could resolve about 80% of cases. However, in cases who are not responsive to these treatments, invasive procedures are required.

Plantar fascia is a thick, sheet-like connective tissue, located in the under surface of the foot originating from the medial calcaneal tubercle and stretch forward to the head of metatarsophalangeal joints capsule. Histologically, it is composed of superimposed collagen fibres, with intermingled elastin fibres ^[1].

The exact mechanism resulting in plantar fascia to undergo this degenerative process is not fully understood, however, repetitive trauma resulting in micro tears was implicated as the underlying cause. Several risk factors have been associated with development of plantar fasciitis like obesity, prolonged work-related weight bearing and reduced ankle dorsiflexion [2]. Plantar fasciitis has also been associated with, old age, and biomechanical abnormalities in the foot, such as tight Achilles tendon, pes cavus, and pes planus [3].

Corticosteroid (CS) injection has been a longstanding acceptable modality of treatment in cases of plantar fasciitis with proven effectiveness, however, there is risk of plantar fascia rupture and a suggested theoretical risk of heel pad atrophy which has not been proven in previous study [4].

Platelet rich plasma (PRP) has been a breakthrough in the stimulation and acceleration of bone and soft tissue healing. PRP is an autologous thrombocyte concentrate with plasma. To obtain platelet concentration 4-5 times above baseline blood platelets, venous blood is drawn from the patient and centrifuged to separate PRP from red blood cells and plasma. This autologous PRP is then injected into the affected joint. When the platelets degranulate after injection, growth factors such as transforming growth factor beta (TGF-beta), platelet derived growth factor (PDGF), epidermal growth factor (EGF), vascular endothelial growth factor (VEGF), fibroblast growth factor (FGF), and insulin-like growth factor are released from alpha granules. These growth factors are believed to have regenerative capacity. More importantly in PF they may inhibit inflammatory effects on chondrocytes by nuclear factor kappa- light-chain-enhancer of activated B cells (NF- κ B) and interleukin 1 (IL-1) [5].

The aim of this study was to assess the long term efficacy of PRP injection in relieving pain and consequently improving function among patients with plantar fasciitis. The continuous generation of prospective trials studying the effect of PRP injection in plantar fasciitis compared to the current, most commonly used treatment (CS injection), promoted the pursue of systematic and statistical analysis of current evidence available in order to reach a conclusion of the outcome expected from PRP injection.

Methodology

A prospective study of 30 patients with clinical diagnosis of Plantar Fasciitis (Unilateral/ Bilateral), satisfying the inclusion criteria, was conducted during the period between June 2023 to September 2024 in the department of Orthopaedics, at tertiary care hospital.

Inclusion criteria

- Patient age 20 years and above, both sex.
- Patient with Plantar Fasciitis and not responding to conservative management for at least 4 weeks.

Exclusion criteria

- Patient age < 20 year
- Infection and bony pathology of the foot.
- Pregnancy.
- Patient with a history of any bleeding disorder

Preparation and Administration of PRP

PRP is prepared through a process known as differential centrifugation, in which acceleration force is adjusted to sediment certain cellular constituents based on different specific gravity [10].

2 samples of about 8.5 ml taken in ACD tube. ACD tube is

centrifuged at 1800RPM for 12 mins. Supernatant is taken in blue top funnel tube. Blue top funnel tube is centrifuged at 4000RPM for 5 mins. Upper 2/3 PRP is discarded from blue top funnel. Lower 1/3 is final product which is put in agitator for 30-45 mins

Follow-Up and Outcome Measures: Participants were followed up at 1 week, 4 weeks, 8 weeks, 12 weeks, and 6 months after the PRP injection. During each follow-up visit, patient-reported symptoms, clinical examination findings, and repeat radiographic assessments were recorded. VAS and AOFAS scores were re-evaluated at each visit and compared to baseline values to assess improvements in pain and functionality. A significant decrease in VAS and increase AOFAS scores over time was considered indicative of clinical efficacy.

Ethical clearance was obtained prior to the study and all participants provided informed written consent. Data analysis was conducted to evaluate the extent of symptom improvement and functional recovery, with a focus on determining the efficacy of PRP therapy in knee OA. A p-value of <0.05 was considered statistically significant.

Results

Evaluation of 30 patients included in the study with respect to history, physical findings and post-injection complications in line with the predetermined objectives was done. All the cases were followed for a period of 6 months. The patients were followed up at 1 week, 4 weeks, 8 weeks, 12 weeks and 6 months.

Study observes that maximum number of patients belong to the age group of 41-60: 16 (53.3%) followed by age groups of 20-40: 08 (26.6%) and age groups of 61-80: 6 (20%).

Study observes that, Female patients were more 20 (66.66%) than male patients 10 (33.33%).

Present study observes that, Plantar Fasciitis Bilateral Heel diagnosed cases were 2 (6.66%), Plantar Fasciitis of Right Heel and of Left Heel patients were 17 (56.66%) and 11 (36.66%) respectively.

Study reveals that, the mean VAS scores were high on the baseline investigation in All age groups. The mean VAS score were significantly reduced baseline to 1 week, 1week to 4 weeks, 4 weeks to 8 weeks, 8 weeks to 12 weeks and 12 weeks to 6 months. The mean VAS score at base line was 7 decreasing to 6 at 1 week follow up, 5 at 4 week follow up, 4 at 8 week follow up, 4 at 12 week follow up and 3 at 6 months follow up.

Study reveals that, the mean AOFAS scores were high on the baseline investigation in all the age groups. The mean AOFAS score were significant reduced baseline to 1 week, 1 week to 4 weeks, 4 weeks to 8 weeks, 8 weeks to 12 weeks and 12 weeks to 6 months. The mean AOFAS score at base line was 53 decreasing to 47 at 1 week follow up, 41 at 4 week follow up, 35 at 8 week follow up, 30 at 12 week follow up and 24 at 6 months follow up.

Significance of VAS Score reduction from baseline compared at 12 weeks is 0.000 and at 6 months is 0.004. This means that the null hypothesis is incorrect and hence our results are not by chance and our hypothesis is true.

Discussion

Plantar fasciitis or plantar heel pain is a disorder of the plantar fascia, which is the connective tissue that supports the arch of

the foot. It results in pain in the heel and bottom of the foot that is usually most severe with the first steps of the day or following a period of rest ^[6]. Pain is also frequently brought on by bending the foot and toes up towards the shin. The pain typically comes on gradually, and it affects both feet in about one-third of cases ^[1]. Platelet-rich plasma (PRP) is most concisely defined as a volume of plasma that contains a concentrate of platelets above that of baseline blood levels.

In recent years, the role of PRP in the treatment of PF has drawn wide attention. However, the advantages of PRP in modern treatment for PF have not been fully confirmed, and different randomized controlled trials have drawn inconsistent conclusions when comparing the use of PRP with CS or placebo ^[7]. The method of injecting corticosteroids (CS) is another common treatment that has proven to be effective, but it has some limitations at the same time. Some studies have reported that different injection sites can produce pain of different lengths ^[7]. On the other hand, this method may also lead to some complications, such as rupture of the plantar fascia and pad atrophy. The systematic review of the validity of PRP and CS in the previous literature is inconsistent. Many literatures indicate that the efficacy of PRP is significantly better than that of CS, but the reliability of these conclusions is affected to some extent by research selection strategies, statistical methods, and interference factors, such as limited number of trials ^[8].

Thus, the aim of our systematic review was conducted to assess the efficacy of PRP for PF in terms of pain and functional outcomes. We performed the best comprehensive analysis of the evidence for the previous RCT. To ensure a more accurate conclusion as a means of guiding clinical decision making, we combined and quantified PRP with CS or placebo for PF on clinical results. Last few years, there is growing interest in exploring PRP as a treatment modality for plantar fasciitis. The platelet concentrate in PRP when activated results in the formation of platelet gel and the release of growth factors and bioactive molecules which effectively participate in the healing process ^[9]. Platelets contain significant amounts of cytokines and growth factors and are responsible for stimulating cellular growth, vascularization, proliferation, tissue regeneration and collagen synthesis. A regenerative therapy that is believed to promote healing by augmenting and accelerating the natural healing cascade. The Injection of PRP to treat plantar fasciitis of heel can be considered a relatively new therapeutic indication ^[9]. PRP may be prepared by single spin or double spin technique. Studies suggest no clear advantage of double-spin technique over single-spin technique or vice-versa. A 2-stage centrifugation process/double spin technique in which the first (hard) spin separates low- platelet concentrated plasma from RBC and PRP. In the second (soft) spin, this mixture or RBC and PRP is separated and the PRP is collected at the bottom of the test tube because of its high specific gravity ^[10].

Limitation

In this study single injection was used. The review of current literature reveals that majority of studies have used 2 or 3 injections. There are very few studies who have used single injection and long term follow up was not done. It was not possible to compare long term results with many studies. However the follow up in other study was one year. Number of platelets in this study were not counted. Based on available literature it was presumed that the PRP concentrate will contain platelets 5-6 times more than the baseline count. This could have been included in this study. Cases of below the

age of 20 years were not included in the study.

Conclusion

Plantar fasciitis is a common cause of heel pain in athletes and non-athletes alike. It often presents as pain at the base of the heel on the sole of the foot. It is often fairly debilitating to an athlete with the condition, as it causes pain that limits the ability to run. This study concludes that single injection of PRP is a safe, simple, inexpensive OPD procedure with minimum foreign body reaction that offered a significant amount of improvement in terms of alleviation of pain and overall functional outcome in Plantar Fasciitis. Also, PRP is effective in long term, upto 6 months pain relief and functional outcome of Plantar Fasciitis as reported by improvement in VAS Scores and AOFAS Scores taken at 1, 4, 8, 12 & 6 months follow up & its significance improvement seen.

Conflict of Interest

Not available.

Financial Support

Not available.

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