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Functional outcome of autologus platelet rich plasma injection as treatment for patients with plantar fascitis

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ABSTRACT

Background: Plantar fasciitis (PF) is the most common cause of pain that occurs in the heel, and approximately 11% to 15% of adults having foot symptoms require an expert care. Heel pain and tenderness are some of the common symptoms. Many conservatives methods are available, Platelet rich plasma is one of the safe and effective therapy in relieving symptoms. To describe the functional outcome of autologus platelet rich plasma as treatment for patients with plantar fasciitis. To describe any complications associated with the procedure.
Methods: It is a prospective observational study 45 patients with chronic Plantar fasciitis aged above 18 years were included in the study. All the patients had a minimum of 3 months of symptoms, were selected based on the inclusion and exclusion criteria and underwent the same method of treatment. All patients had a baseline assessment of numerical pain score and were repeated at regular intervals post treatment. The PRP was prepared from venous whole blood.
Results: Pain score was assessed at the time of injection. The mean pain score of all the patients was 8.614. Percentage pain relief showed 48% had 100% pain relief, 33% had more than 50% pain relief and 6% had less than 50% pain relief from the study.
Conclusion: Autologous PRP injection is a safe and useful modality of treatment in the treatment of Plantar fasciitis. Maximum benefit after PRP injection was observed at 2 months and had sustained for at least 6 months.

Keywords: Plantar fascitis, Platelet-rich plasma, Autologous PRP injection

INTRODUCTION

Plantar fasciitis is the most common cause of foot pain. Most common cause is found to be degeneration that occurs near the site of origin at medial tuberosity of Calcaneum. It also results from sustained stress of weight bearing hopping, jumping, running results in micro trauma to plantar fascia which leads to plantar fasciitis.[1] Plantar fasciitis (PF) is the most common lesion that occurs in the heel, and approximately 11% to 15% of adults having foot symptoms require an expert care.[2] Pain is inceased by prolonged standing, weight bearing, obesity and gradually increased activity, hopping, jumping, running results in micro trauma to plantar fascia which leads to plantar fasciitis.[3] Plantar fascitis occurs at all ages,but the highest risk of occurrence is at 40 to 60 years of age, with no significant sex bias.[4] Pain is felt over the inner aspect of sole on heel on weight bearing.[5] Tenderness is usually present at the inner part of calcaneum. Mainly the diagnosis of PF is based on the patient's history and clinical examination. Various methods have also been used in the treatment of PF, including nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections, and non-drug approaches, such as ice packs, shoe inserts, plantar fascia stretching exercises, physiotherapy, extracorporeal shock wave therapy, and even surgical treatment.[6] It has been reported that the symptoms will disappear after nonsurgical treatment.[7] Patients in whom symptoms do not

improve with conservative measures and they further develop into chronic diseases.[8] Generally, when these conservative treatments fail, injecting steroids is considered an option.[9] However, steroid injections may be associated with potential systemic and local complications, including plantar fascia rupture and fat pad atrophy.[10] Therefore, the study of alternative therapies is important to overcome the limitations of other methods. Over the past decades, Platelet Rich Plasma (PRP) has gained increased importance in various medical fields, including orthopedics.

A local injection of PRP is an emerging therapy for ligament pathologies and recalcitrant tendons, including PF. PRP is prepared from autologous whole blood that contains an increased concentration of autologous platelets. PRP has been widely applied to various tissue injuries, such as osteoarthritis, muscle strain, bone healing, and tendon injury.[11] The mechanism of action of PRP is simple, after injection of PRP in injured area, it induces a local inflammation.

The pro inflammatory mediators together with the growth factors released from the granules of the platelets trigger the localized inflammation and the wound healing cascade, resulting in cellular migration and proliferation, glycosaminoglycan and collagen deposition, collagen maturation and remodeling of the healing tissue at different stages of wound healing.[12] PRP has also been used as an effective treatment modality in sports medicine to rehabilitate disabled muscles.[13]

Literature review on growth factors of autologous platelet rich plasma in vivo and in vitro studies suggests it will be useful for tendonitis and ligament healing. Most studies resolution of symptoms within 2 months of injection.[14] Thus PRP is the new emerging form of treatment for plantar fasciitis. A Prospective Observational Study conducted in a tertiary care hospital, Mandya institute of medical sciences, Mandya. Aim of the study was to describe the functional outcome of functional outcome of autologus platelet rich plasma as treatment for patients with plantar fasciitis. To describe any complications associated with the procedure.

METHODS

The prospective observational study was conducted at the department of orthopedics at Mandya institute of medical sciences and hospital including 45 patients from October 2019 to May 2021. All patients included in the study were assessed clinically and confirmed radiologically to avoid any other pathologies.

Plain radiograph of the elbow in AP and lateral view of the affected site was obtained. After diagnosis, the patients are selected for the study depending on inclusion and exclusion criteria. Patients are assessed based on the numerical pain scoring system. Regular outpatient department follow-up was done at 1,2,4,6 months.

Data collection

Data collection was started after approval from the Institutional Ethics Committee of Mandya institute of medical sciences, Mandya using SSPP Software for analysis. Informed written consent was taken from the study subjects after explaining to them the plan and intention of the study in the language best known to them. A specially designed proforma was used to collect data on each individual patient visiting outpatient orthopedics department with complaints heel pain. A thorough clinical examination was done, and findings were noted in a clinical proforma. In selected cases X-ray was done to know any associated bony pathology. Patients requiring intervention were hospitalized and necessary investigations required for preoperative work-up was done. Written informed consent was taken from patients undergoing the procedure. Patients were injected with autologus PRP.

Patients will be under observation and any complications were noted in proforma. Patients are further assessed on 1st month (visit 1), 2nd month (visit), 4th month (visit 3) and 6th month (visit 4) the date of procedure. At each visit the presenting complaints, general physical examination, local examination of the affected foot, was assessed clinically functional outcome was obtained by using the visual analogue scale (VAS), Foot and Ankle Disability Index (FADI), American Orthopedic Foot and Ankle Society (AOFAS) scale, and the Roles and Maudsley score (RMS).

Sample size

Size of the sample was 45.

Calculation method

Sample size (N)= $Z2 \times p \times q/e2$

Here, Z=Standard Deviation (1.96), p=patients having excellent results, q=(100-p), e=Absolute error or precision (10%).

Sampling method

All consecutive patients are included as per inclusion and exclusion criteria, who are willing to participate in the study during the study period.

Inclusion criteria

Patients with clinically diagnosed plantar fasciitis. Patients should have minimum three months duration of symptoms. Patients should undergo conservative treatment for a minimum period of three months. Patients should have pain score greater than seven at the time of PRP injection. Patients should not have a local steroid injection in last 2 months. Both sexes- males and female. Age-18 years and above.

Exclusion criteria

Infection or ulcer at the injection site. Rheumatoid arthritis. Sero negative spondylus arthritis. Pregnant ladies.

Platelet rich plasma preparation

Here 50 ml of blood is drawn from patient and divided equally in 6 test tubes and centrifuged for 10 min with 3200 rpm and the concentrate is allowed to settle and the clear plasma obtained above separately is taken into two more test tubes and centrifuged again for 10 min. The PRP so obtained is collected is freshly injected into the site of pathology.

Numerical pain score

Numerical pain score is a subjective assessment of pain, where the patient rates the intensity of the pain perceived. Score 0 refers to no pain. Score 10 refers to the worst pain possible. Based on numerical pain score, intensity of pain was divided in to mild, moderate, and severe. Score zero to three was taken as mild, four to six as moderate and seven to ten as severe pain.

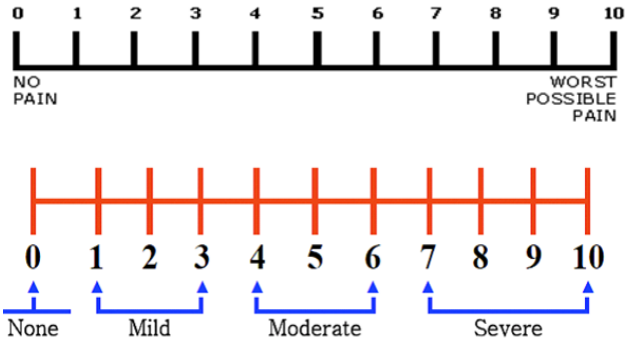

Figure 1: Numerical pain score, the numerical pain score as experienced by the patient.

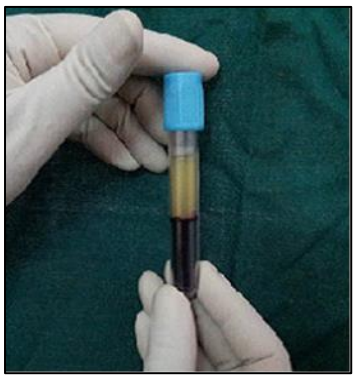

Figure 2: Centrifuged blood with PRP and blood components separated.

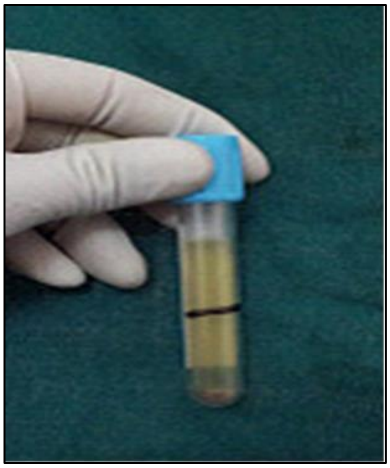

Figure 3: Recentrifugation of the components with PRP and sediments.

Figure 4: Injecting PRP in plantar fasciitis patients at the point of maximum tenderness on heel.

Technique of infiltration

Most tender point was palpated and marked using a skin (figure 3) marker and area was prepared for injection. Under aseptic precaution using a 21 and 1, 1/2-inch needle, 1 ml PRP is injected initially over the maximum tender point and needle is partially withdrawn and multiple punctures are made in the surrounding tissue (peppering technique). The remaining 1 ml of platelet rich plasma was injected in surrounding tissue.

Follow up

Patients were followed up for 6 months. A telephonic follow up was done at second day after injection to find out any adverse reactions. Follow ups was done at 1,2,4,6 months. Patients were assessed subjectively using the numerical pain score.

RESULTS

Patients were analyzed for pain relief subjectively at 1, 2, 4 and 6 months. The results are given below.

Mean pain score

Pain score was assessed at the time of injection. The mean pain score of all the patients was 8.614. When analyzed mean pain score for plantar fasciitis at 0, 1,2,4,6 months was 8.68, 3.68, 2.155, 2, 2.13 respectively. From the above data it can be inferred that patient get maximum relief of symptoms at two months and is sustained till at least 6 months.

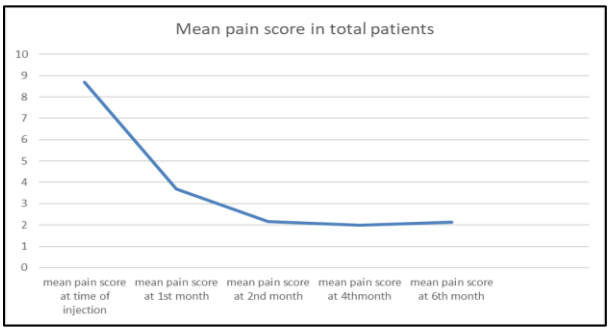

Figure 5: Mean pain score of patients during the subsequent follow up, which showed significant improvement by the end of 2nd month. With mean pain score 8.6.

Percentage reduction of pain

Patients were analyzed for percentage reduction of pain. Percentage reduction of pain is obtained by calculating the percentage of the difference of pain score at every follow up from initial pain score at the time of injection.

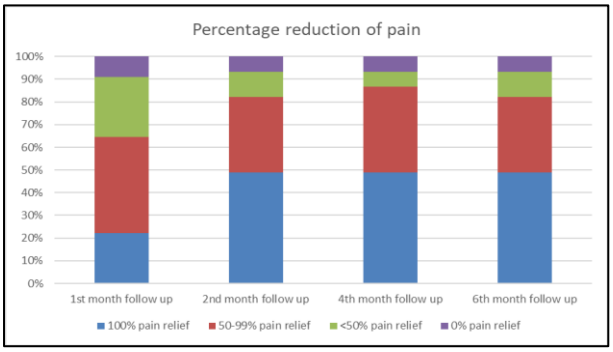

Figure 6: Percentage reduction of pain in patients during subsequent follow up, which shows subsequent pain reduction by the end of 2nd month. Where significant pain relief was found during the 2nd month.

Previous studies depict male to female ratios to be almost equal, the symptoms were related to the prolonged work/activities level, but following the procedure there was no much gender bias with respect to recovery and pain relief, as both groups had significant improvement at the end of 2 months.

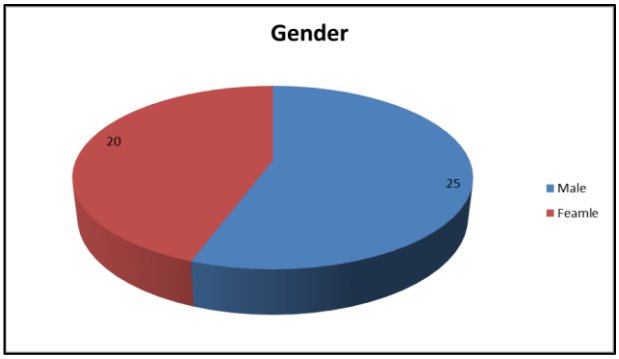

Figure 7: Patients gender in the present study shows most number of patients were male patients.

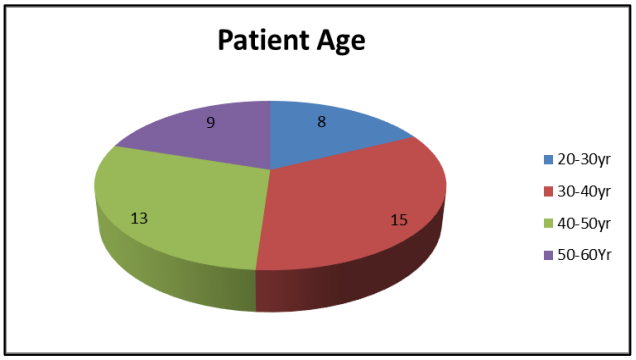

Figure 8: Patients age group in the present study shows most patients belong to the age group of 30-50 years.

Related to their occupation behavior leading to prolonged standing activities, they had significant improvement following the procedure. Although the recovery time for elderly people took more than 2 months period.

DISCUSSION

Platelet contains biologically active substance for blood clotting, such as coagulation factors, adhesive proteins and protease inhibitors. Platelets were also known to release growth factors like TGF-beta 1, CGF, VEGF, and PDGF. These growth factors are released once the platelets were activated. These growth factors initiate the process of tissue healing by cellular proliferation and differentiation, chemo taxis, tissue debris removal, angiogenesis, and extra cellular matrix formation. These properties of tissue healing by platelets are used in treating degenerative enthasopathies like plantar fasciitis and tennis elbow by direct local injection of autologous platelet rich concentrate. Various techniques have been described for the preparation of autologous platelet rich plasma. They differ in duration and speed of centrifugation. The containers used for platelet rich plasma preparation also differ to minimize the direct handling of blood. The volume of platelet rich plasma usually comes about 10 percent of the whole blood used.

The PRP volume of about 5 ml was collected following 12 minutes of rotations at 3200 rpm. Augustus et al used a double centrifugation method which separates blood first in to plasma and RBC. The plasma formed was separated again in to platelet rich plasma and platelet poor plasma by second centrifugation. By repeated trial and error method we standardized the procedure of preparation of platelet rich plasma. Platelet rich plasma is also known as platelet rich concentrate, autologous platelet gel or platelet release. platelet rich plasma is defined as autologous blood with a concentration of platelets above the base line values. The platelet count in our samples ranged from two to six lakhs per cc. Growth factor concentration can be assessed by ELISA. Concentration of growth factors also depends on the method of preparation of PRP. Since the assay of growth factors was not cost effective, we did not do assay of growth factors. PRP can be divided in to low WBC PRP and high WBC PRP depending on WBC concentration. Platelets in PRP get activated once they get released from circulation. We palpated the point of maximum tenderness and injected by single skin portal and five to six penetrations in surrounding tissues. This technique was known as peppering technique. In this study we used same technique for injecting platelet rich plasma in plantar fasciitis.

Parameters such as pain are compared to that of the previous studies as in Buchbinder et al Mazzocca et al, Sciolo et al, Peerbooms et al, studied the preparation of PRP, who concluded that platelet high spin method results in higher number of groeth factors and platelets in the sample, which promotes regeneration of tissue and also observed that the technique of PRP injection to be effective.[3,16] Mazzocca et al, Scioli, Peerbooms et al, studied the preparation of PRP, who concluded that platelet high spin method results in higher number of growth factors and platelets in the sample, which promotes regeneration of tissue and also observed that the technique of PRP injection (peppering) to be effective. Therefore, this method was used in this study Mazzocca et al, Scioli, Peerbooms et al, studied the preparation of PRP, who concluded that platelet high spin method results in higher number of growth factors and platelets in the sample, which promotes regeneration of tissue and also observed that the technique of PRP injection (peppering) to be effective. Therefore, this method was used in this study.[20-22]

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The mean pain score was 8.614 in our study as compared to the previous study done by Wei-yi Yang, Yan-hong Han et al which was found to be 8.452, percentage reduction of pain has been found to be similar in both the studies.[15] The mean age group of this study was found to be 40.11, as compared to previous study by Bezwada et al which was found to be 38.8, and the mean pain score was found in this study was 8.4 as compared to previos study by Bezwad et al which was found to be 6.34.[17] There is need for further similar studies and involvement of more subjects for the study. Low sample size and comparision with other conservative modalities such as steroid injection.

CONCLUSION

Autologous PRP injection is a safe and useful modality of treatment in the treatment of chronic plantar fasciitis with minimal side effects and attains maximum benefit observed at 2 months and sustained for at least 6 months.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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