
Activated Platelet Rich Plasma in the Management of Plantar Fasciitis.

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Abstract

Background: Plantar fasciitis (PF) is the one of the commonest causes of heel pain in middle age groups. In the management of PF, now a day's activated Platelet-rich Plasma (PRP) is growing popularity. We here try to assess the safety and effectiveness of activated PRP in the management of PF.

Materials & Methods: We have included 10 patients with PF who were given activated PRP and ensured regular follow-up. Functional outcomes and pain severity were measured by using Visual Analogue Scale (VAS) and AOFAS scale. Inclusion Criteria-age between 18 to 60 years, sore around the insertion of the plantar fascia on calcaneus, clinical features for about 6 to 9 months, can easily understand the procedure and sign up in the informed consent, minimum 6 weeks gap between steroid injection and 4 weeks from local anesthetic injection, without NSAID'S free period before procedure. AOFAS is more than 30, VAS score more than 5. Exclusion Criteria: Operation done before in the same ankle, pain feels anywhere other than at the insertion of the plantar fascia on calcaneus, connective tissue diseases, uncontrolled diabetes, any inflammatory condition in the procedure site, previously injured Achilles tendon, allergy to calcium gluconate injection, history of collagen diseases or rheumatic diseases, Paget's diseases, thrombocytopenia.

Results: Follow-up was taken on 4th, 6th week, 2nd and 3rd months. Both VAS and AOFAS score were improved significantly. Results were not altered indifferent age and sex. Pain severity was reduced to patient's own satisfactory level.

Conclusion: From our study we concluded that activated PRP is relatively safe, cost effective, and convenient than other available treatment modalities.

Keywords: Plantar fasciitis; Platelet Rich Plasma; Steroid; VAS, Activated PRP.

Introduction:

Now a day's Plantar fasciitis (PF) has become a common problem. It affects the heel badly to compromise daily activities. About 11% to 15% of adult foot symptoms that need professional care.^[1,2] Pain is increased by long duration weight bearing, high BMI and increased activity.^[3,4] It is calculated that approximately 1 in 10 people developed heel pain in their lifetime. Though PF can develop at any age, highest risk group is usually found in between 40 to 60 years. There is usually no significant sex differences.^[5] PF is usually diagnosed by patient's given history and

also by clinical examination. Further investigations are rarely needed. In conventional treatment, various options have been chosen by physician in the management of PF that includes non steroidal anti-inflammatory drugs (NSAIDs), sometimes corticosteroid injections, and non-pharmacological approaches, such as ice packs, shoe modification, plantar fascia stretching exercises, and even surgical treatment.^[6-8] It is found that the usual symptoms will disappear after taking nonsurgical treatment in about 80% of patients.^[9] In about 10% of patients, symptoms usually not improve by conservative measures and may turn into chronic diseases.^[10] In a word, when above mentioned conservative treatments fail, steroids injection is considered a suitable option.^[11] Moreover, steroid injections may sometimes not helpful after 1 injection, so it require multiple injections, which may inturn give rise to potential complications, that includes plantar fascia rupture and more rarely fat pad atrophy.^[12,13] Therefore, the study of using the activated platelet rich plasma therapy in PF is a promising option. Injection of activated platelet-rich plasma (PRP) in the affected part of the fascia and also recalcitrant tendons are growing in as emerging therapy. Activated PRP is prepared from patient's own blood which contains a higher concentration of autologous platelets. Now a days, PRP has been used in various tissue pathologies such as osteoarthritis, bone healing, and also in tendon injury.^[14-16] ^[17]Applying all of these approaches for the treatment of PF results mostly inconsistent in different clinical trials.

In recent time, many studies are designed for focusing on the effectiveness of activated PRP as a treatment option for PF; though the results are inconsistent. In addition to that, the relationships among activated PRP, pain relief and improvements in functional restoration are still unknown.

Materials & method: Total of 10 patients were selected for giving activated PRP therapy according to inclusions criteria. Patients were presenting with pain specially in the heel area which were severe in early morning and felt badly on first few steps and usually disappear after taking rest. Diagnosis was mainly done clinically, palpating the tender area on heel, specially medial calcaneal tubercle and sometimes also on lateral side of the heel. 18 years and above were included in the study who were taken conventional treatment but failed. Who were less than this age who were taken corticosteroid more than 4 weeks ago had Gout, suffering from foot arthritis, presence of infection, any kinds of haematological disorder were excluded.

Whole procedure was briefly explained in every patient and taking written informed consent from the patient before collection of blood sample. After maintaining all aseptic precaution 20 ml venous blood was drawn from the visible antecubital vein and kept in sodium citrate vacutainer(3.2% Ref:XLGA-9SC27 CE). All patients' blood sample were examined for Platelet count before collecting blood for preparing activated PRP. After proper mixing in the vacationer, tubes were placed in the bucket of centrifuge machine. We used Hettich EBA 270(Germany) for our research work. Cascade method was used in every procedure that means double centrifuge for preparing PRP. First centrifuge was 1200RPM for 10 minutes to settle down red blood cells very slowly as because we were focusing to use white blood cells which are enriched with different granules necessary for healing process. After gentle centrifuge, supernatant portion was separated with pipette (1ml, Huawei) and then collected them to another vacationers. Second centrifuge was relatively harder than first one i.e. 2400RPM for 5 minutes. Before giving second

centrifuge, Calcium Gluconate 10% was mixed with in dilution of 1:10. By this, activated PRP were ready for use which were hazier than first centrifuge products. 5 ml injection was given on the maximal tenderness point of the heel by peppering method using single entry point. Paracetamol 500mg was given each patient after procedure three times in a day and advised for non weight bearing for 72 hours. All patients were advised for gentle stretching exercises before standing from prolonged rest usually plantar fascia stretching exercises, toe-walking & bottle roller exercises.

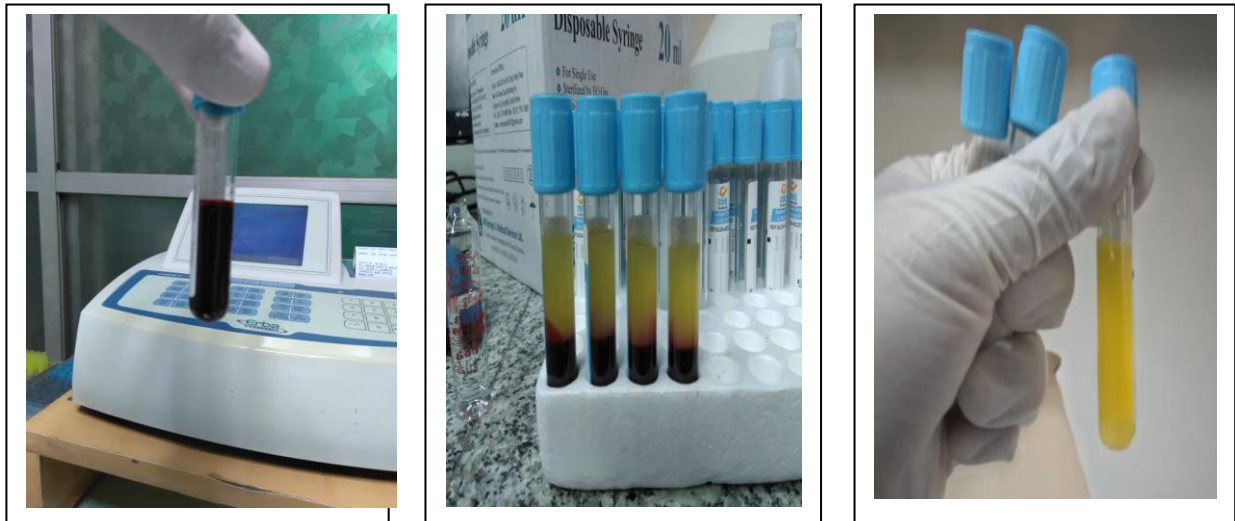


Fig: Platelet rich plasma preparation.

Results:

Total of 10 patients was diagnosed with plantar fasciitis were included in this study. Follow-up was done by VAS and AOFAS score. VAS score was improved more than 1 in each patient from the baseline from second week of therapy. AOFAS score was about 60 up in each patient and became 80 or more from the fourth week of therapy. Response was not satisfactory in 2 patients who did not follow the exercise manual properly or did not maintain weight chart. Pain was not cause any impairment in daily activity after first week and each patient could walk without any help from first week.

Pain (40 points)	Pt-1	Pt-2	Pt-3	Pt-4	Pt-5	Pt-6	Pt-7	Pt-8	Pt-9	Pt-10
1. None	✓	✓				✓				✓
2. Mild, occasional			✓	✓	✓			✓		

3.Moderate, daily								✓		✓	
4.Severe, almost always present											
Function (50 points)											
1.Activity limitations, support requirement											
No limitations, no support	✓	✓	✓	✓	✓	✓			✓		✓
Limited daily and recreational activities, cane								✓		✓	
Severe limitation of daily and recreational activities, walker, crutches, wheelchair, brace											
2.Maximum walking distance, blocks											
Greater than 6	✓	✓	✓	✓	✓	✓			✓		✓
4-6								✓		✓	
1-3											
Less than 1											
3.Walking surfaces											
No difficulty on any surface	✓	✓	✓	✓	✓	✓			✓		✓

Some difficulty on uneven terrain, stairs, inclines, ladders								✓		✓	
Severe difficulty on uneven terrain, stairs, inclines, ladders											
4. Gait abnormality											
None, slight	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Obvious											
Marked											
5. Sagittal motion (flexion plus extension)											
Normal or mild restriction (30° or more)	✓	✓	✓	✓	✓	✓			✓		✓
Moderate restriction (15°-29°)								✓		✓	
Severe restriction (less than 15°)											
6. Hindfoot motion (inversion plus eversion)											
Normal or mild restriction (75%-100% normal)	✓	✓	✓	✓	✓	✓					✓
Moderate restriction (25%-								✓		✓	

74% normal)										
Marked restriction (less than 25% normal)										
Ankle-hindfoot stability (anteroposterior, varus-valgus)										
Stable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Definitely unstable										
Alignment 10 points										
Good, plantigrade foot, midfoot well aligned	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fair, plantigrade foot, some degree of midfoot malalignment observed, no symptoms										
Poor, nonplantigrade foot, severe malalignment, symptoms										

Fig: AOFAS score

Discussion:

Matter of regret that etiology of plantar fasciitis is not fully known. According to the generally accepted view from the literatures, plantar fasciitis is an inflammatory response to micro tears which results in mechanical loading. The usual fascia replaced by angiofibroblastic hyperplastic tissue which spreads to all over the tissue around it and by this producing a self-perpetuating cycle of degeneration ^[1]. Though the myriad is available treatments, about 10% failure rate persists. Alternative treatments are Shockwave, Botulinum toxin-A injection, radiofrequency ablation and surgical procedures. Each provides few success but they also carry measurable amount of risk for complication and failure.

We previously studied with non activated PRP therapy in PF which has shown great promises. However, activated PRP group has shown very significant pain relief and functional status than the non activated. That was similar with the results of Ferhat SAY et al. ^[7]

Nicolo Martinelli et al.^[8] in his study of PRP reported magnificent in 9 (64.3%), good in 2 (14.3%), fair in 2 (14.3%) and very poor in 1 (7.1%) patient whereas we have found 94% patients with exceptional functional status at 3months follow-up period.

Though steroid injections are an accepted method of treating this type of condition, but Crawford et al. ^[9] deduced that steroid injections give short term relief. Conventional treatment with the corticosteroids has a great frequency of relapse, may be due to intra fascial injection lead to long time adverse changes within the structure of the fascia. ^[10] On the other hand repeated corticosteroids injections might predispose to rupture of the plantar fascia ^[11], fat pad atrophy, abscess ^[12] and osteomyelitis ^[13].

Platelet rich plasma was first used by Ferrari et.al. first use platelet rich plasma in 1987 in heart surgery in the event of excessive blood transfusion. Several types of studies have showed that use of PRP in plantar fasciitis is effective ^[14].

The basics of PRP into the treatment promote angiogenesis and also anabolic effects appear in the pathophysiology of collagen matrix degradation seen in plantar fasciitis. Exercise with plantar fascia-specific stretching and giving PRP injection increased and accelerated healing with significant long-term results can be gained in refractory cases [15].

PRP helps increase growth of different types of cells and tissue ^[16]. Various types of growth factors such as vascular endothelial growth factor, interferon growth factor beta, insulin like growth factor, transforming growth factor are secreted from alpha granules of platelet after activation. Moreover, proteins such as fibrinectin, thrombospondin, fibrin are found in PRP. Growth factors playing a great role in soft tissue healing^[17]. By releasing growth factors, PRP recruiting resident stem cells to creates habitual environment and initiates the repair cells in the circulation and bone marrow. Circulation in the affected area is increased by vascular endothelial growth factor, insulin like growth factor helps in matrix development. White blood cells of PRP play an important role as because it contains macrophage, monocytes, neutrophil in copious

amount. M1 macrophage plays vital role in inflammation and M2 macrophage works in immunomodulation. Too much inflammation inhibits apoptosis and metalloproteinase activity [18]. On the other hand, in tendon recovery, PRP also increases tenocyte proliferation in the injured area by ensuring revascularization by means of the secreted growth factors and is constructive increase in collagen expression in tenocytes. [19].

No patient of our study sample was suffer from any complication neither local and systemic up to the end of their follow-up period. Though Omar et al, Acevedo JI et al, Buccilli TA Jr et al and Gidumal R et al has showed in their studies complications like plantar fascia rupture, fat pad atrophy, abscess and osteomyelitis. [8, 9, 10, 12]By this, success rate of PRP treatment approached more than 94%.

The greatest benefit was its prolonged therapeutic action, cost-effectiveness and lower recurrence rate. Limitation of the study was small sample size, short follow-up period.

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Conflict of interest:

There is no conflict of interest.

Conclusion

Activated platelet rich plasma is found safe, cost-effective, convenient, and more suitable to apply than any other conventional methods. Moreover activated form produced rapid action, less painful than non activated PRP.

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