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EFFICACY OF AUTOLOGOUS PLATELET-RICH PLASMA INJECTION IN CASES OF PROXIMAL PLANTAR FASCITIS WHICH HAVE FAILED CONSERVATIVE MANAGEMENT

Orthopaedics

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ABSTRACT

OJECTIVE- The purpose of this study was to evaluate efficacy of autologous platelet-rich plasma injection in case of proximal plantar fascitis which have failed conservative management.

MATERIALS AND METHODS- Fifty patients((total heels 62)) proximal plantar fascitis who have failed to improve even after three months of conservative management, of unilateral and bilateral affected heels receiving one time injections of autologous PRP into the plantar fascia were assessed 1,3,and 6 months follow up after the procedure. The visual analogue scale (VAS) for pain and American Orthopaedic Foot and Ankle Society (AOFAS) Ankle and Hind foot score were used to evaluate the clinical results.

RESULTS- Basis of Visual analogue pain score and AOFAS ankle and hind foot score satisfactory improvement of pain at 1 month, 3 months and 6 month post injection were observed in 22.6%, 45.2%, 75.8% and 21%, 45.2% and 75.2% of heels, respectively.

Pain was significantly decreased on basis of VAS from 7.92 to 6.29, 3.81, 2.6 and on basis of AOFAS from pre-ejection sore 66 to 73.42, 84.69, 89.23 at 1, 3, and 6 month follow up.

CONCLUSION: In this single-center, uncontrolled, prospective, preliminary study indicates that PRP injection has a role to play in the management of chronic intractable proximal plantar fascitis. This technique was efficient in approach 75% affected heels at 6 month follow-up, and injection no associated with any complication.

KEYWORDS:

INTRODUCTION

Proximal plantar fascitis is a commonly seen problem by orthopaedics surgeons every in outpatients. It is estimated that 1 in 10 people will develop heel pain in their life time[1]. Proximal plantar fascitis (PPF) is the commonest cause of plantar heel pain.[2] It is rare under the age of 30 and the peak incidence occurs between 40 and 60 years of age.[3] painful heels due to plantar fascitis are usually unilateral but up to 30% of cases may have a bilateral presentation.[4] It is a degenerative syndrome of the plantar fascia resulting from repeated trauma at its origin on the calcaneus. It effects in individuals regardless of sex, age and ethnicity.[4] It is mainly a clinical diagnosis characterized by infero-medial heel pain, which is often worse with the first few steps in the morning. It is commoner in the obese, women, in those standing for prolonged periods at work, and in those whose jobs involve walking on hard surfaces[5].

In majority of cases, symptoms can be resolved with simple non-operative measures, that include stretching exercises of the Achilles tendon and plantar fascia; cushioned insoles or orthotics to correct biomechanical factors; night splints; activity modification and use of simple analgesics.[6] In the minority of patients who develop intractable pain, other options available include cortico-steroid injections and biologic treatments such as platelet-rich plasma (PRP) in recent years.6 Surgical release of the fascia can also be considered, but results have been variable in efficacy.

Platelet-rich plasma (PRP) is defined as a sample of autologous blood with concentrations of platelets above baseline values.[7] Platelets play an instrumental role in the normal healing response via the local secretion of growth factors and recruitment of reparative cells.[8]

AIMS AND OBJECTIVES

Evaluate efficacy of autologous platelet-rich plasma injection in case of proximal plantar fascitis which have failed conservative management.

MATERIALS AND METHODS

Fifty Patients (total 62 affected heels) were diagnosed as proximal plantar fascitis who failed to conservative management for 3 months, were taken up for study. Conservative treatments included stretching exercises, non-steroidal anti-inflammatory drugs. Stretching of tendo achillis was done with repeated passive dorsiflexion movement of ankle and toes 50 times twice or thrice daily. This was augmented with application of static night splint (light weight ankle foot orthoses) which prevented foot and ankle plantar flexion while sleeping.

These patients were not included in study 1) Pain in the heel other than plantar aspect (eg Posterior tuberosity of calcaneum). 2) Pain associated with calcaneal fracture or fracture-dislocation of the hind foot / mid-foot /forefoot.3) Pain associated with tumour, metabolic disorder or infection any causes other than proximal planter fascitis.4) previously treated cases of plantar heel pain with local steroid injection or surgical operation. 5) Plantar heel pain in children.

Selected patients of proximal plantar fascitis were considered for autologous platelet rich plasma injection locally. These patients were informed about nature of platelet rich plasma therapy and their possible benefit, advantages and disadvantages of therapy. These who gave valid informed and written constants for this new treatment modality were treated with platelet rich plasma injection. Patients having thrombocyte count more than 1 lakh per millimeter were accepted for platelet rich plasma preparation.

Platelet rich plasma preparation: Patient's blood was taken from ante-cubital vein preferably from left, in tri-sodium citrate vacutainer under sterile precautions directly from vein to vacutainer without opening the vacutainer. Autologous blood was collected in seven vacutainer vials (approx. 21 ml) for bilateral and in four vacutainer vials (approx. 12 ml) for unilateral proximal plantar fascitis. The initial separation of plasma was done by standing method (vial was left in standing position for 1hour). After 1hour the vacutainer vials were spun at speed of 1600 round per minute for duration of one minute. Platelet rich plasma (PRP) was seen as the top layer in vial vials followed by yellow buffy coat rich in white blood cells and red blood cell sediment at the bottom. One vial of every patient was used to check quality of platelet rich plasma. Plasma which contained platelet count

more than 2.5 times of the patient's blood platelet counts were accepted for injection. This used vial was discarded. One cm plasma of (approx. 0.8-1 ml) which was just above yellow buffy layer was taken from by opening the top cork in a sterile 10 ml syringe and used for injection. Approx. 2ml of platelet rich plasma was mixed with 0.5ml lignocaine and used for injection in one heel. Usually four vial for bilateral and two vials for unilateral cases were adequate. However one to two excess vials preferred were to maintain plasma volume adequacy for injection even in situation error in preparation of plasma, such as hemolysis due mechanical injury to red blood cell during blood withdrawal from patient.

Platelet rich plasma injection :The affected heel was cleaned with savlon and painted povidine iodine. Sterile draping was done. Approx. 2.5 ml of mixture of platelet rich plasma and lignocaine was injected in at maximum tender point of every affected heel. The injection was given with 22 G needle just above proximal plantar fascitis via a peppering technique (single skin entry, partially withdrawing the needle, redirecting and making multiple penetrations to the fascia, injection just above and just below plantar fascia). Bilateral injection was given simultaneously for bilateral proximal plantar fascitis patient. After injection all patients were allowed to walk but were advised to constant avoid weight bearing sports activity such as running or jumping for at least four week. Non-steroidal anti-inflammatory drugs were usually avoided because these drugs interfere in post injection inflammatory healing process.

Patient were regularly assessed for pain with the Visual Analogue Score for pain9 and the American Orthopedics Foot and Ankle Society (AOFAS) Ankle and Hind foot score10 at pre-injection,1 month, 3month and 6month post injection follow up..
Data analysis was performed using SPSS version 20 (SSPS, Chicago, IL). Values are presented as Mean ± Standard deviation and standard error of mean. Categorical and Continuous variables were compared using appropriate tests. $p<0.05$ is considered statistically significant.

RESULTS and DISCUSSION

Autologous PRP contains a more concentrated amount of platelets than does whole blood. The rationale for using PRP is to increase tendon regenerative abilities with a high content of cytokines and cells, in hyper-physiologic doses, which should promote cellular chemotaxis, matrix synthesis, and proliferation.11 Degranulation of the alpha granules in platelets releases many different growth factors that can play a role in tissue regeneration processes. PRP represents a treatment option for many foot and ankle pathologies, including tendinopathy (Achilles, pe-roneal, posterior tibial, flexor hallucis longus, anterior tibial) and chronic ligamentous injury, such as plantar fascitis.[12]

.Visual Analogue Scale (VAS) measure amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. Operationally a VAS is usually a horizontal line, 100 mm in length, anchored by word descriptors at each end. Assessment pain is highly subjective.9 American Orthopaedic Foot and Ankle Society (AOFAS) ankle hind foot score systems incorporate both subjective and objective factors into numerical scales to describe function, alignment, and pain.[10] In existing literature shows, maximum studies used these scoring system to quantify pain of proximal plantar fascitis and evaluate efficacy of various treatment modalities.

In this study total 50 patients of proximal plantar fascitis who fulfill inclusion criteria were included.38 (24%) patients have bilateral affection and rest 12(76%) patients have unilateral side involvement. Out of total 62 affected heels 30 (48.38%) affected heels belonged to left side and 32 (51.61%) affected heels belonged to right side. 23(46%) patients were male and rest 27 (54%) patients were female. Male patients mean age was 42 years (standard deviation 7.25 years) . Female patients mean age was 41.89 years (standard deviation 10.29 years).

In another prospective study platelet rich plasma injection for chronic proximal plantar fascitis *Martinelli et al*[13] include total 15 patients of proximal plantar fascitis (women 60%, men 40%; mean age 49.2±8.8 years). Mean symptom duration, from the beginning of symptoms to enrolment in the study, was 9.9±2.6 months. The age and sex distribution in this study was comparable to above studies.

Mean visual analogue score of all affected heels at pre injection, at 1 month, 3 month, and 6 month post-injection were 7.92, 6.29, 3.81, and 2.60 respectively. Difference of mean on follow up were significant (p value<0.05). Mean AOFAS ankle and hind foot score of affected heels at pre- injection, at 1 month, 3 month, and 6 month were 66.00, 73.42, 84.69, and 89.23 respectively. Differences of mean on follow up were significant. (P value < 0.05). Patients had showed progressive improvement in pain over month even after single injection of autologous PRP.

Aksahin et al. compared the effects of corticosteroid injections and PRP injections to treat proximal plantar fascitis. Their study consisted of 60 patients who did not respond to conservative treatment for at least 3 months prior to either injection. The patients were placed into two groups in which 30 patients were treated with a corticosteroid injection and 30 patients were treated with a PRP injection. They found no significant difference in pain or patient satisfaction, thus demons trating that PRP injections are as effective as corticosteroid injections without the risks of fat pad attenuation, plantar fascia rupture, and calcaneal osteomyelitis that corticosteroid injections pose.[14]

Shetty et al[15] undertook a prospective non-randomized study to compare the efficacy of traditional corticosteroid injection (Steroid group) to PRP injection (PRP group), in a cohort of patients. The mean post-injection (after 3 month) VAS score of 1.8 significantly improved from the mean preinjection score of 8.1 with a $p<0.001$. AOFAS post-injection scores showed significant improvement in PRP cohort from the preinjection scores, from 33.9 to 83.1 over 3 month follow up. The mean post-injection (after 3 month) VAS score of 4.2 significantly improved from the mean preinjection score of 7.0 with a $p<0.001$. AOFAS post-injection scores showed significant improvement in corticosteroid cohort from the preinjection scores, from 32.5 to 70.5 over 3 month follow up.

Kumar et al [6]evaluated the effectiveness of platelet rich plasma (PRP) ,in chronic cases of proximal plantar fasciitis patients. Patients with proximal plantar fascitis not responded to a minimum of 1years standard conservative management were offered PRP therapy. Prospective data was collected of 50 heels (44 patients). At six month review, VAS improved from 7.7 to 4.2 ($p < 0.001$) and AOFAS improved from 60.6 to 81.9 ($p < 0.001$). 28 patients (64%) were very satisfied and would have the injection again. No complications were reported These studies show efficacy of PRP in proximal plantar fascitis were almost equal to cortico-steroid injection.

The present series also shows significant improvement in VAS and AOFAS in consecutive follow up at 1 month, 3 month, and 6 month of duration. Differences between mean pain score on follow up were statistically significant in every follow up interval.

This present study with single injection of PRP show comparable results with other authors study, where multiple time PRP injections were given.

It was assumed, that patients with visual analogue pain score equal or less than 3 or AOFAS ankle and hind foot score equal or more than 85 had satisfactory improvement of pain. On the basis of Visual analogue pain score, satisfactory improvement of pain were observed in 22.6%, 45.2% and 75.8% of heels at 1 month, 3month and 6month post injection respectively.

On basis of AOFAS ankle and hind foot score , satisfactory improvement of pain were observed in 21%, 45.2% and 75.2% of heels at 1 month, 3month and 6month post injection respectively.

At final follow up (at 6 month) approx. 75 % of patient who received PRP in injection showed satisfactory improvement of pain.

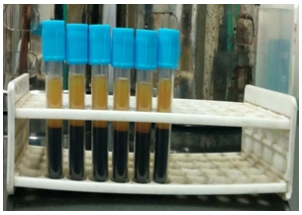
No systemic or local complication noticed till 6 month of follow-up. All patients had improvement in pain. However some have partial resolution of resolution of symptom these were later taken for other modality of invasive treatment at 6 month follow up.

CONCLUSION

The results of this study indicate that PRP injection has a role to play in the management of chronic intractable proximal plantar fascitis. This technique was efficient in approach 75% affected heels at 6 month follow-up. PRP is simple to acquire and prepare easily as opd procedure without any help of very high technology. Hence it provides

satisfactory intermediate and long term results in term of pain relief. It seems a safe clinical procedure. Indeed we had no reported side effects. However larger data set and longer follow up are required to conclude definitive role of PRP. We believe that these initial encouraging results now warrant further investigation, in particular with the use of a prospective randomized controlled trial (RCT).

1



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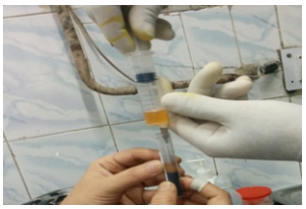

3

4

Above diagram show: 1. PRP (Supernatant part) , 2. Loading of PRP in 10 ml syringe(approx.2ml , 3 Localization of maximum tenderness point, 4. Injection of PRP via peppering technique

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