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Platelet rich plasma for plantar fasciitis: Is it a hype???

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Abstract

Background: Plantar fasciitis (PF) is the most common cause of heel pain. Platelet-rich plasma (PRP) has recently been demonstrated to be helpful in managing plantar fasciitis. The purpose of this study was to assess the safety & efficacy of PRP in the chronic plantar fasciitis.

Materials & Methods: In this study, we included 60 patients with PF of which 30 were given local PRP & other 30 were given steroid and regular follow up was done. Pain intensity and functional outcomes were measured using Visual Analogue Scale (VAS), Ankle-Hind foot Scale (AHFS), Roles-Maudsley Subjective Pain Scale (RMSPS). Patients with PF who had undergone at least 4 weeks of conservative treatment were included whereas patients with history of previous surgery for Plantar Fasciitis, Bilateral cases, Infection, tumours of lower extremity, Haemorrhagic disorders, on anticoagulant therapy, Pregnancy and Uncontrolled Diabetes were excluded.

Results: Both groups were similar in terms of age, gender, side and baseline VAS & AHFS scores. In both the groups, mean VAS scores and the mean AHFS scores improved significantly at the end of one year over the baseline values. Similarly, in both the groups, functional status improved significantly over a period of one year with 73% patients in the steroid group and 97% in the PRP group achieving excellent functional status. The PRP group had significantly higher mean VAS, AHFS and RMSPS scores at 1 year follow-up than the steroid group. ($p < 0.001$)

Conclusion: We conclude that local infiltration of platelet rich plasma is found safe, convenient, superior and more effective treatment compared to local infiltration of steroids in plantar fasciitis.

Keywords: Plantar fasciitis; Platelet Rich Plasma; Steroid

1. Introduction

Plantar fasciitis is an inflammation of the plantar fascia at the bottom of foot which is most common cause of plantar heel pain. Although, thought of as an inflammatory process, plantar fasciitis is a disorder of degenerative changes in the fascia, and may be more accurately termed as Plantar Fasciosis^[1].

Though pathology of plantar fasciitis remained ill understood, there is evidence to suggest that it is probably initiated by repeated micro trauma. The inflammation is never acute and in chronic cases, in fact, there is a loss of inflammatory response and a scar formation.

A heel spur is a calcium deposit - that is, a growth of bone - that can develop on the bottom of the heel bone where the muscles of the foot connect to the bone. One out of 10 people has heel spurs, but only 1 out of 20 people (5%) with heel spur has foot pain^[2]. Heel spur is not the cause of the pain. The injured soft tissue is the cause of pain^[3].

The peak incidence of heel pain occurs between ages 40 and 60 years and is particularly common problem in older athletes, military recruits and labourers^[4]. Individual risk factors include obesity, loss of ankle dorsiflexion, extensive work related weight bearing, standing on hard surfaces for prolonged periods of time, high arches of feet and flat feet^[5].

Numerous methods have been advocated for treating plantar fasciitis including rest, NSAIDs, night splints, foot orthosis, stretching protocols and ESWT (Extra Corporeal Shock Wave Therapy). Local steroid injections are a popular method of treating the condition.

Platelet rich plasma (PRP) is promoted as an ideal autologous biological blood-derived

product, which can be exogenously applied to various tissues. When platelets become activated, growth factors are released and initiate body's natural healing response.

2. Materials & method: A total of 60 patients presenting with pain at the bottom of the heel especially, severe in the morning and on initial few steps after period of prolonged rest were selected for this randomized controlled comparative study. Diagnosis was mainly on clinical grounds i.e. on palpation there was mild to severe tenderness on medial calcaneal tubercle and sometimes on lateral aspect of heel. Age more than 18 years with history of at least 4 weeks of unsuccessful conservative treatment and willing to participate in the study were included in this study. Patients age less than 18 years, bilateral cases of plantar fasciitis, patients with history of corticosteroid injection in last 2 months; dysfunction of foot and ankle, arthritis of foot, infections or tumour of lower extremity, patients with haemorrhagic disorder and on anticoagulant therapy, pregnancy and diabetic patients were excluded from this study. Ethical approval was obtained from the Institutional Ethics Committee. All the patients irrespective of the previous treatments or duration of the symptoms were started with conservative treatment. They

were randomly allocated to two groups after failed conservative treatment at 4 weeks and were treated after taking informed written consent. Platelet rich plasma was prepared under laminar hood flow under all sterile aseptic precautions.

Group-A was treated with Inj. Depo-Medrol® (Methyl prednisolone acetate I.P.) 40mg × 2 ml and Group-B was treated with 3 ml of Platelet Rich Plasma once only. Injection was given over maximal tenderness point of painful heel by peppering technique using single entry point. Post injection, all patients were given Paracetamol 650 mg two times a day and were instructed to remain non-weight bearing for 48 hrs. Patients were instructed on gentle stretching exercises before standing from prolonged rest i.e. plantar fascia stretching exercises, toe-walking & bottle roller exercises.

All the patients were evaluated for pain relief and functional status at 2 weeks, 4 weeks, 6 weeks, 3 months, 6 months and 1 year on the basis of Visual Analogue Scale (VAS), Roles-Maudsley Subjective Pain Scale (RMSPS) and Ankle-Hind Foot Scale (AHFS). Additionally, a clinical history and examination was conducted to assess for local and systemic complications such as infection, unremitting pain etc.

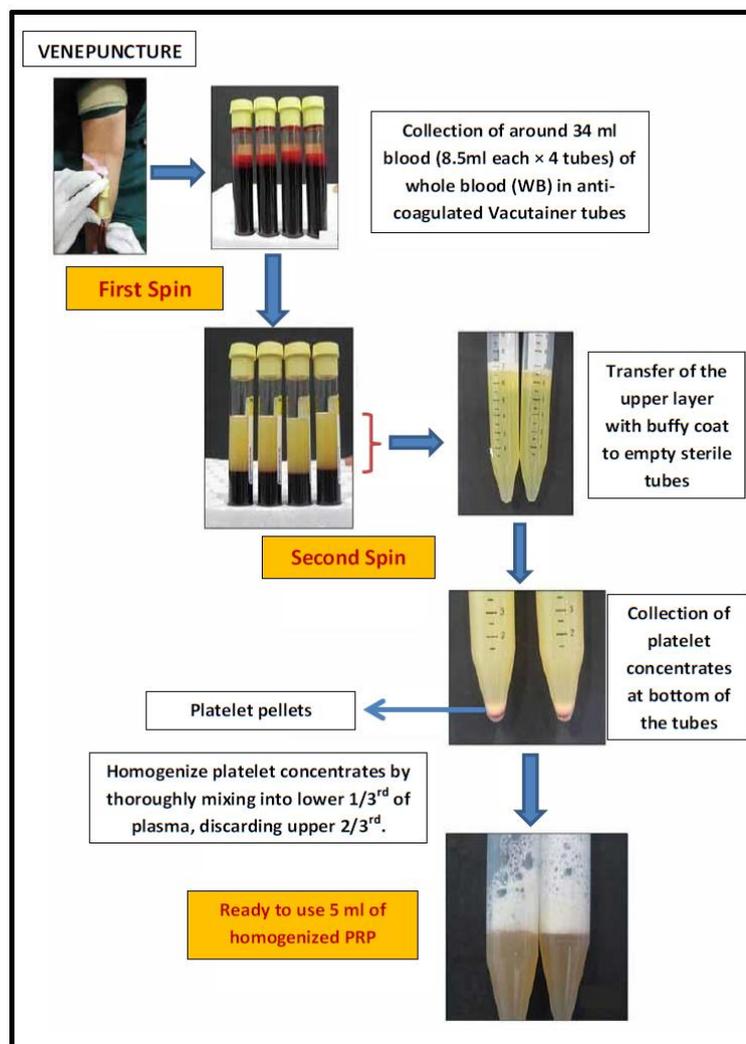


Fig 1: Flowchart describing preparation of PRP [6]

3. Results

A total of 60 patients diagnosed with plantar fasciitis were included in this study. Group-A comprised of 30 patients who had received steroid infiltration and Group-B comprised of 30

patients who had received platelet rich plasma. (n= 60) Both groups were similar in terms of age, gender, side and baseline VAS & AHFS scores (Table1).

Table 1: Comparison of the patients' characteristics at baseline.

	Steroid Group (n=30)		PRP Group (n=30)		P Value
	n	Mean ± SD	n	Mean ± SD	
Age (year)		41.36 ± 6.18		41.26 ± 8.82	> 0.05
Male/Female	9/21		5/25		> 0.05
Affected Heel (Right/Left)	11/19		14/16		> 0.05
VAS		6.93 ± 1.04		6.96 ± 1.12	> 0.05
AHFS		71.86 ± 8.95		71.80 ± 8.97	> 0.05

VAS: Visual Analogue Scale; AHFS: Ankle Hind Foot Scale

In the Steroid group, mean VAS score was 6.93 ± 1.04 at the baseline and 1.23 ± 2.14 at 1 year follow-up (Table 2). Means AHFS score was 71.86 ± 8.95 at the baseline and 95.93 ± 7.74 at 1 year follow-up (Table 2). The differences between pre-treatment and follow-up scores were statistically significant (Table 2).

In the PRP group, mean VAS score was 6.96 ± 1.12 at the baseline and 0.10 ± 0.54 at 1 year follow-up (Table 2). Means AHFS score was 71.80 ± 8.97 at the baseline and 99.03 ± 5.30 at 1 year follow-up (Table 2). The differences between pre-treatment and at 1 year follow-up scores were statistically significant (Table 2).

Table 2: Comparison of VAS and AHFS scores of the groups according to follow-up period.

	Steroid Group (n=30)		PRP Group (n=30)		P Value
	Mean ± SD		Mean ± SD		
VAS					
Baseline	6.93 ± 1.04		6.96 ± 1.12		> 0.05
6 th week	1.26 ± 1.31		3.83 ± 0.79		< 0.05
3 rd month	0.90 ± 1.53		0.76 ± 0.85		> 0.05
6 th month	1.03 ± 1.77		0.33 ± 0.71		< 0.05
1 year	1.23 ± 2.14		0.10 ± 0.54		< 0.05
AHFS					
Baseline	71.86 ± 8.95		71.80 ± 8.97		> 0.05
6 th week	96.06 ± 6.64		89.73 ± 5.54		< 0.05
3 rd month	96.00 ± 6.74		98.56 ± 3.74		> 0.05
6 th month	95.63 ± 7.60		99.23 ± 2.94		< 0.05
1 year	95.93 ± 7.74		99.03 ± 5.30		< 0.05

VAS: Visual Analogue Scale; AHFS: Ankle Hind Foot Scale

At baseline in Steroid group, 16.67% patients had Poor, 63.33% had Fair and 20% had Good functional status and at 1 year follow-up 6.67% had Fair, 20.00% patients had good and 73.33% patients had excellent functional status (Table 3). In PRP group, 16.67% patients had Poor, 66.67% had Fair and 16.67% had Good functional status and at 1 year follow-

up 3.33% patients had good and 96.67% patients had excellent functional status (Table 3).

The PRP group had significantly higher mean VAS, AHFS and RMSPS scores at 1 year follow-up than the steroid group. ($p < 0.001$)

Table 3: Comparisons of RMSPS score of the groups at baseline and 1 year.

	Steroid Group (n=30)				PRP Group (n=30)				Chi Square	p
	P	F	G	E	P	F	G	E		
Baseline	16.67%	63.33%	20%	-	16.67%	66.67%	16.67%	-	0.11	>0.05
1 year	-	6.67%	20%	73.33%	-	-	3.33%	96.67%	6.53	<0.05

RMSPS: Roles Maudsley Subjective Pain Scale; P: Poor; F: Fair; G: Good; E: Excellent

Results in Steroid group revealed greatest improvement in pain and functional status in first 4 weeks and further improvement up to 6 weeks which then remained constant up to 1 year. PRP group revealed improvement in pain and functional status, started after 4 to 6 weeks and further improvement seen up to 3 months which was constantly improving up to 1 year.

None of the patients in any of the groups suffered any complications (local or systemic) till the end of their follow-up. However, In group-A, 8 out of 30 patients had recurrence of pain at 4 to 6 weeks whereas, in group-B, none of the patients had recurrence of the symptoms except 1 who had mild pain till the end of the follow-up.

4. Discussion

The etiology of plantar fasciitis is not fully known. According to the commonly accepted view in the literature, plantar

fasciitis is an inflammatory response to micro tears which form as a result of mechanical loading. In fact, histology of chronic cases with PF has shown no signs of inflammatory cell invasion into the affected area. The normal fascia tissue is replaced by an angiofibroblastic hyperplastic tissue which spreads itself throughout the surrounding tissue creating a self-perpetuating cycle of degeneration^[1]. Despite the myriad of available treatments, a 10% failure rate persists. Shockwave treatment, Botulinum toxin-A injection, radiofrequency ablation, and surgical procedures have each provided some measure of success but also carry measurable risk for complication and failure.

This randomized study was designed to compare the use of platelet rich plasma with steroid in patients with plantar fasciitis.

In both, steroid and PRP groups, there were significantly great improvement in VAS and AHFS score. However, PRP group

has shown significant pain relief and functional status than the steroid group. This was similar with the results of Ferhat SAY et al. [7]

Nicolo Martinelli et al. [8] in his study of platelet rich plasma reported excellent in 9 (64.3%), good in 2 (14.3%), fair in 2 (14.3%) and poor in 1 (7.1%) patient whereas we found 96.67% patients with excellent functional status at 1 year follow-up period.

Steroid injections are a popular method of treating the condition but Crawford et al. [9] concluded that steroid injections provide short term relief. In our study, we found a positive effect on pain and functional scores in the steroid group which can be explained by the anti-inflammatory effect. However, treatment with corticosteroids has a high frequency of relapse and recurrence, probably because intra fascial injection may lead to permanent adverse changes within the structure of the fascia and because patients tend to overuse the foot after injection as a result of direct pain relief [10]. Additionally and more seriously is that repeated corticosteroids injections could 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 in 1987 in heart surgery to prevent excessive blood transfusion. Several studies have reported the use of PRP in plantar fasciitis [14].

The introduction of PRP into the treatment paradigm as a modulator of angiogenesis and anabolic effects appears to address the pathophysiology of collagen matrix degradation and chaotic vascularity seen in plantar fasciitis. By combining eccentric exercise and cyclic plantar fascia-specific stretching with PRP injection, enhanced and accelerated healing with excellent long-term results can be achieved in refractory cases [15].

Platelet-rich plasma stimulates the proliferation of various cell types in cells and tissue [16]. Within the alpha granules of platelets, growth factors such as platelet-derived growth factor, transforming growth factor, vascular endothelial growth factor and insulin-like growth factor, and proteins such as fibrin, fibronectin, vitronectin, and thrombospondin are found in PRP. These growth factors play a function in soft tissue healing [17]. With its growth factors, PRP stimulates the local stem cells and activates the repair cells in the circulation and bone marrow. Excessive inflammation inhibits apoptosis and metalloproteinase activity [18]. Moreover, in tendon recovery, PRP increases tenocyte proliferation in the injured area by providing revascularization by means of the included growth factors and is effective in increasing collagen expression in the tenocytes. [19].

None of the patients of our study in both groups suffered any complications (local or systemic) till the end of their follow-up. Omar et al, Acevedo JI et al, Buccilli TA Jr et al and Gidumal R et al in their studies reported complications like plantar fascia rupture, fat pad atrophy, abscess and osteomyelitis. [8, 9, 10, 12].

Thus, success rate of PRP treatment approached more than 90%. These findings are consistent with many other studies conducted by H. Craig Fox, coal city and William Czarnecki, Chicago who treated 200 patients with autologous platelet concentrate (APC).

The greatest benefit of was seen lies in its prolonged therapeutic action and lower recurrence rate. However, small sample size remains the limitation of this study.

5. Conclusion

We conclude that local infiltration of platelet rich plasma is

found safe, convenient, superior and more effective compared to local infiltration of steroids in plantar fasciitis when potential complications of corticosteroid treatment for relieving pain and improving functional results at 6 month follow-ups were considered.

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