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Platelet Rich Plasma in Treatment of Plantar Fasciitis

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ABSTRACT

Background: Using platelet rich plasma (PRP) was associated with more improvement in activity limitation and physical disability when compared with corticosteroids and even with surgical management.

Objective: The aim of the study is to evaluate the effect of local PRP injection on chronic plantar fasciitis resisting the conservative modalities of treatment.

Patients and Methods: This is a prospective interventional study of 30 patients for 6 months. 18 males and 12 females with planter fasciitis were included in this study. Their ages ranged from 35 to 62 years with a mean age of 44.5 years. Patients with widespread inflammatory arthritis, any wound or skin lesion on the plantar aspect of the foot, previous surgery for heel pain, and other local pathologies for heel pain were excluded. Their improvement was measured by Ankle Hindfoot Scale.

Results: The Ankle Hindfoot Scale showed a statistically significant (p-value 0.02) improvement over time. Acceptable results were obtained in 70% (n=21) of patients from a single injection and 30% (n=9) needed a second injection. Chronic plantar fasciitis that is resistant to conventional treatment techniques can be effectively treated with local PRP injection.

Conclusion: For severe plantar fasciitis that is resistant to conventional treatment approaches, local PRP injection is an effective therapy.

Keywords: Platelet Rich Plasma, Plantar Fasciitis, Conservative modalities of treatment.

INTRODUCTION

The most frequent cause of heel discomfort is chronic plantar fasciitis, which can afflict both active young people and sedentary middle-aged adults [(1-3)]. The disease is diagnosed based on the usual history and the presence of localised soreness in the medial calcaneal tubercle, which are both signs of a degenerative pathology [(4)], as opposed to an inflammatory process [(5-8)].

A variety of conservative treatments for plantar fasciitis are now widely used, including physiotherapy, stretching exercises for the plantar fascia, ice packs, night splints, shoe modifications, and non-steroidal anti-inflammatory medicines (NSAIDs) [(9)]. Following conservative therapy, local injections of corticosteroids are frequently utilised to treat individuals with recalcitrant plantar fasciitis [(10-12)].

PRP is platelet-rich plasma that promotes bone and muscle repair. PRP is often employed in tissue healing processes that are mediated by various cytokines and growth factors [(13, 14)]. In medicine, PRP is frequently utilised to treat osteoarthritis, tennis elbow, Achilles tendonitis, and plastic surgery [(15, 16)].

For the treatment of plantar fasciitis, platelet rich plasma (PRP) has recently been evaluated in contrast to other therapies and drugs. When compared to corticosteroids and even surgical therapy in certain trials, utilising PRP was linked to greater improvement in activity restriction and physical handicap [(11, 12)].

Aim of the work was to evaluate the effect of local PRP injection on chronic plantar fasciitis resisting the conservative modalities of treatment.

PATIENTS AND METHODS

This is a prospective interventional study of 30 patients for 6 months. Through using Z score table with confidence interval (95%) with consideration of estimated prevalence ratio of the disease in Egypt and census; 30 patients with chronic heel pain diagnosed with plantar fasciitis not responding to conservative treatment for 3 months or injection by corticosteroid and ages between 18 and 65 years were enrolled in this study, while patients with any wound or skin lesion on the plantar area of the foot, previous surgery for heel pain, and any other local pathologies for heel pain were rejected.

Platelet Rich Plasma preparation:

The antecubital vein was punctured using aseptic approach to get between 30 and 60 cc of venous blood. In an effort to prevent agitation and damage to the platelets, which were in a resting condition, an 18 or 19 g butterfly needle was indicated. After that, the blood was put into a specialised kit that has received FDA approval and centrifuged for 15 minutes at 3,200 rpm. The blood was then divided into RBC, PRP, and platelet deficient plasma (PPP). The PPP was then removed from the device via a unique port and discarded. The device was shaken for 30 seconds to resuspend the platelets while the PRP was in a vacuumed environment. After that, the PRP was removed. There were around 3 or 6 cc of PRP accessible, depending on the size of the first blood pull [(17)].

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Study procedure:

Injection on medial side of the heel on the most tender point. Patients were evaluated by American Orthopedic Foot and Ankle Score for 3 months. Side effect of injection like inflammation or infection was avoided and patient was protect by good sterilization at site of injection.

Ethical consent:

The study was authorised by Helwan University's Ethical Institutional Review Board. All study participants provided written informed permission after being informed of our research's goals. The Declaration of Helsinki for human beings, which is the international medical association's code of ethics, was followed during the conduct of this study.

Statistical analysis

SPSS version 15.0, a statistical application, was used to examine the data (SPSS Inc., Chicago, IL). Qualitative data were expressed using absolute and relative frequencies, whereas quantitative variables were reported as mean or median and standard deviation (SD). To investigate the relationship between qualitative variables, the Chi-square test was employed. Wilcoxon signed ranks test was utilised to analyse the quantitative data. The cutoff for statistical significance was $P < 0.05$.

RESULTS

This study comprised 30 patients with plantar fasciitis, 18 males and 12 females. Their mean age was 44.5 years, with range from 35 to 62 years. Their improvement was measured by Ankle Hindfoot Scale.

Table (1): Demographic distribution of planter fasciitis

		Count	%	p-value
Gender	**F**	12	40%	0.273
	M	18	60%	
Side	**Bil (Lt >Rt)**	4	13.33%	0.088
	Bil (Rt> Lt)	4	13.33%	
	Lt	11	36.67%	
	Rt	11	36.67%	

Regarding clinical assessment, the average follow up duration was minimum 6 months. The Ankle Hindfoot Scale showed a statistically significant improvement over time.

Acceptable results were obtained in **70% (n=21)** of patients from a single injection and 30% (n=9) needed a second injection. The cutoff for acceptable results was above 70 regarding The Ankle Hindfoot Scale.

Of the participated patients, 21 patients (70%) needed a single injection for a significant improvement of symptoms, while only 9 patients (30%) needed a booster dose. The pain, regarding Ankle Hindfoot Scale, was significantly low in both groups after 2 months of the last injection. In addition, pain reached 40 degree (excellent recovery) after 6 months post last injection.

Table (2): Pain in Ankle Hindfoot scale

Patients needed single injection (n=21)	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	0	0.38	
2 months post injection	30	8.36	**0.001***
6 months post injection	40	12.59	**0.002***
Patients needed second injection (n=9)	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	0	0.43	
Before second Injection (2 months after first injection)	20	9.28	**0.031***
2 months post second injection	30	10.17	**0.023***
6 months post second injection	40	15.36	**0.01***

* Wilcoxon Signed Ranks Test.

Regarding function according to Ankle Hindfoot Scale, there was a significant improvement in activity limitation in both groups with maximum degree of recovery after 6 months after last injection. Consequently, the maximum walk distances besides walking surfaces have significantly increased after the same period (6 months of last injection).

Table (3): Function in Ankle Hindfoot scale

Patients needed a single injection (n=21)			
Activity limitation	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	4	2.01	
2 months last injection	7	3.28	0.04*
6 months post injection	10	2.23	0.02*
Maximum walking distance	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	2	0.63	
2 months last injection	5	1.23	0.01*
6 months post injection	5	0.93	0.02*
Walking surfaces	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	0	0.16	
2 months last injection	5	1.29	0.00*
6 months post injection	5	1.75	0.00*
Hindfoot motion	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	3	0.53	
2 months last injection	3	0.39	0.471
6 months post injection	3	0.28	0.518
Patients needed a second injection (n=9)			
Activity limitation	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	4	1.22	
Before second injection (2 months after first injection)	7	2.40	0.04*
2 months post second injection	7	4.27	0.03*
6 months post second injection	10	1.96	0.01*
Maximum walking distance	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	2	0.57	
Before second injection (2 months after first injection)	4	1.26	0.022*
2 months post second injection	4	1.84	0.018*
6 months post second injection	5	0.65	0.00*
Walking surfaces	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	0	0.18	
Before second injection (2 months after first injection)	3	0.87	0.03*
2 months post second injection	3	1.17	0.01*
6 months post second injection	5	1.36	0.01*
Hindfoot motion	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	3	0.43	
Before second injection (2 months after first injection)	3	0.28	0.864
2 months post second injection	3	0.17	0.632
6 months post second injection	3	0.36	0.546

* Wilcoxon Signed Ranks Test

On the other hand, there was no significant improvement in neither hindfoot motion nor alignment of the foot.

Table (4): Alignment in Ankle Hindfoot scale

Alignment	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	8	1.89	
2 months post last injection	8	2.69	0.278
6 months post last injection	8	9.32	0.375
Alignment	**Mean**	**Standard Deviation**	**p-value**
Pre-injection	8	2.47	
Before second injection (2 months after first injection)	8	3.63	0.581
2 months post second injection	8	4.87	0.854
6 months post second injection	8	7.32	0.478

* Wilcoxon Signed Ranks Test

In single injection group, there was a significant difference between pre-injection total score and 6 months post injection. While the second group needed a booster dose (2 months after) to reach a significant improvement in symptom according to Ankle Hindfoot Scale.

Table (5): Total score in Ankle Hindfoot scale

Total	Single injection (n=21)			Second injection (n=9)		
	Mean	Standard Deviation	p-value	Mean	Standard Deviation	p- value
Pre- injection	27.45	11.23		28.47	10.78	
Before second injection	-	-	-	50.26	24.32	0.06*
2 months post last injection	75.35	35.54	0.03*	76.41	37.21	0.04*
6 months post last injection	96.21	12.23	0.01*	95.27	14.86	0.02*

* Wilcoxon Signed Ranks Test.

Complications

Aside from the complications universally reported of post-procedure, which needed icepack and paracetamol therapy, no systemic or local problems were ever identified.

RESULTS: Overall, PRP injection is a viable option for plantar fasciitis treatment, but close follow-up is needed as according to our results about 30% of the study participants needed a booster dose to reach a significant recovery from symptoms. However, there was no change of foot alignment and stability, because it is related to foot anatomy not to the plantar fasciitis pathology.

DISCUSSION

Plantar fasciitis is the most frequent cause of heel pain, although the exact cause and best course of therapy are still unknown. The patient's medical history and physical findings for at least six months are used to make the diagnosis of plantar fasciitis. This is consistent with the majority of trials, which only included patients who had symptoms for at least six months and had tried and failed conservative therapy[17].

The study on the pathophysiology of plantar fasciitis is a topic of controversy in the literature and is likely to change the treatment approaches. According to popular belief, plantar fasciitis develops as a result of repetitive micro-trauma brought on by overuse, which causes tiny rips in the tissue before a larger damage takes place [18,19]. Plantar fasciitis, according to **Lemont *et al.*** [20]**,** is a degenerative disease rather than an inflammatory one, with micro-tears and necrosis of the plantar fascial ligament and intrinsic flexor muscles of the foot at their attachments on the calcaneus as a result.

Thus, plantar fasciosis is a better name to describe this condition. It was suggested that the ailment popularly known as plantar fasciitis be termed "plantar fasciosis," which more precisely defines the disorder, with regard to specimens of resected plantar fascia [21]. The histological examination of surgical samples of tendons that had "tendonitis" but no signs of inflammation supports these findings further [22]. Similar findings were seen in a research by **Snider *et al.*** [21] that revealed collagen necrosis, angiofibroblastic hyperplasia, chondroid metaplasia, and matrix calcification in surgical biopsy tissues. Once more, no evidence of an anti-inflammatory response in cells was provided [1]. The study's sample group included 30 patients, with 18 men (60%) and 12 women (40%) with a mean age of 44.5. The study's objective was to assess this innovative biological strategy for treating persistent plantar fasciitis utilising PRP. The findings of this study demonstrated that PRP injections improved ankle-hind-foot scores, with a mean overall score of 95.27 after 6 months of injection. This supports claims made by other authors that local delivery of growth factors by PRP injections improves the healing process of tendons [24]. While, there are several research that study the use of PRP injections to treat chronic tendinopathy, there is conflicting information about its efficacy as of this writing [5].

54 patients with Achilles tendinopathy treated at a single facility with exercise (normal care and injection of either PRP or saline solution) participated in a randomised placebo-controlled experiment by **de Vos *et al.*** [5]. The authors came to the conclusion that a PRP injection did not enhance nonfunctional tasks or reduce pain more than a placebo. Two years after PRP injection, **Mishra *et al.*** [23] showed a substantial pain reduction in a prospective trial of 15 patients with chronic elbow tendinosis. The treatment for persistent plantar fasciitis has been extracorporeal shock wave therapy (ESWT). Success rates have varied from 48 to 77% depending on the referenced study, and results have been inconsistent. In the near term, this alternative conservative approach to the treatment of recalcitrant plantar fasciopathy may be wise and cost-effective, reducing the need for surgical operations [24].

There have been reports of using autologous blood injections to treat persistent plantar fasciitis. In a prospective randomised research, **Lee and Ahmad** [25] contrasted the injection of corticosteroids with the injection of autologous blood. Over the course of the six-month follow-up period, intralesional autologous blood considerably reduced pain levels and raised tenderness thresholds; nevertheless, corticosteroids were deemed better in terms of speed and, likely, degree of recovery. For patients in whom first-line noninvasive therapy failed to reduce pain levels and when corticosteroid injection fails or is contraindicated, the authors propose the administration of intralesional autologous blood injection.

Since PRP is produced by centrifuging or filtering the plasma component of autologous blood, it has a higher concentration of platelets and a greater amount of growth factors than other forms of autologous blood. Comparing PRP versus autologous blood in the treatment of plantar fasciitis, the authors

anticipated a stronger benefit [19].

In pilot research including nine patients, **Barrett and Erredge** [26] used a single PRP injection and found 78% symptom remission after a two-month short-term follow-up. The plantar fasciorrhaphy procedure involved injecting PRP into bothersome, resistant plantar fascia in an effort to have a reparative impact that would alleviate symptoms. After two months, they discovered that symptoms had completely disappeared in six out of nine individuals. After a second injection, one participant showed improvement. 77.9% of the participants reported no symptoms after a year. They demonstrated that there was a decrease in the thickness of the plantar fascia as measured by ultrasonography between the pre- and post-injection periods. When the visual analogue scale and the modified Roles and Maudsley scores were evaluated at 3 weeks and 6 months, **Akşahin *et al.*** [19] found no statistically significant difference between the steroid and PRP groups ($P > 0.05$). PRP and corticosteroid injections did not cause any side effects. Both approaches worked well and effectively to treat plantar fasciitis. Although no steroid-related complications have been reported, PRP injection appears to be less dangerous while yet being as effective in treating plantar fasciitis. These hazards include fat pad atrophy, osteomyelitis of the calcaneus, and iatrogenic rupture of the plantar fascia. Given that plantar fasciitis is thought to be a degenerative condition rather than an inflammatory response, the outcomes of the PRP injection group were anticipated to be more positive taking into account the potential restorative impact of PRP. The manner of injection, whether it be ultrasound guided or palpation guided, is the second problem with corticosteroid and PRP injection therapy. Although ultrasound-guided injection was advocated in several research [27].

CONCLUSION

For severe plantar fasciitis that is resistant to conservative treatment approaches, local PRP injection is an effective therapy. Patients having previous surgery for heel pain, any wounds or skin lesions on the plantar aspect of the foot, systemic inflammatory arthritis, and other local pathologies causing heel pain were excluded from the study.

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