

The efficacy of platelet-rich plasma therapy and corticosteroid injection in the treatment of planter fasciitis: A Comparative study

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Abstract

Aim: The aim of this study to compare the efficacy of platelet-rich plasma therapy and corticosteroid injection in the treatment of planter fasciitis. **Methods:** The prospective clinical study was conducted in the Department of Orthopaedics, Narayan Medical College & Hospital, Jamuhar, Bihar, India from July 2020 to June. 44 patients were included for the study and were randomly allotted into two groups, PRP group (n=22) and Steroid group (n=22). For preparation of platelet-rich plasma, 25-27 ml of blood was withdrawn from the cubital vein and placed in a glass tube containing 3 ml of citrate dextrose solution (ratio 9:1). Citrate dextrose solution was used to prevent clotting. The blood was centrifuged at 3300-rpm for 10-12 minutes and 3ml PRP preparation was obtained from the upper buffy coat. **Results:** The mean initial or Pre injection VAS and AOFAS scores in the steroid and PRP group was 7.7±2.1, 59.89±11.77 and 8.3±2.2, 61.58±10.69 respectively and were comparable (p ≥ 0.05). Post injection, the score improved considerably in each group on each follow-up; however no significant difference could be detected between the scores of the two groups at the follow-up of 1 month VAS (4.2±2.3 vs 3.3±0.91) and AOFAS (80.66±10.96 vs 82.65±10.36), 3 months VAS (2.5±1.9 vs 1.9±0.88), AOFAS (85.65±12.97 vs 87.89±12.69) and 6-months VAS (2.0±0.97 vs 1.5±0.6) and AOFAS (88.7±12.69 vs 89.96±11.36). **Conclusion:** We concluded that the treatment of planter fasciitis with steroid or PRP injection was found to be equally effective.

Keywords: Planter fasciitis, Platelet-Rich Plasma, Steroid

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Introduction

Planter fasciitis is an important clinical cause of infero medial heel pain in adults which occurs due to overuse injury arising due to multiple factors[1,2]. There is often inflammation at the origin of the planter fascia and surrounding perifascial structures, such as the calcaneal periosteum[3,4]. Mechanical overload can eventually lead to chronic inflammation and degenerative changes[4]. Combination of treatment modalities is usually recommended over any individual treatment option[4].

Mechanical interventions like foot orthoses, foot taping, footwear, night splints, rest, and walking casts have been thought to reduce the load and stress applied to the inflamed planter fascia to a tolerable level[5,6]. Other treatment options include drugs such as non-steroidal anti inflammatory drugs (NSAIDs) to relieve pain and steroid injections[7]. Night splints, low dye taping, heel pads, cups and orthoses have also been used with varying success rates[8]. Extra corporeal shock wave therapy is used in the recent years to treat this disease with life style modifications[9].

Only 5 to 10% of the people will need surgical intervention like removal of calcaneal spur, neurectomy and planter fasciotomy[10]. The advantages of corticosteroid injections include low cost, low complexity, and rapid pain relief. However, many are concerned about the potential complications associated with this treatment modality, which may offset its benefits.

PRP, which is a natural concentrate of autologous growth factors, is now being widely tested in different fields of medicine for its possibilities in aiding the regeneration of tissue with low healing potential[11].

In Europe and the United States, there is an increasing prevalence of the use of autologous blood products to facilitate healing in a variety of applications. New data exist about specific growth factors, which play a crucial role in the healing process. With that knowledge, there is abundant enthusiasm in the application of concentrated platelets, which release a supramaximal quantity of these growth factors to stimulate recovery in nonhealing injuries[12]. The aim of this study was to compare the efficacy of platelet-rich plasma therapy and corticosteroid injection in the treatment of planter fasciitis.

Material and methods

The present prospective clinical study was conducted in the Department of Orthopaedics, Narayan Medical College & Hospital, Jamuhar, Bihar, India from July 2020 to June 2021, after taking the approval of the protocol review committee and institutional ethics committee.

Inclusion criteria

Patients, who had been diagnosed with planter fasciitis, treated for minimum of 3 months duration and showed no benefit from conservative treatment were included in the study. Diagnosis of planter fasciitis was made by clinical examination and radiographs of ankle were examined to rule out other heel pathologies.

Procedure

Total of 44 patients were included for the study and were randomly allotted into two groups, PRP group (n=22) and Steroid group (n=22). For preparation of platelet-rich plasma, 25-27 ml of blood was withdrawn from the cubital vein and placed in a glass tube containing 3 ml of citrate dextrose solution (ratio 9:1). Citrate dextrose solution was used to prevent clotting. The blood was centrifuged at 3300- rpm

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for 10-12 minutes. 3ml PRP preparation was obtained from the upper buffy coat.

In both groups, injection was given under strict aseptic precautions. The patients were kept in supine position with eyes covered to ensure blinding. The area to be injected was prepared with 10% povidone iodine scrub. The maximum tender spot over the medial aspect of heel was marked and was anaesthetised by using 2 to 3ml of 2% lignocaine. 3ml PRP preparation was injected in the PRP group and 2ml (40mg) of methylprednisolone was injected in steroid group using peppering technique[13] (single skin portal and 4-5 penetrations of the plantar fascia) in both groups.

After the injection, patients were advised to apply ice for pain relief if required and to continue to wear comfortable shoes with cushions and were instructed not to use NSAIDs after the procedure. All patients had physical therapy to stretch the calf muscle and plantar fascia.

Clinical assessment was made prior to the injection and at 1 month, 3 months and 6 months following the injection. Clinical evaluation included pain assessment using visual analog scale (VAS) from 0 to 10 (0 reflects absence of pain, 10 indicates the worst imaginable pain) and the functional outcome score was measured by the American Orthopaedic Foot & Ankle Society (AOFAS) ankle-Hind foot scale.

Statically analysis

Results were stated as mean \pm standard deviation (SD). The comparison of normally distributed continuous variables between the groups was performed by using the Student *t* test. Nominal categorical data between the groups were compared using chi-square test or Fisher exact test as appropriate and non-nominal distributed continuous variables were compared using the Mann-Whitney U test. A value of $p < 0.05$ was accepted as statistically significant.

Results

In this study both groups were similar in terms of age, gender and side involvement as shown in table 1. The mean initial or Pre injection VAS and AOFAS scores in the steroid and PRP group was 7.7 ± 2.1 , 59.89 ± 11.77 and 8.3 ± 2.2 , 61.58 ± 10.69 respectively and were comparable ($p > 0.05$).

Post injection, the score improved considerably in each group on each follow-up; however no significant difference could be detected between the scores of the two groups at the follow-up of 1 month VAS (4.2 ± 2.3 vs 3.3 ± 0.91) and AOFAS (80.66 ± 10.96 vs 82.65 ± 10.36), 3 months VAS (2.5 ± 1.9 vs 1.9 ± 0.88), AOFAS (85.65 ± 12.97 vs 87.89 ± 12.69) and 6-months VAS (2.0 ± 0.97 vs 1.5 ± 0.6) and AOFAS (88.7 ± 12.69 vs 89.96 ± 11.36). (Table 2)

Table 1: Age and gender distribution of patients

	Steroid group (Mean \pm SD)	PRP group (Mean \pm SD)	p-value
Age (years) (Mean \pm SD)	42.7 \pm 6.2	39.9 \pm 4.8	> 0.05
Male/female	7 / 15	8 / 14	> 0.05
Affected foot-right/ left	12 / 10	10 / 12	> 0.05

Table 2: Comparison of VAS and AOFAS score at different time intervals between Steroid and PRP groups

		Steroid group (Mean \pm SD)	PRP group (Mean \pm SD)	p-value
Pre-injection	VAS	7.7 \pm 2.1	8.3 \pm 2.2	> 0.05
	AOFAS	59.89 \pm 11.77	61.58 \pm 10.69	> 0.05
Post-injection 1 month	VAS	4.2 \pm 2.3	3.3 \pm 0.91	> 0.05
	AOFAS	80.66 \pm 10.96	82.65 \pm 10.36	> 0.05
Post-injection 3 months	VAS	2.5 \pm 1.9	1.9 \pm 0.88	> 0.05
	AOFAS	85.65 \pm 12.97	87.89 \pm 12.69	> 0.05
Post-injection 6 months	VAS	2.0 \pm 0.97	1.5 \pm 0.6	> 0.05
	AOFAS	88.7 \pm 12.69	89.96 \pm 11.36	> 0.05

SD= standard deviation, VAS= visual analog scale, AOFAS= American Orthopaedic Foot & Ankle Society (AOFAS) ankle-Hind footscale.

Discussion

The present study aimed to compare the efficacy of intralesional corticosteroid vs autologous platelet rich plasma injection in the management of chronic plantar fasciitis; a very common musculo skeletal problem encountered in orthopaedic day today practice. Initially thought to be an inflammatory disease, plantar fasciitis is now known to occur due to multiple etiologies including anatomical, biochemical and environmental factors. Often, the combination of factors are involved. The term fasciosis has been recommended owing to the chronicity of the disease and the evidence of degeneration rather than inflammation[14,15].

The treatment modalities also vary owing to the different etiologic factors. Conservative approaches such as NSAIDs, low dye taping, heel pads, cups, orthoses, soft soled shoes and night splints, take few weeks to months for the healing. However, most of them have limited scientific evidence of their efficacy. Corticosteroids are recommended owing to their strong anti-inflammatory effect. Corticosteroids act through inhibition of fibroblast proliferation and ground substance protein expression fasciitis[16].

PRP being rich in platelets provide a higher concentration of the bioactive growth factors reported to promote healing. Many growth and differentiation factors are released from the alpha granules, which are the storage units found in platelets. In vivo and in vitro researches also suggest that PRP induces over expression of additional endogenous growth factors beyond what is contained within the platelet concentrate[17].

The potential benefits of PRP are thought to rely on intrinsic properties and interplay between the concentrated growth factors. Some of these important growth factors include platelet derived endothelium growth factors, transforming growth factors- β , vascular endothelium growth factors, fibroblast growth factors, epidermal growth factor and insulin like growth factor-1. Complex interaction of these growth and differentiation factors, along with adhesive protein factors such as fibronectin and vitronectin are what is responsible for the healing response, promoting the long regenerative process of chemotaxis, cell proliferation, removal of tissue debris, angiogenesis, extracellular matrix formation, osteoid production and collagen synthesis. The needle induced bleeding during injection provides the clotting factor thrombin needed to activate platelets. Thus PRP accelerate the physiological process of healing[17].

Degeneration of collagen occurs at the site of the lesion because of micro tears of the fascia that do not heal. This observation was further supported by histological examination of the plantar fascia obtained during surgery of chronic plantar fasciitis patients, which shows no inflammatory cell invasion at the site of the lesion, the normal fascia and surrounding tissue was replaced by Angiofibroblastic hyperplastic tissue[18].

PRP, being a concentrate of platelets that are a source of autologous growth factors such as insulin like growth factor-1 (IGF-1), transforming growth factor β (TGF- β), vascular endothelial growth factor (VEGF), platelet derived growth factor (PDGF) and fibroblast growth factor (FGF), helps in cellular migration, synthesis of collagen, and angiogenesis and thus helps in tendon and ligament

healing[19-22]. Several studies have reported the use of PRP as safe and effective treatment option in chronic refractory plantar fasciitis.

The mean initial or Pre injection VAS and AOFAS scores in the steroid and PRP group was 7.7 ± 2.1 , 59.89 ± 11.77 and 8.3 ± 2.2 , 61.58 ± 10.69 respectively and were comparable ($p\geq 0.05$). Post injection, the score improved considerably in each group on each follow-up; however no significant difference could be detected between the scores of the two groups at the 1, 3 and 6-month follow-ups.

Monto[23] found that platelet-rich plasma injection was more effective and durable than corticosteroid injection at 2 years of follow-up in a study of 40 patients. Shetty *et al*[24], compared the effectiveness of platelet-rich plasma and corticosteroid injections in 60 patients and found no significant difference at 6 months of follow-up. Aksahin *et al*[25], compared intralesional corticosteroid and platelet-rich plasma injections for plantar fasciitis, the treatments were found to be equally effective.

Lee and Ahmad[26] compared intralesional autologous blood injection with corticosteroid injection in patients with chronic plantar fasciitis. At 6 weeks and 3 months of follow-up, the corticosteroid group had significantly lower visual analog scale scores than the autologous blood group, but the difference was not significant at 6 months.

Conclusion

We concluded that the treatment of plantar fasciitis with steroid or PRP injection is equally effective. Autologous blood injections also provide pain relief, although not comparable to steroids in the speed of recovery, but produces sustained effects and are easily available with no potential risk.

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