

ORIGINAL RESEARCH

TO COMPARE THE PLATELET-RICH PLASMA THERAPY AND CORTICOSTEROID INJECTION IN THE MANAGEMENT OF PLANTAR FASCIITIS

¹Dr Sumit Pal Singh, ²Dr Pallav Gupta, ³Dr Nitish Sharma, ⁴Dr Anil Gupta, ⁵Dr Manmeet Singh

^{1,2}SR, ^{3,5}Post Graduate, ⁴Consultant, Dept of Orthopaedics, GMC, Jammu, Jammu and Kashmir, India

Correspondence:

Dr Manmeet Singh

Post Graduate, Department of Orthopaedics, GMC, Jammu, Jammu and Kashmir, India

ABSTRACT

Aim: To compare the platelet-rich plasma therapy and corticosteroid injection in the management of planter fasciitis.

Methods: The prospective clinical trial was carried out at the Department of Orthopaedics. The research involved 40 patients who were randomly assigned to one of two groups: PRP (n=20) or Steroid (n=20). 25-27 ml of blood was taken from the cubital vein and deposited in a glass tube with 3 ml of citrate dextrose solution to make platelet-rich plasma (ratio 9:1). To avoid clotting, a citrate dextrose solution was utilised. For 10-13 minutes, the blood was centrifuged at 3300 rpm. The top buffy coat yielded 3ml of PRP preparation.

Results: In the steroid and PRP groups, the mean initial or pre injection VAS and AOFAS scores were 8.1 ± 1.9 , 60.37 ± 9.58 and 8.9 ± 2.6 , 62.57 ± 9.87 , respectively, and were similar (0.15 and 0.22). Following injection, the score improved significantly in each group at each follow-up; however, no significant difference could be detected between the two groups at the 1 VAS (4.4 ± 2.5 vs 3.5 ± 0.88), AOFAS (79.89 ± 9.74 vs 81.11 ± 8.74), 3 VAS (2.6 ± 0.21 vs 2.1 ± 0.78), AOFAS (84.15 ± 10.55 vs 86.99 ± 10.67) and 6-month VAS (2.1 ± 0.85 vs 1.6 ± 0.45 , AOFA).

Conclusion: We found that steroid or PRP injection therapy for plantar fasciitis is equally effective.

Keywords: Platelet-rich plasma, Corticosteroid injection, Management, Planter fasciitis

INTRODUCTION

Policeman's heel, heel spur syndrome, jogger's heel, sub calcaneal pain, plantar heel pain, plantar fasciopathy, plantar fasciitis (PF), and plantar fasciosis are all terms used to describe discomfort on the plantar surface of the heel. ¹ The annual incidence of PF ranges from 3.83 to 10.5/1000 population, with females having a greater prevalence. ^{2,3} A greater occurrence of

heel discomfort is connected with increasing age and a high body mass index.⁴ Extracorporeal shock wave therapy (ESWT), plantar fascia and Achilles tendon stretching exercises, night splints, shoe inserts, and nonsteroidal anti-inflammatory medications (NSAID), local corticosteroid (CS) injection, platelet rich plasma (PRP) injection, and prolotherapy are used to treat PF.⁵ There has been no agreement on the most successful method. Furthermore, the findings of several investigations disagree.⁶ Other treatment options include pain relievers such as nonsteroidal anti-inflammatory medications (NSAIDS) and steroid injections. With variable degrees of efficacy, night splints, low dye tape, heel pads, cups, and orthoses have also been employed.^{7,8} In recent years, extracorporeal shock wave treatment has been utilised to treat this condition in conjunction with lifestyle changes.⁹ Only 5 to 10% of patients may need surgical intervention such as calcaneal spur excision, neurectomy, or plantar fasciotomy.¹⁰ Corticosteroid injections provide many benefits, including cheap cost, simplicity, and quick pain relief. Many people are apprehensive about the possible drawbacks of this therapy approach, which may outweigh its advantages. PRP, a natural concentration of autologous growth factors, is currently extensively being studied in several sectors of medicine for its potential to help in the regeneration of tissue with limited healing ability.¹¹ The use of autologous blood products to aid healing in a range of applications is becoming more common in Europe and the United States. There is new information concerning certain growth factors that play an important role in the healing process. With this understanding, there is great interest in the use of concentrated platelets, which release a supramaximal amount of these growth factors to encourage recovery in nonhealing lesions.¹² The purpose of this research was to assess the effectiveness of platelet-rich plasma therapy with corticosteroid injection in the treatment of plantar fasciitis.

METHODS AND MATERIALS

After receiving clearance from the protocol review committee and the institutional ethics committee, the current prospective clinical investigation was carried out in the Department of Orthopaedics. Patients with plantar fasciitis who had been treated conservatively for at least three months and showed no improvement were included in the trial. Planter fasciitis was diagnosed clinically, and ankle radiographs were evaluated to rule out other heel diseases.

METHODOLOGY

A total of 40 individuals were included in the trial and were randomly assigned to one of two groups: PRP (n=20) or Steroid (n=20). 26-28 ml of blood was taken from the cubital vein and deposited in a glass tube with 3 ml of citrate dextrose solution to make platelet-rich plasma (ratio 9:1). To avoid clotting, a citrate dextrose solution was utilised. For 10-13 minutes, the blood was centrifuged at 3300 rpm. The top buffy coat yielded 3ml of PRP preparation. In both groups, injections were administered under stringent aseptic conditions. To assure blindness, the patients were kept supine with their eyes covered. The injection site was cleaned with a 10% povidone iodine scrub. The most painful region on the medial portion of the heel was identified and anaesthetized with 2 to 3ml of 2% lignocaine. In both groups, 3ml PRP preparation was injected in the PRP group and 2ml (40mg) methylprednisolone was administered in the steroid group using the peppering technique¹³ (single skin portal and 4-5 plantar fascia penetration).

Patients were advised to use ice for pain treatment if necessary, to continue wearing comfortable shoes with cushions, and not to take NSAIDs following the surgery. Physical therapy was used on all patients to stretch the calf muscle and plantar fascia. Clinical evaluations were performed before injection, as well as one month, three months, and six months thereafter. Pain was assessed using a visual analogue scale (VAS) from 0 to 10 (0 indicating no agony, 10 indicating the greatest conceivable pain), and the functional result was determined using the American Orthopaedic Foot & Ankle Society (AOFAS) ankle-Hind foot scale.

STATISTICAL ANALYSIS

The results were presented as mean standard deviation (SD). The Student t test was used to compare the normally distributed continuous variables across groups. The chi-square test or Fisher exact test was used to compare nominal categorical data across groups, while the Mann-Whitney U test was used to analyse non-nominal distributed continuous variables. A $p < 0.05$ value was considered statistically significant.

RESULTS

Table 1 shows that both groups in this research were comparable in terms of age, gender, and side engagement. In the steroid and PRP groups, the mean initial or pre injection VAS and AOFAS scores were 8.1 ± 1.9 , 60.37 ± 9.58 and 8.9 ± 2.6 , 62.57 ± 9.87 , respectively, and were similar (0.15 and 0.22). Following injection, the score improved significantly in each group at each follow-up; however, no significant difference could be detected between the two groups at the 1 VAS (4.4 ± 2.5 vs 3.5 ± 0.88), AOFAS (79.89 ± 9.74 vs 81.11 ± 8.74), 3 VAS (2.6 ± 0.21 VS 2.1 ± 0.78), AOFAS (84.15 ± 10.55 VS 86.99 ± 10.67) and 6-month VAS (2.1 ± 0.85 VS 1.6 ± 0.45), AOFA (Table 2).

Table 1: Age and gender distribution of patients

	Steroidgroup	PRPgroup	P value
Gender			
Male	6	8	0.11
Female	14	12	
Age(years)	42.7 ± 6.2	39.9 ± 4.8	0.32
Affectedfoot			
Right	11	9	0.21
Left	9	11	

Table 2: Outcome of pre injection and post injection

	Steroidgroup	PRPgroup	P value
Pre-injection			
VAS	8.1 ± 1.9	8.9 ± 2.6	0.15
AOFAS	60.37 ± 9.58	62.57 ± 9.87	0.22
Post-injection			
1month			
VAS	4.4 ± 2.5	3.5 ± 0.88	0.37
AOFAS	79.89 ± 9.74	81.11 ± 8.74	0.15

3month			
VAS	2.6±0.21	2.1±0.78	0.21
AOFAS	84.15±10.55	86.99±10.67	0.31
6month			
VAS	2.1±0.85	1.6±0.45	0.17
AOFAS	87.9±10.27	90.57±10.67	0.16

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

DISCUSSION

PRP includes a higher concentration of platelets than whole blood. Powerful growth factors, including as platelet-derived growth factor, transforming growth factor beta, and epidermal growth factor, are found inside platelets. The injection of PRP into the damaged tissue starts the healing process, which is required to reverse the degenerative process at the plantar fascia's base.¹³ The purpose of this research was to assess the effectiveness of intralesional corticosteroid injection with autologous platelet rich plasma injection in the treatment of chronic plantar fasciitis, which is a fairly prevalent musculoskeletal issue seen in orthopaedic practise today. Plantar fasciitis, formerly assumed to be an inflammatory illness, is now understood to arise owing to a variety of etiologies, including anatomical, biochemical, and environmental variables. A number of elements are often at work. The word fasciosis has been proposed because to the disease's chronicity and indications of degeneration rather than inflammation.^{14,15} Treatment techniques also varied according to the various causative causes. Conservative treatments, such as NSAIDs, low dye tape, heel pads, cups, orthoses, soft soled shoes, and night splints, might take from weeks to months to work. However, the majority of them have little scientific evidence to support their effectiveness. Corticosteroids are indicated due to their potent anti-inflammatory properties. Corticosteroids cause fasciitis by inhibiting fibroblast growth and ground substance protein production.¹⁶ Because PRP is abundant in platelets, it has a greater concentration of bioactive growth factors that have been shown to enhance healing. Many growth and differentiation agents are released from platelet alpha granules, which are storage units. In vivo and in vitro studies further imply that PRP increases the expression of endogenous growth factors other than those found in platelet concentrate. PRP's potential effects are assumed to be based on intrinsic features and the interaction of concentrated growth factors. Platelet-derived endothelial growth factors, transforming growth factors-, vascular endothelial growth factors, fibroblast growth factors, epidermal growth factor, and insulin-like growth factor-1 are only a few of the key growth factors. The healing response is caused by the complex interaction of these growth and differentiation factors, as well as adhesive protein factors such as fibronectin and vitronectin, which promotes the long regenerative process of chemotaxis, cell proliferation, removal of tissue debris, angiogenesis, extracellular matrix formation, osteoid production, and collagen synthesis. The clotting factor thrombin, which is produced by the needle during injection, is required to activate platelets. As a result, PRP hastens the physiological healing process.¹⁷ Collagen degeneration develops at the location of the lesion due to unhealed micro rips in the fascia. This observation was supported further by a histological examination of the plantar

fascia obtained during surgery on chronic planter fasciitis patients, which revealed no inflammatory cell invasion at the site of the lesion, with the normal fascia and surrounding tissue replaced by Angiofibroblastic hyperplastic tissue.¹⁸ PRP is a platelet concentrate that contains autologous growth factors such as insulin-like growth factor-1 (IGF-1), transforming growth factor (TGF-), vascular endothelial growth factor (VEGF), platelet derived growth factor (PDGF), and fibroblast growth factor (FGF). These factors aid in cellular migration, collagen synthesis, and angiogenesis, and thus aid in tendon and ligament healing.¹⁹⁻²² PRP has been used in many trials as a safe and effective therapeutic option for persistent refractory plantar fasciitis. In the steroid and PRP groups, the mean initial or pre injection VAS and AOFAS scores were 8.1 ± 1.9 , 60.37 ± 9.58 and 8.9 ± 2.6 , 62.57 ± 9.87 , respectively, and were similar (0.15 and 0.22). Following injection, the score improved significantly in each group at each follow-up; however, no significant difference could be seen between the two groups at the 1, 3, and 6-month follow-ups. In a study of 40 patients, Monto²³ discovered that platelet-rich plasma injection was more efficacious and lasting than corticosteroid injection after 2 years of follow-up. Shetty et al.²⁴ studied the efficacy of platelet-rich plasma against corticosteroid injections in 60 patients and found no significant difference after 6 months of follow-up. When Aksahinet al.²⁵ compared intralesional corticosteroid injections to platelet-rich plasma injections for plantar fasciitis, they found that both therapies were equally beneficial.

CONCLUSION

We found that steroid or PRP injection therapy for plantar fasciitis is equally effective.

REFERENCE

1. Riel H, Cotchett M, Delahunt E, Rathleff MS, Vicenzino B, Weir A, et al. Is 'plantar heel pain' a more appropriate term than 'plantar fasciitis'? Time to move on. *Br J Sports Med* 2017;51:1576-7.
2. Rasenberg N, Bierma-Zeinstra SM, Bindels PJ, van der Lei J, van Middelkoop M. Incidence, prevalence, and management of plantar heel pain: A retrospective cohort study in Dutch primary care. *Br J Gen Pract* 2019;69:e801-8.
3. Scher DL, Belmont PJ Jr, Bear R, Mountcastle SB, Orr JD, Owens BD. The incidence of plantar fasciitis in the United States military. *J Bone Joint Surg Am* 2009;91:2867-72.
4. Hill CL, Gill TK, Menz HB, Taylor AW. Prevalence and correlates of foot pain in a population-based study: The North West Adelaide health study. *J Foot Ankle Res* 2008;1:2.
5. Babatunde OO, Legha A, Littlewood C, Chesterton LS, Thomas MJ, Menz HB, et al. Comparative effectiveness of treatment options for plantar heel pain: A systematic review with network meta-analysis. *Br J Sports Med* 2019;53:182-94.
6. Uğurlar M, Sönmez MM, Uğurlar ÖY, Adıyeke L, Yıldırım H, Eren OT. Effectiveness of four different treatment modalities in the treatment of chronic plantar fasciitis during a 36-month follow-up period: A randomized controlled trial. *J Foot Ankle Surg Off Publ Am Coll Foot Ankle Surg* 2018;57:913-8
7. Glazer JL, An approach to the diagnosis and treatment of plantar fasciitis. *Foot Ankle Int.* 1996;17: 57-532.

8. Crawford F, Atkins D, Young P, Edwards J. Steroid injection for heel pain: evidence of short-term effectiveness. A randomized controlled trial. *Rheumatology* (Oxford, England) 1999;38(10):974–7.
9. Wheeler PC. The addition of fat emulsion to a structured home rehabilitation programme in patients with chronic plantar fasciitis does not lead to significant additional benefits in either pain, function or flexibility: a single-blinded randomised controlled trial. *BMJ Open Sport—Exercise Medicine*. 2017;3(1):e000234.
10. Vahdatpour B, Sajadieh S, Bateni V, Karami M, Sajjadieh H. Extracorporeal shock wave therapy in patients with plantar fasciitis. A randomized, placebo-controlled trial with ultrasonographic and subjective outcome assessments. *Journal of Research in Medical Sciences : Off J Isfahan Univ Med Sci*. 2012;17(9):834-8.
11. Yang W, Han Y, et al. Platelet-rich plasma as a treatment for plantar fasciitis. *Medicine (Baltimore)* 2017;96(44):e8475. DOI: 10.1097/ MD.00000000000008475.
12. Dhillon RS, Schwarz EM, et al. Platelet-rich plasma therapy—future or trend? *Arthritis Res Ther* 2012;14(4):219. DOI: 10.1186/ar3914.
13. Kalaci A, Cakici H, Hapa O, Yanat AN, Dogramaci Y, Sevinc TT. Treatment of plantar fasciitis using four different local injection modalities: a randomized prospective clinical trial. *J Am Podiatr Med Assoc*. 2009;99(2):108-113
14. Barrett S, Erridge S. Growth factors for chronic plantar fasciitis. *Podiatry Today*. 2013;17:37-42 15.
15. Dyck DD Jr, Boyajian-O’Neill LA. Plantar fasciitis. *Clin J Sport Med*. 2004;14(5):305-9.
16. Thomas JL, Christensen JC, Kravitz SR, Mendicino RW, Schuberth JM, Vanore JV, et al. American College of Foot and Ankle Surgeons heel pain committee. The diagnosis and treatment of heel pain: a clinical practice guideline-revision. *J Foot Ankle Surg*. 2010;49(3 Suppl):S1-19.
17. McMillan AM, Landorf KB, Gilheany MF, Bird AR, Morrow AD, Menz HB. Ultrasound guided injection of dexamethasone versus placebo for treatment of plantar fasciitis: protocol for a randomized controlled trial. *J Foot Ankle Res*. 2010;3;15.
18. Jarde O, Diebold P, Havet E, Boulu G, Vernois J. Degenerative lesions of the plantar fascia: surgical treatment by fasciectomy and excision of the heel spur. A report on 38 cases. *Acta Orthop Belg*. 2003;69:267-74
19. Molloy T, Wang Y, Murrell G. The roles of growth factors in tendon and ligament healing. *Sports Med*. 2003;33(5):381-394.
20. Anita E, Andia I, Sanchez M. Autologous preparations rich in growth factors promote proliferation and induce VEGF and HGF production by human tendon cells in culture. *J Orthop Res*. 2005; 23:281-286
21. Bendinelli P, Matteucci E, Dogliotti G et al. Molecular basis of anti-inflammatory action of platelet-rich plasma on human chondrocytes: mechanisms of NF- κ B inhibition via HGF. *J Cell Physiol*. 2010; 225:757-766.
22. Eppley BL, Woodell JE, Higgins J. Platelet quantification and growth factor analysis from platelet-rich plasma: implications for wound healing. *Plast Reconstr Surg*. 2004;114:1502-1508

23. MontoRR. Platelet-rich plasma efficacy versus corticosteroid injection treatment for chronic severe plantar fasciitis. *Foot Ankle Int.* 2014;35:313-318.
24. Shetty VD, Dhillon M, Hegde C, Jagtap P, Shetty S. A study to compare the efficacy of corticosteroid therapy with platelet-rich plasma therapy in recalcitrant plantar fasciitis: a preliminary report. *Foot Ankle Surg.* 2014;20(1):10-13.
25. Aksahin E, Dogruyol D, Yüksel HY, et al. The comparison of the effect of corticosteroids and platelet-rich plasma (PRP) for the treatment of plantar fasciitis. *Arch Orthop Trauma Surg.* 2012;132:781-785.