

Original Research Article

Platelet rich plasma: a novel therapy in chronic wounds

Abhijeeth Dinesh Sakaria*, Bhargavi V. Alva

Department of General Surgery, Srinivas Institute of Medical Sciences and Research Centre, Mangalore, Karnataka, India

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*Correspondence:

Dr. Abhijeeth Dinesh Sakaria,
E-mail: abhijeethsakaria@yahoo.in

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ABSTRACT

Background: Chronic non-healing wounds/ulcers present a significant healthcare issue globally. Utilizing platelet rich plasma (PRP) to treat these wounds/ulcers has gained attention due to its potential therapeutic properties.

Methods: Our study examined 25 patients with chronic wounds/ulcers who received a single PRP injection and topical autologous platelet gel application. Treatment efficacy and safety were assessed by tracking wound size reduction and adverse events.

Results: Treatment significantly reduced wound size in all patients, with 56% showing over 90% reduction as early as four weeks post-treatment. No complications related to the PRP treatment were noted, aligning with previous studies suggesting PRP as a safe and effective treatment for non-healing wounds/ulcers. Further studies with more extensive samples and controls are necessary for protocol optimization.

Conclusions: PRP injections and autologous platelet gel application present a promising, safe, and effective treatment method for chronic non-healing wounds/ulcers, potentially improving healing times and patient outcomes. Further research is needed for optimal PRP treatment protocol determination.

Keywords: Chronic wounds, Non-healing wounds, Ulcers, Platelet-rich plasma, PRP, Autologous platelet gel, Wound healing

INTRODUCTION

Chronic wounds represent a significant healthcare burden worldwide, with increasing prevalence and associated economic costs. Management of these wounds is challenging and may require a multidisciplinary approach to achieve optimal outcomes.¹ Platelet-rich plasma (PRP) is a novel therapy that has gained interest in recent years as a potential treatment for chronic wounds. PRP is a concentrated solution of autologous platelets, growth factors, and cytokines, obtained through centrifugation of the patient's own blood.² PRP's ability to stimulate tissue regeneration, angiogenesis, and inflammation modulation has been investigated in various medical fields, including dentistry, orthopedics, and dermatology.^{3,4} In chronic wound management, PRP has shown promising results.⁵

Several studies have reported the successful use of PRP in chronic wounds, including diabetic foot ulcers, venous

leg ulcers, pressure ulcers, and surgical wounds.⁶⁻⁸ The mechanism of action of PRP in chronic wounds involves the release of growth factors and cytokines, which promote the migration and proliferation of cells involved in wound healing, such as fibroblasts and endothelial cells.^{9,10} Despite the promising results of PRP in chronic wound management, there is still a need for more robust clinical trials to establish its efficacy and safety. The purpose of this study was to evaluate the safety and efficacy of autologous platelet rich plasma for the treatment of chronic non-healing ulcers on the lower extremity.

Aims

The aim of this study was to evaluate the safety and efficacy of autologous platelet-rich plasma (PRP) for the treatment of chronic non-healing ulcers on the lower extremity.

Objectives

To determine the effect of PRP treatment on wound healing in patients with chronic non-healing ulcers on the lower extremity. To evaluate the safety of PRP treatment in patients with chronic non-healing ulcers on the lower extremity. To assess the impact of PRP treatment on pain, quality of life, and patient satisfaction in patients with chronic non-healing ulcers on the lower extremity.

METHODS

Study design and patient selection criteria

This was a prospective observational study in which 25 patients with chronic or non-healing ulcers of various etiologies who were treated with autologous PRP under compassionate use were included. Patients with an ulcer of at least 4-weeks' duration who presented to the department of general surgery in Srinivas Institute of Medical Sciences and Research Center were enrolled. The study period was from Jan-2023 to March-2023.

Inclusion criteria

Patients between the age group 18-85 years. Patients with chronic or non-healing ulcers of various etiologies (such as pressure ulcers, venous ulcers, arterial ulcers, or diabetic foot ulcers). Patients with an ulcer of at least 4-weeks' duration. Index foot ulcer located on the plantar, medial, or lateral aspect of the foot (including all toe surfaces). Wound area (length x width) measurement between 0.5 and 10 cm², inclusive. Clinically non-infected index ulcers (infection was diagnosed through clinical signs and symptoms rather than culture results). Full-thickness index ulcers without exposure of bone, muscle, ligaments, or tendons

Exclusion criteria

Smokers. Individuals with systemic disease or history of anticoagulant, immunosuppressive, or antibiotic therapy in the last 3 months. Pregnant women. Patients with severe cardiovascular disorder. Patients with a bleeding disorder. Patients with uncontrolled sugar levels.

Preparation of autologous PRP

Autologous PRP was prepared by drawing 30 ml of blood from each patient into citrate-phosphate-dextrose anticoagulant. The blood was centrifuged at 1500 rpm for 15 minutes, and the PRP layer was collected and activated with calcium chloride.

Administration of autologous PRP

All the included patients received a single dose of autologous PRP injections. The injection was administered around the wound bed, and the wound was covered with a sterile dressing.

Patients who met the inclusion criteria were explained the entire treatment and follow-up procedure by the study investigator, and only after obtaining voluntary informed consent from the patients for the treatment procedure, they were treated with PRP and their follow-up data collected. The procedure was conducted in accordance with the Declaration of Helsinki, and all care was taken to maintain patient safety and confidentiality.

Follow-up and outcome measures

The patients were followed up at regular intervals till 8 weeks after PRP injection. At each follow-up visit, wound healing, pain, quality of life, and patient satisfaction were assessed. Additionally, adverse events were monitored and recorded.

Statistical analysis

Descriptive statistics were used to analyze the data. Mean and standard deviation were calculated for continuous variables, and percentages were calculated for categorical variables.

RESULTS

The study included 25 patients with chronic non-healing wounds/ulcers. Among them, 60% (n=15) were males and 40% (n=10) were females. The mean age of the patients was 62.5±13.53 years, with 68% (n=17) falling in the age group of 61-80 years. Venous ulcers were the most common type of ulcers, accounting for 52% (n=13) of cases, followed by diabetic ulcers (32%, n=8), arterial ulcers (12%, n=3), and pressure ulcers (4%, n=1). The mean duration of the ulcers prior to treatment was 17 weeks (±4.16), with a range of 8-26 weeks.

Table 1: Characteristics of the patients included in the study.

Characteristic	Number of patients	Percentage
Gender		
Male	15	60
Female	10	40
Age group (in years)		
<40 years	2	8
41-60 years	6	24
61-80 years	17	68
Ulcer type		
Venous ulcers	13	52
Diabetic ulcers	8	32
Arterial ulcers	3	12
Pressure ulcers	1	4
Ulcer duration		
Mean (±SD)	17 weeks (±4.16)	
Range	8-26 weeks	

After the treatment with single-dose PRP injections and topical administration of autologous platelet gel, significant improvements were observed in all the treated patients. Wound/ulcer healing was observed as early as 4 weeks post-PRP treatment and the mean healing time was found to be almost 7.1 weeks (± 2.1).

Table 2: Percentage improvement in wound/ulcer healing after PRP treatment.

Reduction in ulcer size at the end of follow-up	No. of wound/ulcer	Percentage
$\leq 60\%$	2	8
61-70%	1	4
71-80%	3	12
81-90%	5	20
$> 90\%$	14	56

The Table 2 shows the reduction in ulcer size at the end of the follow-up period. Out of the 25 patients included in the study, 2 patients showed a reduction in ulcer size of $\leq 60\%$, 1 patient showed a reduction of 61-70%, 3 patients showed a reduction of 71-80%, 5 patients showed a reduction of 81-90%, and 14 patients showed a reduction of more than 90%. The majority of the patients (56%) showed a reduction in ulcer size of more than 90%.

Patients tolerated the procedure well, and there were no bleeding, infection, or procedure-related complications, including local injection site swelling in all the subjects on the day of treatment after PRP injection and autologous PRP gel application.

Overall, the study suggests that the PRP injections and autologous platelet gel application led to significant reductions in ulcer size in all treated patients.

DISCUSSION

Chronic non-healing wounds/ulcers represent a major healthcare burden and pose a significant challenge to patients and healthcare providers. There is a growing interest in the use of platelet-rich plasma (PRP) as a potential therapeutic modality for the treatment of non-healing wounds/ulcers. In this study, we evaluated the efficacy and safety of single-dose PRP injections and topical administration of autologous platelet gel for the treatment of chronic non-healing wounds/ulcers.

Our study found that PRP injections and autologous platelet gel application led to significant reductions in ulcer size in all treated patients, with wound/ulcer healing observed as early as 4 weeks post-PRP treatment. These findings are consistent with several previous studies that have reported the effectiveness of PRP in the treatment of chronic non-healing wounds/ulcers. For instance, a randomized controlled trial by Frykberg et al found that PRP treatment led to significant improvements in wound healing rates and wound size reduction in patients with

diabetic foot ulcers compared to the control group.¹¹ Similarly, a systematic review and meta-analysis by Xiong et al reported that PRP treatment led to a significant reduction in ulcer size and improved wound healing rates in patients with venous leg ulcers.¹²

The majority of the patients in our study (56%) showed a reduction in ulcer size of more than 90%. This finding is similar to the results of a study by Wrotniak et al, which found that PRP treatment led to a greater than 90% reduction in wound size in 8 out of 10 patients with non-healing wounds.¹³ In addition, our study found no bleeding, infection, or procedure-related complications, which is consistent with the findings of several previous studies that have reported the safety of PRP treatment for chronic non-healing wounds/ulcers.^{11,14,15}

Our study has several limitations. First, the sample size was relatively small, which limits the generalizability of the findings. Second, we did not include a control group, which makes it difficult to determine the extent to which the observed improvements in wound healing can be attributed to the PRP treatment. Third, the follow-up period was relatively short, which makes it difficult to determine the long-term efficacy and safety of PRP treatment for chronic non-healing wounds/ulcers.

CONCLUSION

In conclusion, our study suggests that single-dose PRP injections and topical administration of autologous platelet gel are safe and effective for the treatment of chronic non-healing wounds/ulcers. However, further studies with larger sample sizes, control groups, and longer follow-up periods are needed to confirm these findings and determine the optimal PRP treatment protocol for chronic non-healing wounds/ulcers.

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