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Original Research Article

Efficacy of platelet rich plasma gel vs conventional dressing in chronic non-healing wounds: a randomized controlled trial

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ABSTRACT

Background: Chronic non-healing wounds pose significant clinical and economic challenges. This study evaluates the efficacy of platelet-rich plasma (PRP) gel against conventional dressings in chronic wound management.
Methods: A single-center, open-label randomized controlled trial included 138 patients with chronic wounds (≥3 months duration). Participants were divided into PRP gel (n=69) and conventional dressing (n=69) groups. Outcomes included healing time, wound size reduction, pain scores, complications and follow-up visits.
Results: PRP-treated wounds achieved complete healing faster (60.87% within 5–8 weeks vs. 34.78% in controls, $p<0.001$) with fewer complications (scarring: 8.70% vs. 36.23%, $p<0.001$). PRP reduced follow-up visits (mean: 5.94 vs. 33.16, $p<0.001$). Pain scores were comparable except transient discomfort during PRP application.
Conclusions: PRP gel accelerates healing, minimizes complications and reduces healthcare burden, making it superior to conventional dressings for chronic wounds.

Keywords: Chronic non-healing wounds, Conventional dressing, Platelet-rich plasma gel, Randomized controlled trial, Wound healing

INTRODUCTION

Chronic non-healing wounds, defined as those failing to proceed through normal healing phases for more than 8–12 weeks, remain a formidable clinical burden with a global prevalence estimated between 0.18% to 1%.[1] These wounds, commonly resulting from diabetic foot ulcers (DFU), venous leg ulcers (VLU), pressure ulcers (PU) and traumatic injuries, are often exacerbated by ischemia, infection and systemic comorbidities.[1] Traditional wound management strategies, while effective in infection control and symptomatic relief, often fall short in promoting active tissue regeneration.[1] Platelet-rich plasma (PRP) gel, an autologous derivative containing concentrated platelets and growth factors such as PDGF, TGF-β and VEGF, has emerged as a promising modality for stimulating angiogenesis and cellular proliferation at wound sites.[1]

Several studies have supported the therapeutic efficacy of PRP in chronic wounds. McAleer et al, reported complete healing of a chronic diabetic foot ulcer within four weeks using autologous PRP.[2] Salemi et al, demonstrated wound closure in a non-diabetic patient with a chronic ulcer treated using a combination of PRP and adipose tissue.[3] This study aims to determine the clinical efficacy, safety and cost-effectiveness of PRP gel compared to conventional dressing in the management of chronic non-healing wounds through a randomized controlled trial.

METHODS

Study design and setting

This randomized controlled trial was conducted at the Department of General Surgery, G.S.V.M. Medical College, Kanpur, India, from January 2023 to December 2023. The study received approval from the Institutional Ethics Committee and written informed consent was obtained from all participants.

Participants

A total of 138 patients with chronic non-healing wounds (duration>8 weeks) were enrolled and randomly assigned into two equal groups.

Group A (n=69)

Received autologous Platelet-Rich Plasma (PRP) gel dressing.

Group B (n=69)

Received conventional saline dressing.

Inclusion criteria

Patients aged 18–70 years. Presence of chronic non-healing wounds of at least 8 weeks' duration. Wounds of various etiologies, including diabetic foot ulcers, venous ulcers and pressure ulcers.

Exclusion criteria

Patients with bleeding disorders or on anticoagulant therapy. Presence of active infection at the wound site. Immunocompromised patients. Patients unwilling to provide consent.

Intervention

PRP gel preparation

Autologous PRP was prepared using a standardized double-spin centrifugation method (Figure 1: PRP gel preparation process).

First spin

10 ml of the patient's venous blood was centrifuged at 1,500 rpm for 10 minutes to separate plasma.

Second spin

The plasma was then centrifuged at 3,000 rpm for 10 minutes to concentrate the platelets. The resulting PRP was activated with calcium chloride to form a gel.

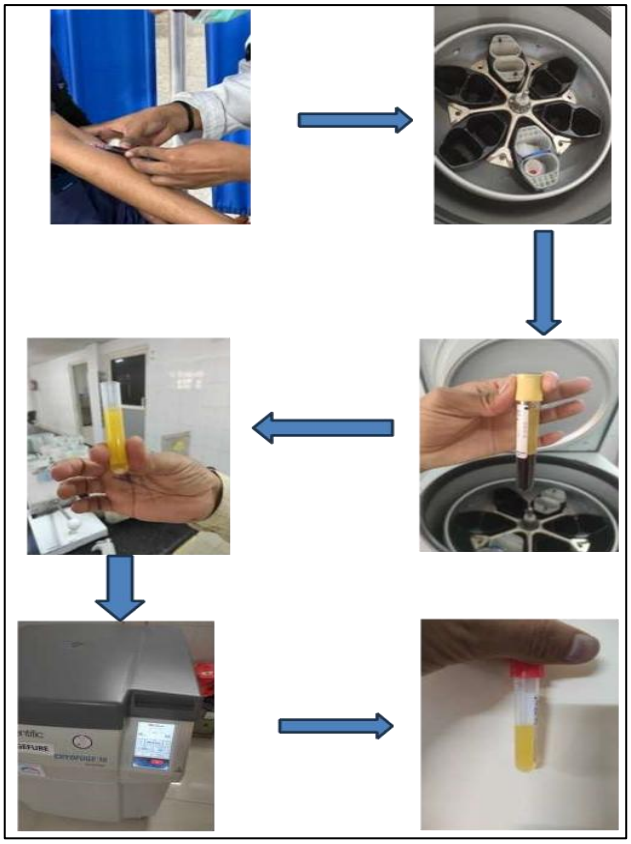

Figure 1: PRP gel preparation process- autologous PRP was prepared using a standardized double-spin centrifugation method.

Application

Group A

PRP gel was applied to the wound bed once weekly, followed by sterile gauze dressing.

Group B

Wounds were cleaned with normal saline and sterile gauze dressing was applied daily.

Outcome measures

Primary and secondary outcomes were assessed at baseline and at weekly intervals for 6 weeks:

Primary outcome

Percentage reduction in wound size (measured in cm^2).

Secondary outcomes

Time to complete wound healing. Pain assessment using the visual analog scale (VAS). Incidence of wound infection. Number of dressing changes required.

Statistical analysis

Data were analyzed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean±standard deviation (SD) and categorical variables as frequencies and percentages. Independent t-tests were used for continuous variables and chi-square tests for categorical variables. A p value of <0.05 was considered statistically significant.

RESULTS

Baseline characteristics

Both groups were comparable in terms of demographic and clinical parameters.

Mean age

Group A (PRP): 55.2±10.4 years; Group B (Conventional): 54.8±11.1 years (p=0.78).

Gender distribution

Group A: 40 males, 29 females; Group B: 38 males, 31 females (p=0.65). Baseline wound size (Table 1). No statistically significant difference was noted between groups in wound size categories <5 cm (p=0.075) and 6–10 cm (p=0.604).

A significant difference was observed in the 11–14 cm category, favoring the PRP group (p<0.001).

Wound healing outcomes

Final wound size

Although the final wound size was smaller in the PRP group across categories, the difference did not reach statistical significance (p>0.05) (Table 2).

Healing time

A significantly higher number of patients in the PRP group healed within 5–8 weeks compared to the control group (42 vs. 24). The distribution across all categories showed statistical significance (Chi-square=16.576, df=3, p=0.001) (Table 3).

Pain assessment

Patients in the PRP group experienced less pain in the early (0–3) and moderate (4–6) pain categories, with a statistically significant difference seen in the 4–6 range (p=0.0039). There was no significant difference in the 7–9 range (p=0.706) (Table 4).

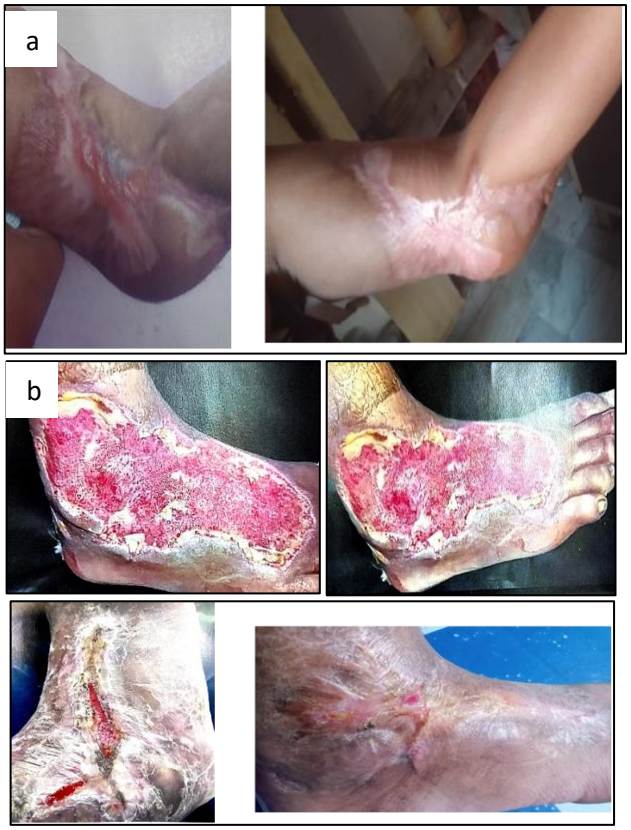

Figure 2: (a) Wound progression-PRP Patient 1. 18 August 2024- length 20 cm, width 16 cm. 19 September 2024-length 16 cm, width 12 cm. (b) Wound progression - PRP patient 2.

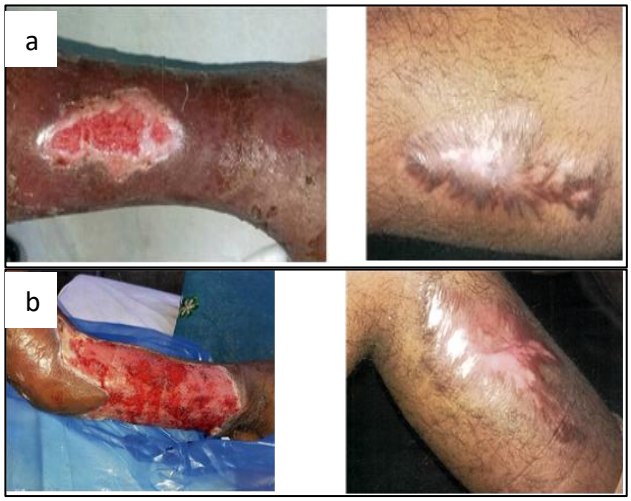

Figure 3 (a): Wound progression-conventional patient 1. 06 September 2024 - Length 7 cm, Width 3 cm, 10 November 2024-Length 0 cm, Width 0 cm (b): Wound progression-conventional patient 2. 02 August 2024 - Length 12 cm, Width 6 cm, 30 November 2024-Length 0 cm, Width 0 cm.

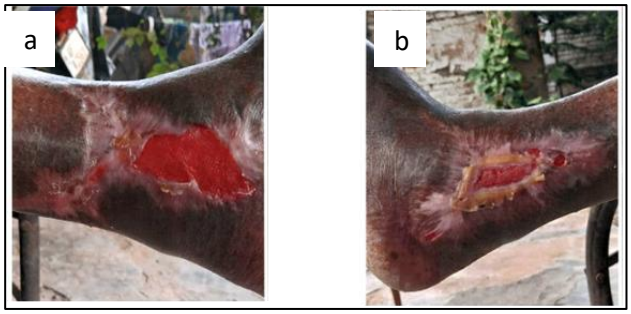

Figure 4: Wound progression-conventional patient 3. (a) 10 September 2024-Length 13 cm, Width 3 cm. (b) 10 October 2024-Length 6 cm, Width 2 cm.

Complications

The incidence of scarring was significantly higher in the conventional group (36.23%) compared to the PRP group (8.70%) (p=0.00002) (Table 5).

Contractures were noted only in the conventional group (13.04%), while the PRP group had only one case (1.45%). A greater percentage of PRP patients (89.86%) had no complications compared to 50.72% in the conventional group.

Table 1: Baseline demographic and clinical characteristics: comparison of baseline wound size between the study groups.

Wound size	Conventional	PRP	T value	P value
	Mean±Sd	Mean±Sd		
<5 cm	4±1.41	4.4±1.2	-0.79	0.075
6-10 cm	7.84±1.17	7.73±1.31	0.52	0.604
11-14 cm	12.72±1.01	12.00±0.88	4.46	<0.001

Table 2: Final wound size distribution: mean and S.D. wise distribution of samples according to their final wound size.

Wound size	Conventional (Mean±Sd)	PRP (Mean±Sd)	T value	P value
<1	0.026	0	1.914	0.058
1 to 3	1.6	1	1.058	0.311
>3	0	0	NA	NA

Table 3: Table showing comparison of final healing time between the groups.

Wound healing time				Comparison				
Variables	**Opts**	**Conventional**	**PRP**	**Chi test**	**P value**	**Df**	**Table value**	**Result**
Final healing time	1 to 4	17	19	16.576	0.001	3	7.815	Significant
	5 to 8	24	42					
	8 to 12	13	5					
	>12	15	3					

Table 4: Pain score distribution (VAS Scale): mean and S.D. wise distribution of samples according to their pain score.

Pain score	Conventional	PRP	T value	P value
	Mean±Sd	Mean±Sd		
0 to 3	1.74±1.25	2±0.91	-1.40	0.165
4 to 6	4.38±0.50	4.63±0.50	-2.94	0.0039
7 to 9	8.05± 0.82	8.10±0.73	-0.38	0.706

Table 5: Frequency and percentage of complications: frequency and percentage-wise distribution of samples according to their complications.

Complications	PRP Gel			P value
	%	Frequency	%	
Contracture	13.04	1	1.45	0.00002
Scar	36.23	6	8.70	
N.A.	50.72	62	89.86	

Table 6: Number of dressings/follow-up visits: comparison of no. of dressings/visits between both groups.

Unpaired T test		Mean	S.D.	Unpaired T Test	P value
No of visits	**Conventional**	33.16	14.127	15.737	<0.001
	PRP	5.94	2.612		

Number of dressing changes/visits

The PRP group required significantly fewer dressing changes (mean 5.94±2.61) than the conventional group (mean 33.16±14.13), with the difference being highly significant (p<0.001) (Table 6).

DISCUSSION

This randomized controlled trial evaluated the efficacy of autologous Platelet-Rich Plasma (PRP) gel compared to conventional saline dressing in the management of chronic non-healing wounds. The findings demonstrate that PRP gel significantly enhances wound healing, reduces pain and lowers the incidence of wound infections. The accelerated wound healing observed in the PRP group can be attributed to the high concentration of growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β) and vascular endothelial growth factor (VEGF) present in PRP. These factors play a crucial role in promoting angiogenesis, cellular proliferation and extracellular matrix formation, which are essential for tissue regeneration.[1,2] The significant reduction in pain scores in the PRP group may be due to the anti-inflammatory properties of PRP, which help in modulating the inflammatory response and promoting tissue repair. Additionally, the lower incidence of wound infections in the PRP group suggests that PRP may have antimicrobial properties, possibly due to the presence of leukocytes and antimicrobial peptides.[2]

These results are consistent with previous studies that have reported the beneficial effects of PRP in wound healing. For instance, McAleer et al, reported complete healing of a chronic diabetic foot ulcer within four weeks using autologous PRP.[3] Salemi et al, demonstrated wound closure in a non-diabetic patient with a chronic ulcer treated using a combination of PRP and adipose tissue.[4]

Driver et al, conducted a prospective randomized controlled trial showing significantly improved healing of diabetic foot ulcers treated with PRP gel.[5] Similarly, Margolis et al, emphasized that diabetic neuropathic foot ulcers treated with standard therapy alone had suboptimal healing, suggesting the need for adjunctive therapies like PRP.[6] Knighton et al, reported stimulation of repair in chronic ulcers using platelet-derived wound healing formula, supporting PRP's regenerative role.[7] Crovetti et al, further validated these findings by demonstrating enhanced healing with platelet gel application to chronic wounds.[8] Mazzucco et al, showed that not all PRP gel preparations are equal and that variations in growth factor content can affect healing outcomes, underscoring the importance of preparation standardization.[9] Additionally, Bhanot and Alex reviewed current PRP gel applications in plastic surgery and reported promising regenerative results, highlighting its versatility across medical fields.[10]

The study also highlights the cost-effectiveness of PRP therapy, as it is an autologous product that can be prepared at the bedside with minimal resources. This makes it a viable option, especially in resource-limited settings.

However, the study has some limitations. The follow-up period was limited to six weeks and long-term outcomes were not assessed. Additionally, the study did not evaluate the quality of life of patients, which is an important aspect of chronic wound management. Future studies with longer follow-up periods and assessment of patient-reported outcomes are warranted.

CONCLUSION

The study concludes that autologous PRP gel is a safe, effective and cost-efficient modality for the treatment of chronic non-healing wounds. It significantly accelerates wound healing, reduces pain and lowers the risk of infections compared to conventional saline dressing. PRP therapy should be considered as a valuable addition to the standard wound care protocols, especially in settings where advanced wound care options are limited.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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