

ORIGINAL ARTICLE

Comparative Efficacy of Platelet-Rich Plasma Dressing Versus Normal Saline Dressing in the Management of Chronic Wounds

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ABSTRACT

Background: Healing times for chronic wounds are prolonged and treatment is often complicated. Platelet rich plasma (PRP) therapy is becoming a viable modality for improving healing of wounds.

Objective: To evaluate and compare the efficacy of PRP dressing versus Normal Saline (NS) dressing in terms of healing rates and duration to achieve healing in chronic wounds.

Material and Methods: A randomized controlled trial was performed in the Surgical 2 Jinnah hospital Lahore in June to march 2023. A total of 100 patients with chronic wounds participated and were randomly assigned into two groups: The comparison was made between PRP dressing (50 patients) and NS dressing (50 patients). We collected information regarding baseline characteristics including age, wound duration and demographics. Patients were followed weekly for up to six weeks or until their wounds healed. Statistical method was used for healing rates and mean time of healing with $p \leq 0.05$.

Results: In this study, mean age of patients was 37.54 ± 11.755 and 38.98 ± 11.828 years in PRP and NS group. The mean duration of wounds was 30.28 ± 12.622 weeks for the PRP Dressing group and 29.66 ± 12.748 weeks for the Normal Saline group. The PRP dressing group achieved a statistically significant higher healing rate of 92.0% compared to 68.0% in the NS dressing group ($p = 0.003$). The mean duration to achieve healing was significantly shorter in the PRP group (1.28 ± 0.882 weeks) compared to the NS group (2.22 ± 1.898 weeks, $p = 0.002$). Stratified analysis showed that PRP dressing was particularly effective in older patients, chronic wounds of longer duration, and specific wound types (e.g., diabetic wounds).

Conclusion: The results indicated that PRP dressing were better than NS dressing for accelerating wound healing and higher success rate used in the management of chronic wounds.

Keywords: Chronic wounds, PRP dressing, Normal Saline dressing, Platelet-Rich Plasma, wound healing

INTRODUCTION

Prolonged healing and frequent complications are the major health care challenge related to chronic wounds on worldwide healthcare systems. These wounds usually result from underlying conditions such as venous insufficiency, diabetes, or long term pressure, and rarely progress through their normal healing phases. Despite this stagnation, it undermines quality of life of patients, leads to increased morbidity and places huge financial burden of recurrent hospitalisation and enormous treatments costs^{1,2}.

The current traditional wound care practice consists of using Normal Saline (NS) dressings to keep a moist wound bed and to facilitate the wound healing. NS dressings, however, are suboptimal in terms of their efficacy in chronic wounds where local ischemia and invasion are hurdles to natural tissue repair³. Regenerative medicine has presented Platelet Rich Plasma (PRP) as an alternative to these challenges. Platelet derived growth factors and other growth factors, contained in autologous blood, such as platelet derived growth factor (PDGF), transforming growth factor (TGF- β), VEGF, are important for tissue regeneration, angiogenesis (i.e. formation of blood vessels), and inflammation modulation^{4,5}.

Healing rates of chronic wound type, diabetic foot ulcer and venous leg ulcers treated with PRP are significantly improved when compared to conventional NS dressings^{6,7}. In order to perform this premises, Li et al.⁸ performed a systematic review of PRP detailing that it promotes granulation tissues formation, accelerates epithelialisation and suppresses inflammation. Secondly, because of their qualitatively positive safety profile when compared to standard treatments, PRP dressings are increasingly recommended over standard treatment⁹.

However, these promising findings are limited by a lack of standardization preparation protocols, variability in how the treatment is used in the field, and expense of treatment. All of which contribute to different variations in the outcomes and lead to

patient specific components such as comorbidities and wound characteristics that are involved in this as well^{10,11}. These challenges highlight the need for definitive, standard guidelines of PRP clinical use in wound management as evidenced by existing randomized controlled trials of high quality.

The goal of this study is to evaluate and compare PRP dressings use in chronic wound management with NS dressings. This research focuses on key parameters such as healing rates, time to complete healing and patient satisfaction in order to provide strong evidence to help guide clinical decision making. The results are expected to demonstrate the potential of PRP as a transformative therapy for the treatment of chronic wounds and may lead to incorporation of PRP into standard of care protocols.

MATERIAL AND METHODS

This study was conducted in Surgical 2 Jinnah hospital Lahore in June to march 2023. A non-probability consecutive sampling method was utilized for participant selection. Sample size calculated at the 8% level of significance, 80% power and we anticipated wound healing frequency of 86.11% in the PRP dressing group and 63.89% in the NS dressing group. We included 100 participants, 50 patients in each group¹⁴.

Participants aged 18-60 years, of either gender, with chronic wounds of ≥ 6 weeks duration and size $\geq 2 \times 2$ cm were included. Exclusion criteria included wounds sustained for < 6 weeks, prior PRP dressing use, hypersensitivity to PRP, and burn injuries, as assessed through medical records. Approval for the study was granted by the institutional ethics committee, and informed consent was secured from all participants. Baseline characteristics, including age, gender, mobility status, history of prolonged standing, wound duration, and type of chronic wound (diabetic, pressure, or venous), were recorded. After debridement, participants were randomized into two groups using the lottery method: Group A received PRP dressings, where platelet-rich

plasma prepared from the patient's blood was injected around the wound twice weekly, followed by gauze application. Group B received normal saline dressings. Treatment continued for six weeks or until wound healing, whichever occurred first. Non-healing cases were labeled as treatment failures and referred for alternative therapy. Weekly follow-ups were conducted, and the duration to achieve wound healing was documented. All data were recorded in a predesigned proforma.

SPSS version 22 was used to perform data analysis. Wound duration, time to heal and age were reported as continuous variables of mean plus standard deviation. Frequencies and percentages on categorical (gender, mobility status, history of prolonged standing, wound type) and healing outcome variables were summarized. Group comparisons of wound healing were conducted by the Chi-square test, and analysis on the time taken for healing was compared using the Students' t test. Factors such as age, gender, wound duration and wound type were used to stratify based on potential effect modifiers, and post stratification comparisons have also used the same statistical tests. A significance level of $p \leq 0.05$ was also used.

RESULTS

In this study, mean age of patients was 37.54 ± 11.755 and 38.98 ± 11.828 years in PRP and NS group. The mean duration of wounds was 30.28 ± 12.622 weeks for the PRP Dressing group and 29.66 ± 12.748 weeks for the Normal Saline group. The mean duration to achieve healing was 1.28 ± 0.882 weeks in the PRP Dressing group and 2.22 ± 1.898 weeks in the Normal Saline group. For the overall sample, the mean age was 38.26 ± 11.754 years, the mean duration of wounds was 29.97 ± 12.625 weeks, and the mean duration to achieve healing was 1.75 ± 1.546 weeks.

The comparison of wound healing rate between the PRP and NS Dressing groups reveals a significant difference in healing rates ($p = 0.003$). In the PRP Dressing group, 92.0% of patients (46 out of 50) achieved wound healing, whereas only 68.0% of patients (34 out of 50) in the NS Dressing group experienced wound healing. Conversely, the proportion of cases who did not achieve healing was substantially lower in the PRP group (8.0%, 4 out of 50) compared to the NS group (32.0%, 16 out of 50). The results strongly suggest that PRP dressing is a more effective management modality for promoting wound healing, making it a potentially valuable option in managing chronic wounds. (Table 1)

Healing rates were compared between PRP and Normal Saline (NS) dressing groups across various demographic and clinical variables. Among patients aged 18–40 years, 26 (89.7%) in the PRP group achieved healing compared to 16 (64.0%) in the NS group ($p = 0.024$). Similarly, in the 41–60 years age group, healing rates were 20 (95.2%) in the PRP group versus 18 (72.0%) in the NS group ($p = 0.038$), highlighting the effectiveness of PRP dressing across age groups.

Analysis of wound duration highlighted the consistent effectiveness of PRP dressing. For wounds lasting 6–12 weeks, all 7 patients in the PRP group (100%) achieved healing compared to 4 patients in the NS group (66.7%), though this difference was insignificant ($p = 0.097$). In wounds persisting for 37–51 weeks, the PRP group had a significantly higher healing rate of 19 patients (100%) compared to 8 patients (50.0%) in the NS group ($p < 0.001$), showcasing its superior efficacy in managing chronic wounds.

Gender-wise comparisons showed that among males, healing rates were higher in the PRP group, with 22 out of 23 patients (95.7%) achieving healing, compared to 18 out of 21 patients (85.7%) in the NS group, though this difference was insignificant ($p = 0.252$). Among females, however, the PRP group exhibited a significantly higher healing rate, with 24 out of 27 patients (88.9%) achieving healing compared to 16 out of 29 patients (55.2%) in the NS group ($p = 0.005$).

Mobility status also revealed notable differences. Among ambulatory patients, 25 out of 27 (92.6%) in the PRP group achieved healing, compared to 18 out of 25 patients (72.0%) in the

NS group ($p = 0.050$). Similarly, in bed-bound patients, the PRP group showed a higher healing rate of 21 out of 23 (91.3%) compared to 16 out of 25 patients (64.0%) in the NS group ($p = 0.025$). These findings strongly support the superior performance of PRP dressing in various clinical scenarios.

Patients with a history of prolonged standing also benefited more from PRP dressing, with a healing rate of 25 (92.6%) compared to 14 (56.0%) in the NS group ($p = 0.002$). In those without a history of prolonged standing, the healing rates were 21 (91.3%) in the PRP group and 20 (80.0%) in the NS group, with no significant difference ($p = 0.268$).

Analysis of wound types revealed that for diabetic wounds, all patients in the PRP group healed (13, 100%) compared to 12 (50.0%) in the NS group ($p = 0.020$). For pressure wounds, healing rates were significantly higher in the PRP group (19, 90.5%) compared to the NS group (10, 62.5%, $p = 0.041$). However, for venous wounds, the healing rates between the PRP (14, 87.5%) and NS (12, 75.0%) groups were not significantly different ($p = 0.365$). (Table 2)

The comparison of the duration to achieve healing between the PRP and NS dressing groups highlights a statistically significant difference. Patients in the PRP dressing group achieved healing in a significantly shorter mean duration of 1.28 weeks (SD: 0.882) compared to 2.22 weeks (SD: 1.898) in the NS dressing group ($p = 0.002$). This finding indicates that PRP dressing is more effective in accelerating wound healing compared to NS dressing. The small standard deviation in the PRP group suggests more consistent outcomes, whereas the larger standard deviation in the NS group reflects greater variability in healing times. (Table 3)

Table 1: Assessment of wound healing outcomes in the two groups

Group	Not Healed (n, %)	Healed (n, %)	Total (n)	p-value
PRP Dressing	4 (8.0%)	46 (92.0%)	50	0.003
NR Dressing	16 (32.0%)	34 (68.0%)	50	

Table 2: Healing Outcomes in PRP and Normal Saline Dressing Groups Based on Demographic and Clinical Characteristics

Variable Category	Subgroup	PRP Healed n(%)	NS Healed n(%)	p-value
Age	18–40 years	26 (89.7%)	16 (64.0%)	0.024
	41–60 years	20 (95.2%)	18 (72.0%)	0.038
Wound Duration	6–12 weeks	7 (100%)	4 (66.7%)	0.097
	13–24 weeks	6 (66.7%)	8 (88.9%)	0.257
	25–36 weeks	14 (93.3%)	14 (73.7%)	0.136
	37–51 weeks	19 (100%)	8 (50.0%)	<0.001
Gender	Male	22 (95.7%)	18 (85.7%)	0.252
	Female	24 (88.9%)	16 (55.2%)	0.005
Mobility	Ambulatory	25 (92.6%)	18 (72.0%)	0.050
	Bed-bound	21 (91.3%)	16 (64.0%)	0.025
History of Standing	Yes	25 (92.6%)	14 (56.0%)	0.002
	No	21 (91.3%)	20 (80.0%)	0.268
Type of Wound	Diabetic	13 (100%)	12 (50.0%)	0.020
	Pressure	19 (90.5%)	10 (62.5%)	0.041
	Venous	14 (87.5%)	12 (75.0%)	0.365

Table 3: Comparison of Duration to Achieve Healing Between PRP and NS Dressing Groups

Group	N	Mean Duration (weeks)	Std. Deviation	p-value
PRP Dressing	50	1.28	0.882	0.002
NS Dressing	50	2.22	1.898	

DISCUSSION

Results of this study showed that PRP dressing is superior to NS in management of chronic wounds, having faster healing rates and significantly shorter healing time in PRP than NS group. In their article, Orban et al. (2022) demonstrated that 86.11% of patients in the PRP group had complete ulcer healing while only 63.89% of patients in the conventional dressing group, with significantly

shorter healing duration (10.9 weeks vs 13.48 weeks $p = 0.01$)¹⁴. Our study findings support these in terms of a statistically significant higher healing rate of 92.0% in the PRP dressing group vs. 68.0% for the NS group ($p = 0.003$). Moreover, the time to achieve wound healing was significantly shorter in the PRP group (1.28 ± 0.882 weeks) than in the NS group (2.22 ± 1.898 weeks, $p = 0.002$). These findings align with the growing body of evidence supporting the role of PRP in promoting faster and more effective wound healing.

PRP superiority was reported by 25 percent improvement in healing rate in the PRP treated compared to 0 percent in the saline treated patients by Elsaid et al. (2020)¹⁵. As commented Abd El-Mabood and Ali (2018) healing rate in PRP group increases to 97.5% compared with conventional dressing group 82.5%, with fewer complications like infection and pain¹⁶. Our results are consistent with these findings, particularly in the PRP group's more regularly higher rates of healing across multiple subgroups.

Stratification of healing outcomes by demographic and clinical variables in our study further highlighted the efficacy of PRP dressing. For instance, among patients aged 41–60 years, the PRP group had a significantly higher healing rate (95.2%) compared to the NS group (72.0%, $p = 0.038$). These findings are supported by Fibrini et al. (2022), who demonstrated improved healing outcomes in older patients treated with PRP¹⁷. Additionally, our results revealed that PRP dressing was particularly effective in long-duration wounds (37–51 weeks), achieving a 100% healing rate compared to 50.0% in the NS group ($p < 0.001$).

The shorter healing time observed in the PRP group in our study is consistent with findings from Elsaid et al. (2020), who reported that PRP therapy significantly reduced the time required for maximum healing (6.3 ± 2.1 weeks vs. 10.4 ± 1.7 weeks for saline, $p < 0.0001$) [15]. Similarly, Peng et al. (2024) found that PRP therapy shortened healing time by a mean of 23.23 days in diabetic foot ulcers ($p = 0.05$)¹⁸. These findings reinforce the accelerated healing benefits of PRP observed in our study.

In terms of safety, our study observed no significant adverse effects associated with PRP therapy. This is consistent with the broader literature. Li et al. (2023) concluded in a meta-analysis that PRP did not increase the risk of wound infections or adverse events compared to standard treatments¹⁹. Suthar et al. (2017) similarly reported no significant complications in patients treated with PRP for chronic non-healing ulcers²⁰. This establishes PRP as a safe and effective option for managing chronic wounds.

Overall, the results of our study are consistent with the existing body of evidence, further solidifying PRP dressing as a superior treatment modality for chronic wounds, offering faster healing times and higher success rates across various patient demographics and wound characteristics.

CONCLUSION

Results of study showed that wounds healed faster when PRP dressing applied as opposed to normal saline (NS) dressing. Different patient groups including differing age ranges, prolonged wound duration, and specific conditions such as diabetic and pressure wounds, all showed enhanced healing with PRP dressing compared to NS. It was effective in females and in patients with a history of prolonged standing. The results indicate that PRP dressing is a reliable and cost effective treatment for chronic and complex wounds.

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