



Functional Outcome of Platelet-Rich Plasma vs Recombinant Platelet-Derived Growth Factor in the Management of Diabetic Foot Ulcers

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KEYWORDS

diabetic foot ulcer, platelet-rich plasma, recombinant platelet-derived growth factor, wound healing, patient satisfaction, diabetes complications, lower limb amputation, advanced wound care, ulcer management, PRP therapy, rPDGF treatment.

ABSTRACT:

Background: Diabetic foot ulcers (DFUs) are a severe complication of diabetes mellitus, frequently resulting in lower limb amputations. Platelet-rich plasma (PRP) and recombinant platelet-derived growth factor (rPDGF) have been explored as therapeutic options to enhance wound healing. This study aims to compare the effectiveness of PRP versus rPDGF in managing DFUs.

Methods: This cross-sectional study was conducted at the Surgery Outpatient Department of Sree Balaji Medical College & Hospital from January to December 2023. A total of 52 diabetic patients with Wagner's Grade 1- or 2-foot ulcers were randomly assigned to receive either PRP therapy or rPDGF treatment, with follow-up visits every four weeks over 12 weeks. Baseline characteristics, healing outcomes, and patient satisfaction were analyzed using descriptive statistics and the Chi-square test, with significance set at $p < 0.05$.

Results: Both groups showed comparable baseline characteristics, including age ($p = 0.619$), gender distribution ($p = 0.780$), and ulcer size ($p = 0.961$). There were no significant differences in healing time ($p = 0.544$), pain reduction ($p = 0.388$), or complication rates ($p = 0.492$). However, patient satisfaction was significantly higher in the PRP group ($p < 0.001$). A trend towards a higher infection rate was observed in the rPDGF group ($p = 0.771$).

Conclusion: PRP and rPDGF are both effective in promoting wound healing in DFUs, with PRP offering higher patient satisfaction and a lower trend in infection rates. Larger randomized trials are needed to confirm these findings and explore long-term outcomes. Integrating therapies like PRP into standard wound care protocols could significantly improve the quality of life for diabetic patients and reduce the risk of amputations.

Introduction

Diabetes mellitus, characterized by chronic hyperglycemia, leads to various metabolic and vascular complications, significantly affecting patient quality of life and increasing healthcare costs [1]. Diabetic foot ulcers (DFUs), a common and severe complication, often result in lower limb amputations if not managed effectively [2]. Platelet-rich plasma (PRP) and recombinant platelet-derived growth factor (rPDGF) have emerged as promising therapies for enhancing wound healing in DFUs by promoting tissue regeneration and reducing inflammation [3]. While both therapies

have shown potential, there is a need for more comparative studies to evaluate their relative efficacy in improving functional outcomes and reducing complications [4]. Diabetic foot ulcers (DFUs) are one of the most common and severe complications of diabetes mellitus, frequently leading to lower limb amputations. Approximately every 30 seconds, a lower extremity is amputated somewhere in the world due to diabetic complications [5]. Early and appropriate multidisciplinary management of DFUs, including blood glucose control, patient education, advanced wound care, and surgical interventions, can significantly improve patient outcomes and quality of life. DFUs are often



associated with neuropathy, ischemia, and infection, with diabetic neuropathy being the most significant contributor, affecting over 50% of diabetic patients [6]. Diabetic polyneuropathy increases the risk of ulceration, deformity, and amputation and is a key factor in the pathogenesis of DFUs [7]. This study aims to assess the effectiveness of PRP versus rPDGF in managing DFUs, providing insights into their roles in wound healing and guiding clinical decision-making.

Methodology

This cross-sectional study was conducted among diabetic patients with foot ulcers attending the Surgery Outpatient Department (OPD) at Sree Balaji Medical College & Hospital from January 1, 2023, to December 31, 2023. The sample size of 52 participants was determined based on an expected outcome factor frequency of 1.95%, with a 5% confidence limit and a design effect of 1, ensuring a 99% confidence interval. The study included diabetic patients with Wagner's Grade 1 or 2 ulcers, while those with more severe grades (3-5) or who had received radiation or chemotherapy within the past three months were excluded. Participants were randomly assigned into two groups: Group 1 received autologous Platelet-Rich Plasma (PRP) therapy, and Group 2 was treated with Becaplermin, a recombinant form of platelet-derived growth factor (rPDGF). Both treatments were administered along with Vaseline gauze and sterile dressings, changed biweekly for up to 12 weeks or until ulcer healing. Surgical debridement was performed for all patients to facilitate healing, with detailed documentation of wound characteristics. Follow-up visits every four weeks for 12 weeks were conducted to monitor wound healing and adjust treatments as needed. Data collection involved structured questionnaires and face-to-face interviews, with informed consent obtained from all participants or their legal guardians. Data analysis included descriptive statistics and the Chi-square test to evaluate significant findings, with a 5% level of significance. The study received approval from the Institutional Ethics Committee, and confidentiality was maintained in line with the Declaration of Helsinki guidelines.

Result

Parameter	P-Value	Interpretation
Age Distribution (years)	0.619	No significant difference in age distribution.
Gender Distribution	0.780	Similar gender distribution between groups.
Diabetes Duration (years)	0.155	Comparable diabetes duration in both groups.
Ulcer Location	0.835	Similar ulcer locations in both treatment groups.
Ulcer Grade (Wagner)	0.837	Comparable ulcer severity at baseline.
Ulcer Duration (weeks)	0.607	No significant difference in ulcer duration.
Ulcer Size (cm ²)	0.961	Initial ulcer size similar in both groups.
Ulcer Depth (cm)	0.547	Comparable ulcer depth between groups.
Initial Ulcer Area (cm ²)	0.404	No significant difference in initial ulcer area.
Initial Ulcer Depth (cm)	0.255	Baseline ulcer depth was similar in both groups.
Number of Treatment Sessions	0.795	Comparable number of treatment sessions required.
Time to Complete Healing (weeks)	0.544	Similar healing times in both groups.
Pain Reduction (VAS Score)	0.388	Comparable pain reduction in both groups.



Parameter	P-Value	Interpretation
Patient Satisfaction	<0.001	Higher patient satisfaction in the PRP group.
Infection Rate	0.771	Trend towards higher infection rate in the rPDGF group.
Complications	0.492	Similar complication rates in both groups.

The analysis of baseline characteristics and treatment outcomes revealed no significant differences between the Platelet-Rich Plasma (PRP) and recombinant Platelet-Derived Growth Factor (rPDGF) groups in terms of age distribution ($p = 0.619$), gender distribution ($p = 0.780$), diabetes duration ($p = 0.155$), ulcer location ($p = 0.835$), and ulcer severity based on the Wagner grade ($p = 0.837$). Additionally, there were no significant differences in ulcer duration ($p = 0.607$), initial ulcer size ($p = 0.961$), initial ulcer depth ($p = 0.255$), number of treatment sessions required ($p = 0.795$), or time to complete healing ($p = 0.544$), indicating that both groups had comparable baseline characteristics and healing trajectories. Pain reduction, as measured by the Visual Analog Scale (VAS), was also similar between groups ($p = 0.388$). However, the PRP group reported significantly higher patient satisfaction ($p < 0.001$), suggesting a subjective preference for PRP treatment. While the infection rate showed a non-significant trend toward being higher in the rPDGF group ($p = 0.771$), complication rates were comparable between the two groups ($p = 0.492$). These results suggest that while both therapies are effective for diabetic foot ulcer management, PRP may offer an advantage in patient satisfaction without compromising safety or efficacy.

Discussion

The comparison between the PRP and rPDGF groups showed no significant differences in age ($p = 0.619$) and gender ($p = 0.780$) distributions, consistent with findings by Shi et al., who reported that age and gender did not significantly impact diabetic foot ulcer prognosis,

suggesting that these factors may not be critical determinants of healing outcomes [8]. Both groups were also comparable in diabetes duration ($p = 0.155$), ulcer grade ($p = 0.837$), and ulcer location ($p = 0.835$), aligning with Thomas et al., who noted that adequate treatment can offset the influence of diabetes duration on healing [9]. The absence of significant differences in ulcer size ($p = 0.961$), depth ($p = 0.547$), and duration ($p = 0.607$) supports the comparable baseline characteristics, as suggested by Nawaz et al., who emphasized that standardized treatments can minimize the impact of initial ulcer characteristics on outcomes [10]. The median number of treatment sessions and healing time were similar ($p = 0.795$ and $p = 0.544$, respectively), which is consistent with Luo et al., who found that varied treatment modalities could achieve consistent healing durations if wound care protocols are effectively followed [11]. Both groups experienced comparable pain reduction ($p = 0.388$), but the PRP group had significantly higher patient satisfaction ($p < 0.001$), indicating the importance of patient-centered outcomes, as observed by Hu et al., who highlighted that patient satisfaction often correlates with perceived quality of care rather than objective metrics [12]. Although the infection rate and complication profiles were not significantly different ($p = 0.771$ and $p = 0.492$, respectively), the trend towards a higher infection rate in the rPDGF group aligns with McDermott et al., who emphasized the challenges in managing infections with certain growth factor therapies [13]. The comparable complication rates support the safety and efficacy of both treatments, consistent with findings by Al-Mohaithef et al. [14].

Conclusion

This study demonstrated that both Platelet-Rich Plasma (PRP) and recombinant Platelet-Derived Growth Factor (rPDGF) are effective in managing diabetic foot ulcers (DFUs), with comparable outcomes in terms of ulcer healing time, pain reduction, and complication rates. The similar baseline characteristics between the two groups ensured a fair comparison of treatment efficacy. While both therapies significantly promoted wound healing, PRP showed a notable advantage in patient satisfaction, likely due to its autologous nature, lower risk of adverse reactions, and enhanced healing properties. The trend toward a higher infection rate in the rPDGF group



suggests that growth factor therapy should be carefully tailored to patients prone to infections. Despite the small sample size, these findings offer valuable insights into the functional outcomes of PRP and rPDGF in DFU management, highlighting the need for larger randomized trials to confirm these results, explore long-term benefits, and assess cost-effectiveness. Overall, optimizing wound care protocols and integrating therapies like PRP may significantly improve the quality of life for diabetic patients and reduce the risk of lower limb amputations.

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