

Comparison of Wound Healing with ‘Autologous Platelet-Rich Plasma’ versus Conventional Dressing in Chronic Diabetic Foot Ulcer

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ABSTRACT

Background: Innovative approaches, such as cellular therapies like platelet-rich plasma (PRP), are emerging to enhance wound healing in diabetic foot ulcers. **Objective:** To compare the effectiveness of autologous PRP with conventional dressing for chronic diabetic foot ulcers. **Study Design:** Randomized controlled trial. **Settings:** Allied Hospital, Faisalabad Pakistan. **Duration:** January 2024 to June 30, 2024. **Methods:** 124 diabetic patients aged 18- 80 with non-healing foot ulcers were included. Exclusions were made for those with bleeding disorders, uncontrolled diabetes (HbA1c > 9), and severe infections, among others. Group A received PRP treatment, while Group B underwent conventional dressing. The wound area was measured weekly for 3 weeks. **Results:** Mean age was similar between groups (Group A: 52.92 ± 9.21 years; Group B: 52.63 ± 9.86 years). Most patients (70.97%) were aged 46 to 80. Out of 124 patients, 37.90% were male, and 62.10% were female. PRP showed an efficacy of 88.71%, compared to 67.74% for conventional dressing, with a p-value of 0.0034. **Conclusion:** Platelet-rich plasma is more effective than normal saline dressing for treating chronic diabetic foot ulcers.

Keywords: Diabetic foot ulcer, Platelet-rich plasma, Healing.

INTRODUCTION

More than 366 million people have diabetes globally, and this number may increase to half a billion by 2030.¹ Diabetic foot ulcers (DFU) are among the major complications, and the pathogenesis is multifactorial. Diabetic foot complications are considered preventable. The new diabetic foot ulcers incidence is 2.2%/year, increasing to 5.8% in 03 years.¹ The lifetime risk of foot ulcer is around 25%.² Important risk factors for developing diabetic foot problems are poor information and defective foot care practices.³ Adequate and timely foot care is mandatory to prevent foot complications in patients with diabetes.⁴

The development of diabetic foot ulcers is a significant health issue posing a lot of economic burden on patients’ families and health departments. It is the main reason for repeated and prolonged hospital admissions and

ultimately amputation. Approximately 6.3% is the incidence of DFU. Healing is hampered in DFU wounds, and 40% is the five-year mortality post-amputation.³

The primary purpose of treatment in DFU is to expedite wound closure as early as possible. Different measures commonly used in this regard include wound debridement, pressure-free wound area, moist wound healing, infection prevention, Adequate perfusion, correction of co-morbidities, and surgical intervention as needed.⁴ New methods with appreciable outcomes are under consideration to improve healing in DFU. Platelet-rich plasma (PRP) is one of the newest techniques in this regard.^{5,6}

An autologous PRP is a serum extracted from whole blood by centrifugation and is a source of platelets, defense factors, anti-bacterial agents, growth agents, and cytokines, which encourage the growth of stem cells and

tissue remodeling. PRP is an effective treatment for decreasing the recovery time of ulcers, ultimately leading to an improvement in quality of life and a reduction in the healthcare burden of wound treatment.⁷

A recent meta-analysis about PRP therapy in cutaneous wounds showed that PRP promoted wound healing and the ulcers improved significantly in both acute and chronic wounds.⁸⁻¹⁰

A RCT analyzing Autologous PRP with traditional dressing for DFU demonstrated complete wound healing rate as 95% (n = 38) and result obtained earlier (6th week) in group A (PRP), in contrast to 77.8% (n = 28) & (9th week) for Group B (traditional dressing) (P < 0.001).¹¹

The Rationale of this study was to find the efficacy of autologous PRP over conventional dressing for wound healing, as there is no such study in our setup. A better technique will be recommended in the future.

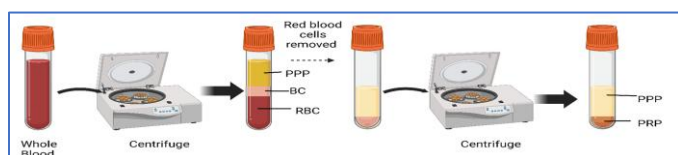
OBJECTIVES

To find the outcome of autologous PRP and conventional dressing in chronic diabetic foot ulcers regarding wound healing.

OPERATIONAL DEFINITIONS:

Efficacy: The technique was labelled as effective when there was $\geq 50\%$ reduction in the wound.

Platelet-Rich Plasma Preparation: PRP is obtained in a 2-step. Centrifugation of blood yields 03 layers: RBC, WBC, platelets layer (buffy coat), and a layer of platelet plasma. 2nd centrifugation concentrates platelets into PRP.



METHODS

This randomized controlled trial was conducted at the Department of Surgery, Allied Hospital, Faisalabad Pakistan. The duration of the study was six months from January 2024 to 30 June 2024.

The sample size was 124 patients. 62 patients (group A) underwent PRP dressing and 62 patients (group B) underwent conventional dressing. Non-probability, consecutive sampling technique was used.

Age group of both sexes from 18 - 80 years, Patients with non-healing diabetic foot ulcers with HbA1c of $<9\%$, Diabetic foot Ulcer ≥ 6 weeks duration and Ulcer $\leq 10\text{ cm}^2$ in size was included in the study.

Patients of known bleeding diathesis, HbA1c $>9\%$, diabetic nephropathy and severe local infection & ischemia was excluded from the study

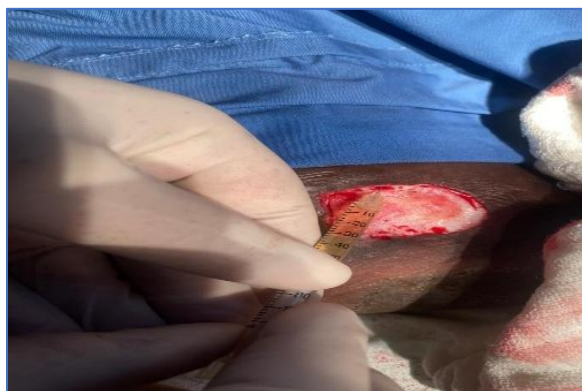
Approval was taken from the Institutional Ethical Review Board & after informed consent, patients were enrolled according to the inclusion criteria. Patients were divided into 02 groups based on a lottery method. Group A underwent PRP therapy while group B received traditional dressing. After clinical evaluation ulcer size was measured before starting the intervention. Both groups were given dressings. PRP dressing was administered 2 times/ week. The follow-up period was 3 weeks in both groups. Wound size was measured at regular intervals weekly basis in both groups of patients. All the data was recorded on a specially designed proforma (Annexure-I).

Figure 1: Before intervention



Figure 2: After Debridement



Figure 3: Injecting PRP on wound Margins**Figure 4: Injecting PRP in wound bed****Figure 5: Injecting PRP on wound Margins****Figure 6: Healed wound**

SPSS 25 was utilized for statistical analysis. Frequency and percentages were estimated for qualitative variables like sex & efficacy. Mean with SD were estimated for quantitative variables like age, weight, height, BMI, HbA1C level, duration of diabetes, duration of ulcer, size of ulcer. Chi-square test was applied to determine efficacy in both groups.

Effect modifiers such as age, gender, BMI, HbA1C level, duration, and initial size of ulcer were managed via stratification. Post-stratification chi-square test applied & $P \leq 0.05$ was taken as significant.

RESULTS

The age ranges from 18 - 80 years with a mean of 52.69 ± 9.43 years. In A-group mean age was 52.92 ± 9.21 years & B-group was 52.63 ± 9.86 years. 88 patients (70.97%) were from 46 -80 years. From 124 patients, males were 47 (37.90%) & females 77 (62.10%) with a male to female ratio of 1:1.6. Mean DM duration was 12.21 ± 2.20 years. The mean ulcer duration was 4.60 ± 1.15 months (Table 1). The mean size of the ulcer was 5.22 ± 1.20 cm (Table 2). The mean height was 162.34 ± 14.32 cm. The mean weight was 78.54 ± 8.43 kg. Mean BMI was 27.21 ± 3.34 kg/m² (Table X). Mean HbA1c was $6.73 \pm 1.22\%$.

The efficacy of PRP was found to be 88.71% & conventional dressing was 67.74% for chronic diabetic foot ulcers with a p-value of 0.0034 (Table 3). Stratification is shown in Table 4.

Table 1: Distribution concerning Ulcer duration.

Ulcer Duration (months)	A (n=62)		B (n=62)		Total (n=124)	
	Number	%	Number	%	Number	%
≤ 4	31	50.0	34	54.84	65	52.42
> 4	31	50.0	28	45.16	59	47.58
Mean $\pm$ SD	4.69 ± 1.22		4.50 ± 1.13		4.60 ± 1.15	

Table 2: Distribution by ulcer size

Ulcer Size (cm)	A (n=62)		B (n=62)		Total (n=124)	
	Number	%	Number	%	Number	%
≤ 5	32	51.61	38	61.29	70	56.45
> 5	30	48.39	24	38.71	54	43.55
Mean $\pm$ SD	5.32 ± 1.21		5.11 ± 1.20		5.22 ± 1.20	

Table 3: Efficacy comparison of autologous PRP & conventional dressing

	A (n=62)		B (n=62)		P-value
	Yes	No	Yes	No	
Efficacy	55 (88.71%)	07 (11.29%)	42 (67.74%)	20 (32.26%)	0.0034

Table 4: Efficacy stratification with different Parameters.

Variables		A (n=62)		B (n=62)		P-value
		Efficacy		Efficacy		
		Yes	No	Yes	No	
Age (years)	18-50	15 (88.24%)	02 (11.76%)	07 (36.84%)	12 (63.16%)	0.0016
	51-80	40 (88.89%)	05 (11.11%)	33 (76.74%)	10 (23.26%)	0.129
Gender	Male	22 (84.62%)	04 (15.38%)	17 (80.95%)	04 (19.05%)	0.739
	Female	33 (91.67%)	03 (8.33%)	23 (56.10%)	18 (43.90%)	0.0005
Duration of DM (years)	≤12	30 (90.91%)	03 (9.09%)	18 (54.55%)	15 (45.45%)	0.0009
	>12	25 (86.21%)	04 (13.79%)	22 (75.86%)	07 (24.14%)	0.315
Duration of ulcer (months)	≤4	24 (77.42%)	07 (22.58%)	23 (67.65%)	11 (32.35%)	0.379
	>4	31 (100.0%)	00 (0.0%)	17 (60.71%)	11 (39.29%)	0.0001
Size of ulcer (cm)	≤5	28 (87.50%)	04 (12.50%)	27 (71.05%)	11 (28.95%)	0.095
	>5	27 (90.0%)	03 (10.0%)	13 (54.17%)	11 (45.83%)	0.0028
BMI (kg/m²)	≤25	22 (88.0%)	03 (12.0%)	14 (63.64%)	08 (36.36%)	0.049
	>25	33 (89.19%)	04 (10.81%)	26 (65.0%)	14 (35.0%)	0.012
HbA1c (%)	≤6	19 (90.48%)	02 (9.52%)	12 (66.67%)	06 (33.33%)	0.066
	6.1-9	36 (87.80%)	05 (12.20%)	28 (63.64%)	16 (36.36%)	0.009

DISCUSSION

The common complication of diabetes is Diabetic foot ulcers ultimately pose a great burden on the health system and may lead to limb amputation. Quality of life is disrupted in patients having chronic ulcers.¹ Lifetime risk of having DFU in diabetics is around 15% & ultimately amputations in 88 %. Diabetic foot ulcers prevalence is 4-10% & 40-80% of subjects develop mortality and morbidity due to infections.² Traditional techniques include normal saline dressing, but it may cause delayed healing and provoke an infection.³ Emerging methods are cellular therapies such as PRP & collagen wound dressing. Platelets are the source of

epidermal growth factors & angiogenesis factors. Several studies proved the effectiveness of PRP for wound healing.^{3,12}

A study was conducted to find the benefits of autologous PRP and conventional dressing in chronic diabetic wound healing. The mean age was 52.92 ± 9.21 years and 52.63 ± 9.86 years for group A & group B, respectively 88 patients (70.97%) were from 46-80 years. From 124 patients, males were 47 (37.90%) and females 77 (62.10%) yielding ratio of male to female as 1:1.6. In this study, the efficacy of platelet-rich plasma was found to be 88.71% and the conventional dressing was 67.74% for chronic diabetic foot ulcers, with p-value of 0.0034. A meta-analysis regarding PRP therapy in cutaneous wounds demonstrated that PRP promoted wound healing and the ulcers improved significantly.⁸ A randomized controlled trial comparing Autologous PRP with conventional dressing for diabetic Foot Ulcers showed that the complete wound healing rate was 95% (n = 38) in 6th week in group A (PRP), contrary to 77.8% (n = 28) in 9th week for Group B (conventional dressing) (P < 0.001).¹¹

After the second and fourth weeks, Abd El-Mabood *et al* found that the PRP group was more effective than traditional care.¹⁴ According to Takashi Hirase *et al*, the PRP group saw faster healing (7.8 weeks vs. 8.3 weeks) and better healing rates (0.68 ± 0.56 cm²/week vs. 0.39 ± 0.09 cm²/week; p < 0.001) than the standard care group.¹⁵ According to the current study, PRP patients recuperate more quickly than those receiving traditional treatment. Ullah *et al* discovered that the PRP group had a greater rate of wound reduction (80%) than the standard therapy group (46.25%) (P<0.001). In contrast to 60.6 days with conventional care, Singh SP *et al* saw full healing after 36.7 days of PRP therapy.¹⁶

Elsaid *et al*¹⁷ found that at 20 weeks, the complete healing rate was significantly higher at 20 weeks with PRP therapy compared to the normal saline dressing group (3/25 vs. 0/25, p = 0.03). The maximum healing time is also shorter for the PRP group, averaging 6.3 ± 2.1 weeks versus 10.4 ± 1.7 weeks for the saline group (P < 0.0001).

CONCLUSION

This study concluded that the effectiveness of platelet-rich plasma is better for the management of chronic diabetic foot ulcers as compared to conventional dressing. So, we recommend that PRP should be used routinely in treating chronic non-healing ulcers in diabetics for improved healing and thus reducing the morbidity.

LIMITATIONS

The study is limited by its single-centre trial.

SUGGESTIONS / RECOMMENDATIONS

It is recommended to conduct larger-scale multicenter studies to confirm and validate these findings.

CONFLICT OF INTEREST / DISCLOSURE

The authors declare no conflict of interest.

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REFERENCES

1. Ullah A, Jawaid SI, Qureshi PN, Siddiqui T, Nasim K, Kumar K, et al. Effectiveness of Injected Platelet-Rich Plasma in the Treatment of Diabetic Foot Ulcer Disease. *Cureus*. 2022 Aug;14(8):e28292.
2. He M, Guo X, Li T, Jiang X, Chen Y, Yuan Y, et al. Comparison of Allogeneic Platelet-Rich Plasma With Autologous Platelet-Rich Plasma for the Treatment of Diabetic Lower Extremity Ulcers. *Cell Transplant*. 2020 Jan;29:1-9.
3. Armstrong DG, Swerdlow MA, Armstrong AA, Conte MS, Padula WV, Bus SA. Five Year Mortality and Direct Costs of Care for People With Diabetic Foot Complications Are Comparable to Cancer. *J Foot Ankle Res*. 2020 Jan;13(1):e993436.
4. Kumar SK, Suggaiah, Ratnam U, Ghalige H. Autologous Platelet-Rich Plasma Dressing Versus Normal Saline Dressing in Management of Diabetic Foot Ulcers. *Int J Eng Res*. 2020 Feb;11(2):922-30.
5. Li T, Ma Y, Wang M, Wang T, Wei J, Ren R, et al. Platelet-Rich Plasma Plays an Antibacterial, Anti-Inflammatory and Cell Proliferation Promoting Role in an In Vitro Model for Diabetic Infected Wounds. *Infect Drug Resist*. 2019 Jan;12:297-309.
6. Sethi D, Martin KE, Shrotriya S, Brown BL. Systematic Literature Review Evaluating Evidence and Mechanisms of Action for Platelet-Rich Plasma as an Antibacterial Agent. *J Cardiothorac Surg*. 2021 Dec;16(1):277-320.
7. Hesseler MJ, Shyam N. Platelet-Rich Plasma and Its Utility in Medical Dermatology: A Systematic Review. *J Am Acad Dermatol*. 2019 Oct;81:834-46.
8. Hossam EM, Alserr AHK, Antonopoulos CN, Zaki A, Eldaly W. Autologous Platelet-Rich Plasma Promotes the Healing of Non-Ischemic Diabetic Foot Ulcers: A Randomized Controlled Trial. *Ann Vasc Surg*. 2022 Jan;82:165-71.
9. Elgarhy LH, El-Ashmawy AA, Bedeer AE, Al-Bahnasy AM. Evaluation of Safety and Efficacy of Autologous Topical Platelet Gel vs Platelet-Rich Plasma Injection in the Treatment of Venous Leg Ulcers: A Randomized Case Control Study. *Dermatol Ther*. 2020 Jul-Aug;33:e13897.
10. Moneib HA, Youssef SS, Aly DG, Rizk MA, Abdelhakeem Y. Autologous Platelet-Rich Plasma Versus Conventional Therapy for the Treatment of Chronic Venous Leg Ulcers: A Comparative Study. *J Cosmet Dermatol*. 2018 Apr;17:495-501.
11. Bekele F, Chelkeba L. Amputation Rate of Diabetic Foot Ulcer and Associated Factors in Diabetes Mellitus Patients Admitted to Nekemte Referral Hospital, Western Ethiopia: Prospective Observational Study. *J Foot Ankle Res*. 2020 Nov;13:65.
12. Liao X, Liang JX, Li SH, Huang S, Yan JX, Xiao LL, et al. Allogeneic Platelet-Rich Plasma Therapy as an Effective and Safe Adjuvant Method for Chronic Wounds. *J Surg Res*. 2020 Jan;246:284-91.
13. Pires BMFB, de Oliveira BGRB, Bokehi LC, Luiz RR, Carvalho BTF, Santana RF, et al. Clinical and Microbiological Outcomes Associated With Use of Platelet-Rich Plasma in Chronic Venous Leg Ulcers: A Randomized Controlled Trial. *J Wound Ostomy Cont Nurs*. 2021 May-Jun;48:292-9.
14. Abd El-Mabood EA, Ali HE. Platelet-Rich Plasma Versus Conventional Dressing: Does This Really Affect Diabetic Foot Wound-Healing Outcomes? *Egypt J Surg*. 2018 Jan;37(1):16-26.
15. Hirase T, Ruff E, Surani S, Ratnani I. Topical Application of Platelet-Rich Plasma for Diabetic Foot Ulcers: A Systematic Review. *World J Diabetes*. 2018 Oct;9(10):172-9.
16. Singh SP, Kumar V, Pandey A, Pandey P, Gupta V, Verma R. Role of Platelet-Rich Plasma in Healing Diabetic Foot Ulcers: A Prospective Study. *J Wound Care*. 2018 Sep;27(9):550-6.
17. Elsaid A, El-Said M, Emile S. Randomized Controlled Trial on Autologous Platelet-Rich Plasma Versus Saline Dressing in Treatment of Non-Healing Diabetic Foot Ulcers. *World J Surg*. 2020 May;44:1294-301.