International Surgery Journal
Bishnoi A et al. Int Surg J. 2024 Oct;11(10):1641-1644
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20242764

Original Research Article

Comparative efficacy of autologous platelet rich plasma and conventional dressing in the management of chronic ulcers

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Received: 28 July 2024
Revised: 04 September 2024
Accepted: 10 September 2024

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ABSTRACT

Background: Chronic ulcers pose a major global healthcare challenge. The use of platelet-rich plasma (PRP) for treating these wounds has garnered interest because of its potential healing benefits. Objective were to determine the effect of autologous PRP therapy on the percentage of surface area reduction/healing in chronic ulcers.
Methods: This randomized controlled trial was conducted at the department of general surgery of M.M. institute of medical sciences and research (M.M.I.M.S.R.) Mullana, Ambala from May 1, 2023, to April 30, 2024. Patients aged 18-80 years of either gender with chronic ulcers were enrolled. Patients were randomly allocated to the PRP group and control group. PRP group was administered autologous PRP once in two weeks for 6 weeks after debridement, while for the control group conventional saline dressings were done after debridement. Final assessment was done at 8 weeks.
Results: Of the 60 patients, the mean age was 53.90±11.23 years. There were 49 (82%) males and 11 (18%) females. At 8 weeks, the PRP group achieved 83.78% (SD=2.99) reduction in surface area of ulcers, whereas the control group had a 57.78% (SD=1.32) reduction in surface area of ulcers, with a p=0.0000 indicating a significant difference. The small sample size and 56-day follow-up period are insufficient to assess long-term treatment effects.
Conclusions: A better outcome of PRP was observed compared to conventional dressing in patients with chronic non-healing ulcers.

Keywords: PRP, Conventional dressing, Chronic non healing ulcer

INTRODUCTION

In era of cutting-edge medical advancements, managing chronic wounds remains a significant challenge.[1] Chronic non-healing ulcers, including venous, arterial, inflammatory, neuropathic, tropical, malignant/traumatic, exhibit prolonged healing time.[2] These wounds pose significant burden on healthcare systems worldwide.[3] Chronic ulcers often remain stalled in healing process due to deficiencies in growth factors (GFs) and cytokines.[4,5] Traditional treatment modalities, while effective in many cases, often fall short in accelerating healing process.[6] PRP therapy, an emerging therapy, has garnered attention for its potential in regenerative medicine.[7,8] PRP, derived from autologous plasma with concentrated platelets, leverages rich reservoir of GFs inherent in platelets to stimulate tissue regeneration.[9]

Aim

The aim of study was to evaluate the efficacy of autologous PRP therapy in the management of chronic ulcers on lower extremities.

Objectives

Objectives were to determine the effect of autologous PRP therapy on the percentage of surface area reduction/healed on various etiologies of chronic ulcers.

METHODS

Study design

This was a randomized controlled trial conducted at the department of general surgery of M.M. institute of medical sciences and research Mullana (Ambala) from May 1, 2023, to April 30, 2024 after approval from institutional ethics committee (MMIMSR/IEC/2473-30/04/2023). Patients aged 18-80 years of either gender with chronic ulcers were enrolled. Patients were randomly allocated to the PRP group and control group.

Inclusion criteria

Patients aged 18 to 80 years with chronic ulcers of following etiologies were included: venous ulcers, diabetic foot ulcers and traumatic ulcers. The ulcers of 4 weeks duration were included.

Exclusion criteria

Patients with systemic infection, active neoplastic disease, on immunosuppressive therapy for 3 months, on anticoagulant therapy, bedridden, arterial ulcers and hemoglobin concentration less than 10 gm% were excluded. Pregnant or breastfeeding women were excluded. Wound areas over 20 cm² (length×width) were excluded in the study.

PRP group

Once ulcer floor was free of slough and showed healthy granulation, group PRP patients received autologous PRP. PRP was injected into ulcer edge with a disposable syringe followed by a moist saline gauze dressing. Group PRP underwent 3 PRP sessions (days 0, 14 and 28), with final outcome assessed at week 8 (day 56). Between PRP sessions, patients received conventional dressings every 3rd day, like the control group.

Control group

Once floor of ulcer was free of slough with healthy granulation; control group patients underwent saline-soaked conventional dressing every 3rd day for 8 weeks.

Autologous PRP preparation

Ten milliliters of autologous blood was drawn and placed in a sodium citrate vacutainer. Using a two-step centrifugation process, the first spin at 1400 rpm for 10 minutes separated the plasma and platelets from red blood cells. The second spin at 2100 rpm for 15 minutes divided the plasma into platelet-poor plasma (PPP) and PRP. PPP was discarded, and PRP was activated with calcium chloride/gluconate (1:9 ratio) just before use. Freshly-prepared PRP was injected immediately to preserve platelet function.

Follow up and outcome assessment

On each planned follow-up visit, the healing of ulcers in both patient groups was assessed by measuring the ulcer's surface area using a sterile scale (maximum length× maximum breadth). The percentage of surface area reduction/healed was calculated with formula: [{(Initial surface area-final ulcer area)/initial surface area}×100]. Other wound characteristics, such as granulation tissue, pain, color, and edges were documented. Study's endpoint was either complete ulcer closure or the end of 56 day follow-up period, whichever came first.

Data analysis

Data was analyzed using SPSS software. Percentage of surface area reduction was compared between 2 groups using t tests, $p<0.05$ considered statistically significant.

RESULTS

In our study of 60 patients, aged 32 to 78 years, chronic non-healing ulcers were most common in those aged 50-60 years. There was a male preponderance with 82% males (n=49) and 18% females (n=11). Of the participants, 33 were smokers (20 in the PRP group and 13 in the control group), while 27 were non-smokers; which was not a confounding factor.

The mean ulcer duration was 6.9 weeks. The most prevalent ulcer site was the leg (68%, n=41), followed by the foot (25%, n=15) and heel (7%, n=4), (Figure 1).

Venous ulcers were the most common (n=34), followed by diabetic ulcers (n=20) and traumatic ulcers (n=6) (Figure 2).

Table 1: Demographic data of study groups.

Variables		PRP group		Control group	
		N	%	N	%
Age group (in years)	≤30	3	7.5	7	8.8
	31-40	6	15	22	27.5
	41-50	13	32.5	20	25.0
	51-60	5	12.5	12	15.0
	61-70	9	22.5	14	17.5
	≤70	4	10	5	6.3
Sex	Male	24	60	22	55
	Female	16	40	18	45
History of smoking	Smokers	20	67	13	43
	Non smokers	10	33%	17	57

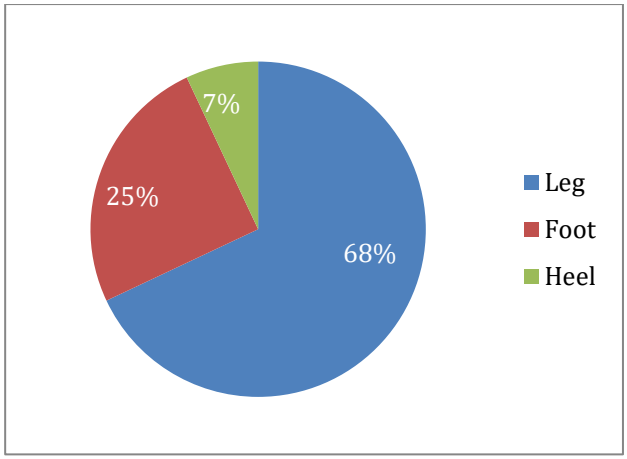

Figure 1: Distribution of ulcer according to site.

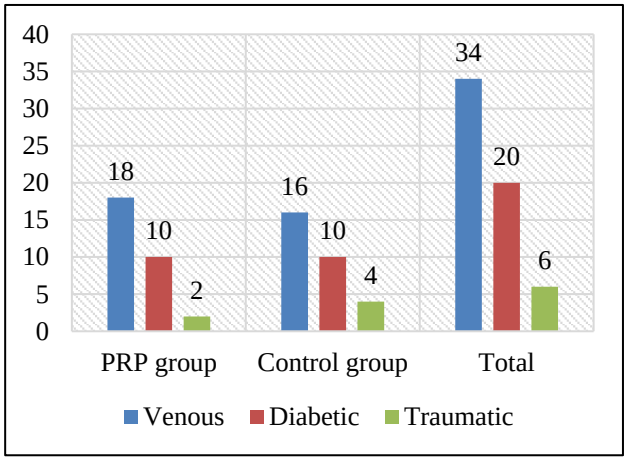

Figure 2: Distribution of type of ulcers in both groups.

Ulcer sizes ranged from 5 to 20 cm^2, with mean sizes of 10.2±3.15 cm^2 in the control group and 9.46±2.51 cm^2 in the PRP group. Ulcer surface areas were measured at day 0, 14, 28, and 56. By day 56, the mean ulcer area in the PRP group had decreased to 1.63 cm^2 (SD=1.82) compared to 4.30 cm^2 (SD=1.70) in the control group ($p<0.0001$). The PRP group achieved an 83.78% surface area reduction (%SAR) by day 56, versus 57.78% in the control group ($p<0.0001$) (Table 2).

Mild adverse effects, such as pain and erythema, were observed in the PRP group, with similar local infection rates in both groups.

Figure 3 (a-d): Ulcer at day 0, 14, 28 and 56.

Table 2: Mean surface area.

Group	Day 0		Day 14		Day 28		Day 56	
	Area (cm^2)	SD	Area (cm^2)	SD	Area (cm^2)	SD	Area (cm^2)	SD
PRP group	9.46	2.51	6.66	1.97	4.16	1.78	1.63	1.82
Control group	10.2	3.15	8.06	2.40	6.00	2.01	4.30	1.70
P value	0.32371		0.01666		0.00044		0.0000	

DISCUSSION

Chronic wounds are a significant health challenge, especially in developing countries. These wounds often lack essential GFs, making them difficult to heal and prone to infections. Conventional treatments include debridement, infection control, revascularization and minimizing pressure, but they often fall short. Skin grafting is costly and doesn't provide necessary GFs. Topical PRP shows promise by releasing multiple GFs and cytokines, mimicking natural healing.

Studies have shown that PRP significantly accelerates wound healing, with better outcomes in chronic non-healing ulcers compared to traditional treatments. Driver et al observed that significantly more healed diabetic foot ulcers with PRP (81.3%) compared to the control group (42.1%).[10] Anitua et al found that ulcers treated with PRP had a 72.9% wound area reduction and complete healing in some cases, compared to 21.5% in the control group.[11] Friese et al demonstrated that PRP treatment led to a higher rate of complete healing and shorter time to heal in diabetic foot ulcers compared to conventional methods.[12]

In our study of 60 patients, those treated with PRP showed greater ulcer area reduction and higher surface area reduction percentage (%SAR) over 56 days. PRP was effective across different ulcer types and had a significant impact on healing rates. Adverse effects were mild and comparable between PRP and control groups. Other studies have corroborated PRP's efficacy in

enhancing wound healing, suggesting it as a valuable tool in managing chronic ulcers.

Limitations

The study's sample size was relatively small, and the follow-up period was limited to 42 days, which is insufficient to assess the durability of the treatment effects. Additionally, although the study was randomized, it was open-label, potentially introducing bias. Future studies with larger sample sizes and double-blind designs are needed to confirm these findings.

CONCLUSION

Autologous PRP therapy demonstrates a significantly better outcome in the management of chronic non-healing ulcers compared to conventional dressing methods. Incorporating PRP into treatment protocols may enhance healing outcomes and provide a viable solution for patients suffering from chronic ulcers.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Strohal R, Dissemond J, Jordan O'Brien J, Piaggesi A, Rimdeika R, Young T, et al. EWMA Document: Debridement: An updated overview and clarification of the principle role of debridement. J Wound Care. 2013;22:S1-49.
2. Sibbald RG, Elliott JA, Persaud-Jaimangal R, Goodman L, Armstrong DG, Harley C, et al. Wound Bed Preparation 2021. Adv Skin Wound Care. 2021;34(4):183-95.
3. Sen CK. Human wounds and its burden: An updated compendium of estimates. Adv Wound Care (New Rochelle). 2019;8(2):39-48.
4. Barrientos S, Brem H, Stojadinovic O, Tomic-Canic M. Clinical application of growth factors and cytokines in wound healing: Wound management: growth factors and cytokines. Wound Repair Regen. 2014;22(5):569-78.
5. Barrientos S, Stojadinovic O, Golinko MS, Brem H, Tomic-Canic M. Growth factors and cytokines in wound healing: Growth factors and cytokines in wound healing. Wound Repair Regen. 2008;16(5):585-601.
6. Phillips T. New treatments for venous leg ulcers. Clin Dermatol. 1994;12(1):35-41.
7. Martinez-Zapata MJ, Martí-Carvajal AJ, Solà I, Expósito JA, Bolíbar I, Rodríguez L, et al. Autologous platelet-rich plasma for treating chronic wounds. Cochrane Database Syst Rev. 2012;10(5):CD006899.
8. Verma R, Kumar S, Garg P, Verma YK. Platelet-rich plasma: a comparative and economical therapy for wound healing and tissue regeneration. Cell Tissue Bank. 2023;24(2):285-306.
9. Marx RE. Platelet-rich plasma (PRP): what is PRP and what is not PRP? Implant Dent. 2001;10(4):225-8.
10. Driver VR, Hanft J, Fylling CP, Beriou JM. Autologel Diabetic Foot Ulcer Study Group. A prospective, randomized, controlled trial of autologous platelet-rich plasma gel for the treatment of diabetic foot ulcers. Ostomy Wound Manage. 2006;52(6):1.
11. Anitua E, Aguirre JJ, Algorta J, Ayerdi E, Cabezas AI, Orive G, et al. Effectiveness of autologous preparation rich in growth factors for the treatment of chronic cutaneous ulcers. J Biomed Mater Res B Appl Biomater. 2008;84B(2):415-21.
12. Friese G, Herten M, Scherbaum WA. The use of autologous platelet concentrate activated by autologous thrombin (APC+) is effective and safe in the treatment of chronic diabetic foot ulcers: a randomized controlled trial. In: Fifth International Symposium on the Diabetic Foot. Noordwijkerhout, The Netherlands. 2007.

Cite this article as: Bishnoi A, Gupta J, Verma N, Bishnoi M, Chauhan P, Chaudhary M. Comparative efficacy of autologous platelet rich plasma and conventional dressing in the management of chronic ulcers. Int Surg J 2024;11:1641-4.