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Role of Platelet-Rich Fibrin (PRF) in the Management of Non-Healing Ulcers: A Prospective Observational Study

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ABSTRACT

Background:

Non-healing ulcers represent a significant public health concern, leading to considerable disability and reduced quality of life. Autologous platelet-rich fibrin (PRF) has emerged as a promising, biologically active scaffold that promotes wound healing.

Objective:

To evaluate the efficacy of PRF in the treatment of chronic, non-healing leg ulcers.

Methods:

This prospective study included 10 patients aged over 18 years with chronic leg ulcers (>8 weeks' duration) unresponsive to conventional therapies. Exclusion criteria included bleeding disorders, pregnancy, lactation, anticoagulant use, and deep ulcers with exposed structures. PRF was derived from the patient's blood and applied once weekly for a maximum of five weeks or until complete healing. Ulcer dimensions were recorded at each visit, and serial photographs were taken.

Results:

The average age of the patients was 41.2 years, with a male-to-female ratio of 2:1. The mean ulcer area measured 7.22 cm^2, and the average duration of ulcers before treatment was 5.1 months. Underlying causes included Hansen's disease (n=4), diabetic foot ulcers (n=3), venous ulcers (n=2), and one case of a neuropathic ulcer. Complete healing was achieved in all cases, with no adverse events or recurrence noted during the 3-month follow-up period.

Conclusion:

PRF is a safe, effective, and cost-efficient treatment for non-healing leg ulcers, demonstrating significant potential for wider clinical use.

Keywords: *Platelet-rich fibrin, nonhealing ulcers, cost-effective*

1. INTRODUCTION

Chronic non-healing ulcers are a prevalent clinical challenge worldwide, with an estimated prevalence ranging from 1.9% to 13.1%. (1) These ulcers can stem from various etiologies, including leprosy, diabetes, venous insufficiency, and neuropathy.

They often impair mobility and mental well- being, significantly affecting patients' quality of life Platelet-rich fibrin (PRF) is a second-generation platelet concentrate derived from autologous blood, rich in growth factors such as platelet-derived growth factor (PDGF), transforming growth factor- beta (TGF-β), vascular endothelial growth factor (VEGF), and insulin-like growth factor (IGF). These bioactive molecules contribute to wound healing by enhancing angiogenesis, cell migration, and tissue regeneration.

2. MATERIALS AND METHODS

Study Design and Duration:

A prospective observational study was carried out between May 2024 and October 2024.

Inclusion Criteria:

- Adults (>18 years) with leg ulcers >8 weeks' duration
- Lack of response to conventional therapies

Exclusion Criteria:

- Refusal to consent
- Pregnancy or lactation
- Bleeding disorders or haematological diseases
- Platelet count <100,000/mm³
- Use of anticoagulants
- Full-thickness ulcers with exposure of underlying bone, muscle, or tendon

3. METHODOLOGY

A detailed clinical history was obtained, and each patient underwent a comprehensive physical examination. After securing informed consent, 10 mL of venous blood was drawn into a plain, sterile vial. The sample was centrifuged at 2000 rpm for 10 minutes, yielding three layers: a top layer of straw-colored platelet-poor plasma, a middle layer of platelet-rich fibrin (PRF), and a bottom layer of red blood cells (RBCs).

The ulcer area was thoroughly cleaned with normal saline, followed by povidone-iodine (Betadine) solution. Using sterile forceps and a surgical blade, the PRF layer, along with approximately 1 mm of the adjacent RBC layer, was carefully isolated and transferred onto sterile gauze. This PRF clot was then applied to the wound bed using sterile jeweler's forceps. The treated ulcer was covered with a non-adherent dressing and secured with a sterile roller bandage.

Patients were instructed to observe bed rest and avoid weight-bearing on the treated limb for 1–2 days post-procedure. Dressings were changed weekly for up to five weeks or until complete wound closure, whichever occurred earlier. In three diabetic patients presenting with secondary infection at baseline, a short course of oral antibiotics was prescribed during the first two PRF applications.

Measurements of ulcer size and photographic documentation were conducted at each visit.

4. RESULTS

The study comprised seven male and three female patients. The anatomical distribution of ulcer sites is detailed in Table 1. At baseline, the ulcers had a mean surface area of 7.22 cm² and an average duration of 5.1 months.

Antibiotic therapy was administered only to three patients with diabetic ulcers, serving as the sole adjuvant treatment. Among the seven non-diabetic patients, complete ulcer healing was achieved within 5 to 6 weeks. The three diabetic patients also exhibited complete healing, with ulcer resolution occurring between 4 and 6 weeks.

The number of PRF applications ranged from four to six sessions, with a mean of five sessions per patient. All participants showed progressive healing, culminating in complete ulcer closure by the final follow-up. No adverse effects or recurrence of ulcers were observed during the three-month post-treatment follow-up period.

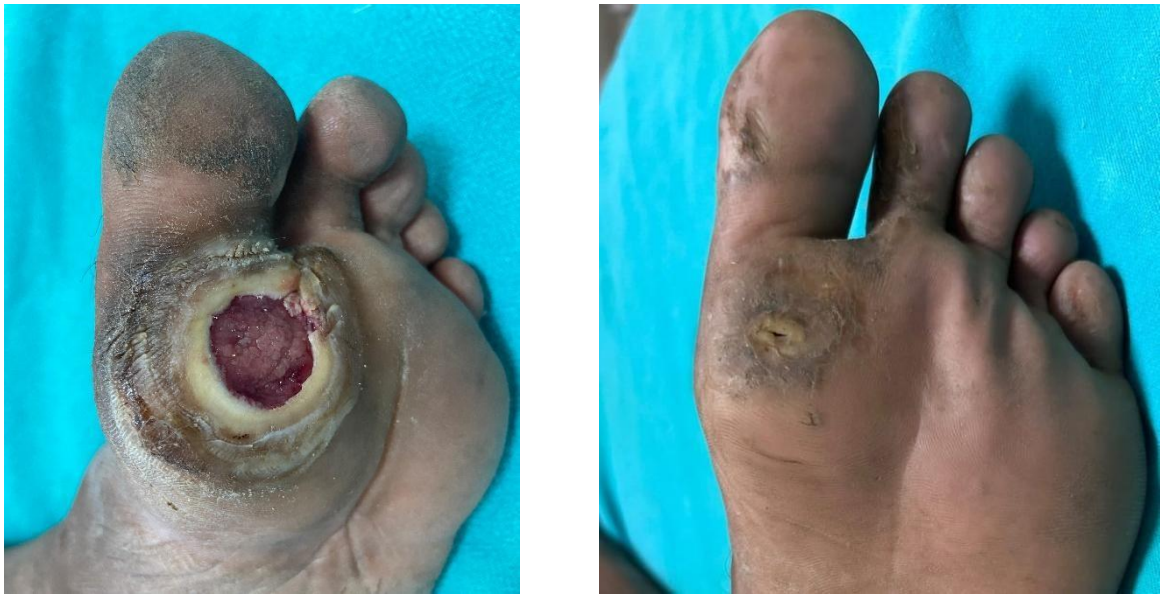


Figure 1: (A) Trophic ulcer near the big toe – *pre-treatment*

(B) Post 5th session – significant healing observed.

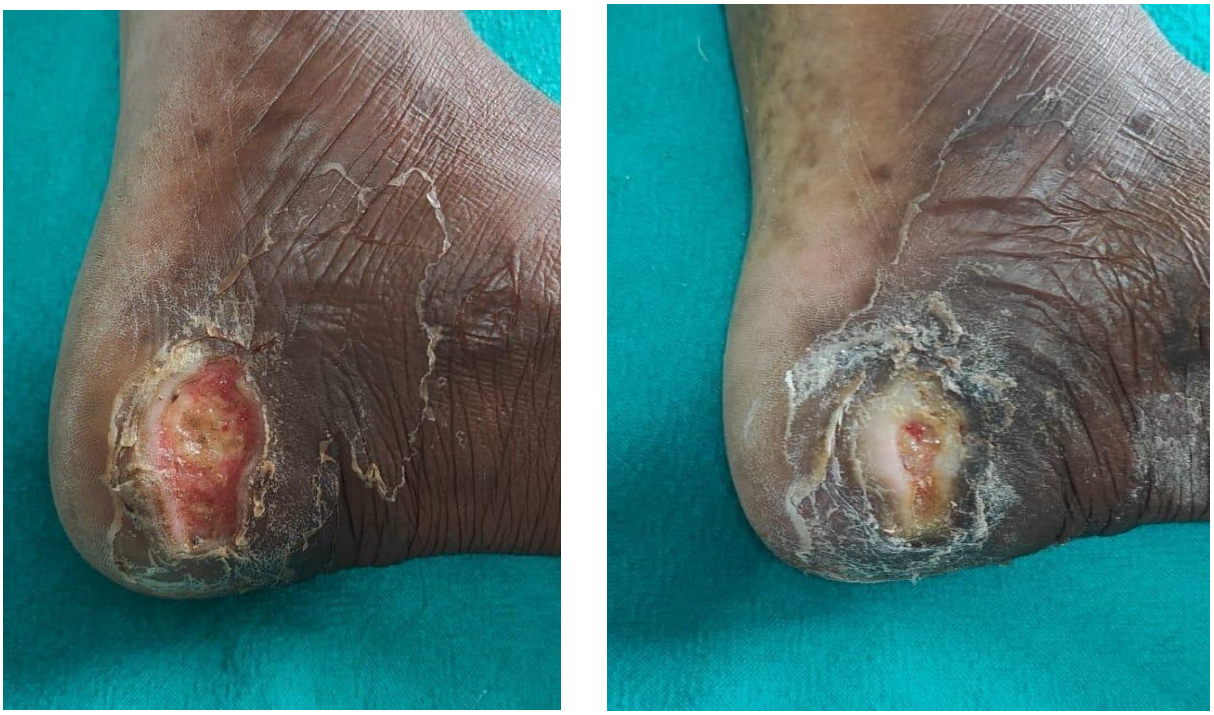


Figure 2: (A) Diabetic ulcer near the medial malleolus – pre-treatment

(B) Notable improvement after the third PRF session

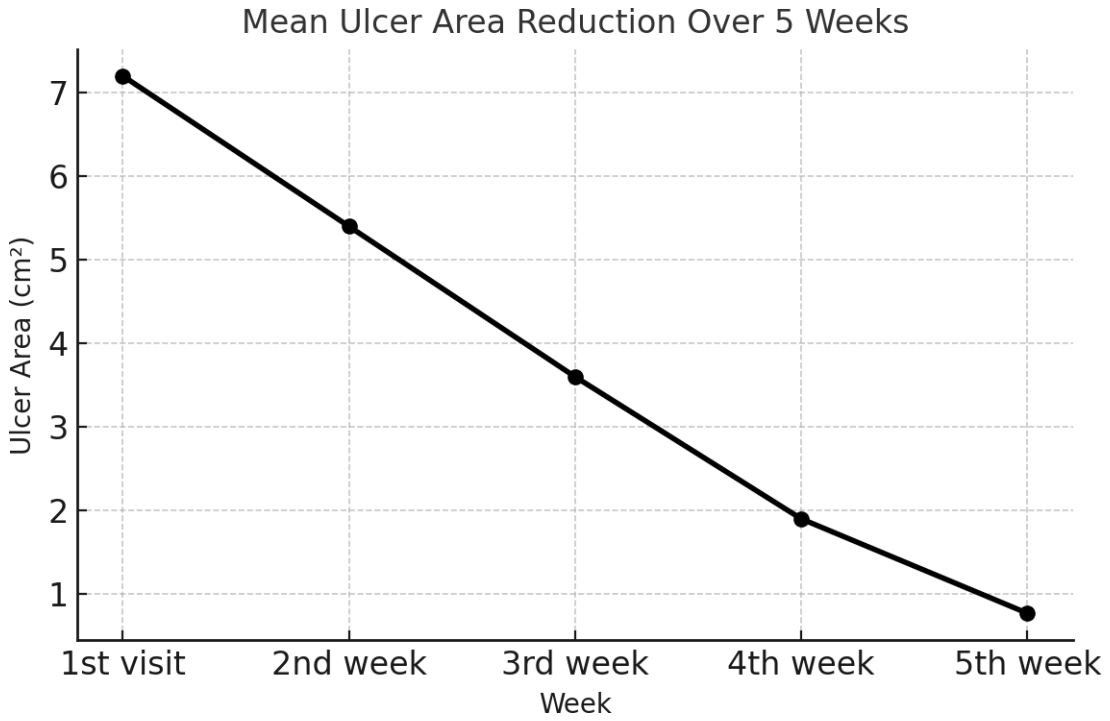
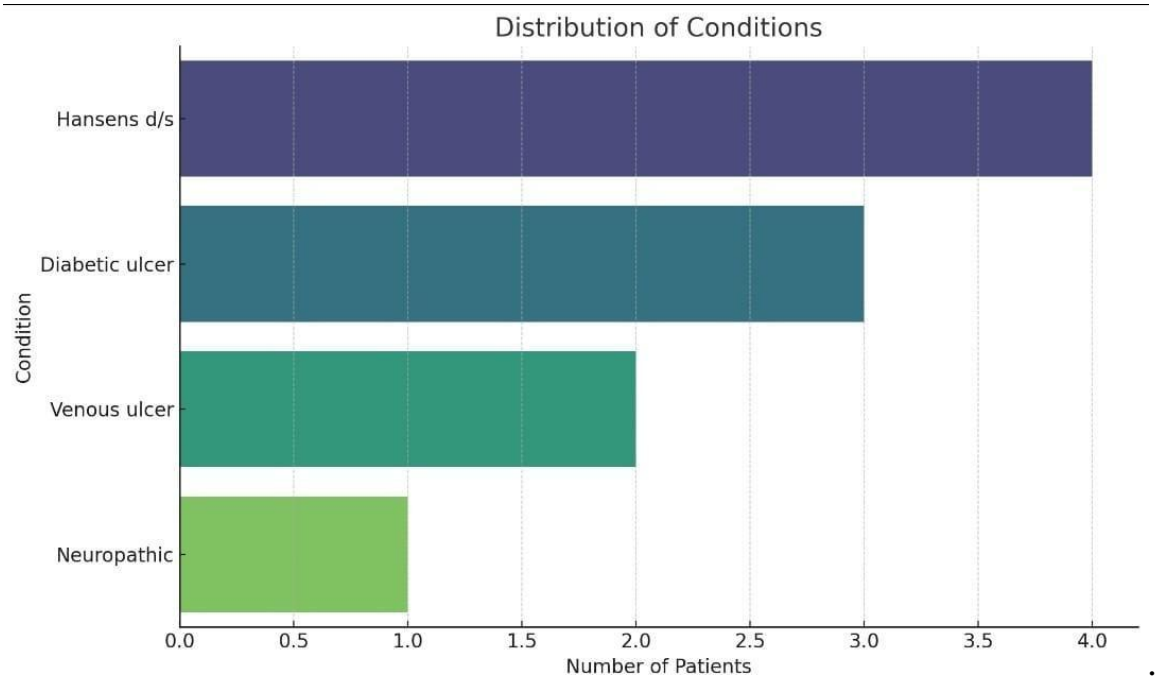


Figure 3: Healing Trend Graph showing average ulcer area reduction over 5 weeks of PRF therapy.

S.NO.	AGE	SEX	CONDITION	DURATION	SITE	Area (cm2)
1	45	M	Hansens d/s	3 months	upper planter of Rt. Foot	6
2	44	M	Hansens d/s	4months	big toe of Rt. Foot	7
3	35	F	Hansens d/s	5 months	Later aspect of the Lt. foot	5
4	30	M	Hansens d/s	5 months	heel of Lt. foot	8
5	44	M	Diabetic ulcer	6months	below medial malleoli Rt.	7
6	44	F	Diabetic ulcer	7 months	planter of Lt. Foot	10
7	45	M	Diabetic ulcer	4months	below the lateral malleoli, Lt.	8
8	40	M	Venous ulcer	4months	Later aspect of Rt. Leg	6
9	44	F	Venous ulcer	6months	medial aspect of lt. leg	6
10	39	M	Neuropathic	7months	heel of rt. Foot	9

Table 1: Demographic data of the patient.

Figure 4: Patient condition distribution



Area (cm2) at 1st visit	2nd week	3rd week	4th week	5th week	6th week	7th week
6	4	2	1	0		
7	5	3	2	1	0	
5	4	3	1	0		
8	6	4	1	0		
7	5	2	0			
10	8	7	5	3	1	0
8	6	4	3	1	0	
6	5	3	1	0		
6	4	2	1	0		
9	7	6	4	2	1	0

Table 2: Progressive reduction in ulcer size following sequential PRF sittings

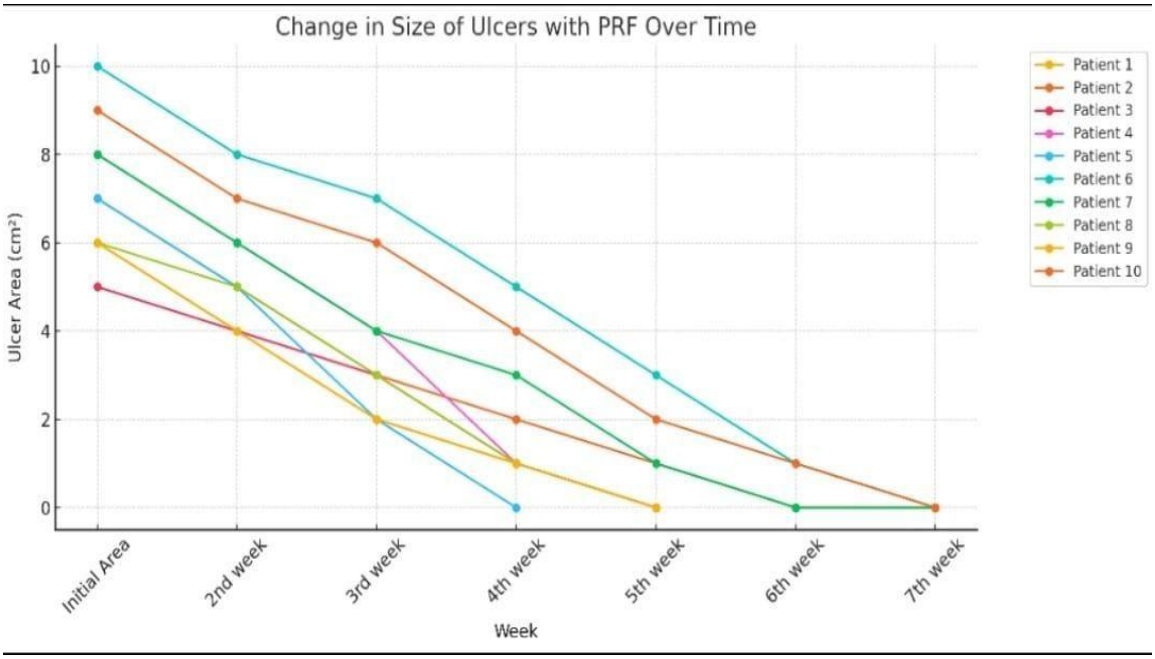


Figure 5: Graphical representation of percentage reduction in the size of the wounds.

1.	The technique is straightforward and requires minimal time to perform.
2.	It is virtually painless, as there is no need for intralesional injections of the sample.
3.	The process does not involve any biochemical alteration, eliminating the need for anticoagulants.
4.	Both the preparation and application are simple and cost-effective.
5.	PRF offers a sustained release of growth factors, extending over seven days or more.
6.	It effectively facilitates cytokine entrapment and promotes cellular migration.
7.	The fibrin matrix enhances the incorporation of circulating (intrinsic) cytokines.
8.	The gradual polymerization process contributes to improved support and acceleration of tissue healing.
9.	PRF aids in achieving hemostasis at the wound site.
10	Its three-dimensional fibrin structure provides elasticity and flexibility, enhancing the mechanical integrity of the membrane.

Table 3: Comparative benefits of PRF versus PRP

5. DISCUSSION

Wound healing is a structured yet intricate biological process comprising three successive and tightly regulated phases: inflammation, proliferation, and maturation. In non-healing ulcers, this cascade is frequently disrupted, with the wound stalled in the inflammatory phase, ultimately impeding progression to complete healing. Platelet concentrates are employed with the aim of overcoming this stagnation by delivering a concentrated source of growth factors that can stimulate the transition from inflammation to the proliferative phase of healing.

Chronic nonhealing wounds are particularly prevalent in developing countries, posing a significant challenge for both patients and healthcare providers due to their prolonged course and associated morbidity.

Platelet-Rich Plasma (PRP) and Platelet-Rich Fibrin (PRF) have both been utilized in the management of ulcers; however, notable differences have been observed in their in vitro biological behaviour.

Among the two, PRF has demonstrated superior efficacy in treating nonhealing ulcers. (4) The advantages of PRF over PRP

can be summarized in Table 3.

Compared to conventional treatment, PRF application is simple, autologous, and inexpensive. Our findings corroborate previous studies, such as those by Varma et al. and Dorjay et al., who demonstrated the efficacy of PRF in non-healing ulcers, especially those related to Hansen's disease. (2)

In our study, complete healing of the ulcers was achieved after an average of five PRF applications, corresponding to approximately five weeks of treatment. This finding is consistent with the results reported by Saravanamuthu et al., who observed a mean healing duration of 5.1 weeks for chronic ulcers treated with PRF or PRP.

PRF significantly reduces the duration and cost of therapy, as well as the morbidity associated with nonhealing ulcers. In our study, all 10 patients achieved complete ulcer healing, which was sustained

Throughout the 3-month follow-up period. However, it was observed that larger ulcers required a greater number of treatment sessions.

6. CONCLUSION

PRF therapy is a safe, efficient, and cost-effective method to promote healing in chronic leg ulcers. Given its biological compatibility and ease of use, PRF holds promise for integration into routine dermatological and wound care practices.

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None

Conflicts of Interest:

The authors declare no conflicts of interest.

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