

Study of Efficacy of Autologous Platelet Rich Fibrin in Chronic Non-Healing Ulcers of Leg

Dr. Suyash Virkar^{1*}, Dr. Swapnil Shah², Dr. Sachin Kore³

¹Jr 3-Md Dermatology, Ashwini Rural Medical College & Hospital, Kumbhari, Maharashtra, India

²Professor and HOD, Department of Dermatology, Ashwini Rural Medical College & Hospital, Kumbhari, Solapur, Maharashtra, India

³Associate Professor, Department of Dermatology, Ashwini Rural Medical College & Hospital, Kumbhari, Solapur, Maharashtra, India

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*Corresponding author: Dr. Suyash Virkar

Jr 3-Md Dermatology, Ashwini Rural Medical College & Hospital, Kumbhari, Maharashtra, India

Abstract

Original Research Article

Introduction: Platelet-rich fibrin (PRF) is the newer treatment option for treatment of chronic non-healing ulcers of leg and it contains various growth factors which boosts the wound healing. **Objectives:** To detect the efficacy of autologous PRF dressing in chronic non-healing leg ulcers and to assess the reduction in ulcer area at the end of each week. **Materials and Methods:** 30 patients (17 females, 13 males) were taken in this prospective study with informed consent. PRF was prepared by drawing 10cc venous blood and directly centrifuging it at 3000rpm (approximately 400g) for 10 minutes without adding anticoagulant. Three fractions were formed consisting of red coloured lower fraction containing RBCs, middle fraction containing PRF and upper fraction consisting of upper straw coloured platelet poor plasma (PPP). PPP fraction was discarded; middle PRF fraction was collected by separating it from the lower RBC fraction with forceps and scissors. PRF was then applied over the healthy bed of chronic non-healing ulcers every week till the wound heals. Reduction in ulcer at the end of each week is assessed by calculating area (Length×Width×0.7854). **Results:** The mean size of the ulcers was 10.4 cm² initially; mean duration of ulcer was 4.7months. Complete healing required minimum 3 and the maximum 8 sittings (mean 4) no adverse events seen. **Conclusion:** We conclude that PRF dressing can be used as it is effective, safe, outpatient procedure in chronic non-healing leg ulcers.

Keywords: PRF, Venous Ulcers, Leprotic Ulcers, Diabetic ulcers, non-healing ulcers, growth factors, wound healing.

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INTRODUCTION

A non-healing ulcer is defined as an ulcer which does not heal even after 6 weeks of constant treatment. It has a large influence on the quality of life. Various causes are diabetes, venous stasis, vasculitis, trauma, trophic changes, infections, and mainly Hansen's disease in the Indian scenario.

Recently, various forms of platelet concentrates, which contains various growth factors secreted by platelets, have been used in promoting wound healing [1, 2]. In chronic wounds, healing is stalled due to a variety of systemic and local factors including inadequate blood supply, high microbial burden, excess devitalized tissue, chronic venous insufficiency; senescent epithelial cells which are poorly responsive to cell signaling [3] and decreased

growth-factor production and response. PRF Dressing provides the various growth factors that promote tissue healing. Hence, we studied a series of 30 cases showing the usage of autologous PRFM in non-healing chronic leg ulcers.

METHODS

After approval from institutional ethical committee study was conducted. Each patient was subjected to Platelet Rich Fibrin Dressing procedure.

Study Duration

12 months (Aug 2021-Aug 2022).

Study Design

Prospective Observational Study.

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Selection Criteria**Inclusion Criteria**

- Age group 18–85 years.
- Patient with chronic, non-healing foot ulcers.
- Hemodynamically stable patient.
- Normal Blood Test Results in terms of platelet and red blood cell counts and haematocrit.
- Informed consent form signed.

Exclusion Criteria

- Patients with Active infection/sepsis at the beginning of study.
- Patients with Anemia (hemoglobin less than 10 g/dL or active bleeding).
- Patients with Thrombocytopenia (platelet count less than 100,000/mL or other platelet disorders).
- Patients with syphilis, hepatitis B, Hepatitis c and HIV.
- Patients with Clotting Disorders.
- Patients on anticoagulant medications (aspirin, warfarin, heparin).
- Patients with malignant ulcers, pregnant and lactating females.

Study Setting

- Tertiary rural health care centre.

30 Patients with Chronic Non Healing Ulcers diagnosed on clinical ground attending dermatology opd at tertiary rural health care centre fulfilling the inclusion criteria.

There are 17 female and 13 male, their ages ranged from 31-71 years. An informed consent was obtained from each patient.

Assessment of the mean reduction in ulcer area was done every week.

Procedure

PRF was prepared by drawing 10 cc of venous blood and directly centrifuging it at 3000 rpm for 10 minutes without adding any anticoagulant.

Three fractions were formed consisting of red coloured lower fraction containing RBCs, middle fraction containing PRF and upper fraction consisting of upper straw coloured platelet poor plasma (PPP).

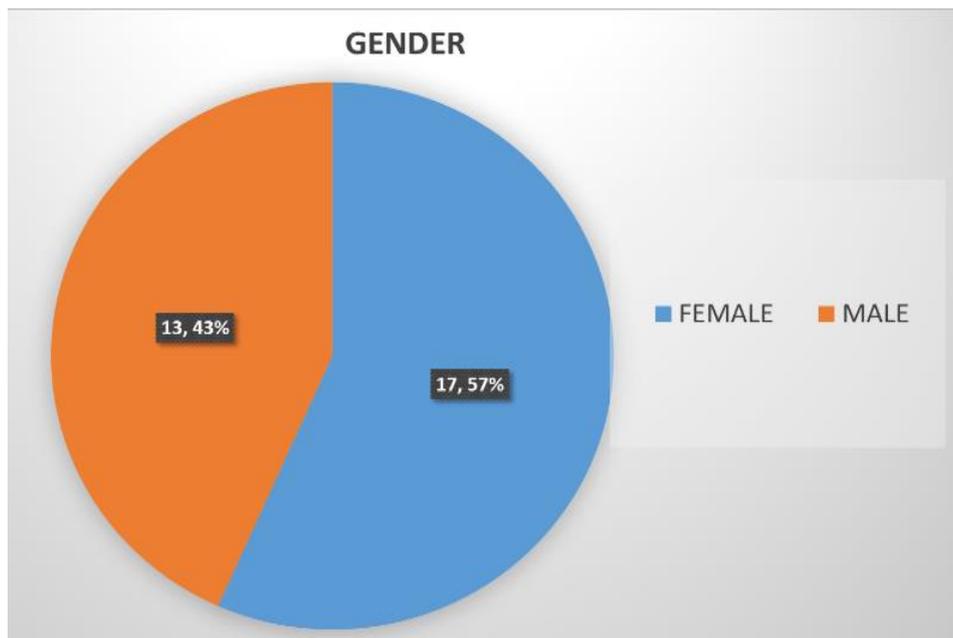
PPP fraction was discarded and middle PRF fraction was collected by separating it from the lower RBC fraction with forceps and scissors. This PRF was then applied over the healthy bed of chronic non-healing ulcers every week till the wound heals.

The procedure was repeated every week till complete healing of ulcers.

At the beginning of every week, healing of the ulcer was assessed, area and volume were calculated and photographs were taken. Wound area was calculated by using the formula of an ellipse: Length \times width \times 0.7854 (an ellipse is closer to a wound shape than a square or rectangle).

The use of an ellipse for calculating wound measurement has been used in randomised controlled trials in wound healing literature [4, 5].

Volume was calculated using the formula (length \times width \times 0.7854) \times depth [5].



Statistical Analysis

ANOVA					
Source of Variation	SS	df	MS	F	P-value
Between Subjects	1180.88	29		144.52	<0.0001
Between treatment	1957.9		5391.5747		
Within	392.9	145	2.7		
Total	3531.641	179			

SUMMARY

Groups	Count	Sum	Average	Variance
Column 1	30	293.7	9.8	18.8
Column 2	30	200	6.7	11.6
Column 3	30	131	4.4	9.5
Column 4	30	69	2.3	8.1
Column 5	30	28	0.9	4.9
Column 6	30	15	0.5	1.4

Column 1:- Area of ulcer at 1st visit

Column 2:- Area of ulcer after 1 session

Column 3:- Area of ulcer after 2nd session

Column 4:- Area of ulcer after 3rd session

Column 5:- Area of ulcer after 4th session

Column 6:- Area of ulcer at last visit.

Here, in our study, P value is <0.0001 which is <0.05.

Therefore null hypothesis is rejected and hence PRF Dressing is useful in healing of chronic non-healing ulcers of leg is proved.

RESULTS

30 patients with chronic leg ulcers of various etiologies were included: Ulcers due to leprosy ($n = 13$), followed by Diabetic foot ulcers ($n = 8$), Venous ulcers ($n = 5$), Post-traumatic ulcers ($n = 3$), and Post-full-thickness skin graft ulcer ($n = 1$).

There were 13 Male and 17 Female 1 patient was lost to follow-up after the fifth sitting.

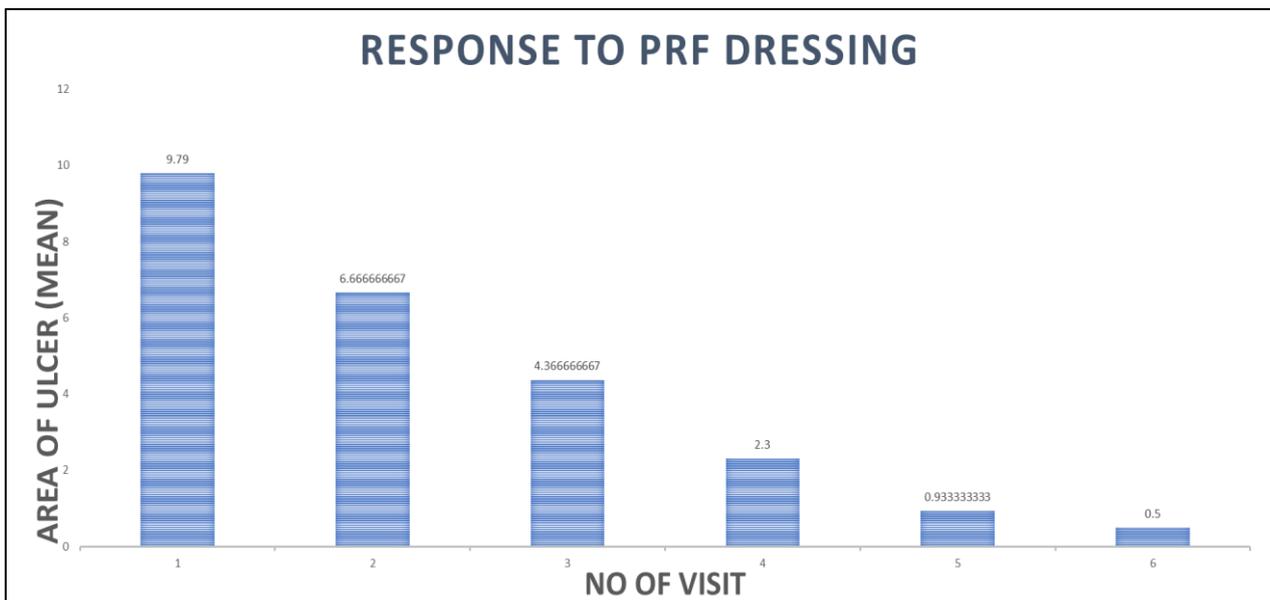
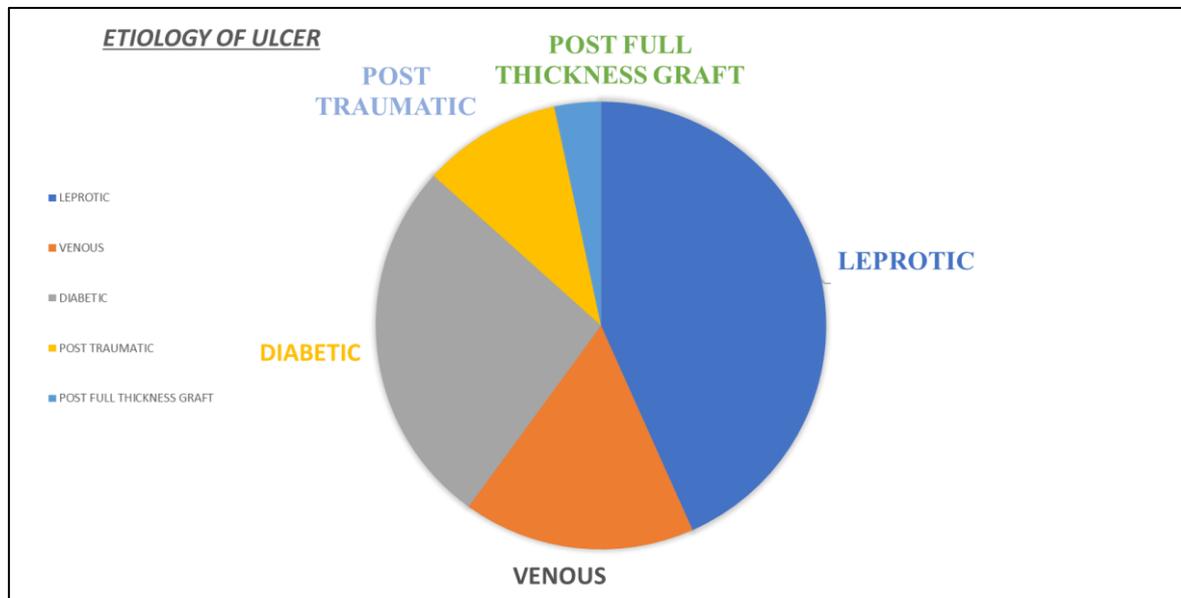
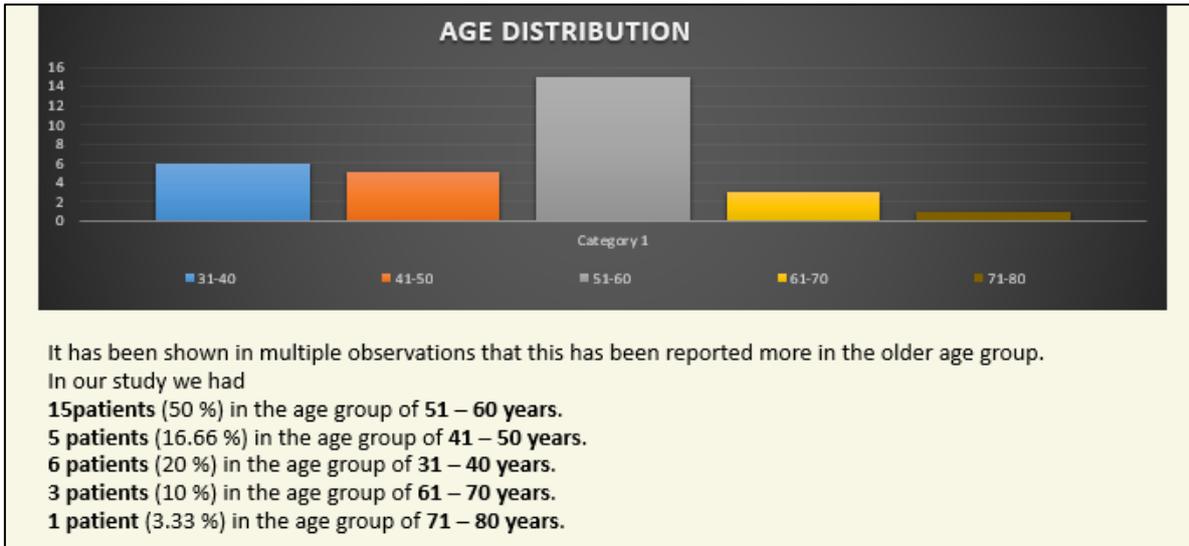
At initial presentation, the mean size of the ulcers was 9.79 cm² (range, 2–32 cm²) and mean duration was 4.73 months (3–12 months). The mean age of the patients was 51.63 years (range, 31–71). At the end of study mean size of ulcers was 0.3 cm².

The mean percentage improvement in the area was 96.46%, and volume was 97% at the end of the 4th sitting.

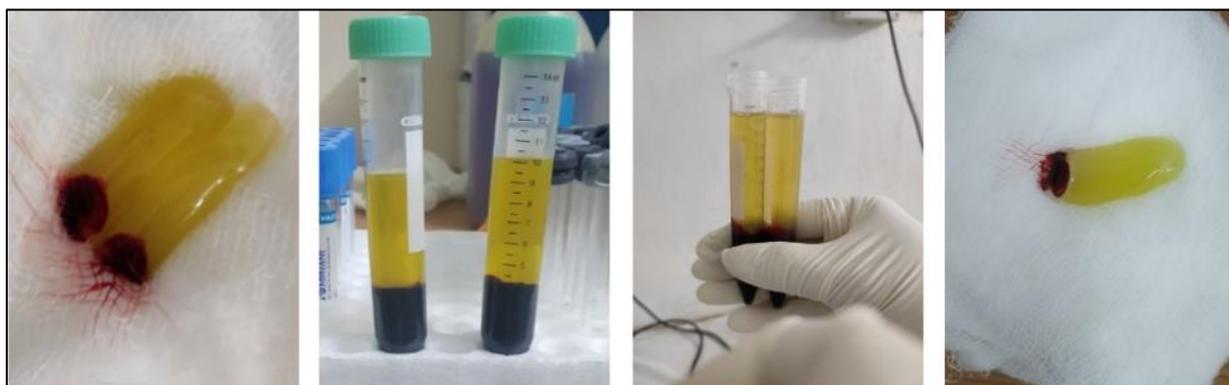
All ulcers closed by a maximum of five sittings. No adjuvant treatment was required for treatment of the ulcers. No adverse events were reported due to PRFM treatment. In all cases, it was possible to finish the treatment within 60 min. The volume of 10 ml of blood was adequate to cover an ulcer of maximum area 18.85 cm² with 1 mm thickness of PRFM.

There was partial recurrence at the same site in one patient after 5 months after a period of prolonged increased BSL level.

We also noticed that the number of weeks which required for an ulcer healing was proportionate to the initial size of the ulcer.



Clinical Photographs











DISCUSSION

This study was done to assess the efficacy of Platelet Rich Fibrin Dressing in Healing of chronic non-healing ulcers of leg.

Non-healing ulcers are believed to get stuck in the inflammation phase leading to a delay in the healing process [6]. PRF push the ulcers out of the phase of inflammation into the next phase of healing of wound by using various growth factors.

Knighton *et al.*, [7] had first shown that locally acting factors originated from autologous blood stimulate healing of chronic non-healing ulcers.

Dohan Ehrenfest *et al.*, [8] compared PRP with PRF dressing in healing of ulcer and significant differences were seen. PRF has been found to be superior to PRP in non-healing ulcers.

High concentration of platelets is trapped in the fibrin mesh. Fibrin plays a key role in platelet aggregation during hemostasis. The beneficial effect can be explained by its high concentration of platelets and leukocytes and slow progressive release of growth factors from the fibrin matrix [8].

Studies have proven that PRF releases various growth factors from fibrin matrix for at least 7 days [6, 7]. These growth factors include platelet-derived growth factor, transforming growth factor β 1, vascular endothelial growth factor, and insulin-like growth factors. PRF also contains matrix glycoproteins, such as thrombospondin-1, fibronectin and vitronectin, and various cytokines [8, 9].

Summary

Platelet Rich Fibrin (PRF) can be used to treat chronic or non-healing ulcers; multiple sittings should be done to promote the healing of such ulcers. But, duration of complete healing depends on initial ulcer size.

Further studies with more sample size and a longer follow-up period would be helpful in establishing this cheap and effective modality in the treatment of non-healing ulcers.

Limitations

Sample size is small, we didn't calculated exact platelet count, larger trial required.

CONCLUSION

Platelet Rich Fibrin (PRF) dressing for the treatment of chronic non-healing ulcers is a easy, safe, simple and cost effective method.

A good patient adherence and satisfaction was seen as there were no problems with PRF Dressing and no complications were reported.

Conflict of Interest: None.

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