ORIGINAL RESEARCH PAPER

Surgery

KEY WORDS: Leg Ulcers, Prf, Wound Healing

EVALUATION OF AUTOLOGOUS PLATELET RICH FIBRIN AS THERAPEUTIC MODALITY IN CHRONIC NON HEALING LEG ULCER.

Dr Yogendra P Chidrawar Junior resident, Department of surgery, Dr.Panjabrao Deshmukh medical memorial college, Amravati, Maharashtra, India.

Dr Anil V Darokar* Associate professor, Department of surgery, Dr.Panjabrao Deshmukh medical memorial college, Amravati, Maharashtra, India.*Corresponding Author

Dr Bhushan J Telhure Junior resident, Department of Dermatology, Dr.Panjabrao Deshmukh medical memorial college, Amravati, Maharashtra, India.

Dr Ankur B Chawla Junior resident, Department of orthopedics, Dr.Panjabrao Deshmukh medical memorial college, Amravati, Maharashtra, India.

ABSTRACT

BACKGROUND: Chronic leg ulcers occupy a significant number of OPD and IPD patients. Currently, Platelet Rich Fibrin (PRF) is being used in reconstructive, cosmetic and dermatologic surgery to improve tissue healing. Wound healing by application of an autologous platelet membrane is a safe, easy and inexpensive modality to treat chronic ulcers. Our aim was to study its efficacy in leg ulcers.

METHODS: 24 patients with 24 ulcers were included in the study. Patients were subjected to once weekly sitting of PRFM for a period of 4 weeks and healing of the ulcer was assessed. Area and volume were calculated and photographs were taken. Final assessment of reduction in the size of the ulcer was determined in percentage

RESULTS: A total of 24 patients with 24 ulcers were included in the study. According to the etiology, there were 6 patients (25%) of Hansen's disease, 5 patients (20.83%) of diabetic foot ulcer, 3 patients (12.5%) of venous ulcers, 4 patients (16.66%) of vascultis and 6 patients (25%) of traumatic ulcer. At the end of four sessions, 4 week follow-up, 1 patient (4.16%) showed reduction by 100%, 12 (50%) patients showed reduction in ulcer size by 70%, 8 (33.33%) showed reduction by 50% and 3 (12.5%) showed reduction by 30%.

CONCLUSION: PRFM is a safe, cost effective modality available even in small setup hospitals without requirement of many skills. Despite the various etiological factors of chronic leg ulcers, it can be very well applied in any type of ulcer without any side-effect.

Introduction:

Chronic leg ulcers occupy a significant number of OPD and IPD patients. These patients require long follow-ups and strict sterile care of wounds. The incidence rate is 2.2 to 5.9% annually [1]. Healing of leg ulcers is a long, chronic process and is often unsatisfactory. Annual recurrence is 6 - 15 % and most ulcers recur more than once [2]. Thus, ulceration of lower limbs is a common complication of a wide spectrum of pathologies that cause a negative impact on the quality of life of patients.

Many factors need to be addressed simultaneously when treating chronic wounds, and healing often does not proceed smoothly. Under these conditions, the application of platelet- rich-derived therapies gives ground for optimism. Currently, Platelet Rich Fibrin (PRF) is being used in reconstructive, cosmetic, orthopedic, cardiovascular, oral maxillofacial and dermatologic surgery in an attempt to improve tissue healing [3]. Conventional therapies for treatment of chronic ulcers may not be always effective, require strict medical care and may in some cases need surgical correction. Hence, method of promoting wound healing by application of an autologous platelet membrane is an interesting and upcoming safe, easy and inexpensive modality to treat chronic ulcers, with no danger of allergic reactions.

Further, cost involved in the long-term management of such ulcers is substantially high. Minimizing the duration of healing can be a major step in the rehabilitation of such patients.

Recent literature shows autologous platelet rich fibrin matrix (PRFM) being rich in growth factors is effective in the treatment[4,5].

Material and methods

In the present study, we included 24 patients 24 ulcers were included in the study.

Patients who have given written consent, of the age group 18-50 years, ulcer of duration of at least 6 weeks were included in the study. Patients with age of less than 18 years, history of bleeding tendency, anemia, and ulcer size of more than 5*5cm, uncontrolled diabetics, thrombocytopenia, and malignant ulcers were excluded from the study.

Procedure:

Ulcer size in terms of length, breadth and depth was measured. Primary infection if any was taken care using antibiotics and surgical debridement wherever necessary before starting the treatment. Under strict aseptic precautions, ten ml of venous blood was drawn and added to a sterile centrifugation tube devoid of anticoagulant. Centrifugation was done at 3000 rpm for ten minutes. Three layers were obtained following this: upper straw-coloured platelet poor plasma (PPP), red-coloured lower fraction containing red blood cells (RBCs) and the middle fraction containing the PRFM. The upper straw-coloured layer (PPP) was discarded. PRFM was separated from red corpuscles at the base using a sterile forceps and scissor, preserving a small RBC layer measuring around one mm in length, which was transferred onto sterile gauze. It was then applied on a healthy wound followed by application of a secondary non-absorbable dressing. Adequate rest was ensured during the treatment course.

The procedure was repeated every week up to a maximum of four sittings or as per requirement. At the beginning and every week, healing of the ulcer was assessed, area and volume were calculated and photographs were taken. Wound area was calculated using the formula for an ellipse: Length × width × 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 randomized controlled trials in wound healing literature [6]. Volume was calculated using the formula (length × width × 0.7854) × depth. [6] Final assessment of reduction in the size of the ulcer was determined in percentage.

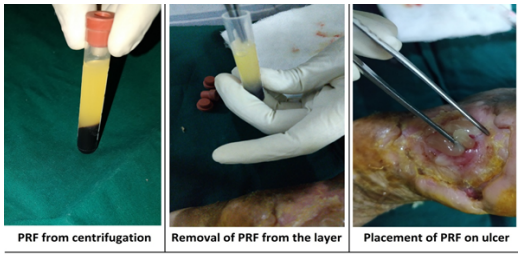


Fig.1 : Preparation of PRF and its placement

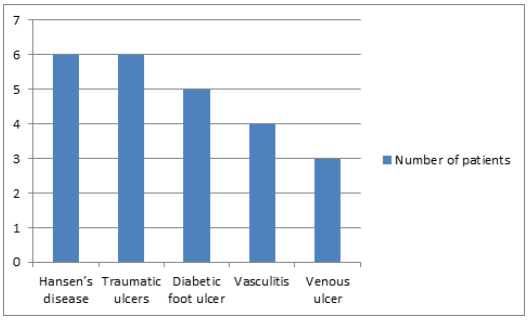
Results:

A total of 24 patients with 24 ulcers were included in the study.

According to the etiology, there were 6 patients (25%) of Hansen's disease, 5 patients (20.83%) of diabetic foot ulcer, 3 patients (12.5%) of venous ulcers, 4 patients (16.66%) of vascultis and 6 patients (25%) of traumatic ulcer.

Table 1: Distribution of patients according to etiology

Etiology	Number of patients
Hansen's disease	06
Traumatic ulcers	06
Diabetic foot ulcer	05
Vasculitis	04
Venous ulcer	03

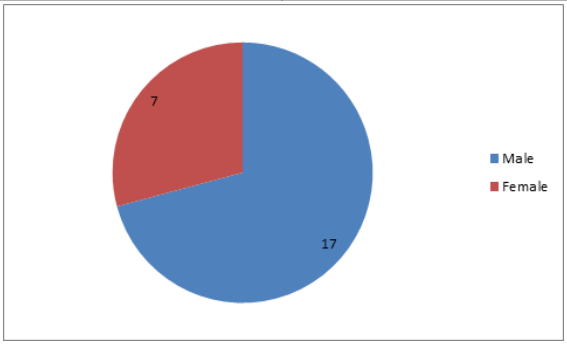


Graph 1: Distribution of patients according to etiology

Out of 24 patients, 17 were male and 7 were females.

Table 2: Distribution of patients according to gender

Gender	Number of patients
Male	17
Female	07

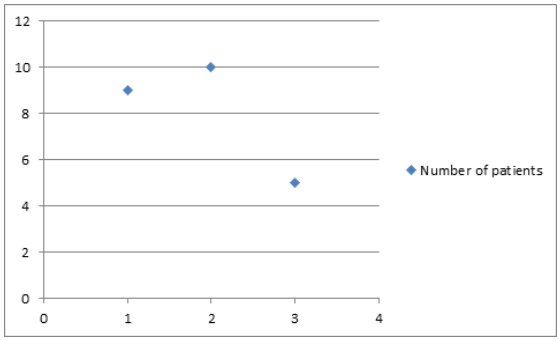


Graph 2: Distribution of patients according to gender

Out of the 24 patients, 9 were in the age group 18-30, 10 were in the age group 31-40 years and 5 were in the age group 41-50 years. The mean age was 34.03 years.

Table 3: Distribution of patients according to age group

Serial No.	Age Group	Number of patients
1	18-30	09
2	31-40	10
3	41-50	05



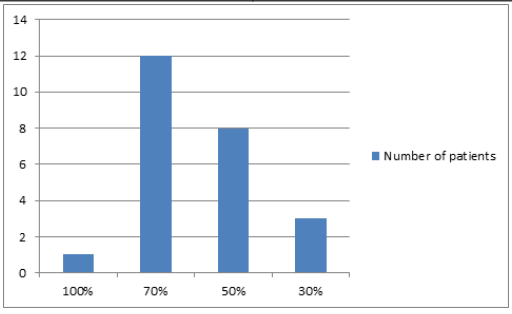
Graph 3: Distribution of patients according to age group

Following two sessions of PRF technique and two week follow up, 5 patients (20.83%) showed reduction in ulcer by 50%, 14 patients (58.33%) showed reduction by 30% and 5 (20.83%) showed response of 10%.

At the end of four sessions, 4 week follow-up, 1 patient (4.16%) showed reduction by 100%, 12 (50%) patients showed reduction in ulcer size by 70%, 8 (33.33%) showed reduction by 50% and 3 (12.5%) showed reduction by 30%.

Table 4: Showing reduction in ulcer size at end of four weeks

Reduction in size of ulcer	Number of patients
100%	01
70%	12
50%	08
30%	03



Graph 4: Showing reduction in ulcer size at end of four weeks

One patient who showed 100% reduction was of traumatic ulcer. Out of the 12 patients who showed reduction by 70%, 3 patients (25%) were of traumatic ulcer, 3 patients (25%) Hansen's disease, 3 patients (25%) of diabetic ulcer, 2 patients (16.66) of vasculitis and 1 patient (8.33%) of venous ulcer

Fig. 2: Reduction in vasculitic ulcer

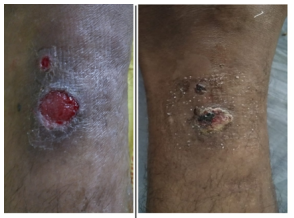
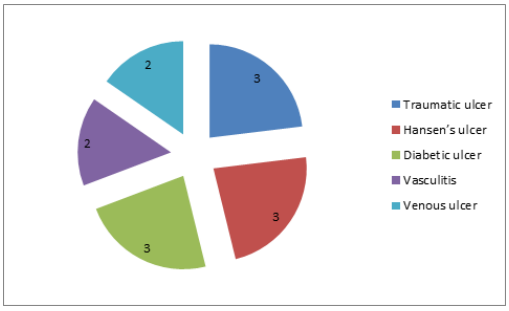


Fig.3 : Reduction in traumatic ulcer

Fig. 4: Reduction on size of diabetic ulcer

Table 5: Distribution of patients showing ulcer reduction by 70% according to etiology

Etiology	Number of patients
Traumatic ulcer	03
Hansen's ulcer	03
Diabetic ulcer	03
Vasculitis	02
Venous ulcer	02



Graph 5: Distribution of patients showing ulcer reduction by 70% according to etiology

Out of the 8 patients who showed reduction by 50%, 2 patients (25%) were of traumatic ulcer, 2 patients (25%) of Hansen's disease, 2 patients (25%) of vasculitis and 1 (12.5%) each of venous ulcer and diabetic ulcer.

Out of the 3 patients who showed reduction by less than 30% included 1 patient (33.33%) each of vasculitis, venous ulcer and diabetic ulcer.

Discussion:

PRF first described by Choukroun *et al*., is a new second generation of platelet concentrate. Simplified processing technique without any complex handling makes it superior to PRP. PRF can be used to promote wound healing, bone regeneration, graft stabilization, wound sealing, and hemostasis[7]. Study by Yazawa et al. which showed that, when incorporated into drug delivery systems such as fibrin, the mean concentration of growth factors in the platelet concentrates was three times or more than that observed with conventional platelet-rich plasma. Furthermore, the growth factors were released in a controlled manner over approximately 1 week[8]

In our study maximum patients belonged to the etiological group of traumatic ulcers and Hansen's disease (25%), followed by diabetic ulcers (20.83%), vasculitis (16.66%) and venous ulcer (12.5%). The best response was found out to be in patients with traumatic ulcers and Hansen's disease. 3 patients who did not have good clinical response belonged to the group of vasculitis, diabetes and venous ulcers.Following two sessions of PRF, few patients showed reduction in size of ulcer of about 50%, indicating more number of sessions was to be required.

Only one patient showed 100% reduction in ulcer size and most patients showed reduction in 70% indicating PRF to be a good, cost effective and a satisfactory therapeutic modality for non healing ulcers.

Conclusion:

PRFM is a safe, cost effective therapeutic modality available even in small setup hospitals without requirement of much skills. Despite the various etiological factors of chronic leg ulcers, it can be very well applied in any type of ulcer without any side-effect. However, determining the outcome of the ulcer is matter of question with multiple factors such as smoking etc. affecting the outcome.

A number of studies have been conducted to show the efficacy of PRF in chronic non healing ulcers. Most studies show that patients have complete clinical resolution at the end of studies at around 6 to 8 weeks. Our study shows that PRF does help in clinical resolution but it has more roles in augmenting the healing at the same time.

As seen in our study, similar result has been obtained in other studies. In a study by nagaraju et al., a complete closure of all ulcers was achieved in a maximum of 5 weeks[9].

In a study by Sarvajnamurthy *et al*. mean duration of the healing of the chronic venous ulcers using PRP was in 5.1 weeks.[10]

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