



Dermatology

EFFICACY OF AUTOLOGUS PLATELET RICH FIBRIN MATRIX IN CHRONIC NON-HEALING ULCERS

Dr. Sravani Garbham

Department of Dermatology, Venereology and Leprosy, Katuri Medical College and Hospital, Guntur, Andhra Pradesh, India.

Dr. B. Swetha

Department of Dermatology, Venereology and Leprosy, Katuri Medical College and Hospital, Guntur, Andhra Pradesh, India.

ABSTRACT Non-healing ulcers are a major health problem worldwide with great impact at personal, professional and social levels. Various treatments have been tried of which platelet rich plasma therapy (PRFM) has been a major breakthrough. In this study, chronic non-healing ulcers of various aetiologies have been treated with PRFM. Area and volume of ulcers were assessed at every week for a total period of 6 weeks. Significant improvement was noted in all types of ulcers, with diabetic ulcers showing minimal improvement. PRFM is a promising therapeutic option for chronic non-healing ulcers as it is simple, safe, effective and inexpensive, with no complications and can be performed as an outpatient procedure.

KEYWORDS : Non-healing Ulcers, Platelet Rich Fibrin Matrix, Area, Volume, Improvement

INTRODUCTION:

Non-healing ulcers are a major health problem worldwide with great impact at personal, professional and social levels. Various treatment options have been tried with no universal effectiveness. Platelet-rich fibrin matrix (PRFM) is one of the newer modalities and it contains various growth factors (GF's) which enhances the wound healing. PRFM has been a major breakthrough in the treatment of non-healing ulcers.

AIMS AND OBJECTIVES:

The objective of this study was to assess the efficacy of PRFM in various chronic non-healing ulcers.

Inclusion And Exclusion Criterion:

Chronic non-healing ulcers of more than six weeks duration of diverse aetiologies who presented to our outpatient department were included in the study.

Patients having history of bleeding disorders, anaemia and other haematological disorders, platelet count <1.5 Lakhs/ mm^3 , patients on anticoagulant medications and patients with active infection were excluded from the study.

MATERIALS AND METHODS:

Fifteen patients with chronic ulcers of various aetiologies and duration >6 weeks, with ulcer area of $1\text{cm} \times 1\text{cm}$ to $7\text{cm} \times 7\text{cm}$ were recruited into the study. Under strict aseptic conditions, ten to twenty millilitres of patient's blood were taken and centrifuged at 3000 rpm for 15 min (figure 1). 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 a sterile gauze. Middle membrane so obtained was compressed between two gauze pieces gently and applied on a healthy wound followed by application of a secondary non-absorbable dressing. The secondary dressing of the patient and the dried PRFM was removed from the wound bed after a minimum of five days. The same procedure was repeated every week for six weeks. The assessment of the ulcer size was done initially and every week for six weeks.

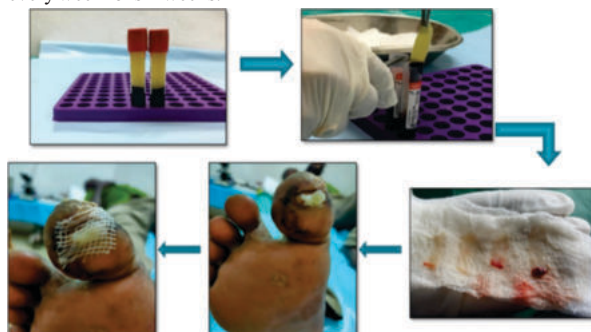


Figure 1: Picture depicting step by step procedure of Platelet Rich Fibrin Matrix

Measurements Documentation:

- The greatest length and the greatest breadth were measured using a scale. Wound area was calculated using the formula - Length \times width $\times 0.7854$.
- Volume was calculated using the formula (length \times width $\times 0.7854$) \times depth.
- Ulcer measurements and digital photographs were taken at the initiation of the treatment, and before repeating the treatment each time at weekly intervals and after the treatment was completed (the final measurement).

RESULTS:

The below picture depicts the data of the total ulcers taken under different categories (Figure 2).

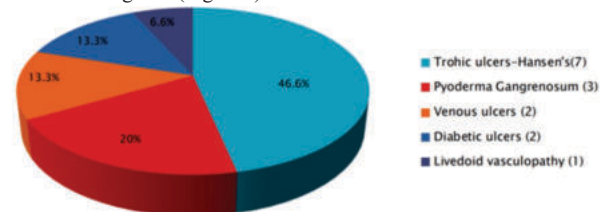


Figure 2: Pie diagram showing ulcers taken in different categories.

The mean percentage of improvement at the end of six sittings (Figure 3)

	Area	Volume
Trophic ulcer (Hansen's)	94.29%	96.13%
Pyoderma gangrenosum	92.7%	94.3%
Venous ulcers	84%	86.4%
Livedoid Vasculopathy	100%	100%
Diabetic Ulcers	62%	43%

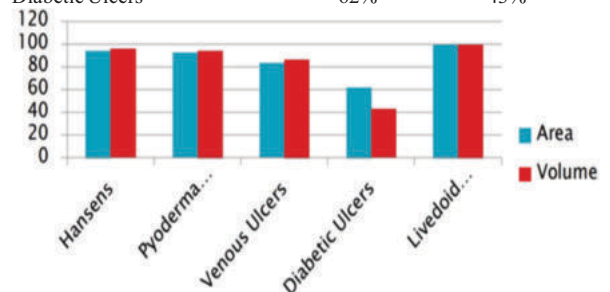


Figure 3: Mean percentage improvement

The data showing improvement in ulcers with each session is as follows.

Hansens Ulcers:

A total of seven ulcers of Hansen's were taken in the study, which constitutes of about 46.6% of the total ulcers. After six sittings, there was about 94.29% improvement in the area and 96.13% improvement in volume of the ulcers.

Table 1: Area and volume measurements of Hansens Ulcers

Case	Site	Measurements	Baseline	1 st Sitting	2 nd Sitting	3 rd Sitting	4 th Sitting	5 th Sitting	6 th Sitting
1	Heel of left foot	Area	11.78cm ²	9.48cm ²	7.83cm ²	4.97cm ²	2.58cm ²	1.37cm ²	0.58cm ²
		Volume	17.67cm ³	14.69cm ³	10.20cm ³	6.47cm ³	4.05cm ³	1.56cm ³	0.88cm ³
2	Lateral aspect of sole of right forefoot	Area	11.87cm ²	8.93cm ²	6.41cm ²	4.47cm ²	3.18cm ²	1.45cm ²	0.95cm ²
		Volume	5.93cm ³	4.63cm ³	3.71cm ³	2.69cm ³	1.37cm ³	0.95cm ³	0.47cm ³
3	Sole of right forefoot	Area	5.02cm ²	3.79cm ²	2.15cm ²	1.43cm ²	0.93cm ²	0.20cm ²	
		Volume	3.51cm ³	2.51cm ³	1.63cm ³	0.89cm ³	0.46cm ³	0.14cm ³	
4	Dorsum of left foot near ankle	Area	6.78cm ²	4.65cm ²	2.90cm ²	1.37cm ²	0.47cm ²		
		Volume	4.05cm ³	3.44cm ³	2.72cm ³	1.37cm ³	0.24cm ³		
5	Sole of left forefoot	Area	10.13cm ²	7.35cm ²	6.04cm ²	3.17cm ²	1.64cm ²	0.50cm ²	
		Volume	4.05cm ³	3.58cm ³	2.71cm ³	1.30cm ³	0.62cm ³	0.20cm ³	
6	Ball of right great toe	Area	3.25cm ²	2.49cm ²	1.94cm ²	1.41cm ²	0.13cm ²		
		Volume	1.30cm ³	0.87cm ³	0.51cm ³	0.25cm ³	0.05cm ³		
7	Heel of left foot	Area	8.35cm ²	7.69cm ²	6.27cm ²	4.49cm ²	2.91cm ²	1.26cm ²	0.66cm ²
		Volume	6.68cm ³	5.46cm ³	4.06cm ³	3.85cm ³	2.47cm ³	1.14cm ³	0.53cm ³

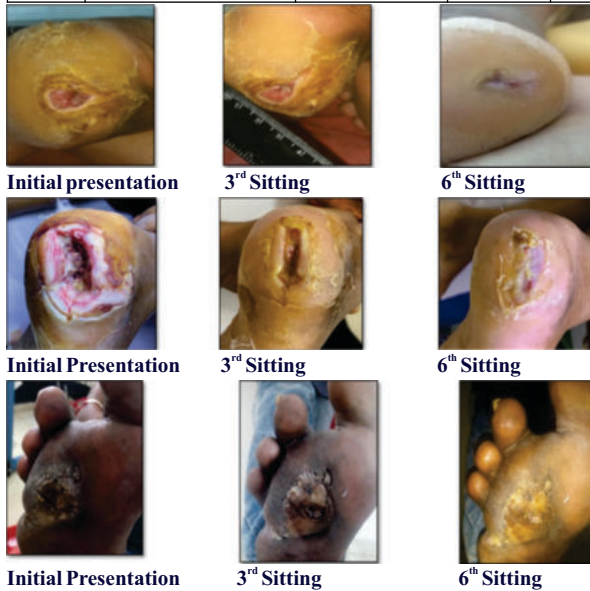


Table 3: Area and volume measurements of Diabetic ulcers

Case	Site	Measurement	Baseline	1 st Sitting	2 nd Sitting	3 rd Sitting	4 th Sitting	5 th Sitting	6 th Sitting
1	Dorsum of right foot	Area	16.27cm ²	14.4cm ²	12.36cm ²	11.18cm ²	10.18cm ²	9.59cm ²	8.78cm ²
		Volume	6.50cm ³	4.95cm ³	3.79cm ³	3.25cm ³	2.98cm ³	2.17cm ³	1.76cm ³
2	Left leg just above the ankle region	Area	6.56cm ²	5.42cm ²	4.97cm ²	4.01cm ²	3.75cm ²	2.81cm ²	2.69cm ²
		Volume	1.31cm ³	1.07cm ³	0.96cm ³	0.79cm ³	0.72cm ³	0.63cm ³	0.59cm ³



Pyoderma Gangrenosum:

Three ulcers of pyoderma gangrenosum were taken included in the study which showed an improvement of about 92.7% and 94.3% in the area and volume respectively.

Venous Ulcers:

Two venous ulcers were taken into the study and there was about 84% and 86.4% improvement in the area and volume of the ulcers respectively.

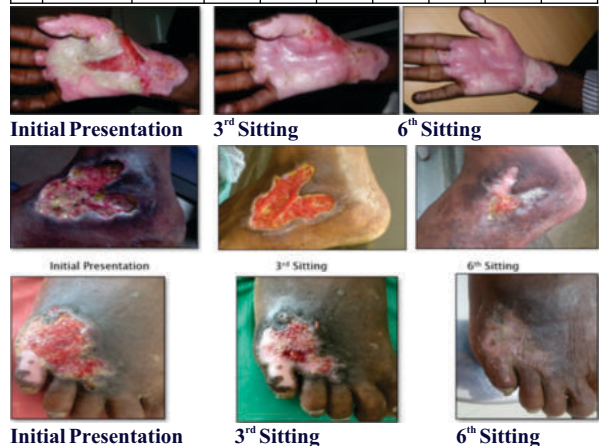
Table 2: Area and volume measurements of venous ulcers

Case	Site	Measurements	Baseline	1 st Sitting	2 nd Sitting	3 rd Sitting	4 th Sitting	5 th Sitting	6 th Sitting
1	Dorsum of right foot	Area	2.37cm ²	1.63cm ²	0.97cm ²	0.53cm ²	0.33cm ²		
		Volume	1.42cm ³	1.05cm ³	0.74cm ³	0.35cm ³	0.17cm ³		
2	Medial aspect of left leg	Area	16.33cm ²	13.90cm ²	10.47cm ²	8.07cm ²	6.96cm ²	4.47cm ²	2.90cm ²
		Volume	6.53cm ³	4.85cm ³	3.54cm ³	2.98cm ³	2.47cm ³	1.26cm ³	0.98cm ³



Table 4: Area and volume measurements of Pyoderma Gangrenosum

Case	Site	Measurements	Baseline	1 st Sitting	2 nd Sitting	3 rd Sitting	4 th Sitting	5 th Sitting	6 th Sitting
1	Right palmar region	Area	18.84cm ²	15.31cm ²	13.56cm ²	8.65cm ²	4.94cm ²	3.58cm ²	
		Volume	15.07cm ³	13.63cm ³	12.32cm ³	6.48cm ³	3.16cm ³	2.41cm ³	
2	Dorsum of right foot	Area	11.87cm ²	8.39cm ²	6.05cm ²	5.69cm ²	2.64cm ²	1.66cm ²	
		Volume	4.75cm ³	3.96cm ³	2.91cm ³	2.20cm ³	0.95cm ³	0.57cm ³	
3	Dorsum of left foot near lateral malleolus	Area	8.05cm ²	7.38cm ²	6.28cm ²	5.03cm ²	3.87cm ²	1.39cm ²	0.80cm ²
		Volume	2.41cm ³	1.92cm ³	1.63cm ³	1.05cm ³	0.75cm ³	0.31cm ³	0.19cm ³



Diabetic Ulcers:

Diabetic ulcers taken into the study showed overall least improvement which is about 62% and 43% in the area and volume respectively.

Livedoid Vasculopathy:

A single patient with ulcers of livedoid vasculopathy was taken into the study and treated with PRFM. The results were excellent in these ulcers showing 100% improvement in both area and volume.

Table 5: Area and volume measurements of livedoid vasculopathy

Case	Site	Measurements	Baseline	1 st Sitting	2 nd Sitting	3 rd Sitting	4 th Sitting	5 th Sitting	6 th Sitting
1	Dorsum of left foot and left lower leg	Area Volume	2.51c m ² 0.75c m ³	1.83c m ² 0.62c m ³	1.48c m ² 0.36c m ³	0.86c m ² 0.12c m ³	0.35c m ² 0.06c m ³		



Initial Presentation

3rd Sitting

6th Sitting

DISCUSSION:

PRFM is an autologous platelet and leucocyte-rich fibrin material and is an important advancement in regenerative medicine.⁽³⁾ It forms an organized network where the platelets and leucocytes are concentrated leading to the sustained release of various GFs, resulting in wound healing.⁽³⁾ It was first developed by Choukroun et al. in France for use in oral and maxillofacial surgery.⁽⁴⁾ They contain transforming growth factor (TGF), platelet-derived GF, vascular-endothelial GF, platelet derived epidermal GF, insulin-like GF-I and basic fibroblast GF which help in wound healing. These trigger biological effects including directed cell migration (i.e. chemotaxis), angiogenesis, cell proliferation and differentiation, which are key elements in the process of tissue repair and regeneration.⁽¹⁾ The mean concentration of growth factors in the PRFM was three times or more than that observed with conventional platelet-rich plasma (PRP). Furthermore, the growth factors were released in a controlled manner over approximately 1 week.⁽⁴⁾

CONCLUSION:

PRFM is a promising therapeutic option for chronic non-healing ulcers. It is simple, safe, effective and inexpensive, with no complications and can be performed as an outpatient procedure. This case study has demonstrated its potential efficacy in treating chronic non-healing ulcers of diverse etiologies.

REFERENCES:

- Suthar M, Gupta S, Bukhari S, Ponemone V. Treatment of chronic non-healing ulcers using autologous platelet rich plasma: a case series. *J Biomed Sci.* 2017;24(1):16.
- Platelet rich fibrin dressings in the treatment of non-healing trophic ulcers of leprosy. Keshavamurthy vinay, Gitesh sawatkar, Sunil dogra & Tarun narang; *Lepr Rev* (2018) 89, 158- 164
- Somani A, Rai R. Comparison of efficacy of autologous platelet-rich fibrin versus saline dressing in chronic venous leg ulcers: A randomised controlled trial. *J Cutan Aesthet Surg* 2017;10:8-12
- Nagaraju U, Sundar PK, Agarwal P, Raju BP, Kumar M. Autologous platelet-rich fibrin matrix in non-healing trophic ulcers in patients with Hansen's disease. *J Cutan Aesthet Surg* 2017;10:3-7