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# COMBINED USE OF NPWT WITH APRP IN TREATMENT OF CHRONIC WOUNDS: OUR EXPERIENCE

**Reddy CL, Chittoria RK*, Sireesha KR, Vinayak C, Aggarwal A, Gupta S, Padmalakshmi**

## ABSTRACT

Chronic wounds are a major cause of morbidity. They cause both time and financial burden on the patient and caregiver. Over the years, there has been drastic improvement in modalities used in treatment of chronic wounds. The recent treatment options include use of negative pressure wound therapy [NPWT], autologous platelet rich plasma [APRP]. None of the previous studies applied these in combination to treat chronic wounds. We would like to share our experience in the management of chronic wounds with combined NPWT and APRP therapy.

**Author Affiliations:**

Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Pondicherry, India-605006

**Keywords:** Chronic wound, wound bed preparation, Negative pressure wound therapy [NPWT], Autologous platelet rich plasma [APRP]

***Corresponding Author:**

**Dr Ravi Kumar Chittoria**
MS, MCh, DNB, MNAMS, PhD, MBA, PGDTM, PDCR, PGDMLS
Professor & Registrar (Academic)
Department of Plastic Surgery & Head of Telemedicine
JIPMER, Pondicherry, India.
Email – drchittoria@yahoo.com
Mobile- 9442285670

## INTRODUCTION

Chronic wounds are a major cause of morbidity. They cause both time and financial burden on the patient and caregiver. Over the years, there has been drastic improvement in modalities used in treatment of chronic

wounds. The recent treatment options include use of negative pressure wound therapy [NPWT], autologous platelet rich plasma [APRP][1-5]. None of the previous studies applied these in combination to treat chronic wounds.We would like to share our experience in the management of chronic wounds with combined NPWT and APRP therapy.

**Materials and Methods**

The study was conducted in a tertiary institute from February 2018 to June 2018 as a pilot study. The study was purely descriptive in nature and no statistical analysis was performed.

A total of 5 patients with chronic wound (Figure 1), were included after obtaining informed consents. The age of the patients varied from 35 to 60 years. Both males and females were included in the study. Patients with vascular insufficiency of the extremity were excluded after Doppler study. Initial debridement was done and NPWT and APRP therapy (Figure 2) were instituted.

NPWT was applied using foam and suction device connected at a continuous pressure of 125mm HG. (Figure 3)

APRP preparation was done in the Operation theatre while debridement/ dressing change of the patient using standard and validated technique described. 4.5 ml of whole blood was taken from peripheral vein with sterile precautions and 0.5 ml of 3.2% Sodium Citrate was added to make it 5 ml (blood: anticoagulant at 9:1). The centrifugation tube was placed in centrifugation apparatus. The solution was centrifuged at 3000 rpm for 10 minutes. Three portions were seen after first centrifugation. Upper portion containing plasma and platelets, middle portion containing White blood cells (WBCs) with some platelets (Buffy coat) and lower portion containing Red blood cells (RBCs). Middle and lower portions are discarded. Upper portion was transferred taken in a new tube for re-centrifugation at 4000 rpm for 10 minutes. Following which two portions were seen. Upper 2/3rd portion containing platelet poor plasma and lower 1/3rd portion containing platelet rich plasma & erythrocyte with platelet Clump. Lower 1/3rd portion was used for APRP therapy.

Multiple subcutaneous injections of 2-3ml of APRP were given in the selected wound following debridement or when the NPWT dressing was opened in wound margins and wound bed. On every dressing change Area

epithelized/ granulated was measured using digital planimetry. (Figure 4)

NPWT changed every 4days or if any leak was observed.

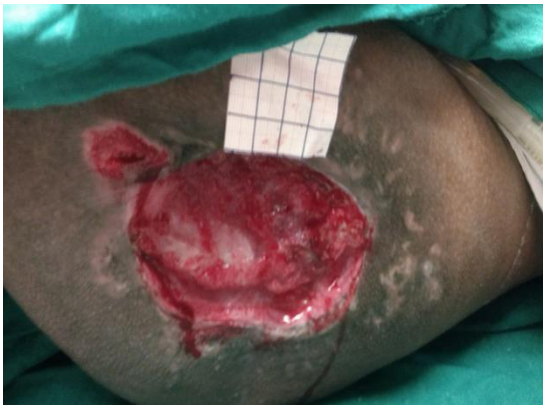

Figure 1: Pressure sore

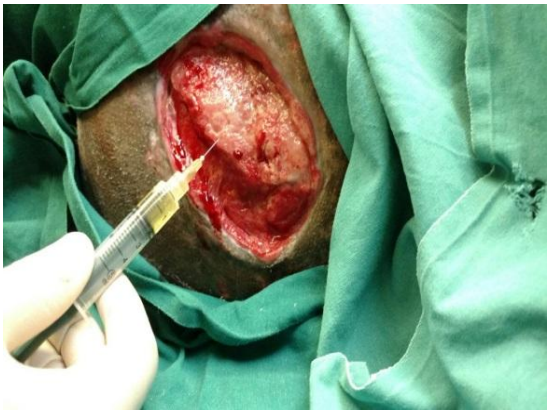

Figure 2: APRP injection

Figure 3: NPWT application

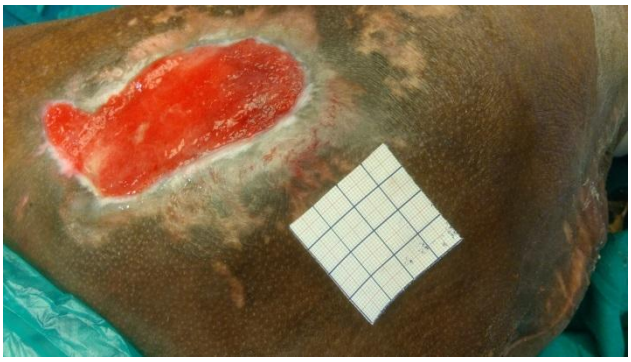

Figure 4: Wound status at 4 weeks of NPWT and APRP

**Results**

In this study we had 2 female patients and 3 male patients of which two patients had past history of diabetes mellitus. All patients had chronic wounds of various aetiology lasting more than 12 weeks. Wound at the end of 4 weeks (figure 4) showed significant reduction in raw area as measured by digital planimetry with healthy granulation tissue bed for Split skin graft. (Table 1)

| SL No. | Age | Sex | Comorbidities | Initial wound size | Wound size after treatment with NPWT and APRP at 4 weeks | Mode of ulcer formation | Number of setting of APRP and VAC |
|---|---|---|---|---|---|---|---|
| 1 | 58 | Male | Diabetes mellitus | 10x8cm | 3x 1 cm | post corn excision | 7 |
| 2 | 40 | Male | No comorbidities | 8x5cm | Healed | Pressure ulcer | 6 |
| 3 | 55 | Female | Diabetes mellitus | 15x 12cm | 5.5x4cm | Post trauma | 11 |
| 4 | 52 | Male | No comorbidities | 18x 10cm | 10x6cm | Post Fournier gangrene | 8 |
| 5 | 48 | Female | No comorbidities | 9 x 6cm | 4x 3cm | Pressure ulcer | 7 |

**Table 1: Patient details with wound etiology, size and reduction in wound area after treatment**

## DISCUSSION

Chronic wounds are due to arrest in one of the stages of wound healing. In our study we have noted from the patient that the size of the wound was almost constant for more than 2 weeks when they presented to the hospital.

So, to accelerate wound healing adjuvant methods of treatment NPWT and APRP were given. NPWT requires a device which is connected through a special set that generates a negative pressure over the wound bed. Various mechanisms that are thought to act both at tissue and cellular level include reduction of the edema, improvement of local blood flow , induction of angiogenesis and granulation, wound margin epithelialization, and facilitation of cell migration and proliferation[2].Macrostrain mechanisms of NPWT involve removal of exudates and infectious materials and contraction of wound margin. NPWT has been shown to be safe and effective in post debridement wounds. Hence NPWT was started, and size of the wound was measured at the time of change of dressing. By the end of 6 weeks there was a significant decrease in the size of the wounds and the wound was covered with healthy granulation tissue in 4 patients and one wound healed completely. One of the complications of

NPWT, excessive bleeding was not noted in our patients.

Sepúlveda et al[6] and Vaidhya et al[7] provided the average time to reach 90% or over 90% of wound granulation tissue formation in the NPWT group; both time periods were shorter than corresponding times in the control group.

Platelets act as regulators of inflammation, angiogenesis, cell migration, and proliferation with the release of various growth factors and anti-inflammatory cytokines which is thought to help in faster and better healing of the wounds. APRP has growth factors which when injected in the wound site or sprayed, act at the intracellular level to bring about cell proliferation and healing of a wound.

Pallua et al. reported that application of PRP for chronic wounds patients could accelerate re-epithelization[8]. In another study, subcutaneous injection of PRP in rabbit skin flap was found to promote arteriogenesis and increased flap survival[9].

Since we applied NPWT immediately at each setting it was prudent to inject the APRP rather than spray it.

In our experience it was noted that irrespective of the etiology of the wound and the comorbidities there was a visible decrease in the size of the wound, with formation of healthy granulation tissue.

## CONCLUSION

Based on our experience it may be concluded that the usage of NPWT and APRP as adjunctive therapies in management of chronic wounds may decrease the duration for healing of the wound, as it helps in the formation of healthy granulation tissue which may be covered with a split skin graft at appropriate time. However since ours is not a comparative study and also since the sample size is small, we cannot definitely conclude that NPWT and APRP will improve the time for healing.

**Conflict of Interest Statement-**

There is no conflict of interest.

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