

Negative Pressure Wound Therapy versus Conventional Wound Therapy in Large Wounds

Sandhya Nagaraj*, Ramesh Hosmani**, Ravi Shankar J C***

*Assistant Professor, Dept. of General Surgery, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India

**Associate Professor, Dept. of General Surgery, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India

***Resident, Dept. of General Surgery, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India

Abstract- Aim: To assess the feasibility and efficacy of Topical Negative Pressure (TNP) dressing using a locally constructed TNP device and comparing it with regular gauze dressings for large wounds.

Materials and Methods: 28 patients were recruited from the in patient ward, Dept of Surgery, KIMS, Hubli, Karnataka, India during the period of June 2014 to November 2014. Of the 28 patients 14 patients received TNP dressings, 14 patients were treated with regular saline dressings.

Results: The use of vacuum therapy in large wounds resulted in improved wound healing as evidenced by improved WBS, faster healing, shorter hospital stay and improved graft uptake compared to conventional dressing.

Conclusion: Topical Negative Pressure (TNP) dressing is a safe and economical method for treatment of large wounds.

Index Terms- Topical negative pressure dressing(TNP), Wound Healing, Vacuum assisted closure(VAC), Wound Bed Score(WBS)

I. INTRODUCTION

Acute and chronic wounds and are a major cause of morbidity and impaired quality of life. They affect at least 1% of the population and represent a significant risk factor for hospitalization, amputation, sepsis, and even death. The treatment of large wounds remains a significant challenge to practitioners, a cause of pain and discomfort to the patients, and costly (1,2,3).

Negative pressure wound dressing is a new technology that has been shown to accelerate granulation tissue growth and promote faster healing, thereby decreasing the period between debridement and definite surgical closure in large wounds. Vacuum-assisted wound closure (VAC) is a wound management technique that exposes wound bed to negative pressure and provides a moist wound-healing environment. This technique has been developed and popularized world-wide by Prof. Louis

Argenta(4) and Prof. Micheal Morykwas(5) from the USA and by Dr Win Flieschmann from Germany(6)

Wound and their management are fundamental to the practice of surgery. Dressings are applications for wounds to provide the ideal environment for wound healing. Many studies have been conducted comparing various dressing modalities for different types of wounds(7,8,9,10,11,12). In developing countries like India where the cost of dressing is a major concern, the locally constructed negative pressure dressings was an option.

II. AIM OF THE STUDY

To assess the feasibility and efficacy of Topical Negative Pressure (TNP) dressing using a locally constructed TNP device and comparing it with regular gauze dressings for large wounds.

III. MATERIALS AND METHODS

28 patients were recruited from the inpatient ward, Dept of Surgery, KIMS, Hubli, Karnataka, India. Of the 28 patients 14 patients received TNP dressings(Group 1), 14 patients were treated with regular saline dressings(Group 2). Wound etiologies included cellulitis/fasciitis, diabetic foot ulcers and others. In all cases underlying wound etiologies and co-morbidities were addressed and treated. All patients underwent debridement before involving into each group.

Inclusion criteria: Post-debridement wounds, Diabetic foot ulcers, Chronic ulcers, Pressure sores

Exclusion criteria: Fistulas to organs or body cavities, Gangrenous tissue with eschar, Osteomyelitis, Malignancy in the wound

Treatment of control group-Patients were treated with regular saline guaze dressings daily.



Figure 1:Conventional saline dressings

Treatment of experiment group

- **Materials needed**-locally available foam, ryles tube, adhesive plaster/Opsite, tubings, wall suction and guage.
- **Procedure**-Foam was autoclaved and was cut according to the shape of the wound. Ryles tube placed in between 2 layers of foam. Adhesive plaster applied around the

foam air-tight. Now the ryles tube is connected to the wall suction using tubings. Negative pressure is set to 125mmHg. Negative pressure is applied for 48hrs continuously, patient was taught to detach the tubing when ambulating. Dressing is opened after 48hrs.



Figure 2: Topical negative pressure dressing application

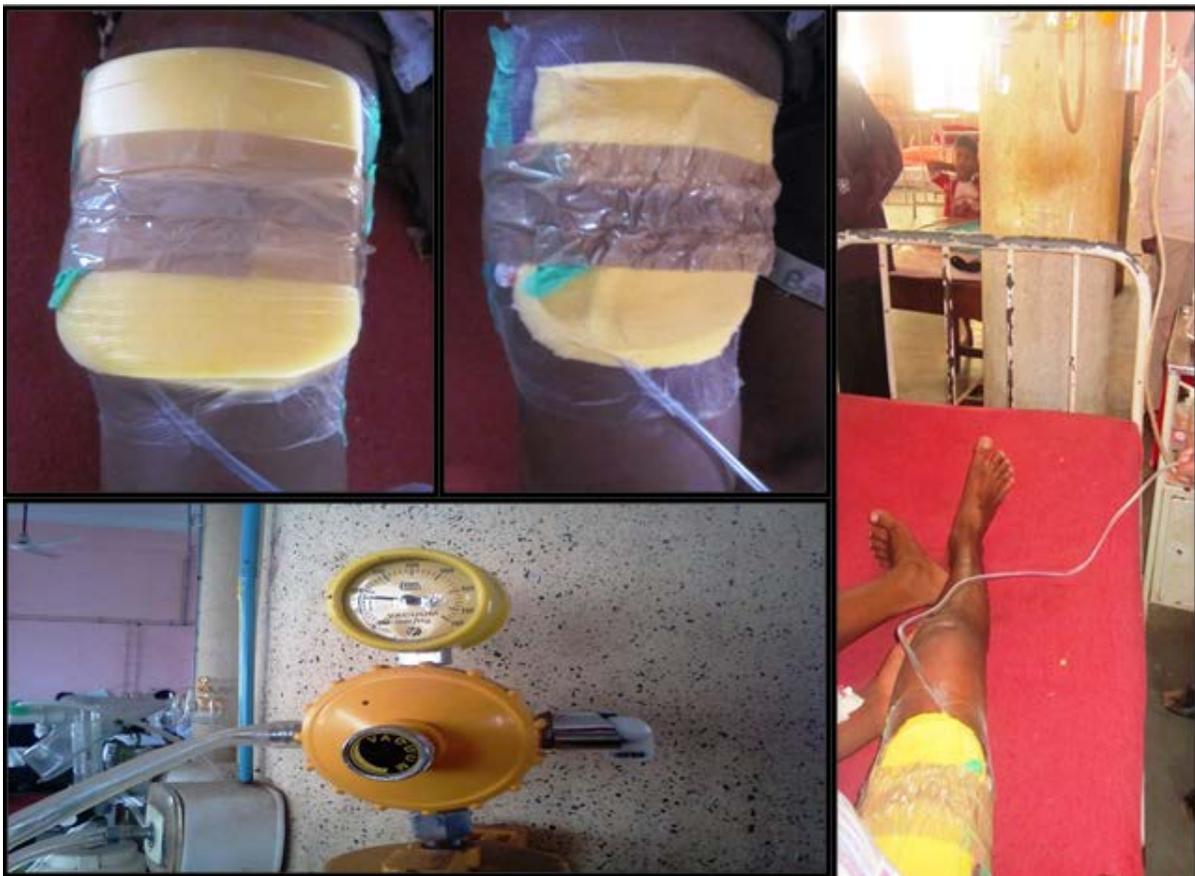


Figure 3: Topical negative pressure dressing after application

- **Assessment-** wound bed score, time taken for 90% granulation tissue, percentage of graft take, duration of hospital stay
- **Wound Bed Score(13)-** The scores are divided into 4 quartiles:4-9, 10 to 11, 12 and 13 to 16 ,with an increase in wound bed score from one unit to next unit there is a 22.8% increase in odds of healing. This

wound bed score will be useful in assessment as a predictor of initial healing and possibly for monitoring adequate response to treatment , with the expectation of achieving quartile increases in the wound bed time

Wound Bed Score (WBS)

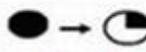
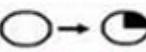
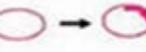
	Scores of 0	Scores of 1	Scores of 2
Black Eschar	 0	 1	 2
Eczema/Dermatitis	 0	 1	 2
Depth	 0	 1	 2
Scarring (fibrosis/callus)	 0	 1	 2
Color of wound bed	 0	 1	 2
Oedema/Swelling	 0	 1	 2
Resurfacing epithelium	 0	 1	 2
Exudate Amount	 0	 1	 2
Add scores for each column →			
TOTAL SCORE (Max=16)			



Figure 4: WBS 8-Before TNP dressing



Figure 5: WBS 15- After TNP dressing

IV. OBSERVATION AND RESULTS

Table 1: Demographic Data

	TNP Dressing	Conventional Dressing
NO. OF PATIENTS	14	14
AGE IN RANGE	29-75	23:75
GENDER RATIO (M:F)	13:1	12:2

Table 2: Etiology

	TNP Dressing	Conventional Dressing
DIABETIC FOOT ULCER	2	1
POST-CELLULITIS	11	12
TRAUMA	1	0
OTHERS	0	1

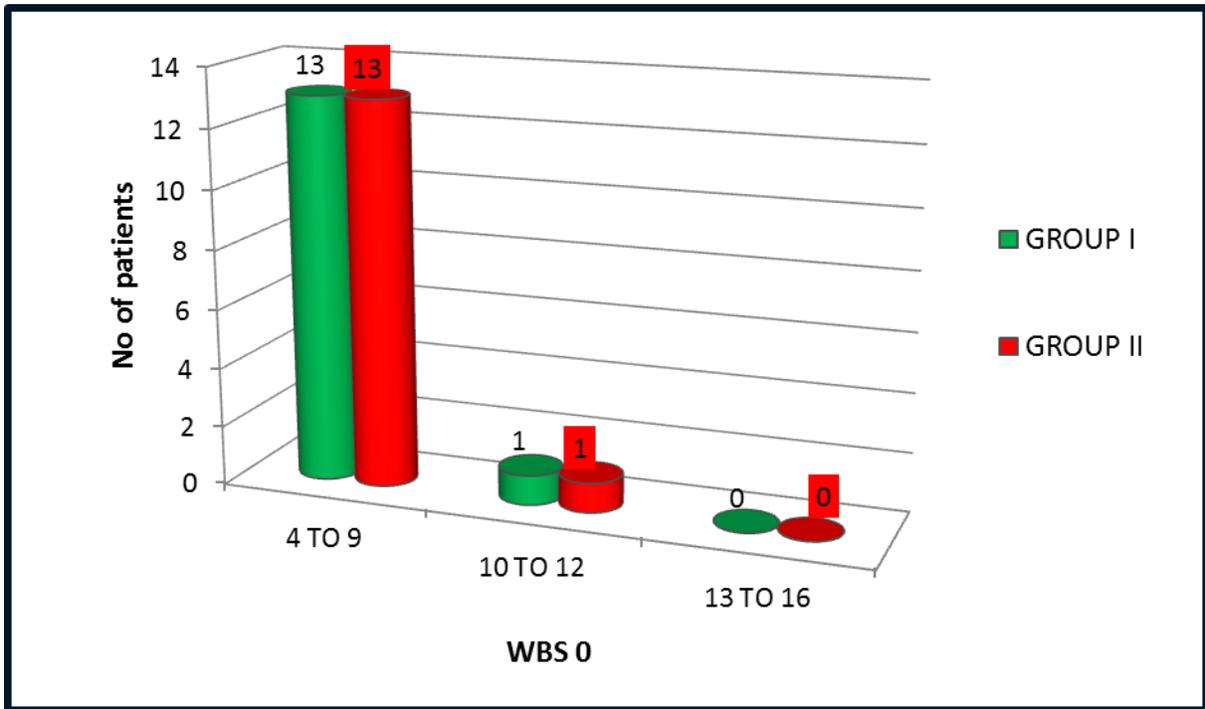


Figure 6: WBS on day 0

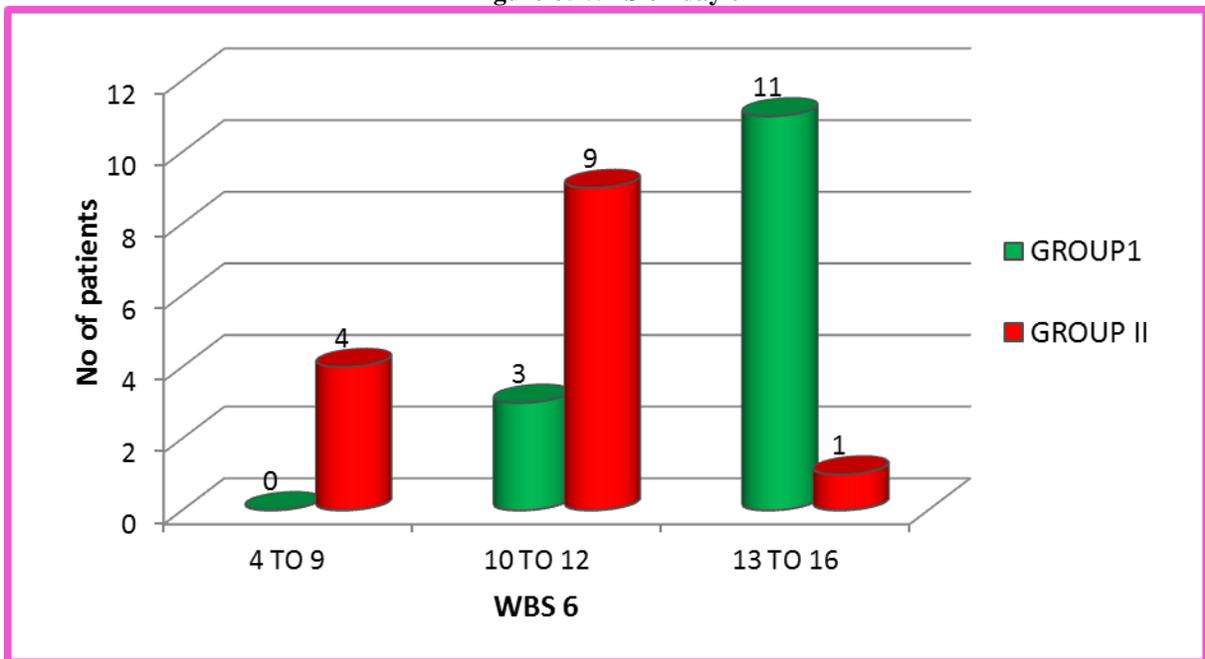


Figure 7: WBS on day 6

Table 3: Time taken for 90% granulation tissue

AVG TIME TAKEN FOR GRANULATION TISSUE	DAYS
TNP Dressing	13.71
Conventional Dressing	24.35

Table 4: Hospital Stay

	DAYS
TNP Dressing	28.21
Conventional Dressing	37.28

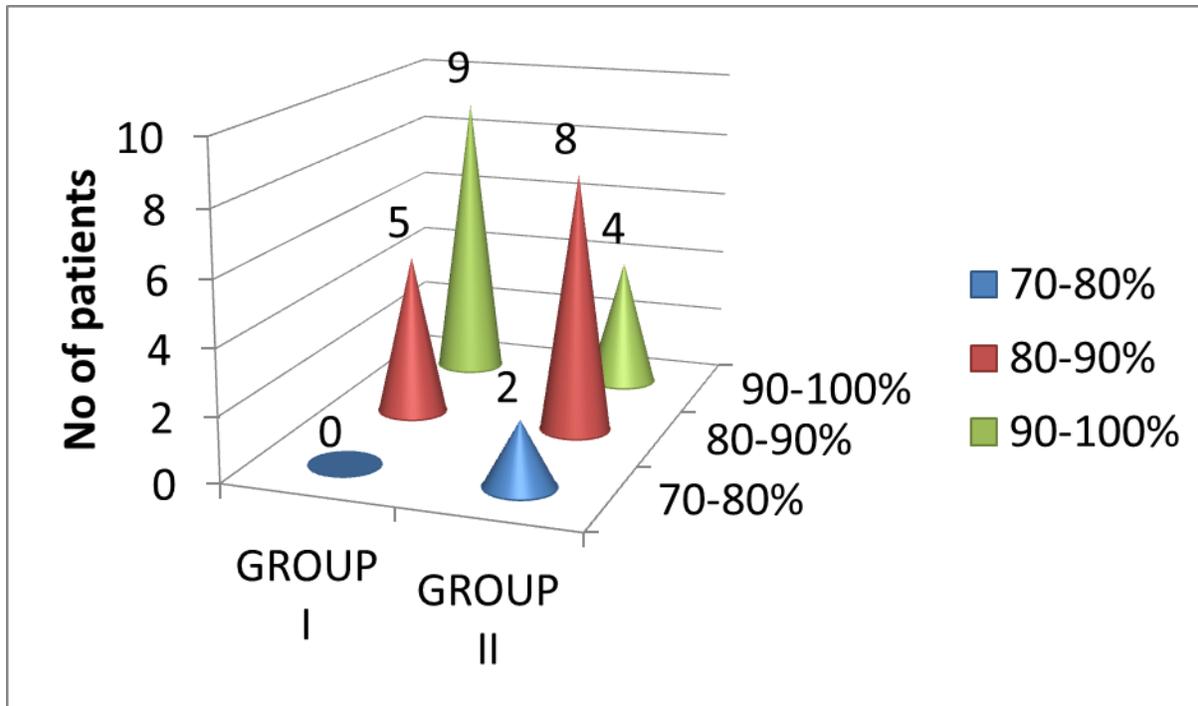


Figure 8: Percentage of graft take

V. DISCUSSION

In this study we demonstrated that the use of vacuum therapy in large wounds results in improved wound healing compared to conventional moist gauze therapy. This is reflected by on average healthier wound conditions i.e. improved WBS, faster healing, increased graft uptake. In our study we demonstrated improved wound healing in acute wounds following initial debridement. One of the important advantages of vacuum therapy is the fact that healthier wound conditions were achieved without intermediate debridements. In most of the conventionally treated patients, debridement was necessary to remove slough.

Mechanism of action that has attributed to TNP therapy are increase in blood flow, promotion of angiogenesis, reduction of wound surface area in certain types of wounds, modulation of the inhibitory contents in wound fluid, induction of cell proliferation(14).

Another major advantage of vacuum therapy is the reduction of the number of dressing changes to once every 48 h instead of daily dressings as in conventional therapy. The reduction of dressing changes leads to an improved patient compliance as the patient suffers less often pain and inconvenience. In our study we have used a locally constructed VAC device which is very economical to the patient owing more cost-effective than conventional dressing.

VI. CONCLUSION

We have found that even with locally constructed TNP device healthier wound conditions were observed compared with conventional therapy, with a faster wound healing. Together, with the fact that locally constructed topical negative pressure device uses inexpensive materials and are easily available and can be used in inpatients in most hospitals.



Figure 9: Large wound over leg: Before and after TNP dressing

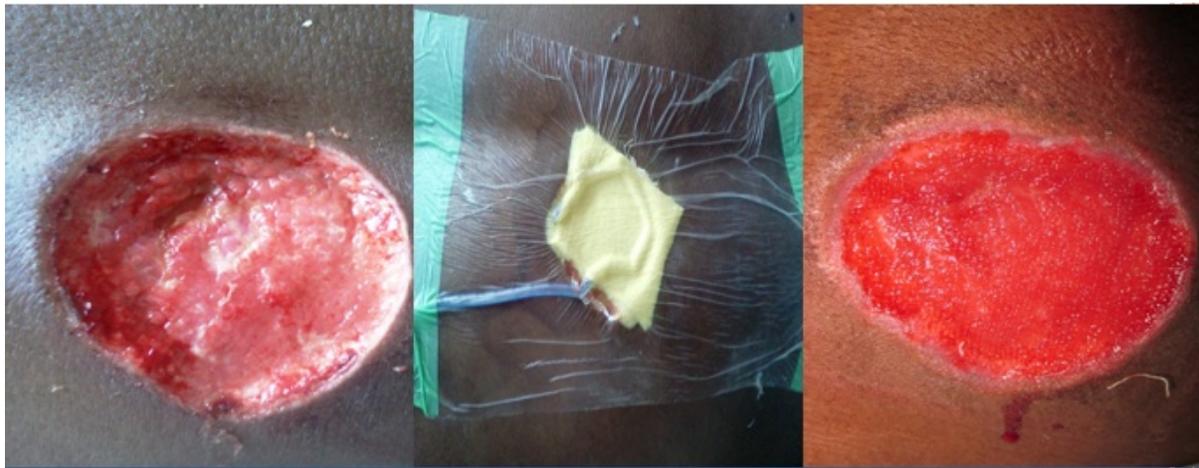


Figure 10: Wound over back: Before and after TNP dressing



Figure 11: Large wounds over foot: Before and after TNP dressing



Figure 12: Large wounds over leg and foot: Before and after TNP dressing

REFERENCES

- [1] Gregor S, Maegele M, Sauerland S, et al. Negative pressure wound therapy. A vacuum of evidence Arch Surg 2008;143:189-196.
- [2] Group Health Care-Clinical Review Criteria. Negative Pressure Wound Therapy(NPWT) Pumps
- [3] Sia SF and Fong EP. Modified vacuum assisted closure. JUMMEC 2006; 9(2): 24-27
- [4] Argenta LC, Morykwas MJ. Vacuum-assisted closure: a new method for wound control and treatment: clinical experience. Ann Plast Surg 1997;38:563-76.
- [5] Morykwas MJ, Argenta LC, Shelton-Brown EI, McGuirt W. Vacuum-assisted closure: a new method for wound control and treatment: animal studies and basic foundation. Ann Plast Surg 1997;38:553-62.
- [6] Trung D. Bui et al. Negative pressure wound therapy with off-the-shelf components. The American Journal of Surgery 192 (2006) 235–237.
- [7] C. M. Moues et al. Comparing conventional gauze therapy to vacuum-assisted closure wound therapy: A prospective randomised trial. Journal of Plastic, Reconstructive & Aesthetic Surgery 2007; 60(6): 672-81.
- [8] C. M. Moues et al. A review of topical negative pressure therapy in wound healing: sufficient evidence. The American Journal of Surgery 2011; 201:544-556.
- [9] Cengiz Tavusbay et al. the use of vacuum assisted closure system for management of difficult wounds. Biomedical Research 2013; 24(3): 329-336.
- [10] Ghulam Rasool et al. vacuum assisted wound closure and normal saline dressing in treatment of Gustilo type 2, type 3a, type 3b open fracture of tibia. Rawal medical Journal. Vol. 38. No. 4. October-December 2013.
- [11] Kushagra Sinha et al. Vacuum assisted closure therapy versus standard wound closure therapy for musculoskeletal injuries. Hindawi publishing company. Advances in orthopedics. Volume 2013. Article ID 245940.
- [12] Ketan Gupta et al. Comparison of vacuum assisted closure therapy with standard wound therapy for open musculoskeletal injuries. International journal of recent trends in science and technology, volume 9, issue 2, 2013. Pp 168-170
- [13] Vincent Falanga et al. Wound bed score and its correlation with healing of chronic wounds. Dermatologic Therapy, volume 19, issue 6, pages 383-390, November 2006
- [14] Dennis P. Orgill et al. The mechanism of action of vacuum assisted closure- More to learn, Surgery 2009; 146: 40-51.

AUTHORS

First Author- Sandhya Nagaraj, MBBS, MS, Assistant Professor, Department of General Surgery, Karnataka Institute of Medical Sciences, Hubli-580022, Karnataka, India, [email-sandhyanagaraj21@gmail.com](mailto:sandhyanagaraj21@gmail.com)

Second Author- Ramesh Hosmani, MBBS, MS, Associate Professor, Department of General Surgery, Karnataka Institute of Medical Sciences, Hubli-580022, Karnataka, India, email-drrameshosmani@gmail.com

Third Author- Ravi Shankar J C, MBBS, Resident in General Surgery, Department Of General Surgery, Karnataka Institute of Medical Sciences, Hubli-580022, Karnataka, India, [email-drravishankarjc89@gmail.com](mailto:dravishankarjc89@gmail.com)