

Negative Pressure Wound Therapy versus Conventional Wound Therapy in Pressure Sores

Dr. Vijay Krishan Agarwal¹, Dr. Dhanesh Kumar², Dr. Sandeep Kansal³, Dr. Chetna Khanna⁴

¹Professor PG Dept of Surgery Subharti Medical College, Meerut, India

²Asso.Professor PG Dept of Surgery Subharti Medical College, Meerut, India

³Associate Professor PG Dept of Surgery Subharti Medical College, Meerut, India

⁴Junior Resident II PG Dept of Surgery Subharti Medical College, Meerut, India

Abstract: ***Aim:** To assess the feasibility and efficacy of Topical Negative Pressure (TNP) dressing using TNP device and comparing it with regular gauze dressings for pressure sores. **Materials and Methods:** 50 patients were included in the study who attended OPD/IPD in departments of general surgery, plastic surgery, neurosurgery and orthopedics in SMC Meerut during the period September 2015-january 2017. Of these 25 patients received TNP dressings and 25 were treated with regular saline dressing. **Results:** The use of vacuum therapy in pressure sores resulted in improved wound healing as evidenced by improved WBS, faster healing, shorter hospital stay and improved flap uptake compared to conventional dressing. **Conclusion:** Topical Negative Pressure (TNP) dressing is a safe, economical, better and faster method for treatment of pressure sores from conventional dressing.*

Keywords: Topical negative pressure dressing(TNP), Vacuum assisted closure(VAC), Wound Bed Score(WBS)

1. Introduction

Pressure ulcer is commonly termed as bed-sore, decubitus ulcer or pressure sore and sometimes as pressure necrosis or ischemic ulcer. The term pressure ulcer was popularized by the Agency for Healthcare Research and Quality. Pressure ulcer has been defined as “an area of unrelieved pressure usually over a bony prominence leading to ischemia, cell death and tissue necrosis”. This definition has been further refined by the National Pressure Ulcer Advisory Panel (NPUAP) and European Pressure Ulcer Advisory Panel (EPUAP) as “localized injury to the skin and/or underlying tissue usually over a bony prominence as a result of pressure, or pressure in combination with shear and/or friction”.¹

According to the National Pressure Score Advisory Panel Consensus Development Conference (2007), pressure ulcers can be classified as:

Stage 1- Intact skin, but with non-blanching hyperemia

Stage 2- Partial thickness loss of skin, reaching the dermis, presenting as a shallow open ulcer, without slough.

Stage 3- Full thickness tissue loss, involving the subcutaneous layer without exposing tendon, bone, muscle. Slough may be present.

Stage 4- Full thickness tissue loss with exposed bone, tendon, and muscle. Slough and necrotic tissue may be present in some parts of wound bed often includes undermining and tunneling.²

Due to the effect of pressure, the ischemic degenerative changes occur at all the levels simultaneously affecting the skin, subcutaneous fat, muscle and fascia if any between the bony prominence and the pressure causing surface. . As pressure ulcers can arise in number of ways intervention for prevention and treatment have evolved over years. This may require changing the treatment modality for an effective

delivery of treatment selected for different individuals. Earlier the most common modality of treatment was conventional wound dressing. But recent studies have shown that application of a sub atmospheric pressure in controlled manner to the wound site has got an important role in assisting wound healing.

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 worldwide by Prof. Louis Argenta³ and Prof. Micheal Morykwas⁴ from the USA and by Dr Win Flieschmann from Germany⁵.

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^{6,7,8,9,10,11}. In developing countries like India where the cost of dressing is a major concern, the locally constructed negative pressure dressings was an option.

Aim of the Study

- 1) To assess the efficacy of topical negative pressure wound dressing as compared to conventional wound dressing
- 2) To prove that negative pressure wound dressing can be used as a much better treatment option in management of bed sores
- 3) To access whether NPWT would decrease morbidity and hospital stay.

- 4) To Compare Vacuum assisted closure with conventional dressing in:
- Reduction of surface area of the bed sore
 - Cost effectiveness and Duration

2. Materials and Methods

50 patients were included in the study who attended OPD/IPD in departments of general surgery, plastic surgery, neurosurgery and orthopedics in SMC Meerut during the period September 2015-january 2017. Of these 25 patients received TNP dressings and 25 were treated with regular saline dressing.

Inclusion criterion:

- Neuropathic ulcers

Exclusion criteria:

- Other co-morbid conditions
- Diabetes mellitus

Treatment of control group:

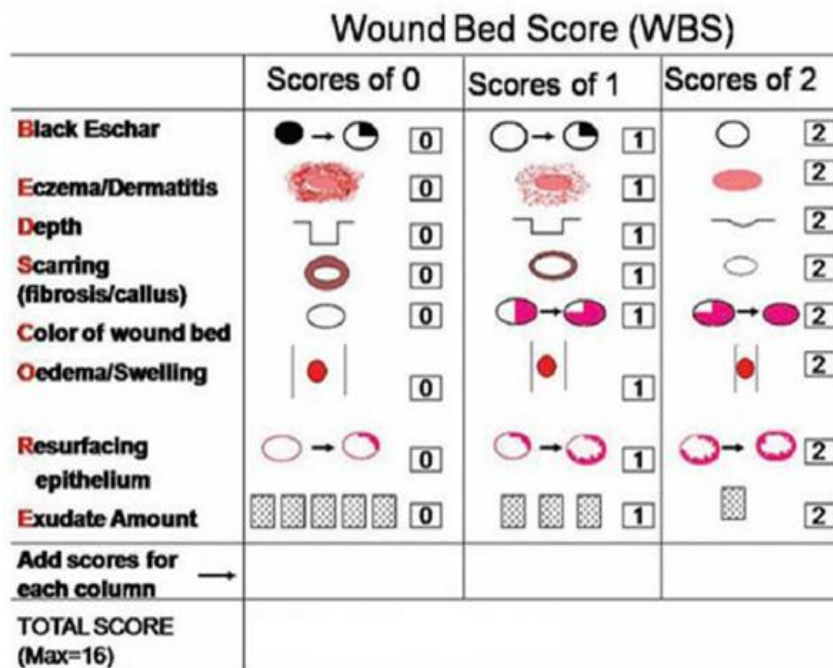
Patients were treated with regular saline gauze dressings daily.

Treatment of experiment group:

Materials needed- locally available foam, suction catheter, adhesive plaster/Opsite, tubings, wall suction and gauze.

Procedure- Foam was autoclaved and was cut according to the shape of the wound. Suction Catheter placed in between 2 layers of foam. Adhesive plaster applied around the foam airtight. Now the Suction Catheter is connected to the wall suction using tubing's. Negative pressure is set to 100 mmHg. Negative pressure is applied for 96 hrs continuously, patient was taught to detach the tubing when ambulating. Dressing is opened after 96 hrs.

- **Assessment-** wound bed score, time taken for 90% granulation tissue, duration of hospital stay
- **Wound Bed Score¹²-** 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.



3. Observation and Results

Table 1: Demographic Data

	TNP Dressing	Conventional Dressing
No. of Patients	25	25
Age In Range	29-75	23-75

	TNP Dressing	Conventional Dressing	P value
Gender Ratio (M:F)	22:3	21:4	.683

Table 2: Time Taken For 90% Granulation Tissue

Average Time Taken For Granulation Tissue	Days
TNP Dressing	13.71
Conventional Dressing	24.35

Table 3: Hospital Stay

	Days
TNP Dressing	25.5
Conventional Dressing	37.28

Table 4: Wound Bed Score on Day 0

Wound bed score	TPN	Conventional Dressing
4-9	21	21
10-11	4	3
12-13	0	1
14-16	0	0
P VALUE	.564	

Table 5: Wound Bed Score on Day 5

Wound bed score	TPN	Conventional Dressing
4-9	13	19
10-11	7	6
12-13	5	0
14-16	0	0
P VALUE	.045	

Table 6: Wound Bed Score on Day 10

Wound bed score	TPN	Conventional Dressing
4-9	4	15
10-11	5	6
12-13	11	3
14-16	5	1
P VALUE	.0033	

Table 7: Wound Bed Score on Day 15

Wound bed score	TPN	Conventional dressing
4-9	2	7
10-11	4	9
12-13	5	7
14-16	13	2
P VALUE	.0045	

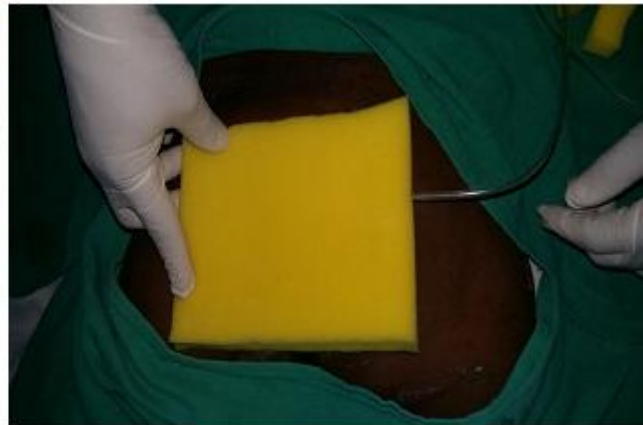


Figure 1: Vacuum Assisted Dressing



Figure 2: Normal Saline Dressing

4. Discussion

In this study we demonstrated that the use of vacuum therapy in pressure sores 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 flap coverage success. In our study we demonstrated improved wound healing in pressure sores 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 proliferation¹³.

Another major advantage of vacuum therapy is the reduction of the number of dressing changes to once every 96 hrs 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.

5. 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.

References

- [1] Consensus development conference statement. West Dundee, III: S N publications; 1989. [Last accessed on 2012 Jul 30]. National Pressure Ulcer Advisory Panel. Pressure Ulcers: Incidence, economics, risk assessment.
- [2] Pressure ulcers prevalence, cost and risk assessment: consensus development conference statement: The National Pressure Ulcer Advisory Panel. *Decubitus*. 1989; 2(2):24-8.
- [3] Argenta LC, Morykwas MJ. Vacuum-assisted closure: a new method for
- [4] 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] CengizTavusbay et al. the use of vacuum assisted closure system for management of difficult wounds. *Biomedical Research* 2013; 24(3): 329-336.
- [10] GhulamRasool 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] KushagraSinha 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.