



ANALYSIS OF INDIGENOUS NEGATIVE PRESSURE WOUND THERAPY IN THE MANAGEMENT OF NON-HEALING WOUNDS

General Surgery

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ABSTRACT

Negative Pressure Wound Therapy is a form of wound therapy where subatmospheric pressures aid by intermittent or continuous suction in healing by granulation while repulsing any exudate/pus/discharge to accumulate. Every dressing has three major components which include Absorbent foam, tubing system and an adhesive sheet. A typical dressing costs around Rs. 8000 to the patient. Intermittent negative pressure is required as it generates more blood flow during vacuum "off" phase. Studies have shown that rate of granulation tissue formation is twice with intermittent negative pressure as compared to continuous negative pressure.

KEYWORDS

Negative Pressure Wound Therapy, Vacuum Assisted Therapy, Non-healing wounds, Indigenous, Dressings

INTRODUCTION

A non-healing or complex wound is defined by most, as a wound that does not improve after four weeks or does not heal in eight weeks. These may include:

1. Diabetic Ulcers
2. Venous related Ulcers
3. Pressure sores
4. Non-healing surgical wounds
5. Traumatic dirty wounds

Because of a number of factors that include diabetes mellitus, presence of any metabolic disease, ageing population, obesity, etc., the incidence of complex wounds have increased rapidly.

Infection is the greatest risk from non-healing wounds. The bacteria which are usually present around us, do not pose a threat when we are healthy and wound free, but an open wound increases the risk for infection, which can even lead to loss of a limb.

Symptoms and signs that may help identify a complex wound include-

- Increasing pain
- Redness and warmth around the wound
- Oozing from the wound
- Offensive odour coming from the wound

Foam dressings used for Negative Pressure Wound Therapy are impressively effective dressings that allow an equal distribution of pressure across the wound, while reducing the risk of infection^[1].

By creating a controlled negative pressure condition, this type of wound therapy when used in combination with foam dressings, can-

- accelerate wound healing times
- reduce the risk of pathogenic infection by decreasing their metabolism to zero
- reduce the number of dressing changes
- increase the blood flow to the wound area while simultaneously drawing out excess fluids.

The first commercial Vacuum assisted closure dressing machine along with all its components was introduced to the world by KCI Mediscus^[2] and since its introduction in 1995 in the US and 1994 in Europe, VAC therapy has changed the way wounds are healed. More than 14 million wounds have been treated so far. The unique open pore structure of VAC® Granufoam® dressings actively promote healing at cellular level.

The interaction between the wound and Vacuum assisted closure Granufoam® dressings delivers the necessary mechanism of action (Macrostrain and Microstrain) critical for fast and effective wound healing.

Size of the pores are 400-600 micron that helps provide uniform

distribution of negative pressure at wound site.

There are mainly three main non-reusable components of NPWT:

Tubing system
Absorbent Foam
Adhesive Sheet

These three items are available as a pack for each dressing session and cost around 8000INR to 10000INR to the patient. Hence, not every patient is able to afford it which makes it necessary to find a method to provide the same to the patient at a much cheaper cost without compromising the efficacy and safety of the commercial method.

MATERIALS AND METHODS

All eligible cases admitted in Maharani Laxmi Bai Medical College, Jhansi from November 2018 to July 2020 who met the inclusion and exclusion criteria were taken up for the study.

After getting informed consent for the application of VAC, NPWT was applied on the patients in sessions, with each one lasting no longer than 48 hours.

The study was done on 100 patients.

Wound Bed Score system was used as an outcome measuring tool, that scores the following parameters:

	0	1	2
Healing edges	None	25-75%	>75%
Black eschar	>25% of wound area	0-25%	None
Greatest wound depth/granulation tissue	Severely depressed or raised	Moderate	Flushed with surrounding skin
Exudate	Severe	Moderate	Mild/none
Edema	Severe	Moderate	Mild/none
Periwound dermatitis	Severe	Moderate	Mild/none
Periwound fibrosis	Severe	Moderate	Mild/none
Pink wound bed	None	50-75%	>75%
Components of NPWT	Substituted by	Cost before substitution	Cost after substitution
Absorbent foam	Mattress foam	8000-10000INR/dressing	20 INR/sq. foot
Tubing system	Ryle's/ Suction catheter		30 INR/ piece
Adhesive sheet	Opsite		200 INR/piece
	Total	8000-10000INR/dressing	250 INR/dressing

Each parameter received a score from 0 (worst score) to 2 (best score), and all the parameter scores were added for a total score. Each wound could have a maximum score of 16 (the best score possible), to a minimum score of 0 (the worst score possible).

Other components of NPWT are Tubing system, Absorbent Foam and Adhesive sheet. The total of these three single-use consumables rounds up to 8000-1000INR for the patient for each dressing session.

So we had to replace them with readily available materials^[3].

Statistical Analysis

Descriptive statistical analysis was carried out to present the data in the study. Results on continuous measurements have been presented with Mean and standard deviation and results on categorical measurements have been presented in number and percentages.

Significance was assessed at 5% level of significance. Two-way Anova (two tailed, independent) was used to find the significance of study parameters on continuous scale between two groups.

The statistical software SPSS version 17.0 was used for the analysis of the data and Microsoft Word and Excel were used to generate graphs and tables.

RESULTS

Table 1 : Age Wise Distribution

Age groups	Frequency	Percent	Valid Percent	Cumulative Percent
0 to 20 yrs	4	4.0	4.0	4.0
21 to 40 yrs	23	23.0	23.0	27.0
41 to 60 yrs	47	47.0	47.0	74.0
>60 yrs	26	26.0	26.0	100.0
Total	100	100.0	100.0	

Table 2: Sex Wise Distribution

SEX	Frequency	Percent	Valid Percent	Cumulative Percent
Female	14	14.0	14.0	14.0
Male	86	86.0	86.0	100.0
Total	100	100.0	100.0	

Table 3: Occupations Of Patients

Occupation	Frequency	Percent	Valid Percent	Cumulative Percent
Farmer	52	52.0	52.0	52.0
Housewife	11	11.0	11.0	63.0
Labourer	22	22.0	22.0	85.0
Nurse	1	1.0	1.0	86.0
Shopkeeper	5	5.0	5.0	91.0
Student	8	8.0	8.0	99.0
Teacher	1	1.0	1.0	100.0
Total	100	100.0	100.0	

Table 4: Diabetes Status

Diabetic	Frequency	Percent	Valid Percent	Cumulative Percent
YES	23	23.0	23.0	23.0
NO	77	77.0	77.0	100.0
Total	100	100.0	100.0	

Table 5: Wound Bed Score

Wound Bed Score	N	Mean	Standard Deviation	Median
Before VAC	100	8.14	1.563	8
After VAC	100	11.11	1.072	11

Table 6: Treatment Received Following VAC

Treatment	N	Percent	Cumulative percent
Conservative	39	39%	39%
Split Thickness Skin Grafting	51	51%	90%
Flap Cover	6	6%	96%
Secondary Suturing	4	4%	100%

DISCUSSION

The most common etiology in our study turned out to be wounds caused due to Road Traffic Accidents (20%) followed by cellulitis (19%) and necrotizing fascitis (14%) and patients with raw areas due to

chronic wounds (14%).



Pre VAC picture

First VAC session application picture

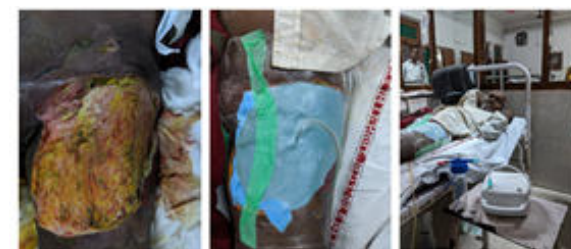


After 1st VAC session

Before 2nd VAC session

After 2nd VAC session

Definitive therapy in the form of split thickness skin grafting provided in the same hospital stay



Pre VAC picture

First VAC applied picture



Post 1st VAC session

Post 2nd VAC session

On applying the statistical tests, it was found that there was a significant correlation between the maximum wound size and the duration of hospital stay (calculated from the date of admission to the date of discharge of patient) which means that the larger the wound, the longer it takes even for VAC therapy to provide complete healing.

In our study it was found that there was positive correlation between duration of VAC applied and duration of hospital stay which means that the longer duration that VAC was applied to the patient, translated in longer hospital stay for the patient.

The indigenous VAC system is completely safe in terms of:

Foam related: No cases of foam reaction or partial foam collapse or foam sticking to the wound. Foam gets evenly soaked.

Tubing system related: Ryle's tube and Suction catheter remains patent and non-collapsed throughout the dressing cycle. No cases of tube migration or tube related injuries.

Adhesive sheet: Opsite is a readily available and stretchable and inexpensive component for VAC therapy. No cases of reaction to the opsite sheet.

Cannister related: No cases of ascending infections resulting in fever

or wound degradation were noted.

CONCLUSION

VAC therapy as an option for Non-Healing Wounds is readily accepted by the patients because of decreased frequency of, and decreased pain during, dressing changes. All the components of the commercial VAC system can be substituted by an Indigenous VAC system to provide commercial like effects of vacuum therapy to the patient at significantly lesser cost. Per dressing cost by Indigenous VAC therapy comes out to be INR 400 which is significantly less when compared to INR 8000-10000 when using the commercial VAC dressing. All this can be achieved while maintaining the same results as a commercial VAC system which translates into increased patient's compliance.

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