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Original Research Article

A clinical study of management of wounds using vacuum assisted dressings

Sanat Kumar Patra[1], Minati Mohapatra[2], Srikant Panda[3], Ashok Kumar Sarangi[4], K. Kiran Babu[5], Anshuman Sarangi[4]*

[1]Department of General Surgery, SCB Medical College and Hospital, Cuttack, Odisha, India
[2]Department of Physiology, Fakir Mohan Medical College and Hospital, Balasore, Odisha, India
[3]Department of Surgery, Bhima Bhoi Medical College and Hospital, Balangir, Odisha, India
[4]Department of Biotechnology, School of Biotech Sciences, Trident Academy of Creative Technology, Bhubaneswar, Odisha, India
[5]R-Biopharm Neugen Pvt Ltd, Hyderabad, Telangana, India

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***Correspondence:**
Dr. Anshuman Sarangi,
E-mail: anshumanbbsr2@gmail.com

ABSTRACT

Background: The application of controlled levels of negative pressure has been shown to accelerate debridement and promote healing in many different types of wounds. Vacuum assisted closure (VAC) has proved its efficacy for wound dressing leading to faster wound healing and shorter hospital stay. The aim of the study was to determine the advantage of vacuum assisted closure over conventional dressing in SCBMCH hospital.
Methods: The study was conducted at general surgery wards of SCB Medical College hospital. After debridement of the wound vacuum assisted dressing was applied. Control group was given conventional dressing.
Results: In the study sample 10% patients were less than 40 years, 76% belonged to 41-60 age group and 7% were more than 61 years of age, 60% male and 40% female. Wounds were located in the foot 27 (54%), leg 19 (38%), sole 2 (4%) and forearm 2 (4%). Patients with sterile pre (VAC), culture and sensitivity was not turning non sterile after VAC, but 90% non-sterile turns sterile after vacuum assisted dressing. In 5 days 25% of granulation tissue formed in VAC dressing whereas only 10% in case control. Similarly, in 10 days it was 40% for VAC and 25% in case of control. Finally, in 15 days it was 70% in case of VAC and 40% in case of control.
Conclusions: VAC results in better healing, with few serious complications, and a promising alternative for the management of various wounds.

Keywords: Wound healing, Wound dressing, Vacuum assisted closure, Negative pressure wound therapy

INTRODUCTION

Wound healing is a complex and dynamic process that includes an immediate sequence of cell migration leading to repair and closure. In most of the sstandard treatment includes debridement of necrotic tissue; dressings with enzymatic debridement compounds, hydrocolloid wound gels, infection control, local ulcer care, mechanical off-loading, management of blood glucose levels, education on foot care, hyperbaric oxygen therapy.[1] When wound fails to undergo this sequence of events, a chronic open wound without anatomical or functional integrity results. In such injuries, debridement of all nonviable tissue can produce significant soft-tissue defects precluding healing through primary closures, delayed primary closures, or secondary intention.

The application of controlled levels of negative pressure has been shown to accelerate debridement and promote healing in many different types of wounds.

The optimum level of negative pressure appears to be around 125 mmHg below ambient and there is evidence that this is most effective if applied in a cyclical fashion of five minutes on and two minutes off.[2] It is believed that the negative pressure assists with removal of interstitial fluid, decreasing localized edema and increasing blood flow. This in turn decreases tissue bacterial levels. Additionally, mechanical deformation of cells is thought to result in protein and matrix molecule synthesis, which increases the rate of cell proliferation.

Despite the significant costs involved, the technique is said to compare favorably in financial terms with conventional treatments in the management of difficult to heal wounds. The concept of applying sub atmospheric pressure to a wound bed was proposed more recently in 1993 by Fleischmann, who described a technique of porous polyvinyl alcohol foam wrapped around suction drains, which were introduced into a wound sealed with a polyurethane drape and attached to a suction apparatus at 600 mm Hg.[3] Negative pressure wound therapy (NPWT) is a technique for managing an open wound by exposing the wound to either continuous or intermittent sub-atmospheric pressure.[4]

Vacuum assisted closure has proved its efficacy for wound dressing leading to faster wound healing and shorter hospital stay. The aim of the study was to show the advantage of vacuum assisted closure over conventional dressing in SCBMCH hospital.

METHODS

The study was conducted at general surgery wards of SCB Medical College hospital. A total of 50 cases clinically presenting as ulcer between July 2018 and November 2019 were included in the study.

Period of study

A total of 50 cases clinically presenting as ulcer between July 2018 and November 2019 were included in the study.

Inclusion criteria

Patient more than 12 years of age. Patients presenting with ulcer.

Exclusion criteria

Patients less than 12 years of age. Malignant ulcers, osteomyelitis, ischemic ulcers. Patients with compromised vascular supply to the affected site. Active bleeding/undebrided wound. Abdominal wounds/acute wounds. Clinical examination of each case was done systematically as per the performa drafted for the study and case selection was done. After debridement of wound VAC dressing is applied. VAC is applied only after bleeding gets stopped. Pre VAC and amp; post VAC C and amp; S is taken. Dressing is given for 5 days. Control group was given conventional dressing. The outcome variables studied were i) number of days of hospital stay; ii) pus culture and sensitivity before and after vacuum assisted dressing; and iii) size of appearance of granulation tissue after 0, 5, 10, 15 days.

Type of study

It was a clinical study.

Ethical approval

The study was approved by the Institutional Ethics Committee.

RESULTS

In Table 1 the age and gender distribution of wounds are shown. 10% patients were less than 40 years, 76% belonged to 41-60 age group and 7% were more than 61 years of age. Gender distribution of the study was 60% male and 40% female.

Table 2 shows the distribution of location of wounds. Wounds were most commonly located in the foot 27 (54%), leg 19 (38%), sole 2 (4%) and forearm 2 (4%).

In Table 3 patients with sterile pre vacuum assisted dressing (VAC), culture and sensitivity was not turning non sterile after VAC, but 90% non-sterile turns sterile after vacuum assisted dressing. In Table 4 the percentage of granulation tissue formed in wound bed at 0, 5, 10, 15 days are shown.

In 5 days 25% of granulation tissue formed in VAC dressing whereas only 10% in case control. Similarly in 10 days it was 40% for VAC and 25% in case of control. Finally in 15 days it was 70% in case of VAC and 40% in case of control.

Table 1: Age distribution of wounds.

Parameters	Frequency	Percentage (%)
Age group (years)		
<40	5	10
41-60	38	76
>61	7	14
Gender		
Male	30	60
Female	20	40

Table 2: Distribution of location of wounds.

Location	Frequency	Percentage (%)
Foot	27	54
Leg	19	38
Sole	2	4
Forearm	2	2

Table 3: Pre-VAC versus post-VAC culture and sensitivity cross tabulation.

	POSTVAC		
	Sterile	**Non-sterile**	**Total**
Pre-VAC sterile	2	0	2
Non-sterile	21	2	23
Total	23	2	25

Table 4: Percentage of granulation tissue form in wound bed at 0, 5, 10, 15 days.

Days	% of granulation tissue formed in VAC dressing	% of granulation tissue formed in control group
0	0	0
5	25	10
10	40	25
15	70	40

Figure 1: Vacuum assisted dressing- creating a closed environment for negative pressure wound therapy.

DISCUSSION

Negative pressure to assist wound healing has a positive impact on wound healing by enhancing granulation tissue formation and wound closure, thus providing a modern wound care system for the poor at an affordable cost.[5] The present study involved 50 cases of wounds that fulfilled the inclusion criteria. Patients affected were most commonly in the age group of 41-60 years. There was a male preponderance with male: female ratio of 1.5:1 VAC dressing was done in wounds occurring in a variety of locations like foot, leg, sole and forearm. 90% of non-sterile pre-vac culture turned sterile after VAC (Vacuum-assisted closure). Compared to 28 days in control group the hospital stay decreased to 21 days for patients with VAC dressing.

Figure 2: Patient wound before and after vacuum assisted dressing.

Figure 3: Patient wound before and after vacuum assisted dressing.

Figure 4: Patient wound before and after vacuum assisted dressing.

There is less amputation rate and more SSG (split thickness skin graft), in VAC dressing patients compared to the control group. In our study sample, pre-VAC compared to post VAC culture and sensitivity, 90% nonsterile turns sterile after vacuum assisted dressing as

indicated in Table 3. Further another improved characteristic of VAC was proved by our observation that percentage of granulation tissue formed in wound bed at 5,10,15 days were significantly higher in vacuum assisted dressing compared to control. VAC has been advocated as novel method in healing of wounds by stimulating the chronic wound environment in such a way that it reduces bacterial burden and chronic interstitial wound fluid, increase vascularity and cytokine expression and to an extent mechanically exploiting the viscoelasticity of periwound tissues. The vacuum assisted dressing in the patient has been depicted in Figure 1 and the significant wound healing after vacuum assisted dressing has been shown in Figure 2-5.

Figure 5: Patient wound before and after vacuum assisted dressing.

Application of negative pressure over the wound bed allows the arterioles to dilate, increasing the effectiveness of local circulation, promoting angiogenesis, which assists in the proliferation of granulation tissue.[6] We observed that the patients on VAC therapy had the early appearance of granulation tissue as compared to the patients treated by moist saline gauze dressings. Armstrong and Lavery observed that the use of negative pressure therapy resulted in an increased rate of granulation tissue formation and a higher proportion of healed wounds compared to saline gauze dressings.[7] Colonization of a wound, corresponding to a level of >105 colonies of bacteria per gram of tissue, has been recognized as a detrimental factor in the process of wound healing. VAC therapy enhances bacterial clearance, which may account for the wound healing effects. From our study, it can be concluded that VAC is a promising new technology in the field of wound healing with multiple applications in a variety of wounds.[8] VAC therapy should be the modality of choice in management of wounds wherever it is feasible.

VAC Therapy provides sterile and controlled environment to large educating wound surfaces by controlled application of sub-atmospheric pressure.[10] It prepares wounds for closure via split thickness skin grafting or secondary closure in lesser time leading to less overall morbidity with decreased hospital stay.[11-15]

CONCLUSION

VAC therapy is a recent modality of treatment of wounds. Its introduction has changed the course of management of wounds. Based on the data from the present study and other studies available, VAC does appear to result in better healing, with few serious complications, and thus looks to be a promising alternative for the management of various wounds. The application of VAC is simple, but requires training to ensure appropriate and competent use. The cost of VAC will vary and depend on the length of hospital stay and cost of supplies. More rigorous studies with larger sample sizes assessing the use and cost effectiveness of VAC therapy on different wound types are required. Awareness about VAC and training on application of VAC dressings will allow its utilization more often.

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