

Original Research Article


# Role of vacuum assisted closure in wound healing among patients attending a tertiary care hospital

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## Abstract

**Background:** Vacuum assisted closure is procedure to aid in improved wound healing. This negative pressure wound therapy can be used in cases of both acute and chronic wounds.

**Objectives:** To find out pattern of wound healing while using vacuum assisted closure for healing chronic non healing ulcers.

**Materials and methods:** It was a prospective study conducted among patients admitted to the Department of General Surgery. Participant included had chronic non healing ulcer due to various etiologies. The study period was from October 2021 to December 2021. 50 participants were enrolled into the study. The data was compiled and analyzed using SPSS version 26.

**Results:** The wound healing was better after day 3. There was significant positive change in wound healing with P value of less than 0.05 over the follow up period. No other factor was found to influence wound healing.

**Conclusion:** Vacuum assisted closure would enhance wound healing among those suffering from chronic non-healing ulcer.

## Key words

Chronic ulcer, Non-healing ulcer, Vacuum assisted closure, Wound healing score, Negative pressure, Trauma, Diabetes mellitus.

## **Introduction**

With lot of researches going on in the field of wound management. The newer procedure of utilising vacuum to provide a better wound healing was called Vacuum assisted closure (VAC). Otherwise called the negative pressure wound therapy, here the wound dressing is done by applying a pressure below normal to the surface of the wound. The pressure was applied either continuously or intermittently. The pressure applied thus was ideally 125 mmHg. The negative pressure would be maintained throughout while the wound is healing. An apparatus would aid in the above process. The advantage of the application of negative pressure was that it could lead to enhanced blood flow and a decrease in edema. The above change means a wound environment with lesser infections. VAC is relatively cheap compared to many other wound management techniques [1].

VAC involves a simple technique. Initially, a foam dressing both sterile and porous will be placed directly on the wound. A sterile adhesive sheet will be placed over following the foam dressing and this would enable the creation of a closed area. To this closed area is connected a tube and at the farther end of the tube is the vacuum pump. The pump would ensure the presence of negative pressure inside the wound. This negative pressure varies between 50 to 125 mmHg. All the fluid and debris would be sucked and drained into collection chamber. The dressing has to be changed every 2 days [2, 3, 4].

Wound scoring system was the tool used for monitoring the wound progress [5]. The advantage of using the wound scoring system is its objective nature. A subjective variable if utilised would have led to lot of biases. The present study was conducted with the objective of finding out the pattern of wound healing while utilising Vacuum assisted closure in case of chronic non-healing wound ulcers. No similar study was conducted in the institute with similar objective before. The study would pave way for a newer modality for treating wounds in the future.

## **Materials and methods**

**Study design:** Prospective hospital-based study

**Study population:** Patients admitted to Department of Surgery, Kilpauk Medical College.

**Study participants:** Chronic non-healing ulcer patients admitted to Department of General Surgery.

**Study period:** October 2021 to December 2021

**Study tool:** Pretested semi structured proforma.

**Sample size:** 50 participants

**Sampling technique:** Convenient sampling.

**Inclusion criteria:** Post traumatic cases of infected open, Wounds presented to hospital during the study period, Postoperative infected wounds, Non-healing wounds, Delayed healing wounds.

**Exclusion criteria:** Chronic osteomyelitis, Malignancy, Raw area with exposed vessels, nerves and tendons, Patients not willing for VAC therapy.

### **Procedure:**

#### **Preparation of the wound:**

Dressings from the wound were removed. A swab culture was taken. Wound irrigated with normal saline. Surgical debridement was done and adequate haemostasis achieved.

#### **Foam placement:**

Foam dressing were taken and then cut with respective to the dimension of the wound and then placed inside the wound cavity. The wound was then sealed with an adhesive ensuring that the drapes cover the foam and tubing and at three centimetres of healthy skin.

#### **Negative pressure application:**

Vacuum pressure was used to apply negative pressure to the wound. The pump delivers continuous or intermittent pressures and the pressure ranged from 50 to 125 mm Hg. The foam dressing squeezes to the negative pressure. The pressure was continuously for the first 48 hours and then changed.

Wound scoring system was used as the outcome in order to accurately assess the wound healing.

### Statistical analysis

The data collected were entered into Microsoft excel 2019 and the master chart was created. The master chart was then loaded into SPSS version 23 for statistical analysis. Both quantitative and qualitative data were available in the data collected. Percentages were used for describing the data. To compare the median between the groups, Mann Whitney U test and Kruskal Wallis test were used. When the P value was less than 0.05, statistical significance was considered.

### Results

36% participants were in the age group 41 to 50 years and 34% were in the age group 51 to 60 years. 76% of the participants were males and 24% of the participants were females. 60% participants were having the wounds between 10 to 30 days and 38% were having it for less than 10 days. 40% of the participants had wounds in the back and 32% had wounds in the leg. 54% of the participants were smokers. 50% were traumatic wounds followed by 36% were diabetic and 14% were vascular (**Table - 1**). At day 3, 12% participants were having wound healing score of less than 3. The proportion decreased at day 7 to zero following VAC therapy (**Photo – 1**). The progression in wound healing was found to be statistically significant (**Table - 2**).

### Discussion

Delay in wound healing contributes significantly to the community health problem especially in old adults, this requires frequent visits to the hospital. With routine wound management, it takes days to months to heal the wound. Non healing of the wound over a period of time would considerably increase the social and financial burdens too. Vacuum-assisted closure (VAC) therapy is an alternative to the routine wound management, this uses negative pressure to optimise conditions and enhances wound healing and therefore few dressing changes [6]. Although

clinical results are promising, there is a gap between scientific evidence which is available and usage in clinical practice does not give a balanced view [3]. The healing of wound could be enhanced through the administration of negative pressure dressing. The optimal negative pressure of around 125 mmHg has to be applied to the wound. VAC is usually well tolerated and, has few contraindications or complications, will become a mainstay of wound care [7, 8].

**Figure - 1:** Vacuum assisted closure done in the study.



The delayed healing in diabetes is associated with change in leukocyte infiltration and IL-6 levels in fluid from wounds during the late inflammatory stage of wound healing [9]. In case of VAC dressing there is application of negative pressure which will drain the serous fluid from the wound more effectively. This effective drainage would aid in the formation of granulation tissue. The negative pressure is applied both continuously and intermittently for about 48 hours hastening the wound healing process. The above would produce a faster recovery while using VAC in comparison to traditional methods. The challenging wounds to take care would be of diabetic origin. Managing the wounds of diabetic origin had also been challenging in case of VAC therapy [10]. The fact to be taken into account while managing diabetic foot ulcers is the infection. Since VAC involves closed dressing there could be flare up of infection. Hence in case of diabetic foot ulcers

with associated infections, the initial management should be towards wound debridement along with control of the infections. The above followed by VAS therapy would have a better prognosis than the latter alone. On the

other hand, non-diabetic wounds; traumatic and vascular benefited from VAC therapy with faster healing in terms of granulation tissue formation. Infection was not a problem in spite of closed VAC dressing [11, 12].

**Table - 1:** Distribution of participants according to baseline characteristics.

Variables		Frequency	Percentage
Age (Years)	< 40	14	28
	41-50	18	36
	51-60	17	34
	>60	1	2
Sex	Male	38	76
	Female	12	24
Duration of wounds	< 10 days	19	38
	10 – 30 days	30	60
	>30 days	1	4
Location of wounds	Foot	5	10
	Abdomen	1	2
	Leg	16	32
	Ankle	4	8
	Back	20	40
	Sole	4	8
Smoking	Present	27	54
	Absent	23	46
Aetiology	Traumatic	25	50
	Diabetic	18	36
	Vascular	7	14
Wound area	<20 sq.cm	44	88
	21-40 sq.cm	4	8
	>40 sq.cm	2	4

**Table - 2:** Change in wound healing score over timeline.

Timeline	Wound healing scores						P value
	<3		3-5		>5		
	N	%	N	%	N	%	
Day 3	6	12	42	84	2	4	< 0.05
Day 7	0	0	29	58	12	24	
Day 10	0	0	6	12	4	8	

Traumatic wounds also included cases of iatrogenic wounds. The healing of traumatic wound was better when VAC was utilised than the remaining wound types. The other types of wounds included vascular wounds. The latter comprised of both ulcers due to peripheral

arterial disease and venous ulcers. Combining both VAC and limb elevation in case of venous ulcers proved more fruitful than VAC alone. The barriers for the administration of VAC were to maintain the negative pressure over the treatment period and maintaining the contact of foam with

the wound surface. Wound debridement and prevention of wound infection shall also be taken into account. Infection control should be given priority before starting on with VAC therapy. Past researches were doubtful regarding the decrease in bacterial count of the wound once VAC therapy was started. Cost of the procedure should also be given a thought. On the whole VAC could be a promising modality of dressing with enhancing wound healing property and faster recovery. It is also benefitting in various types of wound varieties [13, 14, 15].

### **Conclusion**

VAC, the negative pressure dressing would change the ways wounds are treated in the future. Though there were a lot of challenges the resulted wound healing was better with few or nil complications. Though it is a simple procedure appropriate training is essential. Increasing the awareness regarding VAC and appropriate training would be the need of the hour.

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