

## ORIGINAL RESEARCH

# Vacuum assisted closure (VAC) dressing in chronic non healing ulcer: An experimental study

<sup>1</sup>Dr. Musheer Ahmed, <sup>2</sup>Dr. Kanak Arora

<sup>1</sup>Senior Resident, Department of Orthopaedics, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Tamil Nadu, India

<sup>2</sup>Senior Resident, Department of Orthopaedics, ESIC Medical College and Hospital, Faridabad, Haryana, India

### Corresponding Author

Dr. Musheer Ahmed

Senior Resident, Department of Orthopaedics, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Tamil Nadu, India

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### ABSTRACT

Delayed wound healing particularly in difficult wounds and in elderly with co morbidities is a major concern. It leads to the pain, morbidity, prolonged treatment, and require major reconstructive surgery which imposes enormous social and financial burden. Vacuum-assisted closure (VAC) is an alternative method of wound management, which uses the negative pressure to prepare the wound for spontaneous healing or by lesser reconstructive options. Method of VAC application includes thorough debridement, adequate haemostasis and application of sterile foams dressing. A fenestrated tube is embedded in the foam and wound is sealed with adhesive tape to make it air tight. The fenestrate tube is connected to a vacuum pump with fluid collection container. The machine delivers continuous or intermittent suction, ranging from 50 to 125 mmHg. The VAC dressings are changed on 3rd day. Negative pressure therapy stabilizes the wound environment, reduces wound edema/bacterial load, improves tissue perfusion, and stimulates granulation tissue and angiogenesis. All this improves the possibility of primary closure of wounds and reduce the need for plastic procedures. VAC therapy appears to be a simple and more effective than conventional dressings for the management of difficult wound in terms of reduction in wound volume, depth, treatment duration and cost. **Objectives:** To study the Clinical, functional outcome of Vacuum-Assisted Closure (VAC) and its efficiency. **Methodology:** This study was conducted in Department of Orthopaedics, Navodaya Medical College Hospital and Research Centre, Raichur, From January 2021 to June 2021, a total of 50 patients were selected based upon chronic non healing wound and Cases and controls are selected from the same wards at different time period. Total 25 cases and 25 controls were selected and were randomized at the time of admission. **Results:** V.A.C dressing reduces Hospital stay and helps improve pus culture sterility. It improves outcome by decreasing the number of amputations and increases the number of patients undergoing skin grafting. **Interpretation and Conclusion:** Vacuum-Assisted Closure (VAC) is very effective in reducing the size of wound and facilitates wound healing.

**Key words:** Vacuum assisted closure (VAC)-Negative pressure wound therapy (NPWT)-Difficult wounds-Sub-atmospheric pressure dressing

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### INTRODUCTION

Delayed wound healing particularly in difficult wounds and in elderly with co morbidities is a major concern. It leads to the pain, morbidity, prolonged treatment, and require major reconstructive surgery which imposes enormous social and financial burden. Vacuum-assisted closure (VAC) can be used as an alternative to the conventional methods of wound management. Use of negative pressure optimizes the wound for spontaneous healing or by lesser reconstructive options. The vacuum-assisted closure is a non-pharmacologic/non-surgical means for

modulating wound healing; it was first proposed by Argenta and Morykwas in 1997.<sup>1,2</sup>

The application of vacuum reduces oedema, infection and increases local blood flow which promote healing.<sup>3</sup> It is used as an adjunct or alternate to surgery for wide range of wounds with an aim to decrease morbidity, cost, duration of hospitalization and increase patient comfort.<sup>4-5</sup>

### AIM OF STUDY

- To study the advantage of vacuum assisted closure over conventional dressing in the management of chronic non healing ulcers.

**MATERIALS AND METHODS****DESIGN**

Experimental study.

**SETTING**

Study was conducted in Department of Orthopaedics, Navodaya Medical College Hospital and Research Centre, Raichur,

**PERIOD OF STUDY**

6 months extending from January 2021 to June 2021.

**SAMPLE SIZE**

50 Case are selected from the Department of Orthopaedics, Navodaya Medical College Hospital and Research Centre, Raichur. Cases and controls are selected from the same wards at different time period. 25 cases and 25 controls were selected and randomized at the time of admission.

**INCLUSION CRITERIA**

1. Patients included in study are classified according to the grade of the ulcer (Wagner classification).
2. All grades are included except grade 0 and 5
3. Age between 13 and 70 years.
4. Diabetic ulcers
5. Traumatic ulcers.

**EXCLUSION CRITERIA**

1. Fistulas to organs or body cavities

2. Necrotic tissue in eschar.
3. Osteomyelitis (Untreated)
4. Exposed blood vessels
5. Gangrenous foot
6. Active bleeding and patients undergoing anticoagulant therapy.
7. Malignancy
8. Patients below 13 years and above 70 years.

**METHOD OF STUDY**

During the period of study cases and controls selected from the Department of Orthopaedics.

After debridement of the wound, VAC dressing is applied after the bleeding gets stopped. Pre-VAC and post VAC C & S is taken. Dressing is given for 72 hours and intermittent suction is given for ten minutes in an hour, daily for 12 hrs with a negative pressure ranging from 100 to 125 mm of mercury. Rest of the time drain of the VAC dressing connected to the Romo vac suction drain. X-ray taken to rule out osteomyelitis.

Control group patients are given with conventional dressings.

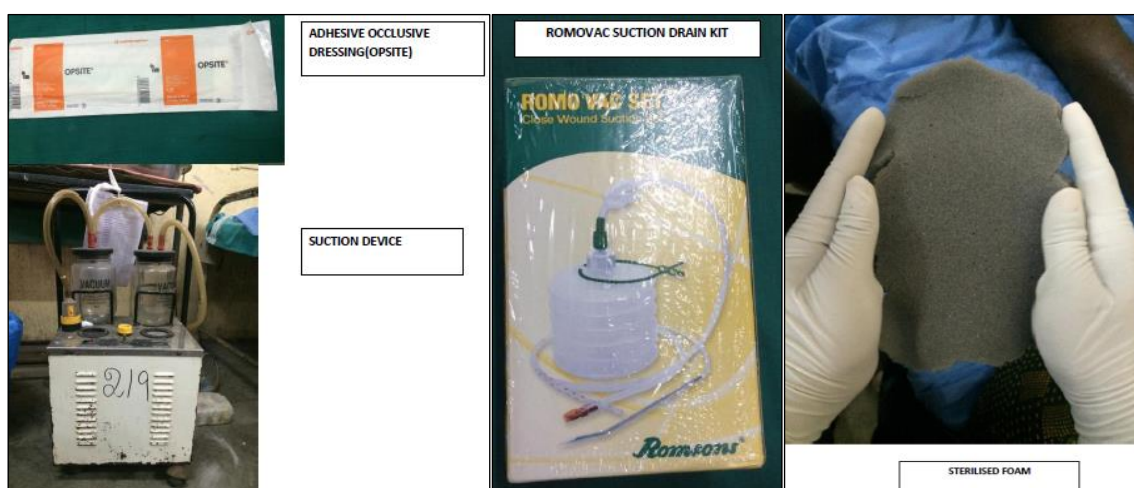
**OUTCOME VARIABLES**

Difference in

1. Rate of healing.
2. Hospital stay.
3. Pus C&S before & after V.A.C.

**MATERIALS USED FOR STUDY**

1. Transparent, sterile material (OP-SITE)
2. Transparent adhesive plaster
3. Sponge (pre-sterilized)
4. Suction drain with suction apparatus.

**SEQUENCE OF PROCEDURE**

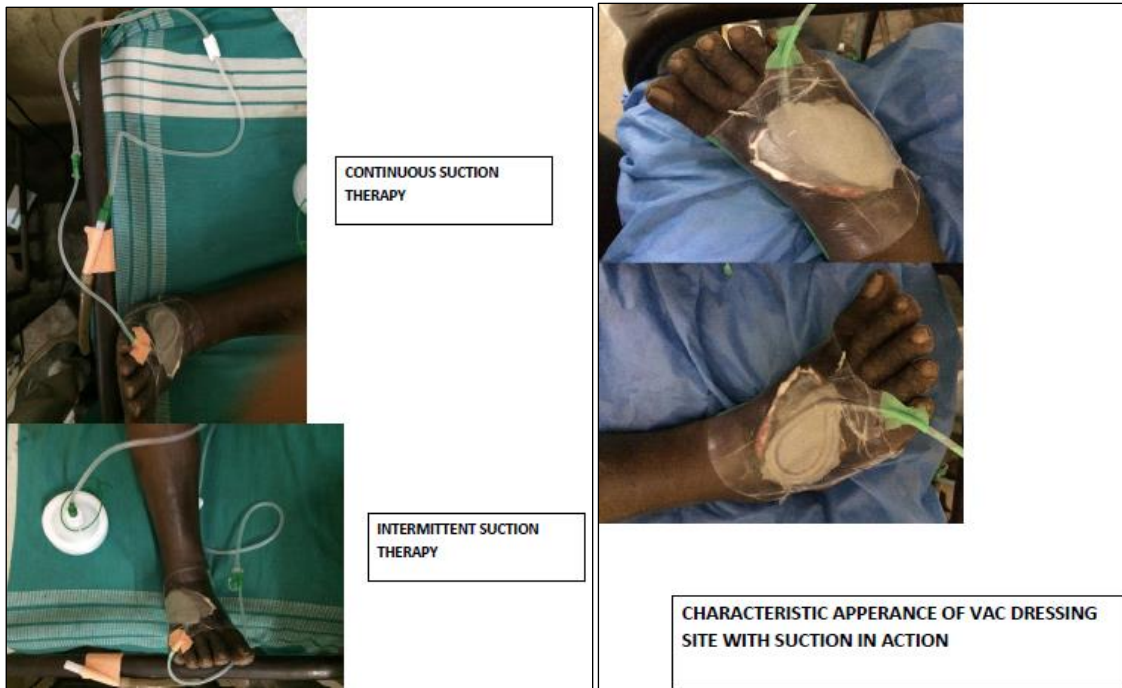
1. Wound preparation.
2. Placement of foam and drain.
3. Sealing with drapes.

**PROCEDURE**

Patient selected for VAC therapy undergoes wound debridement and haemostasis is achieved. Pre-VAC culture and X-ray to rule out active osteomyelitis taken. A piece of pre-sterilized foam (about one cm in thickness) is cut to the size of the wound and is placed on it. Then a perforated drainage tube (Romo vac

suction drain tube is used here) is put on it. Again, a piece of foam is placed on the underlying foam and tube. The whole foam with tube is covered with a sterile transparent dressing (opside). The tube is connected to a common suction apparatus with a pressure gradient. Suction is applied with a negative pressure of 100 to 125 mm of Hg for 10 minutes hourly for 12

consecutive hours. Rest of the time this drainage tube is disconnected to the Romo vac suction apparatus. Dressing changed after 72 hours and post VAC culture is taken. These cycles of dressings and vacuum are applied. Statistical assessment is done using outcome variables.





WOUND AFTER APPLICATION OF VAC THERAPY

**OBSERVATIONS AND DISCUSSION**  
**AGE AND SEX DITRIBUTION**

**Table 1. Gender distribution and its association with group**

Gender	Group		Total
	Control	Cases	
Male	18 72.00%	14 56.00%	32 64.00%
Female	7 28.00%	11 44.00%	18 36.00%
Total	25	25	50
Chi Square : 1.389; P> 0.05			

**Table 2. Gender distribution and its association with group**

Age	Group		Total
	Control	Cases	
<40 yrs	1 4.00%	2 8.00%	3 6.00%
40-49	4 16.00%	5 20.00%	9 18.00%
50-59	11 44.00%	8 32.00%	19 38.00%
Chi Square : 1.389; P> 0.05			
Age Not significant			

Female and Male distribution was almost equal in control and cases. 72% and 56% of the control and

cases population respectively were males where as 44% of the cases were females. The gender difference

between groups was not found to be statistically significant.

Age distribution was almost equal in control and case groups. Chi-square test shows no statistical significance as 'p' value is more than 0.05.

**DURATION OF HOSPITAL STAY**

**Table 3. Gender distribution and its association with group**

Duration of Hospital Stay (Days)	Group		Total
	Control	Cases	
7-14	1 4.00%	6 24.00%	7 14.00%
14-21	2 8.00%	7 28.00%	9 18.00%
21-28	10 40.00%	6 24.00%	16 32.00%
28-35	6 24.00%	5 20.00%	11 22.00%
>35 days	6 24.00%	1 4.00%	7 14.00%
Total	25	25	50

Chi square : 11.012; P<0.05

**COMPARISON OF MEAN AGE AND DURATION OF HOSPITAL STAY (DAYS) BETWEEN CASES AND CONTROLS**

Parameter	Group	Mean	± SD	t value	p value
Age (years)	Control	56.2	8.5147	0.159	>0.05
	Cases	55.8	9.2331		
Duration of Hospital Stay (Days)	Control	30.4	9.3897	3.131	<0.01
	Cases	22.2	9.1287		

Duration of hospital stay highly significant

Duration of hospital stay in days was found to be statistically significant between groups. Control population stayed more days in hospital than cases. Majority(52%) of the cases left hospital within three

weektime, whereas major chunk (88%)of control population stayed more than three weeks time. A study have similar result of faster healing rate and less hospital stay.<sup>7</sup>

**GRADE OF ULCER DISTRIBUTION**

Grade of Ulcer	Group		Total
	Control	Cases	
Grade 1	1 4.00%	2 8.00%	3 6.00%
Grade 2	10 40.00%	11 44.00%	21 42.00%
Grade 3	10 40.00%	8 32.00%	18 36.00%
Grade 4	4 16.00%	4 16.00%	8 16.00%
<b>Total</b>	<b>25</b>	<b>25</b>	<b>50</b>
Chi square : 0.603; P> 0.05			

Grade of the Ulcer distribution was almost equal in cases and control. Chisquaretest shows ‘P’ value is more than 0.05. which is statistically not significant.

**OUTCOME OF VAC DRESSING**

Outcome /Plan	Group		Total
	Control	Cases	
Discharge	19 76.00%	11 44.00%	30 60.00%
Split Skin Graft		12 48.00%	12 24.00%
Amputation	6 24.00%	2 8.00%	8 16.00%
<b>Total</b>	<b>25</b>	<b>25</b>	<b>50</b>
Chi Square : 16.133; P> 0.001			
<b>Very highly significant</b>			

Chi-square test shows study is significant as p-value is less than 0.001. So VAC dressing have better results in patients, VAC dressing produces more split

skin<sup>8</sup>grafts before discharge and less rate of amputation<sup>9</sup>.

**ANALYSIS OF CULTURE STERILITY**

Culture Sterility in cases	Group		Total
	Pre VAC	Post VAC	
<b>Sterile</b>	5 20.00%	23 92.00%	28 56.00%
<b>Non sterile</b>	20 80.00%	2 8.00%	22 44.00%
<b>Total</b>	25	25	50

Chi square : 26.299; P <0.001

Very highly significant

Chi-square test shows significant statistical association as p-value is less than 0.001. Patients with sterile pre-VAC cultures are not turning unsterile after VAC. But 90% unsterile turns sterile after VAC.<sup>10,11</sup>

### **THE BACTERIOLOGICAL AND CYTOLOGICAL ASSESSMENT OF VAC ON PURULENT WOUNDS**

by Davydov YA<sup>12</sup> has shown efficacy of VAC in turning pus C & S Sterile. Above described studies had shown the efficacy of VAC dressing over conventional dressing and its better outcome. More than this VAC dressing decreases hospital expenses, hospital waster, nursing care required.

### **CONCLUSION**

1. V.A.C dressing reduces Hospital stay.
2. V.A.C dressing helps improve pus culture sterility.
3. V.A.C dressing improves outcome by decreasing the number of amputations and increases the number of patients undergoing skin grafting.
4. V.A.C dressing has good outcome in patients with non-active osteomyelitis

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