Original Research Article

Gauze Suction Dressing, A Cost Effective Alternative to Standard Vaccum Assisted Closure Device for Treatment of Diabetic Foot Ulcers - A Prospective Cohort Study

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Abstract

Abstract: Hospital suction assisted VAC dressing, also known as vacuum assisted closure (VAC), is a therapeutic technique using a suction pump, tubing and a dressing to remove excess exudate and promote healing in acute or chronic wounds. This involves the controlled application of sub-atmospheric pressure to the local wound environment, using a sealed wound dressing connected to a suction unit in the beside of hospital.

Materials and Methods: A prospective, Observational cohort study was designed and approved by the Institutional Review Board. 81 patients (N = 45 in the GSUC arm and N = 36 in the VAC arm) were observed under this study, undertaken between September 2020 and May 2021.The study comprised patients with DM foot ulcers of maximum size 15cm. All patients who were eligible were offered the opportunity to participate in the study. Wound was assessed every 5 days, with a maximum of 3 dressings were done. The progress was recorded systematically and photographed after each dressing to assess the shrinkage in size. Time taken to apply dressing, pain levels, failure of treatment and the overall cost incurred during the treatment was noted and analysed. **Results:** Low income countries are having number of issues in public health. The use of Hospital suction unit assisted VAC in the Indian studies has not been reported much. Only few Indian studies have provided ideas into the hospital suction unit assisted VAC dressing use in Indian settings. The hospital suction unit assisted VAC dressing is definitely having an advantage in countries like India, where the patient load on the health centers is high. In countries like India, where more % of the population earns less than one US dollar per day and where only a small portion of government budget goes to health there is an urgent need of faster and cheaper wound healing techniques.**Conclusion:** The VAC will also reduce the total time spent in the hospital and this is ideal for already overloaded hospitals and reduced the daily dressing pain suffering of the patient and it is much cheaper than the negative pressure wound therapy (NPWT) dressing. Besides, the number of follow-ups will also be reduced in cases involving the VAC. But the situation in the rural areas is graver. As, the VAC is not available everywhere in the developing countries and the usage of VAC in the rural areas is very difficult due to difficulties related to terrain, availability of devices, cost issues, etc. Thus the use of such cost effective suction unit for wound management which can be used in rural areas of developing countries is essential.

Keywords: vacuum assisted closure (VAC), negative pressure wound therapy (NPWT), GSUC, terrain.

Introduction

A wound is defined as damage or disruption to the normal anatomical structure and function. Wound healing remains a challenging clinical problem and correct, efficient wound management is essential. The primary aim of the practicing clinicians is to achieve a high rate of success in the wound healing. In the countries like india, where the chances of wound infection are high due to multiple issues, the importance of novel techniques of wound care are essential[1-3]. The scientific community has always looked for a new and more effective wound care techniques. Particularly with an emphasis on new therapeutic approaches and the development of technologies for acute and chronic wound management[4].The relatively newer techniques like hospital suction unit assisted VAC dressing using the vacuum are very promising and are also useful in the management of difficult to heal wounds[5]In this short review, we highlight the importance of the hospital suction unit assisted VAC dressing in the successful wound healing with the real benefit of patient. We will also discuss the importance of this technique in a developing country like india. The practice of exposing a wound to sub-atmospheric pressure is relatively new and was first described by Fleischmann et al. in the year 1993, who first reported the use of sub-atmospheric pressure for an extended period to promote debridement and healing following the successful use of this technique in 15 patients with open fractures. Their study reported that the treatment method of reducing the pressure inside the wound was very effective[6]. However, the first reports about the use of negative pressure wound device came from Argenta and Moryk was in the year 1997. The use of controlled levels of negative pressure application has been shown to accelerate debridement and promote healing in various types of wounds. This optimum level of negative

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pressure appears to be around 125 mml lg 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. Earlier studies used more conventional methods such as a wall suction apparatus or surgical vacuum bottles for creating the negative pressure. However, there were multiple problems present in the use of these conventional methods[7]. In the year 1995, a commercial system for promoting vacuum assisted closure (VAC) also known as vacuum therapy, vacuum sealing or topical negative pressure therapy, was introduced into the United States market. This equipment, called the VAC, was designed to overcome some of the problems associated with conventional methods for the creation of negative pressure. The heart of the system is a microprocessor-controlled. Cuum unit that capable of providing controlled levels of continuous or intermittent sub atmospheric pressure ranging from 25 to 200 mmil lg later on a number of improvements were made to this basic model of VAC.

Materials and Methods

A prospective, Observational cohort study was designed and approved by the Institutional Review Board.

Participants: Patients with diabetic foot ulcers admitted from the General Surgery outpatient department at Saveetha Medical College, Chennai.

81 patients (N = 45 in the GSUC arm and N = 36 in the VAC arm) were observed under this study, undertaken between September 2020 and May 2021.The study comprised patients with DM foot ulcers of maximum size 15cm. All patients who were eligible were offered the opportunity to participate in the study. Wound was assessed every 5 days, with a maximum of 3 dressings were done. The progress was recorded systematically and photographed after each dressing to assess the shrinkage in size. Time taken to apply dressing, pain levels, failure of treatment and the overall cost incurred during the treatment was noted and analysed.

Interventions: In the VAC arm, black sponge was applied to the wounds and sealed with an occlusive plastic cover; continuous suction at 75 to 125 mm Hg was initiated and the dressing was changed every 5days. In the GSUC arm, a gauze dressing moistened with 0.9% normal saline was applied to the wounds, a red rubber catheter was placed in the center of the dressing, and the dressing was then sealed with an occlusive cover. Continuous wall suction at 75 to80 mm Hg was applied and the dressings were changed every 5 days.

Failure of Intervention

Failure of SAWT occurred in either of 2 situations: (1) Adressing could not be maintained because of persistent fluid or suction leaks. If, after 2 attempts in a 24-hour period to reinforce the dressing, the seal could not be maintained, that patient was considered to have failed SAWT. (2) If a patient developed an invasive or progressive wound infection, or systemic sepsis resulting from a wound infection, SAWT was discontinued. These patients were then managed by regular wound debridements, daily dressing and wound care and intravenous antibiotics.

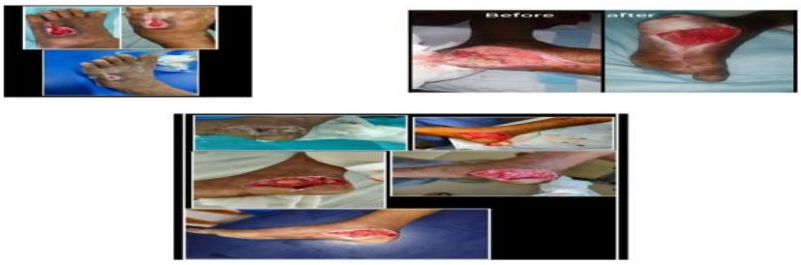

Fig 1: Pre and post GSUC dressing

Fig 2: Pre and post VAC dressing

Results

81 patients (N = 45 in the GSUC arm and N = 36 in the VAC arm) were observed under this study, undertaken between September 2020 and May 2021.The study comprised patients with DM foot ulcers of maximum size 15cm. Mean age in GSUC, VAC groups was 51.4 and 52 respectively. Wound size-length cm was 8.3 in GSUC, it was 9.6 in VAC group.

Table 1: Student T-Test; comparing the mean differences in the study groups

	Study groups	N	Mean	Std. Deviation	P-value
Age	GSUC	45	51.4	8	
	VAC	36	52	7	0.747(NS)
Wound size-length cm	GSUC	45	8.3	3	
	VAC	36	9.6	2	.017(S)
breadth cm	GSUC	45	8.1	3	
	VAC	36	8.7	2	0.227(NS)
Wound Surface area	GSUC	45	54	27	
	VAC	36	67.2	24	.023(S)
WOUND VOLUME-depth cm	GSUC	45	1.4	0.5	
	VAC	36	1.3	0.4	0.747(NS)
Formulated final value	GSUC	45	24.2	17	
	VAC	36	29.3	14	0.148(NS)
Pain score	GSUC	45	2.1	0.7	
	VAC	36	2.9	0.4	.000(S)
% change on day 5	GSUC	42	4.1	0.6	
	VAC	31	3.8	0.5	.022(S)
% change on day 10	GSUC	42	3.9	0.4	
	VAC	31	3.8	0.3	0.213(NS)
% change on day 15	GSUC	42	3.9	0.4	
	VAC	31	4.1	0.3	.008(S)
EAE OF DREING Application	GSUC	45	25.3	3	
	VAC	36	34	2	0.000(S)
COST	GSUC	45	2597.8	396	
	VoAC	36	10755.6	2197	0.00(S)

Table 2: Chi-square test: Association between the study groups: age

Study groups		Age		Total	P-value
		<50yrs	>50yrs		
	GSUC	24	21	45	0.765 (NS)
		53.3%	46.7%	100.0%	
	VAC	18	18	36	
		50.0%	50.0%	100.0%	
Total		42	39	81	
		51.9%	48.1%	100.0%	

Age distribution was 53.3% less than 50 years, 46.7% greater than 50 years in GSUC group. 50.0% less than 50 years, 50% greater than 50 years in GSUC group. Out of 81 patients, 42 (51.9%) were less than50 years, 39 (48.1%) were greater than 50 years.

Table 3: Groups SEX

Study groups		Sex		Total	P-value
		F	M		
	GSUC	22	23	45	0.551(NS)
		48.9%	51.1%	100.0%	
	VAC	20	16	36	
		55.6%	44.4%	100.0%	
Total		42	39	81	
		51.9%	48.1%	100.0%	

Female distribution was 22(48.9%), 20 (55.6%) in GSUC and VAC groups respectively. Out of 81 patients, 42 (51.9%) were females, 39 (48.1%) were males.

Table 4: Groups-Failure of intervention

Study groups		Failure of intervention		Total	P-value
		No	Yes		
	GSUC	42	3	45	0.47 (NS)
		93.3%	6.7%	100.0%	
	VAC	32	4	36	
		88.9%	11.1%	100.0%	
Total		74	7	81	
		91.4%	8.6%	100.0%	

Table 5: Groups-Pain score

		Pain score				Total	P-value
		1	2	3	4		
	GSUC	5	31	7	2	45	0.000(S)
		11.1%	68.9%	15.6%	4.4%	100.0%	
	VAC	0	5	29	2	36	
		.0%	13.9%	80.6%	5.6%	100.0%	
Total		5	36	36	4	81	
		6.2%	44.4%	44.4%	4.9%	100.0%	

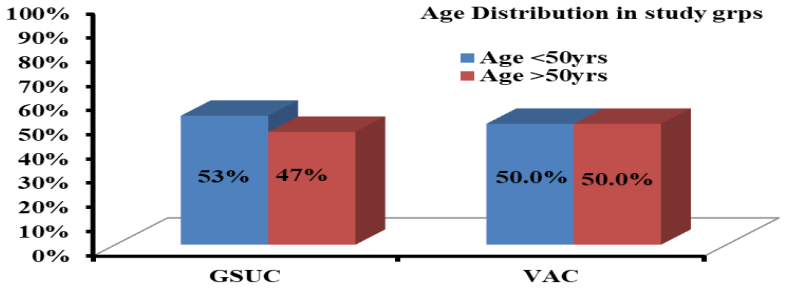

Fig 3: Age Distribution in study groups

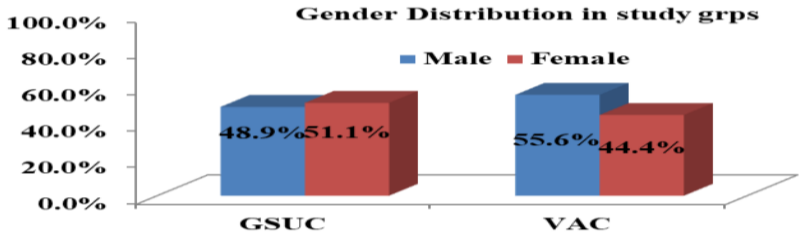

Fig 4: Gender Distribution in study groups

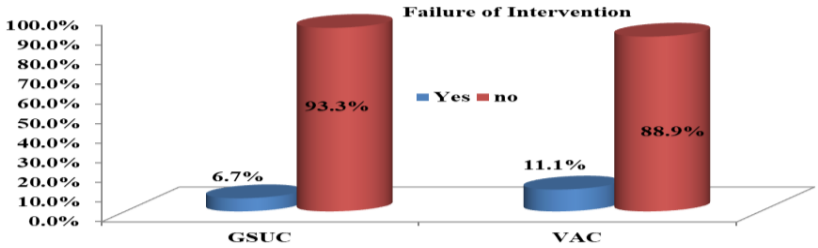

Fig 5: Failure of Intervention

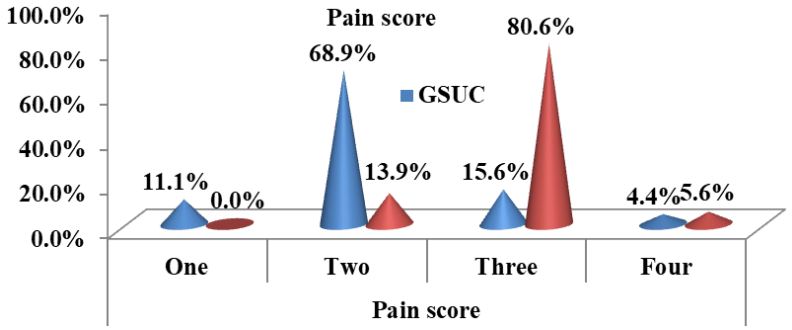

Fig 6: Pain Score

Discussion

The VAC involves following method. The following are the VAC steps, the sponge dressing which is sterilized is cut to the size of the wound with sterile scissors and kept gently into the wound[8]. The ryles tube red size perforation is made manually distally with sterile scissors is then located on top of the foam and a second piece of sponge placed over the top. For smaller wounds, one piece of sponge is used and the red drainage tube is inserted inside it. The sponge along with the first few inches of the red tube and the surrounding area of skin, is then covered with the adhesive opposite sheet. It is

important to ensure that the membrane forms a good seal both with the skin and the ryles tube[9].The distal end of the drain is connected to the hospital suction unit, which is programmed to produce the required level of pressure. Once the suction is switched on, the air is sucked out of the foam causing it to collapse inwards drawing the edges of the wound in with it. Fluid within the wound is taken up by the foam and transported into the disposable container within the main suction unit. Wound inspection done every 5days once[10].

Conclusion

Low income countries are having number of issues in public health. The use of Hospital suction unit assisted VAC in the Indian studies has not been reported much. Only few Indian studies have provided ideas into the hospital suction unit assisted VAC dressing use in Indian settings. The hospital suction unit assisted VAC dressing is definitely having an advantage in countries like India, where the patient load on the health centers is high. In countries like India, where more % of the population earns less than one US dollar per day and where only a small portion of government budget goes to health there is an urgent need of faster and cheaper wound healing techniques. The health care information about the newer and cheaper techniques will help a great deal in the exponentially growing population. In such a scenario any wound healing technique that will work faster than the conventional techniques and deliver at par or at times better results is definitely a boon. It's reported that the VAC has certain advantages like it is easy to handle, hospital admission is not essential, good patient compliance and satisfaction, require minimal training to maintain vacuum at home, can be applied to multiple cases at the same time and give adequate mobility to the patient. The VAC will also reduce the total time spent in the hospital and this is ideal for already overloaded hospitals and reduced the daily dressing pain suffering of the patient and it is much cheaper than the negative pressure wound therapy (NPWT) dressing. Besides, the number of follow-ups will also be reduced in cases involving the VAC. But the situation in the rural areas is graver. As, the VAC is not available everywhere in the developing countries and the usage of VAC in the rural areas is very difficult due to difficulties related to terrain, availability of devices, cost issues, etc. Thus the use of such cheap suction unit for wound management which can be used in rural areas of developing countries is essential.

Conflict of Interest: Nil
Source of support:Nil

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