

Life Can't Be Any Easier than This—Introduction of the Portable and Disposable V.A.C. Machines*

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ABSTRACT

The application of controlled levels of negative pressure on to a wound has been shown to accelerate evacuation of dead cells, debris and fluid which eventually encourages wound healing in a variety of surgical wounds. Vacuum Assisted Closure (V.A.C.) therapy—KCI Medical Limited, the terminology by which this is widely known, became popular, especially among the plastic surgery professionals in America and soon gained recognition worldwide. It is now widely used in the UK to manage and assist healing in a wide variety of wounds. Although KCI's V.A.C. machines were the only ones on the market for a number of years, several wound management companies have now brought out their own machines and these are now known collectively as topical negative pressure therapy (TNPT). Traditional TNPT is often considered a relatively costly procedure. It is often used in patients with large wounds to facilitate dressing management and promote rapid cleaning and granulation. This may also allow them to be discharged to the community when they would otherwise remain inpatients, thereby saving bed days. Capital purchase of the machines is expensive and hospitals often rent or lease them on a short or long term basis. This can lead to difficulties in arranging the finances for discharge to the community. Subsequent dressing changes (recommended every 48 - 72 hrs) also incur high costs and involvement of the trained medical or nursing staff. As we all know; "*Need is the mother of invention*". The disposable TNPT machine (V.A.C. Via™, KCI Medical Ltd.) has been introduced to help to solve these problems. It is a single use machine, inclusive of a dressing and canister and available off the shelf. It is very cost effective, easy to use and is used for small to moderate sized wounds. Senior author is using this machine which excellent results and illustrated the use of this machine with pictures in this paper.

Keywords: Vacuum Assisted Closure; Portable and Disposable Machine; Plastic Surgery

1. Introduction

The method of using sub-atmospheric pressure for a prolonged period of time on a wound to promote debridement and wound healing was first documented by Fleischmann *et al.* in 1993 [1]. This topical negative pressure therapy (TNPT) dressing can be used in the treatment of many types of soft tissue wounds. This includes degloving injuries [2,3], donor sites, chronic radiation ulcers [4], infected sternotomy wounds [5,6] and various soft tissue injuries prior to surgical closure, grafting or reconstructive surgery. The use of vacuum therapy has also been described in patients with compartment syndromes of the lower limb [7] and in patients with acute and chronic infections of various types [8] and in non-healing or chronic wounds like pressure sores has also been published [9,10].

Smith *et al.* [11], in a retrospective review, described the use of vacuum pack technique as the treatment method

of choice for open abdomen management and temporary abdominal closure. TNPT has also been used following split thickness skin grafting in the treatment of burns and is claimed to be particularly useful for body sites with irregular or deep contours such as the perineum, hand or axilla [12,13] as it increases graft bed contact by reducing the chance of fluid accumulation under the graft and effectively splints the graft.

Microbiological studies showed that, compared with control values, tissue bacterial counts of vacuum-treated wounds decreased significantly after four days [14]. The optimum level of negative pressure for wound healing is thought to be around 125 mmHg below ambient and a continuous pressure is proved to be the most effective for splinting or bolstering grafts in place.

2. How the Portable, Disposable V.A.C. Machine (V.A.C. Via) Works

Disposable V.A.C. Via™ System (also called vacuum

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therapy, vacuum assisted closure, vacuum sealing or topical negative pressure therapy) is a sophisticated and modern development of a standard surgical technique.

A portable and disposable V.A.C. therapy system provides simplicity, mobility, and convenience like never before. The technique used in setting up the dressing and V.A.C. Via™ is very simple. The wound is covered in all directions with an air tight seal and then connected to a vacuum in a light weight disposable machine via a tube through which all fluid and air is sucked out in to a container. The machine comes with foam and transparent adhesive dressings (**Figure 1**).

The entire wound area is covered with the foam and then a transparent adhesive membrane is firmly secured on the top of the wound area and to the healthy skin around the wound margin ensuring air seal. Then a hole is created in the film and a self adhesive drain is attached over the hole. The drain tube is then connected to the vacuum source, where the fluid and debris from the wound is drawn out through the foam into a reservoir for subsequent disposal.

3. Clinical Experience with Disposable V.A.C. Machine

We used the disposable V.A.C. Via™ in 52 yrs of age gentleman, who presented with a pretibial abscess on the right lower leg. He underwent debridement twice under general anaesthetic and following debridement, the resulting wound measured the size of 5 cm by 4 cm as shown in **Figure 2**.

The wound was covered with split skin graft and to secure the graft, staples were used as shown in **Figure 3**.

Mepitel was applied on the graft, and then covered with foam with the disposable V.A.C. Via™ as shown in **Figure 4**.

The patient was discharged home the same day and followed up in the dressing clinic one week later. V.A.C. dressing was removed and graft was 100% taken. (**Figures 5(a) and 5(b)**)



Figure 2. Wound right lower leg.



Figure 3. Split skin graft on the wound.



Figure 1. V.A.C. Via™ unit as a whole.



Figure 4. V.A.C. Via™ system applied on the lower leg wound.



(a)



(b)

Figure 5. (a) and (b)—Post op pictures with taken grafts.

Patient didn't find it difficult to cope with the dressing and the machine as thorough post op instructions were given to the patient. This type of portable and disposable dressing has proved to be a very effective treatment modality for a variety of wounds because of its simplicity, mobility, ease and availability as whenever one is needed; all the equipment is present in a single box stored in theatre.

4. Cost Effectiveness of the Disposable V.A.C. Machines

The cost of the traditional TNPT therapy is not insignificant. In addition to the purchase cost (£15,000) or hire charges (£26/day) of the machine itself, it is necessary to purchase disposable foam dressings and drainage tubes (small simplace granufoam dressing kit costs £23.40), canisters (£28.35) and adhesive drapes. Secondly, it is

often necessary to keep the patient in the hospital until community V.A.C. is organized. Each bed in the hospital costs almost £450 per day.

With the introduction of the disposable V.A.C. machines (V.A.C. Via™), this cost has gone down remarkably. Discharge to the community is easy as there are no finances to be arranged. Subsequent dressings are done in the hospital dressing clinic. The machine works for a week and the whole pack (V.A.C. Via™ unit; charger; lanyard; pouch; medium granufoam dressing kit; 250ml canister and adhesive drapes) costs £260. This cost is less than the cost incurred in the use of the traditional machines. With the disposable V.A.C., the patient can be discharged home early therefore saving additional expenses.

5. Statistical Analysis

We divided the patients in 3 groups, who underwent similar procedures and compared costs in the use of traditional V.A.C. machines versus the V.A.C. Via™ unit, costs of hospital stay is also considered. All data is compiled into the following tables and a student t-test value is used to calculate a p-value.

Patients example group 1—Debridement of lower leg infected ulcer + graft

	Hospital Stay £450/day	V.A.C. Machine (price in £)	Canister £28.35 each	Kit £23.40 each	Total (price in £)
Traditional	16 days = 7200	26/day = 416	6 changed = 170.10	6 used = 140.40	7926.50
Disposable	9 days = 4050	260 each, 2 used = 520	None	None	4570

Patients example group 2—Debridement of heal ulcer + graft

	Hospital Stay £450/day	V.A.C. Machine (price in £)	Canister £28.35 each	Kit £23.40 each	Total (price in £)
Traditional	10 days = 4500	26/day = 260	3 changed = 85.05	3 used = 70.20	4915.25
Disposable	6 days = 2700	260 each, 1 used = 260	None	None	2960

Patient example group 3—Elective skin lesion excisions + grafts

	Hospital Stay £450/day	V.A.C. Machine (price in £)	Canister £28.35 each	Kit £23.40 each	Total (price in £)
Traditional	6 days = 2700	26/day = 126	1 used = 28.35	1 used = 23.40	2877.75
Disposable	1 day = 450	260 each, 1 used = 260	None	None	710

Cumulative Data—Traditional vs. Disposable

	Patient group 1 (£)	Patient group 2 (£)	Patient group 3 (£)
Traditional V.A.C.	7926.50	4915.25	2877.75
Disposable V.A.C.	4570.00	2960.00	710.00

Using the above data and a student t-test, we conclude with a two-tailed p-value of 0.02, which is considered to be statistically significant.

6. Benefits of the Disposable and Portable V.A.C. Therapy System

There are various benefits of a disposable and portable V.A.C. Via™ system over current TNPT therapy products:

- 1) Potentially decreases in hospital stay due to quicker patient discharge process.
- 2) Uninterrupted V.A.C. Therapy at discharge.
- 3) Simple application requiring minimal staff training, V.A.C. Via™ is much easier to use than the traditional TNPT machines.
- 4) Reduced administrative coordination by eliminating the steps to activate and discontinue therapy.
- 5) Increased patient satisfaction with ability to conceal device and silent nature of therapy.

Increased patient compliance since therapy will not disturb patient's environment.

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