Clinical Study

Managing Acute Wounds with Negative Pressure System in a Developing Country

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Introduction

The negative pressure system has been found to be a valuable addition to the various procedures of wound management and has been widely accepted to be safe and effective in promoting wound healing. The aim of this study is to find out the outcome of the use of the VAC device in the treatment of patients with acute wounds. The study seeks to find out the outcome of the use of the VAC device in the treatment of patients with acute wounds. Materials and Methods. Between January 2009 and December 2011, a consecutive nonrandomized study was conducted among 48 patients who presented with acute wounds at the Komfo Anokye Teaching Hospital. Patients were made to undergo negative pressure wound therapy using the VAC device. Results. Forty-eight patients with various degrees of acute wounds were treated, of which 43 (89.6%) were females and 5 (10.4%) were males. Ages of patients ranged from 19 to 78 years. Satisfaction with rate of wound healing revealed that 86.7% and 8.9% had excellent and good healing, respectively, while 4.4% said theirs was satisfactory. Therapy was discontinued due to complications in three (6.3%) patients who developed some complications. Conclusion. There was reduction in the hospitalization by patients thereby reducing costs. Also, quality of life of persons who had undergone the therapy with the VAC device had improved. Even though a few device-related complications were observed, patient satisfaction was high.

1. Introduction

Wound management has been a challenging problem over the years requiring innovative methods of treatment to improve wound granulation and contraction, minimize the dressing and nursing requirement, and dramatically reduce the cost associated with wound management [1–5]. Managing acute wounds with negative pressure wound therapy (NPWT) at subatmospheric pressure is safe and effective [6,7]. The use of subatmospheric pressure to promote debridement and wound healing was first documented by Fleischmann et al. (1993) [8]. The NPWT also known as the vacuum-assisted closure (VAC) technique promotes wound healing by suctioning of excess fluid from the wound, increasing local blood flow, and enhancing the formation of granulation tissue [6,9,10]. It also prevents an increase in infection [10]. The NPWT also known as the vacuum-assisted closure (the VAC) technique employs the use of an open cell foam dressing that is placed into the wound cavity and the application of subatmospheric pressure (125 mmHg below ambient pressure) [6,11].

Argenta and Morykwas published a clinical report of a variety of complicated wounds of the torso and extremities that responded successfully to NPWT in a system known as the vacuum-assisted closure (VAC), Kinetic Concepts, Incorporated (KCI; San Antonio, TX, USA) [6,12].

A systematic review of the effectiveness and safety of negative pressure wound therapy revealed that NPWT is as effective as or better than current local treatment for wounds [7]. Thus, the VAC system is linked with complete wound closure and shorter time to satisfactory healing compared with advanced moist wound therapy and saline moistened gauze dressings, respectively [13,14]. In recent years, VAC has been shown to be an effective therapy for the management of large,
complex, acute wounds as well as chronic wounds that have failed to heal by conventional methods [15].

Acute wounds are caused by external damage to intact skin and include surgical wounds, bites, burns, minor cuts and abrasions, and more severe traumatic wounds such as lacerations, avulsions, and those caused by crush or gunshot injuries [16].

The use of the VAC system in the treatment of extremities and orthopaedic trauma and treating degloving injuries and burns have also been documented [17–22]. The use of VAC device results in improvement in the quality of life of patients as a result of decreased hospitalisation and morbidity as well as reduction in hospital expenses. The use of the VAC device in treating burns has been useful for body sites with irregular or deep contours such as the perineum, hand, or axilla [23, 24]. This study has been designed to find out the outcome of the use of the VAC device in the treatment of patients with acute wounds.

2. Materials and Methods

2.1. Study Setting. Komfo Anokye Teaching Hospital (KATH), located in Kumasi, is the second-largest hospital in Ghana and the only tertiary health institution in the middle belt of the country. It is the main referral hospital for the Ashanti, Brong-Ahafo, northern, upper east, and upper west regions.

2.2. Patient Management. A consecutive nonrandomized study was conducted between January 2009 and December 2011 at the Komfo Anokye Teaching Hospital, Kumasi, Ghana. Patients who presented to the Accident and Emergency Unit with acute wounds were enrolled into the study after written consent was obtained. Adults who presented with acute wounds at the Accident and Emergency Center were included in the study while subjects with chronic ulcers such as diabetic ulcers were excluded as well as children and subjects who did not give consent.

Before the start of the negative pressure therapy, the wounds were debrided to remove necrotic and infected tissues in order to get a clean wound bed. The commercially available VAC device was then connected and therapy started according to the manufacturer’s instruction (Kinetic Concepts, Incorporated (KCI; San Antonio, TX, USA) based on the system developed by Argenta and Morykwas).

On the average, the device was used for 28 days. The length of admission ranged from 12 to 54 days. Split thickness skin grafting (STSG) was done to completely cover all wounds.

3. Results

Forty-eight subjects with various degrees of acute wounds were treated using VAC negative pressure wound therapy system. Of the 48 subjects treated, 43 (89.6%) were females and 5 (10.4%) were males. Ages of patients ranged from 19 to 78 years. The length of admission ranged from 12 to 54 days. Table 1 shows the causes of wounds treated within the study period. The therapy was discontinued in three (6.3%) patients who developed some complications which included bleeding, intolerance of device by patients, and severe wound infection. Patients were made to grade their satisfaction rate of wound healing on a scale of 1–5: 1: bad, 2: fair, 3: satisfactory, 4: good, and 5: excellent (Table 2). Complications arising from the use of the VAC device were also assessed on a scale of 1–3: 1: severe, 2: mild, and 3: none (Table 3).

Figure 1 shows a patient, a 37-year-old woman, with a gluteal ulcer following an intramuscular Gvither injection, who had undergone the negative wound pressure therapy using the VAC device.

4. Discussion

Following the introduction of the VAC device over two decades ago, negative pressure wound therapy (NPWT) appears to be safe treatment for wounds and serious adverse events have been rarely reported [6, 7].

In a multicenter randomized controlled trial that compared NPWT with advanced moist wound therapy (predominantly hydrogels and alginates), the NPWT achieved complete wound closure by 43.2% versus 28.9% for advanced moist wound therapy during the treatment period [13]. When compared with saline moistened gauze dressings, VAC was associated with a shorter time to satisfactory healing of 17.5 to 22.8 days versus 37.5 to 42.8 days for saline moistened gauze dressings [14, 25].

In their study of VAC for the management of patients with high-energy soft tissue injuries, Herscovici et al. demonstrated that there was no need for further treatment or tissue transfer in nearly 57% of the subjects [18]. In our study,
however, all wounds had formal debridement of necrotic tissue and also all wounds had tissue transfer in the form of split thickness skin grafting because they were large.

The system was changed at every three-to-five day interval. This is consistent with work done by Chariker et al. (1989) [1]. Generally, changing the system every five days is an advantage of continuous suction, and this method allows for wound contracture and epithelization.

While our study showed satisfactory healing to be as early as 12 days, McCallon and coworkers observed satisfactory healing on average of 22.8 (+/17.4) days [14] calculated from date of wound debridement. The shorter time to satisfactory healing observed in our study could be because our subjects presented with acute ulcers while those studied by McCallon et al. were diabetic foot ulcers. Diabetic foot ulcers are chronic ulcers and are generally more difficult to treat.

The use of the VAC device has facilitated wound healing in patients in this study. Patients who would have otherwise spent much time if the conventional methods were employed in the management of their wounds now showed a high level of satisfaction having undergone therapy with this commercially available device; hence the use of VAC device implies decrease in hospital stay and cost. Cost effectiveness with the use of the VAC device was also reported by Philbeck et al. (1999) [26].

The study showed both patients and clinicians were satisfied with the use of the VAC device. Satisfaction with the use of the VAC device has also been documented by Ozturk et al. (2009) [27]. Quality of life of patients has hereby improved.

The current study revealed complications in three patients of which one suffered severe bleeding. Some complications from the use of the VAC device, though uncommon, have been reported. Citak et al. (2010) reported a rare complication after VAC therapy in the treatment of deep sore ulcers in a paraplegic patient. They recommended close clinical monitoring of the device by experienced medical professionals [28]. Other complications such as pain, infection, bleeding, and fluid depletion have also been reported [29, 30].

5. Conclusion
Managing acute wounds with commercially available VAC device has been very useful and well tolerated by the patients. Hospitalization days as well as comorbidity had reduced resulting in increase in the quality of life of these patients as well as reduction in hospital cost. Patients showed much satisfaction with the use of the VAC device.

Ethical Approval
Ethical clearance was obtained from the Kwame Nkrumah University of Science and Technology School of Medical Sciences/Komfo Anokye Teaching Hospital Committee on Human Research, Publication and Ethics, Kumasi, with approval no. CHRPE/AP/030/12.

Conflict of Interests
No conflict of interests is declared by any of the authors.
References


