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Use of a home vacuum-assisted closure device in the burn population is both cost-effective and efficacious

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ABSTRACT

Introduction: The vacuum assisted closure device (VAC) improves wound-healing when utilized as a bolster to secure split thickness skin grafts (STSG). Patients typically remain hospitalized for VAC therapy; however, home VACs (hVAC) are now available. Limited studies examine burns treated with hVAC as a STSG bolster.

Method: A retrospective study of records from an ABA verified regional burn center was conducted over 23 months. Patients included STSGs for burn. Data points included demographics, burn mechanism and location, graft characteristics, hospital length of stay (LOS), and time to heal.

Results and discussion: Fifty patients were included, with average age of 39 years (range <1–83 years). Average burn TBSA was 1.27 ± 1.42 (range 0.05–8.18). Grafted area average was 102.9 ± 128.1 cm^2. The most commonly treated areas were the leg/foot, thigh, and torso (53%, 16%, and 16%, respectively). Average LOS was 1.1 ± 1.2 days. Mean graft-take was 99.2 ± 2.8% with one patient undergoing repeat STSG. Average post-operative time to heal was 16 ± 6 days. A 5-day inpatient stay with a VAC costs an average of $34,635, compared to $9134 for an hVAC over the same period.

Conclusions: The hVAC is a cost-effective STSG bolster in the burn population for appropriate candidates. Excellent graft-take and low morbidity rates imply that this is an efficacious alternative for STSG bolster.

1. Introduction

Split thickness skin grafts (STSG) are considered a cornerstone in the operative management of burn wounds [1]. A number of factors have been described which affect STSG. These include recipient bed quality and contour, production of seromas or hematomas, and nutritional conditions [2].

Several types of bolsters have been described to hold STSGs to enable wound healing. One such bolster is the vacuum assisted closure device (VAC; Kinetic Concepts, Inc., San Antonio, TX), a form of negative-pressure wound therapy (NPWT). Convenient for home usage is the small and portable non-disposable VAC, KCI-ActiVAC. The VAC is associated with improved wound healing outcomes; however, there is a relative paucity of literature relating to its use in the burn

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population [3–5]. We have previously demonstrated the use of the VAC as a STSG bolster in the burn population wherein graft-take using this device exceeded the reported average of 87–89% found in the literature [6–8]. Despite the excellent results seen with the VAC, its use as a skin graft bolster has not yet gained widespread acceptance [9].

Traditionally, the VAC necessitated multi-day hospital stays while grafts matured on their wound beds [8]. This, along with the inherent costs of therapy, has limited the adoption of the VAC as a bolster due to prohibitive costs associated with increased hospital stay [8,10,11]. This perception, in part, stems from the misconception that unit price differences necessarily equate to changes in total treatment cost [12]. In fact, there has been an increasing body of literature that points to significant long-term cost savings when using the VAC in select situations [12].

Recently, home VAC (hVAC) systems have become available. These systems have the potential to provide the same benefits of NPWT while minimizing in-patient hospital stays, hence reducing cost. There is scant data in the literature, however, that examines the efficacy of the hVAC as a bolster device in the burn population, nor has there been a comprehensive cost-analysis comparing VAC use in both home and hospital settings.

This study retrospectively analyzes our experience using hVAC systems as a STSG bolster in the burn population with special attention to both the efficacy and cost-effectiveness of this outpatient wound treatment method.

2. Methods

The burn registry of an ABA verified regional burn center was retrospectively analyzed. All burn admissions and outpatient visit data were analyzed over a 23-month period (July 2010–May 2012). Inclusion criteria included those patients who suffered any third degree burn undergoing STSGs and were approved for a portable nondisposable home VAC (KCI-ActiVAC) bolster for their STSG. Those patients that were not approved for an hVAC system were excluded from this study. In addition, those patients lost to follow-up or mortality were excluded.

Patient records were reviewed for the following data-points: demographics, burn mechanism and location, grafted area in square centimeters, percent graft take, need for further procedures, and post-operative time to heal.

Our method of obtaining and securing skin grafts has been previously described [8]. Briefly, after excision of the injured tissue, a STSG is harvested from a donor site with a Zimmer dermatome (Zimmer Inc., Warsaw Ind.) set to produce a 0.03-cm (0.012-in) thick STSG. Grafts are meshed as either 1:1 or 1.5:1 based upon surgeon preference. The STSG is then secured to the wound bed circumferentially with either absorbable sutures or staples. The graft is next covered with a non-adherent Xeroform (Covidien, Mansfield, MA) dressing. To ensure wound VAC laminate adherence, the surrounding intact skin is fixed with benzoin. Adhesive laminate is next applied to secure the VAC sponge in place. The VAC setting is kept on continuous negative 125-mmHg suction.

Hemodynamically stable patients with appropriate compliance and strong social support systems who were deemed stable enough for outpatient therapy were approved by the attending burn surgeon. This then prompted the appropriate social work support. In some instances, patients were preauthorized for an hVAC system and were therefore eligible for discharge soon after surgery. In cases wherein patients had not been preapproved, a social work consult was placed post-operatively, and the VAC manufacturer was contacted. The manufacturer coordinated system coverage with the patient's insurance provider. Once approval was secured, visiting nurse services (VNS) certified to conduct VAC inspections and maintenance were arranged. Prior to discharge, patients and any individual assisting in homecare were given basic instructions on VAC operation, common trouble-shooting strategies, and provided with additional maintenance supplies including VAC adhesive tape. Patients were eligible to return home once they had been approved for an hVAC, were choiced with home nurse services, instructed on VAC operation, and met standard discharge criteria involving oral intake, pain control, and ambulatory status.

The VAC remained secure for five days, as per attending burn surgeon preference, at which point patients returned to clinic where the VAC was removed and the dressing changed to antibiotic ointment and Xeroform (Covidien Mansfield, MA). Patients were instructed to keep their wound site clean and moisturized with home dressing changes as needed. Patients were typically seen weekly in clinic to follow wound healing. Once determined to have been re-epithelialized based upon single attending surgeon assessment, patients were instructed to solely utilize moisturizer for their dressings.

Cost data pertaining to use of the hVAC and hospital stays were obtained from the manufacturer (VAC; Kinetic Concepts, Inc., San Antonio, TX), a query of institutional database, and from the Healthcare Cost and Utilization Project (HCUP) [13]. The HCUP search was conducted using Diagnosis Related Group (DRG) 929, full-thickness burns with skin graft or inhalation injury without complications or multiple co-morbid conditions. Amounts are based on the 2012 Medicare rates for the Durable Medical Equipment, Prosthetics, Orthotics and Supplies (DMEPOS) Rochester Competitive Bidding Area (CBA).

3. Results

Fifty patients met inclusion criteria in the twenty-three months of study. Twenty-one patients were female and twenty-nine patients were male with an overall average age of 39 (range <1–83). Average total body surface area (TBSA) of

Table 1 – Etiologies of burns in the patient population studied. Data are shown in percentages of total included cases.

Burn etiology	Percentage
Scald	28
Contact	23
Flame	23
Friction	15
Chemical	9
Other	2

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