Innovations in Addressing Non-Viable Tissue

Clinical Insights, Perspectives, and Treatment Approaches

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Dear Readers,

A very happy New Year to you and your families and from everyone at Acelity, our best wishes for a healthy and peaceful 2018!

This special supplement entitled, *Innovations in Addressing Non-Viable Tissue* is now available for your reading pleasure. As clinicians we know that chronic and surgical wounds affect more than 10.5 million people in the U.S. and Europe and can cost more than $50 billion per year, yet nearly 30 percent of patients in need of debridement are unable to undergo surgical procedures due to age, pain tolerance or co-morbidities. With this backdrop in mind, it is important to shed light on novel approaches to the management of wounds that may mitigate these serious scenarios.

This issue contains fascinating articles from our faculty that cover topics such as the use of a novel reticulated open cell foam, a palliative approach to addressing non-viable tissue, and the management of sacral pressure ulcers using the V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressing.

As always, we hope these topics provide practical insight for you as you treat patients with a variety of wounds. We welcome your feedback and we encourage you to contribute to one of our leading peer-to-peer publications—*Current Dialogues in Wound Management* & *The Chronicles of Incision Management*—if you have a perspective to share with your peers! Please forward the link for this special supplement on to a colleague so that we can continue to grow our readership.

Thank you,

Ronald P. Silverman, MD, FACS | Acelity
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Early Experience with the Use of Negative Pressure Wound Therapy with Instillation and a Novel Reticulated Open Cell Foam Dressing with Through Holes

By: Luis Fernandez, MD, KHS, KCOEG, FACS, FASAS, FCCP, FCCM, FICS

INTRODUCTION

Negative pressure wound therapy (NPWT) is an advanced wound care therapy commonly used in chronic and complex wounds. Historically, standard NPWT has been associated with higher-cost advanced wound care therapies; however, several studies have shown an overall savings in direct and indirect costs, in a large part due to decreases in operating room (OR) visits, early wound closure in many treated patients, reduced hospital stay, less required dressing changes (with resultant lower material/manpower cost and care delivery efficiency), as well as improved limb preservation rates.1-7 Over the years, NPWT has evolved to include the ability to instill topical wound solutions, which are allowed to dwell directly onto the open wound.8-10 A growing body of literature supports the use of NPWTi-d with instillation and dwell time (NPWTi-d; V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing) with positive clinical outcomes and potential cost savings being reported.11-15

Recommendations exist in the literature for the use of NPWTi-d in acute and chronic wounds.8-10 Several dressings for use with NPWTi-d have been developed, among them a reticulated open cell foam dressing with through holes (ROCF-CC; V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing) that assists in removing thick wound exudate and infectious materials.16 ROCF-CC is useful for wound cleansing when debridement is not possible or appropriate, particularly in high operative risk patients. Here, we report our early experience on the use of NPWTi-d with ROCF-CC in the following cases of complex wounds.

CASE STUDIES

Case 1

A 72-year-old male, with a history of essential hypertension, cerebrovascular accident, and moderate to severe malnutrition, presented with an unstageable sacral pressure injury. The wound at presentation measured 15.0 cm x 11.0 cm with >60% adherent nonviable tissue on the wound surface (Figure 1A). After 24 hours of ROCF-CC; V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing NPWTi-d (70cc hypochlorous solution with a 10-minute dwell time, followed by 3 hours of NPWT at -125 mmHg), the wound surface filled with >90% viable tissue (Figure 1B). After noting the results, the patient was transitioned to standard NPWT and discharged to a long-term acute care (LTAC) hospital.

Case 2

A 59-year-old female, with a medical history of obesity, diabetes mellitus, and previous stomach stapling, presented with panniculitis and a grade 3 panniculus ulcer. The ulcer measured 4cm x 8.5cm x 3cm with 80% devitalized tissue and foul-smelling, purulent discharge (Figure 2A). After 9 days of ROCF-CC; V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing NPWTi-d (38 mL hypochlorous solution with a 10-minute dwell time, followed by 2 hours of NPWT at -125 mmHg), the wound displayed >90% viable tissue (Figure 2B). The dressing changes were done at 48 to 72-hour intervals. The patient was transitioned to standard NPWT and discharged to a skilled nursing facility the same day NPWT was initiated.
DISCUSSION

Based on our initial experience, the ROCF-CC dressing demonstrated unique properties that allowed effective and rapid removal of thick exudates in large complex wounds that contained substantial areas of devitalized tissue. We also observed that NPWTi-d with ROCF promoted excellent development of underlying granulation tissue. In the two cases presented, the dressing was used safely in severely debilitated as well as frail patients.

The term “frailty” has become more commonly used in the medical and surgical literature to describe a multifactorial state of general physical weakness, often under recognized patient vulnerability and decreased physiologic reserve. Perioperative risk is heterogeneous in this group, and age and comorbidities, in and of themselves, fail to predict functional deficits and cannot adequately predict operative and perioperative morbidity and mortality in this population group. In a recent systematic study, it was noted “in patients over 75 years of age, frailty has been found to increase post-operative complications; prolonged length of stay; 30-day mortality and discharge to long term care facility” (eg, long-term acute care hospital and/or skilled nursing facility). These findings were noted, “irrespective of the type of surgery conducted “and were found to be consistent across different frailty measurement techniques. The majority of the current literature investigating frailty and surgery has defined ‘geriatric’ as those above 60 or 65 years old. Studies in this patient population have recognized frailty being more prevalent with increasing age. A recent systematic review incorporating 31 studies of frailty in persons 65 years or older found a prevalence of from 4.0% to 17.0% (mean 9.9%) of physical frailty, with a higher prevalence when psychosocial frailty was also included. Thus, in our two cases, NPWTi-d was chosen for therapy, as these patients were not candidates for surgical debridement due to their underlying comorbidities contributing to their perceived frailty risk.

It is interesting to note that the use of NPWTi-d with ROCF-CC may potentially decrease cost of care by assisting in bedside wound cleansing and reducing the need for debridement in the OR. However, further study is warranted in the use of this novel treatment modality to determine the clinical benefits and its cost effectiveness in wound care. This will help to more clearly define and inform best evidence-based practice guidelines for its clinical application in the case of patients with complex chronic wounds.

FIGURE 1. Sacral pressure injury

A. Wound at presentation

B. Wound after 24 hours of NPWTi-d with ROCF-CC

FIGURE 2. Pannicular ulcer

A. Wound at presentation

B. Wound after 9 days of NPWTi-d with ROCF-CC

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REFERENCES


A Palliative Approach to Addressing Non-Viable Tissue

By: Elizabeth F. McElroy, RN, MSN, CRNP, CWS, CWOCN-AP

Often times, we as clinicians are aware of what the best treatment for a diagnosis would be, but patient factors stand as a barrier to utilizing the treatment recommended using evidence-based medicine. We are all given a wound care tool box that we can pull from. Within the last year, clinicians were given a new tool for their wound care toolbox, the V.A.C. VERAFOLO CLEANSE CHOICE™ Dressing Kit that is used with V.A.C. VERAFOLO™ Therapy. The dressing’s unique three-layer design facilitates removal of thick wound exudates, such as thick fibrin (wet slough), and other infectious material, to provide a wound cleansing option for clinicians when surgical debridement must be delayed or is not possible or appropriate.

Recently, I was consulted to see a 75-year-old female with a past medical history of obstructive sleep apnea, Type 2 diabetes mellitus with hyperglycemia, hypothyroidism, hypertension, and anemia, Stage IV endometrial cancer with peritoneal carcinomatosis status post recent surgery by Gynecologic Oncology for tumor debulking and total abdominal hysterectomy with bilateral salpingo-oophorectomy. She was diagnosed in April with Stage IV endometrial cancer and was scheduled for tumor staging surgery by Gynecologic Oncology for tumor debulking and total abdominal hysterectomy with bilateral salpingo-oophorectomy. She was found to have over 3.5 L of ascites in her abdomen. She had a primary closure utilizing staples. Her recovery from surgery was slow but uneventful. She was transferred to an acute care rehabilitation hospital on postoperative Day 11. However, during the next weeks the patient’s condition deteriorated due to the increasing development of ascites, with respiratory and kidney complications. On day 25 she was readmitted to the acute care hospital with shortness of breath and an acute kidney injury. The surgical team ordered V.A.C.® Therapy at that time. The nursing staff applied the therapy, and then the wound, ostomy, and continence nurse (WOCN) was consulted for further management. On postoperative Day 28, the WOCN saw the patient to reapply V.A.C.® Therapy. The inferior aspect of the wound was open, and the superior aspect of the wound was closed with steristrips. The dehisced portion measured 13.2 x 4.1 x 4cm with over half of the wound with non-viable tissue in the base. A cyanoacrylate sealant was applied to the periwound, and then a V.A.C.® GRANUFOAM SILVER™ Dressing was applied. V.A.C.® Therapy continued over the weekend at -125mmHg continuous pressure (Figure 1). The surgical team was aware of all the non-viable tissue. The patient was on bilevel positive airway pressure therapy with no escalation of care. She currently was not a candidate for surgical debridement in the operating room or at the bedside. Her pain was controlled, requiring additional narcotic coverage for dressing changes.

![FIGURE 1. Initial WOCN wound evaluation on postoperative Day 28. V.A.C.® Therapy was applied with V.A.C.® GRANUFOAM SILVER™ Dressing.](image)
On postoperative Day 32, the WOCN came back to evaluate the patient and found thick exudate in the canister (Figure 2).

The WOCN decided to explore additional options in her toolkit and decided to utilize the V.A.C. VERAFLO CLEANSE CHOICE™ Dressing with V.A.C. VERAFLO™ Therapy. Upon assessment of her abdomen, the patient had an extension of her midline dehiscence (Figure 3).

The V.A.C. VERAFLO CLEANSE CHOICE™ Dressing was applied to the wound. Barrier rings were used on the peri-wound skin to aid in seal adherence and prevent any moisture-associated skin damage to the peri-wound (Figures 4 and 5).
The fill assist function of V.A.C. VERAFLÓ™ Therapy was used, and 20 mL of normal saline was instilled into the dressing before it pooled in the inferior aspect. The V.A.C. ULTA™ Negative Pressure Wound Therapy System was reprogrammed to instill 16 mL of normal saline with a dwell time of 10 minutes, and the cycle was set for negative pressure at -125 mmHg every 30 minutes. There were no leaks, and the patient tolerated the therapy over the next two days. The patient underwent routine dressing changes every 48-72 hours (Figures 6 and 7).

One week after the start of V.A.C. VERAFLÓ™ Therapy using the V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing, the patient had robust granulation tissue in the wound base (Figure 8). The patient was then transferred to a skilled nursing facility with V.A.C.® Therapy. She has not been re-admitted since.

The V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing provided the wound care team with a non-surgical option for improving the tissue quality of her wound in a controlled environment. The patient was palliative in the sense that no aggressive therapies were to be implemented, and her focus was on quality of life, which included pain control, infection management and discharge from the acute care facility. We were able to address her palliative needs while using this innovative therapy. For this patient, and for many more patients to come, this new therapy is a game changer for our wound care toolbox.

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Liz McElroy is a Nurse Practitioner in Wound, Ostomy, and Continence Care at the Reading Health System in West Reading, PA. She graduated from Gwynedd Mercy University with her MSN in Adult Nurse Practitioner in 2009, became a Certified Wound Specialist (CWS) in 2010, and certified in Wound, Ostomy, and Continence (CWOCN) in 2012. She serves as an in-patient wound, ostomy, and continence specialist for a 647-bed Level II Trauma Center. She focuses on care of the perioperative, post-operative, cardiac and critical care patients, with an interest in nursing and physician education and V.A.C. VERAFLÓ™ Therapy. She also has two years experience in an outpatient wound care center prior to her acute care position.
Managing Sacral Pressure Ulcers: First Experiences Using V.A.C. VERAFLÒ™ Therapy with the V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressing

By: Paul J. Kim, DPM MS and Thalia Attinger, NP
INTRODUCTION

Negative pressure wound therapy (NPWT) with instillation and a dwell time (NPWTi-d) combines the benefits of traditional negative pressure with intermittent dwelling of a topical wound solution. This adjunctive therapy has been shown to improve outcomes for complex patients with infected or contaminated wounds.1-3 At our institution, we have demonstrated that NPWTi-d can result in greater efficiency and effectiveness to prepare a wound for closure or coverage as compared with traditional NPWT (Kim, Attinger et al. 2014, Kim, Attinger et al. 2015).4,5 However, our use of NPWTi-d had been used solely in conjunction with surgical excisional debridement. Our assumption had been that sharp debridement is absolutely necessary to remove nonviable tissue because NPWTi-d is not indicated for this action. With the advent of the V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing, this dressing may provide an additional wound cleansing option when surgical debridement is not possible or appropriate.

There is a subpopulation of wound patients who are not candidates for excisional debridement and therefore cannot undergo either surgical or bedside debridement. The patient may be too high risk (due to comorbidities) for surgical debridement; the patient cannot tolerate sharp debridement at bedside; there may not be a surgeon available to perform excisional debridement; or there may be a lack of regular or prescheduled access to the operating room. In many cases, decubitus ulcers are managed exclusively by nurses or other healthcare providers who may be prohibited by state licensing or hospital regulations from performing sharp debridement. Therefore, default daily or twice daily dressing changes utilizing wet-to-wet or wet-to-dry dressing changes with a variety of solutions are performed. Dressing changes in this manner are highly inefficient and are resource intensive, consuming hours of work and in many occasions multiple individuals. This method would be acceptable if it clearly demonstrated good outcomes. However, there is no evidence for this technique being effective.

In such an environment, the V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing may be a viable answer. We present our first two patients who received V.A.C. VERAFLÓ Therapy with the V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing for the primary management of sacral ulcers.

PATIENT #1

A morbidly obese 54-year-old male with a BMI of 45 and a past medical history of Type 2 diabetes, hypertension and bilateral lower extremity nonhealing wounds was admitted for multiple bowel perforations requiring small bowel resection at 3 sites, acute kidney injury, and klebsiella Pneumonia bacteremia. Postoperatively, the patient was on multiple vasopressors and started on a 2-month course of antibiotics. He suffered from persistent anastomotic leaks with frank stool coming from the Jackson-Pratt drains, which persisted despite multiple revisions. Complications persisted with hernias, bowel obstructions and further perforations. This all resulted in a very large controlled enterocutaneous fistula, with NPWT and multiple drains putting out bile-stained fluid. As a result, the patient was on vasopressors and continuous veno-venous hemofiltration on and off throughout his stay. He required almost daily blood transfusions. Due to worsening of the lungs (pleural effusion layering, atelectasis vs pneumonia) he was placed on the ventilator for the majority of his hospitalization. Over the next 5 days, the patient began to drain increasing fluid from the left flank pressure ulcer, which was then sharply debrided and packed. One week into his hospitalization, the nurses noted a Stage IV, 12x10cm sacral ulcer with extensive necrotic tissue, no pus or erythema, no deeper fluid pockets, and no bleeding, which was subsequently managed with betadine paint and acetic acid and shifting the position of the patient when possible. The patient then received V.A.C. VERAFLÓ™ Therapy with the V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing on this wound with 3 dressing changes (Figure 1, 2). The solution instilled was normal saline with a dwell time of 20 minutes, followed by 2 hours of negative pressure (-125 mmHg). The patient was eventually discharged to a long term acute care facility on standard NPWT.

FIGURE 1. The patient’s large, deep sacral ulcer at presentation prior to initiating V.A.C. VERAFLÓ™ Therapy using the V.A.C. VERAFLÓ CLEANSE CHOICE™ Dressing. Note the significant amount of nonviable tissue.
PATIENT #2

This patient was a male with a history of Type 2 diabetes, hypertension, coronary artery disease, atrial fibrillation, cerebral vascular accident with residual right-sided weakness, chronic obstructive pulmonary disease, mild pulmonary hypertension and congestive heart failure ejection fraction of 40-45%. He also had a complicated history of prior retrocolic Billroth II for peptic ulcer with intraoperative course complicated by cardiac arrest and postoperative course complicated by duodenal stump leak and bleeding from transverse colon status post exploratory laparotomy, and placement of multiple drains and total parenteral nutrition. This patient presented with tachycardia concerning for sepsis following a recent protracted hospital course for abdominal pain. This was complicated by atrial fibrillation rapid ventricular rate status post diltiazem drips, pneumoperitoneum and volume overload caused by duodenal stump leak status postoperative re-exploration and abdominal washout with placement of multiple drains and duodenostomy tube, as well as pulmonary embolism. This hospital admission was complicated by episodes of atrial fibrillation with rapid ventricular rate, acute hypoxic respiratory failure, as well as sacral decubitus ulcers with polymicrobial infection (acinetobacter, methicillin resistant Staphylococcus Aureus, gram negative rods, Pseudomonas), as well as progressive altered mental status in the context of worsening oliguric/anuric renal failure. On initial evaluation, he was noted to have increased drainage from his abdominal Jackson-Pratt drain; however, computerized tomography imaging revealed no new intraabdominal collections. The same imaging did reveal extensive area of soft tissue fluid collection, stranding with bubbles of gas straddling the midline, posterior and inferior to the coccyx with concern for Stage IV sacral decubital ulcer infection and osteomyelitis of the coccyx. The patient received wet-to-dry dressings twice daily until we initiated V.A.C. VERAFLÒ™ Therapy using the V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressing for 4 weeks (Figure 3-5). The solution instilled was normal saline with a dwell time of 20 minutes, followed by 2 hours of negative pressure (-125 mmHg). The patient was eventually discharged to a long term acute care facility on standard NPWT.

FIGURE 2. The patient’s wound at the third dressing change (POD 18). There is a clear reduction in nonviable tissue and the formation of granulation tissue as indicated by the areas of new bleeding.
FIGURE 3. The patient’s large, deep sacral ulcer at presentation prior to initiating V.A.C. VERAFLÒ™ Therapy using the V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressing. Note the significant amount of nonviable tissue. The surrounding tissue also appears to be macerated with exudate in the wound. The wound also has an ischemic appearance.

FIGURE 4. The patient’s wound at the second dressing change (POD 14). There is a clear improvement in all qualities of the wound, including the removal of all nonviable tissue and the formation of granulation tissue, as indicated by the areas of new bleeding.

FIGURE 5. After four dressing changes, this photo depicts the patient’s wound at the time of discharge (POD 28). Note that the depth has filled in with healthy appearing tissue, including islands of granulation.

DISCUSSION

We present our first 2 patients who received V.A.C. VERAFLÒ™ Therapy using V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressings. Both patients were very sick with a multitude of comorbidities, including poor nutritional and healing potential. Both patients received no excisional debridement throughout their treatment. It was clear to us that the wounds showed significant reduction of nonviable tissue over the weeks of treatment. In our institution, these were ideal candidates for using the novel foam construct with instillation therapy. Although we have a surgical bias, some patients we encounter are not surgical candidates. However, even in our institution, this novel foam may have a role in those patients in which operative debridement is not possible or appropriate and may be able to advance the wound efficiently to closure or coverage.

There is still a need to examine this foam dressing within the confines of a robust study. Currently, there is only one case series that demonstrates its utility (Teot, Boissiere et al. 2017). We believe this dressing has a role and may expand the uses for NPWTi-d to include more complex hosts and complex wounds that for one reason or another cannot be excisionally debrided. It is important to understand that the foam dressing should be used in concert with the V.A.C. VERAFLÒ™ Therapy System. The topical solution provides a medium for softening and hydrating the nonviable tissue and the foam facilitates the removal under negative pressure of thick wound exudates and other infectious materials.
REFERENCES


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Thalia Attinger is a family nurse practitioner, board certified by the American Nurses Credentialing Center. She obtained her Bachelor of Arts as well as Bachelor in Science and Master of Science degrees from Georgetown University in Washington, DC. Prior to joining the Center for Wound Healing and Hyperbaric Medicine she spent over five years working in the Medical Intensive Care Unit at MGUH. She hopes to provide her patients and their families with a sense of control and responsibility by encouraging them to become active participant in their care and to create an environment that promotes physical and emotional healing.

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Initial Experience Using Negative Pressure Wound Therapy with Instillation and a Reticulated Open Cell Foam Dressing with Through Holes

By: Allen Gabriel, MD; Jami Rice, PA

INTRODUCTION

Over the last few years, advancements in negative pressure wound therapy (NPWT) with instillation have made the system easier to use. The first commercially available instillation system (V.A.C. INSTILL™ Wound Therapy System) used timed, intermittent, gravity-fed delivery of an instilled topical wound solution in conjunction with NPWT and demonstrated positive clinical outcomes in a variety of acute and chronic wounds.1-5 To further simplify and enhance the precision of this instillation technique, a next-generation device was developed that automated and volumetrically controlled the delivery of topical solutions to the wound bed with a user-selected dwell time, followed by removal of the topical solution via NPWT. Additionally, specialized dressings were designed to be used specifically with NPWT with instillation and a dwell time (NPWTi-d).6,7 Since its inception, there have been several recommendations and guidelines published8-11 as well as numerous studies on the use of NPWTi-d for the management of complex wounds.12-16

More recently, a novel reticulated open cell foam dressing with through holes (ROCF-CC; V.A.C. VERAFLO CLEANSE™ CHOICE Dressing) has been developed that assists with wound cleansing by removing thick wound exudate and devitalized tissue in patients when debridement is not possible or appropriate. A recent retrospective case series by Teot et al17 was the first to report on the use of NPWTi-d with ROCF-CC for patients with complex wounds containing areas of devitalized tissue. Their preliminary results suggested that “adjunctive use of NPWTi-d with ROCF-CC may help clean large, complex wounds when complete surgical debridement is not possible or appropriate and/or when areas of slough and non-viable tissue remain present on the wound surface.”17 We report on our initial experience using NPWTi-d with ROCF-CC on a patient with complex wounds.
CASE STUDY

A 65-year-old male with a history of coronary artery disease, peripheral vascular disease, hypertension, and diabetes underwent open abdominal aortic aneurysm repair with a clamp time of less than 2 hours. The patient subsequently developed bilateral lower extremity compartment syndrome and underwent open fasciotomies. Following one debridement and wet-to-dry dressing changes, the plastic surgery department was consulted. At this time, another debridement was performed to remove necrotic muscle, and V.A.C. VERAFLÔ™ Therapy using the V.A.C. VERAFLÔ™ Dressing was initiated for 3 days using instillation of saline with a 1-second dwell time, followed by 2 hours of NPWT (-125 mmHg) (Figure 1). The dressing was switched to V.A.C. VERAFLÔ CLEANSE CHOICE™ Dressing, and therapy resumed using the same therapy settings. On Day 7, the wounds were surgically closed, and the PREVENA™ Incision Management System was applied to the closed incisions (Figure 2). After 7 days, the PREVENA™ Incision Dressing was removed from the incisions (Figure 3). At follow-up Day 41, both incisions remained healed (Figure 4).

DISCUSSION

Given the complex nature of this case, advanced therapies and surgical principles were utilized to achieve final closure of the wounds. However, the large amount of muscle loss from the different compartments made it difficult to determine what type of closure would be achieved. One option would have been to continue with wet-to-dry dressing changes, which would have taken a prolonged period of time and potentially increased the pain and discomfort for the patient during the dressing changes. The next option was utilizing standard V.A.C. Therapy (-125 mmHg); however, this would not have given us the cleansing that was needed for this type of wound. One other option was available that provided the necessary wound cleansing along with application of negative pressure, V.A.C. VERAFLÔ™ Therapy. The cleansing benefit of V.A.C. VERAFLÔ™ Therapy has been described in other published studies¹²,¹³,¹⁵,¹⁶ and consensus/recommendation guidelines.⁸⁻¹⁰ Our goal is always to cleanse and cover the wound by the most efficient means and having access to V.A.C. VERAFLÔ™ Therapy gives us the opportunity to achieve this goal.

In this particular case, we found that:
- early utilization of V.A.C. VERAFLÔ™ Therapy was critical
- V.A.C. VERAFLÔ™ Therapy cleansed the wound
- NPWT during V.A.C. VERAFLÔ™ Therapy reduced edema to help achieve delayed primary closure
- V.A.C. VERAFLÔ CLEANSE CHOICE™ Dressing assisted in removal of non-viable tissue and enhanced cleansing
- PREVENA™ Therapy assisted in healing of the delayed primary closure incisions

This case is a perfect example of what appropriate adequate debridement followed by instillation therapy in combination with NPWT can provide. The goal of any wound is to achieve closure in an efficient manner. In this case, a delayed primary closure instead of a skin graft was a much better option for the patient. Hypothetically, if full granulation was achieved by whichever modality described, then complete closure would have been accomplished with a split-thickness skin graft. The aggressive early management with V.A.C. VERAFLÔ™ Therapy and starting the closure process early was the key to the success of a delayed primary closure.
**FIGURE 3.** Incisions after 7 days of PREVENA™ Therapy

**FIGURE 4.** Healed incisions on follow-up Day 41

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**ALLEN GABRIEL, MD**

Dr. Allen Gabriel is a member of the American Society of Plastic Surgeons and in 2001, Dr. Gabriel was chosen by the prestigious Loma Linda University to join the Integrated Plastic Surgery Residency Program. While at Loma Linda University, he volunteered on a medical mission to Ethiopia with Operation Good Samaritan. In addition, he served on several leadership committees and was the chief resident prior to completing his residency. In 2007, Dr. Gabriel was selected by world-renowned plastic surgeon Dr. G. Patrick Maxwell to enter a Breast and Aesthetic Surgery Fellowship in conjunction with Baptist Hospital in Nashville, Tennessee. Completion of this program provided him with advanced training in breast and aesthetic surgery.

Dr. Gabriel is one of the few medical students in the country to have received the prestigious Humanism in Medicine Award. This award lead to the creation of the University of Nevada's Humanism in Medicine Honor Society, of which Dr. Gabriel is still an active member. During medical school, he was involved with both clinical and basic science research, earning several research awards and publications prior to graduating. Dr. Gabriel is board certified in plastic surgery and has been invited to speak nationally and internationally on breast and aesthetic surgery.
V.A.C. VERAFLÔ™ Therapy with V.A.C. VERAFLÔ CLEANSE CHOICE™ Dressing to Facilitate Wound Healing in a Level 2 Trauma Patient with an Infected Gracilis Flap Donor Site

By: Lindsey M. Waddell NP

BACKGROUND

Recently, Agarwal1 discussed risk factors that can affect all types of surgical subspecialties, and subsequently, the difficulty involved with healing surgical incisions/wounds that follow. The most common of those risk factors are diabetes mellitus, obesity, tobacco use and prolonged surgical time. Impaired wound healing can cause surgical incisions/wounds to have varying amounts of non-viable tissue.

When reviewing current up-to-date treatment modalities for removal of nonviable tissue when surgical debridement is not possible or appropriate, the use of V.A.C. VERAFLÔ™ Therapy using V.A.C. VERAFLÔ CLEANSE CHOICE™ Dressing should be considered. A recent retrospective study by Teot et al2 reported on preliminary evidence suggesting that the adjunctive use of V.A.C. VERAFLÔ™ Therapy with V.A.C. VERAFLÔ CLEANSE CHOICE™ Dressings may be suitable for wound cleansing in chronic, complex wounds when complete surgical debridement is not possible or appropriate.

CLINICAL CASE

Back in late summer, I had the opportunity to work with a 55-year-old Caucasian female who was involved in a motor vehicle accident (MVA) in which her extensive injuries were treated at a level 2 trauma center in June of 2017. As it would turn out, on her third hospital admission the wound care team would be consulted and their clinical services would be utilized for wound complications to the right Gracilis Flap donor site. She sustained multiple injuries to bilateral lower extremities and because of the accident, required extensive surgical intervention.

Her initial hospitalization was 20 days. During this stay, the management of wound care was overseen by the trauma, plastics, and orthopedic services teams. Upon discharge, her diagnosis was as follows: open right ankle fracture dislocation, left ankle fracture, right 5 and 6 rib fractures, bilateral pulmonary contusion, abdominal wall contusion, morbid obesity, chronic pain syndrome, motor vehicle collision, vaginal candidiasis, urinary retention, acute renal insufficiency, chronic narcotic use secondary to pain management issues, hepatitis C and history of bipolar disorder.

Procedures performed by the overseeing services during the first hospitalization included irrigation and debridement of a right open ankle wound, followed by V.A.C.® Therapy and short leg splints to bilateral lower extremities. On day 1 of hospitalization, the following procedures were performed: open reduction and internal fixation of the left medial malleolus for provisional stabilization of the medial malleolus, short leg splint to the right lower extremity and closed reduction and short leg splint to the left lower extremity. An inferior vena cava filter placement occurred on day 2 of hospitalization. Then lastly, on day 13 of hospitalization, she had sharp excisional debridement of an open fracture dislocation of the right ankle. A muscle flap graft was then used to cover the medial portion of the right ankle with exposed structures and hardware. The split-thickness skin graft (STSG) was placed over the Gracilis Flap recipient site to the right ankle. The patient went on to be discharged in late June, 2017 and subsequently returned for 2 additional in-patient hospitalizations related to complications and wound infection.

The second hospitalization was in July 2017 and lasted 5 days when the patient was admitted for
a urinary tract infection (UTI) and wound infection to the right medial thigh Gracilis Flap donor site. She was taken to the trauma operating room (OR) for debridement. She was discharged and would return again for another 8 day patient stay later in July (3rd inpatient stay). The diagnosis for this visit included: complications of STSG, necrosis of surgical site, status post MVA with multiple injuries, infection of the right leg donor site, leukocytosis, anemia and morbid obesity. The wound care team was consulted after debridement of the Gracilis Flap donor site wound performed by trauma, after which V.A.C.® therapy was initiated.

TREATMENT APPROACH AND FOLLOW-UP

According to Philippe-Gouin and Kiecolt,9 psychological stress may lead to clinically relevant delays in wound healing. The authors suggested that the relationship between stress and wound repair is not only significant, but also clinically relevant.

The patient whose condition is described above and for whom I was about to care for was extremely stressed. She told me that she was physically, emotionally and mentally worn out from repeat hospitalizations and surgical interventions. Upon entering the room for the first time to meet the patient, she began crying and stated she did not want to go back to surgery. In fact, she stated that she was willing to try anything to avoid further surgical intervention. The trauma care team had discussed taking the patient back to the OR the next day and possibly again later in the week for debridement and V.A.C.® Therapy dressing changes. However, I suggested to the trauma care team that V.A.C. VERAFLÒ Therapy using the V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressing could be used after a bedside debridement and performed by myself, in an effort to keep the patient out of the OR.

I began preparation for placement of V.A.C VERAFLÒ Therapy following debridement. The patient was pre-medicated with IV morphine as available. The debridement started on the surgical wound that was located on the medial thigh. I performed a skin/subcutaneous tissue/muscle/fascia level surgical debridement with a total area debrided of 213.4 cm². A minimal amount of bleeding was controlled with silver nitrate, and the procedure was well tolerated with a pain level of 0 throughout and a pain level of 0 following the procedure. Post debridement, the wound measured 22cm x 9.7cm x 6.1cm.

It was agreed that the bedside debridement and dressing use would be re-evaluated at minimum 2 days post therapy placement. There was significant improvement seen with respect to erythema, edema and wound volume after 3 days of V.A.C. VERAFLÒ Therapy with the V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressing. A second application of the V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressing was applied by a registered nurse on the wound care team with direct communication from myself regarding settings (refer to Table 1 for therapy details). The trauma team had discussed re-evaluating the wound after the weekend to determine if further debridement in the OR was necessary. On Day 6 of therapy, the second V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressing was removed to reveal further reduction in wound size, with almost complete resolution of erythema and periwound edema. At this time, it was determined that the patient could be discharged to rehabilitation. The patient was so excited that her leg was beginning to look like a leg again. Due to the nature of the patient being discharged, debridement at the bedside was repeated and application of V.A.C.® Therapy was placed. The patient did well and was medicated by bedside nursing. After debridement at the bedside, a V.A.C.® GRANUFOAM™ Dressing was applied, so that V.A.C.® Therapy could be resumed at the receiving facility as the patient would be discharged that same day.

Since assuming care of the right medial thigh wound, and other healing wounds, we have made significant strides towards wound healing. The pattern in reduction of wound measurements can be seen in Table 1 along with photographic representations of the wound (Figures 1-6). Given the repeated failure to close the graft site and attempts to manage bacterial bioburden with standard V.A.C.® Therapy, I believe that V.A.C. VERAFLÒ Therapy using the V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressing was able to assist with healing of a stalled wound. There was marked reduction of edema/erythema and promotion of granulation tissue formation, such that optimal wound healing occurred. These benefits can be attributed to V.A.C. VERAFLÒ Therapy’s mechanisms of action: the cleansing during the instillation and dwell phase and the macrostrain and microstrain effects during the negative pressure phase.4-7 The success with this inpatient case has subsequently led to an increase in usage of V.A.C. VERAFLÒ Therapy with both the V.A.C. VERAFLÒ CLEANSE CHOICE™ Dressing and the standard V.A.C. VERAFLÒ Dressing at the Level 2 trauma center where I practice.
TABLE 1. Treatment Schedule of Right Medial Thigh Wound

<table>
<thead>
<tr>
<th>Treatment Day</th>
<th>Therapy</th>
<th>Dressing</th>
<th>Instillation Solution</th>
<th>Dwell time</th>
<th>Cycle Frequency</th>
<th>Negative Pressure</th>
<th>Wound Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 0</td>
<td>V.A.C. VERAFLO™ Therapy</td>
<td>V.A.C. VERAFLO CLEANSE CHOICE™ Dressing (inpatient)</td>
<td>Dakin’s Solution (¼ strength, 44ml)</td>
<td>3 minutes</td>
<td>2 hours</td>
<td>-125 mmHg</td>
<td>22cm x 9.7cm x 6.1cm</td>
</tr>
<tr>
<td>Day 3</td>
<td>V.A.C. VERAFLO™ Therapy</td>
<td>V.A.C. VERAFLO CLEANSE CHOICE™ Dressing (inpatient)</td>
<td>Dakin’s Solution (¼ strength, 38ml)</td>
<td>3 minutes</td>
<td>2 hours</td>
<td>-150 mmHg</td>
<td>19cm x 9cm x 5cm</td>
</tr>
<tr>
<td>Day 6</td>
<td>V.A.C.® Therapy</td>
<td>V.A.C.® GRANUFOAM™ Dressing (inpatient)</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>-150 mmHg</td>
<td>16.5cm x 8.5cm x 5.2cm</td>
</tr>
<tr>
<td>Day 14</td>
<td>V.A.C.® Therapy</td>
<td>V.A.C.® GRANUFOAM™ Dressing (Advanced Wound Care Center)</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>-150 mmHg</td>
<td>15cm x 7cm x 3.3cm</td>
</tr>
<tr>
<td>Day 21</td>
<td>V.A.C.® Therapy</td>
<td>V.A.C.® GRANUFOAM™ Dressing</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>-150 mmHg</td>
<td>12.2cm x 7.2cm x 3cm</td>
</tr>
<tr>
<td>Day 28</td>
<td>V.A.C.® Therapy</td>
<td>V.A.C.® GRANUFOAM™ Dressing</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>-150 mmHg</td>
<td>11cm x 6.1cm x 2.7cm</td>
</tr>
<tr>
<td>Day 35</td>
<td>V.A.C.® Therapy</td>
<td>V.A.C.® GRANUFOAM™ Dressing</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>-150 mmHg</td>
<td>9cm x 7cm x 2.3cm</td>
</tr>
<tr>
<td>Day 42</td>
<td>Local wound care</td>
<td>PROMOGRAN PRISMA™ Matrix/ Sorbact® Dressing/ OPTILOCK™ Non-Adhesive Dressing</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>8cm x 5cm x 1.8cm (tunnel at 4.5cm)</td>
</tr>
<tr>
<td>Day 49</td>
<td>Local wound care</td>
<td>PROMOGRAN PRISMA™ Matrix/ Sorbact® Dressing/ OPTILOCK™ Non-Adhesive Dressing</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>8.6cm x 4cm x 1.8cm (tunnel at 3.5cm)</td>
</tr>
<tr>
<td>Day 56</td>
<td>V.A.C.® Therapy</td>
<td>V.A.C.® GRANUFOAM™ Dressing</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>-150 mmHg</td>
<td>7.8cm x 4.8cm x 1.4cm (tunnel at 5.5cm)</td>
</tr>
<tr>
<td>Day 63</td>
<td>V.A.C.® Therapy</td>
<td>V.A.C.® GRANUFOAM™ Dressing</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>-150 mmHg</td>
<td>7.8cm x 4cm x 1.3cm</td>
</tr>
</tbody>
</table>

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FIGURE 1. Wound at initial bedside evaluation (Day 0)

FIGURE 2. Post debridement at bedside (Day 0)

FIGURE 3. First application of V.A.C. VERAFLIO CLEANSE CHOICE™ Dressing (Day 0)

FIGURE 4. Wound after 2 dressing changes (Day 6)

FIGURE 5. Debridement at bedside and placement of V.A.C.® GRANUFOAM™ Dressing (Day 6)
REFERENCES:


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