



Peer-Reviewed Case Report

VeraFlo Negative Pressure Wound Therapy with Household Bleach for Refractory Driveline Infection in a Patient with Left Ventricular Assist Device

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Abstract:

Driveline infections and sepsis are amongst the most common causes of morbidity and mortality in a patient with a left ventricular assist device. In this case, we present a patient with a multi drug resistant pseudomonas aeruginosa driveline exit site infection. Initially, it was treated with dual antibiotics, followed by surgical debridement utilizing Dakin's solution irrigation and standard negative pressure wound therapy. Wound healing was minimal determined by poor granulation appearance, unchanged size from surgical debridement, purulent drainage, and the wound base remained colonized with multi drug resistant pseudomonas aeruginosa. A novel treatment of VeraFlo negative pressure wound therapy in conjunction with indwelling Dakin's solution into the wound base was introduced. This treatment resulted in improved granulation appearance, decreased drainage, decreasing in wound size, with positive changes noticeable in 7 days. We suggest that the use of VeraFlo negative pressure wound therapy may be used for treatment for cumbersome driveline infections.

Keywords: Left ventricular assist device; heart failure; driveline exit site infection; Dakin's solution; VeraFlo negative pressure wound therapy.



Introduction:

Left ventricular assist device (LVAD) is indicated to provide mechanical circulatory support for patients with advanced heart failure as a bridge to heart transplantation or as a destination therapy. LVAD support has been linked to increased survival and quality of life amongst this patient population (1-4). The long term support with LVAD implant may be jeopardized by adverse events such as driveline infection (5). The most common microorganisms leading to driveline infections are biofilm forming organisms such as staphylococcus and pseudomonas aeruginosa (6). Stabilization of the driveline can aid in preventing exit site infections (7). Several treatments for driveline site infections have been suggested including but not limited to topical and systemic antibiotics, pump exchange, and new tunnel of the driveline exit site (6). Vacuum Assisted Closure (VAC) VeraFlo Therapy (Kinetic Concepts, Inc, San Antonio, TX, USA) combines negative pressure wound therapy with instillation of antimicrobial solution, which cleanses the wound, treats the wound with antiseptic solution, and facilitates healing of the wound. Instillation of the antimicrobial solution are programmed at set intervals which aids in loosening contaminants followed by removal of infectious material resulting in a lower bacterial burden (8, 9). In addition, VAC VeraFlo Therapy has shown that it controls wound cleansing with less aerosolisation compared with standard techniques. Therefore, it reduces the potential spread of biofilm-producing microorganisms during wound cleansing and environmental contamination associated with lavage (10).

Case Report:

A 62 year old woman with a history of a chemotherapy induced cardiomyopathy received a HeartWare LVAD as destination therapy. In a year, she developed pump thrombosis, and the LVAD was exchanged. The driveline exit site was alternated from the right to the left lower quadrant of the abdomen.

Three months post implant of the new device, the patient accidentally dropped the controller and pulled the driveline. Several days later, she developed left lower quadrant pain, mild erythema, and increased mobility of the driveline accompanied by drainage. The driveline culture was positive for pan-susceptible pseudomonas. At the time of presentation, abdominal computer tomography (CT) revealed a fluid collection around the proximal portion of the driveline with inflammatory changes throughout the remainder of the driveline. Intravenous cefepime and oral ciprofloxacin was given for four weeks. Driveline was stabilized with two sutures.

Two weeks post completion of intravenous antibiotics, the patient came to the emergency department with sepsis (fever, chills, tachycardia, fatigue, and leukocytosis). Examination of the driveline exit site revealed left lower quadrant tenderness, mild erythema, serosanguinous drainage, and complete disincorporation of the driveline (Figure 1).



Figure 1: Driveline exit site

The driveline exit site was re-cultured in which revealed *Pseudomonas* susceptible to cefepime, which was started. Despite antibiotics, the abdominal pain was worsening. Repeat CT scan revealed abscess involving the entire length of the driveline. The patient was taken to the operating room for wound debridement. Surgical removal of infected tissue, wash out with Dakin's solution, instillation of cefepime powder and pneumovac with continuous negative pressure and standard black foam was placed. The wound measured abscess was found to be more involved then what the CT scan results showed, with wound measurements (17cm (length) x 7cm (width) x 5cm (depth)) incision was made resulting in removal of the infected tissue, (Figure 2).

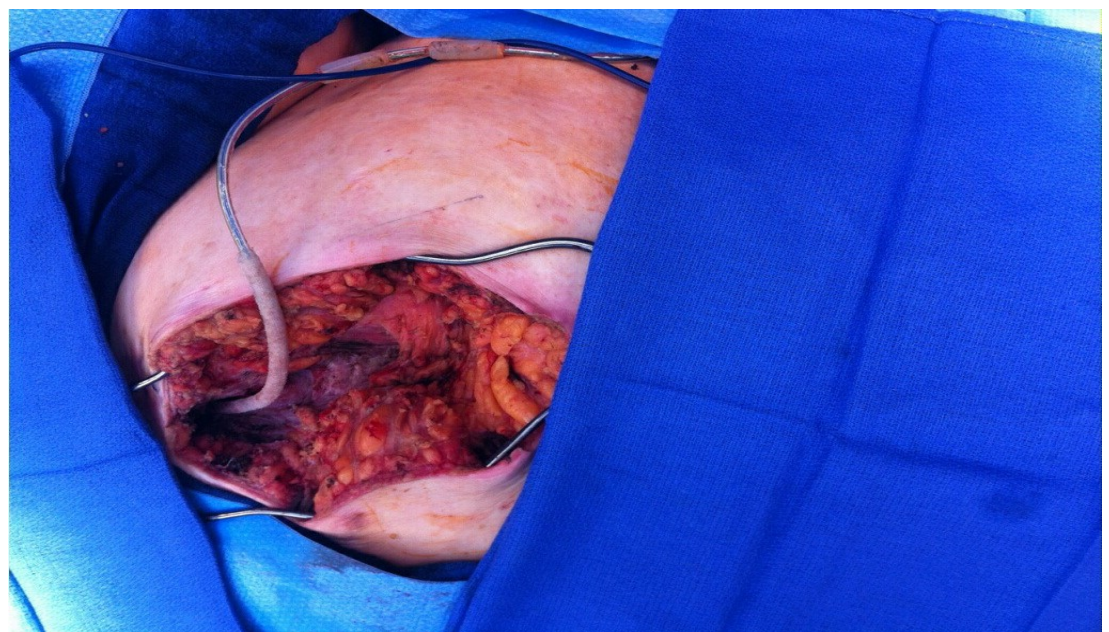




Figure 2. Wound after surgical debridement; 17x7x5 cm

During wound vac, dressing changes completed only by a trained ventricular assist devices Coordinator every 48 hours; velour of driveline was cleansed with topical Dakin's solution in addition to placing cefepime powder in wound bed.

Despite best efforts, no improvement of the wound bed occurred 26 days post debridement (Figure 3). The wound had same size, with the bed covered with purulent discharge.



Figure 3. Wound in 26 days after surgical debridement, on intravenous antibiotics. Size 16x6x4 cm.

VeraFlo negative pressure wound therapy with infusion was initiated on day 26 post-debridement in which we utilized normal saline instillation into the wound bed. The VeraFlo dressing was changed every 48 hours. The first VeraFlo dressing change prompted the team to switch the saline instillation to Dakin's Infusion (65ml Infusion of Dakin's solution with 10 minutes dwell time every 3.5 hours). Prior to the dressing change, the wound bed was re-cultured and revealed a multi-drug resistant pseudomonas. Antibiotics were switched given sensitivities now best treated with intravenous ciprofloxacin.

Within three days of changing to Dakin's instillation, the wound showed signs of improvement as evidenced by increased granulation, lack of purulent drainage, improving size. VeraFlo therapy was utilized for a total of seven dressing changes with 14 days of Dakin's instillation. Patient was then able to be transitioned back to the standard pneumovac. Patient was able to be discharged home with home health nurse and pneumovac therapy in addition to Prisma AG collagen product being placed in wound bed. When comparing the wound



measurements from day 1 post debridement to day 34, initiation of VeraFlo therapy with Dakin's solution revealed the most improvement (Figure 4).



Figure 4 A. Day 6 on Dakin's solution. Size 14.8 x5.8 x 4 cm



Figure 4 B. Day 10 on Dakin's solution. Size 14 x5.8 x 3.8 cm



Figure 4 C. Day 16 on Dakin's solution. Size 14 x 4.6 x 3.5 cm



Figure 4 D. Day 25 on Dakin's solution. Size 14 x 4 x 3 cm



Figure 4 E. Day 2 after discharge. Size 14 x 4 x 2.5 cm



Figure 4 F. Day 15 after discharge. Size 13 x 2.5 x 1.5 cm



Figure 4G. Day 20 after discharge. Size 11 x 1.5x 1cm

Discussion

Until LVADs become fully implantable, the driveline infection will continue to be one of the most common sources of morbidity and mortality in this patient population (6).

Recurrent driveline trauma, tension on the wound edge, and localized hematoma of the pump pocket have been factors in which predispose patients to bacterial colonization and subsequent infection (11-14).

Dakin's solution consists of diluted sodium hypochlorite; i.e. household bleach which has broad antimicrobial activity (15). Dakin was first used as a topical antiseptic during World War I (16). Currently, Dakin's solution is available commercially at full strength (0.5%), half strength (0.25%), quarter strength (0.125%) and 1/40 strength (0.0125%)

Vacuum assisted closure has been used frequently in the context of negative pressure wound therapy, which involves automated wound cleansing and removal of infectious materials. VeraFlo negative pressure wound therapy integrates standard pneumovac with infusion of solution at a timed and intermittent delivery (17). Gabriel et al. reported "a significant decrease in the meantime to bioburden reduction, wound closure, and hospital discharge" when using negative pressure wound with infusion (18).

Previously, Raad et al. applied this therapy with Dakin's instillation to five patients with venous stasis ulcers greater than 200 cm². Two of those patients had multi drug resistant pseudomonas aeruginosa as the causative organism. All patients



in this study had complete wound healing at one year (19). Our case is the first to report the use of this therapy in patient with LVAD and driveline related infection.

In this case, multiple modalities were utilized including intravenous antibiotics (cefepime and meropenem), oral antibiotic (ciprofloxacin), surgical debridement, topical cefepime powder with standard negative pressure wound therapy, and pneumovac therapy with saline instillation. All failed to improve the wound bed. Utilization of Dakin's solution showed to be effective in treating large multi drug resistant pseudomonas aeruginosa infected wound as discussed earlier. Our case supports the utilization of this therapy in LVAD-related infections.

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