Vacuum assisted closure of an exposed prosthetic femoral graft

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ABSTRACT
The multiple co-morbidities present in vascular surgery patients predispose them to surgical site infections, poor wound healing, and prosthetic graft exposure. We report our experience with a patient who underwent an emergent femoral-to-femoral bypass and developed an infection at bilateral groin incisions resulting in wound separation and prosthetic vascular graft exposure. This was successfully treated with Negative Pressure Wound Therapy (NPWT) using the Vacuum-Assisted Closure system (V.A.C., Kinetic Concepts Inc., San Antonio, Texas, USA). This is a case in which NPWT was used to treat a groin wound with an exposed vascular prosthetic graft thereby eliminating the need for additional surgical flap coverage procedures and ultimately resulting in a completely healed wound.


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INTRODUCTION
The multiple co-morbidities present in vascular surgery patients predispose them to surgical site infections, poor wound healing, and prosthetic graft exposure. These complications create significant physiological and psychological setbacks for patients in the midst of recovering from vascular bypass surgery. Managing surgical site infections nonoperatively allows patients to progress toward recovery without the delays imposed by additional surgery. This is especially true for vascular bypass patients in whom surgical site infection may mean a return to the operating room for an extra-anatomic bypass to treat infected vascular prosthetics. The case presented herein will demonstrate how negative pressure wound therapy can be used to manage a surgical site infection involving infected vascular prosthetic material. This patient was able to achieve a healed wound without requiring removal of the vascular prosthesis or muscle flap coverage and an excellent long-term result.

CASE REPORT
The patient is a 55-year-old gentleman who presented to the emergency department complaining of severe back pain and a cold, painful right foot. His past medical history included hypertension, coronary artery disease, and tobacco use. Computerized tomography of the abdomen and pelvis indicated an aortic dissection. A subsequent angiogram was performed which revealed a Type B aortic dissection extending down to the aortic bifurcation with occlusion of the right common iliac artery. He subsequently underwent an emergency left-to-right femoral-to-femoral bypass with an 8-mm Dacron Hemoshiel (Boston Scientific Inc., Natick, MA, USA) graft. Standard vertical groin incisions were utilized. The incisions were closed with interrupted 2-0 Polyglycolic Acid suture in two layers. The skin was approximated with staples.

Post-operatively, the patient did well with normal perfusion of the right leg. On postoperative day 9, the left groin incision began to separate at its superior aspect. The deep tissues remained intact and there was no exposure of the graft at this time. Wound cultures were obtained from the left groin incision. The culture had light growth of alpha hemolytic streptococcus. Vancomycin was started empirically and normal saline wet-to-dry dressings were initiated three times a day. Shortly thereafter, on postoperative day 11, the right groin incision separated and it too was cultured. This grew gram negative bacilli and coagulase negative staphylococcus with moderate growth. Piperacillin/Tazobactam was added to the antibiotic regimen and we began normal saline wet-to-dry dressings on the right side as well. On postoperative day 14 it became apparent that both groin wounds had exposed prosthetic graft (Figure 1). The graft remained patent with good pulses distally. There was no overt evidence of systemic infection. A plastic surgery consultation was obtained and it was recommended to continue with conservative wound care. On postoperative day 20, the NPWT system was placed on both groin wounds. A vaseline gauze dressing was placed over the graft followed by the NPWT sponges (Figure 2). The NPWT system was set on continuous suction at -125 mmHg and dressings were changed every 48 hours. The Vancomycin and Piperacillin/Tazobactam were discontinued and the patient was placed on levofloxacin for 3 weeks. Clinically, the patient continued to improve and remained afebrile with minimal serosanguineous drainage from the wounds, which continued to demonstrate progressive development of healthy granulation tissue over the grafts. On postoperative day 39, the wounds were minimal in size and showed complete graft coverage. At this point, the patient was discharged from the rehabilitation facility with the NPWT system in place to be re-evaluated in both the vascular and plastic surgery clinics as an outpatient. The NPWT system was discontinued on postoperative day 48. The wounds demonstrated complete closure by postoperative day 55 (Figure 3). The patient’s wounds remain healed and his vascular exam remains stable with biphasic Doppler signals at the dorsalis pedis and posterior tibial arteries bilaterally nine weeks following the bypass surgery.

DISCUSSION
Patients requiring vascular bypass grafting operations have multiple disease processes inherent to the nature of their peripheral vascular disease. Risk factors such as advanced age, immunosuppression, diabetes mellitus, obesity, and emergency surgery place them at an increased risk for complications,
specifically surgical site infection. The incidence of prosthetic vascular graft infection has been estimated to be between one and six percent depending on the position of the graft. The anatomic locations with the highest rate of infection are the inguinal and lower extremity incisions in patients undergoing bypass procedures for femoropopliteal or tibial occlusion. In inguinal incisions, both groin-crease contamination and disruption of inguinal lymphatics during surgical dissection lead to an increased rate of infection.

The management options for exposed prosthetic grafts include an attempt at graft preservation, graft removal with in situ graft replacement, or graft removal with extra-anatomic bypass. Individual factors such as degree of infection, underlying arterial disease, general health, and medical co-morbidities must be used to guide clinical judgment in determining the best management strategy. For the current patient, the decision was made to treat with the NPWT system to avoid the need for further surgery, allow his rehabilitation to continue on schedule, and reduce his overall length of stay. Surgical treatment with bilateral muscle flap coverage of the exposed prostheses would have imposed a significant physiological and psychological burden on an already debilitated patient. Since there were no plans to remove the exposed vascular prostheses, it was imperative to have muscle flaps available in the future should the patient present with a delayed graft infection.

Negative Pressure Wound Therapy (NPWT) has been available since 1995 when the Vacuum Assisted Closure (V.A.C) device became available. This was the only NPWT device on the market until recently when several other systems have become available including the Versatile 1 (BlueSky Medical Group Inc., Carlsbad, CA, USA) and the Exsuxex (The Medical Company Ltd, UK) systems. These NPWT systems increase the speed of wound healing through a variety of mechanisms and they have revolutionized the management of wounds.

Negative Pressure Wound Therapy has been previously used to treat infected groin wounds, but rarely as the sole method of management to achieve a closed wound with an exposed prosthetic vascular graft. Several other reports in the literature have utilized NPWT for exposed vascular grafts, but only after additional reconstructive procedures ranging from muscle flaps to local skin flaps were performed to cover the graft. There has been one other published case series of four patients with exposed and infected vascular prostheses treated with NPWT without muscle flap coverage. The authors reported that the average time to complete closure was 48 days with no evidence of late graft infection. Thus, our findings are similar to those previously published in the literature.

The benefit of NPWT as an adjunct for wound treatment is the ability to increase wound closure rates, thereby reducing the number of days to healing and wound coverage. A study comparing the duration of wound closure with saline-moistened gauze and a NPWT system showed a benefit of approximately twenty days in the NPWT group. Another intriguing aspect of the findings reported by us as well as others suggests that NPWT can be used effectively in the face of possible vascular prosthetic infection to salvage the bypass procedure and avoid extra-anatomic bypass. We did not use an antimicrobial interface (e.g. silver-containing dressing) between the NPWT sponge and the graft and still managed to obtain a healed wound without late graft infection. Adjunctive silver therapy is commonly used with NPWT and could easily be included in the management of these problems. NPWT represents an important new option for the management of this type of complication.

**CONCLUSIONS**

Negative pressure wound therapy has revolutionized the management of wounds and it is therefore being applied to a variety of wounds with increasing complexity. This report illustrates a specific case in which negative pressure wound therapy was used to treat a groin wound with an exposed prosthetic vascular graft in which the vascular anastomosis was not exposed. The wound healed secondarily in a timely fashion without the need for additional surgical procedures such as repeat debridement or flap coverage. This case illustrates the utility of negative pressure wound therapy and its continuing emergence as an excellent therapeutic modality for a wide variety
of complex wounds. It also demonstrates a need for further prospective evaluation of NPWT and its role in the treatment of wounds with exposed prosthetic vascular grafts, as most available clinical information is based only on individual case reports.

Figure 3. Healed bilateral groin incisions following VAC therapy.

REFERENCES