

Supplement 2

Prophylaxis and Wound Dressing

Optimal antimicrobial prophylaxis at the time of LVAD implantation remains unclear, with significant variation in type and spectrum of antimicrobial agents used at various institutions. In a review of 10 studies by Acharya et al¹ evaluating antimicrobial prophylaxis for patients undergoing LVAD implantation (both continuous and pulsatile flow), a β -lactam antibiotic was favored (vancomycin in areas where a higher risk of methicillin-resistant *Staphylococcus aureus* [MRSA] existed), in combination with topical mupirocin ointment and a systemic antifungal agent. However, this study also concluded that there was significant heterogeneity among the studies, limiting the generalizability of the conclusions. Moreover, the Acharya et al study¹ only included 2 studies of continuous flow devices.^{2,3}

Other centers used a variety of methods in an attempt to decrease the risk of infection. An Italian study reported the use of a chlorhexidine-impregnated disc and stat-lock for preventing infection. There were no infections reported, but only 6 patients were included in the study. Another small study found a benefit of using a silver-impregnated dressing and locking device.⁴ Eleuteri et al⁵ found that infection rates were significantly reduced after they developed (and used) 2 new types of driveline securement and trained staff and family to recognize and grade infections. Hozayen et al⁶ evaluated a foam-based dressing versus a gauze-based dressing to prevent infection. The foam dressing was noninferior but was associated with greater caregiver satisfaction.

Stulak et al⁷ retrospectively reviewed the experience of 2 institutions: 1 institution's protocol called for chlorhexidine (Hibiclens) application, and routine perioperative antibiotics; the other institution used perioperative antibiotics, sterile dressing changes, and continued prophylactic antibiotics. Overall, there were no significant benefits in the continued prophylactic antibiotic group, with 18% of patients developing driveline infections compared with 13% of patients without continued antibiotics. Likewise, serious infections requiring device removal occurred on 7 occasions in the continued-antibiotic group compared with none in the group

without continued antibiotics. The authors concluded that strategies other than prophylactic antibiotics were more important in preventing driveline infections.

A 2015 study by Tsiouris et al⁸ reported that their program did not have any driveline infections in a 2-year period, which they attributed, in part, to their prophylaxis protocol: vancomycin, cefepime, rifampin, and fluconazole given immediately preoperatively, and the same regimen given postoperatively for 2 days. For penicillin-allergic patients, aztreonam was substituted for cefepime. They used an Acticoat 3 dressing with silver (releases silver during a 3-day period), which was applied to the driveline in the operating room. The dressing was changed for the first time on postoperative day 3 and every 3 days thereafter, including after the patient was discharged. When the dressing was removed and before another dressing was applied, the driveline area was washed with chlorhexidine and sterile water (9). It seems unlikely that choice of preoperative and postoperative prophylaxis would impact long-term risk of driveline infection and more likely that the dressing protocol had more influence on prevention of driveline infection.

Wus et al⁹ used a preoperative regimen of cefazolin (vancomycin or clindamycin if the patient was allergic to penicillin or had MRSA) or vancomycin, rifampin, gentamicin, and fluconazole. No LVAD infections were observed. In this study, dressing changes varied from daily to weekly, without any impact on rates of driveline infection.

Recently published practice guidelines for antimicrobial prophylaxis in surgery acknowledge the limited body of literature regarding the optimal regimen to prevent surgical infections in patients who receive LVADs.¹⁰ These guidelines advocate that clinicians should modify their surgical infection protocols for LVAD implantation on the basis of the individual institution's pathogen prevalence and antimicrobial resistance patterns. In general, use of a β -lactam agent (such as cefazolin) was recommended for perioperative prophylaxis for LVAD implantation.¹⁰ Vancomycin or clindamycin were recommended as acceptable alternatives for patients with a history of allergic reactions to β -lactam agents. Routine use of vancomycin as a first-line agent was not recommended. For patients with known MRSA colonization, guidelines

suggest that it is reasonable to add a single dose of vancomycin to the first-line recommended agent. However, if MRSA colonization status is unknown, vancomycin may be added for high-risk patients (eg, recent hospitalization, nursing-home resident, hemodialysis).

The incidence of infection for various approaches to tunneling the driveline varied. Authors of 1 study concluded that keeping the entire velour portion of the driveline below the skin was associated with fewer driveline infections¹¹. Others showed similar results, with additional benefit if the exposed portion of driveline was made of silicone.¹² Double tunneling was associated with a lower risk in 2 studies^{13,14} but not in another study.¹⁵ A retrospective study on débridement techniques for driveline infections found that the combination of driveline relocation into the rectus muscle, velour removal, and wound vacuum therapy had better outcomes, but the difference was not great enough to reach statistical significance.¹⁶ A study of the Jarvik 2000 device showed that the low rates of infection seen in this device may have been related to the postauricular tunneling technique used.¹⁷ These studies suggest that the approach to tunneling impacts the risk of infection, but they do not identify a clearly superior approach to placing the driveline tunnel.

Another study showed that using a temporary, external anchoring suture after implantation was a risk factor for driveline infection, although this was not statistically significant after adjusting for age, BMI, diabetes mellitus, and device type.¹⁸

Delayed sternal closure was not associated with an increased risk of driveline infection.¹⁹

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