Prevention of Left Ventricular Assist Device Driveline Infections
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Introduction
Despite advances in healthcare and medicine, heart failure occurs in 6-10% of individuals over 65 and is the leading cause of death and hospitalization in western countries. Although approximately 4,000 heart failure patients receive transplants every year, the demand for a donor heart far exceeds the supply. For individuals with severe heart failure, Ventricular Assist Devices (VADs) are a temporary or permanent intervention that can improve quality of life and reduce mortality as a bridge to transplant, bridge to recovery, or destination therapy. One major complication of VAD implantation is infection at the driveline site or pump pocket, which ultimately can lead to bacteremia, sepsis, or endocarditis.

According to the articles surveyed, infections occur in 18-59% of VAD patients. Although the range is wide and the results may vary due to a number of factors, the importance of preventing infection in VAD patients is critical to reducing complications, decreasing morbidity, and mortality, and reducing costs for patients and hospitals. Once an infection develops they are extremely difficult to control.

Driveline infections can be separated into two categories, early onset and late onset. Late onset is defined as an infection that occurs more than 30 days after implantation and is the most common of driveline infections.

An infection is currently identified when there is erythema and purulent drainage at the driveline site and a positive culture test. After one year of therapy it is highly unlikely that a patient will not have a driveline infection, giving permanent implantation the most risks for complication.

Methods
A search of evidence based articles was done using the search engines Google Scholar and EBSCO host. Search terms used were “driveline infection”, “LVAD”, and “ventricular assistive device.” The search did not produce many results and therefore date of publication was not a deciding factor of relevance. A total number of six articles were chosen and read thoroughly, and five were deemed applicable to our approach at the given subject.

Implementation
According to the article, “Late onset Driveline Infections: The Achilles’ Heel of Prolonged Left Ventricular Assist Device Support”, traumatic events that occur to the driveline site are the cause of many driveline infections. According to the methods used in this journal, it was important for the patient to wear an abdominal binder and attachment device at all times. The binder was recommended to help the patient avoid dropping the controller and battery pack, prevent moving without picking the devices up, and prevent accidents catching the devices on objects while passing by. Also, the driveline exit site, when the dressing is being changed, was done so using sterile technique. At Hershey Medical Center, our patients are not enforced to wear the abdominal binder, but the nurses performing the dressing change do indeed follow strict sterile technique. According to the research, we believe it would be beneficial for our patients to wear the abdominal binder. This would prevent the driveline from being pulled at and could reduce trauma at the driveline site which prevents late onset infections.

Another point that the same journal suggests is that axial flow or magnetically suspended flow pumps, which are for medium term support flow pumps, compared to mechanical non-pulsatile flow pumps which are used for more long term support, have significantly lower infections rates. Implementing these types of pumps would be a drastic change that may occur with time, but it is a finding that should be taken into consideration.

The article “Ventricular Assist Device-Related Infections,” suggests another prophylactic intervention that could be implemented to prevent driveline infections is an antibiotic-impregnated driveline. This particular method is not one that we are currently using. The MCSI team uses a synthetic material for the driveline; this material allows the skin to grow tightly against the line to help keep it in place and prevent trauma.

“ALH has been demonstrated effective in eradicating organisms often responsible for LVAD infections.” This is from the article, “Using Active Leptospermum Honey to Address Trascutaneous Driveline Infection.” The practice of using honey on a driveline site is still under investigation; Hershey’s MCS team has not implemented this type of treatment thus far.

Results

A common theme throughout the studies we reviewed was the recommendation for further research and the need for a common definition of “infection” that is precise to the diagnosis and treatment of each manifestation. This would allow researchers to have a clear-cut way of diagnosing an LVAD infection, whether it be percutaneous infection, bloodstream infection, sepsis, or VAD-associated endocarditis and would allow comparison of protocols among researchers to determine the best prevention and intervention.

Another important point stressed by all of the researchers was the need for meticulous surgical technique upon implantation and sterile technique postoperatively when manipulating the driveline.

All four articles also emphasized the importance of preoperative, perioperative, and postoperative prophylactic IV antibiotics.

Discussion
At the Hershey Medical Center surgeons routinely implant left ventricular assist devices into heart failure patients. The driveline infection rate for these patients is 40%. More research is required to find the true reasons as to why these infections occur. Research shows that a main cause is trauma to the driveline site. Based on these results, the Mechanical Circulatory Support team will be informed of the recommendations for their patients to wear abdominal binders along with the drain/tube attachment devices that are already in use. A questionnaire will be developed and dispersed to the patients at Hershey Medical Center to determine if trauma is the cause for their driveline infection versus other factors including inappropriate driveline dressing materials, and care, as well as non-sterile technique, or showering (which is not recommended by Hershey’s MCS team).

References