19.0% multiple pathogens vs. 3-months after CAP: 43.7% one, 25.0% multiple, and 31.3% no pathogens; p=0.43).
Conclusion: CAP is a safe and effective treatment option for DLI in VAD outpatients without further progression of infection to avoid pump exchange. Further studies are needed to evaluate this additional tool compared to usual DLI treatment.

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Prevention of Driveline Infections with Cold Atmospheric Argon Plasma: A Randomized Trial Comparing Two Surgical Techniques

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Purpose: Despite important advances in left ventricular assist device (VAD) therapy, driveline infections (DLI) remain a major unsolved drawback with negative impact on quality of life, morbidity and overall outcomes. It is conspicuous that prevention in the early phase of therapy might currently be the best treatment option for driveline infections. In this context, variation of the driveline velour position and preventive treatment with cold argon plasma (CAP) at the exit site, seem to be promising positive influencing factors. Therefore, our aim was to conduct a randomized prospective study to verify their potential utility.
Methods: Eighty consecutive VAD patients were enrolled at our center and randomized to one of four groups. Group I had their driveline diverted reaching the velour, whereas in Group II the driveline was diverted at "full length", without intracorporal loop and extensive external velour course. Both groups were divided into subgroups A and B, with subgroup B receiving additional preventive CAP therapy during 30 days after VAD implantation. Primary endpoint was defined as first positive germ proof or clinical DLI according to DESTINE stage 2 criteria. Further endpoints include mortality, heart transplantation, as well as VAD weaning. Follow-up concluded at 365 days.
Results: Preventive ACP treatment was found to be superior over optimal standard of care after 180 days, reducing DLI occurrence (92 % freedom from DLI vs 65 %). Driveline divert did not have a statistically significant impact on infection during one year follow-up. Subgroup IA (non CAP, non diverted driveline) illustrated an increased mortality compared to the other groups (75 % survival in Group I versus 90 % in Group II (p=0.009)).
Conclusion: Preventive ACP treatment after VAD implantation significantly reduced the incidence of DLI in the first 180 days. Driveline placement with fully covered velour did not influence the occurrence of DLI, but was associated with increased mortality. Further trials are needed to abrogate confounding factors and to further improve freedom from DLI, but also survival in VAD patients in the future.

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Treatment Concept of Chronic Ventricular Assist Device Driveline Infections with Vacuum Assisted Closure Therapy as Bridge to Transplant Strategy

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Purpose: Driveline infections (DLIs) remain one of the severe long-term complications after ventricular assist device (VAD) implantation. Chronic DLIs often involve microbes which have become resistant to common antibiotics and are difficult to eradicate. Localized DLIs can deteriorate into systemic infections and become a potentially fatal complication as device-explanation is often not a suitable therapeutic strategy. Furthermore, VAD patients with deep DLIs show inferior outcome after heart transplantation (OHT). We hypothesized that abscess drainage and infection control by vacuum assisted closure (VAC) therapy improves the patient's clinical condition before OHT and results in better outcomes.
Methods: At our center we developed a treatment concept for the management of chronic DLIs with continuous VAC therapy until OHT. After initial evaluation of the extend of the infection, cases are discussed at our multidisciplinary endocarditis boards including experts from heart surgery, cardiology, infectiology and pharmacology. For each patient an individual treatment plan involving antibiotics, surgical wound debridement and potential benefit of VAC therapy is developed.
Results: 175 patients have undergone OHT at our center between 2010 and 2022, including 49 patients (28%) with ischemic cardiomyopathy. The mean age was 50±11 years and 127 patients (72.6%) were male. 52 patients (29.7%) were bridged by a VAD. 7 patients (4.0%) had prior temporary mechanical circulatory support (MCS) and 116 patients (66.3 %) have not received any MCS before OHT. 27 VAD patients (51.9%) were listed in high urgency status due to DLIs. Since 2019, 6 patients (22.2%) have successfully been treated with VAC therapy and weekly wound debridement over a period of 5-22 weeks until OHT. 30-day survival was 100% in patients with VAC therapy and 85.7% in patients without VAC therapy. All wounds have been closed at time of OHT without any signs of recurrence of infections during first year post-transplant.
Conclusion: The management of chronic DLIs in VAD patients with VAC therapy as bridge to transplant strategy is a safe and feasible treatment concept. In patients with extensive DLIs a VAC therapy seemed to be beneficial for short-term survival and may increase long-term outcome. Further studies have to prove the benefit of this concept in larger cohorts.

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Silverlon: A Weapon Against Driveline Infections in Lvad Patients

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Purpose: Heart disease is the leading cause of death in the western world. Approximately five million people in the United States have congestive heart failure (CHF), with two hundred fifty thousand of those people in the most advanced stages of CHF. Left ventricular assist devices (LVAD) are currently the state-of-the-art treatment for patients with end stage cardiac failure who are not a candidate for heart transplant. LVADs are powered by external power sources that connect to the pump via a percutaneous lead (driveline). The driveline exits the body typically from the right upper quadrant, creating a chronic wound that renders that site prone to infection. Infectious complications are a leading cause of mortality in the LVAD patient population. The driveline site is often the entry point of infection which can lead to blood stream and pump pocket infections. LVAD driveline infection rates, on average, are around 13%. At Lehigh Valley Hospital, our infection rate from 2013-2020 was 19%.
Methods: In November of 2020, the LVAD program here at Lehigh Valley Hospital placed Silverlon patches in all dressing kits for all newly implanted LVAD patients. The addition of Silverlon was the only intervention done to the driveline dressing kits. We then followed the data and

compared our driveline infection rate pre SIlverlon with the patients that were started on Silverlon right from implant.

Results: From November 2020-September 2022, the driveline infection rate went from 19% to 0%. This innovative plan of care has allowed our team to implement a simple cost-effective method to decrease infectious complications and improve patient outcomes. A secondary finding was a decrease in the readmission rates. In 2021, 30% of all readmissions were directly related to driveline site infections. So far in 2022, we have had "0" readmissions related to driveline site infections. This is a 100% reduction in readmissions related to driveline site infections. This decreased our total readmissions by 34%.

Conclusion: Based on the results of our "best practice" change, a treatment regime involving the use of Silverlon on drivelines has demonstrated significant reduction of driveline related bloodstream and pocket infections, as well as decreased readmissions.

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Bye-Bye Biopsy? Comparing Short and Long-Term Outcomes after Adopting Early Non-Invasive Rejection Surveillance

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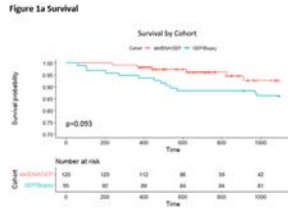
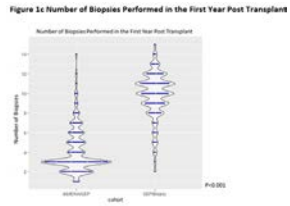
Purpose: Non-invasive rejection surveillance with donor-derived cell free DNA (ddcfDNA) can start within four weeks after heart transplant (HT) and then can be paired with gene-expression profiling (GEP) at 55 days. We sought to assess the impact of the early introduction of ddcfDNA and later paired with GEP as compared to a strategy of GEP testing alone on the number of endomyocardial biopsies and clinical outcomes at three years.

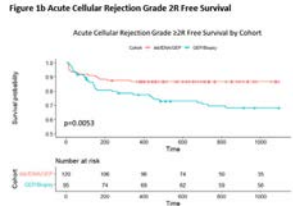
Methods: A retrospective analysis of 215 adult heart transplants at single institution. Patients with multi-organ transplants, death prior to 55 days or followed long-term at another center were excluded. The GEP/biopsy cohort (01/2015-12/2017) started GEP as early as two months post-HT. The paired ddcfDNA/GEP cohort (07/2018-08/2021) started ddcfDNA surveillance as early as 28 days post HT and added GEP as early as 55 days post HT. Primary outcomes were survival and acute cellular rejection (ACR) ISHLT grade 2R or greater free survival up to 3-years post HTx, ejection fraction (EF) 1 year post HTx and total number of EMBx performed in the first year post HTx.

Results: Baseline characteristics were similar between cohorts. Survival between cohorts was similar within the first 3 years post HT (p=0.093), Figure 1a. ACR free survival in the first 3 years post HT was greater in the ddcfDNA/GEP cohort (86.7%) as compared to the GEP/Biopsy cohort (69.5%) (p=0.0053), Figure 1b. There was no observed difference in mean EF at one year post transplant between ddcfDNA/GEP (60%) compared to GEP/biopsy (59%), p=0.73. The ddcfDNA/GEP cohort received a median of 3 [3-5] EMBx in the first year post transplant, significantly fewer than the median number of biopsies in the GEP/Biopsy cohort 10 [9-11] (p<0.001), Figure 1c.

Conclusion: A strategy of the early introduction of surveillance with ddcfDNA, later paired with GEP, as compared to GEP testing alone, results in similar survival and ejection fraction while being associated with significantly fewer biopsies and decreased rates of ACR.







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Isolated Microvascular Cardiac Allograft Vasculopathy is Associated with an Increased Risk of Death or Retransplantation

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Purpose: Cardiac allograft vasculopathy (CAV) is a major cause of morbidity and mortality following heart transplantation (HT). CAV results in impaired blood flow in the epicardial coronaries and microvasculature. Reduction in myocardial blood flow reserve (MBFR) by cardiac PET has been associated with adverse post-HT events. This study sought to investigate the prognostic implication of isolated microvascular CAV.

Methods: Consecutive adult HT recipients who underwent cardiac N13 ammonia PET for assessment of CAV from 2016-2019 were included. Primary outcome was death or retransplant. Patients were classified into 2 groups according to MBFR >2 or ≤2. Microvascular CAV was defined as an MBFR≤2 without epicardial CAV on PET (SDS<2) or angiography (ISHLT CAV 0). Mixed CAV had both ischemia on PET (SDS≥2) or angiography (ISHLT CAV 1+) and MBFR≤2.

Results: 465 patients were included, with median age of 61 years, median time from transplant of 7.8 years, and 26.2% were women. 139 (29.9 %) patients had MBFR≤2, which was associated with a 3-fold increased risk of death/retransplant (HR 3.0, 95% CI 2.0-4.4, p<0.0001). Patients with reduced MBFR were further divided into microvascular (n=114) and mixed CAV (n=25). Mixed CAV was associated with 3.7 times the risk of death/retransplant (95% CI 2.1-6.6, p<0.0001). Microvascular CAV (PET or angiography definition) more than doubled the risk of death/retransplant (HR 2.1, 95% CI 1.4-3.2, p<0.0001; HR 2.1, 95% CI 1.3-3.2, p=0.001, Figure 1A & B). In a multivariable model with significant univariate predictors including sex, time post-HT, PSI use, statin use, ISHLT CAV 2 or 3, DM, GFR<60, prior ACR, prior AMR, and DSA, Microvascular CAV (HR 1.8, 95% CI 1.2-2.7, p=0.006) remained independently associated with an increased risk of death/retransplant.