Ventricular Assist Device Infections with *Pseudomonas aeruginosa*

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Background

- Infection is a leading cause of morbidity and mortality in ventricular assist device (VAD) recipients
- *Pseudomonas aeruginosa* (PA) is the second most common organism implicated in VAD infections, occurring in 10-50% of infections
- The epidemiology of VAD recipients with PA infection are poorly described.

Methods

- We identified patients (pts) at Northwestern Memorial Hospital with a VAD-specific PA infection from January 1, 2012 to Dec 31, 2019
- VADs included the Heartmate II, Heartmate 3, and Heartware HVAD devices
- Peri-operative surgical infection prophylaxis from January 2012 to June 2013 was vancomycin, rifampin, ciprofloxacin, and fluconazole. From July 2013 to September 2018 this changed to vancomycin and cefuroxime
- VAD-specific and VAD-related infections were characterized according to 2013 ISHLT definitions
- *Pseudomonas aeruginosa* was identified by growth of aerobic cultures on sheep blood agar plates
- Species confirmation and antimicrobial susceptibility testing was performed with the Vitek 2 platform
- Summary and comparative statistics were performed using IBM SPSS Statistics version 25.0

Table 1: Clinical characteristics of *Pseudomonas aeruginosa* VAD infections

Total Pseudomonas aeruginosa VAD infections	17 (18.7%)
Age (years)	52 (IQR 47 – 61)
BMI (kg/m^2)	30.54
Gender	
Female	7 (41.2%)
Male	10 (58.8%)
Diagnosis	
ICM	6 (35.3%)
NICM	11 (64.7%)
Indication	
BTT	8 (47.1%)
DT	9 (52.9%)
VAD Type	
Heartmate II	8 (47.1%)
Heartmate 3	2 (11.7%)
Heartware	7 (41.2%)
Time to infection (days)	295 (IQR 154 – 440)
Type of infection	
Pump	2 (11.8%)
Pocket	2 (11.8%)
Driveline exit site	15 (88.2%)
Co-infection/polymicrobial	9 (52.9%)
Multidrug resistant	7 (41.2%)
Ciprofloxacin susceptible (first isolate)	9 (52.9%)
Ciprofloxacin susceptible (last isolate)	8 (47.1%)
Cefepime susceptible (first isolate)	11 (64.7%)
Cefepime susceptible (last isolate)	8 (47.1%)
Meropenem susceptible (first isolate)	9 (52.9%)
Meropenem susceptible (last isolate)	8 (47.1%)
Treatment duration (days)	107 (IQR 55 – 183)
Outcomes	
Surg debride	5 (29.4%)
Explant for HT	5 (29.4%)
VAD exchange	3 (17.6%)
Mortality	5 (29.4%)

*IQR = interquartile range, ICM/NICM = ischemic cardiomyopathy/non ischemic cardiomyopathy, BTT = bridge to transplant, DT = destination therapy, DLES = driveline exit site

Table 1: Demographic and clinical characteristics infections secondary to Pseudomonas aeruginosa

Results

- Seventeen out of 91 (18.7%) VAD infections were due to PA
- Infections of the driveline exit site (DLES) occurred most commonly (n=15, 88.2%), followed by pocket (n=2, 11.8%) and pump (n=2, 11.8%) infections (Table 1)
- Median time to infection after VAD implantation was 295 days (IQR 154 – 440 days)
- Eight (47.1%) pt isolates were not fluoroquinolone (FQ) susceptible on initial culture at diagnosis
- Resistance to multiple antibiotic classes was observed in pts in whom serial cultures were obtained
- Median antibiotic treatment was 107 days (IQR 55 – 183 days, maximum 775 days)
- Five (29.4%) pts received FQ monotherapy on initial diagnosis, 3 (60%) of whom required change to a different class for the development of resistance
- A total of 5 (29.4%) pts went on to successful heart transplantation; one had recurrent PA infection at the prior DLES requiring prolonged antibiotics and removal of retained DL material
- All cause 1-year mortality rate was 11.7% (n = 2), both of whom died from cerebrovascular accidents

Conclusions

- VAD-specific infections with PA occurred late after device implantation and required prolonged antibiotic course
- Antimicrobial resistance was high at diagnosis and worsened in pts on prolonged therapy
- Morbidity and mortality in pts with PA VAD infections were high
- The preponderance of DLES infections warrants further study and highlights the need for improvements in DLES care and infection prevention strategies

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