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Minimum Inhibitory Concentration Changes in Relapsed Left Ventricular Assist Device Driveline Infections

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BACKGROUND

- Driveline infection (DLI) is the most common infectious complication in patients with left ventricular assist devices (LVADs) with described incidence of 9-48%
- Associated organisms most commonly include gram-positive bacteria, specifically *Staphylococcus aureus*, but gram-negative bacteria (*Pseudomonas aeruginosa* and *Enterobacteriaceae*), and fungi have been implicated
- Challenges of DLI treatment include difficulty eradicating organisms due to biofilm formation and relapsed infections with changing susceptibility patterns
- The aim of this study was to describe the epidemiology of relapsed DLIs and minimum inhibitory concentration (MIC) changes with subsequent infections

METHODS

- Study Design: retrospective, descriptive epidemiology, single-center
- Patient Identification and Inclusion: internal advanced heart failure database and INTERMACs database identified patients with infection who met criteria for DLI as defined below, LVAD implantation at Vanderbilt University Medical Center

Driveline Infection Definitions	
Driveline infection	- An infection meeting "proven," "probable," or "possible" criteria for DLI as defined by the International Society for Heart and Lung Transplant - Driveline drainage, blood, or sternal wound culture positive for bacteria - Concern for driveline infection (i.e. presence of drainage or erythema)
New	First episode of DLI with unique pathogen
Relapsed	An infection with an organism previously associated with DLI in the preceding year and similar susceptibility patterns or new resistance to an antibiotic that was utilized for treatment or suppression

- Exclusion criteria: MIC results not available
- Primary Objective: Characterization of relapsed DLI and changes in MIC
- Secondary Objective: Overall prevalence of DLI, time to DLI, associated organisms, description of antimicrobial therapy used for treatment and suppression, identification of possible risk factors for relapsed infections
- Statistics: Descriptive analysis with Fischer's exact test & Wilcoxon rank sum test were utilized with STATA 14.2 (College Station, TX)

RESULTS

Figure 1: Included Patients

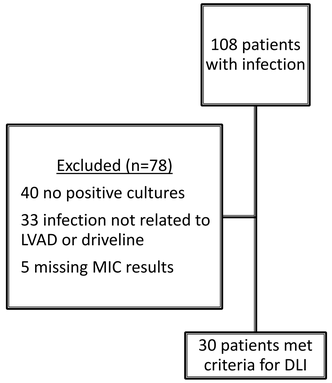
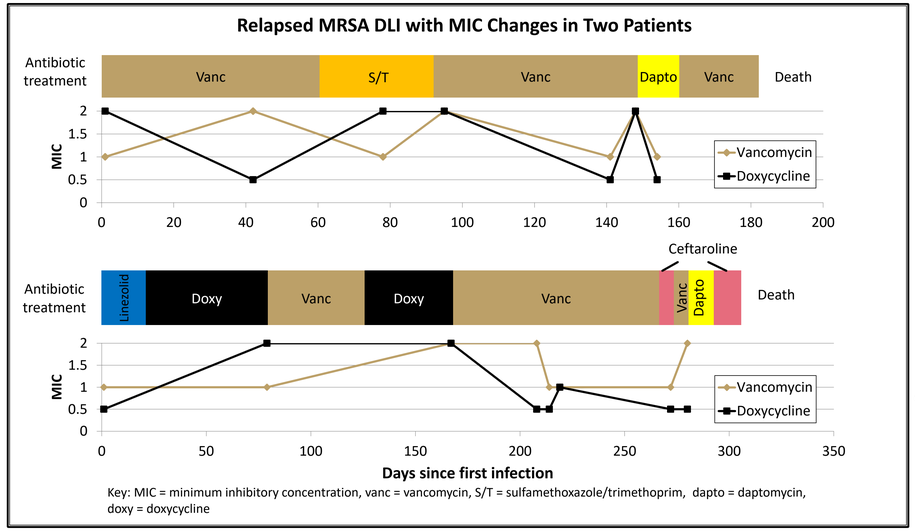


Table 1: Patient Demographics

Characteristic	N=30*
Male	22 (73)
Age, years	51 (31.8, 58.0)
Ethnicity	
White	20 (67)
Black	9 (30)
Other	1 (3)
Comorbidities	
HLD	9 (30)
HTN	15(50)
Diabetes	7 (24)
CKD	10(33)
LVAD Indication	
Bridge to transplant	15 (50)
Destination therapy	15 (50)
Duration of follow up, months	25.8 (15.75, 38.5)

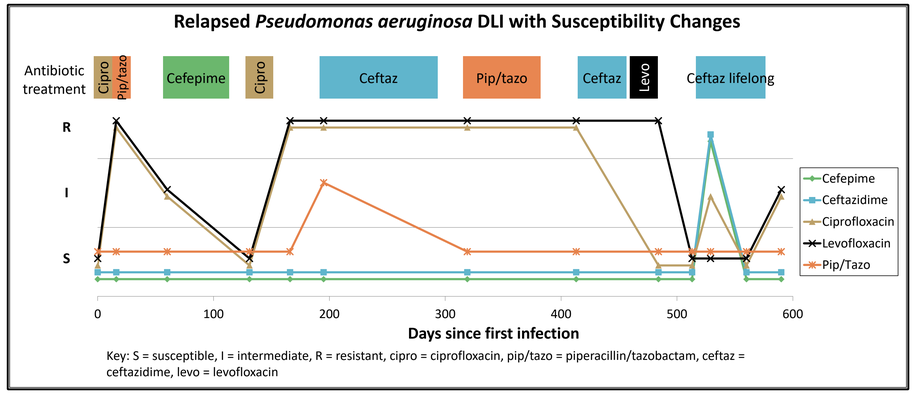
*counts (%) or median (IQR)

Relapsed MRSA DLI with MIC Changes in Two Patients



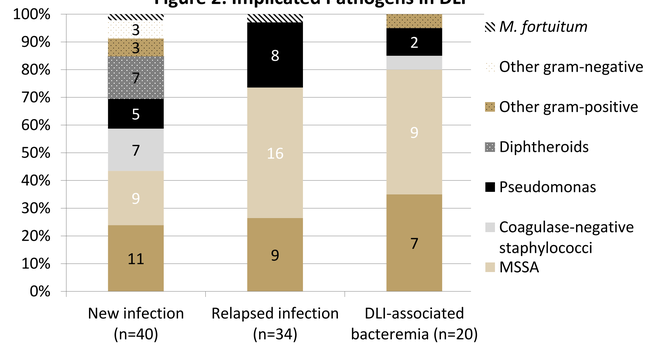
Key: MIC = minimum inhibitory concentration, vanc = vancomycin, S/T = sulfamethoxazole/trimethoprim, dapto = daptomycin, doxy = doxycycline

Relapsed *Pseudomonas aeruginosa* DLI with Susceptibility Changes



Key: S = susceptible, I = intermediate, R = resistant, cipro = ciprofloxacin, pip/tazo = piperacillin/tazobactam, ceftaz = ceftazidime, levo = levofloxacin

Figure 2: Implicated Pathogens in DLI



All lines with no number = 1, other gram-negative organisms included Proteus mirabilis, Neisseria spp., and Acinetobacter baumanii, and other gram-positive organisms included Enterococcus faecalis, group B streptococcus, and mixed gram-positive bacteria. Relapsed infection and DLI-associated bacteremia represent total occurrences, not the number of patients. M. fortuitum = Mycobacterium fortuitum

CONCLUSIONS

- MIC changes in DLI occurred in 30% of all patients with DLI. In patients with relapsed infection, incidence increased to 61%.
- MIC changes in gram-positive DLI were not predictable based on prior antimicrobial therapy, didn't seem to correlate with previous antimicrobial exposure, and never resulted in change from susceptible to resistant.
- In the 2 patients with an MIC change in a relapsed *Pseudomonas* DLI, resistance emerged upon application of antimicrobial pressure.
- Clinicians should consider obtaining a repeat culture with each new episode of DLI as past cultures may not reliably predict MIC or susceptibility, especially in *Pseudomonas* infections.

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