Evaluation of chronic antimicrobial suppression in ventricular assist device infections

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BACKGROUND

- Ventricular assist devices (VAD) prolong life expectancy or serve as a bridge to heart transplant in end stage heart failure, but patients are at high risk for device-related infections with a propensity for relapse
- Infections involving the device often require suppressive therapy due to the inability to obtain adequate source control
- Indications and efficacy of chronic antimicrobial suppression (CAS) to prevent relapse are not well defined

OBJECTIVE

To assess the agent-specific suppressive efficacy in preventing or delaying relapsed LVAD-specific and LVAD-related infections

STUDY DESIGN

Single-center, retrospective, observational study of adult patients admitted January 2013 to October 2020 at an 850-bed academic teaching hospital in Houston, Texas

Primary Endpoint
Incidence of and time to relapsed infections in patients with LVAD-specific or -related infections

Secondary Endpoints
Incidence of adverse events attributable to CAS agents

Inclusion
Age ≥ 18 years
LVAD-specific or –related infection

Exclusion
Non-LVAD-related infections

Statistics
Proportions were compared using Fisher's exact test or Chi-squared test for independence. A Mann-Whitney U test was utilized to compare time to relapse between the groups

STUDY DESIGN

Definitions

LVAD-specific infections: infections that only occur due to the presence of the device, including those affecting the pump, pump pocket, cannula, or driveline

LVAD-related infections: infections that occur more commonly in the presence of the device but may also occur in its absence, including infective endocarditis, mediastinitis, and bloodstream infections

Non-LVAD infections: infections that occur despite the presence or absence of the device, including urinary tract infections, pneumonia, *Clostridioides difficile* infection, and cholecystitis

RESULTS

Table 1. Baseline characteristics (n = 83)

Characteristic	CAS (n = 47)	No CAS (n = 36)
Sex, male, n (%)	36 (77)	27 (75)
Age at index infection, years, Median (IQR)	55 (41-65)	59 (47-66)
Race, n (%)		
Caucasian	26 (55)	19 (53)
African American	20 (43)	17 (47)
Asian	1 (2)	0 (0)
LVAD model, n (%)		
HeartMate II	19 (40)	18 (50)
HeartMate 3	4 (9)	3 (8)
HeartWare	24 (51)	15 (42)
Indication for LVAD, n (%)		
Bridge-to-transplant	20 (43)	20 (56)
Destination therapy	27 (57)	16 (44)
LVAD-specific infection, n (%)		
Driveline, superficial	28 (60)	26 (72)
Driveline, deep	10 (21)	2 (6)
Pump/pocket	2 (4)	0 (0)
Time to index infection, days, median (IQR)	294 (138-735)	411 (156-719)

RESULTS

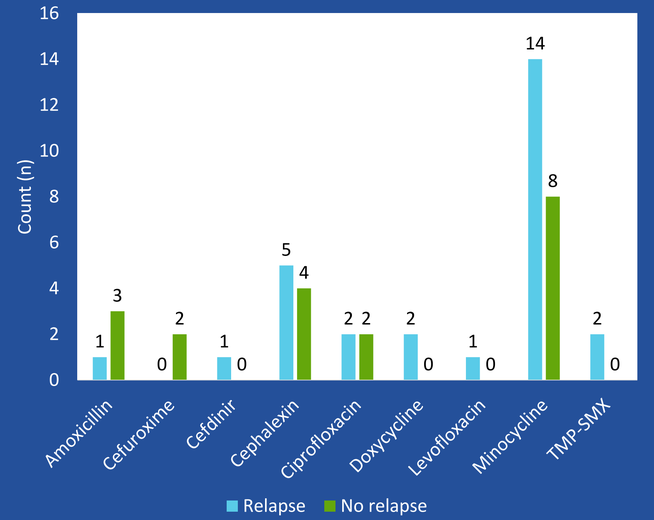
Table 2. Primary and secondary outcomes (n = 83)

Primary Outcomes	CAS (n = 47)	No CAS (n = 36)	p-value
Incidence of relapsing infection, n (%)	28 (60)	29 (81)	0.034
Time to relapse infection, days, median (IQR)	151 (78-247)	57 (36-114)	<0.001
Secondary Outcome	**CAS (n = 47)**		
Incidence of adverse events, n (%)	6 (13)		

Table 3. LVAD infection causative organisms (n = 83)

Organism	CAS (n = 47)	No CAS (n = 36)
Gram-positive, n (%)	35 (74)	23 (64)
Methicillin-susceptible *Staphylococcus aureus*	15 (43)	10 (43)
Methicillin-resistant *Staphylococcus aureus*	11 (34)	5 (22)
Coagulase-negative *Staphylococcus*	2 (6)	3 (13)
Diphtheroid	2 (6)	1 (4)
Corynebacterium spp.	1 (3)	0 (0)
Enterococcus faecalis	2 (6)	3 (13)
Group A *Streptococcus*	1 (3)	0 (0)
Viridans group *Streptococcus*	2 (6)	1 (4)
Gram-negative, n (%)	5 (11)	11 (31)
Pseudomonas aeruginosa	1 (20)	5 (45)
Enterobacter cloacae complex	1 (20)	0 (0)
Klebsiella aerogenes	1 (20)	0 (0)
Moraxella nonliquefaciens	1 (20)	0 (0)
Serratia marcescens	1 (20)	0 (0)
Proteus mirabilis	0 (0)	4 (36)
Neisseria mucosa	0 (0)	1 (9)
Klebsiella pneumoniae	0 (0)	1 (9)
Fungi, n (%)	1 (2)	0 (0)
Candida glabrata	1 (100)	0 (0)
Polymicrobial, n (%)	6 (13)	2 (6)

Figure 1. Chronic antimicrobial suppression agents utilized (n = 47)



CONCLUSIONS

- Agent-specific suppressive efficacy was unable to be assessed due to limitations in the current sample size. Further examination is needed to determine whether specific CAS agents suppress relapse infections for a longer time period
- Patients in the CAS group experienced fewer relapse infections and prolonged infection-free days when compared to those not receiving CAS
- Chronic suppression may be warranted in prolonging relapse-free time, particularly in infections caused by Gram-positive organisms
- CAS agents were well tolerated with only six patients requiring a change in agent