

Epidemiology of Initial and Recurrent Episodes of Infection in Left Ventricular Assist Device (VAD) Recipients

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Introduction

Ventricular assist devices (VADs) are life-supporting therapies used in patients with end stage cardiomyopathy. Their success is greatly limited by an incidence of infectious complications in as many as 34% of cases(1). Treatment of these infections is poorly defined and relapses are frequent despite prolonged antimicrobial therapy. A better understanding of the epidemiology of initial and relapsed episodes of infections in VAD patients is needed for proper risk stratification and management.

Methods

We conducted a single center retrospective cohort study of 158 VAD patients from 2013-2015. A first episode of VAD infection was from first report of symptoms until the time of treatment completion or until a new episode occurred. If symptoms recurred after an initial period of treatment response of at least 3 days, these were classified as another episode. If the additional episode involved same site of infection or same organism(s), the episode was classified as a relapse. If there was a new site or new organisms, these were classified as new episodes. VAD infections were categorized using the criteria by the International Society for Heart and Lung Transplantation (ISHLT). Non VAD infections were defined by the Center for Disease Control/National Healthcare Safety Network (CDC/NHSN) surveillance definitions.

Results

56.9% of the patients had at least 1 episode of infection. Of these, 65.5% were non VAD related and 34.5% were due to VAD infection. Most common site of VAD infection was superficial driveline (32.0%), followed by VAD related blood stream infection (BSI) (17.0%). 56.7% of the patients with a first VAD infection went on to develop relapses. The VAD diagnoses more commonly associated with relapse were superficial driveline infections (47.1%), VAD related mediastinitis (12.0%) and VAD related bloodstream infection (12.0%).

Table 1. Baseline characteristics of patients with none vs single vs multiple episodes of infection.

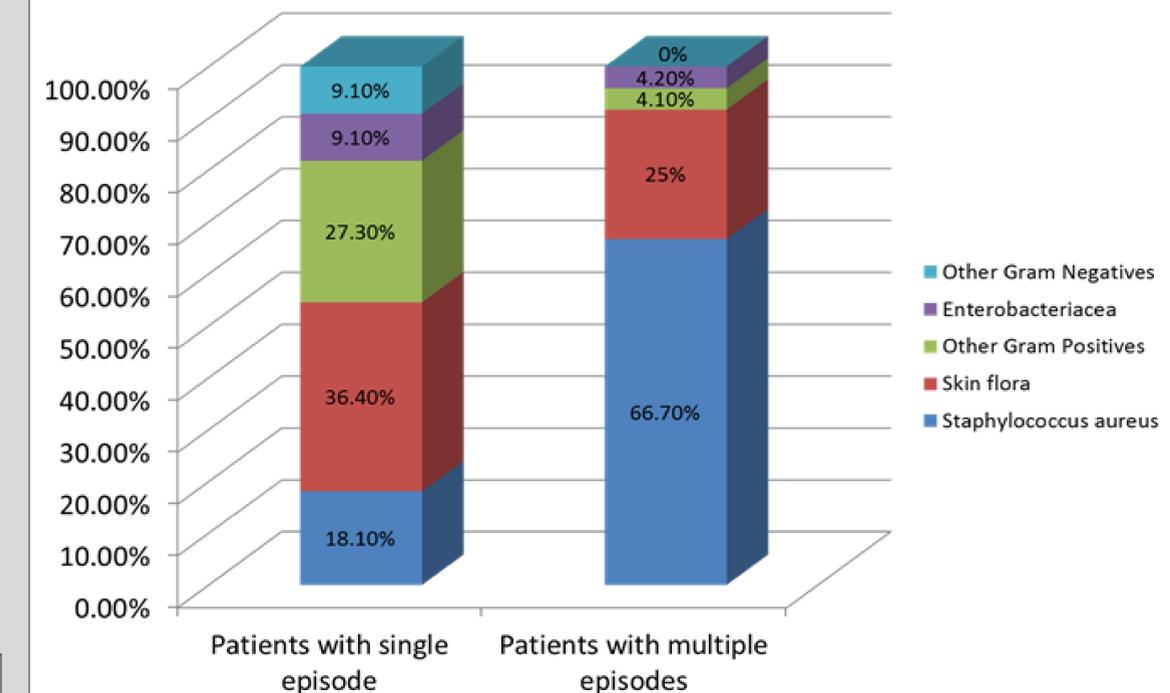
Baseline characteristics	No infection (N=68)	Single infection (N=32)	Multiple infections (N=58)
Age -Mean±SD (Range) years	58.4±10 (23-74)	60.7±9.4 (40-77)	54.3±12.4(24-76)
Male (%)	84.4	84.4	82.8
White/African American (%)	81.3 /18.8	90.6/ 6.3	82.8/17.2
BMI- Mean ± SD (Range)	29.5±5 (18-44)	30.9±6 (21-46.1)	30.6±5.7(19.6-44.4)
DM (%)	50.0	46.9	50.0
CKD (%)	40.6	68.8	51.7
Malignancy (%)	9.4	9.4	8.6
NYHA class IV (%)	96.9	96.9	93.1
INTERMACS scale (%)	I-28.1 II-62.5 III or higher-9.4	I-29 II-64.5 III or higher-6.5	I-32.8 II-58.6 III or higher-8.6
VAD type	HM II-84.4, HW-15.6	HM II-78.1, HW-21.9	HM II-74.1, HW-25.9
Surgical approach (% per approach)	Sternotomy 93.8 Mini sternotomy-6.3	Sternotomy-90.6 Mini sternotomy-6.3	Sternotomy-91.4 Mini sternotomy-8.6
DL exit site on right abdomen (%)	78.2	81.3	75.9
Total OR time- Mean ± SD (Range) in minutes	434.5±121 (277-830)	412.9±107(219-770)	430.3±110 (184-679)
CPB time in minutes – Mean ± SD	74.8 ± 39	69.1±28	89.1±49
Antibiotics for infection at time of LVAD implant (%)	21.9	15.6	28.1
VAD strategy (%)	BTT-56.3, DT 37.5, BD- 6.3	BTT-37.5, DT-53.1, BD-9.4	BTT-56.9, DT-37.9, BD-5.2
LOS on VAD implant admission	Median 36.5, IQR 22	Median 29, IQR 14	Median 39, IQR 39
Preoperative MRSA surveillance positive (%)	9.7	6.9	5.5

Abbreviations: BMI- Body mass index; DM-Diabetes mellitus; CKD- chronic kidney disease; NYHA class- New York Heart Association class; INTERMACS scale- Interagency Registry for Mechanically Assisted Circulatory Support scale; VAD- Ventricular Assist Device; HMII- Heartmate II; HW- Heartware; DL- Driveline; CPB- Cardiopulmonary bypass; MRSA- Methicillin Resistant *Staphylococcus aureus*.

Results (cont.)

For patients with a single episode of infection, the predominant organisms related to VAD infection were skin flora (36.4%) and other gram positives(27.3%). In patients with multiple episodes, VAD infection in the first episode was due to *Staphylococcus aureus* in 66.7% of cases. For relapses, predominant organisms were *Staphylococcus aureus* (36.5%), Enterobacteriaceae (22.0%) and skin flora.

Microbiology of first episode of VAD infection



Conclusions

Infections in VAD recipients are common, with very frequent relapses. The microbiology of the initial infection may be an important predictor of relapse, as VAD infections with *Staphylococcus aureus* and the Enterobacteriaceae were more frequently associated with relapse of infection.

