Predictors of Bloodstream Infections in Continuous Flow Left Ventricular Assist Device Recipients: A Single Institutional Experience of 212 Patients

Andreas Kyvernitakis,1 Orestis Pappas,2 Dimitrios Farmakiotis,5 Edward T. Horn,1 Srinivas Murali,2 Raymond L. Benza,2 Stephen H. Bailey,3 and Richa Agarwal2

1Department of Internal Medicine; Divisions of: 2Cardiovascular Disease, 3Cardiothoracic Surgery, 4Pharmacy, Allegheny Health Network, Pittsburgh, PA; 5Division of Infectious Diseases, Rhode Island Hospital, Warren Alpert Medical School of Brown University, Providence, RI.

Introduction

Bloodstream infections (BSIs) are a challenging complication for left ventricular assist device (LVAD) recipients and a significant cause of morbidity and mortality. Up to 60% of LVAD recipients suffer from BSIs related to the LVAD. BSIs are particularly difficult to treat in this population due to high rates of device seeding, and persistent bacteremia often requiring urgent transplantation.

Patients and Methods

Patients who underwent continuous-flow LVAD implantation at Allegheny General Hospital from 1/2006 to 7/2016 were retrospectively reviewed.

Those hospitalized for BSI were further analyzed for this study.

Multivariate logistic and Cox (with time-varying parameters) regression were implemented to identify factors associated with BSI and investigate the impact of BSI on mortality and time-to-transplantation.

Results

A total of 212 patients underwent continuous-flow LVAD implantation during the study period (Table 1). Median time on LVAD support was 257 days (range 8–2202).

Driveline infection (DLI) affected 31%, with 19% having deep-tissue involvement.

The majority of BSIs were caused by Gram positive bacteria (56%); Staphylococcus aureus was the most common organism.

Pseudomonas aeruginosa was the most common Gram negative organism.

In 36 (68%) of 53 BSIs with concurrent culture data available from the driveline, the same organism was isolated. Median time to first BSI was 108 (range, 1–1965) days.

Age, median (range) 60 (25–80)

Characteristic Number (%) BSI No BSI P OR 95% CI P

Device

HeartMate II 59 (35) 111 (65) 0.02 1.0 0.98–1.1 0.48

HeartWare 1 (17) 39 (63) 0.7 0.3 0.2–2.9 0.55

ISCAMIC 1–3 11 (23) 99 (77) 1.0 1.0 0.7–1.4 1.0

Right Heart Failure 3 (6) 55 (94) 0.04 1.0 0.5–2.0 0.95

Underlying cardiomyopathy 45 (21) 88 (79) 1.0 1.0 0.8–1.4 1.0

INTERMACS 1–3 23 (52) 22 (48) 0.004 2.2 1.0–4.6 0.04

HIV with events 1 (21) 4 (79) 0.04 1.0 0.5–2.0 0.95

Table 1. Characteristics of 212 patients who underwent LVAD implantation

Results (Continued)

Continuous-flow LVAD recipients frequently suffer from BSIs, which lead to prolonged hospitalization and increased mortality. BSIs increase mortality in BTT patients despite the resultant upgrade in listing status and expedited time to transplantation.

DT, right heart failure, higher INTERMACS profile, morbid obesity, and deep driveline infection are independent predictors for BSI development.

BSI should be regarded as a serious complication, similar to pump thrombosis and stroke.

Conclusion

Independent predictors of mortality included age (OR, 1.05 for every year; 95% CI, 1.0–1.1; P=0.03), DT (OR, 3.3; 95% CI, 1.3–8.4; P=0.01), BSI (OR, 6.0; 95% CI, 2.3–15.6; P<0.001), pump thrombosis OR, 4.2; 95% CI, 1.2–14.8; P=0.03), and cerebrovascular accident (OR, 4.9; 95% CI, 1.4–16.0; P=0.01). As a time-varying parameter, BSI was still associated with increased mortality (HR, 8.5; 95% CI, 5.0–14.4; P<0.001).

BTT patients were more likely to receive transplant if they did not have BSIs (75% vs. 56%; P<0.05). Among 104 BTT patients who ultimately received heart transplantation, BSI was associated with shorter time-to-transplantation (HR, 2.0; 95% CI, 1.2–3.3; P=0.009).

Contact

Andreas Kyvernitakis, MD, Allegheny Health Network, andreas.kyvernitakis@ah.org

Poster #1897

Allegheny Health Network