Bloodstream Infections in Advanced Heart Failure Patients Requiring Prolonged Use of Axillary Intra-Aortic Balloon Pumps – A Single Center Study

Diane Dreucean[1], PharmD; Kevin Donahue[1], PharmD; Celia Morton[1], PharmD; Luma Succar[1], PharmD; Jill Krisl[1], PharmD; Tanushree Agrawal[1], MD; Katherine K. Perez[1], PharmD; Taylor Jaramillo[2], PharmD; Mahwash Kassi[1], MD; Rayan Yousefzai[1], MD; Imad Hussain[1], MD; Ashrith Guha[1], MD, MPH; Ju Kim[1], MD; Arvind Bhimaraj[1], MD, MPH

[1]Houston Methodist Hospital – Houston, TX; [2]University of Houston College of Pharmacy – Houston, TX

Introduction

- Temporary mechanical circulatory support (MCS) devices, including the intra-aortic balloon pump (IABP), are a lifesaving intervention for patients with cardiogenic shock
- Axillary placement of these devices may confer benefits over femoral placement including lower risk of infection[1]
- Bloodstream infections (BSI) have been shown to reduce the likelihood of transplantation and increase mortality risk among durable LVAD patients[2-4]
- No data exists regarding the incidence or clinical impact of BSI among patients with axillary IABP devices

Methods

Design

- IRB-approved, single-center, retrospective cohort study

Inclusion criteria

- Adult patients with axillary IABP placement
- May 2016 – June 2020

Exclusion criteria

- Use of other concomitant MCS devices

Primary outcome

- Incidence of BSI during axillary IABP support

Secondary outcomes

- Assess the impact of an institutional antimicrobial prophylaxis protocol on BSI
- Describe microbial organisms isolated in patients with BSI
- Evaluate rates of BSI after reaching end destination therapy

Statistical analysis

- Bivariate analysis using Mann-Whitney U test or chi-square/Fisher's exact tests was performed for continuous and categorical data, respectively

Results

Table 1: Baseline Characteristics

Patients with axillary IABP (N=141)	BSI (n=18)	No BSI (n=123)	*p*-value
Age (yr) – median (IQR)	57 (53 – 66)	62 (53 – 66)	0.6
Male – N (%)	14 (78)	91 (74)	0.7
BMI (kg/m^2) – median (IQR)	28 (27 – 30)	27 (23 – 30)	0.2
Central line days per 100-patient days – median (IQR)	100 (75 – 117)	96 (66 – 112)	0.4
Use of TPN within 72 hours of device placement – N (%)	2 (11)	11 (9)	0.7
Previous femoral device use – N (%) Duration of femoral device use (days) – median (IQR)	12 (67) 7 (6 – 10)	57 (46) 7 (5 – 11)	0.1
Any positive cultures prior to device insertion – N (%)	1 (6)	11 (9)	1.0
Antimicrobial prophylaxis at time of insertion – N (%)	10 (56)	90 (73)	0.1
Index device exchange – N (%) Number of exchanges per individual – median (IQR)	9 (50) 2 (1 – 3)	62 (50) 2 (1 – 3)	1.0
Duration of axillary device support (days) – median (IQR)	49 (28 – 69)	26 (17 – 48)	0.04
Antibiotic days of therapy – median (IQR) Per 100-days on axillary device Per 100-inpatient days	 42 (28 – 56) 54 (40 – 59)	 18 (6 – 33) 28 (18 – 43)	 <0.01 <0.01

Table 2: Primary and Secondary Outcomes

Outcomes	All Patients (N = 141)
Primary Outcome	
Incidence of BSI – N (%) Infections per 1000-device days	18 (13) 4.3
Secondary Outcomes	
Device placement to BSI (days) – median (IQR)	19 (7-45)
Incidence of BSI after end goal – N (%)	2 (1)

Table 3: Peri-Procedural Antimicrobial Use

Regimen – N (%)	All Patients (N = 141)
None	41 (30)
Single Agent Vancomycin Beta-lactam	23 (16) 11 12
Two Agents Vancomycin + Beta-lactam Linezolid + Beta-lactam Dual beta-lactam Beta-lactam + Other	74 (52) 71 1 1 1
Three Agents Vancomycin + Dual Beta-lactam	3 (2) 3

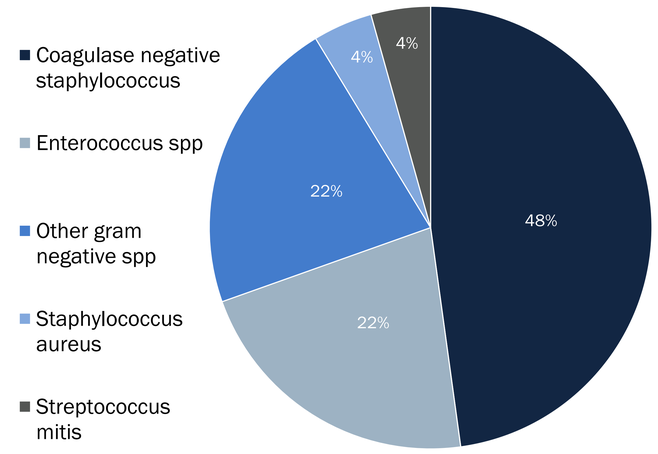
Table 4: Subgroup Analysis

Subgroup	Incidence of BSI – N (%)	*p*-value
End goal OHT (n=108) LVAD (n=15) Recovery (n=4) Decision (n=12)	 13 (12) 2 (13) 1 (25) 2 (17)	0.65
Antibiotics at time of device insertion Yes (n=100) One Agent (n=23) Two Agents (n=74) Three Agents (n=3) No (n=41)	 8 (8) 1 (4) 8 (11) 1 (33) 10 (24)	0.01
Device exchange Yes (n=71) No (n=70)	 9 (13) 9 (13)	1.0
Previous femoral device Yes (n=69) No (n=72)	 12 (17) 6 (8)	0.1

LVAD, left ventricular assist device; OHT, orthotopic heart transplant

Results Continued

Figure 1: Pathogen Distribution



Discussion & Conclusion

- Femoral device use prior to index axillary device placement may demonstrate a risk factor for the development of BSI
- Majority of pathogens causing BSI were a part of normal skin flora which has been known to be implicated with infections at vascular access sites
- BSI rate per 1000 device days in our cohort was fivefold higher than the published 2013 NHSN CLABSI rate of 0.8 infections per 1000-central line days
- Use of an institution-specific periprocedural antimicrobial prophylaxis protocol was associated with a decreased rate of BSI in this patient population
- Study limitations include lack of a matched comparator cohort of patients with femoral devices and the presence of confounding variables potentially contributing to the development of BSI

Disclosures

- All authors have nothing to disclose

References

1. Tayal R, Hirst CS, Garg A, Kapur NK. Deployment of acute mechanical circulatory support devices via the axillary artery. *Expert Rev Cardiovasc Ther.* 2019 May;17(5):353-360.
2. Gordon RJ, Weinberg AD, Pagani FD, et al. Prospective, Multicenter Study of Ventricular Assist Device Infection. *Circulation.* 2013;127:691-702.
3. Tong MZ, Smedira NG, Soltesz EG, et al. Outcomes of Heart Transplant After Left ventricular Assist Device Specific and Related Infection. *AnnThorac Surg.* 2015;11:1292-7.
4. Toda K, Yonemoto Y, Fujita T, et al. Risk analysis of bloodstream infection during long-term left ventricular assist device support. *Ann Thorac Surg.* 2012;94:1387-93.