



Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major article

A clinical practical approach to the surveillance definition of central line-associated bloodstream infection in cancer patients with mucosal barrier injury

Anne-Marie Chaftari MD *, Mary Jordan MD, Ray Hachem MD, Zanaib Al Hamal MD, Ying Jiang MS, Ammar Yousif MD, Kumait Garoge MD, Poonam Deshmukh MD, Issam Raad MD

Department of Infectious Diseases, Infection Control and Employee Health/Division of Internal Medicine, The University of Texas M.D. Anderson Cancer Center, Houston, TX

Key Words:

Central line-associated bloodstream infection
CLABSI
mucosal barrier injury
MBI
catheter-related bloodstream infection
CRBSI

Background: The Centers for Disease Control and Prevention recently introduced the concept of mucosal barrier injury (MBI) in an attempt to recognize the possibility of a gastrointestinal source for certain bloodstream infections. This could underestimate the central venous catheter (CVC) as the source of central line-associated bloodstream infection (CLABSI) in cancer. The definition of catheter-related bloodstream infection (CRBSI) by the Infectious Diseases Society of America is a more specific and stringent definition that identifies the CVC as the source of infection. In our study, we compared the 2 definitions in cancer patients.

Methods: We retrospectively reviewed 149 CLABSI cases that occurred at our center between January 2013 and March 2014 who had 2 simultaneously positive blood cultures drawn from the CVC and peripheral site or concurrent paired tip and blood cultures.

Results: Of the 149 patients with CLABSI, only 70 (47%) had definite CRBSI. CRBSI was identified more commonly in non-MBI CLABSI cases than MBI CLABSI (69% vs 18%, $P < .0001$).

Conclusions: The CRBSI definition may be more accurate in identifying the catheter as the source of bloodstream infection in patients with MBI. Because CRBSI continues to occur in patients with MBI, we caution against excluding all MBI patients from CLABSI surveillance.

© 2016 Association for Professionals in Infection Control and Epidemiology, Inc. Published by Elsevier Inc. All rights reserved.

The Centers for Disease Control and Prevention (CDC) defines central line-associated bloodstream infection (CLABSI) as bacteremia that occurs in a patient who had a central line on the date of bacteremia or the day before, and the central line must have been

in place for at least 2 days before the onset of bacteremia. In addition, the bacteremia should not be related to an infection at another site.¹

However, this National Healthcare Safety Network (NHSN) surveillance definition, although highly sensitive, may lack specificity particularly in a cancer patient population where it may overestimate the catheter as being the source of the bacteremia. To address this concern, the CDC has introduced the concept of mucosal barrier injury (MBI) laboratory-confirmed bloodstream infection (LCBI) in an attempt to recognize the possibility of a gastrointestinal source for certain bloodstream infections (BSIs) caused by intestinal organisms or viridans group streptococci when no other organisms are isolated.¹

This definition may aid in identifying a subset of bacteremia reported as CLABSI that are likely related to mucosal barrier injury with bacterial translocation from the gut, rather than the central line. This definition applies to neutropenic patients with absolute neutrophil count <500 cells/mm³ within a 7-day time period, which includes the day of the bacteremia and the 3 calendar days before

* Address correspondence to Anne-Marie Chaftari, MD, Infectious Diseases, Infection Control and Employee Health/Division of Internal Medicine, Unit 1460, The University of Texas M.D. Anderson Cancer Center, 1515 Holcombe Blvd, Houston, TX 77030.

E-mail address: achaftar@mdanderson.org (A.-M. Chaftari).

Previous Presentation: Presented in a preliminary report at the 54th Interscience Conference on Antimicrobial Agents and Chemotherapy meeting; September 5-9, 2014; Washington, DC (abstract no. K-1668).

Conflicts of Interest: None to report.

Author Contributions: A.-M.C. led the writing of the article and was responsible for interpretation of the obtained results. I.R. had the original idea for this study and together with A.-M.C. and R.H. contributed to the design of the study. M.J., Z.A.H., A.Y., K.G., and P.D. were responsible for data collection. Y.J. performed the statistical analyses. I.R. provided input to the discussion and interpretations of the obtained results. All authors provided contributions to the article and approved the final version.

and after the bacteremia. In addition, this definition applies to recipients of allogeneic hematopoietic stem cell transplant within the last year who either have grade III or IV gastrointestinal graft versus host disease or severe diarrhea (≥ 1 L diarrhea in a 24-hour period) during hospitalization for bacteremia.

The catheter-related bloodstream infection (CRBSI) definition by the Infectious Diseases Society of America is a more specific and stringent definition that requires simultaneous quantitative blood cultures (QBCs) drawn from the central line and peripheral site or differential time to positivity (DTP).^{2,3} A ≥ 3 -fold colony count growth of the same organism from the QBC collected from the central line compared with the one collected from the peripheral site or DTP, which is a pathogen growth detected at least 2 hours earlier in a blood culture drawn from a central line compared with one drawn from a peripheral site, indicates the central line to be the source of the bacteremia. Few studies have compared the CLABSI definition to paired tip and blood cultures⁴ or DTP between the central line and peripheral blood cultures⁵ and found overestimation of the rate of CLABSI. We sought to compare the CLABSI and CRBSI definitions among cancer patients using all 3 diagnostic methods suggested by the Infectious Diseases Society of America in the definition of CRBSI, including simultaneous QBCs drawn from the central line and peripheral site, DTP, and paired tip and blood cultures. We also evaluated the performance of the MBI LCBI definition in the setting of neutropenia among cancer patients.

METHODS

This retrospective observational study was conducted at the University of Texas M.D. Anderson Cancer Center, Houston, Texas. We reviewed 426 CLABSI cases by searching the infection control surveillance database and the microbiology laboratory database at our institution from January 2013–March 2014.

CLABSI and MBI LCBI were defined according to CDC definitions, and CRBSI was defined according to the Infectious Diseases Society of America definition.^{2,3} Among the 426 cases, only patients who had 2 positive simultaneous blood cultures drawn from the CVC and peripheral site or any blood culture and a quantitative catheter tip growing the same organism (using the sonication method) were selected to compare both definitions.

Pertinent data from patient's medical records were extracted, including demographic characteristics, underlying malignancies, presence of hematopoietic stem cell transplantation, presence and grade of gastrointestinal graft-versus-host disease, and neutropenia.

Approval to conduct this study was obtained from the M.D. Anderson Cancer Center Institutional Review Board. On hospital admission, written consent was given by the patients for their information to be stored in the hospital database and used for research. A waiver of informed consent for this study was obtained.

Definitions

CLABSI was defined as per the CDC criteria.³ Patients with an intravascular catheter and no apparent source for the bacteremia except the catheter were considered to have a CLABSI if they had at least 1 positive blood culture with a recognized pathogen or 2 positive blood cultures with a common skin contaminant in the presence of clinical manifestations of infection. To be able to compare the definitions, we only restricted our analysis to the patients who had positive simultaneous blood cultures drawn from the central line and peripheral site or blood culture and tip culture growing the same organism.

CRBSI was defined according to the current Infectious Diseases Society of America criteria as a BSI that fulfills 1 of the 3 criteria: (1) paired QBCs drawn simultaneously through the CVC and

peripheral vein, revealing a 3-fold greater number of colonies from the CVC than the peripherally drawn QBC; (2) DTP, where blood cultures simultaneously drawn from the CVC and peripheral vein are positive for the same organism, and the catheter-drawn blood culture turns positive at least 2 hours earlier than the peripherally drawn blood culture; or (3) the same organism is cultured from a percutaneous blood culture and from a catheter tip culture (in a semiquantitative catheter culture >15 colony forming units [CFU] per catheter segment or in quantitative catheter culture $>10^2$ CFU per catheter segment.²

Neutropenia was defined as an absolute neutrophil count <500 cells/mm³ within a 7-day time period, which included the day of the bacteremia and the 3 calendar days before and after the bacteremia.

Statistical analysis

We used the χ^2 test or Fisher exact test to compare categorical variables, as appropriate. Continuous variables were compared using the Wilcoxon rank-sum test because of the deviation of the data from a normal distribution. All tests were 2-sided, and $P \leq .05$ was considered statistically significant. Statistical analyses were performed using SAS version 9.3 (SAS Institute, Cary, NC).

RESULTS

Of the 426 CLABSI that occurred at our institution during the study period, we identified 149 patients who could be evaluated for CRBSI: 123 (83%) patients had simultaneous positive QBCs drawn from the CVC and peripheral site where a CFU ratio could be calculated, 62 (42%) patients had paired blood cultures where a DTP could be measured, and 17 (11%) patients had blood cultures with quantitative (sonication) catheter tip cultures. Thirty-nine (26%) patients had paired blood cultures where CFU ratios and DTP were both simultaneously calculated, 13 (9%) patients had concurrent paired catheter tip and QBCs, 2 (1%) patients had concurrent tip and blood culture with DTP, and 1 patient had concurrent tip culture with QBC and DTP available. Of the 149 patients with CLABSI, only 70 (47%) had definite CRBSI according to the Infectious Diseases Society of America definitions, and 63 of the 149 CLABSI patients (42%) fulfilled the criteria for MBI LCBI (Table 1). Forty-eight patients met the QBC criteria, 11 patients met the concurrent tip and

Table 1
Characteristics of patients with CLABSI, CRBSI, and MBI-LCBI

Characteristic	CLABSI (n = 149)	CRBSI (n = 70)	MBI-LCBI (n = 63)
Median age (range), y	55 (4-87)	59 (19-87)	53 (4-78)
Sex, male	90 (60.4)	38 (54.3)	43 (68.3)
Race			
White	94 (63.1)	55 (78.6)	31 (49.2)
Black	15 (10.1)	4 (5.7)	8 (12.7)
Hispanic	31 (20.8)	9 (12.9)	18 (28.6)
Others	9 (6.0)	2 (2.9)	6 (9.5)
Cancer type			
Hematologic malignancy	110/148 (74.3)	43/69 (62.3)	58 (92.1)
Solid tumor	38/148 (25.7)	26/69 (37.7)	5 (7.9)
No cancer, n	1	1	
Neutropenia	81 (54.4)	21 (30.0)	58 (92.1)
Organisms			
Gram-positive organisms	77 (51.7)	39 (55.7)	24 (38.1)
Gram-negative organisms	69 (46.3)	29 (41.4)	37 (58.7)
Candida	3 (2.0)	2 (2.9)	2 (3.2)

NOTE. Values are n (%), n/N (%), or as otherwise indicated.

CLABSI, central line-associated bloodstream infection; CRBSI, catheter-related bloodstream infection; MBI-LCBI, mucosal barrier injury laboratory-confirmed bloodstream infection.

Download English Version:

<https://daneshyari.com/en/article/5867211>

Download Persian Version:

<https://daneshyari.com/article/5867211>

[Daneshyari.com](https://daneshyari.com)