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Higher Incidence of Catheter-Related Bacteremia in Jugular Site with Tracheostomy than in Femoral Site

To the Editor—Although the incidence of central venous catheter–related infection has been the objective of many studies,[1-9] we have not found data about the incidence in which the jugular site with tracheostomy is compared with the femoral site. Some studies found a higher incidence of central venous catheter–related infection[1,2] in jugular and subclavian sites with the presence of tracheostomy than without tracheostomy. A higher incidence of central venous catheter–related infection in the femoral site than in the jugular site was found in several studies;[3-6] however, other studies found a higher incidence in the jugular than the femoral site.[7-9] However, none of these studies reported the rate of tracheostomy. The recently published guidelines "Strategies to Prevent Central Line–Associated Bloodstream Infections in Acute Care Hospitals" by the Society for Healthcare Epidemiology of America/Infectious Diseases Society of America[10] recommend avoiding femoral access; however, there are no recommendations about catheter site with regard to the presence of tracheostomy. Thus, we designed a study to determine whether the jugular site with tracheostomy may have a higher risk of catheter-related bacteremia, compared with the femoral site. This prospective observational study was performed May 1, 2000, to April 30, 2004, at the Intensive Care Unit of the University Hospital of the Canary Islands (Santa Cruz de Tenerife, Spain). The study was approved by the institutional review board.

Catheter-related bacteremia was defined according to the following criteria: positive culture result of a blood sample obtained from a peripheral vein; signs of systemic infection (eg, fever, chills, or hypotension), with no apparent source of bacteremia except a central venous catheter; and catheter-tip colonization (growth of a microorganism of more than 15 CFU from the central venous catheter tip) with the same organism as in blood culture (ie, the same species with identical antimicrobial susceptibility).

Cases of central venous catheter–related bacteremia in patients with tracheostomy were recorded if all of the following criteria were met: (1) presence of the same microorganism in a tracheal aspirate specimen (concentration, $<10^6$ CFU/mL) as in a catheter-tip specimen and in a blood specimen obtained from a peripheral vein, (2) absence of purulent tracheal aspirate, and (3) absence of a new or progressive pulmonary infiltrate on chest radiographs. Thus, bacteremia in the presence of the same microorganism in tracheal aspirate and blood cultures and in the presence of tracheobronchitis or pneumonia was considered to be secondary to the respiratory origin and not to the catheter.

Statistical analyses were performed with SPSS software, version 12.0.1 (SPSS); LogXact, version 4.1 (Cytel); and StatXact, version 5.0.3 (Cytel). Continuous variables are reported as means and standard deviations, and categorical variables are reported as frequencies and percentages. Comparisons between groups for continuous variables were performed using the Wilcoxon-Mann-Whitney test. Comparisons between groups for categorical variables were performed using the Kruskall-Wallis test for singly ordered rows × columns (R × C) tables. The comparison of the incidence of catheter-related bacteremia per 1000 catheter-days between groups was performed using the risk ratio of catheter-related bacteremia and its 95% confidence interval. P values less than .05 were considered to be statistically significant.

We diagnosed 16 cases of catheter-related bacteremia involving 208 femoral catheters during 1679 days of catheterization; the incidence of catheter-related bacteremia was 9.52 episodes per 1000 days of risk. We diagnosed 10 cases of catheter-related bacteremia involving 52 central internal jugular catheters during 462 days of catheterization; the incidence of catheter-related bacteremia was 21.64 episodes per 1000 days of risk.

There were no significant differences in the baseline characteristics of both patient groups (Table). Poisson regression

TABLE. Characteristics of Patients for Central Jugular Site with Tracheostomy versus Femoral Site

Characteristic	Central jugular site with tracheostomy (n = 52)	Femoral site (n = 208)	P
No. of days of data	462	1679	
Age, mean years ± SD	57.54 ± 15.33	57.25 ± 16.86	.65
Male sex	29 (55.8)	117 (56.2)	.99
Mean APACHE II score ± SD	14.06 ± 5.01	14.09 ± 5.08	.91
Diagnosis group			.98
Cardiology	13 (25.0)	47 (22.6)	
Respiratory	10 (19.2)	34 (16.3)	
Digestive	4 (7.7)	17 (8.2)	
Neurological	11 (21.2)	52 (25.0)	
Traumatology	13 (25.0)	52 (25.0)	
Intoxication	1 (1.9)	6 (2.9)	
Use of mechanical ventilation	38 (73.1)	161 (77.4)	.58
Use of antimicrobials	42 (80.8)	169 (81.3)	.99
Use of total parenteral nutrition	6 (11.5)	25 (11.1)	.99
Reason for catheter removal			.82
Death	6 (11.5)	27 (13.0)	
Suspicion of catheter-related infection	15 (28.8)	53 (25.5)	
Change with guidewire resulting from the need for longer catheterization	5 (9.6)	19 (9.1)	
No longer needed	25 (48.1)	104 (50.0)	
Accidental removal	1 (1.9)	5 (2.4)	
Duration of catheter use, mean days ± SD	8.44 ± 2.54	8.07 ± 3.29	.39
CRB	10 (19.2)	16 (7.7)	.02
CRB incidence, no. of CRBs per 1000 catheter-days	21.64	9.52	.04

NOTE. Data are no. (%) of patients, unless otherwise indicated. CRB, catheter-related bacteremia; SD, standard deviation.

analysis showed a higher incidence of catheter-related bacteremia among patients with central internal jugular catheter with tracheostomy than in femoral site (21.64 vs 9.52 episodes per 1000 catheter-days; risk ratio, 2.27; 95% confidence interval, 1.04–4.97; P = .04).

The microorganisms responsible for the 16 cases of femoral catheter–related bacteremia were as follows: coagulase-negative staphylococci, 4 cases; *Staphylococcus aureus,* 1 case; *Enterococcus faecalis,* 2 cases; *Pseudomonas aeruginosa,* 1 case; *Klebsiella* species, 1 case; *Escherichia coli,* 5 cases; and *Candida albicans,* 2 cases. The microorganisms responsible for the 10 cases of jugular venous catheter–related bacteremia with tracheostomy were as follows: coagulase-negative staphylococci, 1 case; *S. aureus,* 2 cases; *E. faecalis,* 2 cases; *P. aeruginosa,* 2 cases; *E. coli,* 1 case; *Enterobacter cloacae,* 1 case; and *C. albicans,* 1 case.

In our study, we found a higher incidence of catheter-related bacteremia in the central jugular site with tracheostomy than in the femoral site. This finding might explain the discrepancies between authors regarding the higher incidence of central venous catheter–related infection in the femoral site than in the jugular site found in some studies,[3-6] as well as the higher incidence in the jugular site than in femoral site found in other studies,[7-9] because none of these studies reported the rate of tracheostomy.

This high incidence of catheter-related bacteremia in central jugular site with tracheostomy found in our study is in harmony with the results of previous studies.[1,2] This may reflect easy contamination of the catheters located in the jugular site in the presence of tracheostomy, probably related to the proximity of the insertion site to the mouth, to oropharyngeal secretion, and to the higher density of local skin flora due to higher local skin temperature.

Limitations of this study include the facts that data related to the experience of each operator in catheter insertion and training were not recorded and that the choice of the insertion site was not randomized. Finally, we think that the femoral site could be considered a safer venous access point than central internal jugular site with tracheostomy, to minimize the risk of catheter-related bacteremia.

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Incidence of *Clostridium difficile* Infection in Patients with Acute Leukemia and Lymphoma after Allogeneic Hematopoietic Stem Cell Transplantation

To the Editor—Patient risk factors for *Clostridium difficile* infection (CDI) include antibiotic exposure, exposure to certain chemotherapeutic agents, prolonged hospital stay, and previous hospitalization. These risk factors are common attributes of patients with hematological malignancies who are undergoing high-dose chemotherapy and allogeneic stem cell transplantation (SCT). These patients often experience diarrhea as a complication. In spite of the potential for increased risk of diarrhea and CDI among patients undergoing allogeneic SCT, this association has not been rigorously evaluated. This study evaluates CDI among allogeneic SCT recipients to determine the incidence of and risk factors for CDI and investigates the possibility that different hematological malignancies may be associated with different risks of CDI after allogeneic SCT.

We retrospectively reviewed the medical records of all patients who underwent their first allogeneic SCT at our academic medical center during the period from May 2003 through December 2007. A total of 26 patients were identified; 12 had underlying acute myeloid leukemia, 4 had acute lymphoid leukemia, and 10 had lymphoma disease. All of the patients received high-dose bone marrow ablation chemotherapy before SCT, as well as antimicrobial prophylaxis, which consisted of valacyclovir, ciprofloxacin or gatifloxacin, and fluconazole, from marrow ablation through engraftment. Chart review identified patients who experienced diarrhea, defined as experiencing 3 or more loose bowel movements within a 24-hour period, and recorded the results of *C. difficile* tests. Collected data for each patient included age, sex, body weight, serum albumin level, and creatinine level 2 days prior to the onset of diarrhea; total number of neutropenic days; any history of recent hospitalization within 30 and 60 days before hospital admission; antibiotic use within 30 and 60 days before hospital admission; and all chemotherapy exposure within 60 days prior to hospital admission and during hospitalization. Other medications investigated as potential CDI risk factors included receipt of granulocyte-colony stimulating factor, proton pump inhibitors, and H2 blockers.

Only stool samples that took the shape of the container were tested for *C. difficile*, because it is our institution's microbiology laboratory policy to only accept such samples for *C. difficile* testing. Samples were evaluated for the presence of either *C. difficile* enterotoxin A or cytotoxin B by enzyme linked immunosorbent assay (Premier Toxins A & B kit; Meridian Bioscience). The Fisher exact test was used for univariate analysis, which included a comparison of patient characteristics between the leukemia and lymphoma patient groups and between the *C. difficile*–positive and *C. difficile*–negative groups.

Diarrhea was reported in 23 patients (88.5%), all of whom were tested for *C. difficile*. The onset of diarrhea ranged from 8 to 41 days after patient admission. Seven patients (30.4%) received a diagnosis of CDI. Among these 7 patients, 6 had acute myeloid leukemia, and 1 had acute lymphoid leukemia. No patients with lymphoma received a diagnosis of CDI. This difference was statistically significant ($P = .02$).

Comparison of *C. difficile*–positive and *C. difficile*–negative