Totally Implantable Venous Access Device Placement by Interventional Radiologists: Are Prophylactic Antibiotics Necessary?

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ABSTRACT

Purpose: To determine the rate of early infection for totally implantable venous access devices (TIVADs) placed without antibiotic prophylaxis.

Material and Methods: A list of patients who underwent TIVAD placement in 2009 was obtained from the patient archiving and communication system (PACS). This list was cross-referenced to all patients who underwent TIVAD removal from January 1, 2009, through January 30, 2010, to identify TIVADs that were removed within 30 days of placement. Retrospective chart review was performed to record patient demographics, including age, sex, cancer diagnosis, and indication for removal. Concurrent antibiotic therapy, chemotherapy, and laboratory data before and within 30 days of placement were recorded. Central line–associated bloodstream infections (CLABSIs) were identified using U.S. Centers for Disease Control and Prevention (CDC) criteria.

Results: There were 1,183 ports placed and 13 removed. CLABSIs occurred in seven (0.6%) patients within 30 days of placement. At the time of TIVAD placement, 81 (7%) patients were receiving antibiotics incidental to the procedure. One patient who received an antibiotic the day of implantation developed a CLABSI. Chemotherapy was administered to 148 (13%) patients on the day of placement.

Conclusions: The rate of early infection without antibiotic prophylaxis before TIVAD placement in the interventional radiology suite is $< 1\%$. Based on these data, use of prophylactic antibiotics for TIVAD placement is not recommended.

ABBREVIATIONS

ANC = absolute neutrophil count, CDC = U.S. Centers for Disease Control and Prevention, CLABSI = central line–associated bloodstream infection, INR = international normalized ratio, PACS = patient archiving and communication system, TIVAD = totally implantable venous access device, WBC = white blood cell

Reliable venous access is critical for cancer patients. Totally implantable venous access devices (TIVADs) are commonly placed to facilitate delivery of intravenous chemotherapy. Compared with exterior catheters, TIVADs have the advantages of requiring little maintenance and having a low infection rate (1).

Although TIVAD infections are uncommon compared with other types of catheters, the consequences of a TIVAD infection can be considerable for the patient. Central line–associated bloodstream infections (CLABSIs) are costly and usually necessitate removal of the device. In addition, subsequent treatment of the infection can delay administration of chemotherapy and require an increase in the level of care (eg, hospital admission or home intravenous therapy). The consequences of CLABSIs to both

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From the SIR 2011 Annual Meeting.

None of the authors have identified a conflict of interest.

J Vasc Interv Radiol 2012; 23:358–362

DOI: 10.1016/j.jvir.2011.11.004

patients and providers have been highlighted in the lay press and medical literature in recent years. Policies outlined by the Center for Disease Control and Prevention (2), Centers for Medicare and Medicaid Services (3,4), The Joint Commission (5), and the U.S. Department of Health (6) have made reduction of CLABSIs a priority.

To reduce the risk of insertion-related CLABSIs, prophylactic administration of an antibiotic before central line placement has been recommended by some practitioners (7–9). For a single patient, the administration of a single dose of an antibiotic may seem inconsequential. As a general practice, however, unwarranted antibiotic use adds time, expense, and potential complications in the form of allergic reaction, *Clostridium difficile* infection, and antibiotic resistance (10,11). Limiting cumulative exposure to antibiotic therapy for both individual patients and the population as a whole is a crucial step toward maintaining sensitivity to currently available antibiotics. Because there is little evidence to justify the use of prophylactic antibiotics for patients undergoing TIVAD implantation in the interventional radiology suite, it has been our practice not to use them. The purpose of this article is to report the 30-day infection rate for TIVADs placed in cancer patients by interventional radiologists without the use of prophylactic antibiotics.

MATERIALS AND METHODS

An institutional review board waiver was granted for this retrospective review. The patient archiving communication system (PACS) at a single cancer center was queried to obtain a list of all patients who underwent TIVAD placement from January 1, 2009, through December 31, 2009. TIVADs removed within 30 days of placement were identified by cross-referencing a PACS query of TIVAD placement with TIVAD removals from January 1, 2009, through January 30, 2010. Patient charts and available imaging studies were reviewed to confirm that TIVADs not removed remained in place at day 30 after placement.

Retrospective chart review was performed to collect patient demographic data including age, sex, and cancer diagnosis. Variables in the placement, including site, device type, and size of the port, were also recorded. Laboratory data including white blood cell (WBC) count, platelet count, prothrombin time, international normalized ratio (INR), and partial thromboplastin time were recorded at the time of the procedure and for 30 days after implantation. Date, dosage, and type of any concomitant antibiotic and chemotherapy administered within 30 days of placement were also recorded.

The list of patients with TIVADs removed within 30 days of placement was cross-referenced with microbiologic data to identify patients with positive blood cultures. The records of these patients were reviewed using U.S. Centers for Disease and Control (CDC) surveillance definitions for laboratory-confirmed CLABSI events. These criteria include a primary bloodstream infection (one positive culture for nonskin flora, two positive cultures for skin flora) in a patient who had a central venous catheter in place within 48 hours before the development of infection not related to an infection at another site.

Our technique for TIVAD placement has been described previously (12). Laboratory evaluation before the procedure included WBC count, platelet count, and INR. Patients with absolute neutrophil count (ANC) < 1 at the time of placement were routinely given 1 g of cefazolin sodium before the procedure. Patients with platelet counts $< 20{,}000/\mu l$ were transfused with 1 unit of platelets immediately prior to the procedure and a second unit of platelets during the procedure, and patients with platelet counts $20{,}000-49{,}000/\mu l$ were transfused with 1 unit. Patients with INR > 2.0 were treated with vitamin K until INR was < 2.0 for placement. Since 2008, we have followed the recommendations of several governing agencies, including the Institute for Healthcare Improvement and The Joint Commission, by adopting as standard procedure the components of the central venous care bundle before device insertion (13,14).

The access site was prepared with chlorhexidine and draped with sterile towels. Ultrasound was used for venous access, which was achieved with a 21-gauge micropuncture system (Cook, Inc, Bloomington, Indiana). A subcutaneous pocket was created on the anterior chest wall 4–8 cm from the venous access site. The catheter was tunneled from the pocket site to the venous puncture site. The micropuncture was exchanged over a wire for a peel-away sheath, and the catheter was advanced through the sheath to the high right atrium. The peel-away sheath was removed, and the catheter was cut to an appropriate length so that the tip was in the high right atrium or distal superior vena cava. The catheter was attached to the port. The port was aspirated and flushed and placed in the pocket, which was closed with interrupted resorbable subcutaneous stitches and either a running subcuticular stitch or Dermabond (Ethicon, Somerville, New Jersey) at the discretion of the operator.

Immediately after placement, the port was accessed with a Huber needle and flushed with heparinized saline. If the patient was scheduled for chemotherapy on the same day, the Huber needle was left in place for use; otherwise, it was removed. A sterile dressing was applied.

Statistical Analysis

To determine if WBC count or platelet count before or after the procedure differed between patients who developed CLABSIs and patients who did not, two-sample *t* tests were performed. To determine if ANC < 1 before the procedure, administration of antibiotics before the procedure, or administration of chemotherapy on the day of the procedure differed between patients who developed CLABSIs and patients who did not, Fisher exact