Discarding the Initial Aliquot of Blood Does Not Reduce Contamination Rates in Intravenous-Catheter-Drawn Blood Cultures

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Although venipuncture is the preferred method for obtaining blood cultures, specimens often are obtained from intravenous catheters (IVC). For IVC-drawn blood cultures, some authorities recommend discarding the initial 5 to 10 ml of blood to reduce contamination and remove potential inhibitory substances. To determine whether this practice reduced contamination rates (CR), we assessed the results of IVC-drawn blood cultures for adults. Thirty milliliters of blood was obtained aseptically. The first 10 ml, rather than being discarded, was inoculated into an aerobic culture vial. Using a second sterile syringe, 20 ml of blood was obtained and inoculated in 10-ml aliquots to aerobic and anaerobic culture vials. Positive cultures were evaluated to assess clinical significance (true versus contaminant). Out of 653 IVC-drawn blood culture pairs, both vials were contaminated in 38 pairs (5.8%); only the “discard” vial was contaminated in 33 (5.1%); and only the “standard” vial was contaminated in 31 (4.7%). Overall CR were 10.9% for the discard vial versus 10.5% for the standard vial (P = 0.90). We conclude that discarding an initial aliquot of blood when obtaining blood cultures from IVCs does not reduce CR.

The standard method for obtaining blood for culture is venipuncture using aseptic techniques. With greater utilization of intravenous access catheters (e.g., PICC, Hickman, etc.), blood cultures often are obtained from these devices, yet there is no standardized method for obtaining blood for culture by this technique. Several reports have demonstrated increased blood culture contamination rates (i.e., false-positive results) when blood cultures are obtained from catheters (4, 8, 10, 15), which, in turn, can lead to inappropriate antibiotic administration as well as additional unnecessary diagnostic testing. Some authorities recommend discarding the first 5 to 10 ml of blood when obtaining blood from intravenous catheters (IVCs) prior to inoculating the blood culture vials (17), whereas others do not (1, 9, 16). The purpose of discarding these aliquots of blood is to remove any substances that could potentially inhibit microbial growth (e.g., heparin) (6, 19) and to reduce blood culture contamination rates. However, there are few published systematic assessments of this issue, no consensus recommendations on how to draw blood cultures from an IVC, and no controlled comparative evaluations of different techniques to obtain blood culture samples from an IVC.

It has been standard practice at our institution to discard the first 10 ml of blood prior to obtaining blood for culture from IVCs. If patients have repeated blood cultures, in which 10 ml of blood is discarded with each culture, nosocomial anemia may occur or worsen and result in added morbidity (1, 3, 11, 18, 21). To determine whether discarding the initial aliquot of blood from IVC-drawn blood cultures reduces contamination, we inoculated the initial 10-ml sample of blood that would have been discarded into an aerobic blood culture vial and compared contamination rates in these vials with contamination rates in the “standard” blood sample obtained for culture from the same patient.

MATERIALS AND METHODS

Adult inpatients (≥18 years old) in three oncology nursing units for whom the attending physician ordered a catheter-drawn blood culture from 29 March to 9 October 2007 at Robert Wood Johnson University Hospital, New Brunswick, NJ, were included. The study was approved by the Robert Wood Johnson Medical School Institutional Review Board.

For this study, a “set” was defined as three culture bottles, two aerobic and one anaerobic, obtained from an indwelling catheter. The catheter hub was initially cleansed with 70% isopropyl alcohol and then allowed to dry. The hub was then disinfected with 2% iodine tincture and allowed to dry for 30 s. Using a sterile syringe, the IVC was flushed with 10 ml of normal saline solution. Using a sterile syringe, 10 ml of blood, the “discard” aliquot, was drawn from the IVC and inoculated into a Bactec Plus aerobic/F culture vial. The IVC hub was then cleansed with isopropyl alcohol and iodine tincture in the same fashion. Using a sterile syringe, 20 ml of blood was obtained and inoculated in 10-ml aliquots into a Bactec Plus aerobic/F vial, the “standard” vial, and a Bactec Plus anaerobic/F vial.

Positive blood culture sets were analyzed to determine whether the isolates represented true infection or contamination, and contamination rates in the discard vial were compared to those in the standard aerobic vial. Factors used to differentiate contaminants from clinically important pathogens included the identity of the organism, the number of positive blood culture sets versus the number of culture sets obtained, and when appropriate, review of the medical record of the patient with the positive culture to compare the results to those of any peripheral blood cultures obtained during the same time frame (20). Data were entered and saved on Excel spreadsheets. Overall proportions of contamination in the discard and standard vials were then compared using McNemar’s discordant pairs test of matched results for the same subject.
RESULTS

During the study period, there were a total of 653 blood culture sets collected from IVCs with matched discard and standard vial pairs. In 33 instances (5.1%), only the discard vial was contaminated, and in 31 instances (4.7%), only the standard vial was contaminated. In 38 instances, both the standard and discard vials were contaminated (5.8%). Thus, overall contamination rates for the discard and standard vials were 10.9% and 10.5%, respectively (P = 0.90; 95% confidence interval for difference in contamination rates from the normal approximation of the multinomial, −1.9% to +2.7%). In 551 instances (84.4%), neither the standard vial nor the discard vial was contaminated. In four instances, only the discard bottle grew a true pathogen, and in six instances, only the standard bottle grew a true pathogen. In each of these cases, other blood cultures taken in the same time frame or previously also grew the same pathogen.

DISCUSSION

IVCs frequently are used to administer chemotherapy, blood products, total parenteral nutrition, antibiotics, and many other medications. In addition to the administration of therapeutic agents, IVCs also are used to obtain blood samples to reduce the trauma associated with venipuncture. Although the preferred method for obtaining blood cultures is peripheral venipuncture (2, 7), blood for culture is increasingly obtained from IVCs.

Several methods for obtaining blood for culture via IVCs have been described. In the “discard” method, blood is aspirated into a syringe to clear the catheter of any residual intravenous solutions and medications, and it is then discarded. A second sterile syringe is then used to obtain blood for culture. Blood immediately beyond the hub of an IVC is thought to be diluted by the IV or flush solution. The blood that is removed allows the vein to refill from the capillary bed, thereby allowing the lumen of the catheter to fill with blood more representative of the total venous circulation (14). In some cases, the discard aliquot is described as removal of the first aspirate without flushing the catheter. In others, the discard aliquot is described as including an initial flush of the device and then withdrawal of a discard specimen. In our institution, the discard technique involved an initial flush.

The discard method is used commonly. Seventy-five percent of pediatric bone marrow transplant units reported using this method (12). According to the Oncology Nursing Society’s access device guidelines (5), the discard method is most commonly used in adults as well. An informal online survey recently confirmed that institutions using this method usually discard 5 to 10 ml of blood before inoculating culture bottles (E. J. Baron, personal communication).

MacGeorte et al. (13) reported that adult bone marrow transplant patients lost an average of 95.7 ml of blood per week not including the blood volume for diagnostic testing, assuming that 6 ml of blood were discarded for each lab draw. In severely ill, febrile patients, blood cultures are done frequently, and discarding of 5 to 10 ml of blood at the time of each culture can result in significant blood loss and potential iatrogenic anemia, which, in turn, can lead to transfusion-associated risks.

Although Everts and Harding (9) reported no significant difference in contamination rates between first and second drawn samples (17.1% versus 15.8%), only 152 blood cultures were evaluated. Our study, which has a substantially larger sample size, confirms the observation that discarding the initial aliquot of blood from an IVC-drawn blood culture does not reduce contamination rates. Despite recommendations to use peripheral venipuncture as the preferred method of obtaining blood for culture, sometimes for ease or for other reasons, blood is drawn through an IVC. Whereas we do not advocate IVC-drawn blood cultures, we recognize the reality that some will be obtained in this fashion. Since discarding the initial aliquot of blood may contribute to nosocomial anemia and does not reduce contamination rates, we believe this practice should be abandoned.

REFERENCES