Laboratory-based Evaluation of Breakthrough Bacterial Contamination during Predeposit-Type Autologous Blood Transfusion Preparation

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Abstract

Breakthrough bacterial contamination during blood collection is a potential risk in predeposit-type autologous blood transfusion. A total of 2,209 blood samples were collected from July 2005 to May 2009 for autologous blood transfusion at the University Hospital of the Ryukyus. The first 5 ml of blood samples was cultured in BACTEC Plus Aerobic/F blood culture bottles to detect bacterial contamination. Bacterial growth was monitored by an automated blood culture system, BACTEC 9120. Of 2,209 blood samples, 4 (0.18\%) were positive, with two strains of \textit{Staphylococcus hominis}, and one each of \textit{S. warneri} and \textit{S. capitis}. Bacterial concentrations in blood samples were determined using linear regression between the time (hour) to detect positive and colony forming units (cfu)/ml of the respective isolates. It was demonstrated that three positive blood samples contained 0.06 to 5.3 cfu/ml while the other, positive for \textit{S. warnerii}, was $1.4 \times 10^4$ cfu/ml. To evaluate the benefit of removing white blood cells, \textit{S. hominis} isolate was spiked into an aseptic blood sample from which white blood cells were removed. This preparation revealed significant exponential bacterial growth after standing for 16 hours at room temperature. However, an aseptic blood sample containing a normal number of white blood cells did not show any significant bacterial growth within a 24-hour period. Microscopic examination confirmed that a number of white blood cells had phagocytosed the spiked staphylococcal cells. From these results, we concluded that the breakthrough bacterial contamination ratio was significantly low, but not negligible. Thus, care is necessary in the collection of blood, particularly in disinfection procedures. The benefits of removing white blood cells from the preparation for autologous blood transfusion is an issue that should be discussed further.

Keywords: Breakthrough bacterial contamination, predeposit-type autologous blood transfusion, coagulase-negative staphylococci (CNS), colony-forming unit, removal of white blood cells