Albumin Pretreatment of Autotransfusion Apparatus

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Abstract

Priming the autotransfusion apparatus with 5% albumin solution decreases blood coagulation that, in spite of the administration of heparinized saline anticoagulant at the suction tip, still occurs on the plastic materials. This technique has eliminated the need to change reservoirs during prolonged autotransfusion cases.

Introduction

Since the concept and initial use of intraoperative autotransfusion was reported by Blundell in 1818, it has undergone several evolutionary phases and refinements which have been noted by Orr. The Cell Saver autologous blood recovery device is the most recent and has been shown to decrease the use of bank blood and offers the benefit of infusion of washed, autologous cells without the need for systemic heparinization. An earlier generation device did not have the capability for cell washing and carried the risk of air embolism.

We have utilized blood conservation techniques incorporating cell washing for the past five years. Salvaging oxygenator contents following open-heart surgery with a Cell Saver is not as cost-effective as utilizing a cell processor in the blood bank. There are, however, certain cases in which the Cell Saver can be used to conserve blood during surgery and provide a fairly rapid turnaround during the time between aspiration of blood from the wound and reinfusion of washed red cells. Typically, operations to resect descending thoracic aneurysms using a Gott shunt incorporate the Cell Saver as an adjunct. In this situation, blood is anticoagulated with heparinized saline solution as it enters the suction line. In spite of this maneuver to prevent intrinsic activation of the coagulation cascade, we would occasionally see gross clotting in the cardiotomy reservoir sometimes necessitating its replacement during the procedure. Pretreatment of the system with 5% albumin solution has significantly decreased visible clot formation presumably by coating the foreign surfaces and inhibiting platelet adhesion.

Materials and Methods

The autologous blood recovery system is assembled with an autotransfusion pack (Haemonetics no. 8617) and a large volume, unfiltered cardiotomy reservoir. The combination aspiration/anticoagulation line is passed off the sterile field and 100 mmHg vacuum pressure to the reservoir is established by regulated wall suction. Two hundred fifty mls of 5% albumin solution, which...
has been previously poured into a sterile basin on the field, is aspirated through the autotransfusion sucker in order to prime the reservoir. A small amount of heparinized saline solution (30,000 units per liter) is dripped in during priming to establish fluid flow, and the wall suction is clamped off after the reservoir has been primed with albumin solution. The reservoir is removed from its holder and gently rotated from side-to-side to wet the de-foaming assembly, 120 micron filter mesh, and plastic housing. The reservoir is then replaced in its holder, wall suction is re-established and collection of blood is begun. The rate of administration of the anticoagulant is adjusted to the rate at which blood is collected and amounts to approximately 100 mls for each 500 mls of blood per the manufacturer’s recommendation.8 Centrifugation begins after approximately 500 mls of blood has been collected.

Results and Discussion

Several reports in the literature have discussed the beneficial effects of albumin pretreatment of artificial blood surfaces. Untreated plastic surfaces, depending upon their chemical composition, preferentially adsorb fibrinogen upon exposure to whole blood,9–10 and such adsorption is mediated by the presence of red blood cells.14 Fibrinogen adsorption to foreign surfaces has been shown to favor both platelet adhesion and the conversion of fibrinogen to fibrin due to configurational changes in the protein molecules at the foreign interface.15,16 However, pretreatment with either serum or albumin solution was shown to decrease platelet adhesion to various test surfaces.17–19 Chang,20 using scanning electron microscopy, reported no platelet adhesion, fibrin deposition or entrapment of formed blood elements on albumin-treated activated charcoal granules used for up to two hours of hemodialysis in dogs. Zucker and Mason21 reported similar findings when dialysis membrane materials and tubing exposed to flowing human blood were studied. More recently, Addonizio and co-workers22,23 found albumin precoating of extracorporeal surfaces re-
duced platelet loss and alterations during cardiopulmonary bypass.

While recent panel discussants acknowledged that many problems must still be solved before the development of truly blood compatible artificial surfaces and that albumin coating is not an optimal method,24 our clinical observation suggests that the technique of albumin pretreatment is beneficial for the periods required for autotransfusion and blood processing with a Cell Saver. We have utilized this technique for the past 18 months and on more than 20 patients for both elective vascular and emergency trauma surgery with excellent results and without the need to change clotted reservoirs.

References


* Model ATS-100, Bentley Laboratories, Inc., Irvine, CA 92714.