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ORIGINAL ARTICLE

Is cell salvaged vaginal blood loss suitable for re-infusion?

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ABSTRACT
Background: Haemorrhage is one of the commonest causes of maternal critical care admission. Cell salvage used during caesarean section can contribute to a reduction in allogeneic blood consumption. This study sought to provide a practical method to salvage blood lost after vaginal delivery and a description of the constituents before and after washing.
Methods: Blood lost after vaginal delivery was collected from 50 women and washed in a cell salvage machine. No blood was re-infused to any patient in this study. The following measurements were made pre- and post-wash: haemoglobin (haematocrit), alpha-fetoprotein, albumin, lactate dehydrogenase, plasma free haemoglobin, heparin concentration, fetal red cells and identification of bacterial species and colony-forming units (cfu).
Results: Median haemoglobin concentration post-wash was 15.4 g/dL. Alpha-fetoprotein, lactate dehydrogenase and albumin concentrations were significantly reduced post-wash (<1 KU/L, 183 IU/L, 0.011 g/L, respectively; P <0.001). Median fetal red cell level post-wash was 0.15 mL [range 0–19 mL]. Median bacterial contamination concentration post-wash was 2 cfu/mL, with a median total count of 303 cfu.
Conclusions: Vaginal blood can be collected efficiently with little disruption to patient management. The amounts of haemolysis and washout of non-red cell blood components are consistent with results in our cell salvage quality assurance programme for caesarean section and non-obstetric surgery. Although bacteria are detectable in all the post-wash and post-filter samples, the median residual contamination is similar to that found with cell salvage in caesarean section, and if re-infused would result in a circulating bacteraemia of <1 cfu/mL; this is similar to that seen with dental procedures (0.3–4.0 cfu/mL) and is thought to be clinically insignificant.

Keywords: Bacteria; Blood transfusion; Autologous; Obstetrics; Intra-operative cell salvage; Postpartum haemorrhage

Introduction

The Confidential Enquiry into Maternal and Child Health reports have consistently identified haemorrhage as an important direct cause of maternal death.[1] It is one of the commonest reasons for maternal critical care admission, and obstetric patients are significant users of allogeneic blood products.[2] There are risks associated with donor blood transfusion which include acute transfusion reaction, lung injury and, although rare, the possibility of death from transfusion error, and transmission of infection which may have serious long-term consequences. These risks are monitored by annual Serious Hazards of Transfusion (SHOT) reports.[3] The morbidity from blood transfusion also includes postoperative infection; the risk increasing with each unit transfused.[4] Allogeneic blood is an increasingly scarce and expensive resource, and in the UK a well-developed blood transfusion service exists to minimise risk. In some countries there is difficulty supplying allogeneic blood, and in addition patients may refuse allogeneic transfusion on religious grounds. Blood conservation strategies, including cell salvage, aim to reduce consumption of allogeneic blood.

In current obstetric practice, the use of cell salvage is generally restricted to caesarean section. A 2012 survey of UK obstetric units found that 47% had cell salvage equipment, with frequency of use varying between units.[5] Cell salvage was introduced at The Royal Cornwall Hospital Trust (RCHT) in 2008 and is now used routinely at caesarean section. The number of obstetric patients who receive allogeneic blood per delivery in our unit has reduced from 1.8% in 2008 to 0.8% in 2013, with a reduction in the mean number of units transfused per patient from 3.3 to 1.9. In 2013, however, 81% of women who received allogeneic blood delivered vaginally, not by caesarean section. There is currently no evidence to support or reject the use of cell salvage after vaginal delivery. This study aimed to test the feasibility and effectiveness of a method to salvage vaginal

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blood loss, with a description of constituents before and after washing in a cell salvage machine.

Methods

This descriptive study assessed blood salvaged by a cell saver after vaginal delivery in a series of 50 participants. The study was approved by the National Research Ethics Service Committee Southwest: Plymouth and Cornwall [12/SW/0136]. All participants gave written informed consent. The study was conducted at the RCHT. No cell-salvaged blood was re-infused to any participant.

Inclusion criteria were vaginal delivery and an estimated blood loss of $\geqslant$200 mL after transfer to the operating theatre for clinical reasons, which included on-going blood loss, instrumental delivery, manual removal of placenta and perineal tear repairs. Women whose blood loss was managed entirely in delivery rooms were excluded.

Collection was carried-out by the clinical team using the equipment shown in Figs. 1 and 2. After delivery of the baby, the obstetrician placed an under-buttock drape with pouch (Steri-Drape™ 1084, 3M Health Care, Bracknell, UK) to collect blood. Similar drapes are commonly used in UK maternity units and non-obstetric theatres. The aspiration and anticoagulation line was lowered into the pouch. Approximately 200 mL of heparinised saline (30 000 U in 1000 mL) was run rapidly into the pouch and the rate then adjusted to a slow drip. Once surgical treatment was complete, the blood/heparinised saline mix was aspirated into the reservoir and processed with a Cell Saver® 5+ Autologous Blood Recovery System (Haemonetics Ltd., Coventry, UK). Processing was performed in the automatic mode with a wash volume of 1500 mL, double the manufacturer's recommended setting. This is the same setting used in our hospital at caesarean section, and had been decided before introduction of the obstetric cell salvage service. In all cases a single aspiration line was used.[6]

Samples of salvaged blood were taken from: (1) the collection reservoir labelled 'pre-wash'; (2) the re-infusion bag labelled 'post-wash' and (3) after passing the full volume through a leucodepletion filter (RS1 VAE Pall Medical, Portsmouth, UK) labelled 'post-filter'. At all stages the blood was agitated gently before sampling to ensure even mixing. The following measurements were made at each stage:

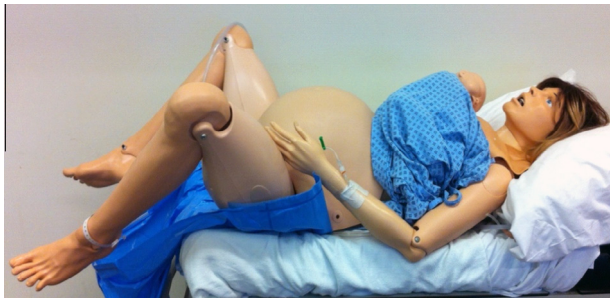

Fig. 1 Position of under buttock drape

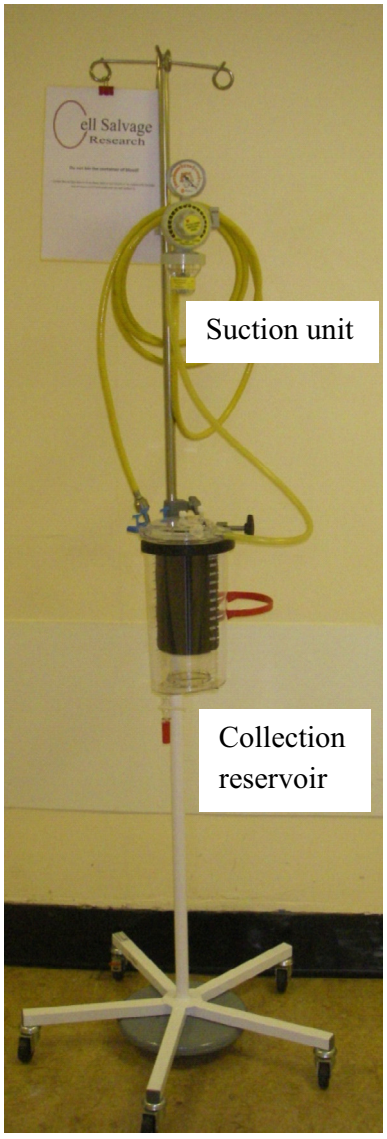

Fig. 2 Collection drip stand with reservoir and suction

1. Full blood count: haemoglobin concentration (Hb) and haematocrit (Hct) were analysed on an Advia® 2120 Haematology System (Siemens UK, Surrey, UK).
2. Alpha-feto protein concentration (AFP), used as a marker of amniotic fluid contamination, was processed on a Hitachi Modular P800 chemistry analyser (Roche Diagnostics, West Sussex, UK).
3. Fetal red blood cells (fetal RBCs) using the Kleihauer-Betke test.
4. Micro-albumin, as a marker of washing efficiency, was processed on a Hitachi Modular P800 chemistry analyser (Roche Diagnostics, West Sussex, UK).