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ORIGINAL ARTICLE

Introduction of cell salvage to a large obstetric unit: the first six months

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ABSTRACT
Background: We introduced red-cell salvage to our obstetric unit following a two-month period of training and education. We report a service evaluation of the first six months of activity from May to October 2007.
Methods: The indications for using cell salvage were: placenta praevia, suspected placental abruption, multiple pregnancy, multiple repeat caesarean, previous history of post partum haemorrhage, refusal of blood transfusion, caesarean section at full dilatation, low preoperative haemoglobin and at the discretion of the theatre team.
Results: The cell saver was used for 46 patients with a blood loss (median; range) of 800 (200–2000) mL and a heterologous transfusion rate of 22% (10 cases). Blood was processed and returned in 19 cases of which nine were emergency and 10 elective. The median volume (range) of blood returned was 390 (200–800) mL. For the unit as a whole the percentage of all theatre cases who received a heterologous transfusion fell from 10.2% for the equivalent time period in the preceding year to 7.9% during the six month period that cell salvage was in use ($P = 0.126$, χ^2). There were no adverse reactions following the administration of processed blood.
Conclusion: We have successfully introduced cell salvage to our unit in a relatively short period of time and have used it for the largest series of patients reported in the UK.

Keywords: Cell salvage; Obstetric haemorrhage; Caesarean section; Autologous transfusion

Introduction

Cell salvage is a means by which the patients' own blood can be recycled, reducing the requirement for heterologous blood with its attendant problems such as transmission of infection and transfusion reaction.[1–5] Another advantage of blood obtained in this way is the likely improved survival and oxygen carrying ability of red cells compared to banked blood.[6] There are also several cases in the literature where the technique has been used for Jehovah's Witnesses.[7] Although cell salvage has been used extensively in the fields of cardiac surgery, orthopaedics and trauma, use in obstetrics has been limited by concerns regarding amniotic fluid embolus and rhesus iso-imunisation.[8]

A recent review of the literature revealed several hundred published cases of the use of cell salvage in obstetrics without significant problems.[9] In addition, its use at caesarean section has been endorsed by several official bodies including the Association of Anaesthetists of Great Britain and Ireland,[10] the Obstetric Anaesthetists' Association[10] and the National Institute for Health and Clinical Excellence.[11]

Many of the cases reported in the literature have concentrated on instances of massive haemorrhage;[7,12] this is variably defined as: blood loss of more than 1500 mL, a decrease in haemoglobin of more than 4 g/dL or acute transfusion requirement of more than four units.[13] Cases of massive haemorrhage occur in approximately 5 per 1000 deliveries[14] so are rare even in a unit such as ours with 7200 deliveries per year. Limiting the use of cell salvage to such cases may have led to insufficient opportunities for training and maintenance of skills. This is particularly important in our hospital as it does not contain any of the specialties that commonly use cell salvage. Consequently we had to set up our service so that the cell saver was run entirely by obstetric theatre staff and was not reliant on staff coming from elsewhere.

In our unit we therefore decided to use cell salvage at caesarean section whenever the blood loss was likely to necessitate blood transfusion. By doing so we hoped to prevent some patients from receiving any heterologous blood and to maintain the skills of theatre personnel. We have evaluated the introduction of a change in practice for which there is evidence derived from research. We have discussed this with the chair of the research

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ethics committee within our trust who agreed that it was not a research project and did not require ethical approval. Our intention in publishing this work is to help others considering the introduction of cell salvage.

Methods

The Jessop Wing Obstetric Unit is a tertiary referral centre with a resident anaesthetic trainee, cover from another anaesthetic trainee shared with other sectors and a dedicated anaesthetic consultant on call. It is attached to the rest of the hospital via a covered corridor. There was no prior experience of cell salvage use in our unit other than a cost analysis which we have previously reported.[15] Consequently a period of preparation was required before the introduction of cell salvage. The cell salvage machine (Haemonetics Cell Saver 5, Haemonetics (UK) Ltd, Glasgow, UK) was operated by theatre staff alone of which there are at least four residents throughout a 24-h period. No additional staff members were taken on to service the cell saver. All the relevant theatre staff (15 in total) were trained in how to use the cell salvage machine. There was also a multidisciplinary programme of education regarding the technique, including lectures and practical demonstrations. To aid discussion of the procedure with patients, patient information leaflets generated by the National Institute for Health and Clinical Excellence[16] were distributed. A service evaluation form was produced for completion by the anaesthetist at the time that the cell saver was used (Appendix). This period of preparation took approximately two months, after which time cell salvage was available 24 h per day.

A list of indications for cell salvage was drawn up (Box 1) based on well recognized risk factors for post partum haemorrhage and instances where significant bleeding could have important consequences.[17] These indications were not binding and were intended to provide some guidance that would aid decision-making in theatre. The indication "low preoperative haemoglobin" was not defined and was left to the interpretation of the attending staff.

Box 1

Indications for cell salvage
Placenta praevia
Suspected placental abruption
Multiple pregnancy
Multiple repeat caesarean section (three or more caesarean sections)
Previous history of post partum haemorrhage
Refusal of blood transfusion
Caesarean section at full dilatation
Low preoperative haemoglobin (this was not defined)
At the discretion of theatre staff

Once a decision to use the modality had been made, blood was collected. It was, however, only processed if it was thought the woman was likely to need a heterologous transfusion. The final decision to return the blood was made according to the volume collected (as a guide to estimated blood loss and likely volume after processing) and pre-operative haemoglobin. We attempted to adhere to current transfusion guidelines regarding haemoglobin threshold at which to transfuse.[18] Within our institution these state that a blood transfusion should be given only when the haemoglobin concentration falls below 8.0 g/dL, there is symptomatic anaemia or active bleeding. Post transfusion targets were between 8.0 and 10.0 g/dL.

To minimize risk of amniotic fluid embolus a different suction device was used from the time of rupture of membranes until after delivery of fetus and placenta. Blood was then aspirated from the surgical field by the suction device attached to the cell saver. Blood-stained swabs were placed in a bowl of saline and were gently squeezed to ensure that blood was removed from them with minimal damage to red cells, before the fluid was collected into the cell saver. Following processing, blood was returned to parturients via a Pall RS1 VAE leucodepletion filter (Pall Medical, Portsmouth, UK). The leucodepletion filter was used to remove remaining amniotic fluid proteins.[19]

It has been established that cell salvage techniques do not separate fetal from maternal red blood cells.[19] Consequently re-infused rhesus-positive fetal blood could immunize a rhesus-negative mother. In cases of maternal-fetal rhesus incompatibility a Kleinhauer-Betke test was performed following delivery to establish the extent of contamination of maternal blood with fetal red blood cells. The appropriate dose of anti-D immunoglobulin was then administered to prevent rhesus immunisation according to unit protocol.

Following completion of the service evaluation, information on blood transfusion rates for the unit were obtained from the blood bank database.

Results

The six months introductory period was from the beginning of May to the end of October 2007 and in that time the cell saver was used in 46 cases. The indications for using the cell saver in these cases are given in Table 1. Blood loss, expressed as median and range, for all patients (excluding a case of massive haemorrhage where blood loss was not documented) was 800 mL (200–2000) with a heterologous transfusion rate of 22% (10 cases). Blood was processed but not returned in three cases, for which the postoperative haemoglobin levels were 8, 8.6 and 9.4 g/dL. Blood was processed and returned in 19 cases (Table 2) and for these patients the