# Intraoperative Cell Salvage for Obstetrics

## Contents:

<table>
<thead>
<tr>
<th></th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Abstract</td>
<td>2</td>
</tr>
<tr>
<td>1.2 Introduction</td>
<td>2</td>
</tr>
<tr>
<td>2. Benefits &amp; Risks of Obstetric Cell Salvage</td>
<td>3</td>
</tr>
<tr>
<td><strong>3. Guidelines</strong></td>
<td></td>
</tr>
<tr>
<td>3.1 Indications and Patient Selection</td>
<td>4</td>
</tr>
<tr>
<td>3.2 Preparation for ICS</td>
<td>5</td>
</tr>
<tr>
<td>Elective Procedures</td>
<td></td>
</tr>
<tr>
<td>Emergency Procedures</td>
<td></td>
</tr>
<tr>
<td>Consent</td>
<td></td>
</tr>
<tr>
<td>3.3 The Procedure of ICS</td>
<td>6-8</td>
</tr>
<tr>
<td>Collection &amp; Processing</td>
<td></td>
</tr>
<tr>
<td>Scrub Midwife Responsibilities</td>
<td></td>
</tr>
<tr>
<td>Re-infusion</td>
<td></td>
</tr>
<tr>
<td>Data Collection</td>
<td></td>
</tr>
<tr>
<td>Responsibilities following ICS</td>
<td></td>
</tr>
<tr>
<td>4. Women who Decline Blood Products</td>
<td>9</td>
</tr>
<tr>
<td>5. Rhesus Negative Women</td>
<td>9</td>
</tr>
<tr>
<td>6. Training</td>
<td>9</td>
</tr>
<tr>
<td>7. References</td>
<td>10</td>
</tr>
<tr>
<td>8. Appendices</td>
<td></td>
</tr>
<tr>
<td>8.1 I - Transfusion Labels</td>
<td>11</td>
</tr>
<tr>
<td>8.2 II - Manufacturer Contact Details</td>
<td>12</td>
</tr>
</tbody>
</table>

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## 1.1 Abstract

- Intraoperative Cell Salvage for Obstetrics
- Contents:
  - Abstract
  - Introduction
  - Benefits & Risks of Obstetric Cell Salvage
  - Guidelines
    - Indications and Patient Selection
    - Preparation for ICS
      - Elective Procedures
      - Emergency Procedures
      - Consent
    - Procedure of ICS
      - Collection & Processing
      - Scrub Midwife Responsibilities
      - Re-infusion
      - Data Collection
      - Responsibilities following ICS
  - Women who Decline Blood Products
  - Rhesus Negative Women
  - Training
  - References
  - Appendices
    - Transfusion Labels
    - Manufacturer Contact Details
This guidance refers to the use of intraoperative cell salvage in the obstetric setting. It is written for use by the multidisciplinary team involved in ensuring safe implementation of obstetric cell salvage in North Bristol NHS Trust.

1.2 Introduction

Intraoperative cell salvage (ICS) is an efficacious technique for blood replacement in which red blood cells lost during surgery are recovered, washed and re-infused to the patient. The procedure is being increasingly accepted as a safe and valuable part of managing obstetric haemorrhage\textsuperscript{1,2}.

The use of ICS in obstetrics has been endorsed by:

- Confidential Enquiry into Maternal and Child Health (CEMACH)\textsuperscript{3}
- Obstetric Anaesthetists Association (OAA)\textsuperscript{4}
- Association of Anaesthetists of Great Britain and Ireland (AAGBI)\textsuperscript{4,5}
- National Institute for Health and Clinical Excellence (NICE)\textsuperscript{6}

Theoretical safety concerns have slowed the introduction of ICS in Obstetric settings. NICE reviewed the evidence in 2005 and supported its use in Obstetrics subject to:

- Data collection
- Reporting of complications to the Medicine and Healthcare products Regulatory Agency
- Patients fully informed ‘whenever possible’ of the potential complications
- Performed by multidisciplinary teams who develop regular experience of intraoperative cell salvage
2.1 Benefits of Obstetric Cell Salvage

Intraoperative cell salvage enhances the safety of Caesarean Section (CS) for patients who decline blood products from donors.

Use of ICS helps to avoid the risks and problems associated with conventional homologous transfusion:
- infection (viruses, bacteria and prions)
- acute incompatibility / allergic reactions
- development of antibodies
- cost
- increasing scarcity
- recipients can not become blood donors (historically a ‘rich source’)

2.2 Theoretical Risks of Obstetric Cell Salvage

2.2.1 Amniotic Fluid Embolism (AFE)

Amniotic fluid embolism is a rare condition. It is not solely related to amniotic fluid entering the circulation at the time of delivery, which occurs in normal women. Rather it seems to be due to an unpredictable complex series of physiological reactions mimicking those seen in anaphylaxis and sepsis. Cell salvage using modern leucocyte depletion filters has been shown to remove all particulate components to a level equivalent to maternal blood at time of delivery\(^7,8,9\). No case of AFE has been reported associated with the use of obstetric cell salvage.

2.2.2 Sensitisation to Fetal Red Cells

The cell saver is unable to distinguish between maternal and fetal red cells. If cell salvaged blood is transfused back to the mother, fetal red cells may be present in higher concentration in the maternal circulation than often occurs naturally at delivery. Maternal sensitisation to fetal red cell antigens may occur. Rhesus D incompatibility is relatively common but sensitisation can be prevented with adequate anti-D administration after delivery.
Guidelines

3.1 Indications and Patient Selection

Patient selection for ICS is at the discretion of the surgeon and anaesthetist caring for the patient and must be considered on a case-by-case basis. The following may be considered indications for cell salvage:

Elective CS procedures at increased risk of bleeding. e.g:
   a. Placenta praevia
   b. Suspected placenta accreta
   c. Classical incision
   d. Past history of uterine atony
   e. Maternal bleeding disorders

2. Emergency CS at increased risk of bleeding. e.g:
   a. Placental abruption
   b. Placenta praevia
   c. Prolonged or obstructed labour associated with atony, head impaction or oedematous lower segment
   d. Women on anticoagulants
   e. Maternal bleeding disorders

3. CS for women who have declined blood products (eg. Jehovah’s witnesses)

4. CS when there is difficulty with cross-matching due to antibodies

5. CS associated with anaemia

6. Laparotomy following postpartum haemorrhage
3.2 Preparation for ICS

3.2.1 Elective Procedures

- When a clinician considers an elective case suitable for ICS, he or she should contact Dr Chris Laxton, Obstetric Lead for Anaesthetics, (Christina.Laxton@nbt.nhs.uk) providing the patient’s name, hospital number, indication for cell salvage and preferred date of the case. A practitioner who is fully trained to operate the cell salvage equipment can then be arranged.

3.2.2 Emergency Procedures

- For Emergency procedures requiring cell salvage between the hours of 08:00 and 16:00, the obstetric anaesthetic consultant on delivery suite should be contacted.

- Out of hours, the decision to use cell salvage will lie with the most senior anaesthetist and will be dependant on whether there is trained member of staff available to operate the machine.

- Obtaining an operator for cell salvage should not delay the start of the procedure unless the indication for ICS is pivotal in providing safe care to the patient.

3.2.3 Consent

- A patient information leaflet is available on CDS and should be given to the patient prior to the procedure, particularly for non-emergency surgery. Adequate time should be given to allow the patient to read the leaflet and discuss any queries with their anaesthetist.

- If a patient information leaflet is not available, discussions should include an outline of the procedure, the known risks of conventional blood transfusion and the theoretical risks of ICS. This should then be documented either in the notes or on the anaesthetic chart.

- In extreme situations, such as massive abruption, the doctor should consider the procedure as part of his or her duty to act in the patient’s best interests. An exception to this would be when the doctor knows in advance that the patient would not accept ICS.
3.3 The Procedure of ICS

Obstetric ICS should be performed only by those fully trained in the technique.

3.3.1 Collection & Processing

- Instructions for set up of collection and processing kits can be found attached to the cell salvage machine.
- A wide bore sucker (aspiration anticoagulation line) is attached to a vacuum of 150 mmHg and blood is collected in a reservoir.
- A separate sucker should be used to aspirate the majority of amniotic fluid.
- The machine will automatically process (spin, wash & package) red blood cells for re-infusion when enough fluid is present in the reservoir.
- In cases where there is doubt about the extent of expected blood loss, it is economical to set up the collection kit only – the decision to process and re-infuse can be made when the degree of haemorrhage has become clear.
- In the presence of heavy bleeding, vacuum settings may need to be increased (maximum of 300mmHg). The rate of anticoagulant will also need to be increased to maintain a 1:7 anticoagulant:blood ratio.
- Technical problems with the cell salvage machine should be reported to C. Laxton, Lead Obstetric Anaesthetist.

3.3.2 Scrub Midwife Responsibilities

- The sterile aspiration anticoagulation line will be handed to the scrub midwife. The bifurcated double end should be handed back to the cell salvage operator. The other end with fused double channel should remain sterile and be positioned for use by the surgeon. A yankeur tip is best avoided unless specifically requested by the surgeon as there is risk of damage to red cell integrity.
- A sterile bowl should be filled with 1000mls of sterile 0.9% intravenous saline. Blood stained swabs should be placed in the bowl before they dry
out. At the end of the case, the swabs should gently agitated to maximise red cell recovery. The swabs should not be wrung as this may damage the red cells and render them useless. This blood/saline solution can then be aspirated into the reservoir for processing.

3.3.3 Re-infusion

- The decision to re-infuse should be made jointly by the obstetrician and anaesthetist in discussion with the woman whenever possible.

- A green patient identification label (see example appendix I) should be completed from details on the patient’s wristband and attached to the salvaged blood bag. Details should include:
  - Full name
  - Date of Birth
  - Hospital number
  - Collection start date and time
  - Expiry date and time

  The peel out section of the label should be detached and placed in the cell salvage transfusion register. These labels can be found on the electa cell salvage machine.

- The blood should be prescribed on the IV fluid chart as ‘autologous blood’.

- Re-infusion of the salvaged blood must take place within 6 hours of the completion of processing. Prior to a decision to use the blood, the bag must remain at the patient’s bedside and not stored in a fridge.

- All salvaged blood should be returned to the patient using a leucodepletion filter (the filter considerably slows down the flow of blood and therefore, in cases of life-threatening blood loss, it may be appropriate to remove the filter to allow rapid return of blood to the patient).

- Blood warmers and pressurised bags should not be used except in the acute life-threatening situation of on-going heavy haemorrhage.

- Massive re-infusion of salvaged red blood cells will result in depletion of platelets and clotting factors. The need for additional appropriate transfusion support e.g. platelets, fresh frozen plasma and cryoprecipitate, must be considered.

- Adverse Events (significant enough for the transfusion to be discontinued or supportive care required on reinfusion of salvaged blood) should be
documented and reported to Dr C. Laxton, Lead Obstetric Anaesthetist. An AIMS form should also be completed.
3.3.4 Data Collection

- **Monitoring forms** should be completed for all cases, even if only collection (no processing or re-infusion) takes place. This is the responsibility of the cell salvage operator.

- Monitoring forms can be found in the red cell salvage folder in anaesthetic room A on CDS. Once completed, one copy should be returned to the folder and if autologous blood is returned to the patient, an additional copy should be filed in the patient’s notes.

- The sticker from the autologous blood transfusion label should be transferred to the cell salvage transfusion record, also kept in the red cell salvage folder.

3.3.5 Responsibilities following ICS

- The cell salvage operator is responsible for dismantling the cell salvage machine and discarding disposables in a yellow clinical waste bin.

- Any obvious external blood contamination of the machine must be cleaned.

- The cover should be replaced and the machine returned to its original storage place.

- Following contamination of the equipment internally, the equipment should be removed from use, identified as a potential biohazard and referred to the manufacturer.
4. Women who Decline Blood Products

- Certain patients (e.g. Jehovah’s Witnesses) may decline the use of blood components (e.g. packed red cells, fresh frozen plasma, platelets, pre-autologous deposit). These patients may accept certain “fractions” of plasma or cellular components (e.g. albumin, immunoglobulins, anti-D, clotting factors, vaccines) and/or intraoperative cell salvage. An Advance Directive should be completed antenatally to clarify these important issues. The anaesthetist should further discuss these issues with the patient prior to the procedure to ensure the patient’s views have not changed and document the discussion in the notes.

- Most Jehovah’s witnesses who accept intraoperative cell salvage demand that a continuous circuit must be in place for the return of blood. Therefore the blood giving set should be primed with 0.9% intravenous (iv) saline and attached to the patient’s IV line prior to starting the operation. This ensures continuity with their circulation from the point of salvage to the point of return at all times (step-by-step set up instructions are attached to the cell salvage machine).

5. Rhesus Negative Women

- The policy for the post delivery management of rhesus negative women is no different to routine cases except that a Kleihauer test should be performed as soon as is practical after re-infusion of salvaged cells and the procedure recorded on the request form.

- In addition to a record in the patients notes, the anaesthetist must make it clear in the handover of care to the midwife that cell salvaged blood has been used. This information should be available to the transfusion laboratory when requesting Kleihauer estimation and the usual dose (1500iu) of prophylactic anti-D given if the baby is RhD positive.

6. Training

- All persons operating the cell salvage machine should have undergone training and have relevant competencies signed either by the company manufacturers (Sorin) or link-trainers within the Trust.

- There is an ongoing programme of training within the Trust. Please contact Dr Chris Laxton, Lead Obstetric Anaesthetist for details.
7. References

1) **Catling Sue, Joels Lisa** Cell Salvage in Obstetrics – the time has come *British Journal of Obstetrics & Gynaecology* 2005; **112**: 131-132


4) **OAA/AAGBI** Guidelines for Obstetric Anaesthetic Services revised Edition May 2005 p25

5) **AAGBI** Safety Guideline. Blood Transfusion and the Anaesthetist; Intraoperative Cell Salvage. 2009 p11


7) **Waters JH. Biscotti C. Potter PS Phillipson E** Amniotic fluid removal during cell salvage in the cesarean section patient; *Anaesthesiology* 2000; **92**: 1531-1536

8) **Sullivan I, Faulds J, Ralph C** Contamination of salvaged maternal blood by amniotic fluid and fetal cells during elective caesarean section. Br J Anaesth 2008; 101:225-229

9) **Catling SJ, Williams S, Fielding A** Cell salvage in Obstetrics: an evaluation of the ability of cell salvage combined with leucocyte depletion filtration to remove amniotic fluid from operative blood loss at caesarean section. *Int. J. of Obstetric Anesthesia* 1999;8;79-8


8.1 Appendix I

Autologous Transfusion Label

- **AUTOLOGOUS TRANSFUSION**
- Untested Blood
- For AUTOLOGOUS use only

- Hospital / NHS No.
- Last name
- First name
- DOB
- Operator Name (Print)
- Collection Date
- Time
- Expiry Date
- Time

- Type of autologous blood:
  - Intra-op Cell Salvage
  - Post-op Cell Salvage (Washed)
  - Post-op Cell Salvage (Unwashed)
- Total Volume

**AFFIX IN TRANSFUSION RECORD**
(This section should be completed and affixed in patient’s transfusion record)

- Autologous Transfusion
- Full Name
- Hospital / NHS No.
- Type:
  - Intra-op Cell Salvage
  - Post-op Cell Salvage (Washed)
  - Post-op Cell Salvage (Unwashed)
- Administered by
- Transfusion Started at: Date
- Time
- Total Volume

**STOP!**
- DO NOT use addressograph labels
- Handwrite the label from the information on the patient’s identification band
- DO NOT separate autologous blood from the patient
- DO NOT Refrigerate
- Reinfuse in accordance with the hospital’s transfusion policies

Before transfusion, carry out the following checks:

1. Confirm the patient’s identification.
2. Check the information on the label matches the information on the patient’s identification band (where possible, ask the patient to state their NAME and D.O.B.).
   - No identification band
   - No transfusion
3. Check expiry date and time of blood.
4. If any details do not match: Do not transfuse.
5. If a transfusion reaction is suspected, STOP the transfusion and seek medical advice.

Back of peel out section of label
8.2 Appendix II

Manufacturers Contact Details

**Machine in current use:**
Sorin Electa

**Sorin Contact Details:**
Matthew Odurny
Sorin Group UK Ltd
1370 Montpelier Court
Gloucester Business Park
Gloucester
GL3 4AH

Tel: 07825 223613
Fax: 01452 638530