

# Obstetric haemorrhage

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## Abstract

Haemorrhage remains a major cause of maternal morbidity and mortality in the developed and developing world. It can be defined as an estimated blood loss of more than 1500 ml, with ongoing blood loss. Postpartum haemorrhage is the most common cause, and accounts for about 50% of cases. Initial management involves patient assessment, estimation of blood loss, obtaining appropriate help, monitoring and resuscitation. Bleeding may be stopped with drugs that promote uterine contraction (oxytocin, ergometrine or prostaglandins) or with external/internal tamponade, arterial ligation and, if all else fails, hysterectomy. Recent advances include the use of recombinant factor VIIa and interventional radiology. Cell salvage and thromboelastography are also emerging as new and helpful techniques. Early anaesthetic involvement should form part of this multidisciplinary management. Clinical circumstances may dictate choice of anaesthetic for examination and delivery. In emergency cases, haemodynamic stability and coagulation status have to be considered, and a general anaesthetic is usually indicated. However, in elective cases, regional anaesthesia is now accepted even if significant blood loss is anticipated. Locally developed protocols, with regular 'fire drill' practice sessions, are essential.

**Keywords** cell salvage; interventional radiology; recombinant factor VIIa; thromboelastography

Haemorrhage is a major cause of maternal mortality and morbidity in both the developed and developing world. According to statistics from the World Health Organization<sup>1</sup> haemorrhage occurred in 10% of all live births in 2000, resulting in 132,000 deaths globally. The most recent Confidential Enquiry into Maternal and Child Health (CEMACH)<sup>1</sup> which is published every 3 years by the Royal College of Obstetricians and Gynaecologists, reported 17 direct deaths in the UK from haemorrhage (3 from placental abruption, 4 from placenta praevia and 10 from postpartum haemorrhage) amounting to 8.5 deaths per million maternities. The Scottish Confidential Audit of Severe Maternal

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Morbidity has identified major haemorrhage as the most common cause of severe morbidity in the pregnant population of Scotland, with a rate of 4.5 per 1000 births.<sup>2</sup> The incidence of major haemorrhage seems to be rising year on year.

## Definition

Major obstetric haemorrhage can be defined as an estimated blood loss of more than 1500 ml (with ongoing blood loss) or more than five units of blood transfused, or treatment for coagulopathy.<sup>2</sup> However, as a general rule, additional resources should be mobilized as soon as blood loss exceeds 1500 ml.

## Risk factors

CEMACH has identified several risk factors associated with haemorrhage. These include increasing age, existing complex medical disorders, assisted reproduction resulting in multiple pregnancies, and the increasing caesarean section rate.

Postpartum haemorrhage is the most common cause of maternal blood loss, and is responsible for 50% of cases of major obstetric haemorrhage. The risk is most extensive in cases of placental abruption or placenta praevia. Emergency caesarean section, retained placenta, previous uterine atony and gestational diabetes present a more moderate level of risk. Lesser risk factors include multiple pregnancies, elective caesarean section, pre-eclampsia, obesity, large baby (i.e. >4.5 kg), slow labour, induction/augmentation of labour, chorioamnionitis and maternal Hispanic race.

## Management

### Evaluate the patient

It is vital to take a past medical and obstetric history. The patient should be examined to establish why and where she is bleeding, and what treatment should be initiated. Treatment depends on whether the fetus has been delivered.

**Antepartum and intrapartum:** placental abruption and placenta praevia can be differentiated by history and presentation. Ultrasound scanning can often aid diagnosis. A placental abruption resulting in fetal death indicates that there has been a substantial bleed. The release of thromboplastin predisposes to disseminated intravascular coagulopathy, the severity of which can be minimized by early delivery. The patient, already hypovolaemic and probably coagulopathic, will be at significant risk of postpartum haemorrhage, and therefore appropriate preparations should be made. Uterine rupture is uncommon and almost always follows previous uterine surgery. It presents with severe abdominal pain, fetal distress/demise or signs and symptoms of hypovolaemic shock.

**Postpartum:** uterine atony is most likely but a clinical examination should be carried out to exclude retained products and genital tract lacerations.

### Estimate blood loss

Maternal haemorrhage can be torrential. Uterine blood flow increases from less than 5% to 12% of the cardiac output through pregnancy, and at term is 700–900 ml/min. Estimation of blood loss is notoriously difficult: blood can be concealed

within the uterine cavity or the retroplacental space, and pregnancy-induced physiological changes can mask the clinical picture. Tachycardia (which may be the only sign), increased stroke volume and compensatory vasoconstriction will maintain the blood pressure. Hypotension may arise only when 30–50% of the circulating blood volume has been lost. It is a late and ominous sign.

### Get help

Every hospital should have a major obstetric haemorrhage protocol. This should be activated to mobilize the appropriate staff (senior midwife, obstetric and anaesthetic registrars, porters and Blood Transfusion Service staff) and release the pre-arranged blood pack. Early involvement of obstetric and anaesthetic consultants is important, and liaison with haematology vital.

### Monitor the patient and ensure ongoing note-taking

ECG, non-invasive blood pressure, pulse oximetry and hourly urine volumes are mandatory. It may be necessary to move the patient to theatre. Consider an arterial line if frequent sampling is required or the patient is unstable or ICU admission is planned. Consider a central line if blood loss exceeds 2 litres and is ongoing. Near-patient tests (Hemacue/arterial blood gas/thromboelastography) are helpful for guiding management.

### Initiate resuscitation

The aim of resuscitation is to restore circulating blood volume and maintain adequate tissue perfusion. If antepartum, place the patient in a left lateral position to avoid aortocaval compression.

- Oxygen: 10 litres per minute.
- Intravenous access: two 14G cannulae. Take blood for full blood count and clotting studies. Cross-match for six units of blood.
- Fluid: ensure fluids are warm, and use high-pressure infusing devices (e.g. level 1) if appropriate.
- Crystalloid: up to 2 litres. Colloid (not dextrans): up to 1.5 litres.
- Blood: O rhesus-negative should be immediately available within the delivery suite. Typically, type-specific blood takes 10 minutes to arrive, whereas a full cross-match takes 45 minutes. Aim for a haemoglobin of 80 g/litre.
- Clotting products: fresh frozen plasma, platelets and cryoprecipitate should be given on the basis of clinical evaluation and laboratory results.

Over-zealous resuscitation can result in pulmonary oedema or dilution coagulopathy. This is most likely when a high-pressure infusion device is used. Regular assessment of volaemic status should be carried out to avoid this complication. It is important to avoid hypothermia and metabolic disturbance. Hypothermia impairs coagulation and may lead to further peripheral vasoconstriction. Active warming devices (*Bair Hugger*) or warmed blankets should be used. Acidosis and hypocalcaemia should be corrected as necessary.

### Stop the bleeding

The approach used to stop the bleeding depends on the aetiology of the haemorrhage.

### Pharmacological

- The main treatment for uterine atony is oxytocin. 5–10 units of this hormone is given by slow intravenous bolus, which can

be repeated if needed, and is usually followed by an infusion of 40 units over 4 hours. Hypovolaemic or cardiac patients should have 5–10 units of oxytocin as a 20-minute infusion because vasodilatation may result in catastrophic hypotension.

- If atony persists, ergometrine, 0.5 mg, is administered (incrementally and slowly) as an intramuscular or intravenous injection. Because ergometrine is a potent uterine and vascular smooth muscle constrictor, it can cause hypertension, and is contraindicated in the pre-eclamptic patient. Ergometrine usually causes nausea and vomiting.

- Prostaglandins are the next group of agents used for the treatment of resistant atony.<sup>3</sup> Carboprost is prostaglandin F<sub>2α</sub> (PGF<sub>2α</sub>), a powerful smooth muscle constrictor. 250 µg can be given every 15 minutes, up to a maximum of 2 mg. However, in practice most clinicians use another agent/technique after two doses. Carboprost is a potentially dangerous drug as it causes significant bronchoconstriction with resultant intrapulmonary shunting and hypoxia. It should never be given intravenously, but can be given intramuscularly or intramyometrially.

- Misoprostol is a prostaglandin E<sub>1</sub> (PGE<sub>1</sub>) analogue, and 1000 µg is given rectally in haemorrhage. It is low in cost and does not require refrigeration (unlike oxytocin and carboprost), and is therefore ideal for use in tropical countries. It can cause shivering, pyrexia and diarrhoea.

- Sulprostan is a PGE<sub>2α</sub> analogue. It is widely used in France and is administered as an intravenous infusion.

- Tranexamic acid is a synthetic lysine derivative with anti-fibrinolytic action. It is cheap and has few side effects. 1 g can be given intravenously, which can be repeated every 4 hours.

### Surgical

- Ensure that there are no retained products or clots within the uterus and that the bladder is empty. Examine the genital tract for lacerations.

- External tamponade: bimanual uterine compression ([Figure 1](#)); B-lynch suture ([Figure 2](#)) (useful for patients who have responded to bimanual compression because continual uterine compression is provided);<sup>4</sup> multiple individual square sutures.<sup>5</sup>

- Internal tamponade: uterine packing (requires antibiotic cover and another theatre session for removal); Rusch balloon ([Figure 3](#)). This balloon is inserted through the cervix into the uterine cavity and inflated to 500–1000 ml. It is then deflated in stages as the bleeding subsides.

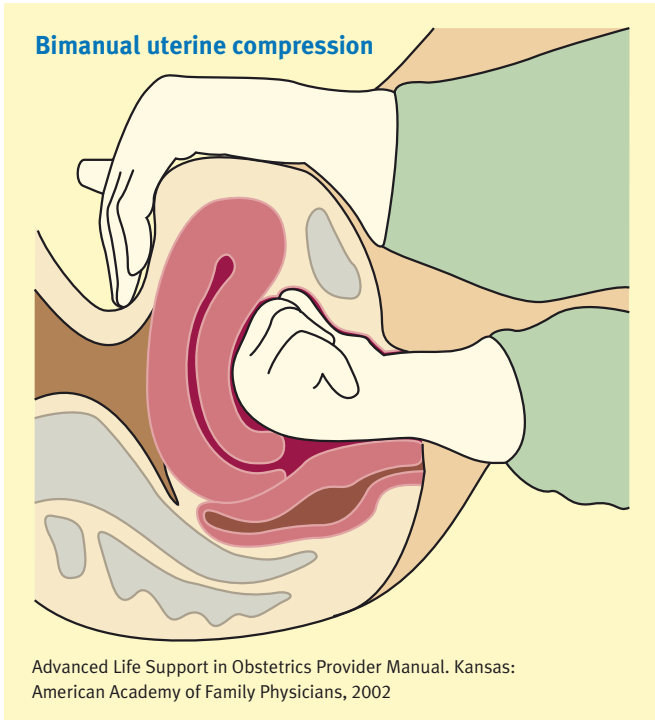
- Arterial ligation: bilateral ligation of the uterine or internal iliac arteries is possible. However, the presence of collateral vessels may make this procedure ineffective. Temporary clamping of the abdominal aorta may allow restoration of circulating blood volume and clinical stabilization.

- Hysterectomy is always a difficult decision. However, it must be considered if other methods have failed and haemodynamic stability cannot be achieved.

### Recent advances

#### Interventional radiology

There is an increasing amount of supporting evidence concerning the use of interventional radiology. It may be used electively in placenta praevia/accreta cases where large blood loss is anticipated or in the emergency situation where conventional means



**Figure 1**

have failed and there is localized arterial bleeding. Success rates are in the order of 90–95%.<sup>6</sup>

Balloon occlusion of the internal iliac arteries (Figure 4) stems the bleeding and allows stabilization of the haemodynamic situation with subsequent selective arterial embolization of the uterine arteries. Occlusion of the distal uterine artery bed lasts for about 4 weeks, whereupon it recanalizes, opening up the uterine vasculature, thus preserving fertility and reproductive potential. However, not all centres have access to interventional radiology, and there are difficulties with the transfer of unstable patients to the angiography suite.

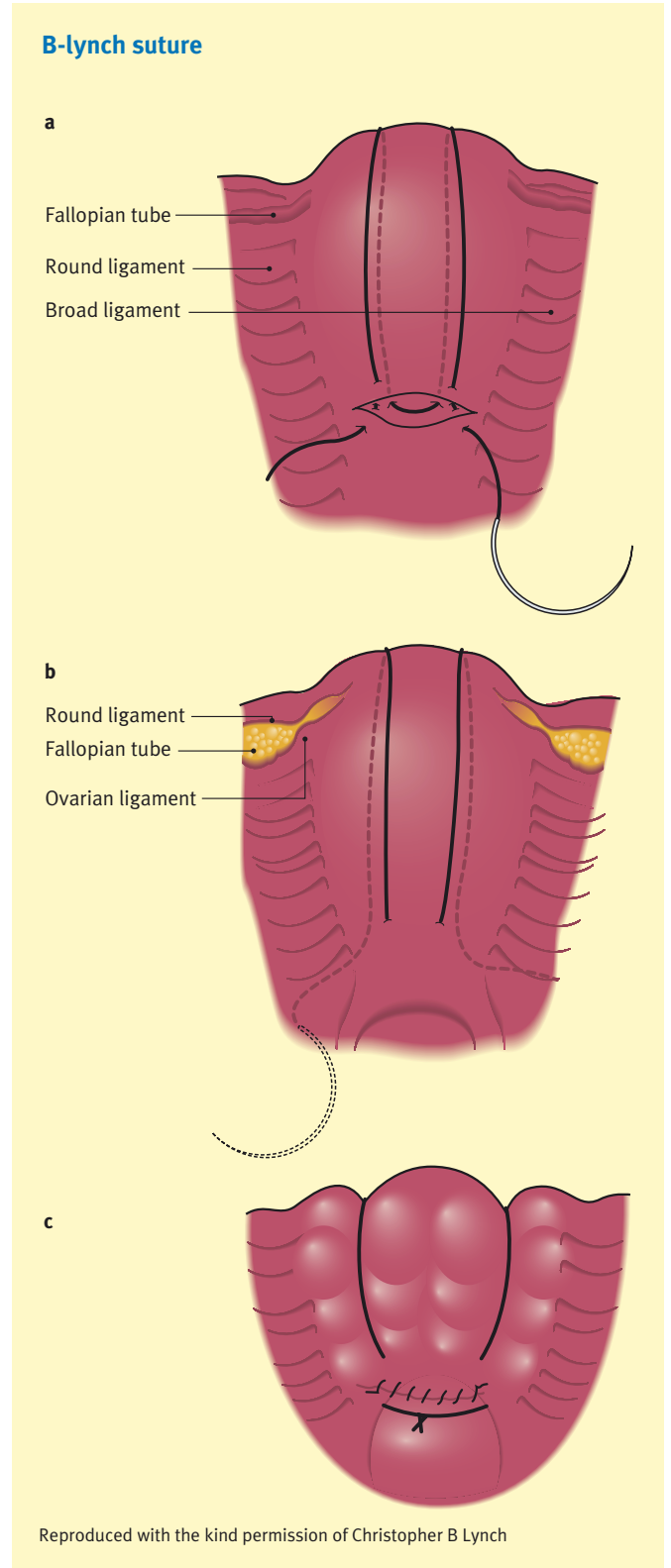
**Cell salvage**

This procedure is well established in cardiac, vascular and orthopaedic surgery. It avoids the hazards of homologous blood transfusion. Although there have been concerns in obstetric practice about the possibility of iatrogenic amniotic fluid embolus, opinion seems to have changed with the publication of more than 400 case reports demonstrating the safety of cell salvage.<sup>7</sup> To reduce amniotic fluid contamination, cell salvage should commence after delivery of the fetus and placenta. A Pall-RS leucocyte depletion filter should be included in the intravenous line during transfusion.

The cell saver cannot distinguish between fetal and maternal red cells, so any aspirated fetal cells will be transfused into the maternal circulation. Prompt Kleihauer testing and appropriate anti-D treatment should be carried out on patients at risk of isoimmunization.

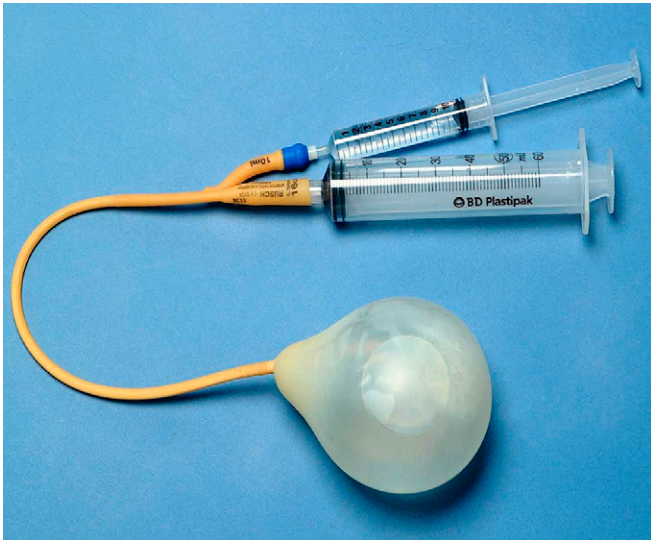
**Thromboelastography**

Thromboelastography (TEG) measures the viscoelastic changes of whole blood during clotting, and provides a picture of haemostasis.



**Figure 2 a** Anterior view; **b** posterior view; **c** anterior view.

Studies have confirmed the presence of a hypercoagulable prothrombotic state during pregnancy and the postpartum period in relation to non-pregnant women. Therefore, baseline levels differ from standard reference ranges. The effect of pre-eclampsia on



**Figure 3** Rusch balloon.

clotting is also reflected in measured values. There remains much debate as to the place of TEG in obstetric anaesthesia.<sup>8</sup>

#### Recombinant factor VIIa

Recombinant factor VIIa is licensed for the treatment and prophylaxis of haemorrhage in patients with haematological disorders but is not currently licensed in obstetrics. Jehovah's Witnesses will accept its administration. It plays a fundamental role in the initiation of clotting following vascular injury by binding to tissue factor exposed after vessel injury and results in a large thrombin burst and conversion of fibrinogen into fibrin

with clot formation. There have been multiple case reports of its use in obstetrics<sup>9</sup> but there is uncertainty about the dose (90 mg/kg has been suggested, which can be repeated every 2 hours) and the optimal conditions for use. The patient will still require substantial coagulation products and must not be acidic. Hypothermia does not impair the haemostatic effect, but the condition should be avoided. Recombinant factor VIIa may not be the treatment of choice in obstetric haemorrhage and is very costly (£4000 per dose). Case reports of non-responders and thromboembolic complications have been published only recently.

#### Anaesthetic considerations

Anaesthetists should be involved early in the initial assessment and resuscitation of the patient, and provide anaesthesia for examination or delivery. The anaesthetist's involvement is often done under very difficult circumstances, where anaesthetic options are dictated by maternal and fetal conditions. Senior anaesthetists should be informed and involved in all difficult cases.

In the emergency situation, the presence of haemodynamic instability with blood loss is a contraindication to regional anaesthesia, and general anaesthesia is unavoidable. Vasodilatory, volatile anaesthetic agents may add to hypotension and further relax an atonic uterus; however, this is not usually a problem because oxytocins are inevitably given concurrently.

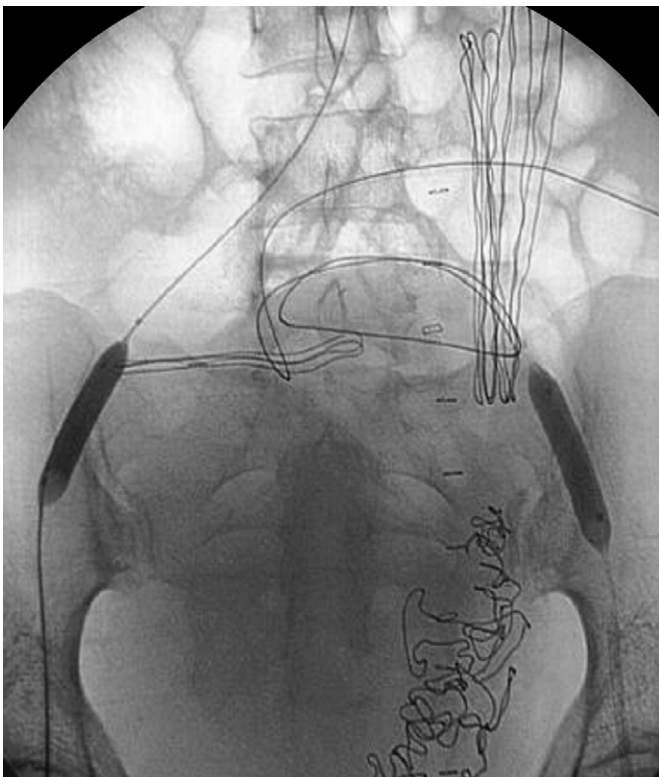
If the patient is cardiovascularly stable, adequately fluid resuscitated, and has no coagulopathy, a regional procedure may be considered. If an epidural is in place, cautious 'top-ups' may be appropriate.

In elective cases, where massive blood loss is anticipated (e.g. placenta praevia/accretae) the Royal College of Obstetricians and Gynaecologists state that the choice of anaesthetic should be the decision of the anaesthetist. They stress that a general anaesthetic may be necessary. However, the view that a general anaesthetic is mandatory for placenta praevia is no longer held by most anaesthetists. The choice of anaesthetic will depend on the exact position of the placenta and ultimately the discretion of the individual anaesthetist. If regional anaesthesia is used, consideration should be given to a combined spinal/epidural technique to allow time for potentially prolonged surgery. In this situation the patient should be prepared and counselled for possible conversion to a general anaesthetic.

Postoperatively, women who have had a major haemorrhage should be cared for in a high-dependency setting. If they are unstable or have ongoing bleeding, intensive care may be more appropriate, with close liaison with obstetricians and obstetric anaesthetists.

#### Protocols

Working as a team is vital during an emergency, and individual staff should have clearly defined roles. Locally developed major obstetric haemorrhage protocols that are regularly reviewed, updated and rehearsed are essential. 'Fire drills' help to identify deficiencies in the protocol, staff training and hospital systems.<sup>10</sup> Training courses such as Managing Obstetric Emergencies and Trauma (MOET) and Advanced Life Support in Obstetrics (ALSO) should be encouraged. ◆



**Figure 4** Internal iliac artery balloons in interventional radiology.

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## FURTHER READING

Managing Obstetric Emergencies and Trauma manual and Advanced Life Support in Obstetrics manual. [www.also.org.uk](http://www.also.org.uk) (accessed 3 April 2007).