



The role of interventional radiology in reducing haemorrhage and hysterectomy following caesarean section for morbidly adherent placenta



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AIM: To report experience of prophylactic occlusion balloon catheters (POBCs) in both internal iliac arteries before caesarean section, with or without embolization, to preserve the uterus and reduce haemorrhage.

METHODS AND MATERIALS: Twenty-seven women diagnosed with morbidly adherent placenta (MAP) and with suspected placenta percreta underwent POBC placement before caesarean section. The balloons were inflated immediately after delivery of the baby. The patients' case notes were reviewed retrospectively for histological grading of MAP, blood loss, transfusion, requirement of uterine artery embolization (UAE), or hysterectomy, radiation dose, and infant or maternal morbidity and mortality.

RESULTS: MAP was confirmed histologically as percreta in 17, accreta in eight, and increta in two women. Mean blood loss was 1.92 l (range 0.5–12 l). Postpartum haemorrhage (PPH) occurred in nine patients. Eight were referred for UAE, which was successful in six. Immediate peri-partum hysterectomy was performed in one patient. Three women in total required hysterectomy, two after recurrent haemorrhage after UAE. No foetal morbidity or mortality occurred. No maternal mortality occurred. There was one case of iliac artery thrombosis, which resolved with conservative therapy.

CONCLUSION: POBC, with or without UAE, contributes to reduction of blood loss and preservation of the uterus in women with MAP.

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Introduction

Morbidly adherent placenta (MAP) is a condition that causes significant maternal morbidity and mortality from primary postpartum haemorrhage (PPH).¹ It occurs when there is invasion of the chorionic villi into the myometrium

and its incidence is increasing, in line with the increase in caesarean delivery.² This is a potentially life-threatening condition, which has traditionally required peripartum hysterectomy with or without bowel or bladder resection,³ depending on the degree of infiltration of these organs. Alternative therapies have included compression sutures and balloon tamponade with the placenta remaining *in situ*^{4–6}; however, this carries a risk of sepsis and delayed haemorrhage.⁷

Placenta percreta is the most severe but least common form of MAP, whereas placenta accreta is the commonest but least severe. MAP can be diagnosed before delivery

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using ultrasound and magnetic resonance imaging (MRI),⁸ and so women at risk of developing haemorrhage from this condition can be identified before delivery.

In 2007, the authors commenced a programme of prophylactic occlusion balloon catheter (POBC) insertion into both internal iliac arteries before caesarean delivery in women suspected of having the most severe form of MAP, placenta percreta. The aim was to reduce blood loss, preserve the uterus, reduce maternal and foetal morbidity, and prevent mortality by reducing blood flow in the uterine arteries immediately after caesarean delivery. However, if haemorrhage occurred despite inflation of the occlusion balloons, the presence of intra-arterial catheters in the internal iliac arteries allowed rapid progression to arterial embolization.^{9–12}

Materials and Methods

Between December 2007 and June 2013, pregnant women diagnosed with placenta percreta by ultrasound or MRI, were referred to Interventional Radiology (IR) for POBC on the morning of elective delivery. All patients were fully counselled and gave informed consent. The study was based on service development, and therefore, local ethics committee approval was not required.

An epidural catheter was inserted by the anaesthetists before the patient was transferred to the IR suite for insertion of the POBCs. Bilateral common femoral arterial punctures were performed under local anaesthetic and occlusion balloon catheters (7 F Standard Occlusion Balloons Catheters, 2010, Boston Scientific, Natick, USA) were inserted contralaterally with their tips in the anterior divisions of each internal iliac artery as shown in Fig 1, using pulsed low-dose fluoroscopic guidance to minimize radiation exposure.

Test occlusion was performed to ensure reduction/stasis in uterine artery blood flow and to estimate the volume of half strength contrast medium/normal saline solution

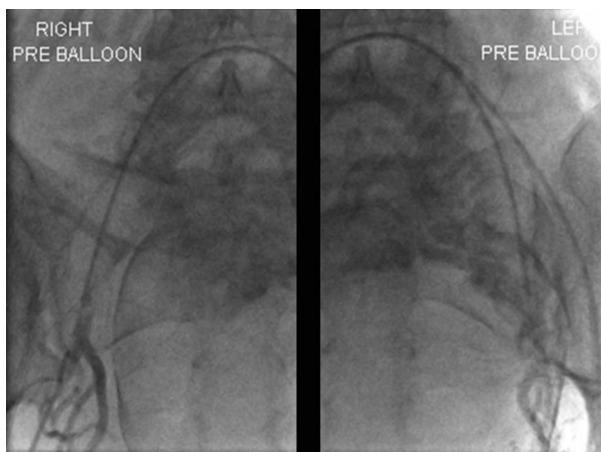


Figure 1 Contralateral placement of POBCs with tips in both internal iliac arteries. Contrast medium injected through the catheters confirms their correct position in the anterior trunk of both internal iliac arteries.

required to inflate each balloon. This was recorded in the patient's notes and Luer lock syringes with the required volume were attached to the catheters. The occlusion balloons take a maximum volume of 2 ml.

The balloons were then deflated. The catheters and the sheaths were flushed, stitched, and dressed to minimize the risk of dislodgement during the patient's transfer. In the obstetric theatre, a mobile image intensifier was used to check that the balloon catheters had not moved during transfer. If this occurred, the IR would reposition the catheter correctly before caesarean section commenced.

After delivery of the baby and clamping of the umbilical cord, the IR inflated each balloon to the predetermined volume to reduce blood flow whilst the obstetrician closed the uterus. If there was no haemorrhage, the balloon catheters were left in place and deflated after 4 h and the patient observed for bleeding overnight. If the patient remained stable, the sheaths and occlusion balloon catheters were removed by the interventional radiologist the next morning. The femoral arterial puncture sites were sealed with a 6 F AngioSeal™ closure device (St Jude Medical, St Paul, MN, USA).

If there was evidence of haemorrhage, the patient was referred for arterial embolization. Ideally, the patient would be transferred to the IR suite, but if deemed too unstable for transfer, the IR would proceed to embolization through the occlusion balloon catheters in the obstetric theatre.

The following parameters were recorded for each procedure: radiographic exposure and screening time, volume of blood loss, transfusion requirements, bilateral uterine artery embolization (UAE) required, hysterectomy performed, length of stay on Intensive Care Unit (ICU), and foetal and maternal complications.

Statistical methods

Descriptive characteristics were calculated for the variables of interest. Discrete variables were expressed as counts and percentages, whereas continuous variables were calculated as means and standard deviation.

Results

Twenty-seven patients of mean age 36 years and 34 weeks + 2.6 days of gestation (± 4 weeks + 2.3 days) with a diagnosis of placenta percreta were treated with POBC and caesarean delivery. All deliveries apart from one were performed electively. The non-elective patient went into labour 4 days before the booked elective caesarean delivery, but the standard treatment protocol was performed as usual, and so she was included in the study. In all cases, occlusion balloons were successfully placed prior to delivery. The occlusion balloons were successfully inflated following caesarean section in all but one case, when the balloons were over-distended and ruptured. The patient characteristics and outcomes are summarized in Table 1.

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