Clinical Radiology xxx (2015) 1–6

Contents lists available at ScienceDirect

Clinical Radiology

journal homepage: www.clinicalradiologyonline.net

Caesarean section combined with temporary aortic balloon occlusion followed by uterine artery embolisation for the management of placenta accreta

X.-H. Duan [a], Y.-L. Wang [a,*], X.-W. Han [a], Z.-M. Chen [b], Q.-J. Chu [c], L. Wang [a], D.-D. Hai [a]

[a] *Department of Interventional Radiology, The First Affiliated Hospital, Zhengzhou University, No. 1, East Jian She Road, Zhengzhou, 450052, Henan Province, People's Republic of China*
[b] *Department of Obstetrics, The First Affiliated Hospital, Zhengzhou University, No. 1, East Jian She Road, Zhengzhou, 450052, Henan Province, People's Republic of China*
[c] *Department of Anesthesiology, The First Affiliated Hospital, Zhengzhou University, No. 1, East Jian She Road, Zhengzhou, 450052, Henan Province, People's Republic of China*

ARTICLE INFORMATION

Article history:
Received 4 February 2015
Received in revised form
11 March 2015
Accepted 19 March 2015

AIM: To determine the efficacy and safety of caesarean section combined with temporary aortic balloon occlusion followed by uterine artery embolisation (UAE) for the treatment of patients with placenta accreta.

MATERIALS AND METHODS: This retrospective study involved 42 patients with placenta accreta. All patients underwent caesarean section combined with temporary aortic balloon occlusion followed by UAE through the right femoral approach.

RESULTS: All patients were confirmed to have placenta praevia and accreta, including five patients with placenta percreta, at the time of delivery. The technical success rate of the combined treatment was 97.6% (41/42). Forty-one patients underwent successful caesarean section with conservation of the uterus. Hysterectomy was required in one (3.1%) patient. The amount of blood loss and blood transfusion, and the operation time were was 586 ± 355 ml, 422 ± 83 ml and 65.5 ± 10.6 minutes, respectively. The mean postoperative hospital stay, occlusion time and fetal radiation dose were 5.5 ± 2.6 days, 22.4 ± 7.2 minutes and 4.2 ± 2.9 mGy, respectively. There were no significant changes before and 7 days after the endovascular procedure in creatinine levels (56.8 ± 13.8 μmol/l versus 63.4 ± 16.7 μmol/l, $p = 0.09$) or urea nitrogen (6.3 ± 2.5 μmol/l versus 7.4 ± 3.8 μmol/l, $p = 0.17$). There were no access-site complications after the endovascular procedure and no complications related to the intervention during follow-up.

CONCLUSION: Temporary aortic balloon occlusion followed by UAE can effectively control postpartum haemorrhage during placental dissection, and reduce transfusion requirements, hysterectomy rate, and operation time in patients with placenta accreta.

* Guarantor and correspondent: Y.-L. Wang, Department of Radiology, The First Affiliated Hospital, Zhengzhou University, No. 1, East Jian She Road, Zhengzhou, 450052, Henan Province, People's Republic of China. Tel.: +86 037166862171; fax: +86 037166862172.
E-mail address: zzuwyl@sina.com (Y.-L. Wang).

http://dx.doi.org/10.1016/j.crad.2015.03.008
0009-9260/

Introduction

Placenta accreta refers to the abnormal attachment of the placenta to the uterine wall such that the chorionic villi invade the myometrium or even penetrate adjacent organs.[1] Placenta accreta is a serious complication of pregnancy, and is associated with massive postpartum haemorrhage and high maternal morbidity and mortality.[1,2] These complications are often a result of attempted manual separation of the placenta from its poorly formed decidual bed, an act that opens up large-calibre spiral vessels and sinuses.[3]

Placenta accreta accounts for 23–64% of peripartum hysterectomies.[4] It has long been accepted that the definitive treatment of placenta accreta is hysterectomy.[5,6] To minimise blood loss after delivery and to preserve the uterus in women with placenta accreta, conservative management of both the uterus and abnormal placenta, which is left inside the uterus at the time of delivery, has been developed.[7,8] This treatment strategy can result in a lower incidence of hysterectomy and primary postpartum haemorrhage, but may be associated with secondary hysterectomy and a higher risk of delayed uterine bleeding.[7,8] Uterine artery embolisation (UAE) has been shown to be effective in the management of secondary postpartum haemorrhage associated with conservative management due to the retention of the placenta in the uterus.[3]

Recently, the use of interventional procedures such as temporary occlusion of the abdominal aorta and bilateral occlusion of the common iliac, internal iliac or uterine arteries during caesarean section has become established in the management of severe postpartum haemorrhage secondary to placenta accreta.[9–11] With the aid of these endovascular treatments, the placenta can be easily removed, and the hysterectomy rate reduced. However, complete removal of the invading placental tissue is difficult, and retained placental tissue is invariably found after placental dissection in patients with placenta percreta.[12]

Thus far, no studies have investigated UAE for the treatment of placenta left *in situ* after caesarean section combined with temporary aortic balloon occlusion. Therefore, data from 42 patients with placenta accreta who underwent caesarean section and temporary aortic balloon occlusion followed by UAE were retrospectively analysed. The aim of the present study was to determine the clinical efficacy and safety of this combined treatment in patients with placenta accreta by assessing postpartum haemorrhage, transfusion requirements, hysterectomy rate, and operation time.

Materials and methods

Study design

Data were collected from consecutive patients who underwent caesarean section for placenta accreta in The First Affiliated Hospital, between January 2013 and June 2014. A total of 42 patients who met all the following eligibility criteria were enrolled in the study: (a) diagnosis of placenta accreta on clinical examination and ultrasonography (US) or magnetic resonance imaging (MRI; Fig 1a); (b) clinical risk factors for placenta accreta; (c) desire to preserve fertility; (d) gestational age >28 weeks; and (e) absence of antepartum bleeding.

With inputs from obstetricians and radiologists, all patients were counselled regarding the potential complications of the management strategy, including diminished fertility in the future, risk of damage to the access artery and aorta, and risk of radiation to the fetus. Informed consent had been obtained from all patients or their immediate relatives before the procedure, and informed consent for the review was also obtained. The study was approved by the ethics committee of the hospital.

Treatment

All the caesarean section and endovascular procedures were performed in a hybrid operation room equipped with a digital subtraction angiography (DSA) machine (Allura Xper FD20, Philips, Best, the Netherlands) under general anaesthesia. Before the endovascular procedure, each patient had fingertip oximeters placed on the great toes of both feet to allow the radiologist to determine when balloon occlusion of the aorta had occurred during placental dissection, as reported by Paull et al.[9] The balloon catheter was inserted into the abdominal aorta prior to the caesarean section. The right common femoral artery was punctured at the groin. A 5 F pigtail catheter (Cook, Bloomington, IN, USA) was introduced through an 8 F sheath (Cook) and placed in the abdominal aorta at the level of T12. Manual injection of 5 ml iodixanol (Visipaque-320, Nycomed, Oslo, Norway) was used to locate the origin of the renal arteries. The diameter of the balloon was equivalent to the diameter of the abdominal aorta on US or MRI. An 8 F, 40 × 16 mm or 40 × 18 mm balloon catheter (Bard Peripheral Vascular, Tempe, AZ, USA) was inserted via the guide wire access into the abdominal aorta 5 minutes before the caesarean section. The balloon was inflated to determine its position in the filled state. Adjustments were made following prompt deflation of the balloon to ensure its correct position, if required. The main part of the filled balloon was placed under the origin of the renal arteries (Fig 1b).

Immediately after fetal delivery and umbilical cord clamping, temporary aortic balloon occlusion was implemented prior to placental dissection. The balloon was inflated to occlude the abdominal aorta (with 15 ml diluted contrast medium to a pressure of 6 atm). A 0.035-inch super-stiff guide wire (THSF; Cook) was left in the catheter to resist the distal displacement of the balloon during inflation. When the patient's pulse and oxygen saturation could no longer be monitored using the pulse oximeter, and when the curve of the blood pressure sensor presented an approximately straight line, complete occlusion was deemed to have been achieved. Two interventional radiologists, two gynaecologists and an anaesthesiologist working in consensus reviewed each patient's parameters and angiograms. The abdominal aorta was subjected to

Please cite this article in press as: Duan X-H, et al., Caesarean section combined with temporary aortic balloon occlusion followed by uterine artery embolisation for the management of placenta accreta, Clinical Radiology (2015), http://dx.doi.org/10.1016/j.crad.2015.03.008