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CLINICAL ARTICLE

Risk factors for intraoperative hemorrhage at evacuation of a cesarean scar pregnancy following uterine artery embolization

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ABSTRACT

Objective: To determine risk factors associated with massive uterine bleeding during dilation and suction curettage (D&C) after uterine artery embolization (UAE) for the treatment of cesarean scar pregnancy (CSP). *Methods:* Data from 128 CSP patients treated with D&C after UAE were analyzed to assess risk factors associated with massive uterine bleeding (blood loss 500 mL or more) during D&C after UAE. *Results:* In total, 15 CSP patients had massive bleeding during D&C after UAE. Univariate analysis showed that a greater gestational age (GA), a larger CSP mass size, a thinner myometrium at the implantation site, a GA of 8 weeks or more, a CSP mass diameter of 6 cm or more, and evidence of fetal heartbeat were risk factors for massive bleeding ($P < 0.05$). In a binary logistic regression analysis, GA of 8 weeks or more and CSP mass diameter of 6 cm or more remained as the only significant risk factors for massive bleeding (OR 11.49 [95% CI 1.08–122.13] and OR 96.59 [95% CI 6.20–150.57], respectively; $P < 0.05$). *Conclusion:* For CSP masses with a GA of 8 weeks or more and a diameter of 6 cm or more, the outcome of surgical evacuation after UAE tends to be unsatisfactory.

1. Introduction

Cesarean scar pregnancy (CSP) is a rare ectopic pregnancy occurring at the site of a lower uterine segment scar from a previous cesarean delivery, with catastrophic complications such as uterine rupture and massive vaginal bleeding that may lead to hysterectomy. Over the past 10 years, there has been an increase in the incidence of CSP worldwide, especially in China [1,2]. The increased prevalence of CSP may reflect the increase in cesarean delivery rates and the wide adoption of transvaginal color Doppler sonography (TV-CDS)-aided diagnosis [1,2].

The purpose of treatment for CSP is to prevent massive bleeding and preserve the uterus. Several therapies such as methotrexate (MTX) alone or in conjunction with dilation and suction curettage (D&C) can preserve the fertility of most patients [2]. In a previous study [3], we reported on 37 CSP patients with a short pregnancy duration and a small CSP mass (data not shown in the original article) who were successfully treated with D&C after uterine artery embolization (UAE) without having experienced massive hemorrhage. The study hospital subsequently adopted UAE followed by D&C in treating most CSP patients, including those with a longer pregnancy duration and a bigger CSP mass. We found that UAE as an adjunctive measure can decrease blood loss during D&C in most, but not all, women with CSP. Some women with CSP experienced massive hemorrhage and even required a hysterectomy during D&C after UAE. Moreover, the high cost of UAE, its ischemic complications (such as bladder necrosis), and the requirement for the procedure to be performed by experienced interventional radiologists have to be considered [4–6]. It is, therefore, clear that UAE should not be offered to all patients with CSP.

To date, there has been no consensus about the indications for the various types of CSP therapy. The present study was conducted to determine risk factors associated with massive hemorrhage during evacuation of a CSP following pre-treatment with UAE. The conclusions drawn from this research may serve as a guide for future clinical decisions when treating patients with CSP.

2. Materials and methods

After obtaining approval from the Medical Research Review Board at Women's Hospital, School of Medicine, Zhejiang University in Hangzhou, China, the present study was conducted at the hospital from August 1, 2007, to September 30, 2012. The study included all women with a CSP who underwent treatment with UAE followed by D&C during the study period. The women had a strong desire to preserve their fertility. All participants were informed of the risks and benefits of the study procedures and provided informed consent. Patients did not receive the study interventions if they had contraindications to UAE such as an abnormal liver or renal function test, unstable hemodynamics, or hypersensitivity to the embolic material and/or contrast medium.

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Cesarean scar pregnancy was diagnosed by a history of prior cesarean delivery, findings indicative of CSP on TV-CDS and transabdominal color Doppler sonography (TA-CDS), and an increased level of serum β-human chorionic gonadotropin (β-hCG). The criteria for the ultrasound diagnosis were as follows: empty uterine cavity and cervical canal; gestational sac located in the anterior wall of the uterine isthmus, with or without evidence of a diminished and/or discontinuous myometrial layer between the bladder and the gestational sac; gestational sac embedded and surrounded by myometrium and fibrous tissue of the cesarean delivery scar; demonstration of blood flow surrounding the sac on color flow Doppler imaging (evidence of functional trophoblastic/placental circulation); and negative "sliding organs sign" [1,2,7,8].

The criterion for CSP treatment with UAE followed by D&C was sonographic evidence of high-velocity and low-impedance vascular flow in and around the CSP mass [1,7–9]. The CSP mass refers to products of CSP.

All UAE procedures were performed by 2 experienced radiologists. The Seldinger technique was applied to puncture and catheterize the bilateral internal iliac arteries via the right femoral artery, to perform pelvic artery digital subtraction angiography; the procedure was performed under conscious sedation and local anesthesia. Methotrexate was infused bilaterally via each uterine artery at a total dose of 1 mg/kg body weight, followed by bilateral UAE [10]. An absorbable gelatin sponge (Gelfoam; Pfizer, New York, NY, USA) at 1400–2000 μm served as embolic agent and was infused into the bilateral uterine artery at a total dose of 100–150 mg. Subtraction angiography was used to confirm that the distal ends of the bilateral uterine arteries were occluded. After 24 hours, the product of conception was removed by D&C.

Successful treatment with UAE followed by D&C was defined as normalization of serum β-hCG levels, resolution of the CSP mass, and preservation of the reproductive function.

Blood loss during D&C was estimated on the basis of an increase in weight (in mL/g) of blood-stained sponges in combination with the method by Dahmani et al. [2,11]. The WHO defines postpartum hemorrhage as a blood loss of 500 mL or more in the first 24 hours postpartum [12], and advises that the loss of 500 mL of blood should be considered as an alert that the health of the woman may be endangered. Therefore, a blood loss of 500 mL or more during D&C was chosen as the cut-off point for massive uterine bleeding in the present study.

If the patient had a massive hemorrhage during D&C, iodoform gauze packs or an inflated balloon catheter were placed in the uterine cavity as quickly as possible and kept in situ for 24–48 hours so as to compress the uterus and achieve hemostasis. If the treatment methods were not effective, wedge resection of the CSP scar and repair of the defect via laparoscopy or laparotomy were undertaken. If the heavy bleeding could still not be controlled, hysterectomy was performed immediately.

During the study period, 153 women with a CSP underwent D&C after UAE. For the analysis, 22 CSP patients who underwent hysteroscopic resection after UAE and 3 CSP patients with incomplete information were excluded. Therefore, the final analysis comprised 128 CSP patients who were treated with D&C after UAE. This number included 33 referred CSP patients who had been misdiagnosed as having an intrauterine pregnancy. They had experienced massive uterine bleeding during D&C in other hospitals and clinics, and had then been transferred to the Women's Hospital with subsequent UAE followed by D&C for CSP.

The associations between massive uterine bleeding and the demographic, gynecologic, and obstetric variables presented in Table 1 were examined. Before UAE, the gestational age (GA) was calculated based on the last menstrual period and adjusted according to ultrasound dating. The mass of the CSP was measured in 3 dimensions (length, width, and height). The CSP mass diameter was defined as the average of the 3 dimensions. A GA of 8 weeks or more and a CSP mass diameter of 6 cm or more were selected as cut-offs after data collection.

The statistical analyses were performed using SPSS version 16.0 (IBM, Armonk, NY, USA). Bivariate comparisons were performed to compare women with a blood loss of 500 mL or more (group A) and those with a blood loss of less than 500 mL (group B) using the *t* test, Mann–Whitney *U* test, or χ^2 test as appropriate. Binary logistic regression [13] was performed to identify correlates of massive uterine bleeding. $P < 0.05$ (2-tailed) was considered statistically significant.

3. Results

During D&C after UAE, 15 patients had a blood loss of 500 mL or more (group A) and 113 patients had a blood loss of less than 500 mL (group B). The intraoperative blood loss was 500–2600 mL (median, 1500 mL) in group A and 10–300 mL (median, 20 mL) in group B, respectively; 6 patients in group B had a blood loss of 100–300 mL. Of the 15 women in group A, 7 (46.7%) were successfully treated by compression hemostasis with iodoform gauze packs or an inflated balloon catheter, 3 (20.0%) by wedge resection of the CSP lesion and repair of the uterine defect via laparoscopy or laparotomy, and the remaining 5 (33.3%) by hysterectomy. For the 8 (53.3%) patients in group A who underwent wedge resection of the CSP lesion or hysterectomy, histopathologic examination after the surgery confirmed deep implantation of villi in the myometrium at the scar site. Tables 2 and 3 show the clinical characteristics, outcomes, and operative findings of patients in group A.

The 15 patients in group A and the 6 patients with a blood loss of 100–300 mL in group B all had deep implantation of villi according to the classification by Vial et al. [9] under sonography. The remaining patients in group B had superficial or deep implantation of villi under sonography (data not shown).

Uterine artery embolization followed by D&C was successful in the 10 CSP patients in group A whose uteri were preserved and in all patients in group B. During the follow-up period, 2 CSP patients (in group A) experienced secondary heavy bleeding and moderate bleeding 42 days and 25 days after UAE and D&C, respectively. The first patient was successfully treated by a second UAE and D&C, and the other woman was successfully treated by compression hemostasis with iodoform gauze packs. No woman had an infection during the follow-up period. All 113 women in group B had normalized serum β-hCG levels within 6 weeks and their CSP masses resolved within 8 weeks. For the 10 women in group A whose uteri were preserved, the serum β-hCG levels normalized within 9 weeks and the CSP masses disappeared within 14 weeks.

There were no significant differences between the 2 groups in terms of age, gravidity, parity, number of abortions and cesarean deliveries, interpregnancy interval after prior cesarean delivery, vaginal bleeding status, serum β-hCG level, and percentage of referred patients (Table 1). Compared with group B, the GA in group A was greater, the CSP mass was bigger, and the myometrium at the implantation site was thinner; in addition, a GA of 8 weeks or more, a CSP mass diameter of 6 cm or more, and evidence of fetal heartbeat were more common in group A ($P < 0.05$ for all comparisons).

All covariables with $P < 0.05$ in the single-variable statistical analysis (Table 1) were entered simultaneously into the binary logistic regression analysis, with the exception of variables X_9 and X_{11}, because these belonged to the same covariate category as variables X_{10} and X_{12}, respectively. In this analysis, a greater GA (8 weeks or more) and a bigger CSP mass size (6 cm or more) remained as the only significant determinants of massive bleeding ($P < 0.05$) (Table 4).

No severe complications associated with MTX or UAE were observed. Twelve (9.4%) patients experienced nausea and vomiting as adverse effects of MTX therapy. The most common post-UAE complications included fever (n = 43 [33.6%]), mild or moderate lower abdominal pain (n = 18 [14.1%]), and mild or moderate lower limb pain (19 [14.8%]). All complications were resolved within 10 days.