Experience with Conservative Strategy of Uterine Artery Embolization in the Treatment of Placenta Percreta in the First Trimester of Pregnancy

Shih-Hui Tseng, Chia-Hui Lin, Jen I. Hwang, Wei-Che Chen, Esther Shih-Chu Ho, Min-Min Chou*
Departments of Obstetrics and Gynecology, and 1Radiology, Taichung Veterans General Hospital, Chung Shan Medical University, Huang Kang University, and National Yang Ming University, Taiwan.

SUMMARY

Objective: There is little prospective experience in the conservative treatment of placenta percreta during the first trimester in order to preserve uterine fertility. We describe herein our experience with uterine artery embolization (UAE) in the management of placenta percreta at 9 weeks of gestation.

Case Report: A 36-year-old woman, gravida 3, para 1, was referred for ultrasonographic evaluation because of suspected molar pregnancy due to persistent vaginal spotting at 9 weeks of gestation. A Grade 3+ lacunar flow pattern with multiple bizarre and large irregular sonolucent spaces were observed. Color Doppler imaging revealed extensive turbulent lacunar blood flow perfusing throughout the whole surrounding uteroplacental tissues and fetus. The patient was informed of the situation and she had a strong desire to avoid surgery. Conservative management with bilateral UAE was performed using polyvinyl alcohol particles to promote involution and shedding of the abnormally adherent placenta. However, an unsatisfactory vessel-occluding effect caused by extensive collateral supply was still detected after repeated UAE. We, therefore, performed hysterectomy, and the patient had an uneventful postoperative course.

Conclusion: The efficacy and complications of UAE as a therapeutic modality for the conservative management of invasive placentation in the first trimester of pregnancy are not clear, as this is the first report of its kind. However, although UAE had failed in this case, it may still be a useful procedure as a prophylactic measure before surgical intervention, and hysterectomy can also be performed for better control of operative hemorrhage. [Taiwanese J Obstet Gynecol 2006;45(2):150–154]

Key Words: hysterectomy, placenta percreta, uterine artery embolization

Introduction

Grayscale ultrasonography and color Doppler ultrasonography (CDU) are very useful tools for the evaluation of abnormally adherent placentas. However, most cases of placenta accreta were diagnosed in the second and third trimesters of pregnancy. Recent studies have reported the diagnosis of invasive placentation in the first trimester. Shih et al [1] and Chen et al [2] reported two cases of multipara with placenta increta/percreta, wherein an emergency hysterectomy was performed at 15 weeks of gestation because of heavy antepartum hemorrhage, with massive blood loss of 12,000 and 5,450 mL, respectively, during surgery. These two cases showed that even though the diagnosis was made in the first trimester and surgery was performed remote from term, the surgical procedure might still be very bloody and problematic. Therefore, it is clear that both early antenatal diagnosis and an appropriate management strategy are crucial for achieving a good outcome.
To our knowledge, conservative management of placenta percreta in the first trimester using uterine artery embolization (UAE) in order to preserve fertility has not been previously reported. We describe our clinical experience with UAE in the management of placenta previa percreta in such an early stage of pregnancy.

**Case Report**

A 36-year-old woman, gravida 3, para 1, was referred for ultrasonographic evaluation because of suspected molar pregnancy due to persistent vaginal spotting during early pregnancy. The patient’s obstetric history was significant for one previous lower segment cesarean section and uterine curettage for abortion. Surgical correction of a complete uterine septum had been performed during her previous cesarean delivery.

Grayscale transvaginal ultrasonography at 9 weeks of gestation revealed an intrauterine viable embryo with a crown-rump length of 27 mm. The β-human chorionic gonadotropin (β-hCG) level was 89,110 mIU/mL. The bulky placental tissue encircling the fetus was located within the whole mid-lower portion of the uterus and covered the internal os of the cervix. A Grade 3+ lacunar flow pattern as described by Finberg and Williams [3] with multiple bizarre and large irregular sonolucent spaces were observed (Figure 1A). CDU (Voluson 730 Expert, GE Medical Systems, Kretztechnik, Zipf, Austria) revealed extensive turbulent lacunar blood flow perfusing throughout the whole surrounding uteroplacental tissues and fetus (Figure 1B). Pulsed Doppler interrogation of the intraparenchymal echolucent spaces and supplying high-pressure myometrial vasculature yielded a pulsatile high-velocity (15–30 cm/sec) venous flow within the lacunar spaces, and low-resistance (resistance index = 0.34) arterial blood flow, respectively.

After appropriate counseling, the patient opted for conservative treatment with UAE to preserve the uterus. Informed consent for UAE was obtained from the patient. Superselective transarterial embolization of the bilateral uterine arteries and branches, and other supplying parasitized vessels when necessary, was achieved with a 4F RC 1 catheter (Cordis, Miami Lakes, FL, USA) using 600–1,000 μm polyvinyl alcohol (PVA) particles (Ivalon, Heyer Schulte, CA, USA) and pledgets of absorbable gelatin sponges (Gelfoam, Johnson & Johnson, Skipton, UK) of varying sizes. Markedly decreased uteroplacental blood flow was recognized immediately on postembolization angiographic study.

To our knowledge, conservative management of placenta percreta in the first trimester using uterine artery embolization (UAE) in order to preserve fertility has not been previously reported. We describe our clinical experience with UAE in the management of placenta previa percreta in such an early stage of pregnancy.

**Case Report**

A 36-year-old woman, gravida 3, para 1, was referred for ultrasonographic evaluation because of suspected molar pregnancy due to persistent vaginal spotting during early pregnancy. The patient’s obstetric history was significant for one previous lower segment cesarean section and uterine curettage for abortion. Surgical correction of a complete uterine septum had been performed during her previous cesarean delivery.

Grayscale transvaginal ultrasonography at 9 weeks of gestation revealed an intrauterine viable embryo with a crown-rump length of 27 mm. The β-human chorionic gonadotropin (β-hCG) level was 89,110 mIU/mL. The bulky placental tissue encircling the fetus was located within the whole mid-lower portion of the uterus and covered the internal os of the cervix. A Grade 3+ lacunar flow pattern as described by Finberg and Williams [3] with multiple bizarre and large irregular sonolucent spaces were observed (Figure 1A). CDU (Voluson 730 Expert, GE Medical Systems, Kretztechnik, Zipf, Austria) revealed extensive turbulent lacunar blood flow perfusing throughout the whole surrounding uteroplacental tissues and fetus (Figure 1B). Pulsed Doppler interrogation of the intraparenchymal echolucent spaces and supplying high-pressure myometrial vasculature yielded a pulsatile high-velocity (15-30 cm/sec) venous flow within the lacunar spaces, and low-resistance (resistance index = 0.34) arterial blood flow, respectively.

After appropriate counseling, the patient opted for conservative treatment with UAE to preserve the uterus. Informed consent for UAE was obtained from the patient. Superselective transarterial embolization of the bilateral uterine arteries and branches, and other supplying parasitized vessels when necessary, was achieved with a 4F RC 1 catheter (Cordis, Miami Lakes, FL, USA) using 600–1,000 μm polyvinyl alcohol (PVA) particles (Ivalon, Heyer Schulte, CA, USA) and pledgets of absorbable gelatin sponges (Gelfoam, Johnson & Johnson, Skipton, UK) of varying sizes. Markedly decreased uteroplacental blood flow was recognized immediately on postembolization angiographic study.

Figure 1. (A) Grayscale ultrasonographic evaluation at 9 weeks’ gestation reveals multiple bizarre and large irregular sonolucent spaces within the placenta parenchyma. The bulky placental tissue encircling the fetus is located within the whole mid-lower portion of the uterus and covers the internal os of the cervix. (B) Color Doppler ultrasonography (CDU) shows extensive lacunar blood flow perfusing throughout the whole surrounding uteroplacental tissues and fetus. (C) On the 2nd day of follow-up, CDU shows markedly decreased uteroplacental hypervascularity in the region of interest after UAE. B = bladder; L = lacunar space; P = placenta.
(Figure 2). On the 2nd day of follow-up, CDU was performed, which revealed a satisfactory devascularization pattern in the region of interest (Figure 1C). The cardiac motion of the fetus was not detected. A heterogeneous patchy echogenic pattern consistent with ischemic change of uteroplacental tissue was noted. Subsequent methotrexate 75 mg (50 mg/m²) was administered intramuscularly once a week for 2 consecutive weeks as adjuvant therapy. Serum β-hCG level dropped to 2,224 mIU/mL and remained at about this level thereafter.

Unfortunately, follow-up CDU showed a gradually increased uteroplacental vascularity due to recanalization and collateral circulation 3 weeks after the first UAE. After counseling, the patient decided to receive a second UAE procedure. This time, the interventional radiologists again chose to use PVA particles of various sizes, ranging from 600 to 1,000 μm, to provide a more definite devascularization in the targeted region of increased vascularity. Two weeks later, however, serial follow-up CDU revealed an unsatisfactory vessel-occluding effect caused by extensive pelvic collateral circulation. Finally, we deemed a hysterectomy to be a necessary definite therapy of choice because we were concerned about the inadequate devascularization and unpredictable outcome of invasive placenta. The total estimated blood loss was 4,000 mL. The major blood loss was caused by a difficult hysterectomy during dissection of the densely adherent bladder–lower uterine segment boundary zone, and prominent
collateral circulation persisted even after the UAE procedure. The patient had an uneventful postoperative course. Histopathologic examination of the resected hysterectomy specimen revealed placental villi invading the outermost layer of the lower segment of the myometrium. In addition, histologic examination found necrotic villi with placental infarct in combination with intervillous thrombosis.

Discussion

A number of risk factors including placenta previa, a history of cesarean section, uterine curettage and metroplasty for septate uterus, and advanced maternal age have been identified in this case. We agree that placenta percreta is caused by a combination of risk factors, and it is unlikely that its occurrence can be attributed to any single risk factor [4]. The etiology may be due to increased interaction between the trophoblasts and the inadequate decidua or even myometrium. Placental implantation is, to a large extent, controlled by a complex interplay between surface molecules on trophoblasts and cells in the uterus. Different cytokines, enzymes, receptors, and adhesion molecules play an essential role. Therefore, a loss of balance between trophoblast invasion and maternal decidual–myometrial defense barrier may result in placenta accreta. We acknowledge that decidual defect is a major contributing factor for the formation of placenta accreta, however, decidua- or even myometrium- and/or stroma-derived factors may cause differing expression of trophoblast invasion factors, thus resulting in the formation of placenta accreta [5,6].

Clinical implications of reproductive outcomes in women with various mullerian anomalies include infertility, early pregnancy loss, a high incidence of obstetric complications such as preterm delivery, premature rupture of membranes, malpresentation, and fetal growth restriction [7]. In a literature review of 51 cases with rudimentary horn pregnancies, seven were associated with placenta accreta [8]. However, the causal relationship between other forms of mullerian anomalies and placenta accreta has not been reported previously. Further studies are needed to address this issue.

Earlier antenatal identification of abnormal placentaion has a positive impact on the peripartum clinical management of at-risk obstetric patients. Management options include operative strategy to terminate the pregnancy before fetal viability in affected patients with extensive hypervascularization highly suggestive of severely invasive placentation. Prophylactic preoperative internal iliac artery embolization before hysterectomy can be offered in an attempt to reduce intraoperative blood loss [9].

The UAE approach has been described for the conservative management of placenta percreta left in situ after delivery in some cases with variable outcomes [10–13]. However, there is little prospective experience in the conservative treatment of placenta percreta during the first trimester in order to preserve uterine fertility. Therefore, such an approach is still of an experimental and investigational nature [14]. After the uterine arteries and other supplying parasitized collateral blood vessels are occluded by UAE, most blood stops flowing in the uteroplacental arteries and veins, adherent placental tissue does not survive this period of uterine ischemia and trophoblasts degenerate and die. In the literature, the majority of retained placenta in ectopic pregnancy such as cervical pregnancy, cesarean scar pregnancy, and interstitial pregnancy would usually take 3 months to achieve complete resolution [15–17]. However, conservative management of placenta percreta with placenta left in situ after delivery in the third trimester would usually take much longer (3–6 months) to promote involution and shedding of the adherent placenta following UAE [12,13]. Therefore, the 2–6 week duration of occlusion using absorbable Gelfoam particles is insufficient for a satisfactory vessel-occluding effect. In this case, failure to achieve adequate devascularization with PVA particles was caused by extensive pelvic collateral circulation. Therefore, permanent metal coil embolization of the internal iliac arteries may be necessary to provide more definitive devascularization with potential complications of embolization of nontargeted pelvic organs such as the ovaries, buttocks, and bladder. Further studies are necessary to validate our findings that UAE may be inadequate as an alternative to hysterectomy for those patients with severe invasive placentation who wish to preserve their fertility or when surgery is contraindicated. Although complication rates and disadvantages associated with UAE are low [18], in rare cases, they can include prolonged follow-up and delayed hemorrhagic complications, thus increasing rates of hospital readmission with surgical reintervention [11]. Moreover, reproductive capacity may be altered by placental chronic retention and further pregnancies may be complicated by recurrent placenta accreta [5,19].

In conclusion, from our experience, we believe that obstetric patients at risk for placenta percreta can be identified successfully during early pregnancy by the complementary combination of grayscale US and CDU [20,21]. It is strongly recommended that women who wish to undergo UAE for uterus preservation
undergo a thorough evaluation by an obstetrician to help facilitate optimal collaboration with interventional radiologists and to ensure the appropriateness of this investigative therapy, taking into account the reproductive wishes of the patient [18]. The efficacy and complications of UAE as a therapeutic modality for the conservative management of severely invasive placentation in the first trimester of pregnancy are not clear, as this is the first report of its kind. However, although UAE failed in this case, it may still be a useful prophylactic measure before surgical intervention, and hysterectomy can also be performed for better control of operative hemorrhage.

Acknowledgments

This study was partly supported by the Medical Research Council (grant number 946403c) of Taichung Veterans General Hospital, Taichung, Taiwan.

References