Placenta previa accreta, the combination of placenta previa and placenta accreta, can cause life-threatening massive post-partum hemorrhage (PPH) and may require emergent hysterectomy. Intraoperative transcatheter arterial embolization (TAE) performed after fetal delivery and before placenta expulsion can significantly reduce blood loss and preserve the uterus. However, TAE may fail under the status of hemorrhagic shock, vasospasm of the uterine arteries, and disseminated intravascular coagulopathy (DIC) due to immediate blood loss after placental delivery. We describe two cases of pregnancy complicated by placenta previa accreta and embolization was performed via different approaches to control bleeding. Emergent TAE failed in the first patient due to impending shock, vasospasm of the uterine artery and DIC. Eventually, an emergent hysterectomy was performed in this patient. Preoperative insertion of a 5 French right femoral arterial angiosheath was done in the second patient. It was easier to perform intraoperative TAE and the blood loss was much less. In our case, insertion of a right femoral arterial sheath before cesarean section with subsequent UAE after fetal delivery is an effective method to control the post-partum hemorrhage due to placenta previa accreta. It may reduce blood loss, preserve ovary function and the patient’s uterus for further fertility.

Placenta accrete, intramyometrial infiltration of the placental villous tissue, is a rare condition with a wide range of reported incidence from 1:540 to 1:93000. The degrees of myometrial invasion by the chorionic villi, distinguish focal placenta accreta from placenta increta and placenta percreta [1]. Placenta accreta means that the placental villous tissues grow into the uterus beyond the Nitabuch’s layers which normally limits penetration of placental villi. If the villi invade the myometrium, it is defined as placenta increta; furthermore, if the villi penetrate the full thickness of the myometrium, the degree of placenta percreta has been reached [2]. Placenta previa accreta, the combination of placenta previa and placenta accreta, is resulting from placental tissues invading the friable lower uterine segment. It is the most serious form of invasive placentation and poses a serious risk of spontaneous uterine rupture as well as massive maternal hemorrhage. Its incidence appears to be on the rise, apparently due to the current high cesarean section (C/S) rates and uterine curettage for abortion [3]. The optimal management of this disease remains unclear. Hysterectomy is often performed to achieve hemostasis in the past, but it results in infertility. Conservative treatment with adjuvant methotrexate to preserve the uterus

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have been reported, but it carry the risks of sepsis, delayed hemorrhage, shock, and disseminated intravascular coagulopathy (DIC)[4]. Transcatheter arterial embolization (TAE) has been proven to be an useful treatment for general postpartum hemorrhage (PPH) with a reported success rate between 83% and 100% [5, 6]. Its role in the management of PPH due to placenta previa accreta remains to be elucidated.

The authors report two cases of placenta previa accreta with different approaches of transcatheter artery embolization (TAE) to control PPH. The approaches are described and compared in details.

**CASE REPORTS**

**Case 1**

A 22-year-old, Gravida 2, Para 1, with one living child and one previous cesarean delivery, was evaluated at 31 weeks age-of-gestation for vaginal bleeding. The antenatal diagnosis of complete placenta previa and accreta was made by ultrasonography. Under general anesthesia, a 2,710 gm male fetus was delivered by low segment transverse cesarean section with normal Apgar score. Active bleeding with more than 3,000 mL blood loss ensued within half an hour. Signs of uterine atony or genital laceration were not observed. On the basis of the patient’s strong desire to preserve her uterus, manual removal of placental fragments was performed followed by hemostatic suturing. Subsequent vaginal bleeding more than 2,000 mL with poor response to utero-tonics occurred after evacuation of placental fragments. Interventional radiologist was consulted for emergent TAE in the operating room.

At the time of arterial catheterization, the patient was in impending circulatory collapse (Blood Pressure: 50/30 mmHg; HR: 124 beats/minute) due to profuse bleeding (Blood loss: 5,000 ml) and massive blood transfusion was required. During UAE, severe vasospasm of the uterine arteries was noted. The internal iliac arteries were embolized with gelfoam pledgets until stasis of blood flow. The TAE procedure took 60 minutes, and the vital signs slowly recovered initially. Persistent massive vaginal bleeding and drop of blood pressure was detected later, and we performed a repeated UAE which was in vain. Finally, the patient underwent emergent hystectomy to stop bleeding. The total blood loss was 10,480 ml and transfusion of 34 units of blood (250 ml per unit) was used to achieve hemodynamic stability. The histopathology findings were consistent with placenta accreta. The postoperative course was uncomplicated; and the patient was discharged 10 days later.

**Case 2**

A 35-year-old, Gravida 1, Para 0, was evaluated at 34 weeks age-of-gestation for vaginal bleeding. The antenatal diagnosis of complete placenta previa and accreta was made by ultrasonography and

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**Figure 1.** Case 2. A 35 year-old woman with 35 weeks of gestation-age a. Sagittal T2-Weighted spin echo MRI demonstrated low-lying placenta covering the entire internal cervical os (arrow), thinning of myometrium with obliteration of uteroplacental interface (arrowhead), compatible with placenta previa accreta; b. Roberts curve catheter (arrow) was selectively put into right uterine artery (arrowhead) for embolization; c. Post-embolization angiography demonstrated occlusion of blood flow in the uterine artery (arrow).
gadolinium enhanced MRI (1.5T MR unit, Gyroscan Integra, Philips, Netherlands) (Fig. 1a). To avoid risk of hemorrhage and preserve the uterus, an elective C/S was scheduled at 38-weeks gestation age.

On the morning of the planned C/S, an introducer sheath (Pinnacle 5 Fr, Terumo, Tokyo, Japan) was inserted into the right femoral artery before the patient was brought to the operating room. Then the radiologists prepared equipment for TAE in the operating room. C-arm X-ray machine (Philips BV29, Philips, Netherlands) and C-arm compatible operating table were used in the operating room. Under general anesthesia, a 2620 gm female fetus was delivered with a normal Apgar score. Diagnostic angiography was done with internal iliac artery injection under fluoroscopy, and embolization was performed immediately after the catheter (Roberts uterine curve, Cook, Bloomington, USA) was selectively put into uterine artery. Both uterine arteries were embolized (Fig. 1b) using the same catheter until stasis of embolic materials in the uterine arteries was noted. Post-embolization diagnostic angiography was performed to confirm complete occlusion of the blood flow in the uterine arteries (Fig. 1c) and residual collaterals to the uterus. Embolization of both internal iliac arteries was also performed thereafter. Gelatin-sponge pledgets (Gelfoam sponge, Pharmacia, Michigan, USA) were used as embolic material. The TAE procedure took only 20 minutes. The tip of the catheter was still placed in the internal iliac artery until placental delivery. After embolization, the placenta was thoroughly removed manually with minimal blood loss. The estimated blood loss was only 460 ml. The postoperative course was uneventful. Normal menstruation returned 6 months after the operation.

**DISCUSSION**

PPH remains a major cause of pregnancy-related mortality in the United States. Approximately 29% of all maternal deaths are due to bleeding [6]. Placenta accreta is an important cause of obstetric hemorrhage and a leading cause of peripartum hysterectomy [7].

The term placenta accreta covers any condition in which the placental villi adhere to, invade, or penetrate the myometrium. The three subdivisions of this condition can be usually delineated. Placenta accreta refers to the placent al villous tissues grow into the uterus beyond the Nitabuch’s layers which normally limits penetration of placental villi. If the villi invade the myometrium, it is defined as placenta increta; furthermore, if the villi penetrate the full thickness of the myometrium, the degree of placenta percreta has been reached [3]. Of the patient with invasive placentation, the reported frequency of placenta accreta is approximately 84%, of placenta increta is 13% and of placenta percreta is 3% [9]. Placenta previa accreta, the combination of placenta previa and placenta accreta, is resulting from placental tissues invading the friable lower uterine segment. It is the most serious form of invasive placentation and poses a serious risk of spontaneous uterine rupture as well as massive maternal hemorrhage.

The choice of management of placenta previa accreta depends on the severity of the clinical symptoms and the desire of the patient for further pregnancy. In our first case, the patient had strong desire to preserve her uterus. Due to lack of clinical experience, the gynecologist performed manual removal of the abnormally adherent placenta. This procedure cause catastrophic maternal hemorrhage and lead to hysterectomy eventually.

There are several conservative methods used to decrease blood loss and preserve reproductive capacity in managing invasive placentation. These methods include uterine packing, oversewing the placental bed, leaving the placenta in situ, administration of prostaglandin or methotrexate, direct aortic compression, uterine and hypogastric artery ligation, and argon-beam coagulation [10]. These conservative measures have been used in carefully selected patients. However, sepsis, delayed hemorrhage, shock, and DIC still occur in some cases [4]. Prophylactic perioperative balloon occlusion and embolization of internal iliac arteries are used in some case reports [11, 12], and it can significantly reduce intraoperative blood loss. But the technique requires 4 min 30 sec—8 min 12 sec of total fluoroscopy time to confirm a stable occluding catheter position in the hypogastric arteries. Exposure of radiation to fetus can not be avoided.

The value of TAE in the treatment of obstetric hemorrhage is supported by some series with a reported primary success rate of between 83% and 100% [5, 6]. Failure rate of TAE is higher in abnormal placentation patients (25%) [3]. High failure rate possibly results from rapid hemorrhage. Under the condition of rapid hemorrhage leading to shock, severe vasospasm of the uterine artery and DIC can cause incomplete embolization and delayed hemorrhage. This factor is probably the main cause...
of TAE failure in the first case of our examples.

In our second patient, placenta previa accreta was diagnosed prenatally. Preoperative insertion of angiosheath into right femoral artery was performed without exposure of fluoroscopic radiation before patient entering the operating room. Subsequent intraoperative TAE was performed immediately after fetal delivery and before placenta expulsion. After embolization, the placenta was thoroughly removed manually with minimal blood loss (460ml).

In our limited experience, pre-operative angiosheath placement and subsequent intraoperative TAE has the following advantages:

First, embolization of uterine arteries can be performed immediately after fetal delivery because the angiosheath is inserted before patient entering the operating room. It can curtail the time spent in femoral artery puncture. After fetal delivery, massive hemorrhage in a short period of time may lead to vasospasm. Vasospasm makes puncture of the femoral artery and selective catheterization of the uterine arteries difficult and may result in false negative angiographic findings. The embolization may be often incomplete due to vasospasm of uterine arteries.

Second, exposure of radiation can be minimized. The angiosheath is placed into right femoral artery preoperatively. It is a simple procedure to perform for radiologist and often fluoroscopic guidance is not required. Exposure of radiation to the fetus is usually none or minimal.

Third, it may preserve ovarian function and future fertility. Chauleur et al. [13] showed that return of normal menses and subsequent fertility is not impaired in 41 patients who underwent TAE for post-partum hemorrhage. In our second patient, normal menstruation returned 6 months after the operation. It means that her fertility can also be preserved. The explanation for the high proportion of normal menstruation return is related to the mechanism of embolization. Use of resorbable gelatine sponge pledgets which allowed revascularization of the uterine artery permits a temporary and reversible decrease in arterial flow. The reabsorption can occur without deterioration of the vascular endothelium in the embolized site.

Nevertheless, some complications related to TAE may be encountered according to the published data [13]. These complications included arterial dissection, allergy to contrast medium, hematomas at the puncture site, pain, infection, amenorrhea and premature menopause. Nonetheless the complication is usually minor and can be treated with conservative management.

**CONCLUSION**

There is no doubt that correct prenatal diagnosis with prophylactic intraoperative embolization is an effective management to control PPH associated with placenta previa accreta. It may significantly reduce blood loss and preserve the ovarian function and uterus for future fertility.

**REFERENCE**

於兩位患黏生性前置胎盤之病人施行手術中子宮動脈栓塞：比較兩種不同步驟之優劣

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黏生性前置胎盤（placenta previa accreta）肇因於前置胎盤部份或全部不正常黏連子宮壁肌肉層，它可能造成致命性的產後大出血，而須緊急子宮切除治療。在胎兒娩出後及胎盤娩出前施以動脈栓塞可以明顯減少出血而避免子宮切除，然而，在胎盤娩出後立即出血引起的出血性休克、子宮動脈收縮及瀰漫性血管內血液凝結病變會導致動脈栓塞治療失敗。在這篇病例報告中，我們描述兩個患有黏生性胎盤病人採用不同步驟施行動脈栓塞控制出血。在第一個病患的動脈栓塞因病患接近休克、子宮動脈收縮及瀰漫性血管內血液凝結病變而失敗，之後接受緊急子宮切除才得以控制住出血。在第二個病患處置，在剖腹生產手術前我們先放置5 Fr右側股動脈導管鞘。手術中，動脈栓塞變得更容易而病患失血更少。從我們提出的病例得知在患有前置黏生性胎盤的病人，在剖腹生產前先行放置股動脈導管鞘及胎兒娩出後立即動脈栓塞是有效方法控制因黏生性胎盤引起的產後大出血。此方法可以減少出血、保留病人卵巢功能及生育力。