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ORIGINAL ARTICLE

Uterine Artery Embolization for Management of Primary Postpartum Hemorrhage Associated with Placenta Accreta

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Objective To evaluate the efficacy and safety of uterine artery embolization (UAE) in the management of primary postpartum hemorrhage associated with placenta accreta.

Methods We retrospectively reviewed the medical records of patients with placenta accreta between January 2010 and August 2014. Totally 18 women (mean age 30.8 ± 4.2 years) of primary massive postpartum hemorrhage with diagnosis of placenta accrete received treatment of UAE after delivery. Images of DSA and medical records were reviewed. Technical success was defined as control of bleeding after embolization. The complications, control of hemorrhage and recurrent bleeding of the placenta left inside the uterus were retrospectively collected for assessment.

Results All patients underwent transcatheter embolization of bilateral uterine arteries. The technical success rate of embolization was 100%. Bleeding was controlled in 17 of 18 patients (94%) during follow-up period (median 18 months, 3-31 months) without further bleeding recurred. One patient with placenta percreta undertook an emergent hysterectomy along with surgical bladder repair after UAE because of persistent uterine bleeding. Eight patients had postembolization syndrome and no other complications occurred.

Conclusion Uterine artery embolization is an effective and safe treatment for the management of primary postpartum massive hemorrhage associated with placenta accreta.

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PLACENTA accreta is a serious complication of pregnancy that is associated with maternal mortality and morbidity resulting from massive obstetric hemorrhage.^{1, 2} The pathogenesis of placenta accrete was thought to be that deficiency of the decidua basalis at the endometrial scar results in invasion of chorionic villi into the myometrium.¹ Traditionally, abnormal placental adherence has been classified into placenta accreta, placenta increta, and placenta percreta based on depth of myometrial invasion: superficial, deep, and through serosa to the adjacent structures, respectively.³⁻⁸

Various treatments have been reported for management of placenta accrete in order to minimize blood loss after delivery and to preserve the uterus in women with placenta accreta after manual removal of the placenta, including uterine packing, prostaglandin administration, argon beam coagulation, methotrexate injection or uterine artery embolization (UAE).⁹⁻¹³ UAE has been shown to be effective in the treatment of postpartum hemorrhage for various sources including placenta accrete.¹⁴⁻²⁰ However, there was limited literature regarding the role of UAE in treating placenta accrete. This retrospective study was taken to evaluate the efficacy and safety of UAE based on our experience in the treatment of placenta accrete.

MATERIALS AND METHODS

Patients

This retrospective study was conducted in patients who

underwent UAE for massive primary postpartum hemorrhages resulting from placenta accrete between January 2010 and August 2014. Institutional review board approval was waived. Massive postpartum hemorrhage was defined as blood loss exceeding 500 ml. Primary postpartum hemorrhage was defined as hemorrhage occurring within the first 24 hours after delivery. The diagnosis of placenta accreta was made on the basis of the clinical and imaging as follows: (a) The placenta was not delivered spontaneously after birth with difficult manual removal and heavy bleeding from the implantation site following forced placental removal; (b) Sonographic and MRI findings were suggestive of placenta accrete, including absence or thinning of the myometrial interface, lacunar spaces in the placental tissue or invasion into the myometrium or beyond the serosa.

By reviewing medical records 18 women with placenta accreta who were treated by emergent UAE because of massive primary postpartum hemorrhage after delivery were included in the study. All patients were single-fetus pregnancies. The mean age was 30.8±4.2 years. According to clinical and sonographic findings, abnormal placentation were diagnosed: placenta accreta, *n*=10; placenta increta, *n*=5; placenta percreta, *n*=3. The estimated blood loss exceeded 500ml in 17 of 18 enrolled patients. The mean estimated blood loss was 1372±587ml. The clinical features in detail were listed in Table 1.

Embolization procedure

Decisions to perform UAE for patients with persistent uterine

Table 1. Clinical featured information of the 18 Cases in this study

No.	Age (years)	Gravidity/Parity	Placentation	Term of pregnancy	Mode of delivery	Estimated blood loss (ml)
1	27	G4P0	Accreta	25w+1d	Induced labour	400
2	30	G2P1	Accreta	38w	Spontaneous vaginal	1000
3	28	G5P2	Accreta	37w+3d	Spontaneous vaginal	800
4	27	G1P1	Accreta	39w+1d	Cesarean section	1000
5	26	G4P1	Accreta	23w+6d	Induced labour	1000
6	33	G5P1	Accreta	38w	Cesarean section	1400
7	37	G4P1	Accreta	37w	Cesarean section	2800
8	28	G3P1	Accreta	37w+4d	Cesarean section	1500
9	31	G3P1	Accreta	36w+6d	Spontaneous vaginal	2000
10	33	G4P1	Accreta	37w+1d	Spontaneous vaginal	1800
11	28	G1P1	Increta	38w+3d	Cesarean section	1500
12	36	G6P1	Increta	36w+5d	Cesarean section	1000
13	29	G2P2	Increta	25w+5d	Induced labour	800
14	30	G2P1	Increta	38w+4d	Cesarean section	1500
15	25	G3P0	Increta	37w+6d	Spontaneous vaginal	1200
16	34	G4P1	Percreta	38w+1d	Cesarean section	2200
17	41	G6P1	Percreta	37w+5d	Cesarean section	1800
18	32	G2P1	Percreta	38w+2d	Cesarean section	1000

bleeding were made by consensus of radiologist and obstetrician after discussion. Embolization procedures were performed by members from a group of six interventional radiologists who had 7 to 22 years of experience in pelvic embolization. Informed consent for the embolization procedure was obtained before UAE. With patient under local anesthesia, pelvic angiography using Omnipaque (350 mgI/ml, GE Healthcare, USA) (pressure: 500 atm; flow rate: 10 ml/s) was performed from the common femoral artery approach with a 5-Fr pigtail catheter via a 5-Fr vascular sheath (Cordis Corporation, USA). The pelvic Digital Subtraction Angiography (DSA, Siemens, German) provided images of vascular road map for the uterine arteries and excluded a potential site of bleeding outside uterus. A long reverse catheter (Beacon Tip Torcon NB Advantage Catheter COOK, USA) or a Cobra catheter (Terumo, Japan) was used to catheterize the uterine artery. Micro-catheters (Progreat Terumo, Japan) were used coaxially when Roberts uterine catheters or Cobra catheters could not advance into the distal uterine artery. In each patients embolization of the uterine arteries was performed using gelatin sponge particles in 700-900 μm or 1400-2000 μm (Hangzhou Aicon Pharm SCI & TEC Co. Ltd, China) or pledgets which were small pieces of gelfoam cutted into 1 to 2 mm in size.

The Gelatin sponge was soaked in the iodinated contrast medium and then was injected through microcatheter until complete stasis in the main uterine artery was achieved. After embolization, a pigtail catheter was placed at the level of renal arteries and an abdominal-pelvic aortography was performed. The technical success of embolization was achieved if uterine arteries was not filled by the contrast media on the completion of pelvic arteriography.

Assessment

Data on the control of hemorrhage after embolization were obtained retrospectively from the clinical medical records. Pain, infection, groin hematoma or uterine necrosis after UAE were documented as complications. Clinical success was defined as control of bleeding without repeat embolization or surgical intervention such as laparotomy or hysterectomy.

RESULTS

Angiography findings

Angiography revealed contrast medium extravasation in the uterine cavities in 8 patients (Fig. 1A). In all cases, embolizations were technically successful in achieving stasis of the uterine artery (Fig. 1B, Fig. 1C). No collateral vessels were found.

Efficacy

In 17 of 18 patients, UAE controlled the bleeding successfully. There was no recurrent bleeding during the follow-up period (median 18 months, 3 - 31 months). The total clinical success rate was 94% (17/18). One woman with placenta percreta required an emergent hysterectomy along with surgical bladder repair because of persistent uterine bleeding after UAE. The serum β -hCG decreased to normal in all patients within two months after the intervention.

Complications

Eight patients encountered fever for 1-2 days and lower abdominal pain after UAE due to post-embolization syndrome. No other complication was noted.

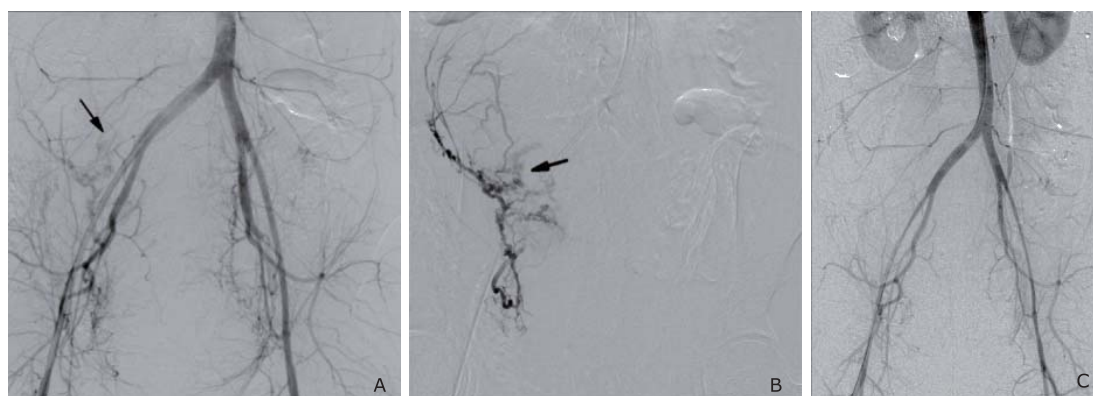


Figure 1. Digital subtraction angiography images of a 33-year-old woman with massive primary postpartum hemorrhage.

- A. Aortogram showed contrast medium extravasating (arrow) from the right uterine artery into the uterine cavity, indicating active bleeding.
- B. Right uterine arteriogram demonstrated contrast medium extravasating (arrow) from the right uterine artery.
- C. Abdominal and pelvic arteriogram after embolization of both uterine arteries with gelatin sponge, showing no uterine artery depicted and no collateral vessels to the uterus revealed.

DISCUSSION

Incidence of placenta accreta has increased in the past a few years due to increasing rates of caesarean section, which is considered as one of the risk factor of placenta accreta for themyometrial damage associated to the pathogenesis of placenta accreta.³⁻⁸ Women with placenta accreta, increta or percreta are at high risk of life-threatening hemorrhage. The maternal mortality rate was high in women with placenta percreta.²¹ Traditionally the treatment option has been hysterectomy to control the bleeding in cases of percreta; however, conservative treatments, if possible, should be the favored options when future fertility is desired.^{9,10} Several invasive conservative approaches, such as arterial ligation, UAE or internal iliac artery balloon occlusion have been developed to control severe primary postpartum hemorrhage.¹¹⁻¹³

UAE has been shown to be associated with high technical success rates and good clinical outcomes for the treatment of primary postpartum hemorrhage.¹⁴⁻¹⁶ However, the success rate of arterial embolization in patients with placenta accrete was relatively low in early studies, and sometimes hysterectomy had to be performed because of persistent bleeding.²² In recent years, with advances of new technologies, catheterization of specific target vessels and interventionist expertise, some authors reported successful cases using UAE in the management of placenta accrete.¹⁶⁻²⁰

This study showed that UAE was effective for controlling bleeding in patients who suffered from massive bleeding after delivery. UAE offers several advantages: distal and specific catheterization may prevent bleeding through collateral circulation, and success of the procedure can immediately be verified by angiogram. Jung et al¹⁸ reported the success rate was 82.4% for UAE in the emergent management of intractable postpartum hemorrhage associated with placenta accreta. In the study of Soyer¹⁹ UAE was shown to be effective to stop bleeding in 83.3% patients with placenta accreta, who conserved uterine successfully. Bros et al¹⁶ performed a retrospective study to identify the predictive factor of recurrent bleeding within 24 h after UAE for postpartum hemorrhage. They found that the placenta accreta was likely to be a significant risk factor for postpartum hemorrhage, but was not associated with bleeding recurrence within 24 h after UAE, which indicating that UAE was effective for postpartum hemorrhage of placenta accrete. The success rate in our study was higher than that in the study of Jung¹⁸ and Soyer.¹⁹ The reason may lie in that there were less patients

with placenta percreta (3/18, 16.7%) in our study than that in the study of soyer which was 50%. The failure cases in both studies were all women with placenta percreta. So the depth of invasion may be a determinant of success.

The embolic agents used for UAE were gelatin sponge, microsphere and polyvinyl alcohol (PVA) particles.¹⁶⁻²⁰ Some authors preferred using absorbable gelatin sponges because gelatin sponges facilitate recanalization of the uterine artery, and thereby preserve the uterine function. The symptoms associated with post-embolization syndrome, such as lower abdominal pain, fever and nausea, occur frequently and vary depend on the management after TAE. In our series, we used gelatin sponge as the embolic agent for temporary occlusion. Gelatin sponge seems to be sufficient to prevent further hemorrhage while making fewer complications.

Although this study has limitations such as relatively small sample and retrospectiveness, the results strongly support the clinical application of UAE in the management of primary postpartum hemorrhage which is associated with placenta accreta.

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