Uterine necrosis following uterine artery embolism due to postpartum hemorrhage: A case report and review

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Introduction

Numerous case reports for uterine necrosis after uterine artery embolization (UAE) in women with postpartum hemorrhage (PPH) have been published. In a case series of 117 patients with UAE for PPH, the rate of uterine necrosis was 2.6% (3/117), resulting in hysterectomy.¹ In a case series of 221 patients with UAE for PPH, uterine necrosis occurred at a rate of 1.4% (3/221).² Therefore, uterine necrosis after UAE for PPH is a relatively rare complication. Although uterine necrosis is sometimes complicated by fever, and may involve sepsis and or pain in the abdomen or pelvis,³ it is important to note that the frequencies of symptoms and clinical features in women with uterine necrosis following UAE for PPH have not been analyzed. We present a woman with UAE due to PPH, in whom uterine necrosis was suspected given her long-lasting subinvolution and fever, as well as her magnetic resonance imaging (MRI) results.

We also reviewed symptoms and clinical features of women with uterine necrosis following UAE for PPH.

Case report

A 29-year-old primiparous woman had a diamniotic dichorionic twin pregnancy following frozen blastocyst transfer. She was referred to our hospital for a maternal check-up at 9 gestational weeks. Her height was 159 cm, and pre-pregnancy body weight was 55 kg. She showed no evidence of complications such as uterine myoma or adenomyosis. She was hospitalized due to gestational proteinuria with a protein creatinine ratio of 0.301 g/gCr at 34 weeks, developed hypertension of 166/88 mmHg at 35 weeks, and was diagnosed with preeclampsia. We were unable to evaluate her for coagulopathy before delivery, but did note that her platelet count decreased, from 28.7 × 10⁴/μl at 9 weeks to 13.9 × 10⁴/μl at 35 weeks.

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Uterine necrosis following UAE in PPH

In spite of the first UAE, the hemorrhage persisted and the blood loss by 5 hours after the first UAE totaled 950 ml. We then decided to perform a second UAE. Considering her severe disseminated intravascular coagulation condition, we decided to use n-butyl-2-cyanoacrylate (NBCA). We explained to the patient about the long-lasting occlusion effects of NBCA and the possible side effect of uterine necrosis before performing the second UAE, and obtained her informed consent. Total blood loss from the operation to completion of the second UAE was 5,690 ml. A total of 18 units of red cell concentrate and 4 units of fresh frozen plasma were transfused until just before the UAE. However, the laboratory data 1 hour after UAE showed hemoglobin of 6.3 g/dl, a platelet count of 6.7 × 10^4/μl, fibrinogen of 85 mg/dl, indicating persistent disseminated intravascular coagulation. We next decided to add 6 units of red cell concentrate and 10 units of fresh frozen plasma.

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Although uterine bleeding stopped after the second UAE, the patient developed tachycardia, showing a low transcutaneous oxygen partial pressure of 94%. She was transferred to an intensive care unit and was intubated and managed on a ventilator. Uterine subinvolution continued after the second UAE, even though she received continuous oxytocin infusion for a prolonged period, and numerous large blood clots remained in the uterine cavity for a long time without spontaneous expulsion toward the vagina. She was extubated 7 days after the second UAE and transferred to the obstetric ward 8 days after the second UAE.

Flomoxef sodium at 3 g/day was administered for 7 days after the operation. Her fever subsided and inflammation improved 7 days after the operation, at which point we stopped the administration of flomoxef. However, the fever returned 11 days after the operation, and flomoxef was administered again. Considering the delayed occurrence of fever, we suspected uterine necrosis due to UAE. Another MRI was performed at 14 days after the UAE. A fat-suppressed T1-weighted image (Figure 1C) showed a diffuse high signal intensity of the myometrium, which suggested coagulative necrosis. Post-gadolinium-enhanced images (Figure 1D, 1E) show a lack of enhancement of the endometrium and myometrium at the uterine fundus and body, associated with a dilated uterine cavity due to hematoma, suggesting partial uterine necrosis at the fundal and lateral walls. Since the fever and intrauterine infection could not be completely eliminated by the 5-day administration of flomoxef followed by 7-day administration of metronidazole 1,500 mg/day with levofloxacin 1,000 mg/day, we decided to perform hysterectomy at 23 days after the cesarean section. With regard to gross findings, the resected uterus showed dilation of the uterine lumen and bleeding in the endometrium; bleeding points were also found in the myometrium. (Figure 1F). Histology revealed necrosis in a relatively wide area and in almost all layers, and most of the endometrial epithelium was eroded; necrosis was predominantly at the bottom of the uterus and slightly evident along on the left-side wall. The remaining muscle layer had a high degree of edematous changes, and the smooth muscle fiber bundles were separated; some blood vessels showed dilated lumens, and a portion of the blood vessels contained basophilic foreign substances, suggestive of emboli (Figure 1G).

Enterococcus faecalis and Peptstreptococcus magnum were detected from intrauterine blood clots, indicating uncontrolled intrauterine infection. Her fever subsided soon after the operation, and the white blood cell count and C-reactive protein also normalized. She was discharged 12 days after the hysterectomy. Hypertension and proteinuria disappeared at 30 days after delivery.

Discussion

Poujade et al.13 reviewed 19 cases of uterine necrosis following UAE for PPH, and found that fever, abdominal pain, menorrhagia, and leukorrhea were the main symptoms of patients with uterine necrosis; however,
Figure 1. A: Transabdominal color Doppler ultrasonography at 3 hours after the operation; arrow indicates rapid blood flow in the uterine cavity originating from the uterine wall. B: Dynamic computed tomography at 4 hours after the operation; arrows indicate two extravasations into the uterine cavity originating from left and right uterine arteries. C: MR image obtained 14 days after UAE; sagittal fat-suppressed T1-weighted MR image shows a diffuse high signal intensity of the myometrium, which suggests coagulative necrosis (arrows) associated with a dilated uterine cavity due to hematoma (H). D: MR image obtained 14 days after UAE; coronal post-gadolinium-enhanced fat-suppressed T1-weighted MR image shows lack of enhancement of the endometrium and myometrium at the uterine fundus and body (arrows). Unenhanced hematoma of the uterine cavity is also noted (H). E: MR image obtained 14 days after UAE; sagittal post-gadolinium-enhanced T1-weighted subtracted MR image clearly shows lack of enhancement of the uterine myometrium. Note the scattered enhancement of the viable myometrium (arrowhead). F: Gross findings of resected uterus. G: Histological findings of resected uterus.
### Table 1. Symptoms or findings related to uterine necrosis following UAE in women with PPH

| No. | Authors, Journal, Year | Embolic material | Repeated UAE | Ligation of uterine arteries | Fever (+), Persistent fever (++) +, sepsis (++++), Abdominal/pelvic pain | Long-lasting subinvolution | Markedly distended uterus in MRI/CT | Delayed appearance of various symptoms | Other symptoms or findings | PMID |
|-----|-------------------------|------------------|--------------|-------------------------------|-------------------------------------------------|--------------------------|-----------------------------------|----------------------------------------|-------------------------------|-------|
| 1   | Pirard et al., Fertil Steril, 2002 | AGS (1st), ALC (2nd) | +            | +                             | +++ + + + + + + + +                                             | − (CT)                   | Yes: fever and pain 53 days PP | Gas in the uterus (CT)                          |                                | 12137882 |
| 2   | Cottier et al., Obstet Gynecol, 2002 | ALC + AGS        |              |                               |                                                                |                         | Unknown (MRI)                         | No                                     | Menorrhagia                      | 12423810 |
| 3   | Porcu et al., BJOG, 2005     | AGS              |              |                               |                                                                |                         | Unknown (MRI)                         | Yes: pain and PPH 21 days PP                  | Late PPH 21 day PP                | 15663413 |
| 4   | Chitrit et al., Eur J Obstet Gynecol Reprod Biol, 2006 | AGS              | ++           |                               | + (CT on 3 days PP)                                             |                         | Yes: discharge of necrotic mass 1 month PP | Purulent vaginal discharge, discharge of necrotic mass, uterine amenorrhea |                                | 16024157 |
| 5   | Eboue et al. J Gynecol Obstet Biol Reprod Biol (Paris), 2007 | ALC              | +            | +                             | NT                                                             |                         | No                                 |                                        |                                | 17317035 |
| 6   | Courbiere et al., Eur J Obstet Gynecol Reprod Biol, 2008 | AGS              |              |                               | + + + + + + + + + +                                             | − (CT)                   | No                                 |                                        |                                | 18541360 |
| 7   | Coulange et al., Acta Obstet Gynecol Scand, 2009: Case 1 | AGS              |              |                               | + + + + + + + + + +                                             | − (MRI)                  | Yes: sepsis and pyometra 36 days PP | Pyometra                                |                                | 19089781 |
| 8   | Coulange et al., Acta Obstet Gynecol Scand, 2009: Case 2 | AGS              |              |                               | + + + + + + + + + +                                             | − (MRI)                  | Yes: fever and pain 10 days PP     |                                        |                                | 19089781 |
| 9   | Tseng et al., Am J Obstet Gynecol, 2011      | AGS              |              |                               | + + + + + + + + + +                                             | − (CT)                   | Yes: fever and pain 10 days PP     | Uncontrolled intrauterine infection     |                                | 21377647 |
| No. | Authors, Journal, Year | AGS, ALC (1st), AGS, ALC (2nd) | ALC + AGS + coil | AGS | AGS | Yes: fever and pain 3 weeks PP | Gas in the uterus | Gas in the uterus | Persistent aseptic leukorrhea | Lower limb weakness 9 days PP | Lower limb weakness 5 days PP | Lower limb weakness | Intrauterine mass (uterine necrosis) | Uncontrolled intrauterine infection |
|-----|-------------------------|--------------------------------|-------------------|-----|-----|-----------------------------|------------------|------------------|------------------------|------------------------|------------------------|-------------------------------|---------------------------------|----------------------------------|
| 10  | Poujade et al., Eur J Obstet Gynecol Reprod Biol, 2013 | AGS | + | + | - (CT) | Yes: fever and pain 3 weeks PP | Gas in the uterus | 22748476 |
| 11  | Desille et al., J Ultrasound Med, 2013: Case 1 | ALC + AGS | ++ | + | - (CT) | Yes: fever and pain 13 days PP | Gas in the uterus | 24065269 |
| 12  | Desille et al., J Ultrasound Med, 2013: Case 2 | AGS | - (MRI) | Yes: leukorrhea 1 month PP | Persistent aseptic leukorrhea | 24065269 |
| 13  | Rohilla et al., Arch Gynecol Obstet, 2014: Case 1 | ALC + AGS + coil | ++ | NA | Yes: lower limb weakness 9 days PP | Lower limb weakness | 24947325 |
| 14  | Rohilla et al., Arch Gynecol Obstet, 2014: Case 2 | AGS | ++ | NA | Yes: lower limb weakness 5 days PP | Lower limb weakness | 24947325 |
| 15  | Jean et al., Int J Obstet Gynecol, 2015 | AGS | + | - (CT) | No | Intrauterine mass (uterine necrosis) | 26026344 |
| 16  | Kwon et al., Taiwan J Obstet Gynecol, 2015 | AGS (1st), AGS, ALC (2nd) | + | ++ | + (CT on 35 days PP) | Yes: fever and pain 35 days PP | 26701007 |
| 17  | Our case | AGS (1st), AGS, NBCA (2nd) | + | ++ | + (MRI on 14 days PP) | Yes: fever 13 days PP | Uncontrolled intrauterine infection |

Abbreviations: UAE, uterine artery embolization; PPH, postpartum hemorrhage; PMID, PubMed Identifier; NBCA, n-butyl-2-cyanoacrylate; AGS, absorbable gelatin sponge; ALC, alcohol; OTH, other materials; PP, postpartum; CT, computed tomography; MRI, magnetic resonance imaging; NA, not available.
they did not analyze the frequencies of various symptoms and clinical features in women with uterine necrosis following UAE for PPH. A PubMed search for articles or case reports on uterine necrosis using the keyword “uterine necrosis” identified 74 articles, including 17 cases of uterine necrosis following UAE due to PPH including our case, using Abstract and/or Case Reports in English where symptoms and clinical features were precisely described. Table 1 shows the symptoms and specific clinical features of women with uterine necrosis. Selected articles are listed with their PubMed Identifier (PMID). In almost all cases, absorbable gelatin sponge was selected as the embolic material. In only 2 cases, repeated UAE was performed. There was only 1 case for which ligation of uterine arteries was performed following UAE. Fever was observed in 76% (13/17); persistent fever or sepsis occurred in 65% (11/17), and sepsis occurred in 18% (3/17). Abdominal or pelvic pain was present in 59% (10/17). Thus, fever and abdominal/ pelvic pain were major symptoms of patients with uterine necrosis, as was reported in the review article by Poujade et al. In addition, delayed appearance of various symptoms was observed in 76% (13/17), suggesting that this may also be a major finding in patients with uterine necrosis. Menorrhagia was observed in only 1 case. A markedly distended uterus was observed in 3 cases including our patient. However, only our case showed long-lasting subinvolution. Considering the impairment of uterine contractility in cases with uterine necrosis, we suggest that long-lasting subinvolution may be a specific feature of uterine necrosis following UAE in women with PPH.

In our case, a fat-suppressed T1-weighted image showed a diffuse high signal intensity of the myometrium, and post-gadolinium-enhanced images showed a lack of enhancement of the endometrium and myometrium at the uterine fundus and body. This was associated with a dilated uterine cavity due to hematoma, suggesting that partial uterine necrosis had occurred at the fundal and lateral walls. The area of necrosis suggested by the enhanced MRI was almost completely consistent with indications of the pathological examination. Although we performed hysterectomy at 23 days after cesarean section, we delayed our decision to do so in consideration of the patient’s desire to have other children in the future. The final decision to perform a hysterectomy was made when the persistent fever failed to respond to the broad spectrum of antibiotics. The MRI findings suggestive of uterine necrosis also played a major role in this. To the best of our knowledge, this might be the first reported case of uterine necrosis suggested by MRI following UAE in a woman with PPH. We believe that post-gadolinium-enhanced images of the uterus may provide important findings suggesting histological necrosis.

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Conflict of interest

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