



Uterine necrosis following uterine artery embolization: case report and literature review

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Background: A cesarean scar pregnancy (CSP) is a high-risk pregnancy that can result in uncontrollable bleeding, hysterorrhexis, peripheral visceral injury, and hysterectomy during or after curettage. Uterine artery embolization (UAE) is an important adjuvant therapy that can be performed for CSP types II and III to decrease the risk of bleeding; however, it may be associated with severe complications, such as uterine necrosis. Uterine necrosis is a major complication of embolization; however, it is extremely rare today. We conducted a search of English articles on PubMed and found 21 reports of uterine necrosis following uterine artery embolization. Our literature search did not identify any reports of uterine necrosis following uterine artery embolization for a cesarean scar pregnancy.

Case Description: We present the case of a 43-year-old woman diagnosed with type III cesarean scar pregnancy and adenomyosis, who underwent uterine artery embolization (prior to curettage) that resulted in a large area of uterine necrosis. We performed a hysterectomy and bilateral salpingectomy.

Conclusions: In conclusion, although uterine necrosis is a major complication of embolization, it is extremely rare today. Uterine artery embolization must be practiced with caution, using large polyvinyl alcohol particles (>500 µm) and/or gelatin sponges >500 µm. Physicians should strictly control the indications for UAE and master the technique explicitly.

Keywords: Uterine artery embolization; cesarean scar pregnancy (CSP); uterine necrosis; case report

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Introduction

A cesarean scar pregnancy (CSP) is a high-risk pregnancy that can result in uncontrollable bleeding, hysterorrhexis, peripheral visceral injury, and hysterectomy during or after curettage. Treatment includes medication, surgery, or a combination of these. CSP was divided into two types in 2000 by Vial *et al.*; however, this classification can not clearly guide clinical work (1). CSP was also classified into three types (I, II, III) according to the location and direction of growth of the gestational sac and myometrial thickness (2,3). It is much easier to select appropriate treatments using this

classification (2,3). Uterine artery embolization (UAE) is an important adjuvant therapy that can be performed for CSP types II and III to decrease the risk of bleeding (3). The most common symptoms following UAE include abdominal pain, fever, and vaginal discharge. Reports have also documented episodes of endometrial, myometrial, and ovarian injuries, which can result in amenorrhea, ovarian failure, and impaired reproductive ability (4,5). Uterine necrosis is a major complication of embolization; however, it is extremely rare today. Uterine necrosis has a significant effect on the menstrual cycle, fertility, and subsequent pregnancies.

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Figure 1 MRI demonstrating a cesarean scar pregnancy and adenomyosis. MRI, magnetic resonance imaging.

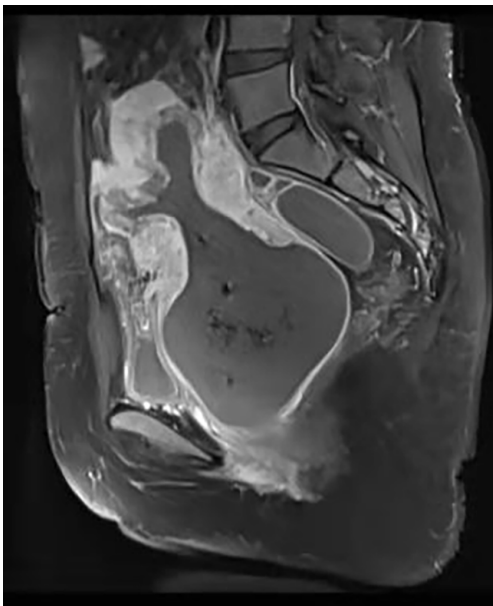


Figure 2 MRI demonstrating a large mass and incomplete uterine inversion. MRI, magnetic resonance imaging.

Herein, we have presented a case of uterine necrosis after UAE for a CSP and have conducted a review of the literature available on PubMed. Only articles written in English were examined in this study. Our literature search did not identify any reports of uterine necrosis following UAE for a CSP. We present the following case in accordance with the CARE reporting checklist (available at <https://gpm.amegroups.com/>

[article/view/10.21037/gpm-21-46/rc](https://doi.org/10.21037/gpm-21-46/rc)).

Case presentation

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal. A 43-year-old woman was admitted to a local hospital and diagnosed with type III CSP and adenomyosis. She had a history of one cesarean section. Her serum human chorionic gonadotropin level was >200,000 mIU/mL. Prior to UAE, magnetic resonance imaging (MRI) revealed a gestational sac along the cesarean scar (*Figure 1*). The patient underwent curettage after UAE. Bilateral UAE was performed using polyvinyl alcohol embolization microspheres (100–300 μm and 300–500 μm) and gelatin sponge particles (560–710 μm). Three months after UAE, the patient was admitted to our hospital due to an asymptomatic vaginal mass (symptoms such as abdominal pain, abnormal vaginal bleeding, or fever were absent). On physical examination, a large, soft vaginal mass and a large uterus corresponding to the size of a four-month-old pregnancy, were detected. The cervix was not assessed at this time. MRI revealed a large mass occupying the uterine cavity, cervical canal, and upper portion of the vagina. The mass was continuous with the myometrium of the fundus uteri and exhibited traction on the fundus, which resulted in incomplete uterine inversion (*Figure 2*). The patient underwent an exploratory laparotomy, and a hysterectomy and bilateral salpingectomy were performed. Intraoperatively, extensive adhesions were noted in the pelvic cavity. Majority of the myometrium was necrotic, and the right side of the fundus was concave. A large, light-yellow mass was noted originating from the fundus and extending into the uterine cavity and vagina (*Figures 3,4*). Histopathological examination of the resected specimen showed extensive necrosis, as well as blood and inflammatory cell infiltration in the myometrium. Gelatin sponge components were also noted in the blood vessels of the myometrium. The exploratory laparotomy was completed in 2 hours, and approximately 200mL of blood was lost intraoperatively. The patient recovered well from surgery, and no complications were noted over the 2-year follow-up period.

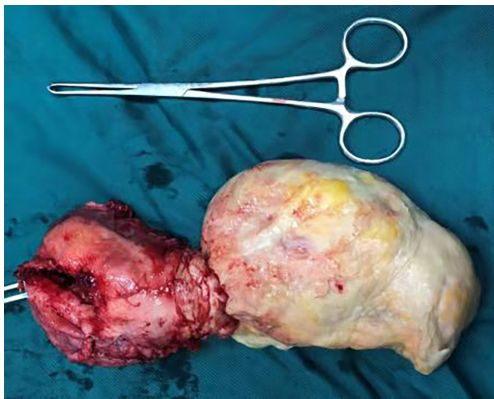


Figure 3 The uterus and mass.



Figure 4 Extensive necrosis of the myometrium.

Discussion

UAE is an important adjuvant therapy for CSP; it blocks the blood flow to the gestational sac, which lowers the risk of intraoperative bleeding and a hysterectomy during or after uterine curettage (6). Among 841 patients who underwent UAE prior to uterine curettage, good hemostasis was achieved in 93.7% (7). Another retrospective study involving 169 patients with CSP who underwent UAE, demonstrated a 96.4% hemostasis success rate during dilation and curettage. UAE is also associated with a reduction in menstrual blood volume and future pregnancy rate (8).

Uterine necrosis is a rare complication of UAE and remains an important issue in the diagnosis and management of this condition. We conducted a search of English articles on PubMed and found 21 reports of uterine necrosis

following UAE (9-26). The search strings were the following: uterine necrosis and uterine artery embolization. The clinical characteristics and outcomes of the patients in these studies are listed in *Table 1*. UAE was performed for three cases of leiomyoma and 18 cases of postpartum hemorrhage (PPH). In all 21 cases, uterine necrosis was managed with embolization agents, such as the Spongostan gelfoam slurry (Gelfoam) (n=9,42.9%), polyvinyl alcohol particle (PVA) (n=5, 23.8%), absorbable gelatin sponge (Curaspon) (n=6, 28.6%), and gelatin sponge pledges (Gelatin) (n=2,0.1%). The most common clinical symptoms after UAE were fever, abdominal pain, and vaginal discharge. The interval between UAE and the diagnosis of uterine necrosis ranged from 4–69 days. Uterine necrosis was often initially demonstrated by ultrasound and later confirmed by computed tomography (CT) and MRI. The CT and MRI findings of uterine necrosis sometimes include uterine elongation, myometrial gas, peripheral contrast uptake, and absent myometrial contrast uptake (27). However, myometrial gas and peripheral contrast uptake can be normal after UAE and are not specific signs of necrosis. Our patient demonstrated extensive uterine necrosis following UAE, resulting in uterine inversion. She was diagnosed by MRI and underwent a hysterectomy for severe uterine necrosis.

Previous studies have identified possible risk factors for uterine necrosis following UAE (27,28). These include the embolization technique, size of the particles of the embolic agents used, absence of vascular anastomoses, and presence of sepsis (27). The incidence of uterine necrosis can be reduced in several ways. First, a suitable embolic agent should be chosen. The gelatin sponge is suitable for UAE because it has large particles, which are unlikely to occlude small arteries. Gelatin sponge particles in UAE should exceed 500 μm in diameter (28). The small particles were used in our patient and may have been one of the causes of uterine necrosis. Second, the speed at which the embolic agent is injected should be controlled. Faster injection may reroute the agent to distal anastomotic channels and result in embolization of vessels supplying surrounding tissues, such as those of the ovaries (27). Third, significant adenomyosis in our patient is a confounding factor because embolization (to prevent hemorrhage) before curettage also treats adenomyosis, which will necrose and be eliminated via the vaginal tract. Furthermore, the treatment of uterine necrosis should be individualized. This report has demonstrated that partial necrosis may be treated with hysteroscopic or laparoscopic excision, which preserves fertility, whereas large necrotic areas require subtotal or

Table 1 Clinical features of 21 reported cases of uterine artery embolization

Author, year	Age (years)	Location of necrosis	Indication for UAE	Embolic agent utilized for UAE	Symptoms after UAE	Auxiliary examination	Management	Time interval between UAE and diagnosis of uterine necrosis (days)
Ruiz Sanchez, 2021 (9)	37	Uterus	PPH	Gelfoam	Fever	MRI	TH	16
Mutiso, 2018 (10)	56	Uterus	Fibroids	Gelfoam	Abdominal pain, vaginal discharge, nausea, vomiting	None	SHT	30
Tanaka, 2017 (11)	40	Uterus	PPH	Curaspon	Fever and abdominal fullness	CT	TH	77
Jean dit Gautier, 2015 (12)	36	Partial uterine and vaginal necrosis	PPH	Curaspon	Abdominal pain	Ultrasonography and CT	Hyperbaric oxygen therapy	/
Kwon, 2015 (13)	19	Uterus	PPH	Gelfoam (1 st UAE), PVA (300–500 µm) (2 nd UAE)	Fever and abdominal pain	CT	TH and bilateral salpingectomy	69
Rohilla, 2014 (14)	22	Partial Uterus	PPH	Gelfoam and PVA (500–700 µm) (1 st UAE), Gelfoam and PVA (500–700 µm) (2 nd UAE)	Fever	Ultrasonography and CT	None (Necrotic mass expelled spontaneously per vaginam. The patient was secondarily amenorrhoeic.)	21
Rohilla, 2014 (14)	26	Partial uterus	PPH	Gelfoam	Fever	None	None (Mass expelled spontaneously per vaginam.)	30
Bouvier, 2012 (15)	43	Uterus	PPH	Curaspon	NR	NR	TH	42
Tseng, 2011 (16)	38	Uterus	PPH	Gelfoam	Fever and abdominal pain	CT	TH	10
Sentilhes, 2010 (17)	37	Uterus	PPH	NR	NR	NR	TH	23
Sentilhes, 2010 (17)	6	Uterus	PPH	NR	NR	NR	TH	9
Coulangue, 2009 (18)	20	Uterus	PPH	Gelatin	Fever, pyometra, and marked leucocytosis	MRI	TH	51
Coulangue, 2009 (18)	28	Uterus	PPH	Curaspon	Abdominal pain and severe infectious syndrome	Ultrasonography and MRI	TH and left adnexectomy	10
Kirby, 2009 (19)	31	Uterus	PPH	Gelfoam	NR	None	TH	14

Table 1 (continued)

Table 1 (continued)

Author, year	Age (years)	Location of necrosis	Indication for UAE	Embolic agent utilized for UAE	Symptoms after UAE	Auxiliary examination	Management	Time interval between UAE and diagnosis of uterine necrosis (days)
Courbiere, 2008 (20)	28	Uterus	PPH	Curaspon	Fever	CT	TH	9
La Folie, 2007 (21)	32	Uterus and bladder	PPH	Gelfoam	Pelvic pain, hemorrhage, and fever	MRI	TH	21
Chitrit, 2006 (22)	30	Partial uterus	PPH	Gelfoam	Fever and purulent vaginal discharge	CT	None (Mass expelled spontaneously.)	30
Porcu, 2005 (23)	32	Uterus	PPH	Curaspon	Pelvic pain and abnormal bleeding	MRI	SHT	21
Torigian, 2005 (24)	47	Uterus	Leiomyoma	PVA (355–500 µm)	Fever, abdominal pain, nausea, vomiting, vaginal bleeding, and vaginal discharge	MRI	TH	4
Pitard, 2002 (25)	34	Uterus	PPH	Gelatin (1 st UAE), PVA (200–500 µm) (2 nd UAE)	Fever and epigastric pain	CT	SHT	53
Godfrey, 2001 (26)	47	Uterus	Leiomyoma	PVA (355–500 µm)	Fever, abdominal pain, and discharge	CT	TH and left salpingo-oophorectomy	60

UAE, uterine artery embolization; PPH, postpartum hemorrhage; Gelfoam, Spongostan gelfoam slurry; MRI, magnetic resonance imaging; TH, total hysterectomy; SHT, subtotal hysterectomy; Curaspon, absorbable gelatin sponge; CT, computed tomography; PVA, polyvinyl alcohol; NR, none reported.

total hysterectomy, which sacrifices fertility.

In conclusion, uterine necrosis is a rare complication of UAE. Therefore, UAE must be practiced with caution, using large polyvinyl alcohol particles (>500 µm) and/or gelatin sponge >500 µm. Physicians should strictly control the indications for UAE and master the technique explicitly.

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Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at <https://gpm.amegroups.com/article/view/10.21037/gpm-21-46/rc>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://gpm.amegroups.com/article/view/10.21037/gpm-21-46/coif>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). The study was approved by Ethics Committee of the West China Second University Hospital and written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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