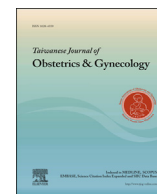


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## Research Letter

## Uterine necrosis and hysterectomy in a postpartum hemorrhage patient who underwent repeated uterine artery embolization



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## Dear Editor,

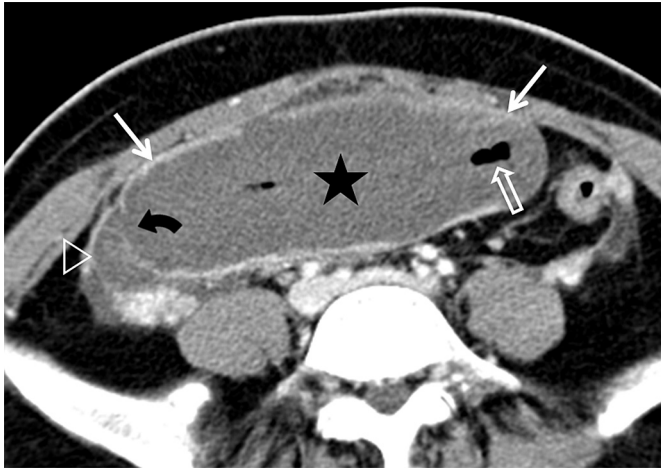
A 19-year-old nulliparous female in the 28<sup>th</sup> week of her first pregnancy, a monoamniotic monochorial twin pregnancy, was transferred to our hospital after she presented with watery vaginal discharge and lower abdominal pain. Soon after admission to our hospital, the patient was managed conservatively; her condition stabilized without significant clinical events. Approximately 1 month later, she developed vaginal bleeding with fresh blood, suggesting premature membrane rupture requiring emergency cesarean delivery. The estimated blood loss during cesarean delivery was approximately 1000 mL. The patient showed continued vaginal bleeding after cesarean delivery in the operating room. Vital signs and laboratory data were: blood pressure = 122/73 mmHg, pulse rate = 111 times/minute, hemoglobin = 8.5 g/dL, and hematocrit = 25.3%. The patient was managed by conservative methods including uterine massage, fluid loading, intravenous administration of oxytocin, and vaginal packing. Uterine atony was considered as the cause of postpartum bleeding because the patient had no abnormal findings of the placenta and no particular event occurred during cesarean delivery. Emergency uterine artery embolization (UAE) was performed for massive postpartum hemorrhage (PPH). The anterior divisions of both the right and left internal iliac arteries were embolized using gelfoam particles (Cutanplast, Mascia Brunelli, Milan, Italy). The next morning, massive vaginal bleeding was again evident. The vital signs were blood pressure = 80/60 mmHg and pulse rate = 125 times/minute. The hemoglobin level was 6.6 g/dL. Emergency UAE was performed once more. A pelvic angiogram showed active bleeding in the

recanalized right uterine artery. The anterior division of the right internal iliac artery was embolized completely using polyvinyl alcohol (PVA) particles (diameter 300–500  $\mu$ m; Cook Medical, Bloomington, IN, USA). The right internal iliac artery was embolized completely using gelfoam particles. Then the vaginal bleeding stopped and the patient's vital signs again stabilized. The patient was discharged as there were no other clinically significant events. The patient was hospitalized again 35 days after the UAE because of high fever and abdominal pain in the right lower abdominal quadrant. Contrast-enhanced computed tomography revealed a paper-thin uterine myometrium suggesting uterine necrosis (Figure 1). On Day 69 after the UAE, the patient underwent total abdominal hysterectomy and bilateral salpingectomy because of continued symptoms. A gross specimen of the hysterectomy showed dilated endometrial cavity containing brownish necrotic material. Histopathological examination of the hysterectomy specimen revealed circumferential ischemic necrosis located at the inner half of the myometrium and endometrium and abscess formation, congestion, and hemorrhage in the outer zone of the necrotic region, accompanied by cervicitis and bilateral salpingitis. Postoperatively, the patient recovered completely without any obstetrical or gynecological problems.

Ischemic complications of UAE, such as necrosis of the uterus, bladder wall, muscle, or skin, and nerve damage are rare [1]. Several factors contribute to the development of uterine necrosis after embolization in PPH. First, the size and type of the particles used in the embolization have been implicated [2]. The use of gelfoam particles that are too small and PVA particles <400  $\mu$ m may result in the embolization of fine distal branches of the uterine arteries which can compromise the collateral vessels [2–5]. Second, the distended uterus after childbirth and the lack of collateral vessels could cause insufficient blood flow to the distal part of the distended uterus [1,3]. Third, high-pressure embolization increases the risk of unwanted occlusion, including the anastomotic channels [3]. Finally, there are other risk factors, such as older age, previous radiation therapy, the absence of antibiotic prophylaxis, sepsis, hypovolemic shock, and a history of cocaine abuse [1,3,5]. In our patient, the first embolization encompassed the anterior divisions of both the right and left internal iliac arteries, and the second embolization the entire right internal iliac artery. As a result, UAE was performed nonselectively in this patient. Furthermore, smaller

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**Figure 1.** Computed tomography scan obtained 35 days after uterine artery embolization. Axial image shows the paper-thin myometrium, peripheral rim enhancement (white arrows), a large hematoma (★), and air (empty arrow) within the uterine cavity. Note both the focal uterine wall defect (curved arrow) on the right side of the uterine fundus and the adjacent fluid collection (▷).

gelfoam particles were used to prevent the proximal occlusion of spastic uterine arteries in the beginning of the first UAE. In a rebleeding situation, PVA particles (300–500  $\mu\text{m}$ ) were used. Both

the sizes of the particles and the nonselective embolization of the pelvic arteries likely contributed to the development of uterine necrosis. Although the optimal embolic agent for PPH has yet to be determined, the current guidelines recommend the use of relatively large absorbable particles, such as gelfoam particles, to prevent prolonged obliteration of the distal vascular bed downstream from the uterine arteries [4]. During UAE for PPH patients, embolization should be performed selectively and particles should not be too small to avoid uterine necrosis.

#### Conflicts of interest

The author has no conflicts of interest relevant to this article.

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