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Case Report

Acute cor pulmonale following uterine artery embolization ☆☆☆

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ABSTRACT

Uterine artery embolization (UAE) is a common procedure for controlling gynecological and obstetric bleeding. We report a case of a 38-year-old female with placenta increta who underwent UAE following a cesarean section and subsequently developed pulmonary embolism from nontarget embolization. Excellent CTPA images demonstrate embolization agents used in the procedure in the pulmonary vasculature. The patient developed acute cor pulmonale, an infrequent complication from the procedure. This case presents a rare and clear demonstration of a complication of uterine artery embolization with clear imaging evidence.

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Introduction

Uterine artery embolization (UAE) is a procedure commonly performed for various gynecological and obstetric indications primarily to control bleeding. However, one of the most dangerous complications associated with this procedure is pulmonary embolism. We present a rare case of a patient with placenta increta who, after giving birth via cesarean section underwent UAE for bleeding control. Inadvertently the procedure was complicated by nontarget embolization (NTE) to the peripheral pulmonary arteries resulting in cor pulmonale.

Case presentation

A 38-year-old female, with a history of placenta increta, hypothyroidism, and 3 prior cesarean sections, presented to the emergency department at 31 weeks and 5 days of gestation with vaginal bleeding. Obstetric US and MRI confirmed placenta previa and increta. Accordingly, she underwent a scheduled cesarean section, which revealed a morbidly adherent placenta in situ. The surgery was uneventful with a viable infant delivered. Postoperatively, the patient recovered well.

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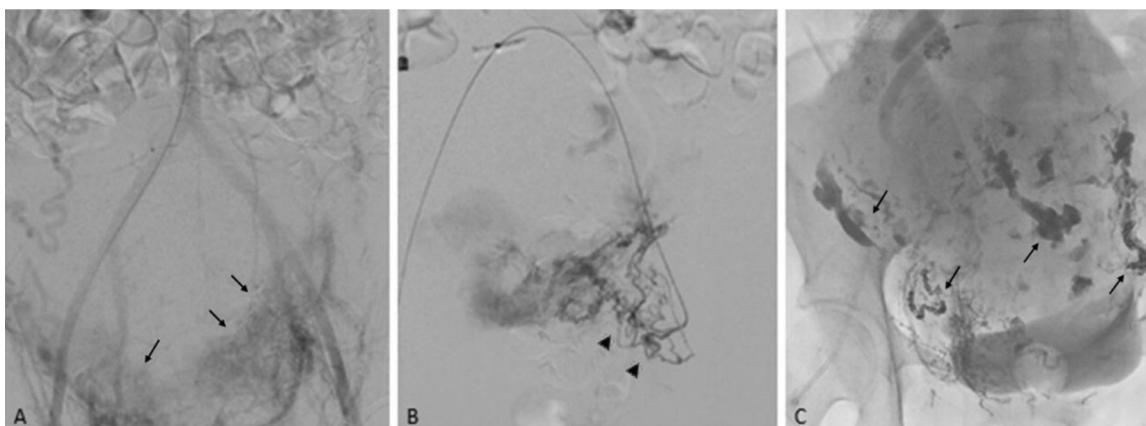


Fig. 1 – (A) Pelvic aortogram and (B) Selective angiogram from the left uterine artery showing a hypervascular uterus/placenta (Arrows) with multiple parasitizing vessels from the internal iliac artery branches (Arrow heads). (C) Post embolization image showing a combination of glue and lipiodol along with multiple coils and other agents staining the uterine/placental vasculature (Arrows).

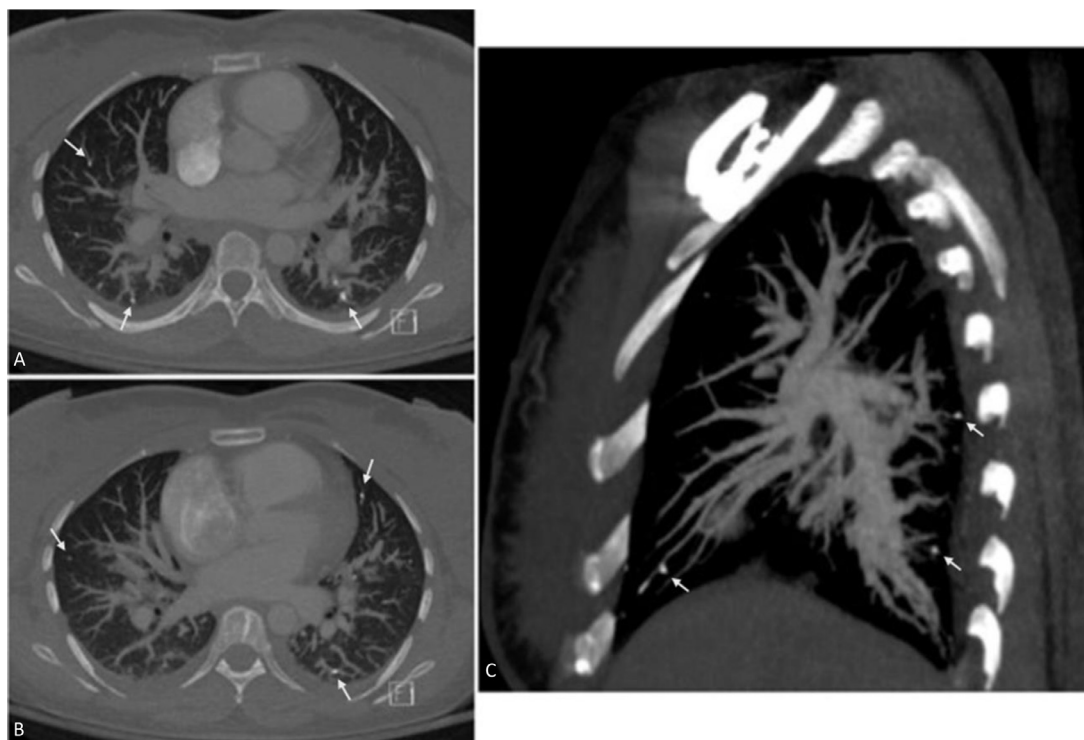


Fig. 2 – Axial (A) and sagittal (B) CT scan of the chest shows multiple small hyperdense materials (Arrows) within the peripheral subsegmental branches of the pulmonary artery consistent with embolization agents.

Five days after the cesarean delivery, the patient underwent uterine artery embolization to reduce the anticipated bleeding during the scheduled hysterectomy. UAE was successfully performed using various embolization agents, predominantly Gelfoam, Avitene, large particles, and n-BCA glue mixed with lipiodol (Fig. 1).

Following the procedure, she developed severe pelvic and back pain, in addition to tachycardia, hypoxemia and fever. Her oxygen saturation levels dropped to 89%. An electrocar-

diogram (ECG) displayed sinus tachycardia with an incomplete right bundle branch block.

Given the recent procedure and the manifestation of symptoms, pulmonary embolism (PE) was suspected and CT pulmonary angiography (CTPA) was requested. Images revealed numerous hyperdensities scattered throughout the subsegmental pulmonary artery branches in multiple bilateral lung lobes, consistent with embolization material (Fig. 2). Imaging also showed diffuse dilation of the central and periph-

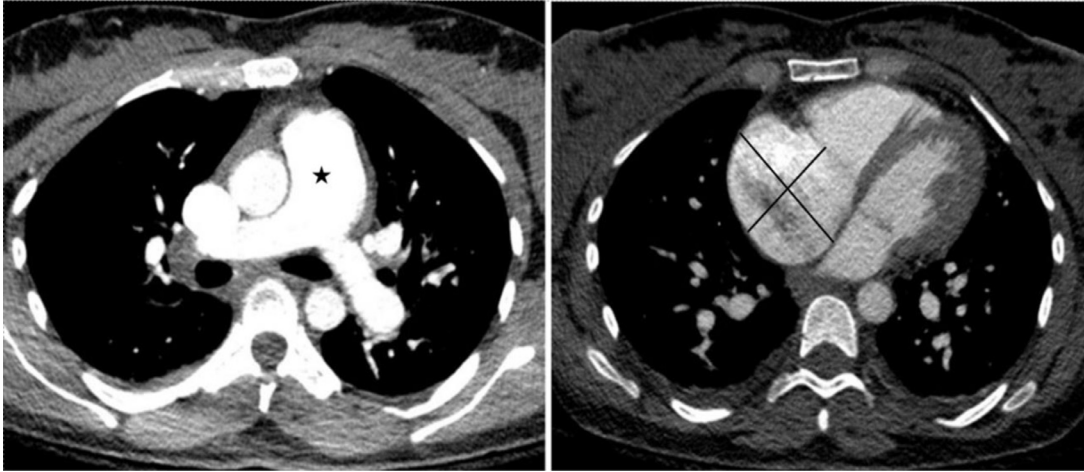


Fig. 3 – Axial Contrast enhanced CT scan showing a dilated pulmonary artery (star) and right atrium (Lines).



Fig. 4 – Axial CT chest diffuse ground-glass opacities with a broncho-vascular and lower lobe predilection accompanied by mild septal thickening (Arrows), indicative of pulmonary edema.

eral pulmonary arteries as well as a severely dilated right atrium (Fig. 3). Evaluation of the lung parenchyma showed diffuse ground-glass opacities with a broncho-vascular and lower lobe predilection, accompanied by mild septal thickening, indicative of pulmonary edema (Fig. 4). These findings suggested a significant burden of embolic material on the pulmonary vasculature, leading to elevated pulmonary and right atrial pressures.

The patient received care from an interdisciplinary team and was started on anticoagulation. Her cardiovascular status was stabilized and eventually a total abdominal hysterectomy was performed. The patient's symptoms improved and she was discharged in stable condition.

Follow-up CT scan after a few months showed reduction in the hyperdense embolic material within the lungs, and

normal appearance of the pulmonary vasculature and right atrium (Fig. 5).

Discussion

Uterine artery embolization is a minimally invasive procedure in which different embolization agents are injected into the uterine artery. It is increasingly performed and has been proven effective for a variety of gynecological and obstetric indications, including uterine fibroids, arteriovenous fistulas, tumors, and postpartum hemorrhage [1,2]. UAE has been demonstrated to be a safe and effective alternative for patients with placental adhesion disorders. Recent studies, including a 2023 study by Muñoz et al., have shown that pelvic artery catheterization and embolization, such as Uterine Artery Embolization, are effective in preventing hemorrhagic events in women with placenta accreta spectrum while improving perioperative outcomes and reducing maternal morbidity [3,4]. UAE can also successfully treat residual placenta accreta in patients with incomplete curettage after abortion [5]. The patient presented in this case had persistent bleeding after delivery due to placenta accreta. UAE was indicated to reduce the chance of bleeding during the planned hysterectomy; being the definitive management for this condition. The angiogram showed at least 6 parasitized uterine arteries that supplied the uterus/placenta.

Several embolic agents can be used for this procedure, some are absorbable in nature and allow vessel recanalization several weeks after placement. Our patient's UAE was done predominantly with Gelfoam and Avitene. Gelfoam is an absorbable gelatin sponge used to promote hemostasis. It is typically mixed with iodinated contrast material before injection and is absorbed completely within 4-6 weeks. [6] Avitene is a microfibrillar collagen preparation that has reabsorption in around 2-8 weeks.

As with any invasive procedure, UAE has risks and some known complications. Some of the acute complications include uterine ischemia, necrosis, and tissue infection, but the

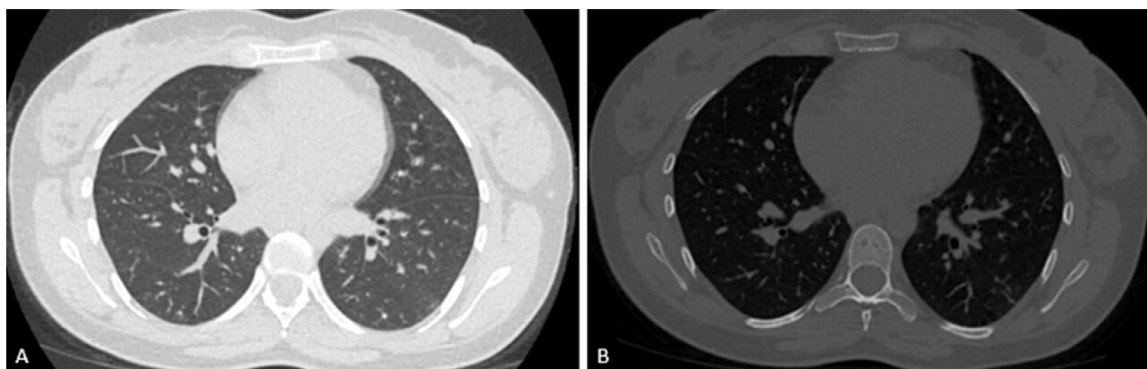


Fig. 5 – Follow up CT scan images in the lung (A) and bone (B) windows shows total resolution of the previously detected hyperdense embolization material within the peripheral pulmonary artery branches.

most severe and life-threatening complication is acute pulmonary embolism (PE) [2,7]. Pulmonary embolism is a rare complication, occurring in only 0.25% of cases [1]. Although several cases have been reported in patients with uterine fibroids who suffer from pulmonary embolism following this procedure, the incidence is very low and not frequently reported for patients with placental adhesion disorders. In these cases, other complications unrelated to embolization, such as infection, are more prevalent [1,8]. Patients post-UAE may present with PE due to various mechanisms. One proposed cause is prolonged and excessive pressure on the puncture site after UAE, potentially causing blood stasis in lower-limb veins which predisposes to thrombosis. Additionally, the endothelial cell disruption from repeated intraoperative punctures can create a prothrombotic environment, promoting local thrombosis [1,9]. While these mechanisms explain how endogenous blood clots can cause PE, a less common but reported mechanism involves embolization material directly entering the venous system, subsequently reaching the pulmonary arteries, and causing PE. NTE is a rare but serious complication of UAE, and the tomographic findings in this patient suggest that this is the cause of her pulmonary embolism.

The patient's CTPA revealed multiple hyperdensities spread across the subsegmental pulmonary artery branches in all lobes of both lungs. Based on these findings, it is possible that some embolic materials passed through the placental tissue lacunes and/or the postpartum capillary bed into the venous system and eventually into the distal pulmonary vasculature. Another possibility is the presence of a direct arteriovenous shunt within the uterus or placenta resulting in the passage of embolizing agents into the venous system. NTE can also occur when embolic material refluxes when ejected too quickly and enters other arteries. Reflux may also occur in the moment of catheter withdrawal [10]. Imaging is crucial for distinguishing pulmonary embolism caused by blood clots from embolization material. On CTPA and chest X-ray, material density provides a key clue: embolization material often exhibits higher attenuation, appearing more radiopaque than blood clots [11]. Additionally, location plays a significant role; NTE typically shows a peripheral distribution, whereas regular PE usually affects larger, central pulmonary arteries and

presents with characteristic radiological signs absent in NTE [11,12].

A unique aspect of this case is the development of pulmonary hypertension resulting in right heart strain, as evidenced by the dilated pulmonary arteries and right atrium seen in CTPA. The main etiology for acute cor pulmonale in the United States is reported to be massive pulmonary embolism, with a 50% of deaths annually from PE occurring in the first hour due to acute right heart failure [13]. There are no specific reports on the incidence of cor pulmonale arising specifically from nontarget pulmonary embolism, as highlighted in this case.

In conclusion, UAE has some established risk, the most feared being PE. Although endothelial cell damage and blood clots are the common cause of PE, another mechanism is through nontargeted embolization to the pulmonary arteries. This case presents a rarely encountered complication in which the patient developed acute cor pulmonale secondary to the embolic agents, which to our knowledge has not been previously reported in the literature.

Patient consent

Upon arrival at our institution, the patient was provided with comprehensive information to facilitate informed consent regarding imaging, procedures, and subsequent studies. This informed consent process is documented in the patient's chart. As no additional patient contact or interaction was necessary for the preparation of this case report, and all images were retrieved from the Picture Archiving and Communication System (PACS), no further Institutional Review Board (IRB) approval was required based on the standards of our institution.

Data sharing statement

No data were generated or analyzed during the study.

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