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## Case Report

# Peritoneal seeding of embolic beads after uterine artery embolization <sup>☆</sup>

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## ABSTRACT

**Background:** Incidental identification of peritoneal nodules during laparoscopy may present a diagnostic dilemma. The differential diagnosis includes a variety of benign and malignant entities such as peritoneal carcinomatosis.

**Case:** A 44-year-old G2P2 woman presented with recurrent menorrhagia and pelvic pain was found to have large uterine fibroids on imaging studies. Bilateral uterine artery embolization was performed with complete devascularization of the fibroid. Seven years later, she presented with similar symptoms. Imaging studies demonstrated a vascular uterine lesion. A total laparoscopic hysterectomy with bilateral salpingectomy was performed with no complications. During surgery, vesicular peritoneal implants were incidentally identified posterior to the uterus between the uterosacral ligaments. Biopsy and pathologic analysis of these nodules confirmed that they contained foreign material consistent with embolization beads. Pathologic analysis of the uterus demonstrated an intramural uterine fibroid, and presence of embolization beads in cervix, myometrium and bilateral peritubal regions. **Conclusion:** Non-target peritoneal implantation of embolic beads after uterine artery embolization is a rare entity that can result in vesicular appearing nodules.

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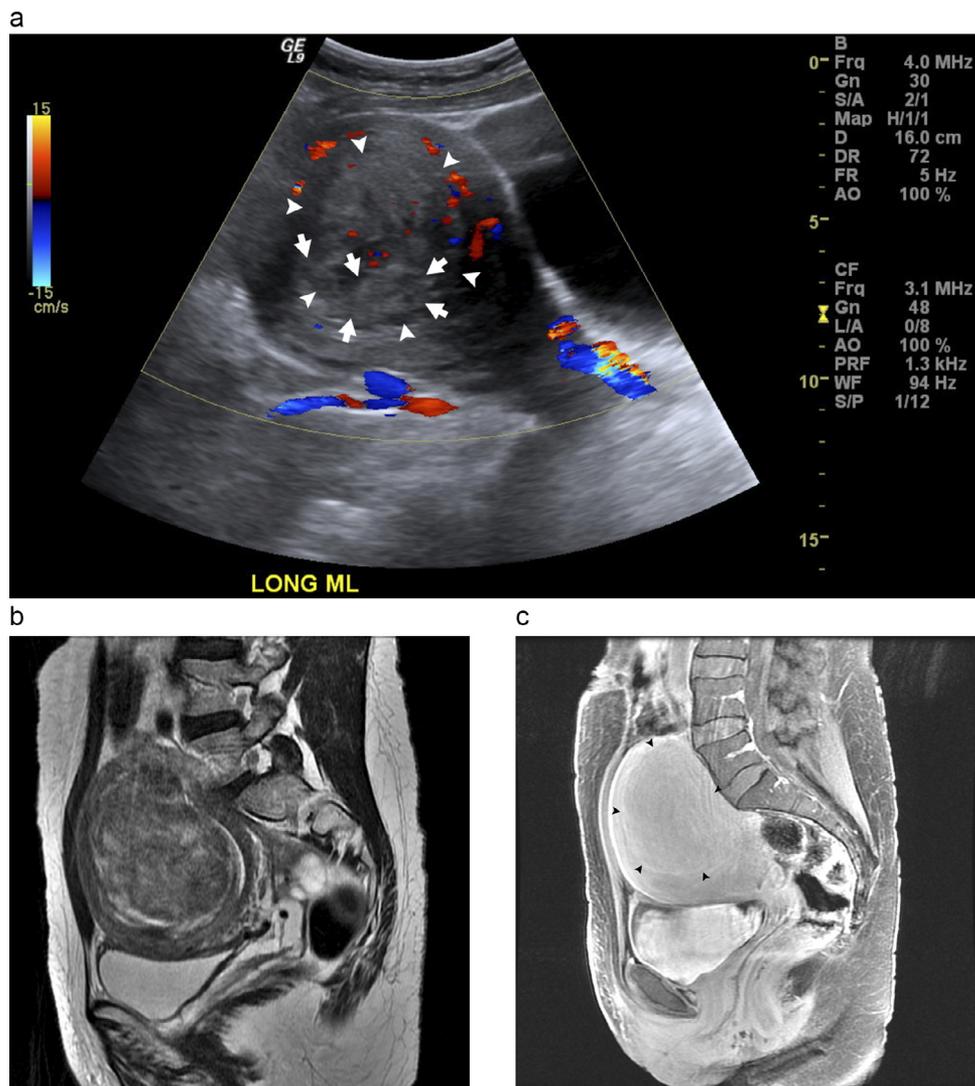
## Introduction

Uterine fibroids are common benign tumors affecting up to 70%-80% of the entire female population during their reproductive ages, and presenting with severe symptoms in about 30% of the cases [1]. Since its introduction in 1995 [2], uterine artery embolization has been shown to be a safe and effective procedure in treatment of symptomatic uterine fibroids [3,4]. Extravasation of the embolic particles including peritoneal implantation is a rare and unusual finding that may be found in patients with a history of uterine artery embolization [5,6]. Embolic particle implants are a benign entity which does not require further treatment or monitoring.

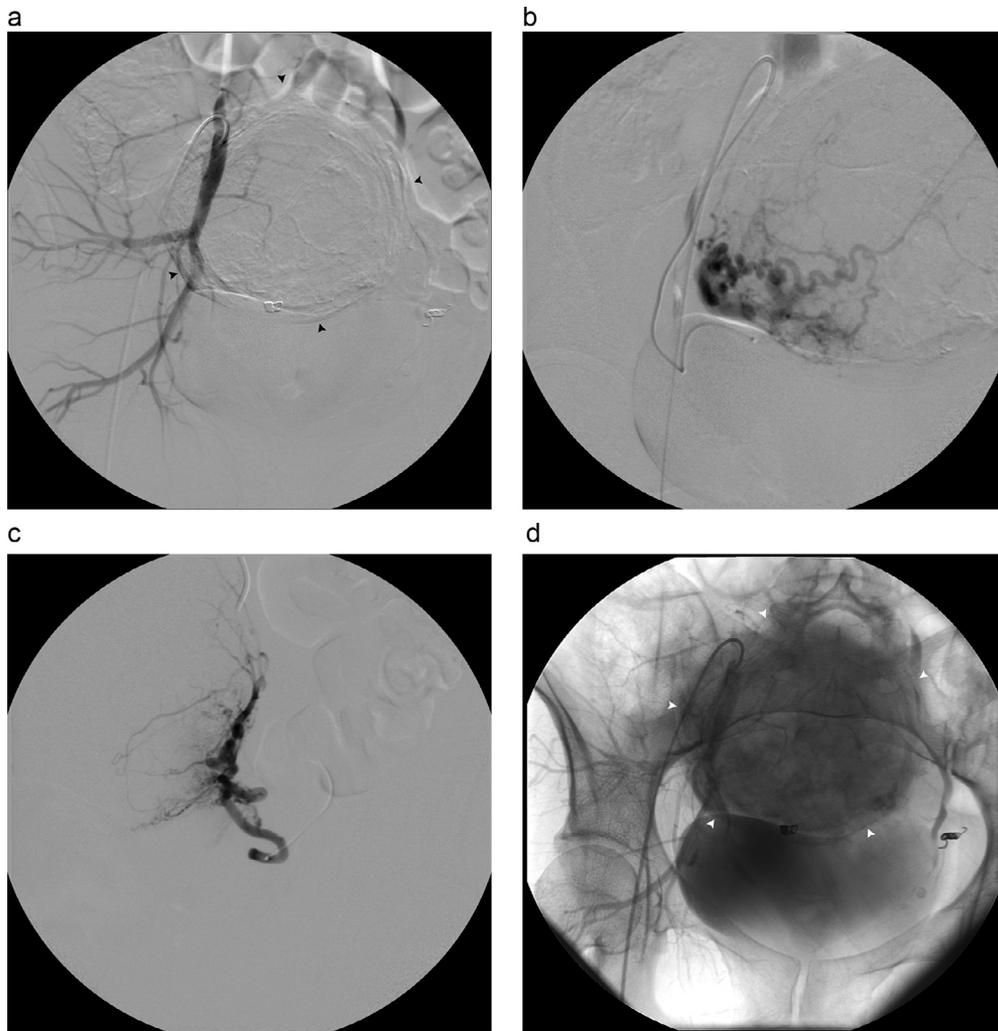
Here, we report peritoneal embolic particle implantations mimicking peritoneal carcinomatosis on direct laparoscopy.

## Case

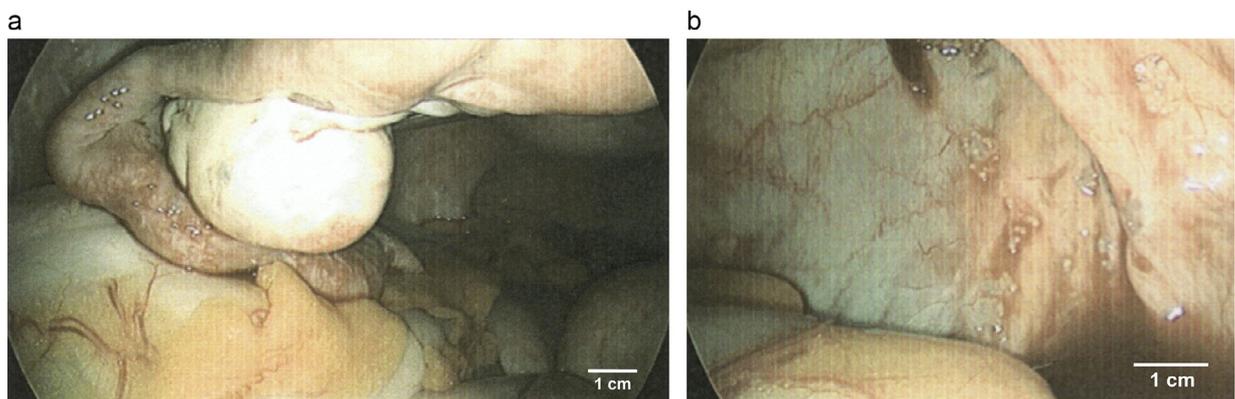
A 44-year-old G2P2 woman presented to her gynecologist's office complaining of menorrhagia, pelvic discomfort, and urinary frequency. Her past medical history was unremarkable outside of chronic menorrhagia. Transvaginal ultrasound showed an enlarged uterus with a  $7.7 \times 6.5 \times 7.2$  cm predominantly intramural fundal fibroid with a small submucosal component in the fundus (Fig. 1a). Contrast-enhanced magnetic resonance imaging (MRI) confirmed the diagnosis demonstrating a submucosal fibroid with mixed signal on the T2-weighted sequences (Fig. 1b) and uniform enhancement following intravenous contrast (Fig. 1c). A bilateral uterine artery embolization was performed. A hypervascular fibroid was visualized on angiography corresponding to the large uterine fibroid seen on previous imaging studies (Fig. 2a).



**Fig. 1** – Transabdominal ultrasound demonstrating a  $7.7 \times 6.5 \times 7.2$  cm predominantly intramural fundal uterine fibroid (white arrowheads) with a submucosal component in the fundus (white arrows) (a). Contrast-enhanced pelvic magnetic resonance imaging (MRI) demonstrating a submucosal uterine fibroid with mixed signal on the T2-weighted sequences (b) and uniform enhancement following intravenous contrast (arrowheads) (c).



**Fig. 2 – Pelvic angiography showing a hypervascular uterine fibroid (arrowheads) (a), and subsequent bilateral uterine artery embolization (b and c). The final angiography demonstrates the embolized fibroid with no residual flow to the lesion (white arrowheads) (d).**



**Fig. 3 – Peritoneal carcinomatosis-like lesions seen on laparoscopy 7 years after uterine artery embolization.**

No vascular anastomosis between uterine and ovarian arteries was detected. The bilateral uterine arteries were embolized to stasis using 500–700  $\mu\text{m}$  bland embolic particles followed by a single Nestor microcoil (Cook, Bloomington IN) embolization (Fig. 2b and c). Final arteriography showed no significant residual flow to the fibroid (Fig. 2d).

Seven years later, the patient experienced recurrent abnormal heavy uterine bleeding. A total laparoscopic hysterectomy with salpingectomy was performed without complication. During laparoscopy, vesicular-appearing peritoneal implants were identified between the uterosacral ligaments in the posterior cul-de-sac and on the right ovary mimicking endometriosis versus carcinomatosis (Fig. 3a and b). Peritoneal biopsies were performed lateral to the right uterosacral ligament in the area of the vesicular implants. Flo-seal was used for hemostasis over the area of biopsy. The patient's postoperative course was uncomplicated and her bleeding resolved.

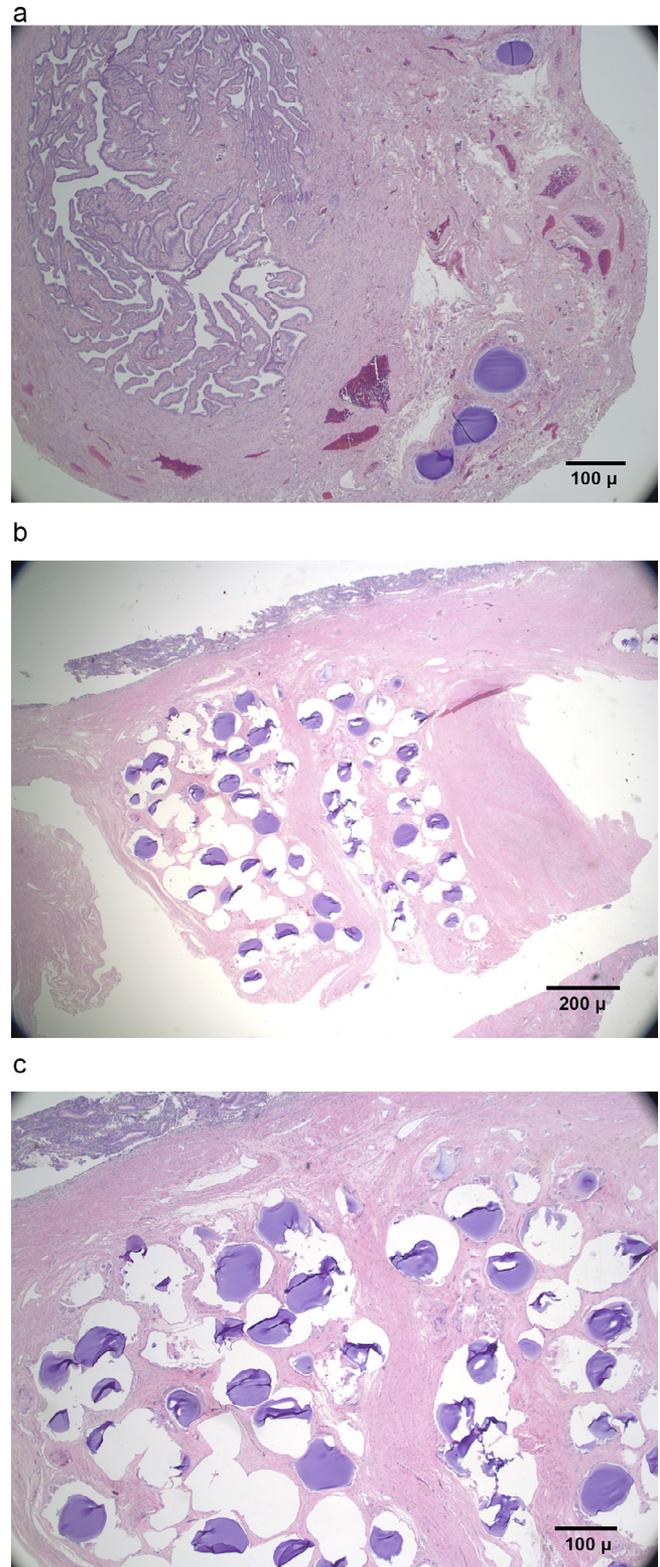
On gross pathological exam, the uterus measured 10.5  $\times$  7.5  $\times$  7.0 cm with tan-brown smooth serosa. The endometrial cavity was partially compressed by a 4.5-cm tan-gray, whorled, well-circumscribed intramural fibroid. Two additional well-circumscribed intramural nodules were found measuring 0.5 and 0.8 cm in greatest dimension. Histological exam demonstrated numerous blue-colored beads compatible with embolization particles in all endometrial nodules. Embolization beads were also found within tissue samples from the myometrium, cervix, and both fallopian tubes (Fig. 4a–c). Additional findings included a Mullerian cyst and mild acute salpingitis in one fallopian tube, and focal peri-tubal endometriosis on the other. No beads were noted in the endometrium or serosa.

## Discussion

Peritoneal nodules can be seen in a variety of conditions including primary neoplasms of the peritoneum, peritoneal tuberculosis, peritoneal carcinomatosis from ovarian or gastrointestinal tract carcinomas, endometriosis, peritoneal myomatosis, and spilled gallstones [7–9]. Depending on the scenario, incidental nodules discovered during laparoscopy may present a diagnostic dilemma. In this case, the nodules were biopsied and found to contain embolic particles.

Benign spillage of embolization beads and implantation within intraperitoneal organs has been reported in a few case reports. One prior case report described “pearl-like” peritoneal particles during laparoscopic myomectomy 14 months after uterine artery embolization. The lesions were not biopsied but were presumed to be embolic particles as several hundred similar particles were found during excision of the tumor and within the arterioles of the embolized myoma under pathologic examination [10]. In second case report, a patient was treated first with uterine artery embolization followed by unprotected surgical morcellation the following year. Five years later she presented with a suspected pelvic tumor and peritoneal carcinomatosis, however frozen section showed embolization particles within the peritoneal lesions [5].

The likelihood of non-target embolization that can cause medical complications such as ovarian ischemia is higher



**Fig. 4 – Histological examination with Hematoxylin-Eosin staining demonstrating embolization bead clumps (large blue areas) in Fallopian tube serosa (a) and myometrium (b and c). Micrographs with 4 $\times$  (a and b) and 10 $\times$  (c) magnification levels.**

with smaller beads less than 500  $\mu\text{m}$  [11]. The exact mechanism of embolic bead implantation into the peritoneum is unknown, however several hypotheses have been suggested: migration and expulsion of particles from the serosa during necrosis of a treated leiomyoma, deposition of particles into the endometrium followed by retrograde expulsion through the fallopian tubes, non-target embolization of the pelvic sidewall or collateral uterine branches, or seeding of the peritoneum after unprotected surgical morcellation [5,6,10,12]. A randomized controlled trial comparing non-spherical polyvinyl alcohol (ns-PVA) particles with calibrated hydrogel microspheres (Embozene) in uterine artery embolization demonstrated similar clinical outcomes at 6-month post-embolization. However, no embolic- or procedure-related complications were reported in either of the embolic groups [13].

Uterine artery embolization may result in peritoneal dispersion of the embolic materials demonstrating as nodules in the peritoneum and throughout uterine tissue. The mechanism of implantation is unclear, but these nodules appear to be a rare and benign finding. Clinicians should be aware of the possibility of these nodules appearing in patients with a history of UAE as a condition that may mimic peritoneal carcinomatosis.

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## Patient consent

Written informed consent was obtained from the patient for publication of this case.

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