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Ultrasound-guided high-intensity focused ultrasound as pretreatment before surgical excision for fertility-preserving management of uterine arteriovenous malformation

Dear Editor,

A 33-year-old female, gravida 4 para 1 (one caesarean section and three abortions), was admitted for emergency treatment of abnormal vaginal bleeding. Transvaginal ultrasound (TVUS) revealed an enlarged uterus with a $4.7 \times 2.1 \times 2.7$ cm (26.65 cm^3) ill-defined hypoechoic lesion on the anterior uterine wall, which suggested uterine arteriovenous malformation (UAVM) (Fig. 1A). Her hemoglobin level was 6.62 g/dL and serum β-hCG was negative. She was referred to interventional radiology for pelvic angiography and uterine artery embolization (UAE) of the UAVM (Fig. 1C–D). Approximately 1 month later, she complained of irregular vaginal bleeding again. TVUS confirmed UAVM recanalization on the anterior uterine wall. She wanted to preserve fertility. We considered that further embolization would increase the risk of complications, and this case was resistant to UAE. Moreover, hypervascularity around the UAVM lesion was contraindicated because of the potential risk of uncontrollable intraoperative bleeding. Therefore, ultrasound-guided high intensity focused ultrasound (USgHIFU) ablation as a preoperative treatment to reduce lesion size and intraoperative bleeding was performed, followed by surgical resection. After HIFU, TVUS revealed significant reduction in lesion size to $2.7 \times 2.2 \times 2.3$ cm (13.66 cm^3) (Fig. 1B). Intraoperatively, the uterus was enlarged, and the lesion was identified as a 2.0 cm × 3.0 cm protrusion in the lower section of the anterior uterine wall (Fig. 1E). The lesion was resected based on the location confirmed by the coagulation necrotic trace of preoperative HIFU ablation (Fig. 1F). After complete clearance of UAVM, the resected area was sutured in multiple layers in a manner similar to myomectomy site closure with polyglactin suture (Fig. 1G). The procedure was successful with an estimated 200 mL blood loss and the pathological diagnosis of the resected specimen was consistent with the clinical diagnosis of UAVM (Fig. 1H–I). Postoperatively, her menstrual cycle returned to normal 1 month after surgery, and she had no further uterine bleeding. Thirteen months later, a 7-week intrauterine pregnancy was discovered.

UAVM is a rare condition but may lead to life-threatening hemorrhage. UAVM treatment includes lesion resection, hysterectomy, UAE, single/bilateral uterine artery ligation, and conservative treatment. Traditional hysterectomy is used for patients without fertility requirements or those in whom other treatments have failed [1]. Although UAE is the current primary treatment method and can also be used prior to surgical excision of lesions, possibly reducing intraoperative bleeding, its uncertainty and side effects limit its further application in UAVM. Direct surgical excision of the UAVM lesion is not recommended because of the potential risk of uncontrollable intraoperative bleeding [2]. Therefore, it is a challenge to identify less invasive and more effective preoperative treatments that have less influence on ovarian function.

HIFU is a non-invasive therapeutic technique that uses non-ionizing ultrasonic waves to heat tissues. USgHIFU ablation is increasingly used for treating solid tumors and gynecological diseases and has shown significant efficacies [3]. USgHIFU is also an effective pretreatment for the curettage of cesarean section uterine pregnancy scars. Our patient was the first to undergo HIFU prior to lesionectomy as she was resistant to UAE. Blood flow and lesion size were significantly reduced after HIFU. Because of the effect of HIFU ablation, we could perform lesionectomy. HIFU significantly reduced intraoperative blood loss and produced fewer complications after surgery. Therefore, HIFU ablation can be considered a safe and minimally invasive method for the treatment of UAVM.

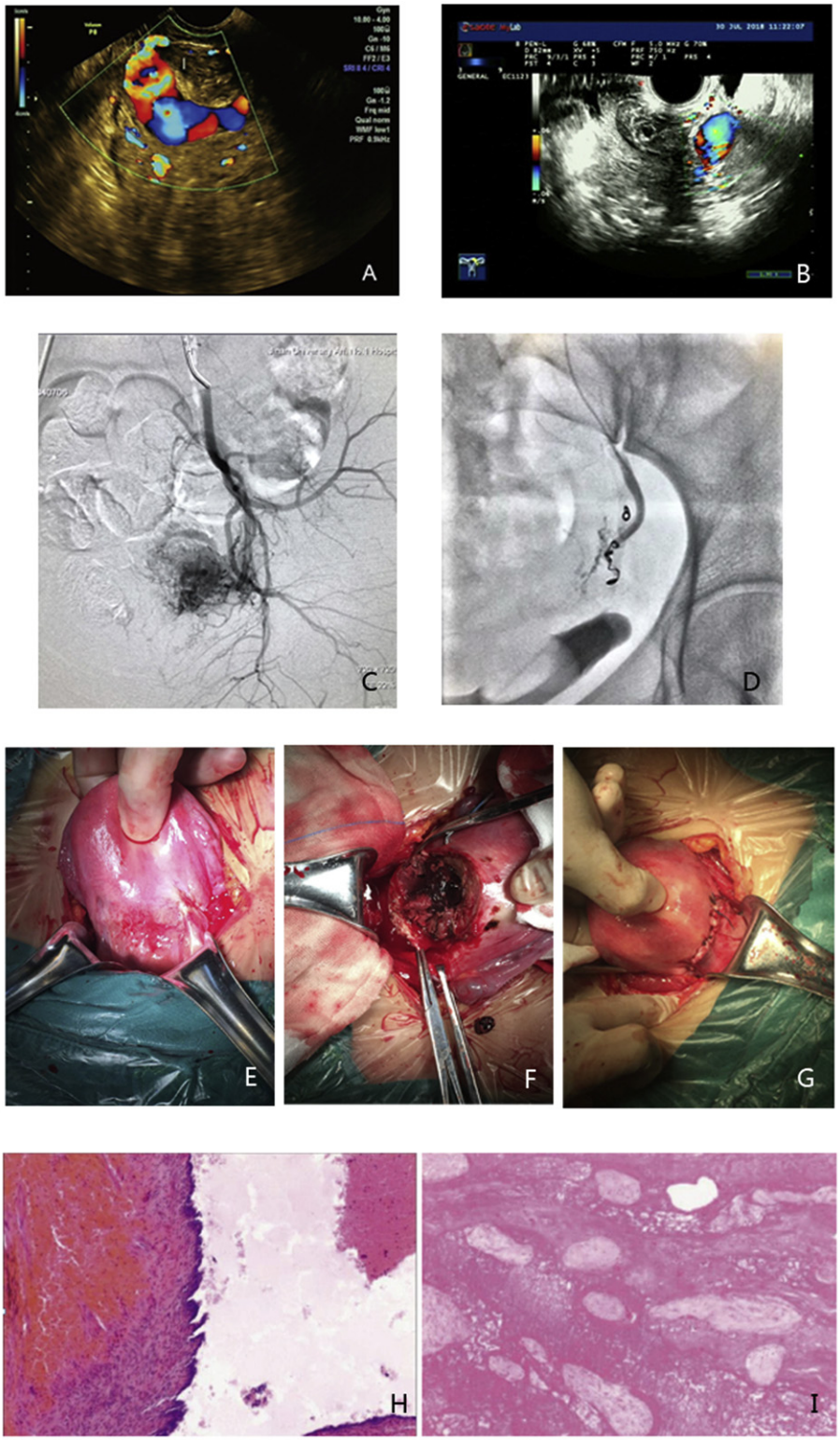

Fig. 1. (A) Mosaic pattern and turbulence with a lesion of about 47 × 21 × 27 mm (26.65 cm^3) before uterine artery embolization (UAE) is observed; (B) Doppler imaging features of the patient with uterine arteriovenous malformation (UAVM) after the high-intensity focused ultrasound (HIFU) procedure showing a significant decrease in lesion size at 2.7 × 2.2 × 2.3 cm (13.66 cm^3), with the blood flow restricted primarily to the inside of the tumor. The color Doppler flow imaging range was micrified.
(C) Arteriogram pre-embolization showing a tangle of vascular structures supplied by the left uterine artery; (D) Arteriogram postembolization showing the absence of filling of the occluded left uterine artery and vascular malformation.
(E–G). Surgical procedure for the resection of the UAVM.
(H–I) Pathological diagnosis was consistent with the clinical diagnosis of UAVM; Coagulative necrosis can be found in the UAVM lesion.

Ethical approval

This work was approved by the Ethics Review Board of First Affiliated Hospital of Jinan University, Guangzhou, China. The written informed consents were obtained from the patient.

Declaration of Competing Interest

None.

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