

# Microwave endometrial ablation may be an ineffective procedure for life-threatening uterine bleeding induced by an uterine arteriovenous malformation

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## Summary

Microwave endometrial ablation (MEA) is effective for the emergent control of uterine hemorrhage. No cases involving life-threatening hemorrhage induced by a uterine arteriovenous malformation (UAVM) treated by MEA have been reported. In the current case, the authors evaluated the efficacy of MEA as a first-line therapeutic option for a bleeding UAVM; however, MEA was ineffective in controlling the bleeding induced by the UAVM. Given its safety, simplicity, and effectiveness, MEA has been widely adopted for the emergency control of uterine bleeding; however, MEA should be used with extreme caution for the treatment of intractable bleeding induced by uterine AVM. Although MEA is thought to be a highly efficacious way to urgently control life-threatening uterine hemorrhage, MEA should be used for the treatment of UAVMs with extreme caution.

**Key words:** MEA; UAVM; Life threatening uterine bleeding.

## Introduction

Severe genital bleeding is one of the most common problems affecting women, and can affect a woman's physical, social, and emotional quality of life. There are a variety of causes of abnormal uterine bleeding, such as myomas, dysfunctional bleeding, endometrial polyps, uterine arteriovenous malformations (AVMs), retained products of conception, and gestational trophoblastic disease.

Microwave endometrial ablation (MEA) at frequency of 2.45 GHz was developed by Kanaoka of Iseikai Hospital (Osaka, Japan) for functional and organic menorrhagia [1]. The present authors' previous report showed that MEA is a useful procedure to control menorrhagia and life-threatening uterine hemorrhage [2]; however, no previous cases of life-threatening hemorrhage induced by uterine AVMs (UAVMs) treated by MEA have been reported. UAVMs are rare, but life-threatening disorders that account for 1-2% of cases of profuse genital bleeding [3-5].

Currently, the gold standard for treatment of UAVMs is uterine artery embolization (UAE), and the effectiveness of MEA in the treatment of UAVMs is unknown. In the current case, the authors evaluated the efficacy of MEA as a first-line therapeutic option for bleeding UAVMs.

## Case Report

A 33-year-old gravida 2 para 2 was referred to the present hospital with profuse vaginal bleeding. She had a normal vaginal delivery 12 days prior. No other significant medical or surgical

history was elicited. The hemoglobin level was 11.6 g/dl and her beta human chorionic gonadotropin (b-hCG) level was not elevated (4 IU/l). The general examination was otherwise normal.

Transvaginal ultrasonography (US) showed a slightly enlarged pulsatile uterus with a normal vulva and cervix. Gray-scale US revealed the presence of tubular anechoic lesions in the uterus with low-impedance, high-velocity color flow on Doppler images. A mosaic color pattern was observed, representing multidirectional high-velocity flow. These findings were consistent with a UAVM.

Because of the life-threatening hemorrhage, there was no time to obtain a contrast-enhanced CT of the pelvis or CT angiography before treatment. Several methods of treatment were discussed with this patient, including total abdominal hysterectomy, laparoscopic-assisted vaginal hysterectomy, UAE, and MEA. The patient selected emergency MEA after written informed consent was obtained. The Ethics Committee of Shimane University Hospital had previously approved a protocol for the use of MEA.

MEA was performed under spinal anesthesia using a device consisting of a sounding applicator and a microwave generator. The 2.45-GHz microwaves were supplied by a microwave generator. Microwaves were transmitted at 70 W for approximately 50 seconds. To avoid perforating the uterus, the authors opted for MEA under the guidance of transabdominal US. No intraoperative complications were noted. MEA was terminated when bleeding from the uterus had stopped. The estimated blood loss during MEA treatment was 230 ml. The intraoperative bleeding was nil; however, the patient was transfused with four units of red blood cells and four units of fresh frozen plasma to replace the preoperative blood loss. The hemoglobin level decreased to 9.4 g/dl four hours after the procedure.

A transvaginal US was performed six hours after the procedure. Large, dilated tubular structures were demonstrated in the right adnexa and myometrium with intense color filling on power color

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Figure 1. — Contrast-enhanced CT of the pelvis showing contrast medium flowing into the uterine cavity. A: Coronal CT. B: Sagittal CT.



Figure 2. — CT angiography was performed in a 64-slice multi-detector CT, which showed a cluster of dilated vascular channels within the uterus. The arterial supply arose from the uterine arteries on the right side, which appeared dilated.

Doppler. Because of the large areas of coagulation within the uterine cavity, the authors suspected recurrent active bleeding. Contrast-enhanced CT of the pelvis was performed, which showed contrast medium flowing into the uterine cavity (Figure 1). Three-

dimensional CT angiography was requested to confirm the diagnosis, rule out extra-uterine involvement, and localize feeder vessels. CT angiography was performed in a 64-slice multi-detector CT, which showed a cluster of dilated vascular channels within the uterus. The arterial supply arose from the uterine arteries on the right side, which appeared to be dilated (Figure 2).

The authors concluded that the MEA treatment had been ineffective. The patient gave informed consent to undergo UAE, which was carried out with gelfoam 1,200 nm particles and release of metallic coils after embolization.

Active bleeding from the uterus persisted during UAE, the estimated blood loss during UAE was 870 ml. The patient was transfused with an additional four units of red blood cells. The patient had no intra- or postoperative complications. Following treatment by UAE, the patient did not have any major bleeding episodes, other than normal menstrual cycles. CT angiography was performed at the three-month follow-up and did not show any significant change in the size of the UAVM or the myometrial low attenuation areas.

## Discussion

AVMs are abnormal communications between arteries and veins in which the usual intervening capillaries are absent. AVMs are broadly classified as congenital or acquired. Congenital UAVMs are generally more difficult to treat and control, and are believed to originate in abnormal embryologic development of the vasculature [6]. In contrast, acquired UAVMs are thought to result from trauma to the uterus, as occurs during vaginal delivery, cesarean section, curettage, retained products of conception, gestational trophoblastic disease, choriocarcinoma, and other gynecologic malignancies [6]. UAVMs can be a life-threatening cause of genital bleeding, therefore it is imperative to make a timely diagnosis and intervene urgently. The diagnosis of a UAVM should be based on a pertinent patient history, negative  $\beta$ -hCG findings, and the characteristic color/spectral Doppler findings. In cases with this clinical presentation and positive  $\beta$ -hCG findings, an intrauterine pregnancy, ectopic pregnancy,

retained products of conception, or gestational trophoblastic disease should be considered. Recent literature supports the use of embolization as the treatment of choice for AVMs with active bleeding in the post-abortion or postpartum setting [7].

The present authors reported MEA to be a highly efficacious method to urgently control life-threatening uterine hemorrhage [2]. This is the first case in which MEA was used in an attempt to treat UAVM-associated bleeding; however, the authors failed to achieve hemostasis for a number of possible reasons. First, UAVM-associated bleeding is arterial. The cauterizing power of MEA is not strong, and treatment by MEA is only suitable for cases involving venous hemorrhage. Therefore, cases with arterial hemorrhage, such as AVMs and placental polyps, may be difficult to treat using MEA. Second, the postpartum myometrium is soft and stretched compared to the non-pregnant myometrium. When MEA is performed, the "touch and feel" of the myometrium is considered. If the myometrium is soft and stretched, the "touch and feel" is decreased, and the difficulty of the technique is increased. Third, this report involved only one case of UAVM treated by MEA. Therefore, several cases may be necessary to confirm the current results.

Whether or not arterial hemorrhage, such as AVMs, can be treated by MEA is not addressed in the MEA guidelines [8]. Thus, the present authors suggest that the MEA guidelines should state that MEA is only suitable for treatment of venous hemorrhage.

In conclusion, although MEA is thought to be a highly efficacious way to urgently control life-threatening uterine hemorrhage, MEA should be used for the treatment of

UAVMs with extreme caution.

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