Italian Journal of
Gynæcology & Obstetrics
June 2019 - Vol. 31 - N. 2 - Quarterly - ISSN 2385 - 0868

# Acquired uterine arteriovenous malformation: management and treatment.

Gennaro Scutiero[1], Ilaria Iafelice[1], Pantaleo Greco[1], Roberto Galeotti[2]

[1]Department of Morphology, Surgery and Experimental Medicine, Section of Obstetrics and Gynecology, University of Ferrara, Cona Italy.

[2]Department of Vascular and Interventional Radiology, University of Ferrara, Cona Italy.

## ABSTRACT

Uterine arteriovenous malformations are rare causes of abnormal uterine bleeding during the midlife. They are congenite or acquired, characterized by an abnormal connection between arteries and veins, without an interconnecting capillary bed. A correct and prompt diagnosis is important.

We present a case of acquired uterine arteriovenous malformation after a medical termination of pregnancy, successfully resolved with uterine artery embolization with multiple platinum coils. In literature this condition is a relatively rare disorder, limited to a few case reports and a small number of series, so we conduct a brief review of literature. All studies presented university setting and were performed in single institutions. All patients were symptomatic and presented with acute abnormal vaginal bleeding. Ten women had elective termination of pregnancy, 22 had a spontaneous/missed/incomplete recent abortion.

Ultrasound is the first-line diagnostic method, completed by Doppler interrogation. Hysteroscopy, computed tomography and magnetic resonance imaging are useful for diagnosis. Angiographic embolization is considered the gold standard to preserve reproductive ability in younger women. Our case is characterized by a punctual diagnosis and a successful treatment in few hours, the patients was dismissed from hospital after four days.

**Keywords:** hysteroscopy; embolization; arteriovenous malformation; abnormal uterine bleeding.

## SOMMARIO

Le malformazioni arterovenose uterine sono delle cause rare di sanguinamento uterino anomalo durante l'età fertile. Possono essere congenite o acquisite, caratterizzate da una connessione anomala tra arterie e vene, senza l'interposizione di un letto capillare. È fondamentale una corretta diagnosi. Noi presentiamo un caso di malformazione arterovenosa uterina in una paziente sottoposta ad un'interruzione volontaria di gravidanza, risoltasi ricorrendo all'embolizzazione selettiva dell'arteria uterina. In letteratura si tratta di una condizione rara, riportata in casistiche limitate o in pochi case reports, su cui abbiamo condotto una breve revisione della letteratura. Tutti gli studi esaminati sono stati condotti in ambiente universitario, in singoli istituti, in pazienti sintomatiche con perdite ematiche vaginali all'esordio: in 10 donne dopo un'interruzione volontaria di gravidanza, in 22 dopo un recente aborto spontaneo/ritenuto/incompleto. L'ecografia è risultata essere l'indagine di prima linea, completata con l'uso del Color Doppler. L'isteroscopia, la TAC e la Risonanza Magnetica sono risultate utili per fare una corretta diagnosi.

L'embolizzazione arteriosa è considerata il gold standard per preservare la fertilità in una donna giovane. I punti di forza del nostro caso sono una precoce diagnosi ed un trattamento efficace e celere, con successiva dimissione al domicilio della paziente in soli quattro giorni.

*Corresponding Author: Ilaria Iafelice*
*ilaria.iafelice@gmail.com*

*DOI: 10.14660/2385-0868-115*

## INTRODUCTION

Uterine arteriovenous malformations (AVM) are rare but important causes of abnormal uterine bleeding in the midlife. Transvaginal ultrasound may help for diagnosis but the findings are not specific. Hysteroscopy is increasingly being used for diagnosis and management of abnormal uterine bleeding and of AVM, but angiography still remain the gold standard. Historically, the definitive treatment for AVM has been either hysterectomy or uterine artery ligation. However uterine artery embolization has become an optimal alternative to surgery since the first reported case in 1982[1]

## MATERIALS AND METHODS

We report a case where the suspected diagnosis was retained products of conception and hysteroscopy showed typical findings of uterine AVM, which were later confirmed by angiography, and conduct a brief review of literature; available data come from only small case series or single case reports.

An Italian 30 years old woman, with a previous spontaneous abortion and a vaginal delivery, underwent medical termination of pregnancy 6 weeks before for failure of contraception. At anamnesis she had systemic lupus erythematosus and she was a thalassemia carrier. She presented to our emergency department with one month lasting moderate vaginal bleeding, more intensive in the last two weeks. At admission she was pale, asthenic, pulse was 100/min, blood pressure was 85/60 mmHg. A transvaginal Doppler ultrasound revealed parenchymal inhomogeneity and an uterine mass with high blood flow (**Figure 1, 2**).

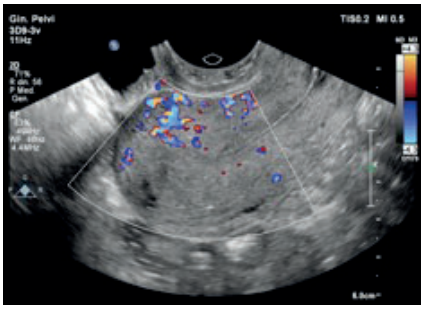

**Figure 1.**
*Transvaginal Doppler ultrasound revealed an uterine mass with high blood flow.*

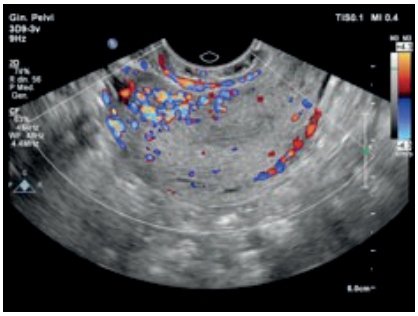

**Figure 2.**
*Transvaginal Doppler ultrasound*

Her complete blood count test showed a Hb of 5,2 gr/dl, requiring blood transfusions. Serum beta Human chorionic gonadotropin (HCG) was 1,7 IU/ml. A diagnosis of organized retained products of conception or uterine arteriovenous malformation was suspected and an urgent hysteroscopy was planned. Hysteroscopy showed a clot in the uterine cavity and a characteristic pulsatile vascular mass on the anterior wall of the uterus.

Abdominal contrast-enhanced multi-detector computed tomography (CT) demonstrated a heterogeneously enhanced mass in the uterus with dilated uterine arteries and multiple intrauterine tortuous vessels, mainly from the right uterine artery (**Figure 3**).

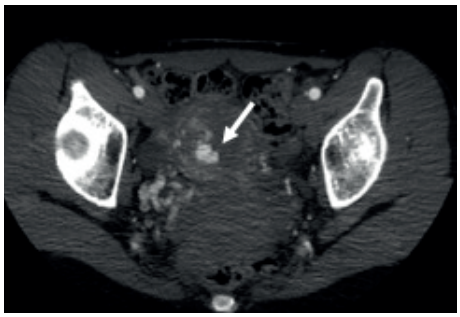

**Figure 3.**
*Pelvic CT, arterial phase: multiple intrauterine dilated arteries on the right side with focal hemorrhagic blush (arrow).*

Based on clinical and imaging findings, an acquired uterine AVM was diagnosed. After multidisciplinary agreement, the patient underwent urgent angiography with superselective right uterine artery embolization (UAE), under local anesthesia. A catheter was inserted through the left femoral artery passed over the aortic bifurcation and positioned in the right uterine artery, which supplied the malformation. Arteriography confirmed enlarged and tortuous arteries, with AVM nidus and intrauterine contrast medium blush. Multiple platinum coils were deployed into the uterine artery and subsequent blood stasis seen on contrast imaging demonstrated successful embolization.

In literature acquired uterine AVM is a relatively rare disorder, particularly after a spontaneous abortion/termination of pregnancy without surgical procedures. They are still limited to a few case reports, a small number of series. We conduct a brief review of literature (**Table 1**)

**Table 1.**

| References | Country | Age | Characteristics | N° cases | Management | Pregnancy |
|---|---|---|---|---|---|---|
| **Bazaries P et al (28)** | Angers, France | 30 (mean) | Retained products of conception with marked vascularity after medical TOP or spontaneous miscarriage | 10 | Mono/bilateral UAE | Unknown |
| **Chen L-Ket al (26)** | Tehran University | 22 | Threatened abortion 2 months before | 1 | Bilateral UAE | Yes (spontaneous delivery) |
| **Priya B et al (29)** | India | 36 | Medical TOP 1 month before | 1 | Bilateral UAE | No |
| **Ko JK et al (30)** | University of Hong Kong | unknown | Medically TOP 6 months before (median) | 4 | UAE | Unknown |
| **Timor-Tritsch IE et al(25)** | New York University Langone Medical Center | 27 | Incomplete abortion, missed abortion, spontaneous abortion | 7 | Serial imaging and hCG, methotrexate, UAE | No |
| **Kim TH, Lee HH (27)** | Soonchunhyang University, Bucheon, Republic of Korea | 31 | Incomplete abortion | 8 | Mono/ bilateral UAE | 1 (caesarean section) |
| **Morikawa M et al(24)** | University of Sapporo, Japan | 37 | Spontaneous abortion | 1 | UAE after GnRH therapy | No |

**Table 1**
TOP = Termination of pregnancy

## RESULTS

All studies presented university setting and were performed in single institutions. All patients were symptomatic and presented with acute abnormal vaginal bleeding. Ten women had elective termination of pregnancy, 22 had a spontaneous/missed/ incomplete recent abortion, such as in our case, suggesting that hormonal changes, such as pregnancy, play an important role in acquired uterine AVMs.

Ultrasound imaging was performed in all patients, in addition with angiography or CT/ magnetic resonance imaging (RM). The most common ultrasound features were reported as "multiple varying-sized hypo-echoic lesions" and hypervascular lesion at Color Doppler Ultrasound. No serious adverse effects were reported during the use of angiography.

UAE was the most common treatment option

performed in these patients, without complications. In one case it was performed after Gonadotropin Releasing Hormone (GnRH) therapy[24]. In 6 cases, serial imaging and serum hCG until complete resolution and therapy with methotrexate were performed[25].

No cases of total abdominal hysterectomy due to uncontrolled bleeding were reported. Pregnancies were reported after UAE in 2 patients, one with cesarean section, the second had a spontaneous delivery at a gestational age of 39 weeks [26; 27].

In our experience, the patient had reduction and then cessation of bleeding after the embolization. Additional involvement of ovarian arteries was excluded (**Figure 4, 5, 6, 7**).

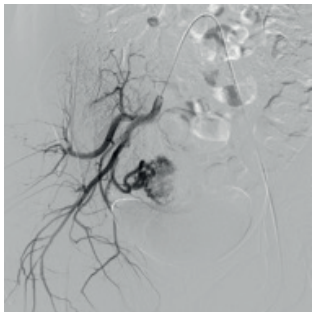

**Figure 4.**
*Right hypogastric arteriography: enlarged and tortuos intrauterine arteries and hypertrophic right uterine artery.*

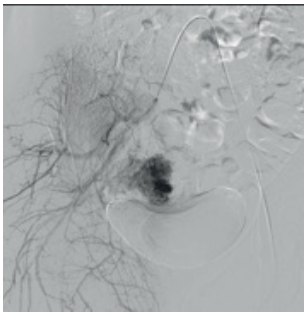

**Figure 5.**
*Right hypogastric arteriography: late phase confirm focal hemorrhagic blush.*

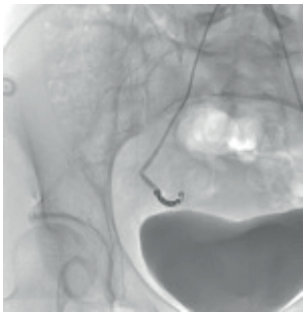

**Figure 6.**
*Selective embolization of right uterine artery with platinum coils.*

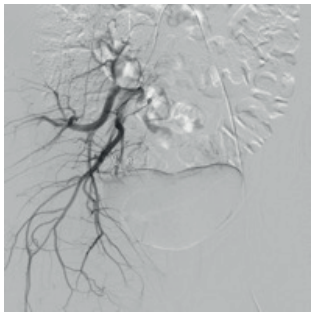

**Figure 7.**
*Final arteriography: complete devascularization of the uterine AVM.*

Transvaginal ultrasound was performed 48 hours later and repeated after one month to monitor the reduction of vascularization and the return of normal uterine vasculature. Hysteroscopy was repeated after three months and revealed normal uterine cavity, the patient was asymptomatic and reported reduced menstrual bleeding.

## DISCUSSION

Uterine AVM are rare but potentially life-threatening conditions, known as vascular lesions due to an abnormal connection between arteries and veins. The true incidence of uterine AVM is unknown: until 2005 there have been less than 100 cases reported in the literature, with just 73 cases reported before 1997[2]. Available data come from only small case series or single case reports. They can be classified as congenite or acquired.

Congenital uterine AVMs are the result of abnormal development of primitive vessels that result in connections between pelvic arteries and veins in the uterus without an interconnecting capillary bed. Acquired uterine AVMs are conformed by communications between the uterine arteries and the myometrial veins, one or both uterine arteries may supply them. They are caused by an iatrogenic event or a pathological condition: curettage, surgical or medical abortion, gestational trophoblastic disease, endometrial carcinoma or caesarean section[3].

Patient history, coupled with imaging findings, is helpful in differentiating between acquired and congenite AVMs.

Uterine AVMs represent 1-2% of all genital and intraperitoneal hemorrhages[4]. After menstruation or instrumentation, the thin wall of the abnormal ectatic vessels of the AVM can be disrupted, with consequent genital bleedings.

In an AVM, high-pressure pulsating arterial blood flows directly into the venous system,

consequently the veins undergo a process of arterialisation. Despite the attempted vessel wall adaptation, these malformations are vulnerable to rupture and hemorrhage.

AVMs usually occur during the reproductive age, presenting with abundant vaginal bleeding, sometimes requiring blood transfusion.

Recurrent pregnancy loss and menorrhagia are common presentations of uterine AVMs. Pelvic examination may demonstrate transcervical bleeding or reveal a pulsatile mass. Other symptoms are lower-abdominal pain, dyspareunia, and anemia secondary to blood loss. Less often, uterine AVMs may present as an asymptomatic mass or cause congestive heart failure when there is large arteriovenous shunting[5].

Most patients with acquired AVM have a history of recent pregnancy or dilation and curettage[6]. Hormonal changes such as pregnancy, menstruation, high dose estrogen and progestinic therapy play a role in uterine AVM[7].

The differential diagnosis includes uterine polyps, adenomyosis, endometrial carcinoma, retained products of conception, gestational trophoblastic disease, hemangiomas, varicosities, uterine sarcoma, infections[8; 9].

In patients with a history of uterine instrumentation and presenting with vaginal bleeding and negative results of serum b-hCG, the diagnosis of vascular abnormalities including arteriovenous fistula, uterine AVM, pseudoaneurysms, and direct arterial injury should be considered. Imaging studies can distinguish among these vascular abnormalities.

Ultrasonography is the first-line diagnostic method to evaluate patients with uterine AVM. Findings of transvaginal ultrasound include an ill-defined inhomogeneous mass with multiple myometrial and endometrial hypoechoic cystic or tubular-like structures, and focal or asymmetric endometrial and myometrial thickening[8].

Doppler examination of the cystic or tubular spaces demonstrates the vascular nature of these lesions[8;10]. The color Doppler interrogation of these tortuous vessels demonstrates multidirectional, high-velocity flow, and color mosaic patterns due to color aliasing and apparent flow reversal.

Ultrasonographic findings of uterine AVMs may overlap with the imaging findings of gestational trophoblastic disease and other hypervascular lesions, such as retained products of conception and abnormal placentation[11]. A b-hCG-positive test suggests the presence of a gestational tumor or postpartum hypervascular areas [12] and helps to distinguish uterine AVMs from these pregnancy-related conditions [10]. Follow-up of a hypervascular lesion during the puerperium with sonography will show spontaneous regression in the presence of retained products of conception usually within days. When the retained placental tissue is expelled or resorbed, b-hCG levels return to normal limits [11]. A AVM must be suspected in case of a uterine hypervascular lesion that does not undergo spontaneous regression in a patient with negative serum b-hCG.

Curettage is helpful for retained products of conception but it can exacerbate the bleeding in the case of an AVM and lead to significant hemorrhage, so it is imperative to distinguish between these two conditions.

The hysteroscopy is often the investigation of choice for abnormal uterine bleeding and, if operative, is the therapy for retained products of conception.

MR imaging can accurately detect and characterize uterine vascular anomalies. MR imaging findings of AVMs include a bulky uterus, ill-defined mass, serpiginous flow-related signal voids, focal or diffuse disruption of the junctional zone and prominent parametrial vessels. The absence of a defined mass and the presence of multiple tortuous and serpiginous flow-related signal voids in the myometrium and parametrium, corresponding to the hypervascular areas on color Doppler sonography, are distinctive characteristics of AVMs[13]. MR 3D contrast-enhanced angiography demonstrates a tangle of vessels in the uterus, draining into parauterine veins.

CT, useful for describing the anatomy and extension of the AVM[14], can show an enlarged uterus with enlarged vessels in a thickened myometrium with associated early-enhancing parauterine veins.

Arteriography can define the main arterial supply to the AVM, the presence of a nidus, the size of arteriovenous shunting, and the venous drainage.

Angiographic embolization is considered as the first-line treatment, since it is a well known and safe alternative to hysterectomy, allowing preservation of uterus. It is a minimally invasive procedure performed under local anesthesia or intravenous sedation, associated with less morbidity, shorter hospitalization, and reproductive structures preservation.

Selective UAE is an efficient treatment of genital bleeding caused by uterine AVM and non-AVM uterine vascular abnormalities[8]. Because

of the presence of multiple arterial pelvic feeders, congenital AVMs are more difficult to treat with arterial embolization than acquired AVMs.

The clinical success of artery embolization in retrospective review articles is greater than 90%[15]. Even if can ideally preserve reproductive ability if compared to hysterectomy, it causes a reduction of uterine blood supply. Nevertheless, most articles suggest that uterine artery embolization does not cause higher risks of ovarian function impairment and fertility[16]; however, adverse effects including miscarriage, loss of ovarian reserve and placental malpositioning are reported[17, 18] .

In literature there are 21 cases of term pregnancy after artery embolization for uterine AVM[19], including one case with twin babies. Complications following UAE are observed in few cases: hematoma at the puncture site, dissection of the uterine artery, transient sciatic nerve paresis [20].

Hysterectomy is to be considered a rescue treatment attempt, after failure of other hemostatic treatment options (isolation of AVM, unilateral uterine/ovarian artery ligation, laparoscopic bipolar coagulation of uterine vessels and bilateral hypogastric artery ligation)[21].

Treatments with GnRH analogues, methylergonovine maleate and danazol have also been described in literature[22].

Coexistence of acquired AVM with conditions such as retained products of conception or gestational trophoblastic disease[23] is possible, but the treatment for retained products is curettage, in AVM, instead, it can lead to torrential haemorrhage.

We supposed that acquired AVM may follow earlier persistent hCG-associated uterine vascular abnormalities and that placental tissues may have been involved in vascular disruption and neovascularization. Then, the vasculature can be disrupted by the placental tissue invasion into the myometrium, promoting neovascularization with long-term effects, such as the development of acquired AVM.

In literature there are a few reports suggesting spontaneous resolution of uterine AVMs but it is a potentially life-threatening condition and UAE remains a safe, first-line and effective treatment when patient wants to preserve her reproductive ability.

In patients that present with moderate vaginal bleeding, the management is less clear, especially in the postpartum period. Not all cases of uterine AVM documented by color Doppler represent true cases of AVM, they maybe represent some form of subinvolution of the placental bed that will eventually regress, so not all cases of documented AVM need aggressive treatment.

However, uterine AVMs should be suspected in any patient who undergoes an induced abortion 1–4 months before the onset of profuse uterine bleeding.

Further studies should be performed to evidence side-effects after UAE and to determine which patients need further invasive procedures and a standardized regimen of ultrasound scan follow-up post-embolization.

## ACKNOWLEDGEMENTS

No.

We declare no conflict of interest.

Informed consent has been applicated to the patient.

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