Uterine Arteriovenous Malformation (AVM) – a Potentially Life-Threatening Cause of Post-Partum Vaginal Bleeding

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Patient: Female, 26-year-old

Final Diagnosis: Uterine arteriovenous malformation

Symptoms: Vaginal bleeding

Medication: —

Clinical Procedure: Uterine artery embolization

Specialty: Obstetrics and Gynecology • Radiology

Objective: Rare disease

Background: Uterine arteriovenous malformation (AVM) is a rare but potentially life-threatening medical condition. It is a congenital or acquired structural abnormality that may result in potentially life-threatening bleeding. Due to the nonspecific symptoms, this condition may be mistaken for more benign causes of vaginal bleeding, thus potentially leading to adverse outcomes and delay in diagnosis and treatment. Most cases of uterine AVM are acquired, and the post-partum period is an especially vulnerable time.

Case Report: This is a case of a 26-year-old woman who presented to the Emergency Department with post-partum vaginal bleeding. During her evaluation, a uterine AVM was suspected based on Doppler ultrasound and was confirmed with computed tomography angiography. The patient was admitted to the hospital and treated with catheter embolization with complete resolution of bleeding and return to normal activities shortly after discharge.

Conclusions: This report describes a hemodynamically stable patient who presented to the Emergency Department with post-partum vaginal bleeding caused by a large uterine AVM. Despite her benign initial presentation clinically, she had a potentially life-threatening condition that could have resulted in significant morbidity if the diagnosis had been missed or delayed. It is important to maintain a high index of suspicion for even benign-appearing vaginal bleeding in the Emergency Department and to obtain the appropriate diagnostic studies to rule out potentially dangerous causes, especially in the setting of recent pregnancy or gynecologic instrumentation.

Keywords: Arteriovenous Malformations • Case Reports • Emergency Medicine • Uterine Artery Embolization • Uterine Hemorrhage

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Background

Uterine arteriovenous malformation is a relatively rare but potentially life-threatening medical condition [1]. It is a congenital or acquired structural abnormality consisting of an abnormal connection between the uterine arterial and venous systems. Congenital cases are rare, and acquired cases are usually the result of pregnancy, uterine surgical procedures, or neoplastic disease [2,3]. The exact incidence is not clearly defined. In a study of almost 1000 patients in which all women were screened for uterine vascular malformation after delivery or abortion, only 6 had a uterine vascular malformation and only 1 (0.10%) had an arteriovenous malformation [4]. The incidence rate would be expected to be higher in the case of post-partum hemorrhage than in asymptomatic patients but has not been well documented. The clinical presentation is abnormal uterine bleeding, primarily in premenopausal women [3]. It can be diagnosed non-invasively by color Doppler ultrasonography, CT angiography, or magnetic resonance imaging. Definitive diagnosis and treatment, usually uterine artery embolization in cases of life-threatening hemorrhage, is performed via pelvic angiography. Other surgical treatment options include laparoscopic coagulation of the uterine vessels and hysterectomy [5,6]. In cases of non-severe bleeding in stable patients, conservative medical treatments with various agents, including GnRH agonists, aromatase inhibitors, and tranexamic acid, have been described [7-9].

In contrast to uterine arteriovenous malformation, post-partum vaginal bleeding is common and normal. Bleeding that is greater than expected or that results in hypovolemia is categorized as post-partum hemorrhage, which is an obstetric emergency and occurs in 1-3% of deliveries [10,11]. Here, we present the case of a hemodynamically stable patient who sought care in the Emergency Department for post-partum vaginal bleeding. Her relatively benign presentation belied a more concerning diagnosis of uterine arteriovenous malformation.

Case Report

A White woman in her mid-twenties, gravida 3, para 3, with no significant past medical history presented to the ED with vaginal bleeding. She was 21 days post-partum after spontaneous vaginal delivery of a healthy full-term infant. The delivery was uncomplicated with the exception of a 4-centimeter succenturiate lobe of the placenta that was removed via ring forceps by the nurse midwife attending the delivery. She was noted to have a boggy lower uterine segment, which was treated with fundal massage, intravenous oxytocin, and rectal misoprostol. On subsequent exam, only scant bleeding was noted, and she was discharged on the following day.

On presentation to the Emergency Department approximately 3 weeks later, she reported continued vaginal bleeding that had been ongoing since the delivery. Upon discharge from her initial hospitalization, she had noticed some bright red blood, which had then become dark red with constant spotting of less than 1 pad per day. The morning she presented to the Emergency Department, she had noticed that the bleeding had become bright red and immediately came in for evaluation. She stated the bleeding was not heavy but the change in appearance was what had caused her concern. She denied any pain or cramping.

On exam, her vital signs were blood pressure 121/75, pulse rate 106, respiratory rate 18, temperature 36.9°C, and oxygen saturation 98% on room air. Cardiovascular examination was notable for slight tachycardia, without murmur, rub, or gallop. Her abdomen was soft and nontender to palpation, without guarding. Her pelvic exam was notable for scant (less than 5 mL) dark red blood from the cervical os. No lesions, discharge, adnexal tenderness, or cervical motion tenderness were noted.

Based on her bleeding and the duration of her symptoms, a complete blood count was obtained to evaluate for anemia and thrombocytopenia, basic metabolic panel was obtained to evaluate for electrolyte disturbance or renal dysfunction, and human chorionic gonadotropin pelvic ultrasound was performed to evaluate for retained products of conception and anatomic or vascular uterine abnormality. Thyroid-stimulating hormone was assessed due to a known association with heavy bleeding and thyroid dysfunction.

Her complete blood count was notable for a hemoglobin of 12.9 g/dl (reference 11.5-15 g/dl), hematocrit 40.2% (reference 34.0-46.0), and normal white blood cell count and differential. Her basic metabolic panel was normal. Human chorionic gonadotropin was 39 mIU/mL (reference less than 2 mIU/mL). The rest of her laboratory studies were unremarkable. The pelvic ultrasound was notable for a 2.3-cm, echogenic, vascular structure posterior to the endometrial complex, which was concerning for a uterine arteriovenous fistula (Figure 1). At that time, consultations with gynecology and interventional radiology were obtained and a CT angiogram was ordered.

The CT angiogram of the pelvis showed multiple dilated parametrial and intramural serpentine vessels in the right body and fundus of the uterus and an engorged, draining right gonadal vein consistent with AV fistula (Figure 2). The patient remained hemodynamically stable and was seen by the obstetrician, who inserted vaginal packing and admitted the patient to the hospital for embolization of the AV fistula.

The patient was then taken to the interventional radiology suite for pelvic angiogram. The right common femoral artery was perforated with a 5F sheath. A 5F pigtail catheter was advanced into the right internal iliac artery, and the common iliac artery was examined. A right common iliac artery angiogram demonstrated good runoff into the gonadal vein. (Figure 3). The right internal iliac artery was catheterized, and a 4F pigtail catheter was inserted. To adequately visualize the pelvic vasculature, a right common femoral artery angiogram was performed. (Figure 4). A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 5). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 6). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 7). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 8). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 9). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 10). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 11). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 12). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 13). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 14). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 15). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 16). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right common iliac artery angiogram demonstrated a prominent right internal iliac artery to gonadal vein AV fistula. (Figure 17). A 5F pigtail catheter was advanced into the right common iliac artery, and the right internal iliac artery was catheterized. A right com
accessed, and bilateral uterine arteriograms were performed. Right uterine angiogram demonstrated serpiginous dilated vessels with direct connection to a large draining vein compatible with a uterine arteriovenous malformation (Figure 3). Using a microcatheter, the distal right uterine artery was catheterized and embolization was performed with Gelfoam slurry followed by 2 vials of Embosphere 500-900 micron. Coil embolization of the feeding arterial was performed with two 4×8 mm.
Concerto coils. Post-embolization right uterine arteriogram was performed and demonstrated coil packing of the right uterine artery with complete obliteration of the right uterine AVM (Figure 4). She remained stable during overnight observation and was discharged home the following day.

Five days later, she was reevaluated in the obstetrics clinic and reported minimal discomfort and vast improvement in her vaginal bleeding, although she was still having light spotting. She was seen again 12 days later with a complete resolution of bleeding and resumption of her normal activities.

**Discussion**

Uterine AVM is an abnormal connection between the arterial and venous system bypassing the capillary bed. It can be congenital or acquired and may result in life-threatening bleeding. Up to half of patients presenting with symptomatic acquired AVM go on to require blood transfusion [12,13]. The diagnosis can be challenging in the absence of appropriate imaging studies, as the presenting signs and symptoms are common and non-specific, and vaginal bleeding is common and usually benign for patients presenting to the ED. In the post-partum period, this can be especially challenging due to many similarities in initial presentation between normal post-partum bleeding and this potentially life-threatening condition. The risk is especially high during the peripartum period due to the potential for uterine trauma as an inciting factor. The hormonal influence of human chorionic gonadotropin or hyperestrogenic state likely contribute to abnormal angiogenesis and vascularity, further increasing the risk of this condition. There is a strong association between pregnancy and symptomatic AVM [14], likely due to these hormonal factors in normal pregnancy, as well as interventions during pregnancy, such as dilation and curettage, prostaglandin E1-induced abortion, and delivery, which have all been listed as primary causes of acquired uterine AVMs [4].

Secondary, or late post-partum hemorrhage is defined as any significant uterine bleeding that occurs between 24 hours and 12 weeks post-partum. While it is usually caused by retained products of conception, subinvolution of the placental bed and infection, less common but potentially dangerous causes include arteriovenous malformation, bleeding diatheses, dehiscence of the cesarean scan and pseudoaneurysms of the uterine, internal pudendal, vaginal, or vulvar labial arteries. Additionally, since vaginal bleeding is normal in the post-partum period, patients may have difficulty differentiating between normal and abnormal bleeding.

To differentiate between the above conditions, it is important to review the relevant parts of the patient’s history such as previous episodes of post-partum hemorrhage, risk factors for retained products of conception, history of instrumentation and risk factors for endometritis such as cesarean birth. Non-obstetrical history such as history of bleeding diathesis, medications and symptoms of infection are equally important.

Diagnostic studies will further help to refine the differential diagnosis as above such as blood tests to evaluate for anemia, human chorionic gonadotropin levels to evaluate for retained products of conception or choriocarcinoma and ultrasound with color and spectral flow Doppler to evaluate for retained products of conception or vascular abnormalities.

In this case, the normal laboratory studies with ultrasonographic findings suggestive of arteriovenous malformation were concerning enough to warrant a CT angiography which was sufficient to confirm the diagnosis and guide treatment. Although it is not possible to determine the exact etiology of the AVM in this setting, it is plausible that the placental removal using instrumentation during delivery may have caused or exacerbated the lesion.

Although arteriovenous malformation can be readily diagnosed with color Doppler ultrasonography, CT angiography, or magnetic resonance angiography, a high index of suspicion must be present in order to make a timely diagnosis. Due to the sporadic and variable nature of the presenting symptoms, it is unlikely the diagnosis would be made without sufficiently

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**Figure 4.** Postembolization arteriogram demonstrates coil packing of the right uterine artery with complete stasis of flow. No residual filling of AVM. Arrow demonstrates position of coils.
high clinical suspicion and imaging studies. Given the potential morbidity associated with untreated AVM and the challenging nature of differentiating between benign post-partum bleeding and AVM it is essential that this diagnosis be considered and investigated, using color Doppler ultrasonography as the initial diagnostic study of choice. Because there are no published clear predictors to differentiate between early bleeding from an AVM more benign causes of bleeding, it is important to correctly identify the presence of uterine bleeding. Failure to do so prior to other procedures such as dilation and curettage, which is often a treatment of uterine bleeding, can paradoxically worsen the bleeding in the presence of an acquired arteriovenous malformation and is therefore contraindicated [10]. Using greyscale sonography, retained products of conception, subinvolution of the placental bed, and adenomyosis may have a similar appearance which is why Doppler imaging is imperative and follow-up with CT or MR angiography may be necessary to correctly make the diagnosis and plan treatment.

In the case presented, the patient sought care immediately after a change in the appearance of the bleeding, which resulted in a timely diagnosis, but this is not always the case. Historically, large uterine arteriovenous malformations, first described in the late 1980s, were treated with hysterectomy. Transcatheter embolization has now become the standard of care [12]. Complications following transcatheter embolization are rare, with no major complications reported among a series of 54 cases. Pelvic pain or cramping were the most common complications, in approximately 10% of patients [12]. In cases where transcatheter embolization does not completely resolve the bleeding, repeat TCE or surgical treatment are both considerations, depending on the stability of the patient and local expertise [12,15]. Successful pregnancy has been described following transcatheter embolization as well as medical therapies, and case reports suggest a high rate of successful pregnancy following either surgical or medical treatment. A systematic review analyzing fertility after uterine artery embolization suggested that pregnancy rates were similar to age-adjusted rates in the general population, with similar rates of complications [16].

In areas where interventional radiology is not readily available, there have been multiple published cases [1,7,9] and a systematic review [14] of uterine AVM successfully treated with medical management by using prostegins, GnRH-a, methotrexate, uterotonicites, danazol, and combinations of these. Among these, progestins and GnRH-a appear to have the greatest efficacy and should be considered in cases of mild disease or in resource-poor settings.

Conclusions

Uterine arteriovenous malformation is a relatively rare but potentially life-threatening medical condition. Our case highlights how seemingly benign post-partum bleeding can mask a more potentially serious condition that could result in significant morbidity in the case of a missed or delayed diagnosis. It is important to keep a high index of suspicion when presented with vaginal bleeding in the Emergency Department and to consider possible complications of recent surgical procedures.

Declaration of Figures’ Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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