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Case report

Iatrogenic uterine injury leading to uterine arteriovenous malformation[☆]

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ABSTRACT

The incidence of acquired uterine arteriovenous malformation has risen significantly because of increased instrumentation. Hysterectomy used to be the treatment of choice, but currently uterine artery embolisation is the preferred treatment. Here, the case of a 34-year-old woman who presented with uncontrolled uterine bleeding after iatrogenic uterine injury and who underwent successful management is described.

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Introduction

Arteriovenous malformation (AVM) is defined as a direct communication between an artery and a vein without an intervening capillary network. AVMs are found most commonly in the brain; less common sites include the liver, spine, lungs, kidney and uterus. In highly vascular structures, such as the uterus, AVMs can lead to bleeding, which may be life threatening [1].

Uterine AVM was first diagnosed in 1926, and many studies have been published since then. With regard to pathoanatomical characteristics, uterine AVMs are abnormal communications between arteries and veins in the uterine myometrium. They can be congenital or acquired. Congenital cases have multiple communications between artery and vein, while acquired ones typically have a single communication [2]. In addition, while congenital cases are extremely rare, the incidence of acquired cases—which occur most commonly secondary to dilatation and curettage (D&C), pelvic surgery, therapeutic

abortion, gestational trophoblastic neoplasia, infection, direct trauma, and gynaecological malignancies [3]—has increased owing to increased instrumentation.

Clinical presentation includes recurrent uterine bleeding and, in some cases, profuse bleeding leading to haemodynamic instability [4]. In the past, diagnosis has been carried out post laparotomy or by pathological examination of gross hysterectomy specimens. Diagnosis can now be achieved with a simple transvaginal ultrasonographic (US) examination. However, in the current scenario of aggressive management, uterine AVM is often overdiagnosed and treated unnecessarily [5].

Case report

A 34-year-old woman presented to the emergency department with persistent vaginal bleeding for 2 weeks after a D&C pro-

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Fig. 1 – Transvaginal ultrasound images showing uterine wall injury (arrows) post procedure.

cedure for abortion. On examination, vitals were stable and recorded hemoglobin level was 11.6 mg/dL. Internal examination was deferred because of vaginal bleeding, and US examination was ordered.

US examination showed a linear defect in the right anterior wall of the uterus, which was interpreted as uterine wall perforation (Fig. 1). In addition, thickening of the endometrium was noted and interpreted as reactionary changes to the D&C. Because of likely uterine perforation, a computed tomography (CT) study was ordered to detect any abnormal intrapelvic contents or free air.

CT examination (Fig. 2) showed a partial-thickness defect in the right anterior wall of the uterus, in keeping with iatrogenic uterine injury. No pelvic hematoma or free air was detected, and the patient was discharged with conservative management.

After 4 weeks, the patient returned with the complaint of ongoing vaginal bleeding. Hemoglobin level was 10.8 mg/dL. US examination showed thickened endometrium. On color Doppler examination, tortuous vessels were seen in the myometrium, extending into the endometrium (Fig. 3). On spectral Doppler, high vascularity with peak systolic velocity (PSV) of 45 cm/s was noted (Fig. 4). CT examination was ordered, with a strong suspicion of AVM. CT angiography (Figs. 5 and 6) showed tortuous intrauterine vessels with a nidus filling up in the arterial phase, and contrast enhancement of endometrial neovascularity. The multiplanar reformation image supported these findings (Fig 7). The patient was shifted to the nearest tertiary care referral centre for uterine artery embolization.

Digital subtraction angiography (DSA) was performed on the right and left uterine arteries, and a nidus was noted arising from one of the branches of the left uterine artery (Fig. 8). Selective embolization of the branch of the left uterine artery was performed, and post-embolization images (Figs. 9 and 10) showed complete obliteration of the nidus. The patient was discharged after 1 week of observation, and the symptoms gradually resolved.



Fig. 2 – CT sagittal, post-contrast images showing uterine wall partial thickness injury (arrow) post procedure.

Discussion

Acquired uterine AVM is usually seen in women of child-bearing age. Bleeding occurs because the nidus is exposed

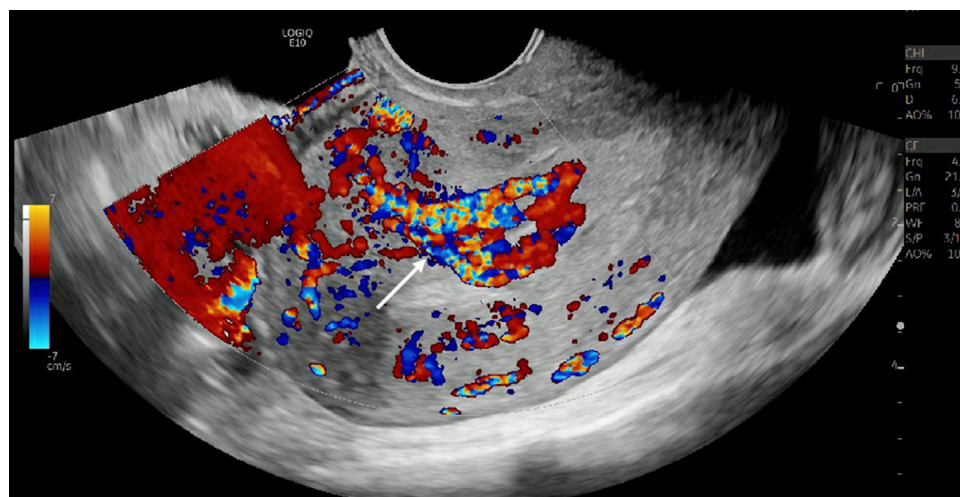


Fig. 3 – Transvaginal ultrasound images showing tortuous vessels (arrow) extending from the myometrium to the endometrium.

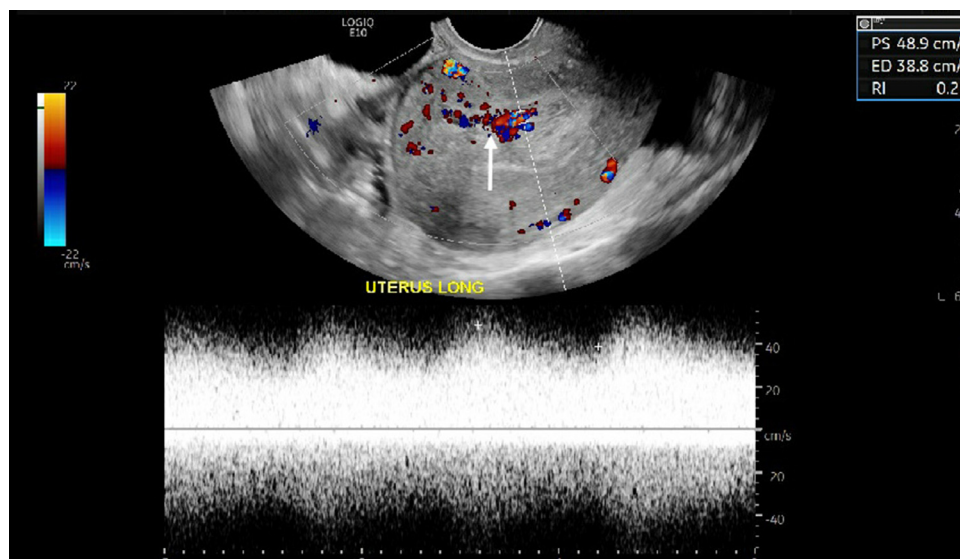


Fig. 4 – Spectral Doppler study images showing high PSV in tortuous vessels.

post D&C, and the most common presentation is uncontrolled uterine bleeding, which varies from trivial to torrential. A pulsatile mass may be detected on clinical examination, although this is usually deferred in favor of non-invasive studies. Doppler examination is the cornerstone of diagnosis, and DSA is the gold standard [6].

Doppler studies show increased vascularity in the myometrium, with typical low-resistance and high-velocity waveforms. However, relying only on Doppler measurements may lead to overdiagnosis of AVM as increased vascularity in the endometrium is also seen immediately post D&C and resolves spontaneously in 1-2 weeks [7]. Timmerman et al. [8] reviewed 30 Doppler-reported AVMs and found only 3 to be true AVMs. Rufener et al. [9] carried out a retrospective study on 29 sonological diagnoses of AVM, and found 26 to be retained products of conception (RPOC), 3 to be other be-

nign pathology and none to be AVM on final pathological examination.

PSV values reflecting increased vascularity can be used to triage patients for appropriate management. Patients with PSV values in the low range (<35 cm/s) can be managed conservatively; those with PSV values >85 cm/s are managed aggressively with immediate referral to interventional radiology for embolization, and those with values of 35-85 cm/s are followed up and undergo appropriate management if necessary [8]. In our case, the PSV of 42 cm/s was in the mid-range, and as the patient continued to be symptomatic, a more aggressive approach was adopted.

CT/magnetic resonance angiography may reveal the feeding artery, nidus and draining vein typical of AVM. This can also be used for preop planning and to detect collateral circulation. However, the gold standard in diagnosis is DSA, with



Fig. 5 – CT post-contrast, axial and sagittal images showing the nidus (arrows) and tortuous vessels filling up in the arterial phase.



Fig. 6 – CT post-contrast, axial and sagittal images showing the nidus (arrows) and tortuous vessels filling up in the arterial phase.

the added benefit that immediate treatment with embolization can be carried out [10].

Differential diagnoses for AVM on Doppler include gestational trophoblastic neoplasia and RPOC. In gestational trophoblastic neoplasia, the beta-HCG level is high and can be used for diagnosis [10]. RPOC shows remarkably similar features to AVM, as reported by Rufener et al. [9], and color Doppler may be used to aid differentiation of these conditions. In RPOC, Doppler flow occurs from the endometrium and ex-

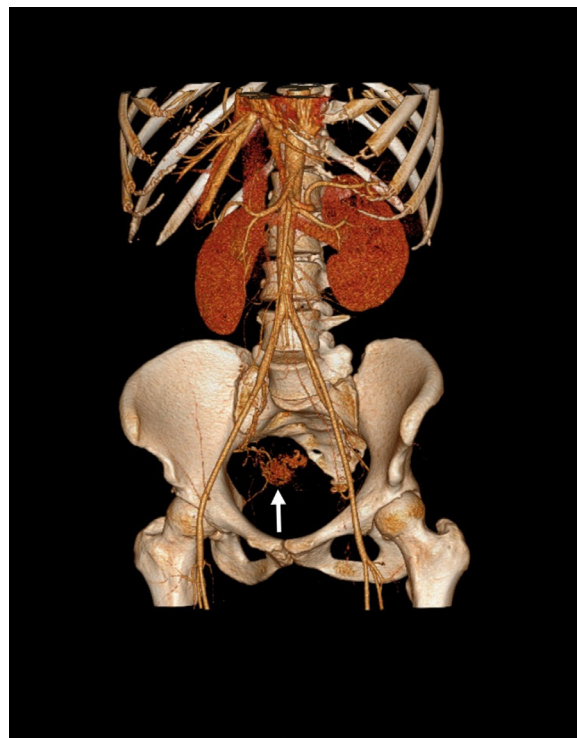


Fig. 7 – CT coronal multiplanar reformation reconstructed image showing the nidus (arrow).

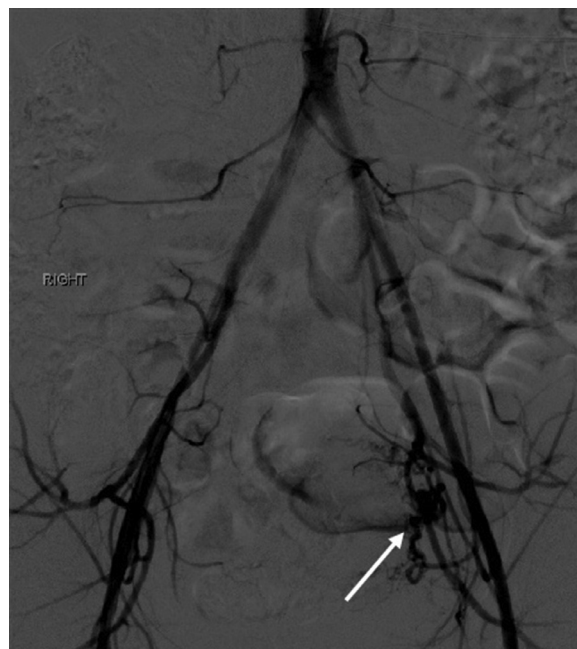


Fig. 8 – DSA image showing the nidus (arrow) arising from the left uterine artery.



Fig. 9 – DSA image post embolisation showing complete obliteration of the nidus.



Fig. 10 – Superselective DSA image showing complete obliteration of the nidus (arrow).

tends into the myometrium, whereas in AVM, flow is primarily centered in the myometrium. Nevertheless, sometimes differentiation is impossible. As in cases of AVM, vascular grading of RPOC helps in proper triage of patients for appropriate man-

agement strategy [11], and the treating physician should be aware of potential bleeding consequences in cases of type 3 RPOC [12].

In summary, uterine AVM is a known complication of D&C. A high index of suspicion, followed by early diagnosis and prompt referral to interventional radiology if indicated, is vital in the management of these cases. Although most cases can be diagnosed with simple Doppler examination, overdiagnosis needs to be avoided as hypervascularity seen post D&C usually resolves spontaneously. PSV values should be used judiciously to triage patients into the appropriate category of management.

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