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Vascular uterine abnormalities: Comparison of imaging findings and clinical outcomes

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ABSTRACT

Objective: To retrospectively compare the imaging findings and the outcomes for patients with vascular uterine abnormalities (VUA) and to identify prognostic factors.
Material and methods: Between 2007 and 2012, 38 patients with vaginal bleeding and abnormal ultrasonographic (US) findings consistent with acquired VUA were consecutively included (mean age 31.6 years, range 19–62). Follow-up was 32 months in mean (1–78 months). Seventeen women (44.7%) started bleeding immediately after curettage, spontaneous miscarriage, trophoblastic disease, or section scars, with the remainder starting bleeding after 8 days to 2 years. All US, CT ($n = 2$), MR ($n = 5$) and angiographic ($n = 26$) images were reviewed and compared to medical reports in order to identify severe VUA requiring treatment, and predictive factors.
Results: No information about severity was provided by US, MRI or CT. Twelve patients were successfully managed conservatively. Angiography identified 6 non-severe VUA, corresponding to an isolated uterine hyperemia, and 20 severe VUA, corresponding to an association of a nidus and early venous drainage. Recurrences were more often observed for severe VUA ($p = 0.001$). The hemoglobin level was significantly lower (below 11 g/L) in these cases ($p = 0.004$). Recurrences were significantly more frequently observed for patients with history of dilatation and curettage ($p = 0.02$). Hysterectomy was performed for three patients only (8%). Among the women who wished to have children, 14 (77.8%) were pregnant after 9 months in mean (range 2–23).
Conclusions: Recurrence happens more frequently after curettage and in case of anemia or severe VUA findings on angiography, justifying adequate embolization for these patients.

1. Introduction

Vascular abnormalities of the uterus (VUA) are rare and due to abnormal connections between arteries and veins. These lesions were firstly reported in 1926 by Dubreuil and Loubat and are considered to be a result of uterine trauma such as curettage, spontaneous miscarriage, trophoblastic disease, cesarean section scars or neoplasms [1]. They are mistakenly often reported in the literature as arteriovenous malformations (AVMs) because they are more acquired rather than congenital [2]. They could cause various symptoms from irregular vaginal bleeding to massive and life-threatening bleeding. Recognition of these abnormalities is therefore important [3].

While the diagnosis of VUA was historically made only upon pathological examination after hysterectomy, other diagnostic methods may be used. Diagnosis can be made with transvaginal ultrasonography (US) with color Doppler imaging, whereas angiography is reserved for cases where surgical intervention or therapeutic embolization are required. Compared to hysterectomy, selective uterine artery embolization seems to be a valuable treatment option, preserving the uterus for future childbearing [4]. Nevertheless, a few authors have also described regression of the VUA with conservative therapy or spontaneous resolution [5].

Therefore, due to the lack of imaging features allowing to classify correctly the severity of VUA, the therapeutic management of these VUA remains unclear. The purpose of the present study was

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Table 1
Patient characteristics ($n = 38$).

	N	%
History of pregnancy	38	100 (38/38)
Postmenauposal	1	2.6 (1/38)
Termination of pregnancy(TP)	30	78.9 (30/38)
Spontaneous	10	33.3 (10/30)
Provoked	20	66.6 (20/30)
Other causes	8	66.6 (8/36)
Therapeutic TP (2nd trimester)	1	12.5 (1/8)
Late miscarriage	1	12.5 (1/8)
Cesarean section	3	37.5 (3/8)
Gestational trophoblastic disease	1	12.5 (1/8)
Myoma section	1	12.5 (1/8)
Endometrial polyp resection	1	12.5 (1/8)
History of curettage	25	65.8 (25/38)
Dilatation and curettage (after TP)	20	80 (20/25)
Curettage only	5	20 (5/25)
Bleeding after trauma		
Immediately	17	44.7 (17/38)
Delayed	21	55.3 (21/38)
Biology		
Anemia	13	34.2 (13/38)
βHCG positive	12	31.6 (12/38)

to retrospectively compare the imaging findings and the outcomes for patients with VUA and to identify prognostic factors.

2. Materials and methods

2.1. Study population

This retrospective study was approved by the Institutional Review Board. Informed consent was waived. Between January 2007 and December 2012, all consecutive patients explored with imaging for VUA in our institution were retrospectively selected from our prospectively maintained institutional database (Table 1). Inclusion criteria were all patients who had undergone transvaginal ultrasonography with color Doppler Imaging or Pelvic MR Imaging (MRI) or computed tomography (CT) or angiography +/− embolization in our institution, with a history of vaginal bleeding and who were diagnosed VUA. Patients with tumors or non-acquired vascular malformations were excluded. Finally, 38 patients were included (mean age 31.6 years old, range: 19–62).

2.2. US/CT/MR and angiography techniques

US examinations were carried out with either an Antares or Acuson Sequoia 1, 2 et 3, Solonine G60 (Siemens, Erlangen, Germany), IU 22 or HDI 3000 (Philips, Bothell, WA) ultrasound system, all equipped for color Doppler imaging.

In case of inconclusive US imaging results, patients underwent MR or CT imaging. Contrast-enhanced computed tomography (CT) was carried out using a 32-section multidetector CT system (Brilliance 40; Philips, Best, The Netherlands).

MR imaging examinations were carried out with a 1 or 1.5-Tesla (T) MR system (Achieva, Philips, Best, The Netherlands; Magnetom Avanto, Siemens Healthcare, Erlangen, Germany). The basic protocol included T1-weighted images of the pelvis in the axial plane and T2-weighted images in the axial and sagittal planes and dynamic multiphase contrast medium-enhanced T1-weighted gradient-echo MR imaging of the pelvis with the following parameters: 3.6/1.75; number of acquired signals, 0.75; matrix, 288 × 192; field of view, 36 cm; section thickness, 4 mm, interpolated to 2 mm; and bandwidth, 80 KHz. Images were acquired at multiple phases of contrast medium enhancement (precontrast, 25 s, 60 s, 120 s and 240 s) after intravenous administration of a gadolinium chelate (0.1 mmol per kilogram of body weight) at a rate of 2 mL/s.

Angiography procedures were performed by an interventional radiologist in an interventional suite under fluoroscopic guidance, on V3000 Integris, V5000, Allura FD 20 (Philips, Best, The Netherlands) or Innova 3131 (GE Healthcare, SA). All procedures were performed under conscious sedation (using midazolam and fentanyl) and local anesthesia after a preprocedural evaluation by an anesthesiologist. After percutaneous introduction of a 5-Fr sheath in the right femoral artery, both uterine arteries were selectively catheterized successively using a 4- or 5-F cobra-type catheter and a hydrophilic guidewire (Glidecath; Terumo, Tokyo, Japan). Angiogram through the catheter was obtained, and special attention was paid for draining or feeding branches. The material of embolization used in this study either in combination or not was gelatin sponge, poly-vinyl-alcohol, glue or coils.

2.3. Data collection and image analysis

All patient data was collected by one of the authors through review of medical records, and imaging and pathology reports. Two radiologists (with 5 and 10 years experience in gynaecological and interventional imaging), blinded to clinical history and outcomes, reviewed all the images independently then in consensus on picture archiving and on communication system workstation. Measurements of serial Beta-Human Chorionic Gonadotrophin (βHCG) and hemoglobin levels were obtained before or after diagnosis of VUA.

Following clinical evaluation, VUA were considered as severe if the patient was anemic or for patients with reports of intense, uncontrollable bleeding, as previously proposed for post-partum hemorrhage [6]. Ultrasonographic diagnosis definition of VUA corresponds to hypoechoic tortuous spaces in the myometrium demonstrating vascular flow on color Doppler, as reported previously [5]. Based on angiographic aspects reported by Pelage et al. [7], VUA were classified as non severe when an isolated uterine hyperemia was found, and as severe when an association of a nidus, early venous drainage +/− a pseudoaneurysm was observed. Information about outcomes (pregnancy and recurrence) was gathered by phone calls to the patients and to their general practitioner, gynecologist and registry office of the last place of residence. Clinical success was defined as the resolution of abnormal uterine bleeding and clinical follow-up suggesting no recurrence of bleeding. Histopathological diagnosis was available for the three patients who underwent hysterectomy.

2.4. Statistical analysis

Descriptive statistics were generated for demographic data (age, gravidity/parity), trauma (curettage, spontaneous miscarriage, trophoblastic disease, cesarean section scars), treatment, recurrence and future childbearing. Categorical variables were compared by using either the χ^2 test or the Fisher exact test. Data was analyzed with the STATA® software package (StataCorp., LP, College Station, Texas, USA). Binary logistic regression analysis was made to identify predictive factors and tested following different combinations identified with the descriptive analysis. A p-value of 0.05 was considered as significant.

3. Results

3.1. Population

Among the 38 patients finally included, all had a history of abnormal vaginal bleeding and uterine trauma. All patients had already been pregnant before (range: Gravidity (G) 1 Parity (P)