



## Iatrogenic uterine vascular lesions: Diagnosis with color doppler ultrasound and treatment with transcatheter arterial embolization "a case report"

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### ABSTRACT

Uterine vascular lesions are considered as a rare complication of gynecologic and obstetric procedures. Occurrence of Uterine vascular lesions such as pseudoaneurysms, acquired arteriovenous malformation, arteriovenous fistula and direct vessel ruptures seems to be more frequently than it has been mentioned in the literatures or previously thought. The delayed diagnosis of this situation may result in life-threatening hemorrhage. Herein, we present three rare cases who presented with uterine bleeding after gynecologic procedures. Although the hemorrhage stopped spontaneously, a massive hemorrhage reoccurred. We would like to emphasize Doppler ultrasound scan as the primary screening modality and also describe transcatheter angioembolization as a good treatment opportunity for these conditions.

**Keywords:** Arteriovenous Malformations; embolization; laparoscopically assisted myomectomy; uterine artery pseudoaneurysm

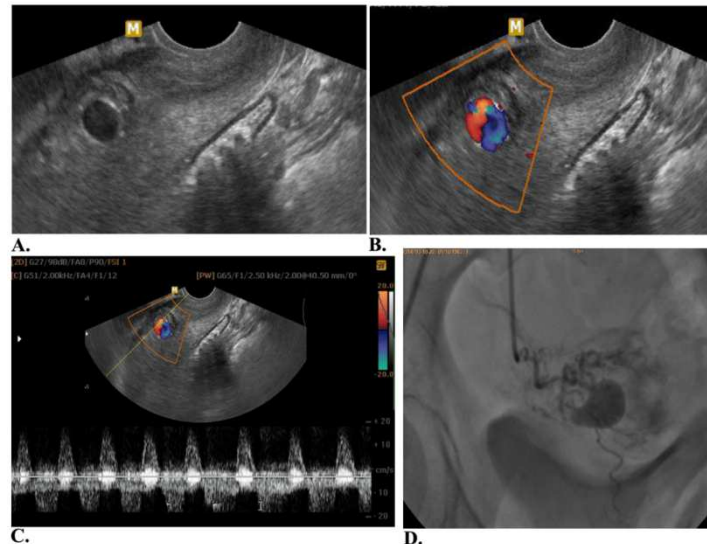
### INTRODUCTION

Uterine vascular lesions are usually rare [1] but in recent years, it has been seen a growing number of reports of acquired vascular lesions of the uterus subsequent to pregnancy, cesarean section, abortion, curettage and myomectomy. Pseudoaneurysm[2], Acquired arteriovenous malformation (AVM)[3], arteriovenous fistula[4] and direct vessel ruptures[5] are common vascular lesions. Although these lesions are very rare but they can cause

severe life threatening hemorrhage which increase morbidity and mortality of the patients, it makes radiologist and gynecologist to be aware of these lesions [1].

In the past, patients were treated with surgical hysterectomy or uterine artery ligation or hypogastric artery ligation [6], but now the early diagnosis can be made with use of color Doppler and duplex ultrasound(US). And also rapid treatment with superselective transcatheter arterial embolization (TAE) can be done for patients safely [1].

In this article we presented three uncommon cases of uterine vascular lesions that diagnosed with color doppler US and treated successfully at our institute with TAE.



**Figure 1.** Pseudoaneurysm after CS in a 32-year-old woman. (a) Longitudinal gray-scale US image shows a cystic lesion in the uterus. (b) color Doppler US image shows that the sac is filled with blood. (c) Longitudinal duplex Doppler US image shows turbulent arterial flow within the sac. (d) Right internal iliac angiogram shows the pseudoaneurysm, which is supplied by the right uterine artery.

### Case 1

A 32-year-old woman, gravida 3, para 3, underwent Cesarean Section(CS) at 40 weeks of gestation due to previous CS she admitted in emergency department because of abnormal uterine bleeding (as menstruation bleeding) 10 days after CS, on arrival patient was hemodynamically stable with an hemoglobin(Hb) level of 9 g/dL. Transabdominal Pelvic US demonstrated absence of retained product of conception. With diagnosis of endometritis, Methylergonovine, oxytocin and intravenous antibiotics administered for patient, the bleeding ceased, and then she was discharged 3 days later with an Hb level of 10.5 g/dL. The patient's Menstruation periods were normal. Three months after operation, she was brought back to hospital with severe bleeding after intercourse. She was hemodynamically unstable and her Hb level was 6.5g/dL. Fluid resuscitation followed by urgent transfusion of 4 units of packed red blood cells (PRBC), 2 units of FFP and 30 units of oxytocin and antibiotics was done for patient, the bleeding decreased and patient became stable and an Hb level became 9 g/dL. A urine pregnancy test was negative and there was no detectable coagulopathy. Transvaginal color doppler US showed a 12 mm cystic structure in right wall of uterus with varying colors and yin-yang appearance (figs. 1a,1b). Duplex Doppler US showed turbulent flow within the structure, Doppler US scan identified to-and-fro flow in the sac(fig. 1c), Indicating a pseudoaneurysm. Then, angiography was performed for the patient. Under local anesthesia, the right common femoral artery was punctured. A bilateral angiogram confirmed pseudoaneurysm in the right uterine artery (fig. 1d), then microcatheter placed and superselective embolization was performed using Gelfoam pledgets and PVA (300-500 $\mu$ m). An immediate angiogram showed the successful occlusion of uterine artery with preservation of the other branches of internal iliac artery. The vaginal bleeding decreased over the next few days. Patient discharged on the 3rd day post-embolization with an Hb level of 9.5 g/dL. Five weeks after embolotherapy, US shows the lesion has almost completely resolved and the patient was asymptomatic.

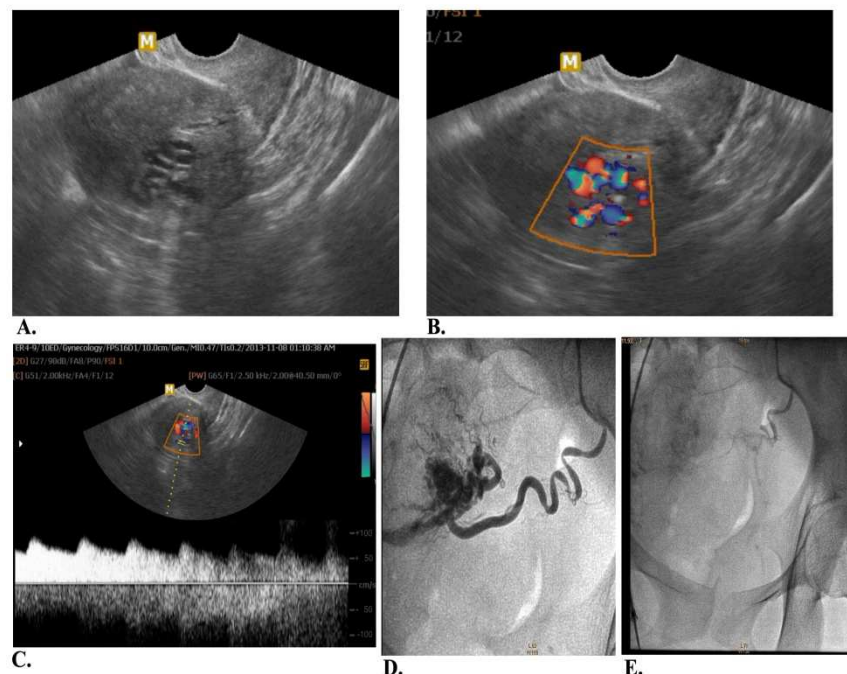
### Case 2

A 50-year-old woman gravida 2, para 2 presented with abnormal uterine bleeding (Menometrorrhagia) for one year. Initial transvaginal ultrasound showed an intramural fibroid in the fundal part of the uterus (measured about 60\*50 mm) and another submucosal fibroid (measured about 38 mm). Hysteroscopy was done which confirmed a submucosal fibroid, then hysteroscopic myomectomy was performed uneventfully, and the patient was discharged on the third day after operation. There were no complications after surgery. She experienced painless massive uterine bleeding 29 days after surgery so she visited our emergency department. Active hemorrhage from the uterine

cavity (in more quantity than a menstruation) was seen. The patient was hemodynamically unstable and her Hb level on admission was 6.7g/dL. Aggressive fluid and blood resuscitation with 5 units of PRBC and Methylergonovine was done for patient. Bleeding decreased and patient became stable (Hb 10.5g/dl). An emergency transvaginal ultrasound that obtained after the transvaginal manual hemostasis revealed a large uterus with 50 mm myoma in its fundus, and also a 15 mm blood filled cystic structure in the anterior wall of uterus, Duplex doppler US showed turbulent arterial flow within the sac, Doppler US scan identified to-and-fro flow in this lesion, indicating pseudoaneurysm. A bilateral angiogram confirmed pseudoaneurysm in the right uterine artery and fibroid. Due to coexistence of fibroid, bilateral embolization with PVA 300-500( $\mu$ m) and gelfoam was done. The vascular image and the pseudoaneurysm disappeared. Four weeks after embolotherapy, US shows the lesion has almost completely resolved and the patient was asymptomatic.

### Case 3

A 20-year-old female, gravida1, abortus1, presented with vaginal bleeding and clot passing 97 days after termination of pregnancy at 18 week with PGE1 due to fetal anomaly followed by D&C due to retained product of conception. She visited our emergency room (ER) due to active bleeding (in more quantity than a menstruation) from the uterine cavity. On arrival patient was hemodynamically stable with an Hb level of 7.6g/dl. Serum Beta-HCG was negative. As uterine bleeding due to retained products of conception was suspected, 0.2 mg of intravenous methylergonovine maleate and 20 units of intravenous oxytocin were administered. Transvaginal US was done for patient that showed a hypoechoic avascular area in endometrial cavity that was suggestive of blood and clot in endometrial cavity and ill-defined area of myometrial inhomogeneity 28\*34 mm in diameter at the fundal area of the myometrial uterine wall (fig. 2a). Color Doppler US shows a tangle of tortuous vessels with multidirectional flow in the myometrium (fig. 2b). Duplex Doppler US shows fast arterial flow with low resistance (RI:0.36) and high PSV (65 cm/second) (fig. 2c), an arterial spectral waveform with a high diastole, and a pulsatile venous waveform with little variation in systolic-diastolic velocities which was highly suggestive of AVM. In hospital course patient didn't respond to medical therapy and developed with episodes of severe vaginal bleeding so, angiography was performed for the patient. A bilateral angiogram shows enlarged left uterine arteries supplying a large vascular mass with early venous drainage conforming to be AVM (fig. 2d). Then microcatheter placed and superselective uterine arterial embolization was performed using glue. Dye stasis was noted after embolization (fig. 2e). The patient had an uncomplicated postembolization course and was discharged four day after embolization. Four weeks after embolization, Pelvic US showed the lesion as almost completely resolved. Eight weeks after embolotherapy, the patient was asymptomatic.



**Figure 2.** Acquired AVM in a 20-year-old woman (a) gray-scale US image shows faint myometrial inhomogeneity with a small internal anechoic component in the posterolateral wall of the uterus. (b) Color Doppler US image shows a group of tortuous vessels in the myometrium. (c) Transverse duplex Doppler US image shows high-velocity arterial flow with a high diastolic component (PSV, 65 cm/sec; RI, 0.36). (d) Selective angiogram of the left uterine artery obtained during the arterial phase shows a markedly opacified vascular tangle and early venous drainage. (e) Following embolization with glue, no hemorrhage recurred.

## DISCUSSION

Female's pelvis vascular lesions are not common. Vascular abnormalities take in aneurysms, pseudoaneurysms, arteriovenous fistula, acquired AVM and vessel ruptures [2]. Here we discuss pseudoaneurysms, acquired AVM that occurred in our cases.

Pseudoaneurysm that may because of curettage, cesarean section, and other surgeries on the uterus, is a well known complication of vessel injury [4,7]. Pseudoaneurysm is an extra luminal blood collection that communicates with arterial blood throughout a defect in the arterial wall. While the uterine arteries are injured or lacerated and does not seal completely blood escapes, dissects the nearby tissue and collects in the perivessel areas. If this collection maintains the communication with the origin vessel, a pseudoaneurysm can happen [8].

In numerous cases a "normal" ultrasound scan can be wrongly reassuring. Furthermore, spontaneous homeostasis can happen. The ultrasound signs consist of expansile pulsations in the pseudoaneurysm and a tract of communication with the artery. Pulsed Doppler ultrasound improves the specificity of diagnosis by demonstration of arterial and occasionally turbulent flow inside the sac of the false aneurysm. The "to-and-fro" sign is diagnostic of each pseudoaneurysm that has a thin tract [9]. One or more pseudoaneurysms that had been supplied by one or more parental arteries clearly demonstrated with angiography [1]. Since uterine angiography has frequently been performed at several institutions, uterine arterial embolization seems to be the management of choice. If embolization is not a selection due to lack of expertise or time, intraoperative ligation of the pseudoaneurysm feeding vessels should be performed before attempting to hysterectomy, mainly in patients with fewer children. [4,7].

Acquired AVM scan be individuating by multiple varying sizes connexions between veins and arteries in the same district [10]. On a traumatic basis, as there is commonly a history of D&C, uterine surgery or trauma to the uterus, acquired uterine AVMs more commonly occur [2]. Less commonly, cervical carcinoma, endometrial carcinoma, and gestational trophoblastic disease have been signified as causes of acquired uterine AVMs [1]. The sonographic characteristics include the presence of hypoechoic tubular structures within the myometrium. The diagnosis of AVMs made on the basis of pulsatility index (PI), PSV, resistance index, and maximum velocity. AVMs with high PSV(>0.83m/s) were referred for immediate embolization [11]. Unluckily, the US findings of AVM can have common characteristics with those of retained products of conception (RPOC). On Doppler US, RPOC can demonstrate severe color signal and low-resistance flow. The gold standard in differentiation between these hypervascular uterine lesions is conventional angiography; although, 3D CT angiography possibly will be a future imaging modality to discriminate these lesions. Once the accurate diagnosis of a uterine AVM is made, additional treatment is based on the clinical condition of the patient. Angiography and embolization should be done for Patients who are anemic or hemodynamically unstable. Patients with a one episode of hemorrhage who are hemodynamically stable can be managed medically and conservatively [1].

Transcatheter arterial embolization with the advantages including: low complication rates, excellent success rates, prevention of surgical risks and the ability of identifying exact bleeding site, has emerged as a highly effective procedure for stopping obstetric and gynecologic hemorrhage [12]. The success rate following embolization is 97% [8]. Repeating embolization could be easily performed if necessary, while it does not prevent any hemorrhage control measures and preservation of fertility [12]. The complication risk of TAE is insignificant while it is performed by an expert interventional radiologist. Although a variety of embolization materials have been used, including gelatin sponge, coils, isobutyl-2-cyanoacrylate(glue), balloons, thrombin, and PVA, a large amount iatrogenic uterine vascular abnormalities can be safely and effectively treated by embolization with pledgets of absorbable gelatin sponge (Gelfoam) [12,4]. Absorbable gelatin sponge pledgets are generally the material of choice for embolization of acquired AVMs and pseudoaneurysms originating from small branches [12,13]. Preservation of fertility and the continuation of menstruation are possible following embolization, because of the temporary occlusion by gel foam and the extensive collateral circulation from pelvic arteries [14]. Recent study suggested Polyvinyl alcohol particles or glue as agents of choice [1]. In cases which did not respond to single embolic agent we used combination of embolic agent until occlusion of feeding arteries confirmed.

## CONCLUSION

Occurrence of uterine vascular lesions beseems more frequently than it has been promulgated in the literatures or considered previously. Detecting uterine vascular abnormalities, with this rate of frequency, owe on the rising awareness of pathologic entities joined with more widespread use of the proper investigations [5]. Physicians should exclude vascular lesions when facing to an intractable uterine bleeding. Until now, diagnostic imaging or therapeutic embolization of such lesions was overlooked by obstetricians and gynaecologists. [8]. Because the suspicion index is



frequently very low, numerous similar cases may have been undiagnosed, thus causing the obstetrician to resort to arterial ligation or hysterectomy [2]. Transvaginal US by an expert radiologist is the standard screening investigation. Patients diagnosed as having dangerous vascular lesions need to undergo angiography to confirm diagnosis and then embolization should be done by an expert interventional radiologist [1]. Knowledge of reasons of postsurgical bleeding, potential risks, and limitations of TAE is important for a timely decision, optimizing TAE, preventing irreversible complications, avoiding hysterectomy, and eventually preserving fertility [6]. Hysterectomy for postsurgical bleeding should be the last solution.

#### REFERENCES

- [1] Vijayakumar A, Srinivas A, Chandrashekar BM, Vijayakumar A. Uterine vascular lesions. *Rev Obstet Gynecol.* 2013;6(2):69-79.
- [2] Mammen T, Shanthakumari H, Gopi K, Lionel J, Ayyappan AP, Kekre A. Iatrogenic secondary post-partum haemorrhage: apropos of two uncommon cases. *AustralasRadiol.* 2006 Aug;50(4):3924.
- [3] Huang MW, Muradali D, Thurston WA, Burns PN, Wilson SR. Uterine arteriovenous malformations: gray-scale and Doppler US features with MR imaging correlation. *Radiology.* 1998 Jan;206(1):115-23.
- [4] Pelage JP, Soyer P, Repiquet D, et al. Secondary postpartum hemorrhage: treatment with selective arterial embolization. *Radiology.* 1999 Aug;212(2):385-9.
- [5] Kwon JH, Kim GS. Obstetric iatrogenic arterial injuries of the uterus: diagnosis with US and treatment with transcatheter arterial embolization. *Radiographics.* 2002 Jan-Feb;22(1):35-46.
- [6] Soyer P, Dohan A, Dautry R, et al. Transcatheter Arterial Embolization for Postpartum Hemorrhage: Indications, Technique, Results, and Complications. *CardiovascInterventRadiol.* 2015 Oct;38(5):1068-81. doi: 10.1007/s00270-015-1054-y.
- [7] Zimon AE, Hwang JK, Principe DL, Bahado-Singh RO. Pseudoaneurysm of the uterine artery. *Obstet Gynecol.* 1999 Nov;94(5 Pt 2):827-30.
- [8] Chitra TV, Panicker S. Pseudoaneurysm of uterine artery: a rare cause of secondary postpartum hemorrhage. *J ObstetGynaecol India.* 2011 Dec;61(6):641-4.
- [9] Langer JE, Cope C. Ultrasonographic diagnosis of uterine artery pseudoaneurysm after hysterectomy. *J Ultrasound Med.* 1999 Oct;18(10):711-4.
- [10] Roven SJ. Arteriographic evaluation of vascular malformations. In: Kim D, Orron DE, eds. *Peripheral Vascular Imaging and Intervention.* St Louis, Mo: Mosby; 1991;165-170.
- [11] Timmerman D, Wauters J, Van Calenbergh S, et al. Color Doppler imaging is a valuable tool for the diagnosis and management of uterine vascular malformations. *Ultrasound Obstet Gynecol.* 2003 Jun;21(6):570-7.
- [12] Vedantham S, Goodwin SC, McLucas B, Mohr G. Uterine artery embolization: an underused method of controlling pelvic hemorrhage. *Am J Obstet Gynecol.* 1997 Apr;176(4):938-48. Review.
- [13] Novak D. Embolization materials. In: Dondelinger RF, Rossi P, Kurdziel JC, Wallace S, eds. *Interventional radiology.* New York, NY: Thieme, 1990; 295-313.
- [14] Pelage JP, Le Dref O, Mateo J, et al. Life-threatening primary postpartum hemorrhage: treatment with emergency selective arterial embolization. *Radiology.* 1998 Aug;208(2):359-62.