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Suspected Uterine Arterial Pseudoaneurysm in Secondary Postpartum Haemorrhage: A Case of Diagnostic Challenge and Successful Uterine Artery Embolisation

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Abstract

Secondary postpartum haemorrhage (PPH) has several causes, one of the less common and less often suspected being uterine artery pseudoaneurysm (UAP), a contained arterial wall defect causing massive, recurrent, life-threatening haemorrhage, typically following uterine trauma or Caesarean section. A 33-year-old primiparous woman underwent emergency Caesarean section for failure to progress. She re-presented with secondary PPH on Day 5, and ultrasound with colour Doppler showed a high-flow, swirling intramyometrial lesion highly suspicious for UAP. Recurrent haemorrhage with haemodynamic instability on Day 8 required re-laparotomy and resuturing, which preserved the uterus. A further massive haemorrhage 21 days later prompted transfer to a tertiary centre. Total blood loss, including the Caesarean section, exceeded 7 L. Triple-phase CT and digital subtraction angiography (DSA) no longer demonstrated the lesion. Empirical bilateral uterine artery embolisation achieved durable haemorrhage control and preserved the uterus. This case highlights the value of ultrasound in raising early suspicion of UAP, the difficulty of confirming it after interim surgical haemostasis, and the feasibility of empirical embolisation as a uterus-preserving option. Embolisation remains effective and uterus-sparing when surgical management fails, underscoring the value of timely interventional radiology access.

Categories: Obstetrics/Gynecology, Radiology
Keywords: caesarean section complications, digital subtraction angiography, interventional radiology, postpartum bleeding, secondary postpartum haemorrhage, uae, uterine artery embolisation, uterine artery pseudoaneurysm (uap)

Introduction

Secondary postpartum haemorrhage (PPH), defined as excessive bleeding occurring between 24 hours and 12 weeks postpartum, most commonly results from retained products of conception or endometritis [1]. Uterine artery pseudoaneurysm (UAP) is a rare but important differential, accounting for a small proportion of cases but carrying a risk of massive, recurrent, and potentially fatal haemorrhage if unrecognised. It may be more common than previously assumed: a single-centre Japanese cohort reported three to six cases per 1,000 deliveries, although this figure included asymptomatic lesions detected on Doppler ultrasound [2].

A true aneurysm involves outward dilation of all three arterial wall layers, whereas a pseudoaneurysm reflects a full-thickness breach of the arterial wall, with extraluminal blood contained only by surrounding haematoma and perivascular tissue and communicating with the parent artery through a neck. Lacking a true vessel wall, the sac has turbulent flow and is more fragile and prone to rupture [3]. UAP is most commonly an acquired lesion resulting from vascular injury during pelvic surgery, such as caesarean section, although cases following non-traumatic events have also been described [4-6].

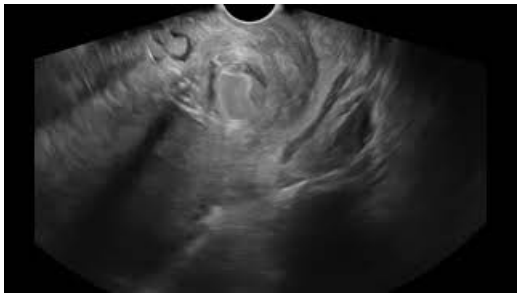
Ultrasound is the first-line imaging modality for PPH. UAP typically appears as a hypo- or anechoic round lesion within the myometrium, with turbulent flow evident within the arterial lumen. On colour Doppler, the pseudoaneurysm sac typically shows swirling bidirectional flow, known as the yin-yang sign, while spectral Doppler at the neck demonstrates a characteristic to-and-fro waveform. Doppler ultrasound has a reported sensitivity of 95% for diagnosis of UAPs [7].

We report a case of recurrent secondary PPH following emergency caesarean section, in which ultrasound raised strong suspicion of a UAP. Definitive imaging was initially deferred as the bleeding settled and subsequent haemodynamic instability necessitated re-laparotomy. Although findings at ultrasound and re-laparotomy were consistent with an underlying vascular abnormality, this was not corroborated on angiography performed three weeks later. We discuss the diagnostic and management challenges this discordance presents.

Case Presentation

A 33-year-old primiparous woman with insulin- and metformin-treated gestational diabetes, no prior

surgical history, and previously regular, non-heavy menstrual cycles underwent emergency caesarean section for failure to progress at 9 cm cervical dilatation. Intraoperative findings were consistent with obstructed labour. Bleeding from the left uterine angle necessitated haemostatic sutures, with an estimated blood loss of 530 mL; Surgicel was applied. She was discharged on postoperative Day 1. Video *1* presents the grey-scale transvaginal ultrasound.



VIDEO 1: Grey-scale transvaginal ultrasound clip showing a round, well-circumscribed hypoechoic lesion within the myometrium adjacent to the left uterine angle, with internal swirling echoes, highly suspicious for uterine artery pseudoaneurysm.

UAP: uterine artery pseudoaneurysm

View video here: https://youtu.be/kg0jMUXE9Gk

On postoperative Day 5, she re-presented with secondary PPH (estimated blood loss of 450 mL). Transvaginal ultrasound demonstrated a 6 cm intra-abdominal collection, comprising mostly the previously applied Surgicel, together with a hypoechoic, well-circumscribed, round, high-flow, swirling vascular lesion measuring 20 × 21 mm within the myometrium, in close proximity to the uterotomy scar and connecting to the left uterine artery on grey-scale and colour Doppler imaging, suspicious for UAP (Figure *1*). On admission, she was normotensive (blood pressure: 117/60 mmHg) but tachycardic (heart rate: 116 bpm), with a respiratory rate of 17 breaths/min and a temperature of 37.5°C. Blood tests showed a haemoglobin of 83 g/L, white cell count of 12.5 × 10^9/L, neutrophils of 11 × 10^9/L, and CRP of 198 mg/L. Given the markedly raised inflammatory markers, low-grade temperature and tachycardia, endometritis was suspected and intravenous antibiotics were started. As the bleeding settled spontaneously and an interval scan showed that the intra-abdominal collection was not expanding, she was managed conservatively and admitted for 24 hours of observation before discharge. CT angiography and referral to an IR-capable centre were not pursued at this stage because the bleeding had settled.

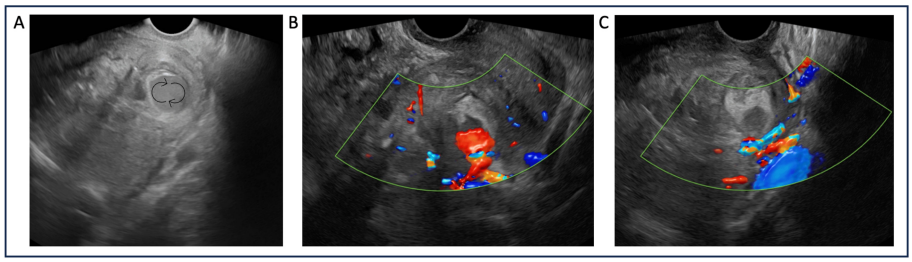


FIGURE 1: Day 5 post-emergency caesarean section.

Transvaginal grey-scale (A) and colour Doppler (B and C) ultrasound images showing a round hypoechoic lesion in the myometrium. Transverse colour Doppler shows a vascular lesion highly suspicious for a uterine artery pseudoaneurysm (UAP) originating from the left uterine artery, with high-velocity turbulent flow (arrows) within the arterial lumen.

On Day 8, she developed recurrent secondary PPH with haemodynamic instability, prompting re-laparotomy. She was hypotensive (78/52 mmHg) and tachycardic (heart rate: 113 bpm), with a respiratory rate of 22 breaths/min, temperature of 37.5°C and SpO_2 of 99%. Blood tests showed a haemoglobin of 69 g/L, white cell count of 17 × 10^9/L, neutrophils of 13.9 × 10^9/L, C-reactive protein (CRP) of 149 mg/L, and normal clotting. Two units of red blood cells were transfused before re-laparotomy. CT angiography and uterine artery embolisation (UAE) were considered but not pursued owing to her deteriorating clinical condition. No active bleeding was identified on entry into the peritoneal cavity; however, reopening the uterotomy revealed brisk arterial haemorrhage from the left uterine angle, with a total blood loss of 4.5 L. Bleeding was

controlled via the abdominal approach but persisted per vaginam on simultaneous vaginal assessment. Hysterectomy was considered intraoperatively given the ongoing blood loss. Haemostasis was ultimately achieved with additional sutures to the left angle, and the patient was transferred to the intensive care unit. Intraoperative transfusion comprised six units of red blood cells, four units of fresh frozen plasma, one unit of platelets, and one unit of cryoprecipitate.

On Day 29, three weeks after re-laparotomy, she presented with a third episode of massive secondary PPH (estimated loss: 2 L). She received two units of red blood cells, one unit of fresh frozen plasma, and 2 g of tranexamic acid, and was transferred to a tertiary centre for uterine-preserving UAE. Triple-phase computer tomography of the abdomen and pelvis was initially reported as suggestive of a uterine arteriovenous malformation. This was subsequently revised to early filling of an ovarian vein alongside a non-dilated ovarian artery, consistent with minor, likely insignificant shunting rather than a true arteriovenous malformation (Figure *2*).

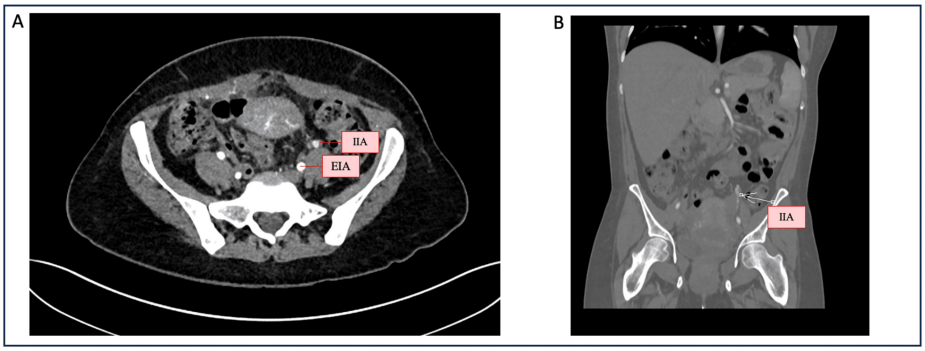


FIGURE 2: Triple-phase contrast-enhanced computer tomography (CT) of the abdomen and pelvis on Day 29 after emergency caesarean section, arterial phase.

(A) Axial image showing left external iliac artery (EIA) and left internal iliac artery (IIA). (B) Coronal image with suspected arteriovenous malformation (AVM), which was later revised as minor, non-significant ovarian shunting.

The following day, empiric bilateral UAE was performed using polyvinyl alcohol particles (500-700 μm; 1 vial right, 0.5 vial left). Angiography identified no definite vascular abnormality or arteriovenous malformation (Figure *3*). She remained on the high-dependency unit for two days and was subsequently discharged with a subdermal etonogestrel (Nexplanon) implant for contraception. No further bleeding has been reported for more than six months. Figure *4* presents the clinical timeline of events.

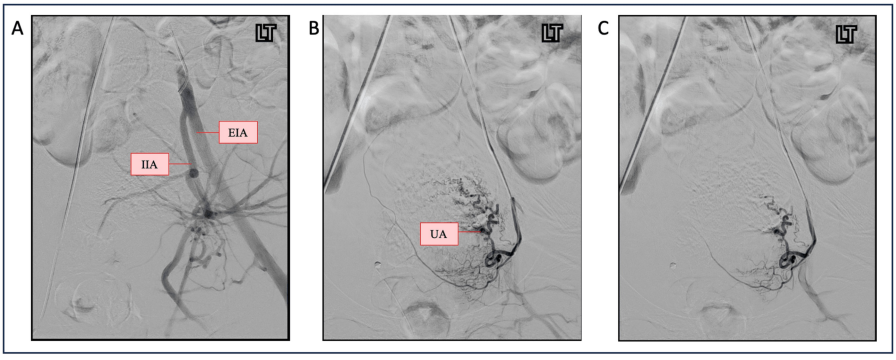


FIGURE 3: Digital subtraction angiography (DSA) on Day 30 after emergency caesarean section.

(A) Left external iliac artery (EIA) and left internal iliac artery (IIA). (B) Left uterine artery with terminal branches (UA). (C) Post-embolisation angiography showing reduced filling of the terminal branches.



FIGURE 4: Clinical timeline of events.

EBL: estimated blood loss; PPH: postpartum haemorrhage; TVS: transvaginal sonography

Discussion

UAP is an uncommon but potentially life-threatening cause of postpartum haemorrhage, with an estimated incidence of three to six cases per 1,000 deliveries, accounting for the underlying cause in an estimated 0.3-1% of all postpartum haemorrhage presentations, suggesting that it may be more frequent than previously recognised [2,8]. Although UAP is classically associated with uterine trauma or instrumentation, 40% of cases in one series followed non-traumatic obstetric events, underscoring that an absent traumatic trigger does not exclude the diagnosis. Spontaneous thrombosis has also been reported in selected patients without ongoing bleeding or angiographic extravasation, suggesting that conservative management may be appropriate in carefully selected cases, and absence of diastolic flow on pulsed-wave Doppler has been proposed as a potential marker of spontaneous resolution. This finding, however, is based on limited evidence and should not replace clinical and imaging assessment when determining management [2,9].

UAP is not confined to obstetric events and has also been described following a range of gynaecological procedures, including robotic-assisted hysterectomy, hysteroscopic polypectomy, excision of pelvic endometriosis, and cervical surgery, with UAE achieving successful haemorrhage control in each of these reported cases [4,10,11,12].

The timing of UAP presentation is highly variable. Reported cases include presentation with severe postcoital bleeding as early as four months and as late as 10 years after Caesarean section, illustrating that UAP may remain clinically silent for prolonged periods and underscoring the relevance of remote uterine surgery when evaluating unexplained vaginal bleeding [13,14].

Rupture can cause rapid, substantial blood loss, necessitating prompt recognition, aggressive haemodynamic resuscitation, and early blood product replacement. Timely definitive management is therefore critical; UAE provides an effective means of haemorrhage control, although unilateral embolisation may be insufficient, with contralateral embolisation sometimes required to achieve definitive haemostasis [15,16]. Laparoscopic ligation of the feeding vessel offers an additional uterus-preserving alternative to transarterial embolisation in selected cases [17].

Our patient underwent a high-risk Caesarean section at 9 cm dilatation for obstructed labour, complicated by a Bandl's ring and markedly oedematous tissues; multiple sutures were required at the left uterine angle to achieve haemostasis. Blood loss at Caesarean section was 530 mL with an uncomplicated postoperative recovery and was fit for discharge the following day. She subsequently developed recurrent high-volume secondary postpartum haemorrhage. Doppler ultrasound demonstrated findings highly suggestive of a pseudoaneurysm. An ultrasound performed earlier in pregnancy had shown no vascular abnormality, supporting an acquired postoperative aetiology. In retrospect, the initial conservative management on Day 5 warrants reflection. Although the bleeding had settled and the intra-abdominal collection was not expanding, the patient was tachycardic and anaemic, and had a 20 × 21 mm high-flow lesion suspicious for UAP. Conservative management has been described in selected patients without ongoing bleeding [2,9], but our patient's subsequent course illustrates the risk of recurrent major haemorrhage. Her tachycardia and raised inflammatory markers may also have reflected haemorrhage and infection. Early CT angiography, discussion with interventional radiology or referral to an IR-capable centre should be considered when ultrasound raises suspicion of vascular abnormality, even if the bleeding has settled.

Following recurrent haemorrhage, re-laparotomy was performed in the context of haemodynamic instability, with further sutures placed at the left uterine angle achieving haemostasis and successful uterine preservation. Twenty-one days later, following a further episode of recurrent haemorrhage, triple-phase CT of the abdomen and pelvis and digital subtraction angiography (DSA) were performed but failed to demonstrate a significant vascular abnormality. The additional surgical suturing may have altered or occluded the suspected pseudoaneurysm or its feeding vessel, potentially accounting for its absence on imaging. However, this remains hypothetical. Alternative explanations include spontaneous thrombosis, intermittent filling, vasospasm, or a different postoperative vascular abnormality, such as enhanced myometrial vascularity. Without angiographic or histological confirmation, the diagnosis cannot be established with certainty. Nevertheless, the characteristic Doppler findings, recurrent high-volume secondary postpartum haemorrhage, and close anatomical relationship to the previous uterotomy remained highly suggestive of UAP. Given the ongoing risk of recurrent haemorrhage and the need to preserve the uterus, empirical bilateral UAE was pursued as definitive treatment for recurrent, life-threatening secondary PPH, rather than as targeted embolisation of a demonstrated pseudoaneurysm, achieving durable

haemorrhage control with no further episodes of secondary PPH.

Permanent PVA particles (500-700 µm) were chosen instead of a temporary agent, such as gelatin sponge. Secondary PPH had persisted despite re-laparotomy, making embolisation the last fertility-sparing option before hysterectomy. A permanent agent was therefore preferred to achieve durable occlusion. Large particles were selected to occlude the uterine arteries proximally without penetrating the myometrial microcirculation, reducing the risk of uterine ischaemia and necrosis and helping to preserve future fertility.

Across reported cases of UAP, UAE has been the predominant uterus-preserving approach, with successful haemorrhage control described for a range of clinical presentations and underlying causes. The wider literature supports UAE as an effective, fertility-preserving intervention for secondary PPH refractory to conventional management. Agrawal et al. retrospectively reviewed 12 women with secondary PPH treated with UAE, achieving haemorrhage control in all cases without hysterectomy [18]. Jung et al. reported emergency UAE for intractable PPH associated with placenta accreta, controlling bleeding in 14 of 17 women (82.4%), with the remaining three requiring hysterectomy [19]. Urundady et al. described five women with refractory atonic PPH who underwent UAE after failure of uterotonics and uterine massage, all achieving complete haemorrhage control without hysterectomy and no major long-term complications [20]. In contrast, Park et al. demonstrated that UAE can fail in severe haemorrhage associated with uterine atony or complex collateral supply: embolisation was unsuccessful in 2 of 10 women with atony, both with severe uterine arterial vasoconstriction, leading the authors to emphasise the importance of adequate resuscitation before embolisation, since vascular collapse may itself compromise the procedure [21]. Together, these series indicate that UAE is effective in most cases but requires careful angiographic assessment and a low threshold for escalation to further embolisation or surgery when bleeding persists. However, small sample sizes, the absence of control groups, and limited fertility follow-up temper the strength of this evidence; larger studies with longer-term outcome data are needed.

Fertility after UAE remains a legitimate concern: pregnancy is achievable following the procedure, but published data point to possible risks, including miscarriage, preterm birth, low birth weight, and reduced ovarian reserve, with the evidence base too limited for reliable risk stratification [22]. This differs from UAE performed electively for fibroids: in the emergency setting of secondary PPH, where the only uterus-preserving alternative has already been exhausted, the benefit of avoiding hysterectomy is likely to outweigh the uncertain long-term reproductive risk.

Conclusions

This case highlights UAP as a cause of recurrent secondary PPH that may be under-recognised, and limited clinical awareness risks delaying diagnosis and appropriate treatment. In this patient, ultrasound, as the first-line imaging modality for PPH, identified a vascular lesion highly suspicious for UAP. Although DSA remains the diagnostic gold standard, ultrasound is more widely available and accessible in the acute setting. A key diagnostic challenge arose after re-laparotomy, when triple-phase CT and DSA no longer demonstrated the lesion seen on ultrasound, suggesting that a vascular abnormality may cease to be visible after intervening surgical haemostasis. Despite negative angiography, empiric bilateral UAE achieved durable haemorrhage control, supporting its feasibility as a uterus-preserving option in selected patients with recurrent, life-threatening secondary PPH. Early recognition of UAP may allow minimally invasive treatment before haemodynamic deterioration. In unstable patients, the choice between embolisation and surgery should be guided by the degree of instability, response to resuscitation, the suspected bleeding source, and the immediate availability of surgery and interventional radiology. The long-term fertility implications of bilateral UAE in the emergency setting remain incompletely defined and warrant further study. Finally, this case underlines the importance of infrastructure, referral pathways, and timely access to interventional radiology: greater availability of specialist IR services, including out-of-hours provision for patients presenting to district general hospitals, may facilitate earlier definitive treatment, reduce delays in transfer, and potentially improve maternal outcomes while increasing the opportunity for minimally invasive uterus-preserving management.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Aysel Ashir, Ruchi Bhambani, Zain Velji, Shabana Syed, Francis Ayim

Acquisition, analysis, or interpretation of data: Aysel Ashir, Ruchi Bhambani, Zain Velji, Shabana Syed, Francis Ayim

Drafting of the manuscript: Aysel Ashir, Ruchi Bhambani, Zain Velji, Shabana Syed, Francis Ayim

Critical review of the manuscript for important intellectual content: Aysel Ashir, Ruchi Bhambani,

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Supervision: Shabana Syed, Francis Ayim

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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