

Arterial embolization in the management of genital hemorrhage.

Abstract:

Background Arterial embolization provides targeted hemostatic control of selected gynecologic and obstetric hemorrhages and may preserve the uterus when the patient is suitable for endovascular management.

Objective To describe the indications, technical approaches, and outcomes of arterial embolization in five patients managed at Mohammed VI University Hospital in Oujda, Morocco.

Patients and methods This retrospective, descriptive, single-center study included five patients who underwent embolization in 2026 for genital, obstetric, or postoperative bleeding. Clinical, laboratory, imaging, transfusion, procedural, and outcome data were analyzed. Clinical success was defined as sustained bleeding control without an additional hemostatic procedure.

Results Mean age was 32.8 years (range 29–37). Three patients presented after cesarean delivery, one after medical termination of pregnancy while receiving anticoagulation, and one with an acquired post-abortion uterine arteriovenous malformation. Three patients required transfusion, totaling eight units of packed red blood cells and eleven units of fresh frozen plasma. Target vessels were the left uterine artery in two cases, both uterine arteries in two cases, and the inferior epigastric and deep circumflex iliac arteries in one case. Embolic agents were absorbable gelatin in three cases, cyanoacrylate in one, and microcoils in one. Technical success was achieved in all five procedures. Sustained clinical control after the first embolization was achieved in four patients (80%). Recurrent abdominal-wall bleeding in one patient required surgical revision. Final outcome was favorable in all patients, with no hysterectomy.

Conclusion Arterial embolization achieved sustained hemostasis in four of five patients and preserved the uterus in this series. Accurate vascular targeting, appropriate embolic-agent selection, and multidisciplinary coordination are essential. The findings remain descriptive because of the small and heterogeneous sample.

Keywords arterial embolization genital bleeding postpartum hemorrhage uterine arteriovenous malformation interventional radiology

Introduction

Acute genital hemorrhage encompasses heterogeneous conditions, ranging from post-abortion uterine bleeding to massive obstetric hemorrhage and postoperative arterial bleeding. Management combines assessment of severity, resuscitation, correction of coagulation disorders, and rapid control of the bleeding source. In postpartum hemorrhage, delayed treatment increases the risk of massive transfusion, disseminated intravascular coagulation, multiorgan failure, and hemostatic hysterectomy [1,2].

Arterial embolization selectively occludes the vessel responsible for bleeding. The Cardiovascular and Interventional Radiological Society of Europe standards of practice identify embolization as an important option for gynecologic and obstetric hemorrhage when appropriate expertise and facilities are available [3]. Its advantages include avoidance of laparotomy, the ability to explore several vascular territories during the same procedure, and potential uterine preservation. Its effectiveness nevertheless depends on the patient being stable or stabilized, the bleeding mechanism, vascular anatomy, and timely access to interventional radiology [3-5].

Published data mainly concern postpartum hemorrhage and uterine vascular malformations. Local series describing varied mechanisms remain valuable for examining real-world indications, target vessels, embolic-agent selection, and situations of clinical failure. This study aimed to describe the experience of Mohammed VI University Hospital in Oujda through five cases of genital or obstetric hemorrhage treated by arterial embolization in 2026.

Patients and methods

Study design and population

We conducted a retrospective, descriptive, single-center study including five patients who underwent arterial embolization at Mohammed VI University Hospital in Oujda during 2026. Patients were eligible when embolization was performed for genital, obstetric, or postoperative hemorrhage. Records without an embolization procedure were excluded.

Data collection

Data were obtained from the available clinical, laboratory, imaging, and embolization records. The variables analyzed were age, gravidity and parity, clinical setting, timing, hemoglobin values, transfused blood products, ultrasonographic and computed tomography findings, embolized territory, embolic agent, angiographic control, recurrent bleeding, need for an additional procedure, and outcome at discharge. Commercial brands, quantities, and device sizes that were not documented were not assigned retrospectively.

Imaging and endovascular procedure

Preprocedural imaging was selected according to clinical condition and included pelvic ultrasonography with Doppler and contrast-enhanced computed tomography when appropriate. Digital subtraction angiography was used to identify target vessels and guide selective or superselective embolization. Embolic material was selected according to vascular territory, focal or diffuse bleeding pattern, and flow characteristics. Completion angiography assessed disappearance of active extravasation or pathologic vascularity.

Outcome definitions

Technical success was defined as satisfactory angiographic occlusion of the target territory. Clinical success was defined as sustained control of hemorrhage without repeat embolization or hemostatic surgery. The need for a new procedure because of persistent or recurrent bleeding was considered an initial clinical failure. The analysis was descriptive; quantitative variables are reported as means and ranges, and qualitative variables as counts and percentages. All presented data were anonymized.

Results

Clinical characteristics

The five patients had a mean age of 32.8 years, with a range of 29 to 37 years. Three hemorrhages occurred after cesarean delivery. One patient presented with persistent uterine bleeding after medical termination of pregnancy at 17 weeks and 4 days while receiving anticoagulation for a mechanical mitral valve. One patient was treated for an acquired uterine arteriovenous malformation 20 days after an abortion.

The most severe presentations were hemorrhagic shock three hours after cesarean delivery, with a blood pressure of 70/40 mmHg and a heart rate of 122 beats per minute, and delayed abdominal-wall hemorrhage on day 16 after cesarean delivery, associated with a hemoglobin level of 6 g/dL and a prothrombin time of 50%. Three patients received blood products. A total of eight units of packed red blood cells and eleven units of fresh frozen plasma were transfused.

Table 1 *Clinical characteristics, endovascular treatment, and outcomes of the five patients*

Case	Clinical context and imaging	Minimum Hb and transfusion	Target vessel and agent	Outcome
1	37 years, G4P2. Shock 3 hours after cesarean delivery. Left pelvic hematoma measuring 110 × 76 mm with left-sided arterial extravasation.	6.8 g/dL 2 PRBC + 6 FFP	Left uterine artery Absorbable gelatin	Sustained control. Hb increased to 9 g/dL.
2	29 years, G4P1. Bleeding 1-2 weeks after medical termination at 17+4 weeks while receiving anticoagulation. Active intrauterine extravasation without retained tissue.	10 g/dL No transfusion	Bilateral uterine arteries Absorbable gelatin	Sustained control without recurrence.
3	36 years, G6P5. Bleeding 20 days after abortion. Acquired fundal uterine arteriovenous malformation.	8.8 g/dL No transfusion	Bilateral uterine arteries Cyanoacrylate	Uncomplicated course without recurrence.
4	31 years, G1P1. Incisional bleeding on day 16. Rectus sheath and subcutaneous hematomas with inferior epigastric arterial bleeding.	6 g/dL 5 PRBC + 3 FFP in total	Inferior epigastric and deep circumflex iliac arteries Microcoils	Recurrent abdominal-wall bleeding; surgical evacuation, drainage, and coagulation. Favorable final outcome.
5	31 years, G2P1. Hemorrhage 12 hours after cesarean delivery at 31 weeks for placental abruption with intrauterine fetal death. Hematometra 50 mm, pelvic fluid 6 cm, intrauterine hematoma 75 mm.	7 g/dL 1 PRBC + 2 FFP	Targeted left uterine artery Absorbable gelatin	Sustained control. Follow-up Hb 10.8 g/dL.

Imaging and angiographic findings

Cross-sectional imaging localized the bleeding source and guided arterial targeting. Figures 1 through 4 show the radiologic and angiographic findings in cases 1 through 4. Figure 5 documents the recurrent incisional bleeding in case 4. Case 5 is summarized in Table 1.



Figure 1 Case 1. Axial contrast-enhanced computed tomography after cesarean delivery showing a large left pelvic hematoma adjacent to the cervico-isthmus region. Follow-up after targeted left uterine artery embolization showed no persistent active extravasation.

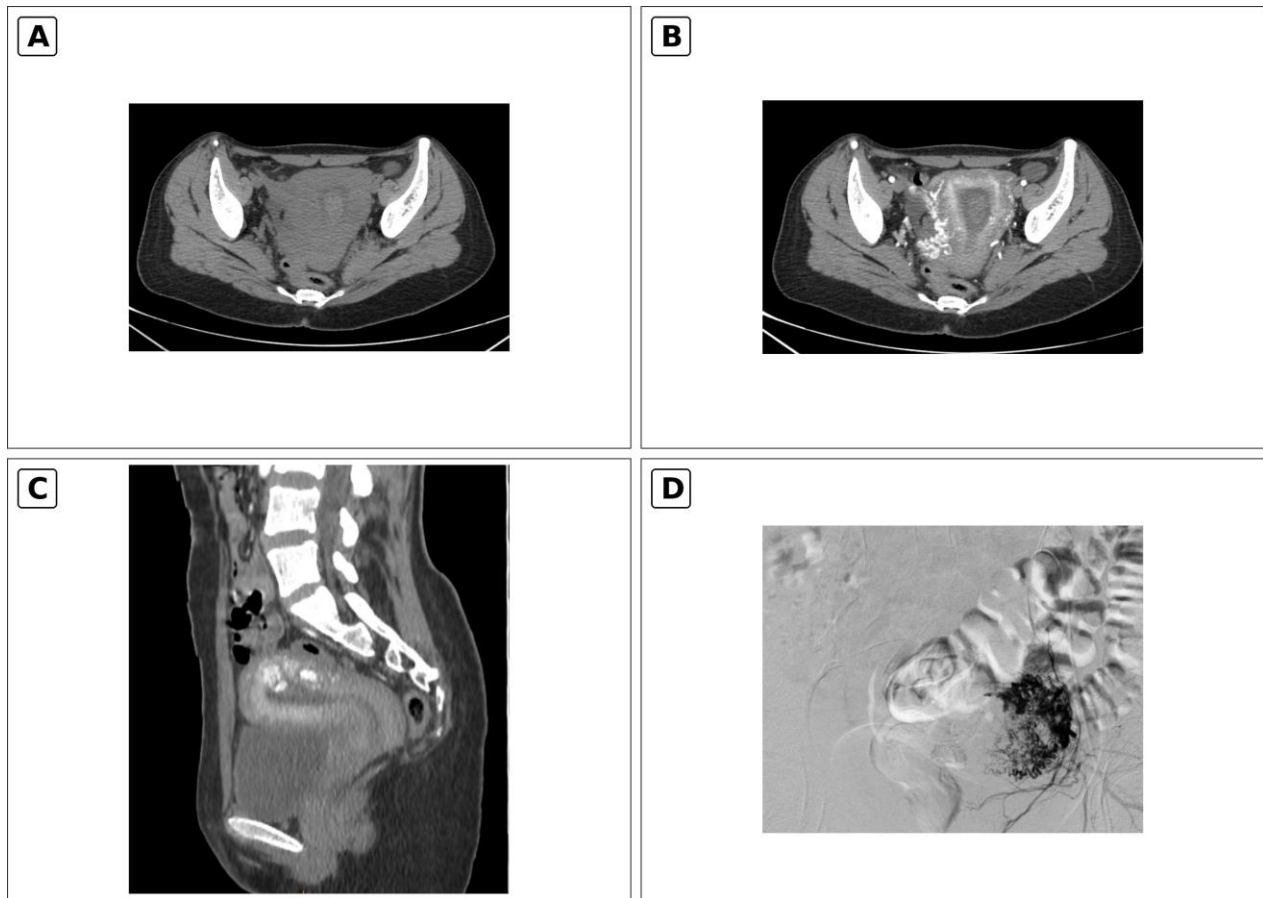


Figure 2 Case 2. Computed tomographic and angiographic assessment of persistent uterine bleeding after medical termination of pregnancy in a patient receiving anticoagulation. A, noncontrast axial CT. B, contrast-enhanced axial CT showing active intrauterine extravasation. C, sagittal reconstruction. D, selective uterine angiography before bilateral embolization.

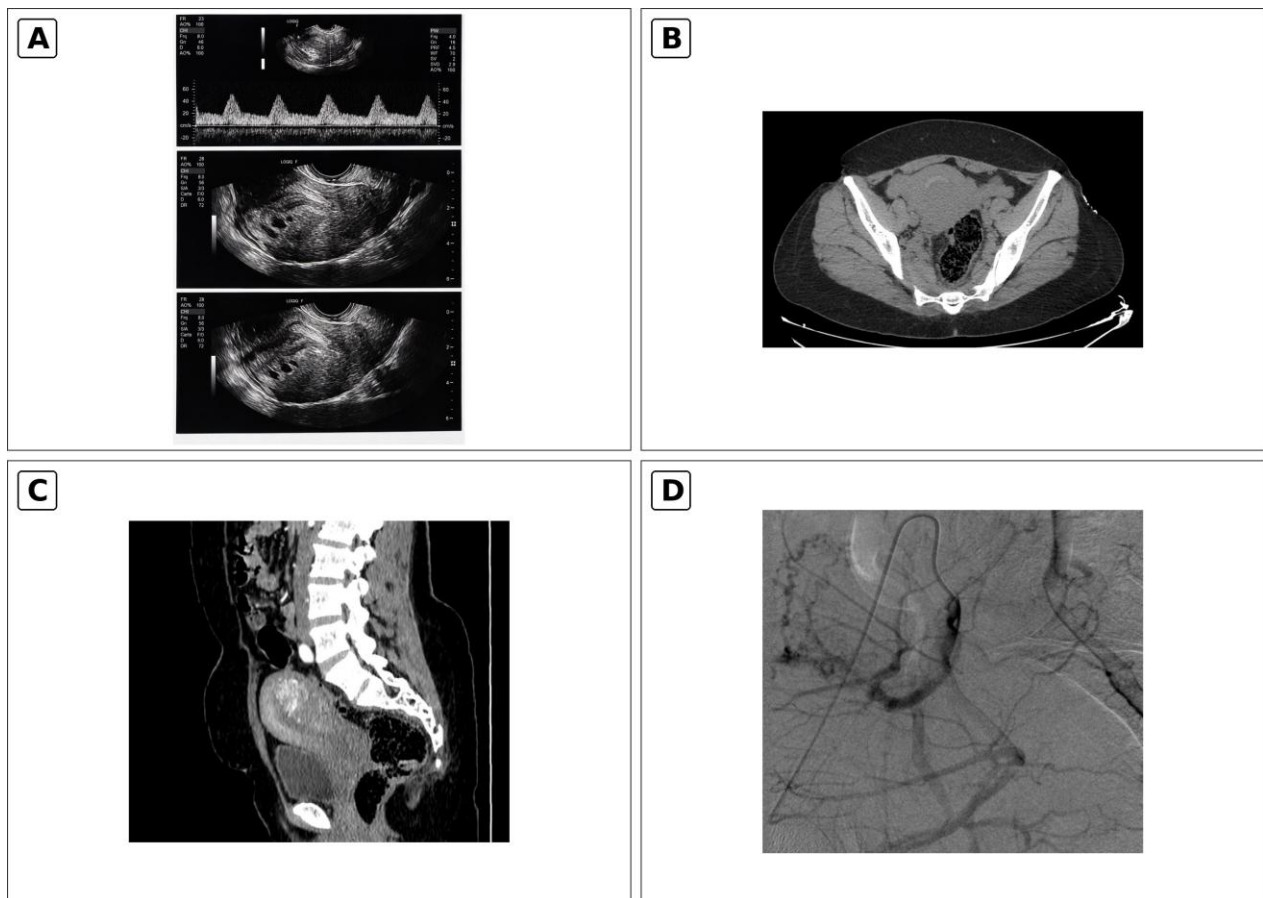


Figure 3 Case 3. Acquired uterine arteriovenous malformation after abortion. A, transvaginal ultrasonography with pulsed Doppler showing a hypervascular uterine lesion. B, axial CT. C, sagittal reconstruction showing serpiginous fundal vessels. D, selective uterine angiography before bilateral cyanoacrylate embolization.

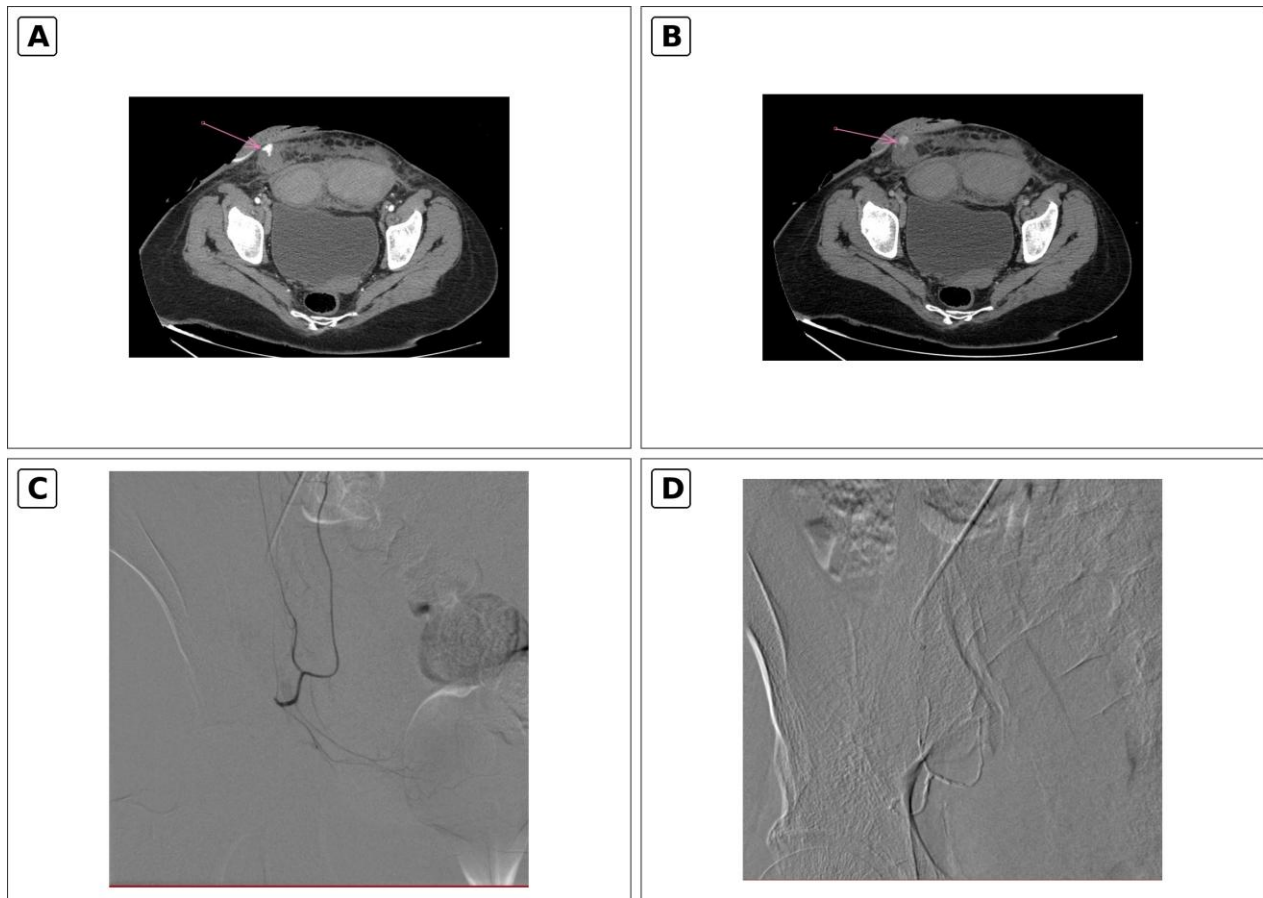


Figure 4 Case 4. Delayed abdominal-wall hemorrhage after cesarean delivery. A and B, contrast-enhanced axial CT images showing active bleeding in the right anterior abdominal wall, indicated by arrows. C and D, selective angiographic assessment of the inferior epigastric and deep circumflex iliac branches treated with microcoils.



Figure 5 Case 4. Anonymized clinical photograph showing recurrent incisional bleeding after embolization. Surgical evacuation, drainage, and coagulation of bleeding points achieved definitive control.

Technical approach

The treated territory was uterine in four cases. Embolization was unilateral and targeted to the left uterine artery in cases 1 and 5, and bilateral in cases 2 and 3. In case 4, abdominal-wall bleeding originated from the external iliac arterial network; the inferior epigastric and deep circumflex iliac arteries were embolized. Absorbable gelatin was used in cases 1, 2, and 5, cyanoacrylate in the uterine arteriovenous malformation in case 3, and microcoils in case 4.

Effectiveness and outcomes

Satisfactory angiographic control was obtained after all five procedures, corresponding to a technical success rate of 100%. Clinical success after the first embolization was achieved in four patients (80%). The patient in case 4 developed recurrent incisional bleeding approximately one week after embolization. Surgical revision with evacuation and drainage of the hematoma and coagulation of subcutaneous bleeding points achieved definitive control. Final outcomes were favorable in all five patients. No hysterectomy was required.

Discussion

This series illustrates the diversity of indications for arterial embolization in obstetrics and gynecology. Four patients had a uterine bleeding source and one had an abdominal-wall hemorrhage. Sustained control in four of five cases is consistent with published series reporting generally high clinical success rates for obstetric hemorrhage, while emphasizing the influence of initial severity, coagulopathy, treatment delay, and the definition of success [4-6]. However, the small sample precludes a robust estimate or comparison between techniques.

Selection of the vascular target

In diffuse uterine hemorrhage, bilateral embolization is frequently performed because of pelvic anastomoses and the possibility of contralateral reperfusion [3,4]. Conversely, unilateral or superselective embolization is appropriate when a focal, lateralized extravasation is identified. This approach was used in cases 1 and 5, in which imaging and angiography pointed to the left uterine artery. Target selection must nevertheless be guided by complete angiographic assessment and the treatment response, because ovarian, vaginal, and other pelvic collateral vessels may contribute to persistent bleeding [3,5].

Case 4 demonstrates that bleeding after cesarean delivery is not necessarily uterine. In the presence of a rectus sheath hematoma or incisional bleeding, angiographic assessment should include abdominal-wall branches of the external iliac artery, particularly the inferior epigastric and deep circumflex iliac arteries. An examination limited to the internal iliac arteries may fail to identify the responsible vessel [5].

Selection of the embolic agent

Absorbable gelatin is suitable for many diffuse obstetric hemorrhages because it provides temporary occlusion and permits subsequent recanalization. Microcoils provide precise mechanical occlusion of a focal branch, although overly proximal placement may allow collateral perfusion to persist [10,11]. Liquid agents such as N-butyl cyanoacrylate are particularly useful for high-flow lesions, arteriovenous malformations, and selected coagulopathic patients because their effectiveness is less dependent on coagulation. Their use requires specific expertise to minimize reflux and nontarget embolization [10,11]. In this series, agent selection reflected the presumed mechanism: gelatin for three uterine hemorrhages, cyanoacrylate for the arteriovenous malformation, and microcoils for the focal abdominal-wall hemorrhage.

Uterine arteriovenous malformation

Acquired uterine arteriovenous malformations most often occur after pregnancy, abortion, curettage, or uterine surgery. Color Doppler imaging, supplemented when appropriate by magnetic resonance imaging or

computed tomography angiography, can identify a serpiginous vascular network and help avoid potentially hazardous curettage. Systematic reviews indicate high embolization effectiveness and the possibility of subsequent pregnancy, although the evidence consists mainly of retrospective series and published case reports [7-9]. The patient in case 3 underwent bilateral cyanoacrylate embolization with clinical control and an uncomplicated course.

Clinical failure and surveillance

Angiographic success does not guarantee durable clinical control. Persistent coagulopathy, arterial spasm masking the target, overly proximal occlusion, recanalization, or untreated collaterals may explain recurrent bleeding [12,13]. In case 4, initial angiographic control did not prevent recurrent abdominal-wall bleeding requiring surgery. This outcome supports close clinical and laboratory surveillance after embolization, including bleeding, hemodynamic status, hemoglobin, coagulation, pain, and the arterial access site. Any recurrence requires immediate multidisciplinary reassessment to choose between repeat embolization and surgery.

Uterine preservation and fertility

A major expected benefit of embolization is avoidance of radical surgery. No hysterectomy was performed in this series. Anatomical preservation of the uterus, however, does not establish complete preservation of reproductive function. Available studies report pregnancies after embolization, but outcomes vary according to indication, age, embolic agent, and duration of follow-up [14,15]. Standardized follow-up of menstrual recovery, pregnancy intentions, and subsequent obstetric outcomes is needed.

Strengths and limitations

The main strength of this study is the detailed description of a real-world local experience including several bleeding mechanisms, three types of embolic agents, and a documented clinical failure. This diversity highlights the need for reasoning based on the vascular target rather than the obstetric context alone. The principal limitations are the retrospective design, the sample of only five patients, heterogeneous indications, incomplete technical data for individual procedures, and absence of standardized long-term reproductive follow-up. The reported percentages are descriptive and should not be generalized.

Practical implications

A formal multidisciplinary pathway should define the criteria for involving interventional radiology, the arrangements for stabilization and transfer, the availability of blood products, and simultaneous access to rescue surgery. A prospective local registry should document the decision-to-puncture interval, hemodynamic status, coagulation parameters, vascular territories explored, embolic agent and quantity used, radiation dose, complications, recurrent bleeding, and subsequent gynecologic and obstetric outcomes.

Conclusion

In this five-patient series, arterial embolization achieved technical success in all procedures and sustained clinical control after the first procedure in four cases. Final outcomes were favorable in all patients, with no hysterectomy. Embolization was used across varied settings, from post-cesarean uterine hemorrhage to post-abortion uterine arteriovenous malformation and delayed abdominal-wall bleeding. Accurate vascular targeting, appropriate embolic-agent selection, and coordination among obstetrician-gynecologists, interventional radiologists, anesthesiologists, intensivists, and surgeons determine the outcome. Prospective data and extended reproductive follow-up are needed to assess effectiveness, safety, and long-term outcomes more precisely.

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