








Endovascular Embolisation Using N-Butyl-2-Cyanoacrylate: An Effective Treatment Option for Uterine Artery Pseudoaneurysm in Postpartum Hemorrhage

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Abstract

In this case series, we evaluated the efficacy and safety of uterine artery embolization (UAE) using N-butyl-2-cyanoacrylate (NBCA)/glue for the treatment of uterine artery pseudoaneurysm (UAP). Here, we report 8 patients with uterine artery pseudoaneurysm, who underwent UAE using NBCA/glue. Angiograms and medical records were retrospectively analyzed to determine the technical success, clinical success, complications, average procedure time, the average duration of hospital stay after UAE. All patients were presented with secondary postpartum hemorrhage with hemodynamic instability. The technical and clinical success rates were 100%, respectively. The average procedure time was 21 minutes and the average duration of hospital stay was 2.2 days. We did not encounter any major complications. Two patients following UAE were naturally conceived and delivered by repeat LSCS. UAE using NBCA/glue is a safe and effective treatment option for UAP in both hemodynamically stable and unstable patients.

Keywords

- ▶ uterine artery embolization
- ▶ NBCA
- ▶ uterine artery pseudoaneurysm

Introduction

Postpartum hemorrhage (PPH) remains a major cause of maternal morbidity and mortality despite the advances in intensive postpartum care.¹ Uterine artery pseudoaneurysm (UAP) is an uncommon cause of PPH and typically presents with secondary postpartum hemorrhage, which is defined as excessive bleeding from the genital tract that occurs more than 24 hours post-birth to up to 12 weeks postpartum. The

prevalence of secondary PPH is 2–4/1000.² UAP is an extraluminal collection of blood from the uterine artery because of a localized defect in the uterine cavity or adnexa. The presentation of UAP can vary from insidious bleeding to acute severe hemorrhage and is often incorrectly attributed to more common causes of PPH, such as uterine subinvolution, endometritis, and retained products of conception. Failure to recognize UAP can lead to inappropriate

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management and poor outcomes, including hysterectomy, in severe cases.

Uterine artery embolization (UAE) with common embolic agents, such as gelatin sponge particles, has been considered to be safe and effective in the management of PPH. However, in patients with coagulopathy, performing UAE with gelatin sponge as the sole embolic agent shows limited effectiveness in controlling PPH.³ Furthermore, the gelatin sponge may be ineffective in cases of active bleeding and in patients with pseudoaneurysm.⁴ While treating patients with secondary PPH who exhibit coagulopathy, an alternative embolic agent is required, and N-butyl-2-cyanoacrylate (NBCA) may be effective in ensuring a definitive and prompt devascularization.³⁻⁵

However, a consensus on the efficacy of NBCA/glue in UAP has not been reached owing to the dearth of literature in this field. Hence, this study retrospectively evaluated the safety and effectiveness of NBCA/glue in the treatment of UAP.

Methods

We report eight patients with UAP, all of whom presented with secondary PPH and were successfully treated with UAE using NBCA in our hospital. Of the eight treated patients, six presented after lower segment caesarian section (LSCS), one after dilatation and curettage (D&C) for an invasive mole and one after medical termination of pregnancy (MTP). The history was typical in all cases, and the patients presented with secondary PPH in the form of recurrent bouts of bleeding and hemodynamic instability. The patients were initially treated with resuscitation, uterotonic agents, appropriate antibiotics, and finally UAE. They were first evaluated with ultrasonography (USG) to look for retained products of conception, UAP, or other vascular anomalies, such as arteriovenous malformations. If no obvious cause could be established, the patients were subjected to pelvic angiography. Those who were diagnosed with UAP via USG and/or pelvic angiography were considered for UAE.

Procedure

Prior to UAE, counseling was given regarding the procedural details (including benefits, risks, and complications) and informed consent was obtained. Under monitored anesthesia care, USG-guided endovascular access was established via the right common femoral artery and a 5F vascular sheath was inserted. Bilateral internal iliac angiograms were obtained to demonstrate arterial anatomy and vascular pathology. Once the UAPs were identified, selective angiograms of the uterine arteries were obtained with a microcatheter (Progreat; Terumo, Leuven, Belgium). UAE was performed using NBCA (Histacryl, B.Braun Surgical S.A., Spain). Contralateral internal iliac angiogram was obtained to exclude cross filling of the pseudoaneurysm. Various ratios of NBCA and Lipiodol (Lipiodol Ultra Fluid, Guerbet, France) were used (1:2–1:4). The ratio was determined on a case-by-case basis by calculating the polymerization times of the mixture and the time taken for the contrast material to travel from the microcatheter tip to the neck of the pseudoaneurysm. After the procedure, all patients were started

on prophylactic antibiotics—injections of ceftriaxone 2 g/IV BD and metronidazole 500 mg/IV BD for 3 days. Clinical and USG follow-ups were done immediately after the procedure and after 1 month for residual/recurrence of UAP. Technical success was defined as nonopacification of the UAP in the postembolization check angiogram. Clinical success was further defined as the obviation of recurrent bleeding, hysterectomy, or mortality. Complications were categorized into major and minor types. Major complications were those requiring prolonged hospitalization and causing permanent adverse sequelae or death. Minor complications were those requiring no treatment or treatment by an interventionist in an angiography room without prolonged hospitalization or adverse consequences.

Results

All eight women with UAP were treated with UAE using NBCA/glue. Their age range was 21–37 years, with an average of 29 years. One woman presented after D&C for an invasive mole, one woman presented after MTP, and the other six women presented after LSCS. The onset of bleeding was between the 3rd and 80th day. Blood components were administered before UAE, which ranged from 2 to 5 packed cell units, with an average of 3.1 units. Color Doppler evaluation showed the presence of pseudoaneurysm in five of the eight cases. The other three cases were subjected to angiogram, which confirmed the pseudoaneurysm. Of the eight UAPs, five were on the left side and three were on the right side. In this procedure 100% technical and clinical success was obtained (► Figs 1–3). The average procedure time was 21 minutes. All patients were discharged 2–3 days after UAE, and the average length of hospital stay was 2.2 days. No major complications were encountered. None of the patients required blood transfusion after UAE. Table shows the case summary of the eight patients (► Table 1).

Discussion

UAP is a life-threatening complication that occurs after vascular injury at a rate of 0.2–0.4%. The etiology of the vascular injury include pelvic surgeries and uterine procedures, such as caesarian section, myomectomy, hysterectomy, ovarian cystectomy, traumatic delivery/traumatic pregnancy termination, curettage, vacuum extraction, manual removal of the placenta, and forceps delivery. UAP forms when the uterine artery is injured in a way that breaches the integrity of the three-layered arterial wall lining. Thus, unlike true aneurysm, pseudoaneurysm lacks the three-layered arterial wall and is usually surrounded by adjacent perivascular tissues and blood clots. The risk of rupture is directly proportional to the internal sac pressure and the size of the pseudoaneurysm, according to Laplace's law. Clinically, UAP may remain silent in a few cases; however, most of the cases have been reported to exhibit sudden and severe PPH.⁶ In some instances, rupture of the pseudoaneurysm involves the peritoneal surface of the uterus and presents as severe hypotension and shock due to intra-abdominal

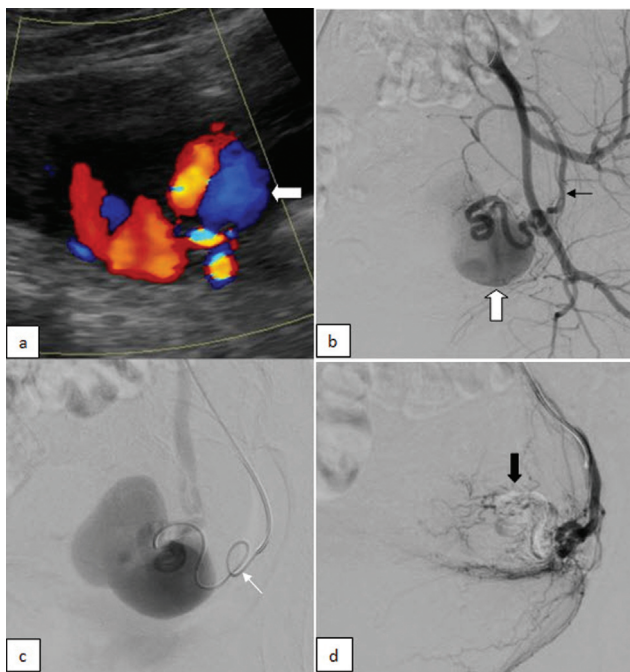


Fig. 1 (a–d) A 30-year-old woman with secondary PPH 80 days after curettage for an invasive mole. (a) Color Doppler USG shows a yin-yang sign that indicates pseudoaneurysm (white block arrow). (b) Left internal iliac angiogram shows a pseudoaneurysm (white block arrow) arising from the left uterine artery (black arrow). (c) Selective angiogram of the left uterine artery with a microcatheter (white arrow) better delineates the pseudoaneurysm. (d) Final angiogram immediately after embolization with NBCA (black block arrow) shows nonopacification of the pseudoaneurysm.

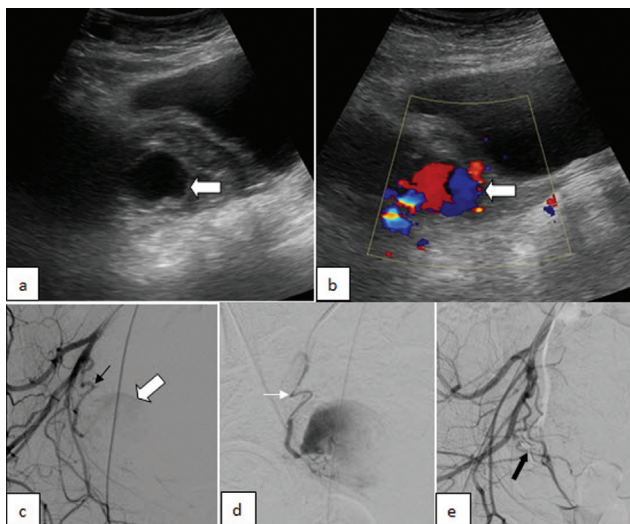


Fig. 2 (a–e) A 32-year-old woman with secondary postpartum hemorrhage 19 days after caesarian section. (a) Gray-scale USG of the pelvis shows an anechoic lesion (white block arrow) in the right lateral myometrium. (b) Color Doppler shows a yin-yang sign that indicates pseudoaneurysm (white block arrow). (c) Right internal iliac angiogram shows a faintly opacifying pseudoaneurysm (white block arrow) arising from the uterine artery (black arrow). (d) Selective angiogram of the right uterine artery with a microcatheter (white arrow) shows the pseudoaneurysm, thus confirming its origin. (e) Final angiogram immediately after embolization with NBCA (black block arrow) shows nonopacification of the pseudoaneurysm and the tortuous uterine artery.

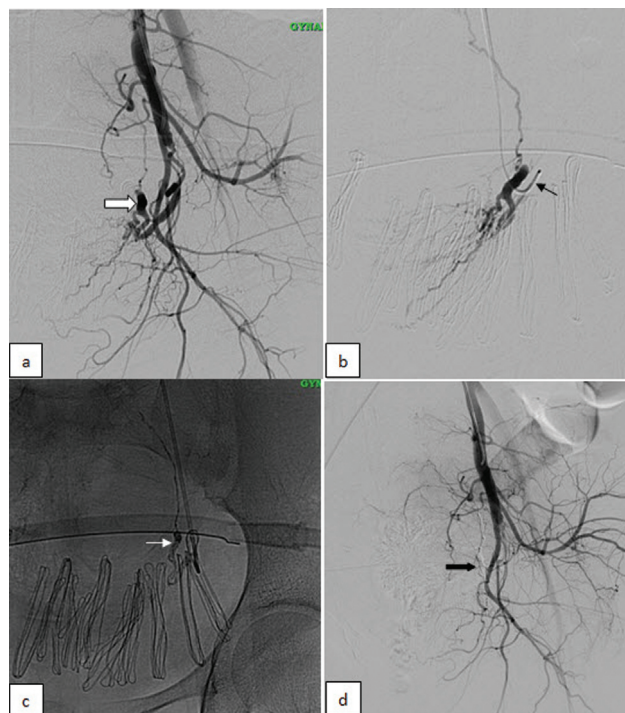


Fig. 3 (a–d) A 27-year-old woman with secondary postpartum hemorrhage 12 days after caesarian section. (a) Left internal iliac angiogram shows a small uterine artery pseudoaneurysm (white block arrow). (b) Selective angiogram of the left uterine artery with a microcatheter (black arrow) shows the pseudoaneurysm, thus confirming its origin. (c) Fluoroscopic image after embolization shows the NBCA cast (white arrow). (d) Final angiogram immediately after embolization with NBCA shows nonopacification of the pseudoaneurysm (black block arrow).

hemorrhage. Advances in imaging have simplified the diagnosis of this entity; hence, the increasing incidence. On gray scale USG, UAP appears as a hypoechoic or anechoic lesion in the myometrium, whereas color Doppler USG shows “to and fro” phenomenon or “yin-yang” pattern. However, angiography remains the gold standard for the diagnosis of UAP.

Initially, all patients in our study were managed conservatively, and various treatment options were considered. Because all of our patients were desirous of retaining their fertility, UAE was preferred over surgical intervention. The other advantages of UAE are its minimally invasive and time-effective nature, exact identification of the bleeding site, repeat embolization, if necessary, and avoidance of general anesthesia. The commonly used embolic agents for UAE are gelatin sponge particles, polyvinyl alcohol particles, pushable coils, and NBCA/glue. When particulate embolic agents are used, it may be difficult to achieve successful hemostasis after embolization for pseudoaneurysms.⁵ Coils may be used for embolization; however, because of uterine artery tortuosity, very distal coil deployment may not be feasible. Kovo et al.⁷ reported the first case of UAP successfully treated with percutaneous USG-guided thrombin injection. Nonetheless, this technique can be used only in patients with an adequate acoustic window. Contrary to superficial pseudoaneurysms with a small neck, such as those involving the femoral artery, percutaneous treatment

Table 1 Case summary

S.no	Age (Yrs)	Prior Procedure	Onset of bleeding	Packed cells (PC) required before UAE	Angiographic findings	Embollic material Used	Technical success	Clinical success	Procedure time	Duration of hospital stay	Major Complications
1	30	D&C	80 th day	2 Units	Left UAP	NBCA(25%)	yes	yes	13min	2 days	Nil
2	33	LSCS	61 st day	2 Units	Left UAP	NBCA(33%)	yes	yes	24min	2 days	Nil
3	32	LSCS	19 th day	3 Units	Right UAP	NBCA(25%)	yes	yes	18min	2 days	Nil
4	23	LSCS	3 rd day	5 Units	Left UAP	NBCA(20%)	yes	yes	35min	3 days	Nil
5	27	LSCS	12 th day	4 Units	Left UAP	NBCA(33%)	yes	yes	27min	2 days	Nil
6	29	LSCS	7 th day	3 Units	Right UAP	NBCA(33%)	yes	yes	21min	2days	Nil
7	37	LSCS	5 th day	4 Units	Right UAP	NBCA(25%)	yes	yes	15min	3days	Nil
8	21	MTP	9 th day	2 Units	Left UAP	NBCA(20%)	yes	yes	19min	2days	Nil

Abbreviations: D&C, Dilatation and curettage; LSCS, Lower segment caesarian section; MTP, Medical termination of pregnancy; NBCA, N-butyl-2-cyanoacrylate; UAP, Uterine artery pseudoaneurysm.

of high-flow UAP may not be effective because it neither guarantees the complete exclusion of the pseudoaneurysm from circulation nor prevents nontarget embolization.⁸ Pelage et al. first documented the use of NBCA in patients with UAP. Soyer et al.⁹ reported seven patients with ruptured pseudoaneurysms who were successfully treated with TAE, but NBCA and metallic coils were used only in two patients. Furthermore, some recent studies have opined that UAE with NBCA does not adversely affect future fertility.¹⁰ In our study, two patients conceived naturally after UAE and delivered by repeat LSCS. Clinical and technical success was achieved in all patients. No major complications were encountered. One patient experienced ischemic pelvic pain after the procedure, which was managed conservatively.

Conclusion

UAE with glue as an embolic agent may be viewed as the treatment of choice for UAP because it is a minimally invasive and quick procedure with a high success rate. Moreover, the post-procedure recovery time is short and is associated with few complications when performed by an experienced interventional radiologist. Additionally, the procedure preserves fertility and avoids unnecessary hysterectomies in women of reproductive age.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Conflict of Interest

None declared.

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