CASE REPORT

Advantages of contrast-enhanced ultrasonography and uterine balloon tamponade during intrauterine evacuation of retained products of conception

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Aim: Retained products of conception (RPOC) can cause postpartum hemorrhage. However, if intrauterine evacuation is performed for RPOC without adhesion, it can lead to massive hemorrhage due to an inability to identify bleeding points during the operation. Here, we describe the advantages of intrauterine evacuation of RPOC using contrast-enhanced ultrasonography (CE-US), which can identify bleeding points and contribute to successful hemostasis, and uterine balloon tamponade (UBT) in four clinical cases.

Methods: We encountered four cases of RPOC and performed intrauterine evacuation combined with CE-US and UBT from 2018 to 2019. The ultrasound contrast agent, perfluorobutane, was infused immediately before the operation. After intrauterine evacuation, the uterine balloon was retained.

Results: In all cases, CE-US identified bleeding points immediately, enabling retention of the uterine balloon on the bleeding points and subsequent hemostasis. None of the cases experienced complications the day after the operation.

Conclusion: CE-US facilitated the identification of bleeding points during intrauterine evacuation of RPOC and contributed to successful hemostasis when used in combination with UBT.

Introduction

Postpartum hemorrhage can be divided into early postpartum hemorrhage, which occurs within 24 hours after delivery, and secondary postpartum hemorrhage, which occurs 24 hours to 6 weeks after delivery.1) Placental remnants, also referred to as retained products of conception (RPOC), occur as a result of secondary postpartum hemorrhage and reportedly develop in 0.1% to 3% of all pregnancies.2–4) RPOC can be diagnosed immediately and easily by monitoring blood flow using color Doppler ultrasound.5)

Conventionally, ultrasound is used to confirm hemostasis in intrauterine evacuation procedures. However, intrauterine evacuation is associated with complications, such as uterine perforation, postoperative infection, and difficult hemostasis.6) Uterine balloon tamponade (UBT) after intrauterine evacuation has contributed to decreased rates of total hysterectomy in cases of massive hemorrhage after intrauterine evacuation.6) Nonetheless, hemostasis cannot be achieved in some cases given the difficulty of contacting the uterine balloon with invisible bleeding points even under ultrasound guidance. Thus, alternative methods have been developed to address secondary postpartum hemorrhage caused by RPOC, such as removal under hysteroscopy and hemostasis using uterine artery embolization (UAE).4) Hysteroscopy enables direct visualization of remnant tissue and bleeding points during surgery and prevents adhesions in the intrauterine cavity.7,8) However,
hysteroscopy is limited by the surgeon’s skills and available facilities. Similarly, UAE enables the detection of bleeding points and the immediate verification of hemostasis, but is also limited by available facilities and the possibility of infertility. Intrauterine evacuation, on the other hand, is not limited by surgeon skills or facilities, but bleeding points cannot be detected during the operation.

The present case report describes for the first time a procedure combining contrast-enhanced ultrasonography (CE-US) with UBT during intrauterine evacuation of RPOC, and its efficacy, in four clinical cases. Under CE-US, we were able to evaluate bleeding points at the bedside.

Materials and methods

Intrauterine evacuation combined with CE-US and UBT was performed in four cases with RPOC between June 2018 and May 2019. Transvaginal ultrasonography and contrast-enhanced magnetic resonance imaging were performed in all cases before the operation. CE-US was performed using the HI VISION Preirus ultrasound platform (Hitachi Aloka Medical, Ltd., Tokyo, Japan) and C251 Probe (HITACHI, Ltd., Tokyo, Japan) at a frequency of 3.5 MHz. Perfluorobutane (Daiichisankyo Company, Ltd., Tokyo, Japan) was used as the contrast agent. Conventional intrauterine evacuation was performed using transabdominal ultrasonography under intravenous anesthesia, and perfluorobutane (0.015 ml/kg) was administered intravenously to identify bleeding points.

Table 1. The characteristics of four cases

| Backgrounds of cases | Details of operation |
|----------------------|----------------------|
| Case | Age | Delivery method | Time to onset of major bleeding after delivery (days) | Operative time (min) | Blood loss (g) | Uterine balloon | The volume of saline infused (ml) |
| 1 | 38 | Normal delivery | 10 | 32 | 400 | Fujimetro a | 150 |
| 2 | 32 | Caesarean section | 28 | 6 | 5 | — | — |
| 3 | 42 | Normal delivery (IUFD) | 27 | 16 | 30 | Minimetro b | 30 |
| 4 | 38 | Forceps delivery | 30 | 14 | 15 | Minimetro a | 30 |

Abbreviation: IUFD, intrauterine fetal death. aThe capacity of Fujimetro (Fuji Latex Co., Ltd., Tokyo, Japan) is up to 150 ml. bThe capacity of Minimetro (SOFT MEDICAL Co., Ltd., Tokyo, Japan) is up to 40 ml

Figure 1. The operation images of contrast-enhanced ultrasonography

B mode image is shown on left side. Enhanced mode image is shown on right side. The left side of the image is the head side. 1: Extravasation to the uterine cavity can be seen. Placenta remnant (circled area) was enhanced by Perfluorobutane. Evacuation with hemostatic forceps. 2: Uterine cavity seems liner with the B mode (left). Still placental remnant can be seen with the enhanced mode (right). 3: Extravasations from some points (location indicated by arrow) can be seen. 4: After inversion of the balloon (Fujimetro), hemostasis was confirmed. 150 ml of saline was infused into the balloon.
continuous hemorrhage and bleeding points. In cases with bleeding points, hemostasis was confirmed using UBT. The present study was approved by the Ethics Committees of Juntendo University Hospital (#25-576), and written informed consent was obtained from all cases prior to the operation.

Results

Characteristics and clinical details of the four cases, including age, delivery method, time to onset of major bleeding after delivery, blood loss, operative time, UBT, and volume of saline infused, are summarized in Table 1. Intraoperative images of Case 1 are shown in Figure 1. Hemostasis was achieved in three of the four cases using UBT (Cases 1, 3, and 4). In all cases, the procedure enabled detection and clear visualization of remnant tissue and bleeding points. The balloon was removed the day after the operation, and none of the cases experienced postoperative rebleeding, blood transfusion, or complications.

Discussion

The present study reports the first attempt to combine intrauterine evacuation of RPOC with CE-US—using perfluorobutane as the contrast agent—and UBT. Indeed, a search for published articles on hemostatic intrauterine evacuation using perfluorobutane from 1999 to 2019 in PubMed yielded no hits.

Perfluorobutane in Japan is covered by insurance for use in the treatment of liver and breast tumors. The contrast effect of perfluorobutane facilitates visualization of bleeding points as early as 3 minutes after administration. Recently, perfluorobutane was also used to identify bleeding points for liver trauma and gallbladder perforation. Taking advantage of this property, we were able to identify bleeding points immediately and detect remnant tissue. The contrast effect of perfluorobutane is not inferior to contrast-enhanced CT, and is useful for evaluating the contrast effect in local tissues. Perfluorobutane is considered to be highly safe for use in lactating women because the blood concentration falls below the detection limit by 60 minutes after administration. Any ultrasound device can be used with perfluorobutane, but a device with a low-pressure harmonic mode can provide a clearer picture of bleeding points by changing the mode immediately after perfluorobutane injection. Moreover, ultrasonic devices equipped with a monitor mode allow for the simultaneous generation of contrast and monitor images.

Compared to color Doppler ultrasound, CE-US may be more effective in evaluating residual tissue and bleeding points due to its ability to describe tissue, blood vessels, and bleeding points, although color Doppler is useful for evaluating blood flow velocity and determining the presence or absence of blood flow.

A few studies have used perfluorobutane to identify bleeding points in obstetrical and gynecological diseases. We also reported cases of UBT using ultrasound contrast agents for pseudoaneurysms. As with the present case, we reported in that study that bleeding points can be identified and reliable hemostasis can be achieved with UBT. Another advantage of this method is that intrauterine evacuation can be performed without technical restrictions and hemostasis can be achieved in a shorter time and at a lower cost relative to hysteroscopy or UAE.

CE-US is considered highly effective as a point-of-care ultrasound in the field of obstetrics and gynecology. However, there is a time limit because perfluorobutane loses its contrast effect approximately 3 minutes after administration. Thus, in order to avoid excessive administration of the agent, it is important to perform the procedures quickly while still ensuring reliable intrauterine evacuation and UBT. This requires the well-coordinated efforts of both the surgeon and ultrasound operator, which could be difficult in some cases and is thus a potential limitation of the method.

If achieving hemostasis is difficult with our technique, then the presence of other residual placental tissue should be confirmed, as well as whether an appropriately sized balloon is being used. If hemostasis proves difficult even after confirming that no residual placental tissue exists and an appropriate sized balloon is used, then other methods of hemostasis, such as UAE, may be needed. Cooperation with relevant departments, such as radiology, should be considered when other methods of hemostasis are required for patients at high risk of bleeding.

Conclusion

Effective and rapid intrauterine evacuation and hemostasis can be achieved in cases of RPOC using CE-US and UBT. The technique is minimally invasive, quick, and inexpensive, and may be useful in the context of obstetrical and gynecological diseases that involve massive hemorrhage.

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Conflict of interest

None of the authors have conflicts of interest to declare.
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