VIDEO ARTICLE

Video image: Ultrasound findings of a novel subtype of atonic postpartum hemorrhage: is it still a diagnosis of exclusion?

Eiji Kondoh, Yoshitsugu Chigusa, Akihiko Ueda, Baku Nakakita, Haruta Mogami, Masaki Mandai

Department of Gynecology and Obstetrics, Kyoto University, Kyoto, Japan

Introduction

Postpartum hemorrhage (PPH) is the most common cause of maternal death worldwide.1 Blood transfusion is required in 4 to 5 cases per 1,000 deliveries in high resource countries.2 Uterine atony is a leading cause of PPH, and the use of intrauterine balloon tamponade (IBT) is recommended as the first-line surgical intervention for intractable atonic PPH. However, IBT fails to control uterine bleeding in roughly one-fifth of cases.3 We previously reported that intractable atonic PPH is invariably due to a serious subtype of PPH, termed “PRACE” (Postpartum hemorrhage, Resistance to treatment, and Arterial Contrast Extravasation on dynamic computed tomography (dCT) scans).4 Here we report that color Doppler ultrasonography can be a useful tool for diagnosing upper type of PRACE.

Case summary

A 36-year-old woman with severe PPH after spontaneous vaginal delivery at 40 weeks’ gestation was transferred to our hospital. On admission, her uterus was firmly contracted, and although uterotonics and a Bakri balloon tamponade were used to control bleeding, she continued to have heavy uterine bleeding through the drainage catheter. Arterial blood flow into the upper uterine cavity was observed on color Doppler ultrasonography (Video 1, available in zenodo at https://doi.org/10.5281/zenodo.2565942), which was confirmed on dCT scans (Figure 1). Transarterial embolization (TAE) was performed, resulting in successful control of PPH. The total estimated blood loss was 4,500 ml.

Figure 1. Dynamic CT evaluation of the arterial bleeding site.
Images (sagittal, coronal, and axial) of intractable atonic postpartum hemorrhage. Dashed lines in sagittal and coronal images show reference lines for the axial image. Contrast extravasation (arrow) was identified in the upper uterine cavity in an early phase (40 s after the start of contrast administration). The bleeding site is far from the inflated Bakri balloon (arrow head).
Discussion

To date, atonic PPH has remained a diagnosis of exclusion. “PRACE” is a significant subtype of atonic PPH that is characterized by arterial contrast extravasation on dCT scans and resistance to conventional treatments including IBT, and is significantly associated with the need for TAE.\(^4\) Women presenting with PRACE differ from those with traditional PPH, in that arterial bleeding persists irrespective of the degree of uterine contractility; that is, these patients are non-responsive to uterotonics. Indeed, we observed a thickened myometrium on CT, which suggested that PRACE is not controlled by uterine contractions. The identification of PRACE is thus a crucial step in the strategic management of patients with intractable atonic PPH.

IBT is a simple, safe, and minimally invasive method for managing atonic PPH. However, it is not feasible in patients with PRACE, i.e., when the presence of contrast extravasation into the upper uterine cavity is noted on CT images (upper type of PRACE), as an intrauterine balloon is normally placed in the lower uterine cavity\(^4\) and does not exert direct pressure on the arterial bleeding site. Consistently, in the present case, CT images clearly showed the tamponade balloon placed in the lower uterine cavity. Hence, for those who do not respond to treatment by IBT, the early diagnosis of upper type of PRACE could prevent delays in the initiation of effective treatments, such as TAE.

This is the first report to show that upper type of PRACE could be detected by color Doppler ultrasonography and confirmed by dCT scans. As ultrasonography is readily available at the bedside, the use of color Doppler ultrasound should be considered as the initial approach in the management of intractable PPH. We previously reported that the arterial bleeding site was clearly visualized by color Doppler ultrasonography in women with intractable PPH.\(^5\) Contrast-enhanced ultrasound is a promising technique to detect PPH,\(^6\) but it does not provide sufficient information regarding the accurate location of the bleeding site or the shape of the uterine cavity. On the other hand, color Doppler ultrasonography and subsequent dCT scans could be useful for determining treatment strategies for women with intractable atonic PPH.

In conclusion, upper type of PRACE, which is resistant to conventional IBT and often necessitates TAE, can be detected using color Doppler ultrasonography.

Conflict of interest

The authors have no conflicts of interest to declare.

References

1. WHO recommendations for the prevention and treatment of postpartum haemorrhage. Geneva, Switzerland: WHO Library; 2012.
2. Sato M, Kondoh E, Iwao T, et al. Nationwide survey of severe postpartum hemorrhage in Japan: an exploratory study using the national database of health insurance claims. J Matern Fetal Neonatal Med. 2018. doi: 10.1080/14767058.2018.1465921.
3. Son M, Einerson BD, Schneider P, Fields IC, Grobman WA, Miller ES. Is there an association between indication for intrauterine balloon tamponade and balloon failure? Am J Perinatol. 2017; 34: 164–168.
4. Ikeda A, Kondoh E, Chigusa Y, et al. Novel subtype of atonic postpartum hemorrhage: dynamic computed tomography evaluation of bleeding characteristics and the uterine cavity. J Matern Fetal Neonatal Med. 2019; in press.
5. Kondoh E, Konishi M, Kariya Y, Konishi I. Ultrasonographic visualization of bleeding sites can help control postpartum hemorrhage using intrauterine balloon tamponade. J Clin Ultrasound. 2015; 43: 23–25.
6. Imai K, Kotani T, Tsuda H, Nakano T, Hirakawa A, Kikkawa F. A Novel Approach to Detecting Postpartum Hemorrhage Using Contrast-Enhanced Ultrasound. Ultrasound Med Biol. 2017; 43: 615–620.

Video Legend

Video 1. Ultrasonographic visualization of bleeding site. Transabdominal color Doppler ultrasound image shows a jet of blood flow into the upper uterine cavity. An inflated Bakri balloon was located in the lower uterine cavity.