CASE REPORT

Over-expanded lower uterine segment: a cause of intrauterine balloon tamponade failure

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Intrauterine balloon tamponade (IBT) is widely used for treating obstetric hemorrhage. However, only a few reports on IBT failure exist. We report a case of IBT failure caused by an over-expanded lower uterine segment (LUS). A 30-year-old woman with twin pregnancy presented with bleeding after cesarean section. During surgery, uterine atony was observed; however, intravenous administration of oxytocin and ergometrine resolved the condition. Continuous hemorrhage was observed postoperatively, despite the administration of uterotonics and uterine massage. Although IBT was performed, the bleeding persisted, as recognized from the drainage fluid. Enhanced computed tomography revealed that the bleeding spot could not be compressed by the inflated balloon due to the over-expanded LUS. The balloon was removed; uterine artery embolization was required to achieve hemostasis. Our experience indicated that over-expanded LUS could cause IBT failure. If bleeding continues post-IBT replacement and an over-expanded LUS is observed, alternative treatments should be promptly provided.

Introduction

The treatment of postpartum hemorrhage (PPH) remains challenging for obstetricians. Traditional uterotonics and uterine massage have been widely used as first-line treatments for PPH. In the past 10 years, intrauterine balloon tamponade (IBT) has been gradually adopted for the treatment of uncontrolled obstetric hemorrhage when uterotonics are ineffective. However, hemostasis failure may occur in some cases, such as balloon prolapse due to cervical loosening. This study reports a case of IBT failure in a patient with an over-expanded lower uterine segment (LUS).

Case presentation

Informed consent was obtained from the patient for treatment and the publication of this report. IRB approval was not required as this was a single case report. A 30-year-old woman (G2P0) presented with bleeding 30 minutes after the cesarean section was performed. Prior to the surgery, she was admitted to our hospital at 33 weeks and 6 days of gestation due to a dichorionic diamniotic twin pregnancy. Her height and body weight were 160 cm and 54 kg, respectively (body mass index: 21 kg/m²), prior to pregnancy. She had no remarkable medical history and tested negative following screening for gestational diabetes mellitus during pregnancy. During hospitalization, uterine contraction was not detected on daily routine cardiotocography. A uterine contraction inhibitor was not required because shortening of the cervical length was not observed. She underwent a cesarean section at 37 weeks and 6 days of gestation and two infants (male: 3,423 g/female: 2,590 g) were delivered. The surgical procedure lasted for 50 minutes during which uterine atony was observed; however, immediate intravenous administration of oxytocin and ergometrine resolved the condition. Although the total blood loss was 2,130 ml (excluding 600 ml of total amniotic fluid), uterine contraction was stable once the skin was sutured and the vital signs were stable. Approximately 30 minutes after she was shifted to the recovery room, continuous hemorrhage was observed despite the continuous administration of uterotonics and...
uterine massage. The hemoglobin level decreased to 7.5 g/dl, and the fibrinogen level was 288 mg/dl, compared to 10.6 g/dl and 459 mg/dl, respectively, preoperatively. Momentarily, the uterus appeared soft. Therefore, the most probable diagnosis was uterine atony. An intrauterine balloon (Bakri balloon) was inserted into the uterus and inflated with 500 ml of sterile water. The entire inserting procedure was precisely monitored using a portable transabdominal ultrasound device (GE voluson e portable ultrasound system) to confirm the proper placement of the intrauterine balloon. However, it was unclear whether the balloon was effective enough to compress the uterus after balloon inflation due to the limitation of ultrasound.

To prevent balloon prolapse, approximately 2 meters of gauze was inserted into the vagina. The total hemorrhage was 920 g during treatment. Disappointedly, continuous bleeding of approximately 100 g within 30 minutes was still observed in the drainage fluid of the Bakri balloon, despite the uterine corpus contraction seeming adequate. Once the gauze was removed, the external os showed no expansion, and the possibility of a balloon prolapse was excluded. Subsequently, emergent enhanced computed tomography (CT) scan revealed extravasation from the left uterine artery and an extended uterus with an extremely large LUS (alongside a clot surrounding the balloon); this indicated that the bleeding spot could not be compressed by the inflated balloon due to the over-expansion of the LUS (Figure 1A and B). Following the confirmation of tamponade failure by the CT scan, uterine artery embolization was treated, and 8 units of RBC transfusion were subsequently required because the total hemorrhage had eventually exceeded 3,250 ml. The patient’s recovery was uneventful, and she was discharged from the hospital with no complications on postpartum day 12.

**Discussion**

The present case demonstrated the failure of IBT in treating postpartum bleeding due to an over-expanded LUS. It was concluded that the overdistension of the LUS, caused by multiple pregnancies and overweight infants, could be a possible reason for balloon tamponade failure. In such conditions, effective compression aimed to stop bleeding from the vessels in the uterus wall cannot be achieved, and bleeding may possibly continue, despite no expansion in the external os.

The LUS comprises the lower part of the uterus and the upper part of the cervix. Anatomically, it is located under the attachment of the peritoneum to the uterovesical pouch and between the retraction ring and the internal cervical os. To facilitate the safe passage of the baby through the birth canal, the LUS expands by stretching and thinning of the uterine muscle layers during pregnancy and undergoes circumferential dilatation during labor.

Postpartum hemorrhage due to overdistension of the LUS has been reported in the past. A previous study observed 16 non-placenta previa/low implantation patients with PPH who had similar ultrasound findings regarding overdistension of the LUS, despite the appropriate contraction of the uterine corpus. Balloon prolapse due to cervical loosening has similarly been reported as the main factor causing hemostasis failure (Figure 2A). However, overdistension of the LUS resulting in balloon failure in the treatment of postpartum hemorrhage has not been described in the literature. In this case, in addition to the poor contraction of the uterine body, the extension of the lower uterine segment was extreme to the extent that bleeding from the uterine body could not be stopped by the inflating Bakri balloon (Figure 2B). Our experience draws new

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**Figure 1.** A) Coronal section. Enhanced computed tomography revealed extravasation originated from the left uterine artery (yellow arrow). An extended uterus with an over-expanded LUS was observed (blue arrows). B) Sagittal section. A balloon was not available to compress the bleeding spot (yellow arrow) because of the over-expanded LUS.

LUS, lower uterine segment.
attention towards observing the LUS in the treatment of postpartum hemorrhage by IBT. If IBT fails in cases with similar risk factors such as multiple pregnancies and overweight infants, massive blood transfusion, and alternative treatments, including uterine artery embolism, surgical treatment, or hospital referral should be promptly administered.

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Conflict of interest

The authors have no conflicts of interest relevant to this article.

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Figure 2. Causes of intrauterine balloon failure. A) Balloon prolapse caused by cervical loosening. B) Overexpansion of the LUS due to multiple pregnancies/overweight infants.

LUS, lower uterine segment.