

## CASE REPORT

# Acute complete uterine inversion after controlled cord traction of placenta following vaginal delivery: a case report

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## Introduction

Obstetrics hemorrhage remains one of the leading causes of maternal death in developed and developing countries [1]. Acute uterine inversion is a rare and serious obstetrics emergency, estimated to occur in one in 3737 deliveries [2]. This tends to happen at least once a year in our unit. In acute uterine inversion, the uterus has turned inside out and may protrude from the vagina. Often, this occurred when fundal massage and umbilical cord traction were performed incorrectly or overenthusiastically. Uterine inversion is usually classified according to the degree of inversion. In incomplete inversion, the uterine fundus is inverted and lies within the endometrial cavity without extending beyond the external os, whereas a prolapsed inversion is one where the fundus protruded through the vaginal introitus. In complete uterine inversion, the uterus as well as the vagina is inverted. In this high-risk group of patients, early recognition and prompt management in a multi-disciplinary approach using standard guidelines will enable the safe delivery of a baby

### Key Clinical Message

Early recognition and active management of the third stage of labor will reduce the risks associated with uterine inversion. All staff members in the maternal unit should be updated with Green-Top guidelines No. 52 and be appropriately trained in the PROMPT course to provide a standardized approach in obstetric emergencies.

### Keywords

Complete uterine inversion, Green-Top guideline, hydrostatic balloon, postpartum hemorrhage, PROMPT, propofol, ROTEM™.

while saving the mother's life. We described a case of acute uterine inversion following the delivery of placenta despite controlled cord traction from the perspective of an obstetrician and an anesthetist.

## Case Presentation

A 35-year-old female (gravida 2, parity 2) was admitted for an induction of labor at 41 + 3 weeks as per local protocol for the management of post-dates pregnancy. She had a past medical history of postpartum hemorrhage (PPH) following her first pregnancy. Although no record was available on the exact cause and nature of the PPH (i.e., atonic or traumatic), it was understood that she received blood transfusion. On admission, we aimed for active management of third stage of labor with routine precautions (e.g., IV access, group and save, etc.) in case of recurrent PPH.

The labor was augmented with an artificial rupture of membrane (ARM). Active pushing of labor was commenced when the cervix was fully dilated at 10 cm. Owing

to deep transverse arrest, we attempted ventouse delivery for the patient. Following this, a male infant with a weight of 4.16 kg was delivered and the Apgar score was 9. Immediately after delivery of placenta, the patient experienced major PPH due to complete uterine inversion despite controlled cord traction. The patient was in lower abdominal pain, with signs of hemodynamic shock out of proportion with the blood loss. The consultant obstetrician was referred and manual replacement of uterus was attempted as soon as uterine inversion was recognized. It was decided that the patient would need vigorous fluid resuscitation; hence, she was transferred to the operating theater for interventions under general anesthetics with propofol. General anesthesia was preferred rather than spinal or regional anesthesia due to the hemodynamic instability.

In the operating theater, the uterine inversion was corrected manually without difficulty. Additional interventions for the patient included administration of oxytocin bolus and infusion, ergometrine, prostaglandin, and simultaneous bimanual compression. Despite the delivery of pharmacological agents and manual compression, the patient continued to deteriorate. As the urine became bloodstained, concern about disseminated intravascular coagulopathy (DIC) was raised. The hemoglobin value as measured by (HemoCue™, Ängelholm, Sweden) was 5.1 g/dL and the estimated blood loss was 3 L. Using a (ROTEM™, Tem International GmbH, Munich, Germany) machine, clotting defects were ruled out rapidly prior to the transfusion of six units of packed red cells. Following a discussion with the consultant anesthetist, we decided to switch off propofol, which was thought to be associated with the inhibition of uterine contraction and would lead to further blood loss. One gram of intravenous tranexamic acid was subsequently administered followed by the insertion of a (Bakri™, Cook Medical, Bloomington, IN) balloon. The hydrostatic balloon was left in situ for 24 h. The patient's persistent acidosis was managed with 50 mL of 8.4% bicarbonate and her arterial blood gases reading returned to a normal value on day 2 postoperatively. Antibiotics prophylaxis was also given as per protocol. The patient's metabolic acidosis resolved over the course of ICU stay. On day 2 after the delivery, the uterus was well contracted with minimal lochia. The patient was discharged home on day 3 in a stable condition after a debriefing on the acute event of uterine inversion. She was instructed to schedule an appointment for future deliveries, allowing advance planning to prevent the recurrence of postpartum hemorrhage.

## Discussion

Active management of the third stage of labor was introduced and adopted in both developed and developing countries to reduce the mortality and morbidity in

postpartum hemorrhage [1] following recommendation from World Health Organisation (WHO) and International Federation of Gynaecology and Obstetrics (FIGO). This involved the immediate administration of uterotonic drugs to contract the uterus [6], the application of controlled cord traction, and counter-pressure on the uterus after placental delivery. Controlled cord traction is the preferred mode of action following signs of placental separation, in line with the recommendation from the Cochrane systematic review database [3]. In a recent systematic review examining comparative studies of active versus expectant management (spontaneous delivery of placenta) by the Cochrane group [4], the author concluded that active management reduced the risk of hemorrhage which were >1000 mL.

Here, the case report demonstrated the successful multi-professional team management of postpartum hemorrhage secondary to complete uterine inversion using a hydrostatic balloon and turning off the anesthetic agent propofol. Making a prompt diagnosis of uterine inversion is essential to a good outcome. Our case demonstrated a classic presentation of complete uterine inversion in which the uterus is visibly displaced while delivering the placenta and the patient developed symptoms of lower abdominal pain and signs of hemodynamic shock out of proportion to the apparent blood loss. We do, however, recognize that the clinical picture is not always obvious and may initially only be noted by a change in maternal observations and signs of shock; therefore, a high index of suspicion is required. The patient continued to deteriorate despite the aforementioned active management of labor and immediate manual replacement of the uterus. This mandated rapid resuscitation and the need to escalate the treatment accordingly.

In a guideline published by the Royal College of Obstetricians and Gynaecologists [5] (Green-top Guidelines No. 52), there are four components in the management of PPH, in the order of: Communication, Resuscitation, Monitoring and Investigation, and Arresting the bleed. The guidelines suggested that once the uterus was successfully inverted and other causes of PPH were ruled out, pharmacological and mechanical interventions should be initiated. This involved bimanual compression and injection of syntocinon, ergometrine or carboprost [5]. Misoprostol can also occasionally be given per rectal [7]. If these measures failed to stop the bleeding, surgical hemostasis should not be delayed and often than not, balloon tamponade is an appropriate treatment for most patients where atony is the only cause of hemorrhage. This simple and reproducible approach is often cited in British medical literature and [8] is supported by the United Kingdom Obstetric Surveillance system data, which demonstrated that early tamponade is associated

with reduced maternal mortality secondary to postpartum hemorrhage [9].

Uncontrolled hemorrhage can deplete coagulation factors via obstetric-triggered situations that set off a cycle of consumption of coagulation factors, platelets and fibrins, resulting in disseminated intravascular coagulation (DIC) [10]. When considering the potential etiologies of uncontrolled hemorrhage, it is important to rule out any coagulation defects and DIC as patients with coagulation disorders are unlikely to respond to the pharmacological measures as described earlier. Evaluation should include the use of a thromboelastometry (ROTEM™) machine to monitor any clotting defects. In the event of DIC, the mainstay of hemodynamic supports may include fresh frozen plasma, cryoprecipitate, recombinant factor VIIa, and platelet products [11, 12]. The patient did not have any past medical history of coagulopathies and we effectively ruled out DIC and avoided the unnecessary administration of hematological products by serially evaluating the coagulation status. When all measures were exhausted, a laparotomy should not be delayed. Based on clinical studies, propofol-maintained anesthesia is known to influence uterine tone [13]. Although little is known about its exact mechanisms of action, some studies suggested that propofol may have significant effects on uterine muscle tone, reducing uterine contractility in a dose-dependent manner [14]. The smooth muscle vasodilation in the uterus may stem from the Ca<sup>2+</sup> channel blocking effect of propofol on vascular smooth muscle [15] or the nitric oxide production and release from endometrial cells [16]. For this reason, we decided to switch off the propofol agent to prevent further uterine atony. The bleeding was eventually stopped following the insertion of hydrostatic Bakri™ balloon.

Another key aspect of the management of severe postpartum hemorrhage was effective staff members' training in the maternal unit. In the UK, a PRactical Obstetric Multi-Professional Training (PROMPT) course was developed by a group of obstetricians, midwives and anesthetists to guide healthcare professionals in response to obstetric emergencies [17–19]. The day course was designed and structured to help develop practical skills and drill training in order to facilitate a safer delivery in a timely manner. To the best of our knowledge, we believe all staff members working in the maternal unit should be properly trained and be informed of evidence-based guidelines to improve perinatal outcomes and intrapartum care.

## Conclusion

In summary, this report highlighted a rare case of severe postpartum hemorrhage (PPH) secondary to acute

complete uterine inversion. Active management of third stage of labor is recommended for postpartum hemorrhage. This encompassed the immediate use of uterotonics, the application of controlled cord traction, and fundal massage immediately after placental delivery. In addition, making a prompt diagnosis of uterine inversion and an immediate attempt at manual replacement of the uterus is essential to a good outcome. A high index of suspicion is required in cases where the clinical picture is not obvious. This should be followed by an urgent call for help and prompt multi-professional team management. Because of the emergent nature of uterine inversion, it is best practice to make an immediate attempt at manual replacement and bimanual compression of the uterus as a holding measure while transferring the patient to the theater. The use of a hydrostatic balloon should not be delayed if pharmacological and mechanical interventions are not successful, and a laparotomy would be the last resort. Equally important, any coagulopathies or complications such as DIC should be identified and treated promptly. From an anesthetic point of view, general anesthetic agents can potentially exacerbate uterine atony and hence, the decision to switch off the agent should be considered to encourage uterine contraction. Last but not least, this case report demonstrated the importance of implementing evidence-based guidelines so that the skills and knowledge of staff members in obstetric emergencies can be maintained over time.

## Conflict of Interest

None declared.

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