

# Bakri balloon, Simple Solution for Management of Postpartum Hemorrhage in Low Resource Setting: Case Report and Literature Review, 2023

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## 1. Abstract

**1.1. Background:** Post-partum hemorrhage is an obstetric emergency in which risk assessment and early recognition is critical to avoid maternal morbidity and mortality. Bakri balloon is a simple technique used as second line treatment in the management of post-partum hemorrhage, with similar effectiveness to invasive surgical techniques.

**1.2. Case report:** A 27 years old woman admitted to Orotta Maternity National Referral Hospital on 23-11-2022 for elective induction at gestational age of 38 weeks and 3 days. She is known hypertensive for four years with poor adherence to treatment. Anti-hypertensive drugs were shifted to methyldopa and nifedipene during her first antenatal visit at 6<sup>th</sup> week of gestation and aspirin was started at the beginning of second trimester. Urine albumin was negative and ultrasonography of fetus and complete blood count revealed normal study. Induction was started with ripening of cervix by 50µg of misoprostol and labor progressed well until second stage, augmented for poor contraction and delivered a 3.4 kg female, active neonate vaginally. After delivery, she had post-partum hemorrhage which was intractable to oxytocin, misoprostol and bimanual compression. Bakri balloon was inserted as second line management and bleeding stopped immediately. Prophylactic antibiotic was given, and after 24 hours the balloon was removed and mother discharged home.

**1.3. Conclusion:** Bakri balloon has comparable effectiveness to invasive

techniques for management of post-partum hemorrhage. This could be cost effective and lifesaving in resource limited areas, were the invasive procedure are not feasible. So, introducing bakri balloon as second line treatment is advisable because it is less invasive and simple technique which preserves future fertility.

**2. Keywords:** Post-partum hemorrhage, bakri balloon, Eritrea

## 3. Background

Post-partum hemorrhage (PPH) is an obstetric emergency, traditionally defined as an estimated blood loss of more than 500 mL after a spontaneous vaginal delivery or more than 1,000 mL after cesarean delivery. [1, 2] The incidence of PPH due to uterine atony has been reduced in developed countries by improved intrapartum care, but because of increasing cesarean section rates, hemorrhage originating from the placental implantation site due to placenta previa remains a serious obstetric complication with maternal mortality and morbidity [2, 3]

Many risk factors for PPH have been reported and often are interdependent. The main causes of PPH which constitute 70-80% is uterine atony, a decreased contraction of the myometrium which reduces compression of the blood vessels supplying to the placental bed, thus increasing blood loss after delivery. [1, 4] PPH is managed in multidisciplinary approach, so it is vital to have written protocols for the departments for proper interdisciplinary care. [1, 5] When PPH is suspected an immediate careful thorough assessment of vulva, perineum, vagina and cervix to exclude lacerations with thorough assessment of placenta should be performed for its completeness [6].

Treatment of PPH mainly aims towards correcting the underlying cause of bleeding. In the case of uterine atony, the uterus is massaged, and uterotonic agents are administered. The first-choice uterotonic agent is oxytocin, misoprostol, tranexamic acid, carboplasta tromethamine or ergot alkaloids are recommended. [1] If bleeding didn't stop insertion of Bakri balloon is a simple second line management of PPH. The third line of management includes different surgical procedures like B-lynch, arterial ligation and hysterectomy's [7].

In 2001, Bakri and colleagues published a study discussing their use of a silicone, fluid-filled balloon designed for tamponade function. The balloon in question had a filling capacity volume of 500 cc of sterile saline, and had the strength to withstand a maximum internal and external pressure of 300 mmHg. [8] The balloon is a successful method for postpartum

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hemorrhage management, and this has been borne out by studies in recent years. [6] It can also be used as a temporary measure to decrease hemorrhage while waiting and preparing for other definite treatment, such as open abdominal surgery or uterine artery embolization, or while the patient is being transferred to another unit with more experience and resources [5, 6].

Balloon tamponade is used in PPH resulting from uterine atony, cesarean delivery with placenta previa, low lying placenta, or a focally invasive or adherent placenta acute or recurrent uterine inversion and secondary PPH (24 h to 12 weeks after delivery). [1, 6] Complications related to intrauterine balloon placements are very rare but potentially include uterine rupture, balloon prolapse, cervical trauma due to inflation at an incorrect location and air embolism when inflated with air or carbon dioxide [1].

In a study which was done in 2016 by Satori Nagai et.al stated that the overall success rate of Bakri balloon tamponade was 90% [7] The findings suggest that Bakri balloon tamponade may be applied to the treatment of massive PPH in uterine atony and placenta previa. [7] In another small case series, success rates of uterine balloon catheters for controlling hemorrhage ranged from 57% after cesarean delivery to 100% after vaginal delivery. [6] It was effective in all women with vaginal delivery and in all women with uterine atony who did not respond to medical uterotonic treatment [5].

## 4. Case Report

This was a 27 years old primiparous mother who was admitted to high risk ward of Orotta Maternity National Referral Hospital on 23-11-2022 according to her appointment for elective induction. Her first day of her last menstrual cycle (LMP) was on 28-02-2022 making gestational age of 38 weeks and 3 days. She was a known hypertensive patient for the last four years on hydrochlorothiazide 25 mg once daily and enalapril 10 mg daily with poor adherence to her treatment. She didn't have preconception counseling about the risk factor, but she visited to her nearby hospital after she misses her regular cycle.

She started following antenatal care (ANC) regularly from 6th week of gestation, making a total of seven visits during the whole pregnancy. Antihypertensive drugs were shifted to methyldopa 250mg oral TID and nifedipene 10mg oral BID in early pregnancy and aspirin 100mg was started at the beginning of second trimester. According to her ANC card, her blood pressure ranges between 110/70mmHg to 160/100 mmHg. The routine screening tests of ANC available in our setting like HIV and Syphilis was negative. She was economically stable and vaccinated for tetanus toxoid. From the very beginning, urine albumin via dipstick continues to be negative throughout the pregnancy which was done as routine tests. During the third trimester, patient assessed fully by an obstetrician and biophysical profile was reassuring followed weekly and elective induction at 38 weeks was planned after discounting aspirin. Patient didn't experience any headache, blurred vision or epigastric pain

throughout her pregnancy.

Physical examination during her arrival for induction was blood pressure 150/100mmHg in sitting position, pulse rate 88beats per minute, respiratory rate 18breaths per minute and temperature of 36.2 °C. Her height was 163cm, weight 74kg, body mass index (BMI) of 27.85. She had pink conjunctivae, non-icteric sclera and chest was clear to auscultation. On cardiovascular system, S1 and S2 were well heard without murmur or gallop. Fundal height was 36 weeks and fetal heart beat was positive with low BISHOP score.

Investigation result showed complete blood count of WBC  $9.25 \times 10^3/\mu\text{L}$ , hemoglobin 11.88g/dl, hematocrit 36.6% and platelet of  $228.7 \times 10^3 \times 10^3/\mu\text{L}$ . Urine analysis revealed negative albumin and leukocytes +2. Her blood chemistry revealed ALT 10 U/L, AST 18 U/L, ALP 201 U/L, albumin 3g/dL, BUN 4 mg/dL, and creatinine of 0.4 mg/dL. Trans-abdominal ultrasonography showed single viable fetus, cephalic presentation, and adequate amniotic fluid and fundal located placenta. After collecting laboratory results, elective induction at 38 weeks and 3 days gestation was started by ripening of cervix with 50µg of misoprostol sublingual every 4 hours.

She went to labor in 24 hours of ripening with misoprostol and transferred to labor ward as a case of latent phase of labor. At cervical dilatation of 6cm and station -1, the frequency of uterine contraction decreased and artificial rupture of membrane was done which was of clear liquor. Contraction resumes adequately and cervix dilates at a rate of 1cm/hour in which she reached to second stage in five hours. On second stage, contraction ceases again and augmentation with oxytocin was started. Contraction resumed and small episiotomy was done after crowning of fetal head and the mother delivered vaginally to a 3.4 kg active female neonate at 1:00pm on 24-11-2022.

Active management of third stage of labor was started by giving oxytocin 10 IU intramuscularly, uterine massaging and assessing episiotomy site for active bleeding. Placental extraction by controlled cord traction tried, but there was a resistance and bleeding increases in amount. Urinary catheter was inserted and bladder was kept empty. Third stage of labor prolonged to 20 minutes and additional 20 IU of oxytocin in fast running 0.9% normal saline was given and placenta was successfully removed with controlled cord traction. Placenta was checked and it was complete without avulsed cotyledons. Bleeding continues in amount and second intravenous line was secured and another 20 IU of oxytocin in bag, 600µg of sublingual misoprostol was given. Bimanual compression of the uterus was also accompanying the uterotonic agents, but it was unsuccessful. Perineum, vagina, and cervix were explored circularly for possible lacerations. There was no tear or laceration and episiotomy site was repaired, but still the bleeding was coming from the uterine cavity.

Abdominally, uterus was not contracted and fundal height was 18 weeks. Uterine rupture was entertained but trans-abdominal sonography showed empty uterine cavity with intact wall. Patient became dizzy and her

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blood pressure dropped from 160/90 mmHg to 110/60mmHg. She was put in trendelenberg position and already x-matched blood was started transfusion. Immediately, bakri balloon was inserted and inflated with 300cc of normal saline and the bleeding stopped. The total amount of blood loss was 1500cc and prophylactic 2g IV ampicillin was given. After 24 hours, bakri balloon was removed and discharged after 3 days.

## 5. Discussion

Low income countries are still facing several challenges in the management of postpartum hemorrhage. The main factors are poor infrastructure, manpower and transport system. Bakri balloon is a successful method for management of postpartum hemorrhage especially for uterine atony which is the most common cause of PPH and maternal mortality in low income countries. In developing countries, where the base line hemoglobin is low due to several factors like malnutrition, parasite infestation; even moderate amount of blood loss can cause hemodynamic instability leading to poor perfusion of vital organs. Unavailability of blood banks for immediate transfusion of blood and blood products in resource limited areas increases the necessity of early recognition of women at high risk to prevent the development of potentially lethal complications. [2] The purpose of this case report is to discuss indications and effectiveness of bakri balloon in the management of PPH.

The balloon tamponade is less invasive, fast and easily applicable which could be useful to hold bleeding until operative theater becomes ready or to transfer patients to higher centers for surgical management. After excluding other etiologies of PPH such as retained placenta, uterine rupture, genital tract trauma and uterine inversion, uterine tamponade should be timely initiated to prevent hemorrhagic, hypovolemic shock, dilutional coagulopathy, tissue hypoxia, and acidosis. [5, 6] If management didn't start on time, patient can develop Sheehan syndrome, renal failure, and acute respiratory distress syndrome. [2, 6]

Bakri balloon tamponade could be best choice of management of PPH even in lower health facilities run by midwives. In our setting bakri tamponade is not being practiced, for PPH intractable to uterotonic agents direct invasive surgery (hysterectomy) is usually performed. To our knowledge, this management method was used for the first time while bakri and colleagues published a study discussing their use of a silicone, fluid-filled balloon designed for tamponade function in 2001. [2] To their understanding, the data available to date are from case reports and case series but no randomized studies have appeared on the use of intrauterine balloons. [6, 9]

Our case is a high risk woman for PPH who delivered vaginally in which the operative team were on stand for invasive procedure (hysterectomy), but the only available bakri balloon stopped the bleeding immediately and saved her fertility. The success rate was reaching to 100% for PPH related to atony, whereas for labors that ended with cesarean delivery, the success rate was only 57% [6], and another study showed that overall success rate of 79%. [8] Techniques like arterial embolization needs

sophisticated infrastructure but the easy, inexpensive bakri balloon which could be cost effective in resource limited areas has similar efficacy. [5] So, this effectiveness could be an important reason to use bakri balloon in prevention maternal deaths related to PPH in remote areas.

After giving short training, even midwives can apply uterine balloon to prevent hemorrhage related tragic outcomes during delivery. Though, it's simple and effective using balloon tamponade as conservative management of PPH is not without complication. Because it is a foreign body, prophylactic antibiotics is necessary and close follow up of vital signs and ongoing bleeding through the tube. Uterine balloons can further complicated PPH by rupturing the uterus necessities immediate laparotomy. For this reason balloon inserted in lower health facilities should be used only for transporting patients to higher centers.

## 6. Conclusion

Based on its comparable effectiveness like surgical management in saving life, preserving future fertility and being simple technique which can be done by midwives, it could have profound outcome in decreasing maternal mortality and morbidity related to hysterectomies. The policy makers should provide it in stocks and organizing short courses for training of staff up to the level health station about the technique as a second line treatment. This could be cost effective and lifesaving in resource limited areas where surgical management is not feasible.

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