

DOI: <https://dx.doi.org/10.18203/2320-1770.ijrcog20213447>

## Original Research Article

# A study of uterine balloon tamponade for the management postpartum haemorrhage using Bakri balloon

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**Received:** 25 July 2021

**Accepted:** 16 August 2021

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## ABSTRACT

**Background:** PPH is the most common cause of maternal morbidity and mortality around the world. Incidence of PPH is 2-4% following vaginal delivery and 6% following cesarean delivery in India. Uterine atony is the most common cause of PPH. Treatment of PPH involves medical treatment and surgical management. In between medical and surgical management of PPH comes uterine balloon tamponade which is simple, less invasive and can be managed with minimal training.

**Methods:** A retrospective cohort study was done for 2 years at Vanivilas hospital, Bangalore medical college and research centre, Bangalore, Karnataka. Cases of atonic PPH managed using Bakri balloon were included in the study. The objective of the study was to study the effectiveness of uterine balloon tamponade using Bakri balloon in the management of atonic PPH and to study the maternal outcome.

**Results:** In this study total of 50 cases were included. Women were in the age group of 18 to 33 years. Regarding obstetric history, 22 (44%) were primigravida and 28 (56%) was multigravida. Among these 50 cases 8 (16%) women had undergone caesarean delivery and 42 (84%) had vaginal delivery. All women received blood transfusion, 17 (34%) received blood and blood components (like PRBC, FFP AND platelets) and 33 (66%) cases received only PRBC transfusion. In these 50 cases, 32 (64%) required ICU admission for monitoring, remaining 18 (36%) were monitored in the labor-room. Bakri balloon was effective in 49 cases among 50. Success rate was 98%.

**Conclusions:** Intrauterine balloon tamponade using Bakri balloon is effective for control of atonic PPH in majority of cases.

**Keywords:** PostPartum Hemorrhage, Bakri balloon, Uterine balloon tamponade

## INTRODUCTION

Postpartum haemorrhage (PPH) is defined as a blood loss of 500 ml or more within 24 hours after birth.<sup>1</sup> PPH is the leading cause of maternal mortality in low-income countries, and the primary cause of nearly 25% of all maternal deaths globally.<sup>2</sup> Sixty percent of pregnancy related maternal deaths occur during the postpartum period. A study by Li XF et al showed 45% of these maternal death occur in first 24 hours.<sup>3</sup> Important steps in the management of PPH are prediction and assessment of blood loss during third stage of labor. Uterine atony is the most common cause for PPH and constitutes about 70-

80% of PPH cases. Risk factors for atonic PPH are overdistended uterus in cases of multiple pregnancy, polyhydramnios, induction of labor, abnormal placentation, oxytocin augmentation, prolonged labor etc. PPH is unpredictable in more than fifty percent of cases.

Initial treatment of atonic PPH involves medical management, which includes replacement of fluids, blood and blood products and oxytocics use like oxytocin, methargin, misoprostol, and carboprost. Trenaxemic acid is also used. If there is failure of medical management of PPH one should consider uterine balloon tamponade (UBT) which is simple, less invasive and needs minimal

training for insertion. Surgical methods available for atonic PPH are step wise devascularization, uterine compression sutures, internal iliac artery ligation and hysterectomy. All these methods require expertise. The world health organization (WHO) recommends the use of UBT as a second-line treatment for PPH due to uterine atony when bimanual compression and uterotonic drugs fail. Uterine balloon tamponade is an important step to limit ongoing uterine blood loss while initiating other measures, and can be readily implemented by health care providers with minimal training. It can be a life-saving intervention, especially in low-resource settings where blood transfusion and surgical facilities may not be available.<sup>4</sup> If balloon tamponade is effective it will avoid surgical management. The presumed mechanism of action of intrauterine balloon catheters is application of inward to outward hydrostatic pressure against the uterine wall; this pressure may or may not be in excess of systemic arterial pressure. It is important to place the balloon as early as possible, it becomes ineffective once coagulopathy sets in because this procedure work by facilitating blood clotting in uterine vessels and thus reduces bleeding. Different types of balloons are used for uterine tamponade, namely Sengstaken–Blakemore tube, the Bakri balloon, the Rusch balloon, Foley catheters and the condom catheter balloon. Among these Bakri balloon is specially designed for control of bleeding in atonic PPH. Bakri balloon made of silicon, designed with two way catheter. Insertion is simple, can be used following vaginal delivery and during cesarean delivery also. PPH can lead to various complications like shock and multiorgan failure. Maternal death can occur if appropriate treatment not given in initial 2 hours. Hence timely and effective management is very essential to save life of mother and to reduce morbidity.

### Objectives

Objectives of current study were to study the effectiveness of uterine balloon tamponade using Bakri balloon in the management of atonic PPH and to study the maternal outcome.

### METHODS

A retrospective cohort study was done for 2 years from 1 January 2018 to 31 December 2019. Study was conducted at Vanivilas hospital, Bangalore medical college and research institute Bangalore, India. Cases of atonic PPH following vaginal delivery and caesarean delivery, managed using Bakri balloon were included in the study. cases of traumatic PPH were excluded from the study. Details of the patients were collected from Bakri balloon register and case records of the patients and the same were entered in a proforma.

Women with atonic PPH were considered for Bakri balloon insertion if there is no response to uterotonic treatment. Protocol followed for uterotonic treatment was, initially oxytocin IV infusion, methargin,

carboprost, trenaxemic acid and misoprostol. Class of hemorrhagic shock was assessed in PPH cases before insertion of Bakri balloon. Bladder was catheterised. Vagina packed. Depending on the patient's hemodynamic condition monitoring of patient done at labor room or ICU. Blood and blood components transfused depending on the requirement. Monitoring of vital parameters, urine output, uterine contraction and vaginal bleeding done. Required blood investigations were sent. If there was continued bleeding per vagina, decision for surgical management was done. Bakri balloon was deflated after patient is stable around 12-24 hours after insertion. Injectable antibiotics were given. Non pneumatic antishock garment (NASG) was used in hemodynamically unstable patients. There are four classes of hemorrhagic shock. In class 1 blood loss is around 15% presenting with giddiness and palpitation. In class 2 blood loss is 20-25% presenting with tachypnea, sweating and narrow pulse pressure. In class 3 blood loss is 30-35% presenting with tachycardia, tachypnea, air hunger and fall in blood pressure. In class 4 hemorrhagic shock 40-45% blood loss presenting with shock, anuria or oliguria.<sup>5</sup>

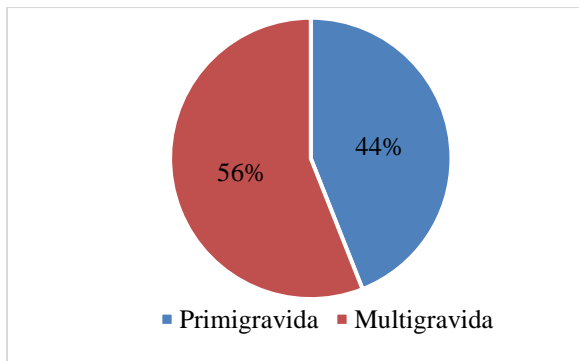
Data regarding demographic details of the women, obstetric history, associated obstetric complications and significant past history noted. Details of ICU care, blood and blood components transfusion noted. Duration of Bakri balloon insertion recorded. Details of surgery if required by the patient for the management of PPH noted. maternal outcomes also studied. Success of balloon tamponade defined as no active bleeding after Bakri balloon insertion and no need of surgical intervention for the management of PPH. Failure of balloon tamponade defined as continued active bleeding or need for surgical intervention for the management of PPH. Number of cases with success and failure with use of Bakri balloon for the management of PPH noted.

### Statistical analysis

The data collected was tabulated in SPSS. Descriptive statistics like numbers and percentages were enumerated for all categorical variables such as age, ICU care, blood and blood components transfusion etc. Relevant graphs and charts were potted. All statistical analyses were performed using the SPSS version 18. Descriptive Statistical tests like mean, proportion and percentage are used.

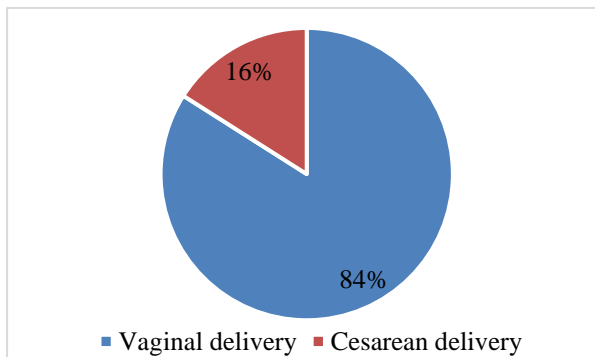
### RESULTS

The present study was done at Vanivilas hospital Bangalore medical and research institute Bangalore, Karnataka, India. The study was done for a period of 2 years. In total of 50 cases Bakri balloon was inserted for the management of atonic PPH in 2 years period. Women were in the age group of 18 to 33 years. Regarding obstetric history, 22 (44%) were primigravida and 28 (56%) were multigravida (Figure 1).



**Figure 1: Obstetric history.**

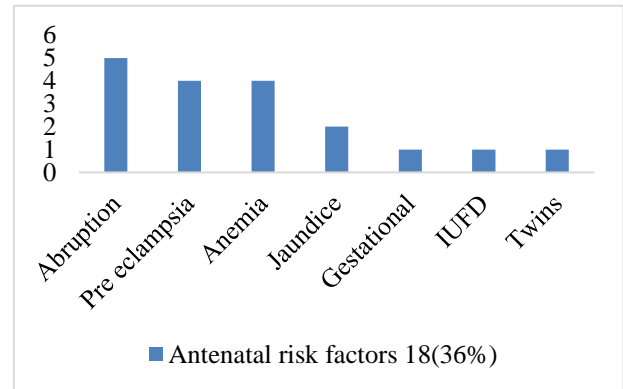
Among these 50 cases 8 (16%) women had undergone caesarean delivery and 42 (84%) had vaginal delivery (Figure 2). Of these 50 women, 18 (36%) cases were associated with identifiable antenatal risk factors. As shown in (Figure 3), 18 women had antenatal risk factors, anemia cases were 4, 4 cases of severe pre eclampsia (among these 2 cases had HELLP Syndrome), 5 cases of abruptio placenta in that 2 had DIC, gestational thrombocytopenia in 1 case, 2 cases of jaundice in pregnancy (1 case was AFLP and other was a case of intra hepatic cholestasis pregnancy), intra uterine fetal death 1 case, and twin gestation 1 case. In remaining 32 cases with no risk factors, 2 cases underwent manual removal of placenta for retained placenta and one case of inversion of uterus.



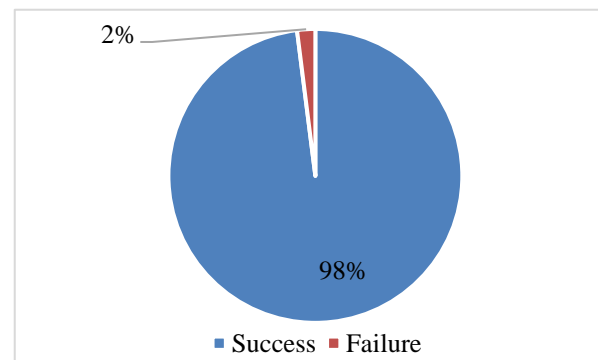
**Figure 2: Mode of delivery.**

Stages of hemorrhagic shock was assessed in PPH cases before insertion of Bakri balloon. Among these 50 cases, 37 (74%) had class 2 hemorrhagic shock and 13 (26%) had class 3 hemorrhagic shock. Mean duration for which Bakri balloon was left in situ was 20 hours. NASG (non pneumatic anti shock garment) was used in 23 cases for improving hemodynamic stability along with intravenous fluids and blood. All women received blood transfusion. In 50 cases 17 (34%) received blood and blood components (like PRBC, FFP and platelets) and 33 (66%) cases received only PRBC transfusion. In these 50 cases, 32 (64%) required ICU admission for monitoring, remaining 18 (36%) were monitored in labor-room. As shown in (Figure 4), Success rate was 98% (49 cases), Bakri balloon was effective in 49 cases among 50. In one

case there was failure with Bakri balloon, because of continued excessive vaginal bleeding she was taken for surgical management, peripartum hysterectomy was done. Later she improved and got discharged. Maternal outcome was good in all cases except one case who underwent peripartum hysterectomy, all mothers were fine and got discharged in healthy condition.



**Figure 3: Antenatal risk factors 18 (36%).**



**Figure 4: Success rate.**

## DISCUSSION

The utility of a balloon intrauterine tamponade in cases of uterine atony, especially when medical line of management of PPH fails or conditions preclude the use of uterotonics, or when excessive hemorrhage is observed should be kept in mind. Optimal treatment of uterine atony includes control of postpartum haemorrhage, replacement of fluid/blood loss, prevention of other complications which can happen subsequently. In our hospital, 50 cases were studied in whom Bakri balloon was inserted after initial PPH protocol failed to arrest bleeding. Women were in the age group of 18 to 33years. There were 22 (44%) primigravida and 28 (56%) multigravida. In a study by Aibar et al Bakri balloon for the management of postpartum hemorrhage primigravida were 58%.<sup>6</sup> Among these 50 cases 8 (16%) women had undergone caesarean delivery and 42 (84%) had vaginal delivery. In a study by Aibar et al Bakri balloon for the management of postpartum hemorrhage, out of the 24 deliveries, five were vaginal delivery and 19 were caesarean delivery.<sup>6</sup> In these 50 women, 18 (36%) cases

were associated with antenatal risk factors. Among these 18 women with risk factors, anaemia cases were 4, severe preeclampsia 4 cases (among these 2 cases had HELLP syndrome), abruptio placenta 5 cases in that 2 had DIC, gestational thrombocytopenia 1 case, 2 cases of jaundice in pregnancy (1 case was AFLP and other was a case of intra hepatic cholestasis pregnancy), intra uterine fetal death 1 case, and twin gestation 1 case. In remaining 32 cases with no risk factors, 2 cases underwent manual removal of placenta for retained placenta and one case of inversion of uterus. Stages of hemorrhagic shock was assessed in PPH cases before insertion of Bakri balloon. Among these 50 cases, 37 (74%) had class 2 hemorrhagic shock and 13 (26%) had class 3 hemorrhagic shock. All women received blood transfusion. Among 50 cases 17 (34%) received blood and blood components (like PRBC, FFP and platelets) and 33 (66%) cases received only PRBC transfusion. In our study Bakri balloon was effective in 49 cases among 50. Success rate was 98%. A study by Alouini et al Bakri balloon tamponade for severe post-partum haemorrhage: efficiency and fertility outcomes showed PPH was stopped in 88% of cases.<sup>7</sup> A study by Vitthala et al in a series of 15 cases, use of Bakri balloon in post-partum haemorrhage showed Bakri balloon was effective in 80% of cases.<sup>8</sup> A systematic review and meta-analysis by Suarez et al uterine balloon tamponade for the treatment of postpartum hemorrhage showed overall pooled success rate was 85.9% for uterine balloon tamponade.<sup>9</sup> The uterine balloon tamponade success rate was lower in cesarean deliveries (81.7%) than in vaginal deliveries (87.0%). In this study, we present our experience using Bakri balloon for a case of uterine inversion who was unstable hemodynamically when referred. We were successful in performing manual reposition of the uterus. However, profuse hemorrhage was still observed due to uterine atony. Therefore balloon tamponade was placed to stop the hemorrhage and reduce the risk of recurrence of inversion. The patient was then stabilized; no surgical management or hysterectomy was required. A similar case report by Sunjaya et al have showed the benefits of tamponade in cases of uterine inversion.<sup>10</sup> In another study by Yadav et al Bakri balloon was used effectively in cases of uterine inversion with fewer complications (infection and necrosis uterine) compared to uterine sutures.<sup>11</sup> Bakri balloon not only helps for uterine atony, it is also a re-inversion prevention method. Vivanti et al, were successful in using Bakri Balloon in the treatment of puerperal uterine inversion during caesarean section. This allowed treating extreme uterine atony, immediate haemorrhage, and prevented a possible risk of immediate recurrence.<sup>12</sup> In our study though some reviews mention that tamponade might be less effective in established DIC cases, we were successful in managing the atony and hemorrhage due to DIC in two cases of abruption complicated by DIC. Both patients were stabilised after transfusion of blood products. A similar study by Jelks et al have described two cases of massive postpartum hemorrhage complicated by DIC diagnosed after completion of cesarean delivery that were successfully temporized

nonsurgically with combined use of the Bakri balloon and nonpneumatic antishock garment (NASG).<sup>13</sup> Hence we can say that Bakri balloon should be tried without hesitancy in patients with abnormal coagulation parameters. Most often can be therapeutic or prevents further worsening of patients till other treatment modalities are being tried. In our study there was a case of retained placenta, where manual removal of placenta was done, followed by insertion of Bakri balloon in view of uterine atonicity and continued vaginal bleeding in spite of medical management. Bleeding stopped.

The world health organization (WHO) recommends the use of UBT as a second-line treatment for PPH due to uterine atony when bimanual compression and uterotonic drugs fail. Early use of intrauterine balloon tamponade is a way of limiting ongoing uterine blood loss while initiating other measures, and can be readily implemented by providers with minimal training. It can be a life-saving intervention, especially in low-resource settings where blood transfusion and surgical facilities may not be available.<sup>14</sup> In one case following vaginal delivery, there was failure with Bakri balloon, because of continued excessive vaginal bleeding she was taken for surgical management, peripartum hysterectomy was done. Later she improved and got discharged. Maternal outcome was good in all cases except one case that underwent peripartum hysterectomy; all mothers were fine and got discharged in healthy condition. No complications seen secondary to Bakri balloon.

## CONCLUSION

Intrauterine balloon tamponade using Bakri balloon is effective for control of atonic PPH in majority of cases. It is simple to insert, minimally invasive and effective to stop atonic PPH even in resource poor settings. Hence reducing catastrophes and adverse outcome in women with atonic PPH which reduces maternal morbidity and mortality.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Patil SB, Indumathi HK, Sarojini, Savitha C. A study of uterine balloon tamponade for the management postpartum haemorrhage using Bakri balloon. *Int J Reprod Contracept Obstet Gynecol* 2021;10:3347-51