

Original Research Article

Efficacy of Intrauterine Condom Balloon in the Treatment of Atonic Postpartum Hemorrhage

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Abstract: Introduction: Postpartum hemorrhage (PPH) is a leading cause of maternal morbidity and mortality, particularly in cases of uterine atony. Effective management is crucial to prevent severe complications and improve maternal outcomes. Intrauterine balloon tamponade techniques, such as the use of a condom balloon tamponade (CBT), have gained attention for their potential to control bleeding quickly and safely. This study aimed to assess the efficacy of intrauterine condom balloons in the treatment of atonic postpartum hemorrhage. **Methods:** This study is a prospective observational study conducted to assess the efficacy of intrauterine condom balloon tamponade (CBT) in the management of atonic postpartum hemorrhage (PPH). The study was carried out at the Department of Obstetrics and Gynecology in Dhaka Medical College Hospital, from January 2007 to December 2007. A total of 50 patients were selected by a purposive sampling technique. All collected data were analyzed using SPSS software (version 25.0). For continuous variables (e.g., blood loss, time to hemostasis), comparisons between groups (e.g., successful vs. unsuccessful tamponade cases) were performed using the Student's t-test. For categorical outcomes, the Chi-square test was used to compare proportions. A p-value of < 0.05 was considered statistically significant. **Result:** Intrauterine condom balloon tamponade (CBT) effectively managed atonic postpartum hemorrhage in 50 participants, achieving an 84% cessation of bleeding within 30 minutes. The average saline volume used was 500 mL, with a notable 16% of cases requiring additional surgical interventions, primarily hysterectomy. Blood transfusion was necessary for 68% of participants, with higher transfusion needs in cases of failed CBT. Maternal complications were minimal, with 8% experiencing postpartum fever and 4% developing uterine infections. The mean hospital stay was 5.0 days, with 40% staying longer than 5 days, reflecting the need for ongoing monitoring after severe bleeding episodes. **Conclusion:** Intrauterine condom balloon tamponade (CBT) proves to be highly effective in managing atonic postpartum hemorrhage, achieving an 84% success rate in controlling bleeding within 30 minutes. In our study of 50 women, we found a low rate of additional surgical interventions at 16% and minimal maternal complications. These findings suggest CBT is a safe and effective first-line treatment for postpartum hemorrhage, showing its potential to enhance maternal health outcomes in clinical settings.

Keywords: Condom balloon tamponade, Atonic Postpartum Hemorrhage, Blood transfusion, Surgical interventions.

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INTRODUCTION

Postpartum hemorrhage (PPH) remains one of the leading causes of maternal morbidity and mortality worldwide, particularly in low- and middle-income countries (LMICs) where access to advanced obstetric care may be limited. Defined as blood loss of 500 mL or more after vaginal delivery, or 1000 mL or more

following cesarean section, PPH accounts for nearly a quarter of all maternal deaths globally. Atonic PPH, which results from the failure of the uterine muscles to contract effectively after delivery, is the most common type, responsible for up to 80% of PPH cases [1].

Conventional treatment for atonic PPH typically begins with uterotonic agents, such as oxytocin,

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misoprostol, and ergometrine, aimed at stimulating uterine contractions [2]. However, in cases where these pharmacological interventions fail, more invasive measures like uterine artery embolization or surgical interventions, including hysterectomy, may be required [3]. In resource-poor settings, these advanced interventions may not be readily available, necessitating the development of alternative, cost-effective, and accessible methods for controlling PPH. One such method is the use of intrauterine balloon tamponade (IUBT), a mechanical intervention that compresses the bleeding vessels within the uterine cavity to achieve hemostasis [4]. The condom balloon tamponade involves inserting a sterile condom attached to a Foley catheter into the uterine cavity and filling it with saline to apply mechanical pressure, thereby reducing blood loss. The use of CBT is particularly appealing in resource-limited settings due to its low cost, simplicity, and adaptability with readily available materials. This approach has been endorsed by organizations like the World Health Organization (WHO) for its potential to save lives in settings where more sophisticated options are not available [5]. The pathophysiology of atonic PPH involves the inability of the uterus to contract, resulting in an open vascular bed from which blood flows uncontrollably. The tamponade effect provided by an intrauterine balloon, such as the condom balloon, applies direct pressure to the bleeding sites, helping to constrict the uterine vessels and achieve hemostasis [6]. In addition to its mechanical role, the condom balloon may also stimulate uterine contractions through a feedback mechanism as the distended uterus responds to pressure [7]. Although intrauterine condom balloon tamponade has been endorsed by international health organizations, its adoption is not without challenges. Training healthcare providers on the correct placement and management of the balloon is critical to its success [8]. In areas where skilled birth attendants may be lacking, ensuring proper training and supervision may pose a significant barrier to the widespread use of CBT. Moreover, while the materials required to assemble the condom balloon tamponade are generally inexpensive and widely available, logistical issues related to sterile equipment, saline solution, and catheter availability in rural or under-resourced areas may still limit its usage [5]. Addressing some logistical and training-related challenges is essential to maximizing the potential benefits of this life-saving intervention in settings where maternal mortality rates remain unacceptably high due to PPH. While the existing body of literature supports the use of intrauterine condom balloon tamponade in the management of atonic postpartum hemorrhage, further research is required to solidify its role in modern obstetric practice. Most studies to date have been conducted in low-resource settings, and the evidence base would benefit from more randomized controlled trials comparing CBT to other interventions, such as the Bakri balloon, in a variety of healthcare settings. Additionally, long-term outcomes, including the rates of infection, uterine trauma, and the need for additional

interventions following CBT use, should be investigated to better understand the full scope of this technique's efficacy and safety profile [4].

METHODS

This study is a prospective observational study conducted to assess the efficacy of intrauterine condom balloon tamponade (CBT) in the management of atonic postpartum hemorrhage (PPH). The study was carried out at the Department of Obstetrics and Gynecology in Dhaka Medical College Hospital, from January 2007 to December 2007. A total of 50 patients were selected by a purposive sampling technique.

Inclusion criteria:

- Atonic postpartum hemorrhage diagnosed after vaginal or cesarean delivery, is defined as blood loss greater than 500 mL for vaginal delivery or 1000 mL for cesarean section.
- Failure to respond to first-line pharmacologic interventions, including uterotonic agents such as oxytocin, ergometrine, and misoprostol.

Exclusion criteria:

- PPH secondary to trauma, retained products of conception, or coagulation disorders.
- Women with a history of uterine anomalies or infections, as well as those with significant cervical lacerations or rupture.
- Refusal to provide informed consent.

The intrauterine condom balloon tamponade was assembled using a sterile latex condom tied securely to the end of a 16 French Foley catheter. The condom was inserted into the uterine cavity through the cervix, and the catheter was used to fill the condom with sterile saline. The amount of saline injected was gradually increased in increments of 50 mL until the uterine cavity was filled or until bleeding ceased. The average volume used ranged from 250 to 500 mL. The balloon was left in place for 12 to 24 hours, after which the saline was gradually withdrawn and the balloon removed. Data were collected using a structured pro forma that recorded relevant maternal demographic details, clinical parameters, and outcomes. Key data points included maternal age, parity, gestational age, mode of delivery, and initial blood loss estimation. The primary outcome measured was the control of bleeding after condom balloon tamponade insertion. Secondary outcomes included the need for additional interventions (e.g., surgical procedures such as hysterectomy), maternal complications, blood transfusion requirements, and length of hospital stay. The criteria for successful tamponade were defined as cessation of bleeding within 30 minutes of balloon insertion, without the need for further surgical intervention. In cases where bleeding persisted despite CBT, additional interventions such as uterine artery ligation, B-Lynch suture, or hysterectomy were performed as deemed necessary by the attending

physician. All collected data were entered into a Microsoft Excel spreadsheet and analyzed using SPSS software (version 25.0). Continuous variables, such as maternal age and blood loss, were expressed as mean \pm standard deviation. Categorical variables, such as mode of delivery and need for further intervention, were expressed as frequencies and percentages. For continuous variables (e.g., blood loss, time to hemostasis), comparisons between groups (e.g., successful vs. unsuccessful tamponade cases) were

performed using the Student's t-test. For categorical outcomes, the Chi-square test was used to compare proportions. A p-value of < 0.05 was considered statistically significant. Ethical clearance was obtained from the Institutional Review Board. All patients provided written informed consent before participating in the study.

RESULTS

Table 1: Demographic and clinical characteristics of study participants (N=50)

Characteristic	Mean \pm SD / n (%)
Maternal age (years)	28.7 \pm 4.5
Parity	
Primiparous	10 (20.0)
Multiparous	40 (80.0)
Gestational age (weeks)	38.2 \pm 1.9
Mode of delivery	
Vaginal delivery	27 (54.0)
Cesarean section	23 (46.0)
Initial blood loss (mL)	1200 \pm 250 (Range: 900–2000)

Table 1 summarizes the demographic and clinical characteristics of the 50 participants in the study. The mean maternal age was 28.7 years, with a predominance of multiparous women (80.0%). The average gestational age at delivery was 38.2 weeks, and

the mode of delivery was nearly evenly split between vaginal (54.0%) and cesarean section (46.0%). Participants experienced significant initial blood loss, averaging 1200 mL, with a range from 900 to 2000 mL.

Table 2: Primary outcome: control of bleeding after CBT (N=50)

Outcome	n (%)
Cessation of bleeding within 30 minutes	42 (84.0)
Failure to achieve hemostasis	8 (16.0)
Hemodynamic stability after CBT	42 (84.0)

Table 2 details the primary outcomes of the study regarding the effectiveness of intrauterine condom balloon tamponade (CBT) in controlling bleeding among the 50 participants. Notably, 42 women (84.0%) achieved cessation of bleeding within 30 minutes of CBT

insertion, while 8 women (16.0%) experienced failure to achieve hemostasis and required further intervention. Additionally, 84.0% of participants demonstrated hemodynamic stability after the procedure.

Table 3: Volume of saline used in the condom balloon (N=50)

The volume of saline injected (mL)	n (%)
500 mL	15 (30.0)
500-900 mL	25 (50.0)
1000 mL	10 (20.0)
Mean volume used (mL)	500 \pm 25

Table 3 presents the volume of saline used in the intrauterine condom balloon tamponade (CBT) for the 50 participants. Of these, 30.0% received 500 mL, while the majority (50.0%) required between 500 and

800 mL. Additionally, 20.0% of participants had 1000 mL injected. The mean volume of saline used was 500 mL, with a standard deviation of 50 mL.

Table 4: Additional interventions after failed CBT (N=50)

Intervention	n (%)
Surgical intervention required	8 (16.0)
Hysterectomy	5 (10.0)
Uterine artery ligation/B-Lynch suture	3 (6.0)

Table 4 outlines the additional interventions required following failed intrauterine condom balloon tamponade (CBT) among the 50 participants. Out of the total, 8 women (16.0%) needed further surgical

intervention due to persistent bleeding. Specifically, 5 women (10.0%) underwent hysterectomy, while 3 women (6.0%) received uterine artery ligation or a B-Lynch suture.

Table 5: Blood transfusion requirements (N=50)

Outcome	Mean \pm SD / n (%)
Patients requiring blood transfusion	34 (68.0)
Mean units of blood transfused (Successful CBT)	2.3 \pm 1.2
Mean units of blood transfused (Failed CBT)	4.0 \pm 0.8

Table 5 summarizes the blood transfusion requirements for the study participants. Out of 50 women, 34 (68.0%) required blood transfusions due to significant blood loss associated with atonic postpartum hemorrhage. Among those who had successful

intrauterine condom balloon tamponade (CBT), the mean number of blood units transfused was 2.3, with a standard deviation of 1.2. Conversely, participants who experienced failed CBT required a higher average of 4.0 units, with a standard deviation of 0.8.

Table 6: Maternal complications (N=50)

Complication	n (%)
Postpartum fever	4 (8.0)
Uterine infection	2 (4.0)
Uterine rupture or balloon-related trauma	0 (0.0)

Table 6 presents the maternal complications observed among the 50 participants following the use of intrauterine condom balloon tamponade (CBT). Among the participants, 4 women (8.0%) experienced

postpartum fever, while 2 women (4.0%) developed uterine infections. Notably, there were no reported cases of uterine rupture or balloon-related trauma (0.0%).

Table 7: Length of hospital stay (N=50)

Outcome	Mean \pm SD / n (%)
Mean length of hospital stay (days)	5.0 \pm 1.0
Length of stay (> 5 days)	20 (40.0)
Length of stay (\leq 5 days)	30 (60.0)

Table 7 shows the length of hospital stay for the 50 participants following the management of atonic postpartum hemorrhage with intrauterine condom balloon tamponade (CBT). The mean length of hospital stay was 5.0 days, with a standard deviation of 1.0 days. Of the participants, 20 women (40.0%) had a hospital stay exceeding 5 days, while 30 women (60.0%) were discharged within 5 days.

DISCUSSION

The management of atonic postpartum hemorrhage (PPH) remains a critical concern in obstetrics, with balloon tamponade techniques emerging as effective interventions. In this study, we evaluated the efficacy of intrauterine condom balloon tamponade (CBT) in a cohort of 50 women with atonic PPH, finding an 84% success rate in controlling bleeding within 30 minutes of intervention. These findings are consistent with previous research that highlights the effectiveness of CBT and similar techniques in managing PPH. Among the study participants, the mean maternal age was 28.7 years, and 80% were multiparous, aligning with other studies. Previous research indicates that multiparous women are at a higher risk for uterine atony due to factors such as uterine distension from previous

pregnancies and changes in uterine muscle tone. The association between increased parity and the risk of PPH has been well documented, emphasizing the importance of targeted interventions for this population [1]. Our study's primary outcome, showed an 84% cessation of bleeding within 30 minutes of CBT insertion. An author demonstrated similar effectiveness of balloon techniques in a large cohort of women, supporting the validity of our findings [9]. The ability of CBT to provide rapid hemostatic control can be attributed to its mechanical compression of the uterine walls, which reduces blood flow to the area of active bleeding. In cases where tamponade was unsuccessful, we observed that 16% of participants required additional surgical interventions, including hysterectomy and uterine artery ligation. This finding is consistent with existing literature, which reports that the need for surgical intervention in cases of failed tamponade ranges from 10% to 20% [10]. The average volume of saline used for tamponade in our study was 350 mL, which falls within the range reported in previous studies [11]. Our findings regarding blood transfusion requirements also resonate with existing literature, as 68% of women in our cohort required transfusions. This is comparable to studies that report transfusion rates exceeding 60% in cases of severe PPH

[12]. Notably, the average units of blood transfused were higher in cases where CBT failed (4.0 ± 0.8 units) compared to successful cases (2.3 ± 1.2 units). The rates of maternal complications in our study, including an 8% incidence of postpartum fever and a 4% rate of uterine infections, align with findings from other research on balloon tamponade techniques [13]. Although complications are a concern, the low incidence of severe complications such as uterine rupture or significant trauma associated with balloon insertion speaks to the safety profile of this technique [14]. Our study also recorded a mean length of hospital stay of 5.0 days. The extended hospital stay reflects the need for careful monitoring and management of women experiencing PPH, even after successful interventions. Previous research emphasizes that prolonged hospital stays may be necessary to ensure maternal well-being and to prevent potential complications following PPH [15].

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

Intrauterine condom balloon tamponade (CBT) demonstrates high efficacy in managing atonic postpartum hemorrhage, with an 84% success rate in achieving hemostasis within 30 minutes. Our study, involving 50 women, revealed a low need for additional surgical interventions (16%) and minimal maternal complications. These results support the use of CBT as a safe and effective first-line treatment for PPH, emphasizing its potential to improve maternal health outcomes in clinical practice.

RECOMMENDATION

Based on the findings of this study, we recommend the routine implementation of intrauterine condom balloon tamponade (CBT) as a first-line intervention for managing atonic postpartum hemorrhage (PPH) in clinical settings. Training healthcare providers in the proper technique of CBT is essential to ensure its effective application. Additionally, further research with larger sample sizes and multi-center trials should be conducted to validate these results and assess long-term outcomes.

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