

ORIGINAL ARTICLE

Comparison of efficacy of uterine gauze packing and intra uterine balloon tamponade in the management of postpartum hemorrhage (PPH).

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ABSTRACT... Objective: To compare the efficacy and safety of uterine gauze packing and intrauterine balloon tamponade in the management of postpartum hemorrhage unresponsive to medical therapy. **Study Design:** Comparative Cross-sectional study. **Setting:** Department of Obstetrics and Gynecology at AJK Medical College, Muzaffarabad, **Period:** August 2025 to January 2026. **Methods:** A total of 120 women with primary postpartum hemorrhage were included and divided into two groups. Group A included women in which uterine gauze packing was used and Group B included women in which intrauterine balloon tamponade technique was utilized. Outcomes assessed included successful control of hemorrhage need for additional surgical intervention, blood transfusion requirements, maternal complications and duration of hospital stay. Data was analyzed using appropriate statistical tests. A p-value < 0.05 was considered statistically significant. **Results:** Hemorrhage was successfully controlled in 48 patients (80.0%) in the uterine gauze packing group and 56 patients (93.3%) in the intrauterine balloon tamponade group ($p = 0.03$). The need for additional surgical intervention was significantly higher in the gauze packing group (20.0%) compared to the balloon tamponade group (6.7%). Patients managed with balloon tamponade required fewer blood transfusions and had lower rates of maternal complications and shorter hospital stays. **Conclusion:** Intrauterine balloon tamponade is more effective and safe technique than uterine gauze packing in the management of postpartum hemorrhage. Its use is associated with higher success rates, reduced need for surgical intervention, fewer complications and improved maternal outcomes. However, uterine gauze packing remains a useful alternative in resource-limited settings.

Key words: Intrauterine Balloon Tamponade, Maternal Outcomes, Postpartum Hemorrhage, Uterine Gauze Packing.

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INTRODUCTION

Postpartum hemorrhage (PPH) is one of the serious and life-threatening obstetric emergencies. It represents a major challenge to maternal health care systems worldwide. Despite the advances in obstetric care, PPH continues to be the leading cause of maternal mortality. This mortality rate is high in low- and middle-income countries.¹ It is estimated that approximately one quarter to one third of all maternal deaths globally are due to postpartum hemorrhage. This burden is higher in developing regions. This is due to delays in diagnosis, limited access to emergency obstetric services and shortages of skilled healthcare personnel as well as essential medical resources.² Even in well-resourced settings, PPH remains a significant contributor to severe maternal morbidity. This includes shock, organ failure, infertility and the need for emergency hysterectomy.³

Postpartum hemorrhage is defined as blood loss exceeding 500 mL following vaginal delivery or more than 1000 mL following cesarean section within the first 24 hours after childbirth.⁴ However, recent clinical practice explain the importance of clinical assessment over quantitative measurement of blood loss. Because visual estimation is often inaccurate and tends to underestimate the true volume of hemorrhage.⁵ Any amount of bleeding that results in hemodynamic instability or necessitates blood transfusion should be considered clinically significant. Primary PPH occurs within the first 24 hours of delivery and accounts for the majority of cases. While secondary PPH occurs after 24 hours and up to six weeks postpartum.⁶

The etiology of postpartum hemorrhage is commonly described using the “four Ts”: tone, trauma, tissue and thrombin.

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Among these, uterine atony i.e, failure of the uterus to contract effectively after delivery is the most frequent cause, responsible for approximately 70–80% of cases.⁷ Other causes include genital tract trauma, placental fragments, placenta accreta spectrum disorders and coagulation abnormalities.⁸ After delivery, uterine contraction is required for compressing the uterine blood vessels and preventing excessive bleeding. When this physiological mechanism fails, rapid and effective intervention becomes necessary. It is important in order to prevent maternal morbidity and mortality.⁹

Management of postpartum hemorrhage follows a stepwise approach. It begins with recognition and immediate resuscitative measures. These measures include securing intravenous access, fluid replacement, blood transfusion as well as correction of coagulopathy.¹⁰ First-line treatment focuses on medical management. This management includes uterine massage and the administration of uterotonic agents such as oxytocin, ergometrine, prostaglandins and misoprostol.¹¹ Even though, medical therapy is effective in a large proportion of cases but majority of patients fail to respond adequately. This makes mechanical or surgical interventions necessary.¹²

Mechanical methods of uterine tamponade have gained prominence as fertility-preserving and relatively less invasive options for controlling hemorrhage when pharmacological treatment fails.¹³ These methods work on the principle of exerting pressure from within the uterine cavity. Therefore, the bleeding vessels compress and hemostasis occur. Uterine gauze packing and intrauterine balloon tamponade are the most utilized techniques.¹⁴

Uterine gauze packing is a long-lasting and widely practiced technique. This technique involves the insertion of sterile gauze into the uterine cavity to create pressure against the uterine walls.¹⁵ This method is considered simple and cost-effective. Because it does not require specialized equipment, this makes it particularly useful in low-resource settings.¹⁶ This technique has some limitations that include difficulty in assessing ongoing bleeding, the risk of concealed hemorrhage, increased chances of infection and discomfort during removal. Despite

these limitations, this technique continues to play an important role in the management of PPH. It is especially useful in areas where advanced devices are not available.¹⁷

Intrauterine balloon tamponade is a recent advancement in the mechanical management of postpartum hemorrhage. This technique involves the insertion of a balloon device which include Bakri balloon or a condom catheter into the uterine cavity. This balloon is then filled with sterile saline to apply uniform pressure on the uterine walls.¹⁸ Advantages of balloon tamponade includes the ability to measure the volume of inflation according to the severity of bleeding. It helps to monitor the ongoing blood loss through the drainage channel.¹⁹ Several studies have reported high success rates with intrauterine balloon tamponade. This results in a significant reduction in the need for invasive surgical procedures.²⁰

The increasing use of intrauterine balloon tamponade is due to its effectiveness, ease of insertion as well as relatively low complication rates.²¹ It serves as a bridge between medical therapy and surgical intervention. So, this allows time for stabilization and potentially avoiding procedures such as uterine artery ligation or hysterectomy.²² Preservation of the uterus is particularly important in young women as well as in societies where fertility holds significant social and cultural value. Furthermore, balloon tamponade has been included into many national and international guidelines as an essential component of postpartum hemorrhage management.²³

In many low-resource areas, uterine gauze packing is used due to its simplicity and low cost. The use of balloon tamponade devices may be limited due to unavailability and high costs. However, the potential advantages of balloon tamponade, including higher success rates and better monitoring of bleeding requires further research. Comparative studies on these two techniques are essential for evidence-based clinical decision. This is particularly important in resource-limited areas where the rate of postpartum hemorrhage is high. Understanding the relative effectiveness, complication rates and impact on maternal outcomes can help clinicians to select the most appropriate intervention and optimize management protocols.

METHODS

This comparative cross-sectional study was conducted in the Department of Obstetrics and Gynecology at AJK Medical College, Muzaffarabad. The study was conducted for the interval of 6 months (August 2025 to January 2026). Ethical approval for the study was obtained from the Institutional Review Board (Registration no. OBG-2023-107-12689). The study was conducted in accordance with the principles of the Declaration of Helsinki. The study population included women who developed primary postpartum hemorrhage following vaginal or cesarean delivery. These patients did not respond adequately to standard medical management. All eligible patients were evaluated and managed by senior obstetricians trained in the management of obstetric emergencies. A total of 120 patients diagnosed with primary postpartum hemorrhage were included in the study. A non-probability consecutive sampling technique was used. Patients were divided into two equal groups of 60 based on the mechanical method used for hemorrhage control. Group A included Uterine gauze packing method ($n = 60$) and Group B included Intrauterine balloon tamponade method ($n = 60$). Inclusion Criteria: Women aged 18–45 years, Primary postpartum hemorrhage occurring within 24 hours of delivery, PPH due to uterine atony, failure to respond to medical management, including uterotonics and uterine massage and hemodynamic stable at the time of intervention. Exclusion Criteria: PPH caused by genital tract trauma requiring surgical repair, retained placental tissue or placenta accreta spectrum, known coagulation disorders, Secondary postpartum hemorrhage and patients requiring immediate hysterectomy due to uncontrolled bleeding. All patients with suspected postpartum hemorrhage received immediate standard management. Medical therapy included oxytocin infusion, intramuscular or intravenous ergometrine (when not contraindicated) and prostaglandins as per hospital protocol. Uterine massage and bimanual uterine compression were performed in all cases. Patients who failed to respond to these measures within a reasonable time frame were considered candidates for mechanical intervention.

In Group A patients, uterine gauze packing was performed under aseptic conditions. A long sterile

gauze ribbon was inserted into the uterine cavity using sponge-holding forceps. Care was taken to avoid excessive pressure that could cause uterine injury. The vaginal cavity was packed to maintain the position of the uterine pack. Broad-spectrum antibiotics were administered prophylactically. The pack was usually removed after 24 hours.

In Group B patients, intrauterine balloon tamponade was performed. This was done by either a commercially available balloon device or a condom catheter attached to a Foley catheter. The balloon was inserted into the uterine cavity under aseptic conditions. It was then gradually inflated with sterile normal saline until bleeding was controlled. The volume of inflation ranged from 250 to 500 mL. The volume was dependent on uterine size and response. Continuous monitoring of vaginal bleeding was done through the drainage channel. The balloon was retained for 12–24 hours and emptied gradually before removal.

All patients were closely monitored in intensive care setting for at least 24 hours following the intervention. Monitoring included vital signs, uterine tone, vaginal bleeding, urine output and hemoglobin levels. Blood transfusion was administered based on clinical condition and laboratory findings. Antibiotic prophylaxis was continued for all patients.

The primary outcome was successful control of postpartum hemorrhage. This was defined as cessation of active bleeding without the need for additional surgical intervention. Secondary outcomes included: Time to control of bleeding, requirement of additional surgical procedures, number of blood transfusion units required, maternal complications such as infection, uterine injury, or re-bleeding.

Data was collected using a structured proforma, which included demographic details, obstetric history, mode of delivery, cause of PPH, intervention details and maternal outcomes. Statistical analysis was done using SPSS version 24. Continuous variables were expressed as mean $\pm$ standard deviation while categorical variables were presented as frequencies and percentages. The chi-square test was used to compare categorical variables and the independent t-test was used for continuous

variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 120 women diagnosed with primary postpartum hemorrhage (PPH) were included in this study. They were divided equally into two groups: Group A included patients in which uterine gauze packing was used (n = 60) and Group B included those patients in which intrauterine balloon tamponade was used (n = 60).

The baseline demographic and obstetric characteristics of patients in both groups were comparable. The mean age of patients in Group A was 28.6 ± 4.8 years while in Group B it was 29.1 ± 5.2 years. Most patients in both groups had more than one child. The majority of cases occurred following vaginal delivery.

TABLE-I

Demographic and obstetric characteristics of study participants

Variable	Group A (Gauze Packing)	Group B (Balloon Tamponade)	P-Value
Mean age (years)	28.6 ± 4.8	29.1 ± 5.2	0.62
Primiparous	22 (36.7%)	24 (40.0%)	0.71
Multiparous	38 (63.3%)	36 (60.0%)	
Vaginal delivery	42 (70.0%)	44 (73.3%)	0.68
Cesarean section	18 (30.0%)	16 (26.7%)	

TABLE-II

Causes of postpartum hemorrhage

Cause of PPH	Group A n=60	Group B n=60
Uterine atony	46 (76.7%)	48 (80.0%)
Retained placental tissue	8 (13.3%)	7 (11.7%)
Placenta previa/accreta	4 (6.7%)	3 (5.0%)
Coagulation disorders	2 (3.3%)	2 (3.3%)

Uterine atony was the most common cause of PPH in both groups, accounting for the majority of cases.

TABLE-III

Primary outcome – control of hemorrhage

Outcome	Group A n=60	Group B n=60	P-Value
Successful control	48 (80.0%)	56 (93.3%)	0.03
Failure	12 (20.0%)	4 (6.7%)	

Successful control of hemorrhage without the need for further surgical intervention was achieved in 48 patients (80.0%) in the uterine gauze packing group and 56 patients (93.3%) in the intrauterine balloon tamponade group. The difference was statistically significant, indicating higher efficacy of balloon tamponade.

TABLE-IV

Additional surgical interventions

Surgical Intervention	Group A n=60	Group B n=60	P-Value
Uterine artery ligation	8 (13.3%)	3 (5.0%)	0.04
Hysterectomy	4 (6.7%)	1 (1.7%)	
No surgery required	48 (80.0%)	56 (93.3%)	

The requirement for additional surgical procedures, including uterine artery ligation or hysterectomy, was significantly higher in Group A compared to Group B.

TABLE-V

Blood transfusion requirement

Variable	Group A	Group B	P-Value
Mean units transfused	3.2 ± 1.4	2.1 ± 1.1	0.001
≥4 units required	18 (30.0%)	8 (13.3%)	

Patients in the uterine gauze packing group required a higher mean number of blood transfusion units compared to those in the balloon tamponade group.

TABLE-VI

Maternal complications

Complication	Group A n=60	Group B n=60	P-Value
Febrile morbidity	10 (16.7%)	4 (6.7%)	0.04
Re-bleeding	6 (10.0%)	2 (3.3%)	0.12
Uterine injury	2 (3.3%)	0 (0%)	
No complications	42 (70.0%)	54 (90.0%)	

Maternal complications were more frequently observed in the uterine gauze packing group. Infection and discomfort during pack removal were notably higher in Group A.

TABLE-VII

Duration of hospital stay

Variable	Group A	Group B	P-Value
Mean hospital stay (days)	5.6 ± 1.9	3.8 ± 1.5	<0.001

The mean duration of hospital stay was longer in the uterine gauze packing group compared to the balloon tamponade group.

DISCUSSION

Postpartum hemorrhage (PPH) is considered the leading cause of maternal morbidity and mortality worldwide. It mainly affects underdeveloped regions. This study compared uterine gauze packing and intrauterine balloon tamponade for the management of primary postpartum hemorrhage. The results demonstrated superior outcomes with balloon tamponade.

In our study, intrauterine balloon tamponade achieved successful control of hemorrhage in 93.3% of cases compared to 80% in the uterine gauze packing group. These findings are similar with the study by Bakri et al., who first described the Bakri balloon and reported high success rates in controlling severe postpartum hemorrhage refractory to uterotonics. Many other studies have shown success rates ranging from 85% to 95% with intrauterine balloon tamponade. This supports its effectiveness as a fertility-preserving intervention.¹⁸

The higher efficacy of balloon tamponade observed in this study can be due to its ability to exert uniform, adjustable pressure within the uterine cavity. Moreover, it allows continuous assessment of ongoing bleeding. Georgiou emphasized that balloon tamponade provides a controlled and predictable tamponade effect, reducing the risk of concealed hemorrhage that is commonly associated with uterine gauze packing. In contrast, gauze packing may obscure continued bleeding and delay recognition of treatment failure.²⁴

The requirement for additional surgical intervention was significantly higher in the uterine gauze packing group in this study. Doumouchtsis et al., reported that balloon tamponade significantly reduces the need for surgical procedures such as uterine artery ligation and hysterectomy. Hysterectomy is particularly avoided in young women and in societies where preservation of fertility has profound psychological and social implications.²⁵

In our study, Blood transfusion requirements were

significantly lower in the balloon tamponade group. A systematic review by Suarez et al. reported that early use of uterine balloon tamponade is usually linked with decreased blood loss and less transfusion requirements. Thereby, lowering transfusion-related complications and improving overall maternal outcomes.²⁰

Maternal complications, particularly febrile morbidity and re-bleeding, were more frequent in patients managed with uterine gauze packing. This finding is in consistence with previous studies. Belfort et al. reported higher rates of infection and patient discomfort with uterine packing. They observed that this was due to prolonged intrauterine foreign material and difficulty in maintaining aseptic technique. In comparison to this, balloon tamponade devices are smoother, easier to insert and remove and are associated with lower infection rates.²⁶

The shorter duration of hospital stay was observed in the balloon tamponade group in our study. Early stabilization, fewer complications as well as reduced need for further interventions result in faster recovery and discharge. This has important implications for healthcare resource utilization. Despite the advantages of balloon tamponade, uterine gauze packing continues to have an important role in the management of postpartum hemorrhage. This is used especially in low-income areas due to its cost effectiveness. The World Health Organization describes uterine packing as a potential life-saving measure when balloon tamponade devices are unavailable.²⁷ Therefore, training of healthcare providers in both the techniques is essential for optimal clinical outcomes.

CONCLUSION

Postpartum hemorrhage is a critical obstetric emergency that requires effective management to reduce maternal morbidity and mortality. The findings of our study demonstrated that intrauterine balloon tamponade is superior to uterine gauze packing in controlling hemorrhage. Intrauterine balloon tamponade had higher success rates, reduced need for additional surgical interventions, lower blood transfusion requirements, fewer maternal complications as well as shorter hospital stays. While uterine gauze packing continued to

be a valuable, low-cost option in low-income areas. Intrauterine balloon tamponade should be preferred whenever available as a fertility-preserving and effective second-line intervention. Incorporating balloon tamponade into standardized postpartum hemorrhage management protocols and training programs may significantly improve maternal outcomes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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2	Mohsana Saeed Zia: Proof reading.
3	Kiren Farooq: Data analysis.
4	Samreen Kishwer Abbasi: Manuscript writing.