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Original Research Article

Comparative study of oxytocic drugs versus negative pressure suction method in management of atonic postpartum hemorrhage in high-risk mothers

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ABSTRACT

Background: Postpartum hemorrhage (PPH) is the most dreadful obstetric emergency and atonic PPH being most common cause of PPH accounting for 70-80% of cases leading to maternal mortality worldwide. The aim of the present study was to compare efficacy of oxytocic drugs and panicker PPH hemostatic suction cannula in management of postpartum haemorrhage in atonic PPH and to describe an effective, simple and minimally invasive method to avoid excess blood loss.

Methods: This study was carried out in Department of Obstetrics and Gynecology, Adesh Medical College and Hospital, Mohri, Kurukshetra. All the high-risk patients who delivered in Adesh Medical College by vaginal delivery and underwent PPH were included in this study. Patients requiring PPH management were admitted to the obstetrics ward and managed.

Results: This study included a total of 50 patients, divided equally into two groups. Group A consisted of 25 patients who were managed with medical therapy alone, while Group B included 25 patients who received both medical treatment and management with the Panicker PPH hemostatic suction cannula. In Group A, all patients required more than four minutes for the bleeding to stop. Of these, 15 patients experienced a blood loss between 250-500 ml, and 10 patients had a blood loss ranging from 501-1000 ml. Regarding transfusion requirements, 15 patients did not require any blood transfusion, whereas 6 patients received two units and 4 patients required three units. In contrast, all patients in Group B achieved cessation of bleeding within four minutes of cannula application. Among them, 20 patients had a blood loss of up to 250 ml, and 5 patients had a loss between 251-500 ml. Most patients (20) in Group B did not require any transfusion, and only 5 required a single unit of blood.

Conclusions: Management of atonic postpartum hemorrhage with the Panicker suction cannula proved to be highly effective and efficient. The study concludes that the Panicker suction cannula offers a simple, safe, and minimally invasive technique for the prompt control of atonic PPH. It serves as a cost-effective and practical alternative, particularly suited for use in rural or resource-limited settings, thereby contributing significantly to the reduction of maternal morbidity and mortality associated with postpartum hemorrhage.

Keywords: Atonic PPH, Bleeding minimally invasive, Negative intrauterine pressure suction device, Panicker cannula, Post-partum hemorrhage

INTRODUCTION

Postpartum hemorrhage (PPH) is the most dreaded obstetric emergency and is a leading cause of maternal mortality. The incidence of maternal death in low-income countries is as high as 1 in 45 in low-resource settings. Every year, 14 million women around the world suffer from PPH. It is estimated that worldwide, 140,000 women die of PPH annually, accounting for almost one maternal

mortality every four minutes. PPH contributes to nearly one-third of all maternal deaths worldwide.[1] The maternal mortality rate (MMR) in Indian women stands at a figure of 97 per 100,000 live births.[1,2] PPH still remains the leading cause of maternal mortality and morbidity, especially in low- and middle-income countries. The major contributing factors to PPH are anemia, multiparity, and delay in seeking antenatal care, leading to undiagnosed high-risk conditions. Common causes of PPH are the four Ts: tone (atonicity), tissue (retained bits, blood clots), trauma (genital tract injury), and thrombin (coagulopathy).

The reported incidence of PPH in India is 2-4% after vaginal delivery and 6% after cesarean section, with uterine atony being the most common cause (50%).[3] Postpartum hemorrhage is defined as blood loss from the genital tract exceeding 500 ml within 24 hours of vaginal delivery and 1000 ml or more during a cesarean section. According to American College of Obstetrics and Gynecology (ACOG) def PPH is defined as the amount of blood loss that decreases the hematocrit by 10% or any amount of blood loss necessitating a blood transfusion. For clinical purposes, amount of blood loss that has the potential to produce hemodynamic instability should be considered PPH.[4]

PPH-preventing interventions need to be prioritized and can be integrated with conventional methods of PPH prevention. The introduction of negative intrauterine pressure using a suction cannula can be one of the cheapest modalities to decrease PPH secondary to uterine atonicity. This negative pressure acts by sucking on the inner surface of the uterus, thereby mechanically closing all the sinusoids in the endometrium. The current study was designed for comparison of Panicker PPH suction cannula with medical methods in case of intractable postpartum hemorrhage.[1]

METHODS

This observational study was conducted in Department of Obstetrics and Gynaecology, Adesh Medical College and Hospital, Shahbad. All the patients who delivered in Adesh Medical College by vaginal delivery during the study period from December 2022 to November 2023 and underwent PPH, meeting the inclusion criteria were included in this study.

Inclusion criteria

Patients with anemia, IHCP, prolonged labor, previous history atonic PPH, hypertensive disease of pregnancy, multiple pregnancy, PROM, bronchial asthma, cardiac disease, Rh negative pregnancy and twins pregnancy with first vertex presentation were included.

Exclusion criteria

Traumatic PPH, previous cesarean section with risk of scar dehiscence, morbidly adherent placenta, congenital coagulation disorder and HELLP syndrome were excluded.

Methodology

Administration of 10 IU of oxytocin through the intravenous route slowly within one minute of delivery, placental delivery by controlled cord traction, and assessment of uterine tone in the third stage of labor as per the hospital protocol was done. In case of vaginal delivery, if atonic bleeding did not stop with all routine medical measures, Panicker suction cannula was applied in lithotomy position, and the bladder was catheterized. Blood clots were removed from the uterine cavity by bimanual compression. The cannula was kept in position as long as the threat of recurrence of bleeding was expected. Panicker's PPH suction haemostatic cannula is a 25 cm long and 12 mm diameter SS cannula with multiple holes of 4 mm diameter at the distal 12 cm (total 48 holes). The cannula was inserted into the post-partum uterus to prevent and treat PPH. After introducing the cannula, 700 mm of negative pressure was applied. The wall of the uterine cavity was strongly sucked into the small holes of the cannula, thereby closing all the bleeding sinusoids and arterioles due to the pressure effect of suction. Because the wall of the uterine cavity was strongly sucked and held by the cannula, the uterus could not expand and relax even in atonic PPH. The negative suction pressure was maintained for 30 minutes so that clotting occurred in these small vessels and bleeding was permanently stopped. After 30 minutes, the suction was released and the cannula was slightly rotated and taken out. This was a very simple and safe breakthrough invention to prevent and treat PPH with absolute success.

In case of caesarean section, one end of the suction tube was connected to the cannula, and the other end was inserted through the uterine wound and brought outside the vagina. If the cervix was not well dilated, a small size cannula was used. The outer end of the suction tube was connected to the suction machine. The uterine wound was closed when negative suction pressure was working. The study comprised a total of 48 patients (30 patients with medical management and 18 patients managed with medical treatment and Panicker cannula). No surgical method was required after using Panicker cannula.

RESULTS

The age distribution of patients in both groups was comparable. In Group A (medical management alone), the largest proportion belonged to the 21-25 years age group (32%), followed by 26-30 years and 31-35 years (20% each). Similarly, in Group B (medical management plus Panicker cannula), most patients were also in the 21-25 years range (28%), with a slightly higher proportion in the 31-35 years group (24%). Both groups had fewer patients below 20 years and above 35 years. Overall, the demographic pattern was similar across the two groups (Table 1).

Table 1: Age distribution.

Age group (years)	Group A (Medical Management, n=25)	Percentage	Group B (Medical + Panicker Cannula, n=25)	Percentage
< 20	3	12	2	8
21-25	8	32	7	28
26-30	5	20	5	20
31-35	5	20	6	24
> 35	4	16	5	20
Total	25	100	25	100

In Group B, the majority of patients (72%) required only one application of negative pressure with the Panicker suction cannula. A smaller proportion needed two applications (16%), while only 12% required three applications. This indicates that a single application was effective for most patients (Table 2).

Table 2: Number of times negative pressure applied (Group B Only, n=25).

No. of times negative pressure applied	Number of patients	Percentage
Once	18	72
Twice	4	16
Thrice	3	12
Total	25	100

The distribution of risk factors was similar in both groups. Anemia was the most common risk factor overall (38%), followed by hypertensive disorders of pregnancy (18%) and prolonged labor (14%). Previous history of atonic PPH, PROM, and multiple pregnancy were less frequent. Rare risk factors such as IHCP, cardiac disease, and Rh-negative pregnancy were also seen in small numbers. Overall, both groups showed comparable patterns of underlying risk factors (Table 3).

All patients in Group B achieved bleeding control within 4 minutes using the Panicker suction cannula, whereas none in Group A did. In contrast, all patients in Group A required more than 4 minutes for bleeding to stop. This shows that the Panicker cannula significantly reduced the time needed to control hemorrhage (Table 4).

Table 3: Distribution of risk factors among patients (n=50).

Risk Factor	Group A (Medical Management, n=25)	Percentage	Group B (Medical + Panicker Cannula, n=25)	Percentage	Total (n=50)	Percentage
Anemia	10	40	9	36	19	38
Hypertensive disease of pregnancy	4	16	5	20	9	18
Prolonged labor	3	12	4	16	7	14
Previous history of atonic PPH	2	8	3	12	5	10
Multiple pregnancy	1	4	1	4	2	4
PROM	2	8	1	4	3	6
IHCP	1	4	1	4	2	4
Bronchial asthma	1	4	0	0	1	2
Cardiac disease	1	4	1	4	2	4
Rh-negative pregnancy	0	0	1	4	1	2
Twin pregnancy (vertex)	0	0	1	4	1	2
Total	25	100	25	100	50	100

In Group B, 80% of patients had blood loss limited to ≤250 ml, and none exceeded 500 ml. In contrast, Group A showed significantly higher blood loss, with 60% losing 251-500 ml and 40% losing 501-1000 ml. This indicates that the Panicker cannula markedly reduced overall blood loss compared to medical management alone (Table 5).

Most patients in both groups did not require blood transfusion, but the need was significantly lower in Group B (80%) compared to Group A (60%). In Group A, several patients required multiple units, including two or three units, whereas in Group B no patient required more than one unit. This shows that the Panicker cannula helped reduce the need for blood transfusion (Table 6).

Table 4: Time taken to stop bleeding.

Time taken to stop bleeding	Group A (Medical Management)	Percentage	Group B (Medical + Panicker Cannula)	Percentage
≤ 4 minutes	0	0	25	100
> 4 minutes	25	100	0	0
Total	25	100	25	100

Table 5: Volume of blood loss.

Volume of blood loss (ml)	Group A (Medical)	Percentage	Group B (Medical + Panicker Cannula)	Percentage
Up to 250 ml	0	0	20	80
251-500 ml	15	60	5	20
501-1000 ml	10	40	0	0
Total	25	100	25	100

Table 6: Blood transfusion requirement.

Number of blood transfusions	Group A (Medical)	Percentage	Group B (Medical + Panicker Cannula)	Percentage
None	15	60	20	80
One unit	0	0	5	20
Two units	6	24	0	0
Three units	4	16	0	0
Total	25	100	25	100

Table 7: Summary of comparative findings.

Parameter	Group A (Medical Only)	Group B (Medical + Panicker Cannula)	Interpretation
Total patients	25	25	Equal sample size
Time to stop bleeding	> 4 minutes (100%)	≤ 4 minutes (100%)	Cannula achieved faster hemostasis
Blood loss	40% had 501-1000 ml	80% ≤ 250 ml	Cannula reduced blood loss significantly
Blood transfusion need	40% needed 2-3 units	20% needed 1 unit	Less transfusion requirement with cannula
Surgical intervention	Some may require further management	None required	Cannula avoided surgery
Outcome	Slower and more blood loss	Faster control, minimal blood loss	Panicker cannula more effective

The comparative summary shows that Group B, treated with medical management plus the Panicker suction cannula, had clearly superior outcomes. Bleeding stopped much faster (within 4 minutes), blood loss was significantly lower, and fewer patients required blood transfusion. No surgical intervention was needed in Group B, unlike Group A, which showed slower control and higher blood loss. Overall, the Panicker cannula proved to be more effective than medical management alone (Table 7).

DISCUSSION

In the present study, the comparative efficacy of oxytocic drugs and the Panicker negative pressure suction cannula was evaluated in the management of atonic postpartum hemorrhage (PPH) among high-risk mothers. Out of 50 patients studied, 25 received conventional medical management (Group A) and 25 were managed with a combination of medical therapy and the Panicker PPH hemostatic suction cannula (Group B). The results demonstrated that use of the Panicker suction cannula resulted in rapid control of bleeding within four minutes in all patients, significant reduction in blood loss, and decreased transfusion requirements compared to the medical management group.

Comparison with previous studies

Our results are consistent with those of Panicker TNV (2017) who first described the vacuum suction hemostatic device for atonic PPH. He demonstrated that negative

pressure application inside the uterus effectively closes the uterine sinusoids, resulting in prompt cessation of bleeding. In our study, all patients in Group B achieved hemostasis within four minutes, confirming the high efficacy and safety of this device.[5]

Similar findings were observed by Priyanka et al, who reported that 82% of patients achieved bleeding control within four minutes using the SR vacuum cannula. This is comparable to the present results, which showed rapid hemostasis in 100% of cases in the suction group.[6]

Purwosunu et al studied vacuum-induced uterine tamponade and reported bleeding control in most cases within one hour. The faster response in our study (≤4 minutes) reflects the superior negative pressure dynamics of the Panicker cannula compared with balloon tamponade techniques, which rely on outward pressure rather than suction.[7]

The findings are further corroborated by Samartha et al who observed that 68.2% of patients needed negative pressure only once to control bleeding. In our study, 72% required a single suction cycle, indicating reproducible success across populations.[8]

Similarly, Sharma et al demonstrated that prophylactic use of a negative intrauterine pressure suction device reduced the incidence of atonic PPH by more than 75%. Our findings reinforce its therapeutic role when used as an intervention rather than prophylaxis.[9]

Shanthi and Chitra found a statistically significant reduction in mean blood loss (223.6 ml) in women managed with a vacuum retraction cannula compared to 299 ml in those with AMTSL alone. In our study, 80% of patients in the suction group had blood loss ≤250 ml, aligning with these observations.[10]

The efficacy of the negative pressure cannula also compares favorably to other tamponade devices. A systematic review and meta-analysis by Suarez et al reported that uterine balloon tamponade (UBT) achieved an overall success rate of about 85.9%, which, although substantial, was lower than the 100% success observed in our suction group. Balloon tamponade relies on compression, while suction devices actively collapse bleeding vessels, providing faster hemostasis.[12]

Recent evidence by Dyer et al demonstrated an 86% success rate of vacuum-induced tamponade in atonic PPH, supporting the present findings of rapid and effective control.[15] Similarly, a retrospective cohort (2024) comparing balloon versus vacuum-induced hemorrhage devices showed a significantly lower massive transfusion rate in the vacuum group ($p<0.05$).[11]

In a randomized trial (2024) comparing suction tube tamponade with balloon tamponade, the suction group showed a 44% reduction in major bleeding events (RR = 0.56).[13] Another RCT evaluating three devices artery clamp, suction cannula, and condom tamponade found the suction method achieved the shortest hemostasis time and least blood loss.[14] These contemporary trials substantiate our finding that vacuum-based methods outperform balloon tamponade and pharmacologic therapy, especially in resource-limited settings.

Our results are also aligned with Rathore et al and Snelgrove et al who emphasized the importance of simple, cost-effective uterine tamponade methods in reducing maternal mortality. The Panicker cannula, being reusable, affordable, and requiring minimal training, is particularly suited for peripheral or rural hospitals where access to surgical interventions is limited.[3,4]

Clinical implications

The Panicker PPH suction cannula provides a simple, rapid, and highly effective technique for the management of atonic PPH unresponsive to oxytocics. It obviates the need for surgical procedures such as uterine artery ligation or hysterectomy and significantly reduces the requirement for blood transfusion. Furthermore, its application is minimally invasive, carries no significant complications, and can be performed by trained obstetricians even in low-resource facilities.

Summary

All patients in Group B achieved hemostasis within 4 minutes. 80 % of Group B patients had ≤ 250 ml blood loss compared to none in Group A. 80 % of Group B required no transfusion, while 40 % in Group A required 2-3 units. No patient in Group B required surgical intervention. These findings confirm that the Panicker suction cannula is a highly effective, safe, and low-cost method for treating atonic postpartum hemorrhage and could significantly reduce maternal mortality when incorporated into standard PPH management protocols.

CONCLUSION

Management of intractable PPH was made easier due to Panicker suction cannula. All the patients who were not managed by medical treatment were completely treated by Panicker suction cannula, and surgical treatment was not needed in any of the patients. This concluded that Panicker suction cannula was the safest, cheapest, and best method in the treatment of intractable PPH, especially in rural settings, to reduce the maternal mortality rate due to haemorrhage.

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