BRIEF COMMUNICATION

Vacuum Devices for Treating Postpartum Hemorrhage: Indian Innovation, Indian Pride

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ABSTRACT

Postpartum hemorrhage (PPH) is a major cause of maternal morbidity and mortality. We focus on two innovations by Indian gynecologists, the Panicker's vacuum suction cannula and the SR suction cannula. These effective devices are economical and easy-to-use, and help prevent and manage PPH. They can also be used to reduce bleeding in non-PPH indications. These Indian innovations are a matter of pride, and need to be studied extensively in diverse settings. This will help ensure that their benefits can be shared across the world.

Keywords: Atonic PPH, blood loss, India, LSCS, PPH, vaginal delivery

Postpartum hemorrhage (PPH) is a major cause of maternal morbidity and mortality.[1] This is especially true in developing countries, where maternal health resources may be limited. Many of the known risk factors for PPH, such as prolonged labor, anemia and delayed operative intervention, are more common in such settings. The greatest risk is conferred by prior PPH due to any cause, placenta previa, placental abruption, uterine rupture and multiple gestation. Newer risk factors including hypertension, diabetes and ethnicity are also emerging.[2]

Even though there is significant interest in the diagnosis and treatment of PPH, current management strategies leave much to be desired. Uterine massage, oxytocin and methylergonovine are the standard of care, along with hemostatic drugs.[3] In some cases, these do not prove sufficient hemostasis and invasive interventions such as internal iliac artery ligation and hysterectomy may be required. However, there is no concordance between various national guidelines[4] and more effort is required to develop effective means of management.

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IMPACT OF PPH

PPH is associated with a significant impact on maternal health, as well as on the healthcare system and healthcare costs.[1] This impact worsens as the hemorrhage continues. It is rational, therefore, to develop means of preventing, limiting and managing PPH in a time-bound and cost-effective manner. Researchers across the world have proposed novel ways of diagnosing and stratifying PPH, as well as limiting it.[5,6] Many of these methods and devices require technology, which is either inaccessible or unaffordable to persons working in resource-limited healthcare system. In such a situation, Indian innovations, the vacuum suction hemostatic devices, stand out as an efficient and extremely cost-effective method of preventing and managing PPH.

INNOVATION 1

Panicker[7] proposed that creating negative pressure within the uterine cavity, using a cannula made of stainless steel or plastic, results in stoppage of bleeding from the postpartum uterus in women with atonic PPH and abnormal uterine bleeding (AUB). He inserted a 25 cm long cannula, 12 mm in diameter, with multiple holes of 4 mm diameter over the distal 10 cm of the cannula, into the uterus, through the vagina, to reach the fundus (Fig. 1). He connected the cannula to a suction apparatus to produce and maintain negative pressure of 700 mm mercury. This approach was tried in 55 women (40 post-normal vaginal deliveries and 15 post-lower segment cesarean sections [LSCS]) who experienced PPH refractory to uterotonic drugs used as standard of care.[7]

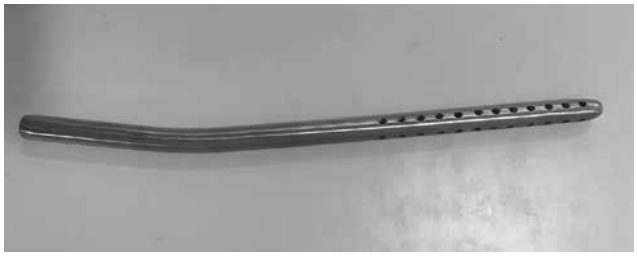

Figure 1.

Panicker reported his findings and highlighted the need to ensure accurate placement and care of the cannula, as well as to manage cervical and vaginal tears and lacerations concomitantly. The author also mentioned the limitations of the cannula, stating that it is effective only in managing uterine sources of bleeding. He suggested an improvisation in case a suction machine is not available, proposing the use of a mechanical suction unit of ventouse or manual vacuum aspiration (MVA) syringe.

INNOVATION 2

The Uterine Vacuum Retraction System, developed by HS Ram[8] uses the SR suction cannula to control PPH after vaginal delivery. Vacuum retraction is created by negative pressure within the uterine cavity, using a cannula made of stainless steel, various lengths of cannulae are available (Fig. 2). The appropriate model, based upon size of uterus and mode of delivery, is inserted in the uterus, through the vagina, to reach the fundus. The cannula is connected to a suction apparatus to produce and maintain negative pressure of 650 mm mercury for 15 minutes.

The SR suction cannula was used to manage atonic PPH in an observational study. The bleeding stopped within 3 minutes in 60 women (50%); in 38 women (31.7%) bleeding cessation occurred between 3 to 4 minutes and in 22 women (18.3%) it took 4 minutes for the bleeding to stop. In 75 (62.5%) women, negative pressure was applied only once, in 20 (16.7%) it was applied twice, while in 25 women (20.8%) the negative pressure had to be applied three times to stop the bleeding. Blood collected in bottle after SR Cannula Application ranged from 100 to 150 mL.[9]

These innovations have been tried in multiple patients at our hospitals, and we attest to the efficacy and efficiency of these economical tools (personal experience).

INTROSPECTION

It is surprising; however, to see minimal research published on Paniker's PPH cannula and SR vacuum suction cannula. Is this because these innovations are from resource-challenged medical care settings, and not from established "research" centers? Is it because these devices display their maximum benefit in peripheral centers, which do not have a "voice" in publications? Is it because the obstetricians who use these cannulae are so busy with their clinical work that they neglect publishing their data?

Figure 2.

INSIGHT

Whatever the reason, we should celebrate Indian innovations with pride, rather than with prejudice.[10] These innovative ideas deserve a fair chance, and must be studied in controlled settings, to assess their efficacy, safety and tolerability. The Indian vacuum devices are supported by experience and by eminence.

We suggest a pragmatic method of placing these devices in clinical practice (Table 1). The cannulae can be used for primary, secondary as well as tertiary prevention of atonic PPH, after both vaginal delivery and LSCS. Application of cannula helps clear the field of vaginal bleeding for better assessment and ease of stitching. As the cervical walls get apposed to the cannula, bleeding from cervical tear reduces and cervical stitching can be done in comfortable and clean environment.

We have used these devices in non-PPH indications as well. Small size cannulae can be used in endometrial

Table 1. Usage of PPH Vacuum Suction Devices

Clinical usage

- Primary prevention: Prophylactic insertion when risk factors are present
- Secondary prevention: Insertion of device when excessive PPH is anticipated, e.g., rise in shock index
- Tertiary prevention: Curative insertion if bleeding is excessive

Caveats

- Check patency of cannula holes
- Check placement of tip of cannula at tip of fundus
- Check degree and duration of negative pressure

Check points

- Hemodynamic monitoring
- Local monitoring of cannula

Concerns

- Does not address cervical/vaginal bleed
- Does not obviate need for good obstetric and nursing care

polyp removal, scar ectopic and post-abortal heavy bleeding. Once backed by robust published evidence, these economical interventions will certainly find utility in maternity centers across the world, and serve to improve maternal health.

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Awake Prone Positioning Benefited Select COVID Patients

A meta-analysis reported in *Lancet Respiratory Medicine* stated that the awake prone positioning reduced the need for intubation in selected patients with severe COVID-19. The meta-analysis included data from a 2021 meta-trial with a total of more than 1,000 COVID-19 patients, mostly in ICU, which found awake prone positioning to decrease the need for intubation. It also included data from 7 randomized controlled trials (RCTs) which did not find a difference in intubation risk among almost 700 patients on conventional oxygen therapy. A total of 29 studies were included in the review, with 10 RCTs (1,985 patients) and 19 observational studies (2,669 patients). In 10 RCTs, awake prone positioning significantly reduced the need for intubation in the overall population, compared to supine position, especially among those patients who received advanced respiratory support at enrollment (relative risk [RR] 0.83 [0.71-0.97]) and those in the ICU (RR 0.83 [0.71-0.97]). No reduction was seen in patients receiving conventional oxygen therapy (RR 0.87 [0.45-1.69]) or in non-ICU settings (RR 0.88 [0.44-1.76]).

The study concluded that awake prone positioning should be encouraged among COVID-19 patients with acute hypoxemic respiratory failure, especially when the patients are in ICU and need advanced respiratory support. (*MedPage Today, March 17; Lancet Respiratory Medicine, March 16, 2022*)

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Original Research Article

A comparative study of efficacy of panicker vacuum retraction cannula and intrauterine foleys balloon tamponade in atonic post partum haemorrhage

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Abstract

Introduction: According to the World Health Organization (WHO), Post-partum hemorrhage (PPH) is a leading cause of maternal deaths worldwide and the majority of these deaths take place in immediate postpartum period because of uterine atonicity. Effective non-surgical treatments are essential for managing PPH not responding to first-line management before proceeding to surgical interventions.
Materials and Methods: Hospital- based study, 100 patients were recruited with 50 patients in each group & randomly selected for Panicker's (Uterine suction Tamponade) group or Foley's Balloon Tamponade (Uterine balloon Tamponade) group designated as Group P & Group-B respectively.
Results: In Panicker's Group, 60% patients (n=30) experienced blood-loss between 150–200 mL while in Balloon Tamponade group, significantly higher proportion 40% (n=20) patients experienced blood-loss between 201–250 mL,(P=0.001). In Group P, 78%(n=39) and in Group B 62%(n=31) patients had hemoglobin deficit of less than 2.5 g/dl. In Group P, 24% (n=12) while in Group B, 48% (n=24) cases required blood transfusion, (p value =0.012). In Group P, 78% (n=39) had bleeding successfully controlled as compared to 46% (n=23) participants in Group B, (P<0.001).In Group P, 8% (n=4) participants required application of hemostatic sutures while. In Group B, 26% (n=13) needed it, (p=0.033). In Panicker's group, 8% (n=4) participants required ligation of anterior division of internal iliac arteries as compared to Group B, 14% (n=7) participants. In Group P, 6% (n=3) while in Group B, 14% (n=7) patients underwent hysterectomy.
Conclusion: Our study reflects that Panicker's cannula offers an equally cost-effective yet more physiological and effective approach with faster intra-uterine blood evacuation, superior bleeding control and seems to be a promising alternative in management of atonic PPH.

Keywords: Atonic PPH, Panicker's cannula, Foley's balloon Tamponade.

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1. Introduction

According to World Health Organization (WHO), Post-partum hemorrhage (PPH) is a leading cause of maternal deaths worldwide and is described as a blood loss of more than 500 mL within 24 hours after vaginal delivery or more than 1000 mL following cesarean delivery.[1,2] Say et al using a new approach, updated the previous WHO systematic study by developing and analyzing global, regional, and sub-regional statistics of the causes of maternal mortality during 2003-09 and accounted for 661,000 deaths globally due to hemorrhage.[3] Majority of these deaths take place in immediate postpartum period following childbirth, because of uterine atony following placental delivery.[4] Hypotonicity, residual products of conception or trauma to uterus or lower genital tract may result in PPH.[5]

Primary PPH and secondary PPH are the two types of PPH. Secondary PPH occurs beyond 24 hours and can occur up to 6 weeks after delivery. Atonic PPH can also be caused by certain risk factors, such as prolonged labor, pregnancy-related hypertension, accidental hemorrhage, anemia, polyhydramnios, and large newborns.[6]

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WHO suggests a series of measures as‘first-line treatment for women’who start bleeding. Management consists of a series of quick, progressively more invasive procedures until bleeding stops. Fluid resuscitation, placental removal, bimanual uterine compression, tranexamic acid, uterotonics, suturing lower genital tract injury, replacement of blood products, laparotomy, balloon tamponade, stepwise uterine devascularization, uterine compression sutures, and hysterectomy are some of these interventions.[5] The WHO suggests giving additional uterotonics, a second dose of tranexamic acid, and an intrauterine balloon tamponade (UBT) to women who still bleed after receiving first-line treatment (a condition known as "refractory PPH") before invasive surgical procedures are performed.[4,7] The most frequent surgical procedure done to treat severe PPH not responding to standard therapy after cesarean (CS) deliveries is emergency hysterectomy.[8] An in-depth understanding of the etiology of PPH in women who experience refractory PPH as well as the correlation between maternal features and refractory PPH is crucial.[9] The most common medication used for preventing atonic PPH, oxytocin, has low real-world effectiveness due to its susceptibility to heat and quality problems.[10]

Surgical procedures are not often available limited resource settings and are linked to a higher risk of morbidity and mortality.[11] Uterine compression sutures, such as B-Lynch brace sutures are simple and practiced by obstetricians worldwide. Total or sub-total emergency peri-partum hysterectomy’(EPH) is a procedure used as last option when all conservative methods have failed to manage atonic PPH and are associated with high maternal morbidity and mortality.[13]

Effective non-surgical treatments are essential for managing refractory PPH to prevent surgery & treat patients where surgery is not a feasible option.[11] In recent years, number of intra-uterine devices available for treating refractory hemorrhage has rapidly increased. According to WHO, use should only be permitted in situations where care escalation and monitoring are feasible.

Two types of uterine tamponade devices are available for treatment of PPH i.e. Uterine Balloon Tamponade (UBT) and Uterine Suction Tamponade (UST). A modified Bakri balloon and suction tube uterine tamponade via Levin tubing are examples that have been documented in research.[11] Two hypotheses exist regarding how hemostasis is accomplished by a intra-uterine balloon tamponade. First is, the UBT device prevents bleeding from the spiral arteries by applying pressure from within that is greater than the pressure in systemic arteries similar to mechanical action of uterine artery ligation. A more recent notion suggests that the tamponade device’s hydrostatic pressure directly compress the uterine arteries.[11]

On the other hand, uterine suction tamponade device creates negative pressure inside uterus, which causes it to shrink and prevent atonic PPH. It is comparable to physiological mechanism of uterine contraction and retraction that occurs naturally to prevent atonic PPH. It is extremely efficient, simple, economical, life and fertility-saving technique which can be made accessible in any situation and serve as the first line of treatment against atonic PPH.

Panicker's suction cannula is a quick, safe & easy device for treating and preventing atonic PPH when medical management fails. Through vagina, a 25 cm long, 12 mm diameter cannula with several 4 mm diameter holes across the distal 10 cm of the cannula is inserted into uterus to reach fundus & attached to a suction device to create and sustain a negative pressure of 700 mmHg.[14] It works on principle that soft cervical tissues are pulled into small pores in cervical section of cannula when negative pressure is applied. The uterine cavity becomes closed as a result.[16]

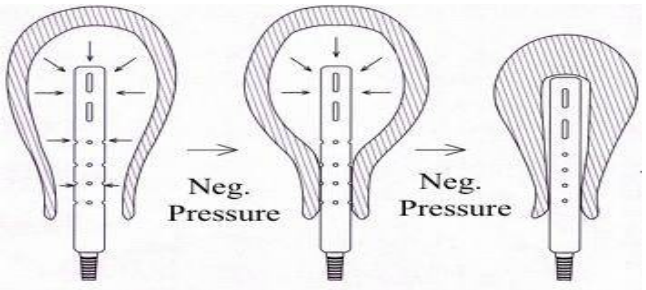

Figure 1: Mechanism of action of Panicker’s suction cannula inside uterine cavity. (* Diagram Cited from link.springer.com)

Both uterine tamponade devices have been taken into consideration for treatment of refractory PPH and found effective. Uterine balloon tamponade method is quickly gaining attraction as the recommended second-line treatment.[17] Devices which are improvised include balloon catheters (such as the Sengstaken–Blakemore tube, the Foley catheter, and the Rusch balloon) that are used off-label and those that rely on use of surgical gloves and condoms connected to Foley or other catheters. Bakri balloon, BT-Cath balloon, Ellavi balloon (by Sinapi Biomedical), and EBB tamponade device (Belfort-Dildy) are Purpose-designed UBTs for atonic PPH.[18,19]

UST devices like Panicker’s suction cannula due to their similar mechanism of action as that of physiological uterine retraction, may be regarded as a biologically plausible alternative for the treatment of unresponsive PPH.[20]

This study was conducted to study efficacy and safety of Panicker Vacuum Retraction Cannula as compared to Intra-uterine Foleys Balloon Tamponade in management of atonic PPH and to compare the amount of blood loss between the two in atonic PPH after vaginal deliveries and caesarean sections.

2. Materials and Methods

This comparative interventional study was conducted in Department of Obstetrics & Gynecology, Nehru Hospital, BRD Medical College at Gorakhpur (Uttar Pradesh) from 01/02/2024 to 31/01/2025 after due permission from Institutional scientific committee & ethical committee. The sample size was taken as 100 patients with 50 patients in each group and were randomly selected for Panicker's (UST) group designated as Group-P or Balloon Tamponade (UBT) group designated as Group-B.

Inclusion criteria were all Primary atonic PPH women in labour room/ operation theatre with failed medical management who gave written informed consent. Patients with primary PPH due to causes other than atonicity, secondary PPH and patients in sepsis were excluded from the study. Patient's history and other study-specific relevant information was documented in a pre-structured proforma. Laboratory tests (Hb% estimation before and after PPH episode) were also done to document the amount of blood loss.

In Uterine Suction Tamponade (UST) group, specially designed stainless steel Panicker cannula was introduced into uterine cavity up to fundus and was connected to suction apparatus, and a negative pressure of 700 mmHg was created. Blood collected inside uterine cavity was aspirated out & collected in suction jar. With continued intra-uterine negative pressure, blood coming in suction cannula reduced and then stopped. The negative pressure was maintained for about 30 minutes and then cannula was slowly removed after releasing the suction. Once the blood coming out of the suction tube stopped, vaginal tears or episiotomy if given were repaired with cannula-in-situ. Bleeding per vaginum and vitals were monitored every 15 min for 2 hours. Procedure abandoned if more than 300 ml of blood collected in suction apparatus during the observation period or vitals worsened during the procedure or in observation period.

In Uterine Balloon Tamponade (UBT) group, we followed the Chhattisgarh technique. A condom-attached foley's catheter was inserted into the uterine cavity. The balloon was inflated with 200-300 ml of normal saline and connected to a collection bag. I V antibiotics were started. The pressure effect was maintained for 6 hours then removed following the protocol. Bleeding per vaginum and vitals were monitored every 15 min. for 2 hours. The procedure was abandoned if vitals worsened during observation period or UBT bag collection more than 100 ml in 1 hour.

3. Results

In our study, a total 29% women were between 20-25 years age, 37% between 25-30 years and 34% women in 30-35 years age. According to obstetric score, 45% women were primigravida, 18% women were 2nd gravida, 21% were 3rd gravidas and 16% were grand multi-gravidas.

Majority of the patients (67%) had gestational age between 36- 40 weeks, 25% were more than 40 weeks and 8% were less than 36 weeks. Total 46% women belonged to high risk pregnancy category. 32% patients in Group-P and 60% patients in Group-B were high risk pregnancies. In Panicker's group, 20% (n=10) of participants underwent induction or augmentation of labour, while the majority, 80% (n=40) had spontaneous onset and progress of labour. In contrast, balloon Tamponade Group was noted to have a higher rate of labour induction or augmentation, observed in 38% (n=19) of participants, with remaining 62% (n=31) having spontaneous onset and progress of labour. In Group-P, 70% (n=35) patients had vaginal delivery, Caesarean sections were performed in 20% (n=10) of cases while assisted vaginal deliveries using forceps or vacuum occurred in 10% (n=5) patients. In Group B, 52% (n=26) patients had vaginal deliveries, Caesarean section done in 44% (n=22) patients and Assisted vaginal deliveries in 4% (n=2) cases.

Out of total 68 vaginal deliveries including assisted vaginal deliveries, both groups had a similar percentage of patients with average duration of labour {Group P 70% (n=28) vs. Group B 71.5%(n=20)} and prolonged labour {Group P 30% (n=12) vs. Group B 28.5% (n=8)}. In Panicker's Group, 2% (n=1) of participants had minimal blood loss of <100 mL, majority (60%, n=30) experienced blood loss b/w 150–200 mL, while 26% (n=13) had blood loss b/w 100–150 mL. In Group B, 4% (n=2) patients had blood loss <100 mL, and 4% (n=2) lost 100–150 mL with majority (52%, n=26) having blood loss b/w 150–200 mL and a significantly higher proportion 40% (n=20) patients experienced blood loss b/w 201–250 mL as compared to Panicker's group; this finding was statistically significant (P=0.001).

In Group P, majority of patients 78%(n=39) had hemoglobin deficit of less than 2.5 g/dl, indicating a relatively smaller drop in hemoglobin levels postpartum. A deficit between 2.5–5 g/dl was observed in 6 (12%) cases while 5 (10%) participants experienced a significant drop of more than 5 g/dl. In Group B, 62% (n=31) participants had a Hb deficit of less than 2.5 g/dl, 9 (18%) cases had a deficit between 2.5–5 g/dl and 10 (20%) patients had a deficit greater than 5 g/dl.

In Group P, 24% (n=12) of participants required blood transfusion, while the majority, 76%(n=38) did not need this intervention. In Group B, 48% (n=24) cases required a blood transfusion, which was quite higher than in Group P. The remaining 52% (n=26) required no transfusion. It was statistically significant (p value 0.012).

In Group P, 78% (n=39) patients had bleeding controlled, while in 22% (n=11) bleeding control was not achieved. In Group B, 46% (n=23) of participants had bleeding controlled, while a higher proportion, 54% (n=27), faced challenges in controlling bleeding. It was statistically significant (P<0.001).

In Group P, 8% (n=4) of participants required application of hemostatic sutures for bleeding control while majority, 92% (n=46) did not require it. In Group B, 26% (n=13) of participants needed hemostatic sutures, which was higher than Group P. The remaining 86% (n=43) did not need this intervention. And this finding was statistically significant (p=0.033)

In Panicker's group, 8% (n=4) of participants required bilateral ligation of anterior division of internal iliac arteries while in UBT group, 14% (n=7) cases required internal iliac ligation, which is higher than in Group P. However, this result was statistically not significant.

In Group P, 6% (n=3) patients required hysterectomy whereas in Group B, 14% (n=7) patients underwent hysterectomy, which is slightly higher than in Group-P. However, it was also statistically not significant.

Table 1: Distribution of participants based on age & obstetric score

S. No.		Group-P (n=50) (Panicker group)	Group-B (n=50) (UBT group)	Total (n=100)
Age Category				
1	20-25 Years	19	10	29
2	25-30 Years	18	19	37
3	30-35 Years	13	21	34
Obstetric Score				
1	Primigravida	20	25	45
2	Gravida 2	10	8	18
3	Gravida 3	13	8	21
4	Gravida 4 & more	7	9	16

Table 2: Distribution of participants based on gestational age & high risk pregnancy

S. No.		Group P (n 50)	Group B (n 50)	Total (n 100)
	Gestational age			
1	<36 weeks	3	5	8
2	36-40 weeks	33	34	67
3	>40 weeks	14	11	25
	High risk pregnancy			
1	Yes	16 (32%)	30 (60%)	46 (46%)
2	No	34 (68%)	20 (40%)	54 (54%)

Table 3: Distribution of participants based on onset of labor

S. No.	Onset/progress of labor	Group P (n 50)	Group B (n 50)	Total (n 100)
1	Induction/ augmentation	10 (20%)	19 (38%)	29 (29%)
2	Spontaneous	40 (80%)	31 (62%)	71 (71%)

Table 4: Distribution of participants based on mode of delivery

S. No.	Mode of delivery	Group P (n 50)	Group B (n 50)	Total (n 100)
1	Vaginal delivery	35 (70%)	26 (52%)	61 (61%)
2	Caesarean section	10 (20%)	22 (44%)	32 (32%)
3	Assisted vaginal delivery	5 (10%)	2 (4%)	7 (7%)

Table 5: Distribution of participants based on duration of labor

S. No.	Duration of labor in VD/Assisted VD	Group P (n 40)	Group B (n 28)
1	Average (6-8 hours)	28 (70%)	20 (71.5%)
2	Prolonged (>8 hours)	12 (30%)	8 (28.5%)

Table 6: Distribution of participants based on amount of blood loss, Hb deficit & blood transfusion

S. No.		Group P n50	Group B n50	p value
Blood loss (in ml)				
1	<100	1 (2%)	2 (4%)	0.001
2	100-150	13 (26%)	2 (4%)	
3	150-200	30 (60%)	26 (52%)	
4	201-250	6 (12%)	20 (40%)	
Hemoglobin deficit (g/dl)				
1	<2.5	39(78%)	31(62%)	0.20
2	2.5-5	6(12%)	9(18%)	
3	>5	5(10%)	10(20%)	
Blood transfusion				
1	Yes	12 (24%)	24(48%)	0.012
2	No	38 (76%)	26(52%)	

Table 7: Distribution of participants based on duration of labor

S. No.	Bleeding controlled	Group P	Group B	p value
1	Yes	39 (78%)	23 (46%)	<0.001
2	No	11 (22%)	27 (54%)	

Table 8: Distribution of participants based on requirement of surgical interventions

		Group P	Group B	p value
A. Haemostatic sutures				
	Yes	4 (8%)	13 (26%)	0.033
	No	46 (92%)	37 (74%)	
B. Bilateral Internal iliac artery (Anterior division) ligation				
	Yes	4 (8%)	7 (14%)	0.523
	No	46 (92%)	43 (86%)	
C. Hysterectomy				
	Yes	3 (6%)	7 (14%)	0.317
	No	47 (94%)	43 (86%)	

4. Discussion

In our study, the majority of participants in Group P (Panicker group) fell within the 20-25 years age category (n= 19, 38%), whereas Group B (Foley's UBT group) had a higher percentage in the 30-35 years category (n=21, 42%). The difference in age distribution is important to consider, as maternal age is a known influencing factor in obstetric outcomes. Younger mothers are often presumed to have better uterine contractility due to a more resilient myometrium, which may contribute to more effective response observed with Panicker's cannula in Group P. Suarez et al. have identified that women above 30 years are at a higher risk for uterine atony, particularly in multiparous women or those with prolonged labour.[21] Additionally, Miuli et al. emphasized that advancing maternal age is linked with reduced myometrial responsiveness to oxytocin and increased rates of operative deliveries, both of which correlate with increased risk of PPH.[22]

The obstetric profile revealed that 40% (n =20) of women in Group P were primigravida compared to 50% (n =25) in Group B. However, in our study, higher primigravida representation in Balloon Tamponade group may have affected the results, as primigravidas may also often experience more intense and prolonged labour, increasing the risk of uterine exhaustion and atony.

Tindell et al. highlighted that uterine atony is not limited to multiparas and that primigravidas can equally be at risk, particularly when induction of labour or instrumental deliveries are involved.[19] In our study, despite the higher number of primigravida in Foleys balloon group, Panicker group achieved better hemostatic outcomes. Moreover, Samartha et al. demonstrated successful outcomes of vacuum retraction cannula across varying parity levels, reinforcing the versatility of this approach. This further strengthens the conclusion that Panicker's device is not restricted by gravidity status and offers consistent control over PPH regardless of obstetric score.[23]

In our study, the majority of participants (67%) delivered between 36 – 40 weeks of gestation-66% (n= 33) in Group P (Panicker) and 68% (n=34) in Group B (Foley's balloon). A significant proportion of our patients 46% (n = 46) belonged

to high-risk pregnancy category and 54% (n=54) were classified as low-risk pregnancy. This finding has critical implications, as PPH may occur in low-risk pregnancies but high-risk pregnancies-characterized by conditions like anemia, hypertensive disorders, polyhydramnios, multiple gestation and prolonged labour are more prone to post-partum complications including PPH. Widmer et al. emphasized importance of individualized second-line interventions in high-risk obstetric cases.[9]

Labour was spontaneous in onset and progress in 80% patients of Group P and in 62% of Group B, while induction or augmentation was done in 20% of Group P and 38% patients of Group B. Labour induction, especially when done with high-dose oxytocin or prostaglandins, increases risk of uterine muscle fatigue, which can lead to atony and refractory PPH. Hence, higher use of labour induction/augmentation in Group B may have influenced higher rates of uncontrolled hemorrhage and surgical interventions observed in that group. This observation is strongly supported by Overton et al., who noted that pharmacologically induced labour is a significant contributor to uterine atony, especially when active management of third stage of labour is not optimally timed or executed.[11]

In this study, a prolonged duration of labour (>8 hours) was observed in 30% of participants in Group P and 28.5% in Group B which was almost similar in both groups. Prolonged labour leads to uterine muscle fatigue, impairing the uterus's ability to contract efficiently after delivery, thereby increasing the risk of refractory atonic PPH. Numerous studies, including Tindell et al. have established prolonged labour as an independent predictor of atonic PPH.[19] It suggests that when labour extends beyond 8-10 hours, particularly in primigravidas or augmented labours, likelihood of uterine exhaustion increases substantially. Panicker's Group had a higher number of vaginal deliveries (70%) compared to UBT Group (52%), while cesarean sections were more common in Group B (44%) than Group P (20%). This is an important distinction, as the risk of PPH, particularly refractory PPH, is known to be higher after cesarean sections. The reason lies in possible uterine incision extensions and longer surgical durations that contribute to increased blood loss in caesarean sections. According to Suarez et al., UBT is slightly less effective in cesarean sections than in vaginal deliveries, with success rates of 81.7% and 87.0% respectively.[21] These figures align with our findings where the Balloon Tamponade group having more cesarean cases showed reduced effectiveness in controlling hemorrhage. Conversely, the Panicker group, with more vaginal deliveries, achieved better hemostatic results. Moreover, Haslinger et al. observed that vacuum-induced uterine tamponade not only helped preserve hemoglobin but also minimized the need for escalation to blood transfusions and ICU care.[24]

In our study, favourable outcome was seen in Panicker's group with respect to blood loss, 60% had blood loss between 150-200 ml, and only 12% crossed 200 mL. In contrast, balloon Tamponade Group had 40% of women losing blood between 201-250 ml- a clear indicator of higher and more uncontrolled bleeding and this finding was statistically significant. Blood loss of 150–250 mL was observed in most patients treated with vacuum suction, which was comparable to our findings in Group P.

A hemoglobin deficit of <2.5 g/dl was seen in 78% of Group P indicating a relatively smaller drop in Haemoglobin levels post partum and in 62% patients of Group B. Conversely, 20% in Group B had a deficit >5 g/dl, which was double that of Group P (10%). This stark difference highlights the superior performance of Panicker's vacuum cannula in controlling blood loss. Gulersen et al. reported that intra-uterine vacuum devices significantly reduce hemoglobin deficit and massive transfusion needs compared to balloon tamponade.[25] Similarly, Suarez et al., in a meta-analysis, noted that balloon tamponade is associated with variable results and greater hemoglobin drops in cesarean-associated PPH.[21] Blood transfusions were required in 24% patients of Group P and in 48% patients of Group B with a statistically significant difference (p=0.012). This again highlights superior blood - sparing capacity of the Panicker device. Blood transfusions, while life-saving, carry their own risks including transfusion reactions, transmission of infections, and increased hospital stay. Raouf and Abdullah (2020) showed that early control of bleeding with mechanical interventions significantly reduced need for transfusion.[26] Bleeding was successfully controlled in 78% (n= 39) patients of Group P, whereas only 46% (n=23) of Group B achieved similar outcomes. This finding was highly statistically significant (p<0.001) and underlines the core conclusion of this study that Panicker's vacuum retraction cannula is markedly more effective in achieving hemostasis in atonic PPH compared to UBT. This aligns with findings from D'Alton et al. who reported a 94% success rate with vacuum-induced hemorrhage control devices.[27] Furthermore, Singata-Madliki et al. in a direct comparison between suction tube uterine tamponade (STUT) and UBT, found higher success and lower discomfort in the suction group.[28] In our study, 8% patients in Group P and 26% in Group B required application of uterine hemostatic sutures for bleeding control which was higher and the difference was statistically significant (p =0.033) and the trend was consistent that Panicker group had fewer surgical interventions overall. Surgical procedures increase surgical risk, lengthen recovery and add to healthcare costs. As noted by B-Lynch et al., while compression sutures during laparotomy are highly effective, they are invasive and ideally reserved for when all other measures fail. In Panicker's group, 8% (n= 4) of women required bilateral ligation of Anterior division of internal iliac arteries for securing hemostasis as compared to 14% (n=7) in balloon Tamponade Group (p=0.523). While not statistically significant, this difference reflects the trend toward greater

surgical escalation in the Foley group. Cebekhulu et al. emphasize that suction methods like STUT are more acceptable and practical alternatives in such cases.[29] Avoiding need for surgical interventions, not only reduces patient morbidity but also the strain on healthcare systems- which the Panicker group in our study better achieved. Only 6%(n=3) patients of panicker's group required hysterectomy compared to 14% (n =7) in balloon Tamponade Group. Though, the difference was not statistically significant (p=0.317), still this finding points toward a uterine-sparing advantage with this suction device. Hysterectomy, although life-saving results in permanent loss of fertility, and hence, avoiding it is a major goal in modern obstetrics. Studies by Makhija et al. and Pandey & Kumari documented cases where vacuum retraction methods helped avoid hysterectomy even in severe haemorrhage.[30,31] Panicker's device, by quickly establishing a negative-pressure seal and collapsing the uterus from within, often prevents the hemorrhage from progressing to a stage requiring surgical interventions. This is crucial in resource-constrained settings, emergency cases, or in patients with comorbidities.

5. Conclusion

Post-partum hemorrhage continues to be a major contributor to maternal morbidity and mortality, particularly in low-resource settings where access to advanced medical interventions is limited. Atonic PPH, caused by failure of uterus to contract effectively after delivery, represents the most common variant. When first-line pharmacologic therapies fail, timely and effective second-line interventions are crucial in achieving hemostasis and preserving uterine integrity. Our study reflects superior physiological compatibility and efficacy of vacuum-assisted Uterine Suction Tamponade using Panicker's cannula as compared to uterine Foley's Balloon Tamponade in cases of atonic PPH. Panicker's group demonstrated significantly higher success rate in achieving haemostasis with reduced blood loss, lower Hb% deficit, lesser need for blood transfusion and application of uterine haemostatic sutures as compared to UBT group. Although the differences in surgical interventions such as ligation of anterior division of internal iliac arteries and hysterectomy did not reach statistical significance, these findings favoured Panicker's cannula method in reduced requirement of these procedures. Importantly, in our study, several demographic and clinical variables were unevenly distributed between the two groups due to random selection of patients such as higher number of patients with High risk pregnancy, cesarean section and labour induction/ augmentation in Foley's balloon Tamponade group – which may have partially influenced outcomes. Despite these confounding factors, the consistent better results in Panicker's group across a range of parameters underscore the device's robustness and reliability in real-world settings. At present, intra-uterine Foley's balloon Tamponade (UBT) remains a widely accepted, practiced and effective method in obstetric practice especially in low resource settings yet UST with Panicker's cannula offers an equally cost-effective yet more physiological and effective approach with faster intra-uterine blood evacuation, superior bleeding control, shorter time to application & lesser technical skills requirement and seems to be a promising alternative in management of atonic PPH in future.

6. Source of Funding

None.

7. Conflict of Interest

None.

8. Ethical Approval

The study was approved by the Institutional Ethics Committee (Ref. No. 143/IEC/2024).

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there are no known teamwork measurement tools for these contexts. An intuitive teamwork tool for real-time feedback could foster measurement and quality improvement. As part of a larger study of PRONTO's obstetric simulation, this nested observational study aims to create a robust, abbreviated teamwork tool that can 1) rapidly and accurately measure clinical teamwork, 2) be implemented with limited training, 3) provide real-time feedback during obstetric trainings or clinical mentorship and 4) track a facility's skills longitudinally.
Method: [illegible] simulated obstetric emergencies were managed by primary care clinicians at [illegible] sites from a cluster-randomized trial in Guatemala. This nested observational study analyzed 73 achieved videos of the simulations. They were coded for six teamwork behaviors using the Performance Assessment for Communication and Teamwork Video tool (PACT-V) that quantifies teamwork behaviors. Blinded bilingual coders randomly scored 73 videos. Standard [illegible]. Principal Factor Analysis (PFA) with varimax orthogonal rotation and post-model decision criteria were used to extract factors and surrogate variables for a short-form of the PACT-V.
Results: Domain-specific Kaiser-Meyer-Olkin criterion (KMO) for each teamwork domain ranged from 52.04–78.56%. 10 factors and 21 surrogate variables were extracted from the 52-item PACT-V using PFA. These variables constituted to a short-form of this tool – the MOM (Measurement of Obstetric teamwork Management). Cohesion of the MOM's domain-specific scales exceeded the original PACT-V tool with Alphas [illegible] ranging from [illegible]. The MOM's behavioral anchors were adapted from [illegible] scales for [illegible] measurement and MOM matched the typography and structure of the PACT-V to promote intuitive use and to match "[illegible] Score Card" [illegible] used in Kenya and other [illegible].
Conclusions: The MOM's quantitative, simplified five-point scales and intuitive typography could promote rapid teamwork measurement of primary obstetric facilities in [illegible]. The [illegible] behavioral anchors could promote team [illegible] in [illegible] facilitator feedback during training or facility-based quality improvement coaching. The tool's flexibility permits specific domain-specific feedback or longitudinal tracking. Using the MOM to disseminate teamwork measurement throughout health systems could accelerate continuous improvements in obstetric quality and promote maternal-neonatal survival.

FC3.06 – Addressing Maternal Mortality

FC3.06.1
ANALYSIS OF POLITICAL PRIORITY FOR THE MATERNAL DEATH SURVEILLANCE AND RESPONSE (MDSR) POLICY

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Objectives: The aim was to determine the ability and degree of political priority that the MDSR can generate by examining the processes that shaped how this policy was made, introduced and implemented as well as analyzing the processes of power, control and conflicts of interests between key actors. By assessing the degree of global political priority, we aimed to identify challenges and barriers that the MDSR faces and propose policy directions for successful implementation.
Method: 34 stakeholders representing various institutional categories from high and low income countries participated in interviews, questionnaires and surveys. Questions were derived from Shiffman's framework for determinants of political priority and covered four content areas: policy community, political context, portrayals and policy characteristics. A comprehensive literature search of published and grey literature was conducted to complement the findings. 23 relevant papers, policy documents and web materials (websites, videos) were reviewed and included in the analysis.

Results: The MDSR was introduced following high profile policy opportunities. It is portrayed in technical and human rights frames in the published literature but was sometimes perceived as a rebranding of existing policies by respondents. The policy community is diverse with supporting actors from all sectors with varying resources and different levels of participation at the global and local levels. Although concerns were expressed, there is no overt opposition to the MDSR. Respondents identified features of the policy that were benefits over previous policies but highlighted several that were barriers to successful implementation.
Conclusions: The MDSR has the potential to generate political priority but more political will and dedicated resources are required. Operational challenges and lack of integration into the existing health systems were other identified barriers that need to be addressed.

FC3.06.2
PAN[illegible] VACUUM SUCTION HAEMOSTATIC DEVICE FOR TREATING POST PARTUM HEMORRHAGE

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Objectives: To find out a safe, simple and one technique for preventing and treating PPH thereby decreasing maternal mortality and morbidity. And also to find out a method to treat PPH in low resource setup, primary care setup where even paramedical personals including ANMs can use this method in emergency situation very safely and effectively to save the life of the mother.
Method: Forty women who had normal vaginal deliveries and fifteen women who had LSCS were included in this study in a low resource maternity hospital. All these 55 women developed PPH in spite of using all uterotonic drugs. Four women developed atonic PPH. A specially made plastic cannula of 12 mm in diameter and 25 cm in length with multiple holes of 5 mm diameter at the distal 5 cm of the cannula was introduced into the uterine cavity through the vagina to reach the fundus. The cannula is connected to a suction machine and a negative pressure of 80 mm mercury was produced.
Results: The negative suction resulted in sucking out all the blood collected in the uterine cavity. The quantity of blood sucked was 50 to 300 ml. When the collected blood was completely sucked out, the bleeding ceased. The suction was maintained for 30 minutes. Then the cannula was taken out slowly after releasing the suction. There was no further bleeding from the uterine cavity and the uterus was well contracted. Two patients had fresh bleeding from the vagina even after removing the cannula. These were all found to have vaginal tears and suturing was done.
Conclusions: The inner surface of the uterine cavity got strongly sucked by the cannula and the bleeding arterioles and sinusoids got sucked into the holes of the cannula, closing them. The bleeding points are permanently closed due to the clot formation within 30 to 40 minutes. This is a very simple, safe, sure and inexpensive technique to prevent and cure PPH with absolute success. Instead of using suction machine, a mechanical suction unit of vacuum or MVA syringe can be used. No complications and failure observed. This life saving procedure is very useful for preventing maternal mortality in the world.

FC3.06.3
MONITORING MATERNAL AND NEWBORN HEALTH OUTCOMES IN BAUCHI STATE, NIGERIA: AN EVALUATION OF A STANDARDS-BASED QUALITY IMPROVEMENT INTERVENTION

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Objectives: Maternal mortality ratio and neonatal mortality rate in Bauchi state of northeast Nigeria are among the highest in the country. Substandard care factors are associated with increased ratio of maternal and newborn mortality and morbidity at facilities in Bauchi

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INSTRUMENTATION AND TECHNIQUES

Panicker's Vacuum Suction Haemostatic Device for Treating Post-Partum Haemorrhage

T. N. Vasudeva Panicker[1]

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About the Reviewer

Dr. T. N. Vasudeva Panicker is consultant Gynaecologist, Anaesthetist and managing director of Panicker's Hospital, Kodungallur. He is the National Coordinator of Maternal Mortality Prevention Cell of Indian Medical Association. He has invented 15 surgical instruments and 15 surgical and treatment techniques; many of them are life saving, cost saving and time saving. He is the author of the book "SAY GOODBYE TO PPH"—Life saving Inventions in Obstetrics and Gynaecology. (For videos www.drvpanicker.com).

Objective

The objective is to find a safe, simple and sure technique for preventing and treating PPH, thereby decreasing maternal mortality and morbidity, and also to find a method to treat PPH in low-resource and primary care settings where even paramedical personnel including ANMs can use this method safely and effectively to save the life of the mother.

Background

Negative pressure created within the uterine cavity results in cessation of bleeding from the post-partum uterus including atonic post-partum haemorrhage (PPH) and AUB.

Methods

Forty women who had normal vaginal deliveries and fifteen women who had LSCS were included in this study during the last two-year period in a low-resource maternity hospital which has about 1000 deliveries in a year. All these 55 women developed PPH in spite of using all uterotonic drugs according to the protocol. Four women developed atonic PPH, and the blood loss was more than 1500 ml. Blood pressure, pulse rate, haemoglobin haematocrit, platelet count, clotting time and bleeding time were

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noted. A specially made stainless steel or plastic cannula of 12 mm in diameter and 25 cm in length with multiple holes of 4 mm diameter at the distal 12 cm of the cannula was introduced into the uterine cavity through the vagina to reach the fundus. The cannula was connected to a suction apparatus, and a negative pressure of 700 mm mercury was produced.

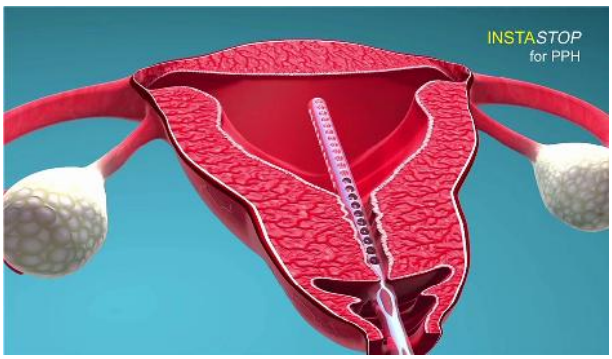
Result

The negative suction resulted in aspiration of all the blood collected in the uterine cavity. The quantity of blood sucked varied from 50–300 ml. When the collected blood was completely sucked out, the bleeding ceased. The suction was maintained for 30 min. Then the cannula was taken out slowly after releasing the suction. There was no further bleeding from the uterine cavity, and the uterus was well contracted. Five patients had fresh bleeding from the vagina even after connecting the suction. These were all found to have vaginal tears, and suturing was performed. In two cases where the bleeding was very heavy the cannula got blocked by blood clots. This was observed by the continued bleeding from the vagina even though suction was maintained, and no blood was seen entering into the suction bottle. Immediately the cannula was replaced with another cannula, and suction continued and bleeding stopped. Hence another cannula should always be kept ready. In two cases bleeding persisted on initiating the suction; the suction bottle was found to be full. On rechecking, the placement of the cannula was faulty as it was within the uterine cavity but not reaching up to the fundus. Hence the suction was discontinued and the cannula correctly positioned, after which suction was reapplied and the bleeding stopped. In cases where bleeding or oozing persists despite suction, it is usually from the cervix as the holes of the cannula are within the uterus and are ineffective in the cervix. This bleeding can be stopped by suturing or by packing.

Conclusion

The strong negative suction produced in the uterine cavity by this special cannula resulted in sucking out all the blood and blood clots. The inner surface of the uterine cavity got strongly sucked by the cannula. All the bleeding vessels including arterioles and sinusoids get sucked into the holes of the cannula, thereby mechanically closing them. The bleeding points are permanently closed due to clot formation within 30–40 min. This is a very simple, safe, sure and inexpensive technique to control and cure PPH with absolute success. Instead of using suction machine, a mechanical suction unit of ventouse or MVA syringe can be used. There were no complications and no failure observed by using this device. This life-saving procedure will have a key role in bringing down maternal mortality.

PPH cannula inserted into the post-partum uterus with PPH.



Suction started, and uterus is contracting.

Uterus contracted well, and bleeding stopped completely.

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Vacuum retraction of uterus for the management of atonic postpartum hemorrhage.

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Abstract:
Background*: Creating negative pressure inside the uterine cavity results in shrinking of uterus which can assist the natural physiological process of contraction and retraction to stop atonic postpartum hemorrhage.* ***Methods:*** *Sixteen women who had normal vaginal delivers, and 4 women who underwent caesarean sections, who developed atonic postpartum hemorrhage, and who did not respond well for routine use of Inj. methergine, oxytocin, and Carboprost were included in this study. A specially designed uterine cannula measuring 25cm long and with 12/18mm diameter, with uterine angle, and with multiple perforations on uterine portion was used. When bleeding did not stop due to uterine atony in vaginal deliveries in spite of routine measures, the uterine portion of the cannula was inserted in to uterine cavity up to fundus, and the outer end was connected to suction machine with thick walled flexible tubing. A negative pressure of 650mmHg was created inside the uterine cavity and maintained for 10mns. This procedure wasrepeated every hour for 3hrs. After this the negative pressure was created whenever there was recurrence of bleeding. In case of caesarean section, the cannula was inserted through the uterine wound and brought outside through vagina. Negative pressure was applied after closure of uterine wound. The cannula was removed in all women6hrs after initiation of procedure.* ***Results:*** *complete cessation of bleeding which was associated with contraction and firm retraction of uterus was observed in all women within 4mns after initiation of procedure. The amount of blood collected in suction bottle ranged from 150ml to 250ml.* ***Conclusion:*** *Vacuum shrinking of uterus is a very effective physical method which can assist the natural physiological process of contraction and retraction to stop atonic postpartum hemorrhage. This simple, cost effective, life-saving, and fertility saving technique, which can avoid laparotomy can be made available in any setting, and can become the first defense against atonic PPH.*

Key Words: *Vacuum retraction of uterus, Atonic postpartum hemorrhage.*

I. Introduction

As per the WHO estimate, 287 000 maternal deaths occurred globally in the year 2010. Sub-Saharan Africa (56%) and Southern Asia (29%) accounted for 245 000 maternal deaths (85%). At the country level, two low resource countries accounted for a third of global burden. India accounted for 56 000 (19%) and Nigeria accounted for 40 000 (14%) maternal deaths. In India, postpartum hemorrhage was the leading cause of maternal deaths (29.6%), and in majority of women atonic PPH was the cause[2]. Many studies reported increasing trends in atonic PPH in recent years [3, 4]. Even though some risk factors like obstructed prolonged labor, accidental hemorrhage, and big babies are known to cause atonic PPH, it is not very clear why some women develop atonic PPH and why some women do not[5, 6]. For the same reason this problem cannot be predictable[7]. The only management strategy even today is 'watchful expectancy' and act immediately when the problem develops. Simpler techniques like uterine massage, uterotonics drugs, and uterine packing and balloon tamponadecan be practiced in low resource settings. Techniques like B-Lynch suturing, stepwise devascularization, internal iliac ligation and uterine artery embolization are available at higher medical centers. These higher techniques are not within the reach of every parturient woman when simpler techniques fail. In low resource settings unpredictable sudden massive bleeding makes it difficult to organize competent manpower, compatible blood and transport to higher medical center. Many times mothers die on roads while being transported to higher medical centers due to hypovolemic shock. In some women the speed with which

the hemorrhage kills the mother is so rapid, that the usually quoted first 1 or 2 hours as "Golden hours" is missing[8]. Sometimes women succumb to death just within 1-1.5 hours after the onset of bleeding[8]. The rapidity with which some women slip in to coagulation failure and multi organ dysfunction syndrome from hemorrhagic shock is alarming[8]. Because of these complex reasons the maternal mortality is not coming down in low resource countries[9]. There is every need for a simpler and sure technique which can stop bleeding, or at least stop bleeding temporarily to buy some time to tide over the crisis. In this study we attempted vacuum constriction of uterus by creating negative pressure inside the uterine cavity with a specially designed uterine cannula, which is a simple, safe and cost effective technique.

II. Methods

Sixteen singleton pregnant women who had normal vaginal delivers and 4 women who underwent caesarean sections, and who developed atonic postpartum hemorrhage were included in this study. All the women received 10units of oxytocin IM at the appearance of anterior shoulder, 5units of intra venous oxytocin after the delivery of placenta, and then uterine massage. Inj. Carboprost 125micgmsIM was also given when the bleeding did not stop.

Description of uterine vacuum retraction system: Consists of, 1.Uterine retraction cannula. Cannulas are of two different sizes. One measuring 25cm long with 12mm diameter, and the other one measuring 25cm long with 18mm diameter, and they have uterine angle and perforations on uterine portion. The perforations on fundal portion are large and longitudinal, and on cervical portion round and small (Fig.1). Smaller perforations were given on cervical portion to prevent blocking of cannula by cervical tissues when suction applied. 2. Thick walled (not easily collapsible) flexible plastic suction tube with 1.25cm diameters. 3. High vacuum suction machine with single bottle, or vacuum extraction pump which can produce negative pressure up to 650mm Hg. within 1mnt.

In case of vaginal delivery, when the bleeding did not stop by routine medical measures, under 30mg pentazocine and 0.6mg of atropine intravenous analgesia, women were kept in lithotomy position, and the bladder was catheterized with an indwelling catheter. Under good source of light with wide blade vaginal speculum application, the genital tract was explored to exclude traumatic PPH, and to confirm uterine atony. Blood clots were removed from uterine cavity by bimanual compression. The anterior lip of cervix was grasped with sponge holding forceps, and the uterine end of the cannula was inserted in to the uterine cavity up to the level of fundus. Sponge holder and speculum were removed. The outer end of the cannula was connected to the suction machine with suction tube. Air leak in the system was prevented by proper fitting. Theleft palm supporting the fundus on abdomen, right fingers grasp the outer end of the cannula, and push it towards the fundus. Keeping the cannula in this position (to prevent slipping out), suction machine was put on and a negative pressure of 650mmhg was created and maintained for 10mnts.Then the suction machine was put off. This makes the cannula to get fixed in this position due to sucking of soft cervical tissues in to the perforations.This procedure was repeated every hour for 3hrs. After this, the negative pressure was created whenever there was recurrence of bleeding. Twenty units Pitocin drip in 5% dextrose 60drops/mint was run throughout the procedure. The cannula was removed after 6hrs in all women. After the procedure when we tried to pull the cannula, it was not coming out. The temporary adhesions developed due to sucking of soft cervical tissues in to perforations of the cannula were released by gentle finger manipulation. After this the cannula could be easily taken out.

In case of caesarean section the cannula was inserted through the uterine wound and brought outside through vagina. The outer end of the cannula was connected to the suction machine through tubing. The uterine wound was closed quickly. Cannula fixation (tip at the level of fundus) was done in the similar way as mentioned in vaginal insertion and then negative pressure was applied.

Informed and written consent was obtained from all subjects who participated in this study. This study confirms to the standards of declarations of Helsinki.

III. Results

Complete cessation of bleeding which was associated with contraction and firm retraction of uterus was observed in all women within 4mns after initiation of procedure. None of the women had recurrence of bleeding after 3hrs of initiation of procedure, and there was noneed for repeat suction. All the women were clinically stable during the procedure. The amount of blood collected in suction bottle ranged from 150ml to 250ml. The clinical details of all women who underwent vacuum constriction of uterus in this study are given Table.1. At caesarean section,we could observe contraction and firm retraction of uterus, and formation of rougosities on the surface of the uterus.

Fig.1 Two uterine vacuum retraction cannulas.One measuring 25cm long with 12mm diameter, and the other measuring 25cm long with 18mm diameter, and they have uterine angle and perforations on uterine portion.

Fig.2: Thick walled (not easily collapsible) flexible plastic suction tube with 1.25cm diameters.

Fig.3: Vacuum retraction of uterus using single bottle suction machine for atonic postpartum hemorrhage.

Table1. Clinical details of women who underwent vacuum constriction of uterus for atonic PPH

Case	Age (years)	Gravida	Para	Gestation (weeks)	Duration of labor (hrs)	Time taken to stop bleeding (mints)	Blood collected in bottle (ml)	Mode of delivery
1	32	2	1	39	8	3.00	200	vaginal
2	28	3	1	37	6	3.50	150	vaginal
3	27	2	1	40	7	3.00	250	vaginal
4	29	3	2	40	5	2.50	150	vaginal
5	19	1	0	38	11	4.00	250	vaginal
6	26	2	2	37	6	3.50	200	vaginal
7	30	4	1	39	7	2.50	150	vaginal
8	31	2	1	36	8	3.00	200	vaginal
9	27	2	1	39	7	3.50	200	vaginal
10	26	2	1	38	9	2.50	100	vaginal
11	33	3	2	37	5	4.00	250	vaginal
12	22	2	1	35	7	3.00	200	vaginal
13	29	2	1	36	7	2.50	100	vaginal
14	24	2	1	40	6	3.50	150	vaginal
15	28	3	2	39	6	3.00	150	vaginal
16	32	3	2	36	7	3.50	200	vaginal
17	27	3	2	17	0	4.00	250	C.S
18	31	3	2	35	9	2.50	200	C.S
19	28	3	2	36	0	3.00	200	C.S
20	22	1	0	38	12	4.00	200	C.S

IV. Discussion

Atonic postpartum hemorrhage is the leading cause for maternal death, especially in developing world[1]. It is the rapid exsanguination of the woman due to uterine atony in a low resource setting makes it difficult to organize competent manpower and compatible blood and transport to save the mother. As the techniques available to control bleeding in low resource settings are inadequate, majority of maternal deaths still continue to occur in theses settings.

In our present study, vacuum retraction could stop bleeding in all 20 women within 4mnts after the initiation of negative pressure inside the uterine cavity.

Currently the balloon tamponade is being widely advocated as an affordable alternative to blood loss management in severe atonic postpartum hemorrhage refractory to uterotonic therapy[9]. In this technique the uterine cavity is filled with condom balloon or Bakri balloon, and maintained with hydrostatic pressure. This water filled balloon expands the uterine cavity and applies constant pressure (more than the systolic blood pressure) on sinusoids and stops bleeding[10]. The draw backs with this technique include, the mechanism of action is against the natural physiological mechanism of contraction and retraction. It requires some time to organize this balloon tamponade system and to perform tamponade test. This technique cannot be used when tamponade test is negative[10]. When the woman is bleeding profusely, even this few minutes time is very precious and critical. In a case of profuse bleeding due to adherent cotyledons or concealed partial uterine rupture, delay in organizing tamponade system may result in a catastrophe. Sometimes the balloon may get expelled when the tone in the uterine wall increases if the vagina is not effectively packed with gauge[10]. This technique is preferably done in a theater setting after examination under anesthesia to exclude lacerations and retained placenta.

In contrast the mechanisms involved in vacuum retraction include, the negative pressure created inside the uterine cavity results in physical constriction of uterus, and assists the natural physiological process of contraction and retraction. The soft cervical tissues around the cervical portion of the uterine cannula get sucked in to the perforationsresulting in closed uterine cavity. Further application of suction results in quick development of negative pressure inside the uterine cavity resulting in uniform constriction of uterus. This assists the natural physiological process of contraction and retraction and results in cessation of both arterial bleeding and venous oozing. As the negative pressure inside the uterine cavity is maintained in between suctions, the uterus cannot relax and let loose the blood. As the blood circulation to uterus is not interfered, the utero tonic drugs continue to act and maintain the process of contraction and retraction. In this technique blood collected in the uterine cavity get sucked and collected in to the suction bottle and helps to measure the blood loss correctly. As this procedure needs little time and minimal skills, this procedure can be done in labor room settings as a first aid measure. As this is a simple technique, even maternity nurses can be trained, and the

bleeding can be stopped without any delay. This life saving technique avoids laparotomy and other complex procedures to stop atonic bleeding, and helps to save the mother and her fertility function in low resource settings.

As the soft cervical tissues get sucked in to the perforations of the cannula and become adherent, the uterine cannula cannot be removed easily after the completion of the procedure. Cannula can be removed easily after gentle separation of these adhesions with finger manipulation.

V. Conclusions

Vacuum retraction of uterus assists the normal physiological process of contraction and retraction. This simple and cost effective technique, takes very little time to organize and can stop bleeding with in 4mnts in atonic PPH as shown in this study. This lifesaving technique is useful in all settings especially in low resource settings. Vacuum retraction cannula should be made part and parcel of normal delivery tray, and the labor room staff should be trained in this technique, so that bleeding can be stopped without any delay. We anticipate wider applications for this technique in the management of placenta praevia, placenta accreta percreta, and traumatic PPH with some modifications. Its utilization in cases of inherited coagulopathies of pregnancy and DIC has to be further explored. The long term effects of ischemia on cervix and uterus due to vacuum effect has to be further explored. As this is a small study, these results have to be further evaluated by randomized controlled studies with larger sample size before its recommendation for general use.

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Suction and Evacuation for Management of Postpartum Hemorrhage

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Abstract

Objectives: To report the authors' experience in suction and evacuation with cannula followed by maintenance of negative pressure in the uterine cavity by keeping the cannula inside for 20-30 minutes, which was performed for controlling intractable postpartum hemorrhage (PPH) in a tertiary care hospital.

Materials and Methods: This is a retrospective observational study carried out from July 2011 to December 2012 at Batra Hospital and Medical Research Centre, New Delhi, India. Nine patients who delivered either vaginally or via caesarian section and developed primary PPH refractory to conventional medical treatment, were included in the study. Suction and evacuation of the uterine cavity was done and then the cannula was kept inside the uterine cavity for 20-30 minutes thereby maintaining negative pressure (400-600 mmHg) in the cavity. Data were retrieved from patients' hospital records.

Results: Intractable primary hemorrhage was encountered in 9 patients of whom 6 had bleeding after caesarian section and 3 after vaginal deliveries. Uterine atony due to prolonged labour was the commonest cause. Hemorrhage was effectively controlled in 8 out of 9 cases (88.9%) and hysterectomy was avoided. In one patient (11.1%) the procedure failed and life saving hysterectomy was done to control the bleeding. This approach not only controls PPH but also preserves the woman's reproductive functions and avoids hysterectomy and its related complications and consequences.

Conclusion: This is a simple conservative surgical method to treat PPH in low resource settings. It requires minimal training, conserves the uterus, and is technically less challenging and associated with less blood loss than hysterectomy.

Keywords: Suction Evacuation, Postpartum Hemorrhage, Cannula, Atonic Uterus

Introduction

Postpartum hemorrhage (PPH) is one of the major causes of maternal mortality and a redoubtable contributor to puerperal death from other causes. World Health Organization (WHO) has traditionally defined primary PPH as postpartum blood loss of 500 ml or more from the genital tract within 24 hours of the birth of a baby (1). Ratnam and Rouff (2) state that most Asian women have smaller built, lesser blood volume, lower hemoglobin and poor nutrition. Due to these facts even a lesser blood loss has a more sinister effect. Hence they advocate 300 ml blood loss as a definition of PPH. In developing countries like India where women have no access to trained birth attendant the incidence of PPH is bound to be high. Efforts to prevent PPH in developing countries are therefore of paramount importance to the global effort to achieve the Millennium Development Goal of reducing maternal mortality ratio by three quarters (from 1990 levels) by 2015 (3).

We saved laparotomy and further surgical intervention for atonic PPH by just suction and evacuation, a simple conservative surgical technique.

Material and Methods

This is a retrospective observational study carried out from July 2011 to December 2012 in Department of obstetrics and gynecology at Batra Hospital and Medical Research Centre, New Delhi, India, a tertiary care hospital. This study included nine women who delivered either vaginally or via caesarian section (CS) who developed severe primary PPH refractory to conventional medical treatment. When medical management failed, suction and evacuation of the uterine cavity was done and then the cannula was kept in the uterine cavity maintaining negative pressure of 400-600 mmHg for 20-30 minutes.

Steps of the technique are; 1) the patient is shifted to operation theatre. Procedure is performed under general anesthesia, 2) the patient is catheterized and placed in the lithotomy position, 3) full surgical asepsis is to be taken, 4) the appropriate suction cannula is fitted to the suction apparatus, 5) the cannula is then introduced into the uterus; the tip is to be placed in the middle of the uterine cavity, 6) the negative pressure of suction is raised to 400-600 mmHg, 7) evacuation of all clots, if present, 8) the suction cannula is retained there for 20 to 30 minutes, thereby maintaining negative pressure of 400-600 mmHg in the uterine cavity, 9) the suction is broken before withdrawing the cannula down through the cervical canal to prevent injury to the internal os, 10) simultaneously uterotonics are also given, 11) After being satisfied that

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the uterus is remaining firm and there is no bleeding, procedure is withheld and a sterile vulval pad placed.
Maintenance of negative pressure in the uterine cavity with suction cannula keeps the uterine cavity collapsed and does not let it distend thereby complimenting contraction of the uterus and retraction of the vessels. This technique was performed on all nine patients. The patient's age, parity, gestational age, mode of delivery and outcome of procedure were recorded (Table 1).

Results

The age of patients was between 22 and 36 years (means 31 years). The majority of patients (66.7%) were multipara. The gestational age at which procedure was performed ranged from 37 to 41 weeks. Cesarean section (CS) was performed in six cases (66.7%) and three cases (33.3%) delivered vaginally. Eight cases (88.9%) were delivered at our institute, while a case was delivered at another hospital and referred to our institute for further management of severe PPH with shock. On examination, general condition was fair and vitals were stable in all patients except one who was admitted in condition of shock and PPH after CS. Majority of cases of PPH in our study group were due to prolonged labour or non-progress of labour. Suction and evacuation technique with maintenance of negative suction pressure successfully stopped bleeding in eight (88.9%) of the nine patients. In one patient (11.1%) the procedure failed and life saving hysterectomy was done to control the bleeding (Table 1). The total volume replacement ranged from 1,000 to 4,000 ml. All the patients made a good recovery after procedure. None of the patients developed complication related to procedure. There was no maternal death.

Discussion

PPH is one of the leading causes of maternal mortality and an important cause for serious morbidity in the developing and developed world. Morbidity from PPH mainly includes surgical interventions, sepsis and severe anemia. Uterine atony, in which there is failure of the uterine muscle to contract normally following delivery of the baby and placenta, is responsible for up to 70% of all causes of PPH (4). The general management of PPH starts by conservative measures like uterine massage and uterotonics drugs. Severe postpartum blood loss in hemodynamically unstable patients is more likely to need hysterectomy which can be one of the dangerous procedure and cause permanent loss of fertility. Since last decade, conservative surgical procedures have been successfully used in various circumstances and forms. Conservative surgical approach not only controls PPH but also preserves the woman's reproductive functions and avoids hysterectomy and its related complications and consequences (5). Conservative surgical approach in management of PPH includes: a) Uterine and ovarian arteries ligation; b) Hemostatic brace suturing like B-LYNCH suture; c) Bilateral Internal iliac artery ligation; d) Arterial embolization.
Postpartum hemostasis normally depends on mechanical events which induce strong contractions of the uterine musculature (6). Additional hemostasis may also be related to the opposition of the uterine walls once the myometrium has contracted. Probably our technique of suction of the blood and clots in the uterine cavity and then keeping the cannula inside the uterine cavity for 20-30 minutes keeps the cavity collapsed and does not let it distend. This actually complements the action of uterotonic agents which are also given simultaneously. It does not require great expertise or skill.
The simple mechanical and physiological measures of massaging the fundus, bimanual uterine compression and emptying the bladder to stimulate uterine contraction represent time-honored first-line management of PPH. No published studies were identified to provide an evidence-base for these interventions; nevertheless, professional consensus supports their continued use (7). However techniques of external compression like uterine massage and bimanual uterine compression are not able to maintain constant pressure which is taken care of by the suction pump in this technique.
In recent years, tamponade using various types of hydrostatic balloon catheters like foley catheter, Bakri balloon, Sengstaken-Blakmore esophageal catheter, and condom catheter, has superseded uterine packing for control of atonic PPH. There are no evidence based guidelines on how long the balloon tamponade should be left in place. Usually 4-6 hours of tamponade is adequate to achieve hemostasis. As compared with studies on other conservative surgical interventions for management of PPH, our technique has better success rate (Table 2).

Table 1. Summary of patients with severe PPH treated by the use of Suction Evacuation

Case No.	Age	Parity	Gestational Age	Presentation	Mode of delivery	Outcome
1	22	Primi	40	Prolong labour	CS	Successful
2	34	Multi	37	Accidental Hemorrhage	NVD	Successful
3	32	Primi	38	Prolong labour with PROM with Gestational Diabetes	CS	Successful
4	27	Multi	39	Prolong labour with PROM	NVD	Successful
5	30	Multi	38	Hemorrhagic Shock	CS	Successful
6	25	Primi	40	Obstructed labour	CS	Successful
7	30	Multi	39	Prolong labour	NVD	Successful
8	35	Multi	41	Prolong labour	CS	Successful
9	36	Multi	40	Prolong labour	CS	Failure

Primi= Primigravida, Multi= Multipara, PROM= Premature Rupture of Membrane, CS= Cesarean section, MTP= Medical Termination of pregnancy, NVD= Normal Vaginal Delivery

Table 2. Comparison of suction and evacuation with other techniques of PPH

	Technique	Number of patient	Successful rate
1	Uterine packing (8)	20	85%
2	Ballon Temponade (9)	19	79%
3	Hemostatic brace suturing (10)	52	81%
4	Bilateral hypogastric artery ligation (11)	26	76.9%
5	Arterial embolisation (10)	14	71%
6	Suction and evacuation (Our study)	9	88.9%

Ours is also a technique of internal compression like balloon tamponade. However in this technique the pressure is more as compared to balloon tamponade, which keeps the cavity collapsed. Moreover the duration of the procedure is also much less (30 minutes) which allows us to decide in time whether to proceed for laparotomy or not. It plays an important role in controlling atonic PPH and at times to maintain hemodynamics for bleeding women to reach the referral hospital from the periphery. We have found that suction and evacuation is simple, highly effective, safe, easy to learn and can be easily performed. It seems to be a good option in resource poor settings.

Conclusion

PPH is an obstetric emergency which every obstetrician has to face often unexpectedly. Even after so much of technological advances, very few practical and affordable solutions are available today to decrease PPH related morbidity and mortality. This (Suction with cannula followed by maintenance of negative pressure in the uterine cavity by keeping the cannula inside for 20-30 minutes) is a simple, safe, highly effective and conservative surgical method to control PPH in low resource settings. It requires minimal training, conserves the uterus, and is technically less challenging and associated with less blood loss than hysterectomy.

However we have very few cases to recommend it globally, but it could be possible area of research and larger trials are needed.

Ethical issues

The local ethics committee approved the study.

Conflict of interests

Authors declare that there is no any conflict of interests.

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Original Research Article

Panicker's vacuum suction hemostatic device- a novel innovation for the treatment of atonic postpartum hemorrhage

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ABSTRACT

Background: The aim of this study was to evaluate the effectiveness of the Panicker's vacuum suction hemostatic device in treating postpartum hemorrhage refractory to medical treatment.
Methods: A retrospective study including women with atonic postpartum hemorrhage in whom Panicker's vacuum suction hemostatic device was used, since they did not respond to the medical management. The demographic factors, mode of delivery, volume of blood loss, blood transfusion and outcome of the procedure were studied.
Results: The study demonstrated that the device achieved effective hemostasis in both minor and major PPH, helping reduce maternal morbidity and mortality. Early recognition and timely preventive measures in at-risk women could have limited bleeding and reduced the need for transfusions.
Conclusions: Panicker's vacuum suction hemostatic device which works on the principle of vacuum retraction of the uterus was found to be effective in the management of atonic postpartum hemorrhage.

Keywords: Atonic postpartum hemorrhage, Conservative treatment, Hemostatic technique, Panicker's cannula, Vacuum retraction

INTRODUCTION

Postpartum hemorrhage (PPH) is an obstetric emergency complicating 1-10% of all deliveries.[1] Postpartum haemorrhage (PPH) is estimated to cause approximately 20% of global pregnancy-related deaths with these deaths occurring overwhelmingly in low and lower-middle income countries (LMIC).[2] Postpartum hemorrhage due to uterine atony is the primary direct cause of maternal mortality globally.[3] Uterine atony (accounts for 70% of PPH) can be anticipated after prolonged labour particularly with the use of oxytocin, in pregnancies complicated with chorioamnionitis, high parity, general anesthesia, and other factors that lead to uterine overdistension such as multiple fetal gestation, polyhydramnios, and fetal macrosomia.[4,5] The first response PPH bundle comprises of initial fluid resuscitation (isotonic crystalloids), uterotonics, tranexamic acid, and uterine massage.[6] The "response to refractory PPH bundle" comprises of intrauterine balloon tamponade (IBT), compressive measures (aortic or bimanual uterine compression), and the non-pneumatic antishock garment.

Panicker's vacuum suction hemostatic device has been a game changer. It is a safe, simple and sure method for the treatment of atonic PPH, thereby reducing maternal mortality and morbidity. This device consists of a specially made stainless steel or plastic cannula of 12 mm in diameter and 25 cm in length with multiple holes of 4 mm diameter at the distal 12 cm of the cannula. It has to be introduced into the uterine cavity through the vagina to reach the fundus. The cannula has to be connected to a suction apparatus, and a negative pressure of 700 mm mercury has to be produced. A mechanical suction unit of ventouse or MVA syringe can be used, instead of using suction machine.[7] This procedure helps to treat atonic PPH in low-resource and primary care settings where even

trained paramedical personnel can use this method safely and effectively to save the life of the mother.[7] Hence, this device can be used in the labor room as well as operating theatre.

In limited resource settings, the non-availability of competent manpower to perform procedures like B-lynch suturing, stepwise devascularization, internal iliac ligation, and uterine artery embolization is challenging to save a mother's life. Timely use of a vacuum suction device during the golden hour of PPH can be life-saving for mothers.

METHODS

A retrospective study was conducted to investigate the effectiveness of the Panicker's vacuum suction hemostatic device, as a conservative treatment option for PPH in women who delivered at Khoulah Hospital, Oman from January 2022 to December 2024. The hospital is a government tertiary facility that serves as a referral center for the care of high-risk pregnancies.

The demographic and epidemiological data were recorded, risk factors associated with PPH and variables related to the appropriate use of the Panicker's vacuum suction hemostatic device. The study group included women for whom the vacuum suction device was inserted vaginally and after cesarean delivery.

The study included women with atonic postpartum hemorrhage and excluded women who exhibited disseminated intravascular coagulation, had inherited bleeding disorders, or had traumatic postpartum hemorrhage. Those experiencing secondary postpartum hemorrhage due to retained products of conception were excluded.

Women were considered candidates for treatment with a Panicker's vacuum suction hemostatic device, if they had postpartum hemorrhage that did not respond to 'first response PPH bundle' consisting of uterine massage, volume replacement and uterotonic medical treatment. The protocol we followed called for uterotonic treatment initially, i.e. intravenous oxytocin, followed by intramuscular methylergometrine (if not contraindicated) if the bleeding was not controlled. If bleeding persisted, intramuscular prostaglandins (carbopost) were used, and if this did not control the bleeding, misoprostol was given rectally and intravenous tranexamic acid.

The Panicker's suction metal cannula was introduced vaginally into the uterus under ultrasound visualization to ensure correct placement. A negative suction pressure of 650 mmHg was generated within one minute and maintained for 10 to 15 minutes using the suction machine. This led to uterine retraction and effective aspiration of all blood accumulated in the uterine cavity. The cannula was removed once the uterus was well contracted and bleeding had ceased.

RESULTS

The study findings highlight that most cases of postpartum hemorrhage were among women aged 26-30 years, though it occurred across a wide age range. Multiparity, was the most common obstetric profile who were at risk of atonic postpartum hemorrhage (Table 1).

Table 1: Demographic pattern.

	Frequency	Percentage
Age (in years)		
21-25	5	23.8
26-30	7	33.3
31-35	4	19.0
>36	5	23.8
Parity		
0	4	19.0
1	5	23.8
2	6	28.6
3	5	23.8
4	1	4.8
Gestational age		
<36	5	23.8
36-40	14	66.7
>40	2	9.5

Table 2: Obstetric outcome with postpartum hemorrhage.

	Frequency	Percentage
Blood loss		
<250	1	4.8
251-500	1	4.8
501-1000	10	47.6
>1000	9	42.9
Mode of delivery		
CS	2	9.5
Instrumental	3	14.3
SVD	16	76.2
Blood transfusion		
0	8	38.1
1	7	33.3
2	4	19.0
3	2	9.5
Survival		
Survived	21	100.0
Surgical procedures	0	0.0

The majority of women delivered at term, and two patients had significant atonic PPH after abortion. Importantly, there was substantial blood loss, with 48% losing more than 500 ml and 43% had major PPH which was noted before the application of Panicker's hemostatic device (Table 2).

Postpartum hemorrhage is not just limited to operative deliveries; spontaneous vaginal delivery was the predominant mode of delivery. More than half of the patients required blood transfusion, with a significant proportion needing multiple units, which reflects both the clinical burden and the resource implications of managing such cases (Table 2), which reflects the need for early diagnosis and prevention of postpartum hemorrhage.

Although all patients survived, the need for transfusion and the high volumes of blood loss emphasize the potential for morbidity. It is notable to mention none of them proceeded to the other surgical managements like tamponade, compression sutures or hysterectomy (Table 2). Risk factors such as previous cesarean section, precipitate labor, and severe preeclampsia were common, yet more than one-fifth of patients had no identifiable risk factor, highlighting the unpredictable nature of postpartum hemorrhage (Figure 1).

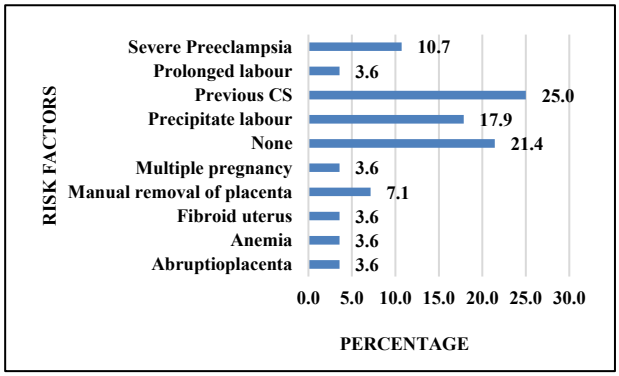

Figure 1: Risk factors.

These results underline the importance of preparedness for postpartum hemorrhage in all deliveries, the need for readily available blood products, and the necessity of vigilance even in women without apparent risk factors. However, the time taken for the bleeding to stop with the use of Panicker's vacuum suction hemostatic device has not been studied.

DISCUSSION

Postpartum hemorrhage (PPH) has a significant impact not only on maternal health but also on the healthcare system and associated costs. It is therefore both rational and essential to develop strategies for the timely, cost-effective prevention, limitation, and management of PPH.[8]

The study shows that there was major PPH in 43% women following which the Panicker's hemostatic device was used to maintain hemostasis. This morbidity could have been avoided by timely diagnosis of postpartum hemorrhage. The device has significantly reduced the mortality and morbidity by avoiding further surgical procedures.

The vacuum suction hemostatic device supports the uterus's natural physiological processes of contraction and retraction. The cannula applies strong negative pressure to the inner surface of the uterus, promoting effective hemostasis by enhancing uterine wall apposition and encouraging retraction.

Balloon tamponade is also being promoted as an affordable option for managing severe atonic postpartum hemorrhage that does not respond to uterotonic therapy.[9] In this technique, a fluid-filled device- such as a condom catheter or Bakri balloon- is inserted into the uterine cavity and inflated to exert hydrostatic pressure. This internal pressure expands the uterine cavity and applies a force greater than the systolic blood pressure on the uterine sinusoids, thereby achieving hemostasis. However, a notable limitation of this approach is that it acts contrary to the uterus's natural physiological mechanisms of contraction and retraction, which are critical for effective postpartum bleeding control.[10]

Comparative studies have shown that bleeding ceases within 20 minutes with the use of uterotonics such as oxytocin and misoprostol, in contrast the Bakri balloon has been reported to control hemorrhage within approximately 9 minutes.[11,12] Notably, inexpensive and easy-to-use suction-based technique can effectively stop bleeding in cases of atonic PPH within 4 minutes which also requires minimal setup time.[13,14]

Makhija et al showed when medical management failed, suction and evacuation of the uterine cavity was done and then the cannula was kept in the uterine cavity maintaining the negative pressure. Hemorrhage was effectively controlled in 8 out of 9 cases (88.9%), thereby avoiding the need for hysterectomy.[15]

Panicker conducted a study to evaluate the effectiveness of the Panicker's vacuum suction hemostatic device in managing atonic postpartum hemorrhage in a cohort of 55 women- 40 following vaginal deliveries and 15 after lower-segment cesarean sections. Following insertion of the cannula and the application of negative pressure maintained at 700 mmHg for 30 minutes, firm uterine retraction was consistently observed. The volume of blood loss in these cases ranged from 50 to 300 ml, indicating effective hemorrhage control.[7]

In a study conducted by Purwosunu et al, the use of a suction-based device demonstrated effective management of postpartum hemorrhage in all 10 cases studied. The device created an immediate seal at the cervical os, led to evacuation of 50-250 ml of residual blood from the uterine cavity. Following this, the uterus collapsed and regained tone within minutes, resulting in rapid control of bleeding. The device remained in place for a minimum of 1 hour, with the longest duration being 6.5 hours in one case. During this time, vaginal and perineal lacerations were easily repaired.[16]

The vacuum suction cannula can be effectively utilized for primary, secondary, and tertiary prevention of atonic postpartum hemorrhage following both vaginal deliveries and lower segment cesarean sections (LSCS). In addition to promoting uterine contraction, the cannula helps evacuate accumulated blood, improving visibility and facilitating accurate clinical assessment and suturing. As the cervical walls are drawn into contact with the cannula, bleeding from cervical tears is often reduced, allowing for repair in a cleaner and more controlled environment.[17]

The drawback of the Panicker's vacuum suction device is that in cases of heavy bleeding the blood clots block the cannula which results in continued bleeding from the vagina even though suction is maintained, and no blood enters into the suction bottle. Hence, extra cannula should be kept ready. This is attributed to the smaller diameter of the cannula and smaller fenestrations in the cannula.[7,18]

Limitation of the study is the sample size was relatively small, the time required to achieve hemostasis was not documented, and the volume of blood collected in the canister was not recorded.

CONCLUSION

The application of negative intrauterine pressure presents a promising approach for the management of atonic postpartum hemorrhage. Its effectiveness, combined with low cost, ease of use, and minimal setup requirements, makes it particularly valuable in low-resource and high-burden settings. This technique holds considerable potential to improve maternal health outcomes globally, by promoting physiological uterine contraction and reducing the need for invasive procedures such as hysterectomy. Broader clinical adoption and further prospective studies are needed to confirm its long-term benefits and integration into standardized care protocols.

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EDITORIAL

Intrauterine vacuum device treatment of postpartum hemorrhage

First-line, conservative treatment of postpartum hemorrhage includes uterotonic medications and, if indicated, uterine balloon tamponade or intrauterine vacuum device hemorrhage control

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Postpartum hemorrhage (PPH) is a common complication of birth. In 2019, 4.3% of births in the United States were complicated by at least one episode of PPH.[1] Major causes of PPH include uterine atony, retained products of conception, reproductive tract trauma, and coagulopathy.[2] Active management of the third stage of labor with the routine administration of postpartum uterotonics reduces the risk of PPH.[3,4]

PPH treatment requires a systematic approach using appropriate uterotonic medications, tranexamic acid, and procedures performed in a timely sequence to resolve the hemorrhage. Following vaginal birth, procedures that do not require a laparotomy to treat PPH include uterine massage, uterine evacuation to remove retained placental tissue, repair of lacerations, uterine balloon tamponade (UBT), uterine packing, a vacuum-induced hemorrhage control device (VHCD; JADA, Organon), and uterine artery embolization. Following cesarean birth, with an open laparotomy incision, interventions to treat PPH due to atony include vascular ligation, uterine compression sutures, UBT, VHCD, hysterectomy, and pelvic packing.[2]

Over the past 2 decades, UBT has been widely used for the treatment of PPH with a success rate in observational studies of approximately 86%.[5] The uterine balloon creates pressure against the wall of the uterus permitting accumulation of platelets at bleeding sites, enhancing the activity of the clotting system. The uterine balloon provides direct pressure on the bleeding site(s). It is well known in trauma care that the first step to treat a bleeding wound is to apply direct pressure to the bleeding site. During the third stage of labor, a natural process is tetanic uterine contraction, which constricts myometrial vessels and the placenta bed. Placing a balloon in the uterus and inflating the balloon to 200 mL to 500 mL may delay the involution of the uterus that should occur following birth. An observation of great interest is the insight that inducing a vacuum in the uterine cavity may enhance tetanic uterine contraction and constriction of the myometrial vessels. Vacuum-induced hemorrhage control is discussed in detail in this editorial.

Vacuum-induced hemorrhage control device

A new device for the treatment of PPH due to uterine atony is the JADA VHCD (**FIGURE**), which generates negative intrauterine pressure causing the uterus to contract, thereby constricting myometrial vessels and reducing uterine bleeding. The JADA VHCD system is indicated to provide control and treatment of abnormal postpartum uterine bleeding following vaginal or cesarean birth caused by uterine atony when conservative management is indicated.[6]

System components

The JADA VHCD consists of a leading portion intended to be inserted into the uterine cavity, which consists of a silicone elliptical loop with

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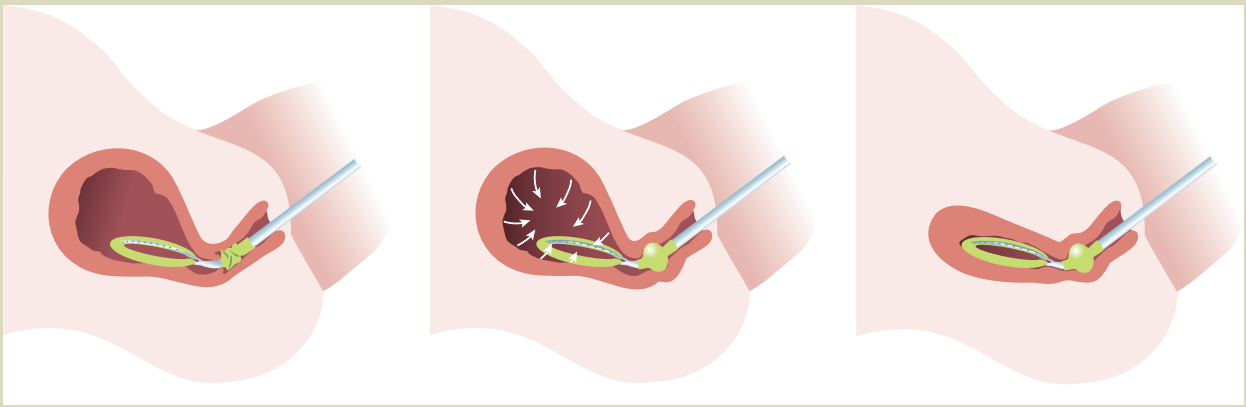
FIGURE JADA system



Soft silicon loop is placed within the uterus; vacuum seal rests outside uterus

Low-level vacuum applied, causing uterine contraction

Contraction stops PPH

Source: https://thejadasystem.com

20 vacuum pores. A soft shield covers the vacuum loop to reduce the risk of the vacuum pores being clogged with biological material, including blood and clots. The elliptical loop is attached to a catheter intended for connection to a vacuum source set to 80 mm Hg ±10 mm Hg (hospital wall suction or portable suction device) with an in-line cannister to collect blood. Approximately 16 cm from the tip of the elliptical loop is a balloon that should be positioned in the upper vagina, not inside the cervix, and inflated with fluid (60 mL to 120 mL) through a dedicated port to occlude the vagina, thereby preserving a stable intrauterine vacuum.

Correct usage

A simple mnemonic to facilitate use of the JADA VHCD is "120/80"—fill the vaginal balloon with 120 mL of sterile fluid and attach the tubing to a source that is set to provide 80 mm Hg of vacuum with an in-line collection cannister. The VHCD may not work correctly if there is a substantial amount of blood in the uterus. Clinical experts advise that an important step prior to placing the elliptical loop in the uterus is to perform a sweep of the uterine cavity with a hand or instrument to remove clots and ensure there is no retained placental tissue. It is preferable to assemble the suction tubing, syringe, sterile fluid, and other instruments (eg, forceps, speculum) needed to insert the device prior to attempting to place the VHCD. When the elliptical loop is compressed for insertion, it is about 2 cm in diameter, necessitating that the cervix be dilated sufficiently to accommodate the device.

Immediately after placing the VHCD, contractions can be monitored by physical examination and the amount of ongoing bleeding can be estimated by observing the amount of blood accumulating in the cannister. Rapid onset of a palpable increase in uterine tone is a prominent feature of successful treatment of PPH with the VHCD. The VHCD should be kept in the uterus with active suction for at least 1 hour. Taping the tubing to the inner thigh may help stabilize the device. Once bleeding is controlled, prior to removing the device, the vacuum should be discontinued, and bleeding activity should be assessed for at least 30 minutes. If the patient is stable, the vaginal balloon can be deflated, followed by removal of the device. The VHCD should be removed within 24 hours of placement.[6]

The JADA VHCD system should not be used with ongoing intrauterine pregnancy, untreated uterine rupture, unresolved uterine inversion, current cervical cancer, or serious infection of the uterus.[6] The VHCD has not been evaluated for effectiveness in the treatment of placenta accreta or coagulopathy. The VHCD has not been specifically evaluated for safety and effectiveness in patients < 34 weeks' duration, but clinicians report successful use of the device in cases of PPH that have occurred in the second and early-third trimesters. If the device can be appropriately placed with the elliptical loop in the uterus and the balloon in the vagina, it is theoretically possible to use the device for cases of PPH occurring before 34 weeks' gestation.

When using the JADA VHCD system, it is important to simultaneously provide cardiovascular support, appropriate transfusion of

ILLUSTRATION: MARY ELLEN NIATAS FOR OBG MANAGEMENT

blood products and timely surgical intervention, if indicated. All obstetricians know that in complicated cases of PPH, where conservative measures have not worked, uterine artery embolization or hysterectomy may be the only interventions that will prevent serious patient morbidity.

Effectiveness data

The VHCD has not been evaluated against an alternative approach, such as UBT, in published randomized clinical trials. However, prospective cohort studies have reported that the JADA is often successful in the treatment of PPH.[7-10]

In a multicenter cohort study of 107 patients with PPH, including 91 vaginal and 16 cesarean births, 100 patients (93%) were successfully treated with the JADA VHCD.[7] Median blood loss before application of the system was 870 mL with vaginal birth and 1,300 mL with cesarean birth. Definitive control of the hemorrhage was observed at a median of 3 minutes after initiation of the intrauterine vacuum. In this study, 32% of patients had reproductive tract lacerations that needed to be repaired, and 2 patients required a hysterectomy. Forty patients required a blood transfusion.

Two patients were treated with a Bakri UBT when the VHCD did not resolve the PPH. In this cohort, the vacuum was applied for a median duration of 144 minutes, and a median total device dwell time was 191 minutes. Compared with UBT, the JADA VHCD intrauterine dwell time was shorter, facilitating patient progression and early transfer to the postpartum unit. The physicians who participated in the study reported that the device was easy to use. The complications reported in this cohort were minor and included endometritis (5 cases), vaginal infection (2 cases), and disruption of a vaginal laceration repair (1 case).[7]

Novel approaches to generating an intrauterine vacuum to treat PPH

The JADA VHCD is the only vacuum device approved by the US Food and Drug Administration (FDA) for treatment of PPH. However, clinical innovators have reported alternative approaches to generating an intrauterine vacuum using equipment designed for other purposes. In one study, a Bakri balloon was used to generate intrauterine vacuum tamponade to treat PPH.[11] In this study, a Bakri balloon was inserted into the uterus, and the balloon was inflated to 50 mL to 100 mL to seal the vacuum. The main Bakri port was attached to a suction aspiration device set to generate a vacuum of 450 mm Hg to 525 mm Hg, a much greater vacuum than used with the JADA VHCD. This study included 44 cases of PPH due to uterine atony and 22 cases due to placental pathology, with successful treatment of PPH in 86% and 73% of the cases, respectively.

Another approach to generate intrauterine vacuum tamponade involves using a Levin stomach tube (FG24 or FG36), which has an open end and 4 side ports near the open tip.[12-14] The Levin stomach tube is low cost and has many favorable design features, including a rounded tip, wide-bore, and circumferentially placed side ports. The FG36 Levin stomach tube is 12 mm in diameter and has 10 mm side ports. A vacuum device set to deliver 100 mm Hg to 200 mm Hg was used in some of the studies evaluating the Levin stomach tube for the treatment of PPH. In 3 cases of severe PPH unresponsive to standard interventions, creation of vacuum tamponade with flexible suction tubing with side ports was successful in controlling the hemorrhage.[13]

Dr. T.N. Vasudeva Panicker invented an intrauterine cannula 12 mm in diameter and 25 cm in length, with dozens of 4 mm side ports over the distal 12 cm of the cannula.[15] The cannula, which is made of stainless steel or plastic, is inserted into the uterus and 700 mm Hg vacuum is applied, a level much greater than the 80 mm Hg vacuum recommended for use with the JADA VHCD. When successful, the high suction clears the uterus of blood and causes uterine contraction. In 4 cases of severe PPH, the device successfully controlled the hemorrhage. In 2 of the 4 cases the device that was initially placed became clogged with blood and needed to be replaced.

UBT vs VHCD

To date there are no published randomized controlled trials comparing Bakri UBT to the JADA VHCD. In one retrospective study, the frequency of massive transfusion of red blood cells (RBCs), defined as the transfusion of 4 units or greater of RBCs, was assessed among 78 patients treated with the Bakri UBT and 36 patients treated with the JADA VHCD.[9] In this study, at baseline there was a non–statistically significant trend for JADA VHCD to be used more frequently than the Bakri UBT in cases of PPH occurring during repeat cesarean delivery (33% vs 14%). The Bakri UBT was used more frequently than the JADA VHCD among patients having a PPH following a vaginal delivery (51% vs 31%). Both devices were used at similar rates for operative vaginal delivery (6%) and primary cesarean birth (31% VHCD and 28% UBT).

In this retrospective study, the percentage of patients treated

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with VHCD or UBT who received 4 or more units of RBCs was 3% and 21%, respectively ($P < .01$). Among patients treated with VHCD and UBT, the estimated median blood loss was 1,500 mL and 1,850 mL ($P=.02$), respectively. The median hemoglobin concentration at discharge was similar in the VHCD and UBT groups, 8.8 g/dL and 8.6 g/dL, respectively.[9] A randomized controlled trial is necessary to refine our understanding of the comparative effectiveness of UBT and VHCD in controlling PPH following vaginal and cesarean birth.

A welcome addition to treatment options

Every obstetrician knows that, in the next 12 months of their practice, they will encounter multiple cases of PPH. One or two of these cases may require the physician to use every medication and procedure available for the treatment of PPH to save the life of the patient. To prepare to treat the next case of PPH rapidly and effectively, it is important for every obstetrician to develop a standardized cognitive plan for using all available treatment modalities in an appropriate and timely sequence, including both the Bakri balloon and the JADA VHCD. The insight that inducing an intrauterine vacuum causes uterine contraction, which may resolve PPH, is an important discovery. The JADA VHCD is a welcome addition to our armamentarium of treatments for PPH. ●

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ORIGINAL ARTICLE

Prevention of Postpartum Hemorrhage Using Vacuum Retraction Cannula during Cesarean Section in Major Degree Placenta Previa

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Abstract

Aim: To evaluate the effectiveness of a vacuum retraction cannula (VRC) for the prevention of postpartum hemorrhage (PPH) in major degree placenta previa (PP).

Materials and methods: The study was an ambidirectional interventional cohort study undertaken in the Department of Obstetrics and Gynaecology, for 18 months in the tertiary care center, after obtaining the Institute Human Ethical Committee (IHEC) clearance. The effectiveness of a VRC was evaluated in pregnant women undergoing an elective or emergency cesarean section for major degree placenta previa. The primary outcome was the number of cases that were prevented from PPH.

Results: Out of a total of 15 patients, the treatment prevention rate in our study was estimated to be 20% (95% confidence interval [CI]: 17.5–22.5). The mean total blood loss intraoperatively was 1218.57 mL (1132.23–1304.91). The total mean duration for the cannula kept *in situ* was 940.71 minutes (821.12–1060.31). In total, 6 (40%) patients had received blood products. The average of preoperative hemoglobin was 11.06 g/dL (10.76–11.37) and the postop day 2 hemoglobin was 9.05 mg/dL (8.67–9.42). The median length of hospital stay was 5.46 ± 0.84 days. Device-related superficial vaginal tear incurred in 2 (14.29%) patients.

Conclusion: Prophylactic application of a VRC in major degree placenta previa can prevent catastrophic bleeding.

Clinical significance: The device is cost-effective and provides a rapid modality of treatment options for one of the highest risk cases in obstetrics and gynecology.

Keywords: Cesarean section, Maternal morbidity, Placenta previa, Postpartum hemorrhage, Vacuum retraction cannula.

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Introduction

Placenta previa is the complete or partial covering of the internal opening in the center of the cervix (os) with the placenta. The prevalence of placenta previa (PP) in Asia is 27.4%.[1] The incidence in India is between 2 and 0.5%.[2] There is no definite consensus for the mode of delivery for the low-lying PP (where the edge is within 2–3.5 cm from the internal os). However, in cases of major degree placenta, the faith does not allow a safe vaginal delivery rather a cesarean section, even if the diagnosis was made early in pregnancy. Clinical studies in India reported the incidence of postpartum hemorrhage in PP as 43.6%.[3]

A great number of strategies from scheduled delivery planning, discussions, and counselling's with the interprofessional branches has been taken into account to reduce the risk of hemorrhage. Despite the preparedness, during cesarean in PP when the placenta detaches from the less contractile lower segment of the uterus it poses an increased risk of antepartum (relative risk [RR]: 9.8), intrapartum (RR: 2.5), and postpartum hemorrhage (PPH) (RR: 1.9).[4] For management various maneuvers such as bimanual uterine massage, uterotonics, intrauterine tamponade using balloon or gauze, B-Lynch sutures, Hackethal suture, Cho sutures, uterine artery or internal iliac artery ligation, and uterine artery or internal iliac artery embolization have been tried and tested.[5,6] The balloon tamponade remains the least invasive intervention with reported effectiveness of controlling postpartum hemorrhage (PPH) up to 87% and an overall complication of 6.5%.[7,8] Yet the morbidity and mortality of the mother and neonate seem to be significantly at rise.[9]

The overall adverse impact of placenta previa invites more conservative but effective and easily available techniques. A vacuum retraction cannula (VRC) established for use in the management of PPH may be the need of the hour. The present study has been undertaken to understand the prophylactic application of (VRC) in critical cases of major degree placenta previa and its clinical implications in preventing PPH.

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Conflict of interest: None

Materials and Methods

The aim of our study was to determine the role of a VRC for the prophylactic use in the prevention of PPH during cesarean section for major degree placenta previa.

A VRC is a slender angulated metallic device made of stainless steel with a blunt insertion tip (Fig. 1), available by the brand names Panickers or SR suction cannula. All the patients with major degree placenta previa above the age of 18 years undergoing an elective or emergency cesarean section with a period of gestation (POG) of 34 weeks and above were included. The screening was done and enrollment was initiated after obtaining a written consent (Flowchart 1). The exclusion criteria were moderate to severe anemia, multiple pregnancies, preeclampsia or fibroid in pregnancy (International Federation of Gynecology and Obstetrics [FIGO] type 2–5; size >5 cm), morbidly adherent placenta, uterine anomaly, and uterine rupture.

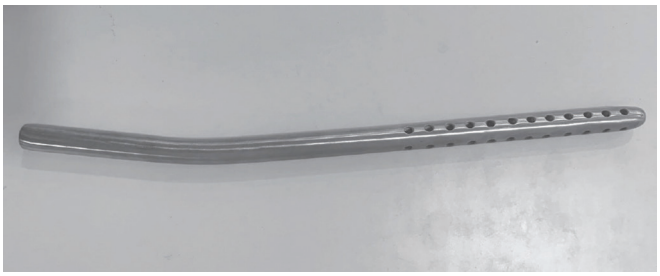


Fig. 1: Vacuum retraction cannula

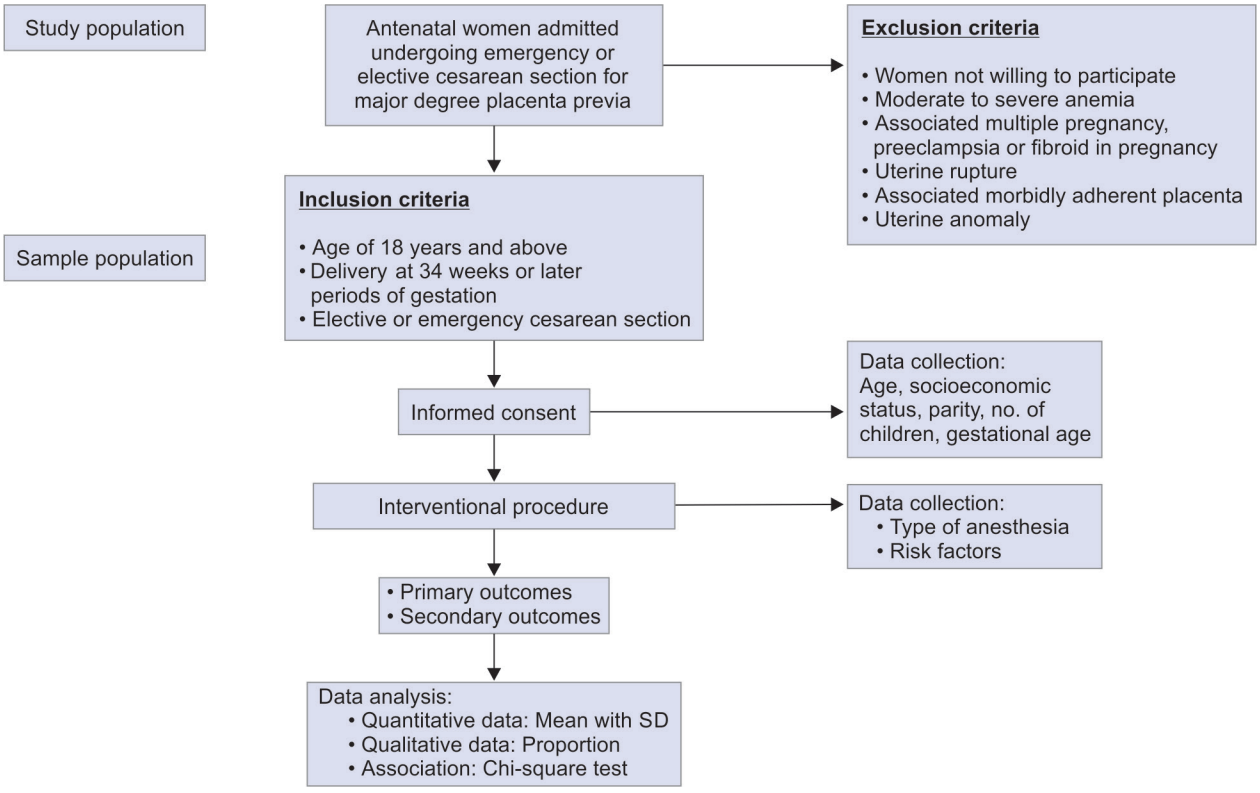
The parameters for objective analysis were as follows:

- Estimation of the total blood loss.
- Assessment of the additional need for intraoperatively or postoperatively (medical or surgical) interventions and blood transfusion.
- Estimation of the total duration of application of the cannula.
- Undue complications in the postpartum period.

During cesarean sections after the complete removal of the placenta uterus, the device was placed under aseptic precautions through the uterine incision. In the closed cervix, minimal manual pressure was applied to dilate the cervix to about 1–2 cm, sufficient for the device to pass through. After the standard technique of uterine closure, the vacuum connector attached to the suction machine was immediately connected to VRC and negative pressure was gradually increased up to 700 mm Hg. The blood collected in the vacuum jar gives the measure of ongoing blood loss correctly.

The amount of blood loss is an important component of the analysis in the study. We substantiated a combined method of modified quantitative gravimetric measurement and visually estimated blood loss (EBL) to avoid overestimation or underestimation.[10] All the cases underwent lower segment cesarean section (LSCS) and standard AMTSL protocol. Once the device was connected subjective assessment of the myometrial contraction was done by the operating surgeons. Requirements and implication of additional standard medical or surgical management protocol for PPH were at surgeons' discretion. All the patients were prophylactically given intravenous oxytocin 20 IU in 500 mL NS at 100 mL/hour for the next 2–3 hours.

Flowchart 1: Flowchart of the sequence of events



The effectiveness endpoint was defined as blood loss of less than 1000 ml in 24 hours, with no aid of other second-line intraoperative surgical (vascular ligation, uterine compression sutures, hysterectomy, or exploratory laparotomy) or nonsurgical interventions (uterine balloon tamponade therapy, uterine packing, or uterine artery embolization) and no blood transfusion intraoperative or postoperative within 24 hours. Further analysis of the total duration of the application and postpartum morbidity were also estimated. The patients were followed up with standard postoperative care and monitoring till discharge. The statistical analysis was performed on the enrolled cohorts. Categorical data were summarized using frequency tables, presenting participant counts and relative percentages. Continuous variables were summarized as mean and standard deviation (SD). A 95% CI was calculated for the treatment success rate.

Results

A total of 15 pregnant women were enrolled. The majority of the patient were between the age group 20–35 years. The mean maternal age was 30.28 ± 4.2 years. Most women were educated up to secondary level (70%) and belonged to the rural population (66 %). The majority were nulliparous (66.7%). The mean POG in the study was 36.86 ± 0.55 weeks. None of the patients had a previous history of placenta previa or PPH. Out of the total 15 cases, 9 (60%) cases were taken as emergency sections due to bleeding per vagina. Of these, five cases had been scheduled for an elective cesarean.

The parameters to estimate the objectives of our study are shown in Flowchart 1. The mean total blood loss in our study was 1218.57 mL (1132.23–1304.91). The pressure was kept on continuously for 2 hours immediately postpartum. The total mean duration for the cannula kept *in situ* was 940.71 minutes (821.12–1060.31) which included vacuum treatment time as well as pressure released observation time.

General anesthesia (GA) was used in three cases compared to spinal anesthesia (SA) in the rest of the 12 cases; in the 3 cases done under GA, blood products were required in 100% of the cases. Blood products were required in 6 patients (40%). While in those who received SA only 25% (3 out of 12) cases needed blood products. Bilateral uterine artery ligation was performed in 1 case in our study. No further surgical intervention was required in any case. Blood products were required in 6 patients (40%). None of the cases had ICU admissions. In the present study 2 (14.29%) patients had device-related superficial mucosal vaginal tears while removal. Suture was taken in both cases as the site was oozing. The average of preoperative hemoglobin was 11.06 g/dL (10.76–11.37) and the postop day 2 hemoglobin was 9.05 mg/mL (8.67–9.42). Postoperatively only 1 (6.67%) patient had a single episode of fever (100°F) on postoperative day 3, which was resolved with medication. There was no case of wound infection or gape per abdomen and no patient complained of any foul-smelling discharge during the period of hospital stay. The median length of the hospital was 5.46 ± 0.84 days. On postnatal follow up there was no readmission for maternal complaints or any case of re-exploration. It was observed that only in three cases no additional medical management of PPH was required. Hence, the treatment prevention rate in our study was estimated to be 20% (3/15, 95% CI: 17.5–22.5).

Discussion

Placenta previa are the cases where preparation for complications is of utmost importance. Prophylactic measures can be intervened in elective cases in advance by optimizing the fitness of the patient preoperatively and the correcting underlying comorbidities. However sudden bleeding is a more common tendency, thus they mostly present as emergency cases with serious complications. As no studies were found at present depicting the prophylactic use of the suction cannula in cases of placenta previa, we compared the present study with the studies where the device has been used for the treatment of PPH.

In Panicker's study, 15 out of 40 total women had LSCS and the quantity of blood collected varied from 50 to 300 mL.[11] In a study by Meena et al., 4 out of 25 cases (16%) were of placenta previa and EBL ranged from 50 to 350 mL.[12] The duration of the device kept *in situ* has been seen to vary from study to study. In most of the studies, the pressure was maintained only for 10–15 minutes while in some up to 30 minutes. The median time of vacuum treatment in the study by D'Alton et al. was 144.0 minutes (interquartile range, 85.8–295.8), with a total device in-dwelling median time of 191.0 minutes (interquartile range, 132.8–365.8).[13] It was 940.71 minutes much higher in our study. The device is an established method for PPH management and keeping the device *in situ* eliminates the need to reinsert and increase the exposure to trauma or chances of infection along with the benefit of saving precious time from diverting to other time-consuming procedures. Based on the severe morbid experiences with cases of placenta previa in the institute prior to the study initiation, the decision was made to keep the device *in situ* for the next 6 hours for all the patients with or without pressure on. Beyond 6 hours the keeping further was at the surgeon's discretion. Due to a lack of studies on a complete understanding of long-term device-related effects it was intended not to keep the device for more than 24 hours. A success rate of 60% (9 cases) was observed when uterotonics were used along with VRC in our study. It was found to be comparable to the treatment success rate of 94% (100/106, 95% CI: 88–98%) as seen in a multicentric, single-arm prospective study that evaluated the effectiveness of the vacuum cannula method to control PPH.[13] The study by Meena et al. showed that the majority of cases 23(92%) survived following the use of an SR cannula.[12] Requirement for blood products which is 40% in our study was comparable to 38% in the study by D'Alton et al.[13]

While removal of the device gentle manipulation was required to release the apposed tissues of the cervix to the pores of the devices. Device-related vaginal injury was 5 for Panicker while it was 8 for D'Alton et al. To date, the reports have a low rate of adverse events that resolved with minor treatment and without serious clinical sequelae. A retrospective clinical study evaluated 39 cases of women with placenta previa in a tertiary referral center and reported adherent placenta previa in 20.5%, hysterectomy in 15.4%, ICU admission in 15.4%, and no significant effect on perinatal outcome.[3] In the present study, there were no cases of peripartum hysterectomy. The effectiveness of prophylactic use of VRC in our study for the prevention of PPH was 20%.

The strengths of our study were the preparedness of multidisciplinary facility availability, well-trained staff and rigorously defined protocols for the total blood loss calculation. The limitation

of our study was that it was not a randomized design. Several placenta previa cases still low in numbers due to a lack of chain of referrals. In most studies, normal deliveries were included which limits the generalization. The duration of device pressure for 6 hours invariably was not based on standard reference but rather based on labor physiology and past observations. This could mask the cases which might not have PPH even without the use of the device. The inference on the lesser duration of device requirement in other studies compared to our study could be explained by the discrepancies in the cohorts which included higher risk groups, as well as in our study the estimation was for prevention rather than post PPH management. Therefore, one has to be cautious before undermining or extrapolating these percentages and presuming the lower efficiency of the device.

Conclusion

The effectiveness of the vacuum device as a prophylactic treatment observed in this study is promising. The study demonstrates that the device has a minimal learning curve and a reassuring safety profile. Appropriate monitoring with the real-time quantification of the blood loss throughout helps in mitigation for necessary treatment. The indwelling nature of the device decreases the chances of re-exposures and infection rates. The device can be used successfully with uterotonics in the management of PPH, thus offering a fertility-preserving treatment on contrary to the last resort to peripartum hysterectomy when other methods fail. The simplicity of connection with a rapid function activation is the main features of the device that make it one of the best feasible options at the most critical time to save time and prevent PPH.

Clinical Significance

In this study, we propose the use of VRC as a method of prevention for PPH. It provides an option that may eliminate the need for more invasive procedures, such as uterine artery embolization and surgical interventions, which are riskier, costlier, and may not be available in all obstetric units. Reusability and lower maintenance requirements make it a cost-effective tool. The assembling and activation of the device have minimal skill requirements, enabling hands-on training by nurses or even paramedics, and use in an emergency without any delay. A correct, timely decision for the application of this simple and quick conservative approach may help in bridging the extra time taken in saving the life with minimal blood loss. Postnatally it may potentially enhance maternal recovery and facilitate maternal–new-born bonding benefitting the patient, her family, the clinical team, and the healthcare system overall. Hence the VRC can effectively mitigate the rates of severe maternal morbidity and mortality. The implications of continuous negative pressure in a future pregnancy and long-term effect can be undertaken in future studies.

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Comparative Analysis of Panicker's Vacuum Suction Hemostatic Device Versus the Chhattisgarh Balloon Tamponade in the Management of Postpartum Hemorrhage at a Tertiary Health Facility in Uttar Pradesh, India

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Abstract

Introduction: Etiologies of postpartum hemorrhage vary widely and most commonly include uterine atony and placental site bleeding. The Chhattisgarh balloon tamponade applies positive pressure to the intrauterine myometrial wall and compresses the placental bed within the endometrial lining to stop postpartum hemorrhage. In contrast, Panicker's vacuum suction hemostatic device is used to perform vacuum retraction of the uterus. This study compared the effectiveness of Panicker's vacuum suction hemostatic device and the Chhattisgarh balloon tamponade in controlling postpartum hemorrhage.

Methods: Patients older than 19 years of age with atonic postpartum hemorrhage were included in the study. Patients with other causes of postpartum hemorrhage, such as coagulopathy, traumatic postpartum hemorrhage, retained products of conception, uterine rupture, and perforation, were excluded. Patients were randomly divided into two groups (A and B), with 70 participants per group. In Groups A and B, Panicker's vacuum suction hemostatic device and the Chhattisgarh balloon tamponade were used, respectively. The outcome in both groups was measured based on different parameters.

Results: Statistically significant differences were found between Groups A and B regarding the time taken to control uterine bleeding, time taken to restore uterine tone, amount of blood loss, pain score, and length of hospital stay.

Conclusion: Vacuum retraction of the uterus using Panicker's vacuum suction hemostatic device was found to be more effective in the management of postpartum hemorrhage than the Chhattisgarh balloon tamponade.

Categories: Obstetrics/Gynecology
Keywords: chhattisgarh balloon tamponade, hemostasis, panicker's suction cannula, post-partum hemorrhage, uterine atony

Introduction

Postpartum hemorrhage (PPH), defined as severe bleeding after childbirth, is the primary cause of maternal death worldwide. Globally, approximately 14 million women per year experience PPH, leading to 70,000 maternal deaths. Women who survive PPH may have permanent reproductive impairment and often require immediate surgical procedures to stop the bleeding [1]. In predominantly rural countries such as India, PPH occurs in approximately 12% of deliveries, with a high recurrence rate of 15% in subsequent pregnancies [2]. Postpartum hemorrhage (PPH) is defined by ACOG's reVITALize program as cumulative blood loss ⩾1000 mL or with signs and symptoms of hypovolemia within 24 hours of delivery [3]. The causes of PPH are diverse, with the most frequent being uterine atony and bleeding from the placental site (e.g., retained placenta or "placenta accreta spectrum"). Moreover, PPH can result from a large baby, prolonged labor leading to tissue injury, or underlying blood clotting disorders. Uterine atony is the leading cause of PPH in 80% of cases [4]. Conventional tamponade devices are used to stop the bleeding by applying positive pressure to the intrauterine myometrial wall and compressing the placental bed within the uterus [5]. Conservative management techniques such as uterotonic medications, which cause the uterus to contract, external uterine massage, and bimanual compression are generally used as "first-line" treatments [6]. The Chhattisgarh balloon tamponade is a uterine balloon tamponade with a central draining channel and is used for second-line management of atonic PPH [7].

A more recent development in the treatment of atonic PPH is vacuum retraction of the uterus, which facilitates uterine contraction and retraction. All bleeding arterioles and sinusoids get sucked in, which stops the bleeding owing to the negative pressure formed inside the uterine cavity. Devices used to perform

vacuum retraction include Panicker's vacuum suction hemostatic device, SR suction cannula, suction tube uterine tamponade, and the Jada system [8].

Panicker’s vacuum suction hemostatic device is a steel or plastic tube (12 mm in diameter and 25 cm in length) with numerous perforations (4 mm in diameter) on the distal portion (12 cm) of the cannula [9].

India is a developing country with limited resources, and it is often challenging to control unexpected, severe bleeding owing to a lack of doctors and paramedics, a shortage of blood and blood products, and the need for transportation to more advanced medical facilities. There is no previous study comparing the effectiveness of Panicker’s vacuum suction hemostatic device and the Chhattisgarh balloon tamponade. Based on our observations prior to this study, it was expected that Panicker's vacuum suction hemostatic device would provide better results in controlling PPH. To confirm this observation, we carried out the study to determine the better option.

Materials And Methods

This study was performed at the Obstetrics and Gynecology Department of Ganesh Shankar Vidyarthi Memorial (GSVM) Medical College in Kanpur, Uttar Pradesh, India, between April 2022 and June 2024. The study aimed to compare the efficacy of two interventions, Panicker's hemostatic device and the Chhattisgarh balloon tamponade, in reducing postpartum hemorrhage. Study participants were randomly assigned to one of two groups (Group A and Group B), with 70 participants per group.

The study included women with atonic postpartum hemorrhage who were 19 years of age or older. Women who exhibited disseminated intravascular coagulation, had inherited blood clotting disorders, or had traumatic postpartum hemorrhage were excluded. Additionally, women with uterine rupture requiring cesarean hysterectomy, those with uterine perforations, and those experiencing secondary postpartum hemorrhage due to retained products of conception or placental anomalies were excluded.

Panicker's vacuum suction hemostatic device was used in Group A. The cannula was placed in the uterine cavity up to the fundus. It was inserted in the lithotomy position through the cervix in the case of vaginal delivery, and through the uterine wound in the case of lower segment cesarean section.

A negative suction pressure of 650-700 mm Hg was created within one minute and maintained for 10 to 15 minutes using a suction machine. This resulted in uterine retraction, and all blood accumulated in the uterine cavity was aspirated. During this process, soft cervical tissues were drawn into the uterine and cervical perforations of the cannula. The time required to achieve hemostasis was recorded. The cannula was reinserted if bleeding continued. This process was repeated every three hours or whenever bleeding resumed.

FIGURE 1: Panicker's vacuum hemostatic suction device without suction attachments.

The Chhattisgarh balloon tamponade method was applied in Group B. The following steps were followed to prepare the Chhattisgarh balloon tamponade. First, the drainage tube of a Foley catheter was cut into two ring-shaped segments. Next, the bulb of the catheter was inflated by pumping 2 to 5 mL of air into it and then excised. A condom was then rolled over the catheter and secured at both ends using the two rings. The rings were wrapped around the condom twice, leaving 1.5 to 2 cm of the condom at either end. The tip of the catheter and the closed end of the condom were excised at approximately 0.5 cm from the tied ring, leaving both rings in place. A drainage port was attached to a Urobag. The balloon inflation port was used to inflate the balloon. In cases where the tamponade was evacuated during inflation, it was deflated, reinserted, and secured in place with vaginal packing before re-inflation. The process is illustrated using photographs (Figures *2*-*9*).

FIGURE 2: Drainage tube of a Foley catheter is cut into two ring-shaped segments.

FIGURE 3: Bulb of the catheter is inflated by pumping 2-5 mL of air.

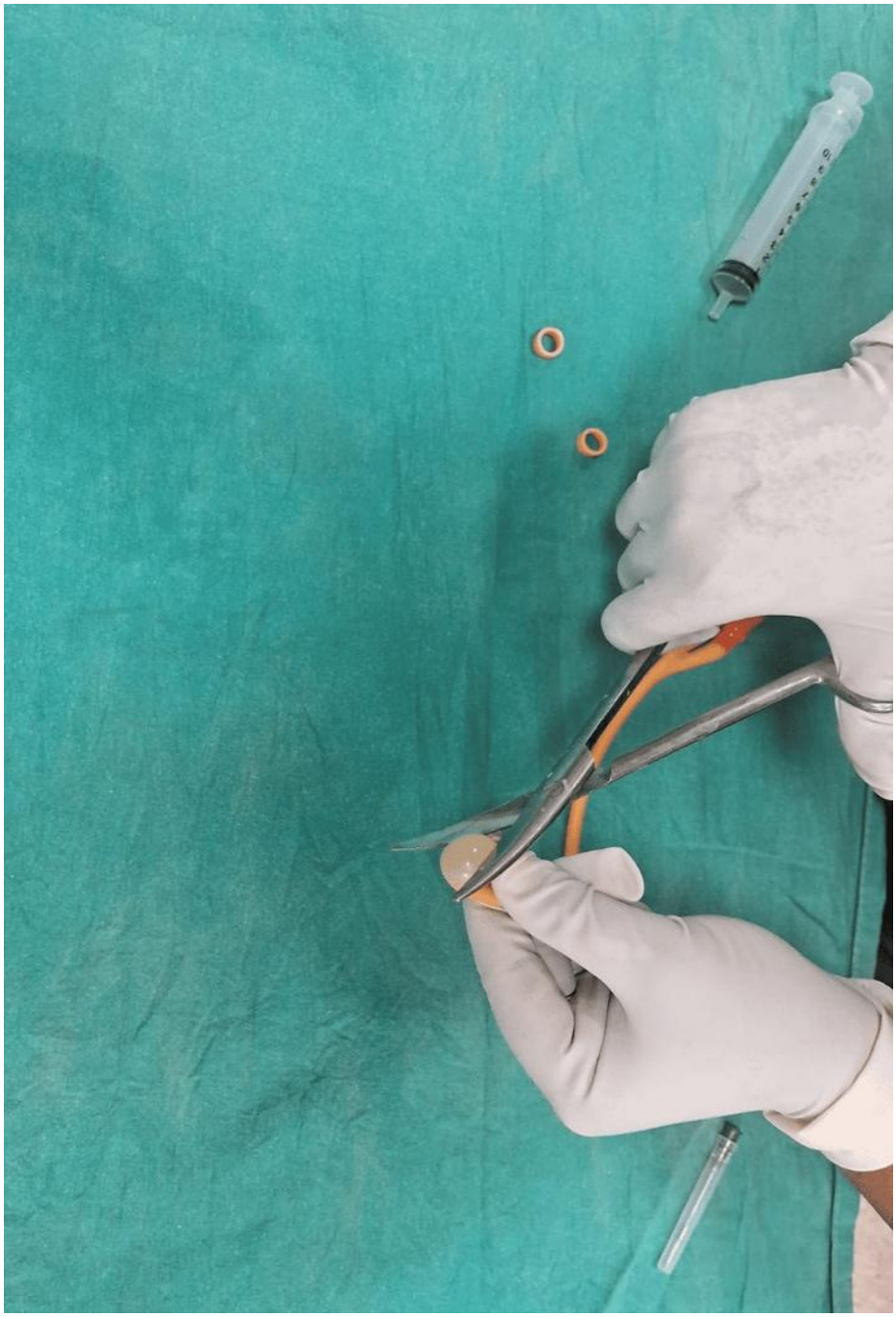

FIGURE 4: Bulb of the catheter is inflated by pumping 2-5 mL of air into it and then excised.

FIGURE 5: A condom is rolled over the catheter.

FIGURE 6: The rings are wrapped around the condom twice, leaving 1.5-2 cm of condom at either end.

FIGURE 7: The tip of the catheter and the closed end of the condom are excised at approximately 0.5 cm from the tied ring, leaving both rings in place.

FIGURE 8: A drainage port was attached to a Urobag.

FIGURE 9: A balloon inflation port was used to inflate the balloon.

Through this comparison, the study sought to determine which of the two devices, the Chhattisgarh balloon tamponade or Panicker's hemostatic device, offers better postpartum hemorrhage control.

To ensure consistency in practices and adherence to guidelines, all researchers and personnel responsible for data collection received training in the preparation and application of the Chhattisgarh balloon tamponade as well as in the use of Panicker's vacuum hemostatic suction device. They were also trained in the assessment of blood loss during PPH, maintaining records of the time taken to control the bleeding, and using the Universal Pain Assessment Tool. The degree of pain was assessed using the Universal Pain Assessment Tool [10], and the participants' socioeconomic status was assessed according to the modified Kuppuswamy socioeconomic scale 2024 [11]. The collected data were analyzed using IBM SPSS Statistics for Windows, Version 23 (Released 2015; IBM Corp., Armonk, New York).

Results

Most participants in both groups were younger than 30 years of age, with 60 participants (85.71%) in Group A and 56 participants (80.00%) in Group B. According to the modified Kuppuswamy socioeconomic scale 2024, the participants were categorized into upper-middle, lower-middle, or lower socioeconomic classes. The largest proportion of participants, i.e., 37 (52.86%) in Group A and 34 (48.57%) in Group B, belonged to the lower-middle class. In terms of educational background, the highest percentage of participants in each

group had completed formal education ranging from Class 6 to Class 12 (Table 1).

Parameter	Group A, n (%)	Group B, n (%)	p-value
Gravida status			
≤2	36 (51.43%)	37 (52.86%)	0.866
≥3	34 (48.57%)	33 (47.14%)	-
Mode of delivery			
Vaginal	60 (85.71%)	33 (47.14%)	<0.001
Cesarean	10 (14.29%)	37 (52.86%)	
High-risk factor			
None	57 (81.43%)	57 (81.43%)	
Anemia	5 (7.14%)	3 (4.23%)	-
Hypothyroidism	4 (5.71%)	5 (7.14%)	0.936
Previous cesarean delivery	2 (2.86%)	2 (2.86%)	-
Diabetes	2 (2.86%)	3 (4.23%)	-

TABLE 1: Association between group and gravida status, mode of delivery and high-risk factors.

Chi-square test; results are significant at $p < 0.05$.

The gravida status of participants in Groups A and B was not significantly different. In terms of delivery method, the percentage of women who had a vaginal delivery was significantly higher in Group A than in Group B. However, when assessing the presence of high-risk factors, no significant difference was observed between the two groups (Table 2).

Variable	Group A, n (%)	Group B, n (%)
Age		
<30 years	60 (85.71%)	56 (80.00%)
≥30 years	10 (14.29%)	14 (20.00%)
Socioeconomic class		
Upper middle	9 (12.86%)	8 (11.43%)
Lower middle	37 (52.86%)	34 (48.57%)
Lower	24 (34.29%)	28 (40.00%)
Education level		
Uneducated	19 (27.14%)	11 (15.71%)
Classes 1–5	4 (5.71%)	7 (10.00%)
Classes 6–12	45 (64.29%)	48 (68.57%)
Graduate and postgraduate	2 (2.86%)	4 (5.71%)

TABLE 2: Sociodemographic characteristics of the patients.

The time required to stop uterine bleeding was significantly shorter in Group A. Moreover, these patients regained uterine tone in a significantly shorter period and experienced significantly lower total blood loss.

However, no statistically significant differences were observed between Groups A and B in terms of pre-delivery and post-delivery hemoglobin levels, nor in the decline in hemoglobin levels associated with the procedure. Notably, participants in Group A reported significantly lower pain scores and had a significantly shorter hospital stay than those in Group B (Table 3).

Parameter	Group A (mean ± SD)	Group B (mean ± SD)	p-value
Time taken to stop the bleeding (min)	4.85 ± 0.89	8.61 ± 0.65	<0.0011
Time taken to restore uterine tone (min)	3.27 ± 0.81	6.72 ± 0.87	<0.0011
Amount of blood loss (mL)	178.80 ± 26.71	229.42 ± 20.21	<0.0011
Hemoglobin (g/dL, before delivery)	10.32 ± 1.53	10.31 ± 1.35	0.9671
Hemoglobin (g/dL, after delivery)	9.04 ± 1.23	8.91 ± 1.35	0.5531
Decrease in hemoglobin (g/dL)	1.28 ± 0.82	1.40 ± 0.50	0.2981
Pain score	2.62 ± 1.20	3.78 ± 1.40	<0.0011
Duration of hospital stay (days)	3.14 ± 1.10	5.13 ± 1.10	<0.0011

TABLE 3: A comparison of the efficacy of Panicker's vacuum suction hemostatic device and Chhattisgarh balloon tamponade.

Wilcoxon-Mann-Whitney U Test results are significant at $p < 0.05$.

Discussion

In India, there are limited resources in health facilities for the management of PPH. Both Panicker's suction cannula and the Chhattisgarh balloon tamponade are promising modalities for the control of PPH. To identify the better option among them, we conducted the present study and compared the Chhattisgarh balloon tamponade with Panicker's vacuum suction hemostatic device. In our study, it was found that the time required to stop the bleeding and the amount of blood loss were significantly less in Group A. These results are consistent with previous findings, which emphasize the superior efficacy of Panicker's vacuum suction hemostatic device in the management of atonic PPH.

In 2021, Rana et al. conducted a study in patients with postpartum hemorrhage using Panicker's cannula at M. K. Shah Medical College and Research Center, Ahmedabad (India). A total of 20 women with singleton pregnancies were included; of these, 14 had vaginal deliveries and 6 had lower-segment cesarean sections. With the use of Panicker's suction cannula, complete cessation of bleeding, accompanied by contraction and firm retraction of the uterus, was achieved in all women within four minutes. The amount of blood collected in the suction apparatus ranged from 150 to 250 mL. This study demonstrated that vacuum retraction of the uterus supports the natural physiological processes of contraction and retraction [12].

In 2022, Sowjanya and Suseela conducted a study at the Government Medical College, Kadapa (India), to evaluate the efficacy of the SR suction cannula in preventing postpartum hemorrhage. It was found that the suction cannula successfully stopped bleeding within four minutes, with 100 to 200 mL of blood loss. The mean blood loss in the SR suction cannula group (187.6 mL) was significantly lower than that in the control group (378 mL). This finding is similar to ours and confirms that the suction procedure is a practical approach for controlling postpartum hemorrhage in resource-limited settings [13].

Likewise, Meena et al. highlighted that vacuum retraction of the uterus represents a novel advancement in managing atonic postpartum hemorrhage. Their findings indicated that generating negative pressure in the uterine cavity facilitates a reduction in uterine size, which supports the physiological process of uterine contraction and retraction to prevent atonic postpartum hemorrhage. Complete cessation of bleeding, accompanied by contraction and firm retraction of the uterus, was mostly observed within four minutes after the procedure was started [14]. However, a study by Mishra et al. using the Chhattisgarh balloon tamponade reported that the time taken from the diagnosis of atonic postpartum hemorrhage to the insertion of the Chhattisgarh balloon tamponade was 20 minutes. The amount of blood loss before insertion of the tamponade was approximately 1600 mL, and the mean blood loss after control of PPH was 35 mL in the subsequent 12 hours [7]. Samartha et al. also reported that vacuum retraction of the uterus leads to cessation of bleeding, associated with contraction and firm retraction of the uterus within four minutes [8]. Makhija et al. found that suction and evacuation are effective techniques, involving the maintenance of negative suction pressure in the uterine cavity, and they successfully stopped bleeding in 88.9% of patients [15]. Panicker analyzed the effectiveness of Panicker's vacuum suction hemostatic device in the

management of atonic postpartum hemorrhage in 40 women who had vaginal deliveries and 15 who had lower-segment cesarean sections at a low-resource maternity hospital over two years. After insertion of the cannula and maintenance of negative pressure at 650-700 mm Hg for 30 minutes, firm retraction of the uterus was observed, with blood loss ranging from 50 to 300 mL [9].

Limitations

The present study included only 140 participants (70 in each group), which may restrict the generalizability of the findings. Moreover, the results may not be representative of outcomes in other healthcare settings, particularly in rural or resource-constrained environments, as the study was limited to a single tertiary care facility. The findings may not be applicable to all occurrences of postpartum hemorrhage, as the study did not include patients with secondary postpartum hemorrhage, genetic blood coagulation disorders, or other complications. Additionally, the study focused primarily on short-term management and outcomes, rather than long-term impacts such as future fertility or healing. Although Panicker's device is affordable, we could not provide a thorough analysis comparing the costs associated with the two approaches. As both devices require clinical knowledge for insertion and management, differences in operator skill may lead to heterogeneity in outcomes. Lastly, our study did not fully document patient satisfaction, pain thresholds, or comfort with either device.

Conclusions

The present findings suggest that Panicker's vacuum suction hemostatic device is more user-friendly, requires less time and specialized training to operate, and is both inexpensive and reusable. Vacuum retraction of the uterus is a highly effective physical method that supports the natural physiological processes of uterine contraction and retraction to manage atonic postpartum hemorrhage. Additionally, the affordability and reusability of Panicker's device can help alleviate the financial burden in developing countries with limited resources and financial constraints, such as India. In health centers where Panicker's vacuum suction hemostatic device is unavailable, the Chhattisgarh balloon tamponade can be prepared and used.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Deepak Anand, Preeti Tyagi, Pratima Verma, Anamika .

Acquisition, analysis, or interpretation of data: Deepak Anand, Preeti Tyagi, Pratima Verma, Anamika .

Drafting of the manuscript: Deepak Anand, Preeti Tyagi, Anamika .

Supervision: Deepak Anand, Preeti Tyagi, Pratima Verma

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Disclosures

Human subjects: Consent for treatment and open access publication was obtained or waived by all participants in this study. Ethics Committee, GSVM (Ganesh Shankar Vidyarthi Memorial) Medical College, Kanpur, Uttar Pradesh, India issued approval Ec/307/Aug/2024. This original article is part of a thesis. Ethical approval was obtained from the ethics committee of GSVM Medical College, Kanpur, Uttar Pradesh, India. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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ORIGINAL RESEARCH

A Study on Role of Panicker's Vacuum Cannula as A Novel Technique for Atonic PPH Management at A Tertiary Care Center

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ABSTRACT

Background: Atonic postpartum hemorrhage is ceased by creating negative pressure inside the uterine cavity which works by shrinking of uterus. It is similar to the natural physiological process of contraction and retraction to stop atonic postpartum haemorrhage. **Methods:** Forty three women with different risk factors for atonic PPH like obstructed prolonged labour, accidental haemorrhage, PIH, anaemia complicating pregnancy, multifetal pregnancy, and polyhydramnios, either alone or in combination, and who delivered either normally or by caesarean section were included in this study. Age, parity, gestational age at delivery was recorded.In vaginal delivery, if the bleeding did not stop by medical measures, womenwas put in lithotomy position, vaginal exploration was done to exclude genital tract trauma. A specially made stainless steel (PANICKERS PPH CANNULA) of 12 mm in diameter and 25 cm in length with multiple holes of 4 mm diameter at the distal 12 cm of the cannula was introduced into the uterine cavity through the vagina to reach the fundus. The cannula was connected to a suction apparatus, and a negative pressure of 650 mm mercury produced. The quantity of blood sucked varies from 50–300 ml. The suction was maintained for 30 min. Then the cannula was taken out slowly after releasing the suction. Usually there is was no further bleeding from the uterine cavity, and the uterus gets well contracted and retracted. In case of atonic PPH noted during cesarean section cannula was inserted into uterine cavity through incision site, suction tubings brought out through vagina via cervical os and the negative pressure was created. The blood collected in suction bottle was measured and recorded. **Results:** Complete cessation of bleeding which was associated with contraction and firm retraction of uterus was observed in most women within 4minutes after initiation of procedure. The amount of blood collected in suction bottle ranged from 50ml to 300ml. **Conclusion:** Creating negative pressure inside uterine cavity is a very effective physical method which mimics the natural physiological process of contraction and retraction to stop atonic postpartum hemorrhage. It is easy, cost effective, fertility saving and life-saving technique. It can be made available in any setting, and can become the first defense against atonic PPH.

Keywords – Atonic PPH, Vacuum retraction, suction cannula

INTRODUCTION

Postpartum hemorrhage is a major obstetrical emergency. It is often sudden, frequently unpredictable and catastrophic. If timely action is not initiated maternal death can occur in very short period. In a developing country like India it is the leading cause of maternal death(28%) and 50% of these women die out of atonic PPH. India's MMR is already down to 103, against a global MMR of 211 (2017).[1] According to the American college of Obstetricians , and Gynecologist, PPH is defined as cumulative blood loss of >1000 mL accompanied by signs and symptoms of hypovolemia within 24 hours after the birth process regardless of route of delivery. Therefore, clinical sign and symptoms should be included in assessment of PPH (RCOG-2016).[2]

PPH is classified as primary PPH occurring within 24 hours of birth and secondary PPH or late PPH occurring more than 24 hours post-birth to up to 12 weeks of postpartum. Common causes of PPH are four Ts'; Tone (atonicity), Tissue (retained bits, blood clots), Trauma (genital tract injury) and Thrombin (coagulopathy). In addition, some risk factors like obstructed prolonged labor, accidental hemorrhage,

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hypertension in pregnancy, anemia, polyhydramnios and big babies are known to cause atonic PPH.[3] First 1 hour is called golden hour, when immediate measures should be taken.

Simpler techniques like uterine massage, and uterine packing and balloon tamponade can be practiced in low resource settings. Some women slip into coagulation failure and MODS rapidly. But we need critical care unit for monitoring and arranging blood products is also difficult. Hence the present study concentrates on adoption of an effective new technique **Panicker's suction cannula** when the medical management fails.[4] It is safe, simple and sure technique for preventing and treating PPH, thereby decreasing maternal mortality and morbidity, and also to find a method to treat PPH in low-resource and primary care settings where even paramedical personnel including ANMs can use this method safely and effectively to save the life of the mother.[5] In this study Panickers vacuum cannula was applied to create negative pressure inside the uterine cavity with a specially designed **Panickers PPH cannula**, which is a simple, safe and cost effective technique. Panicker [5] proposed that creating negative pressure within the uterine cavity, using a cannula made of stainless steel or plastic, results in stoppage of bleeding from the postpartum uterus in women with atonic PPH and abnormal uterine bleeding (AUB). A 25 cm long cannula, 12 mm in diameter, with multiple holes of 4 mm diameter over the distal 10 cm of the cannula,is inserted into the uterus, through the vagina, to reach the fundus (Fig. 1), which is then connected to a suction apparatus to produce and maintain negative pressure of 700 mm mercury. This approach was tried in 55 women (40 postnormal vaginal deliveries and 15 post-lower segment cesarean sections [LSCS]) who experienced PPH refractory to uterotonic drugs used as standard of care. Panicker reported his findings and highlighted the need to ensure accurate placement and care of the cannula, as well as to manage cervical and vaginal tears and lacerations concomitantly. The author also mentioned the limitations of the cannula, stating that it is effective only in managing uterine sources of bleeding. He suggested in case a suction machine is not available, mechanical suction unit of ventouse or manual vacuum aspiration (MVA) syringe can be used.[5]

MATERIALS AND METHODS

Source Of Data

Pregnant mothers, delivered vaginally or by cesarean delivery in Chamarajanagar institute of medical sciences with atonic PPH refractory to medical management were taken in this study

Methods of Collection of Data

A. Study Design: Prospective observational study.

B. Study Period: 6 months

C. Place of Study: Department of OBG, CIMS, Chamarajanagar

D. Inclusion Criteria

1. Women willing to participate in the study
2. Parturient with atonic PPH

E. Exclusion Criteria

1. Women not willing to participate in the study.
2. Secondary PPH
3. PPH due to causes other than atonicity like traumatic, mixed, retained bits of placenta or Coagulation abnormalities.

G. Methodology

After obtaining institutional ethical committee's clearance all pregnant women fulfilling inclusion and exclusion criteria were included in the study.

Women with vaginal deliveries and women who underwent caesarean delivery with atonic PPH refractory to uterotonic drugs used according to protocol was included in this study.

Description of uterine vacuum retraction system: Consists of, 1. A specially made stainless steel (PANICKERS PPH CANNULA) uterine retraction cannula. Cannulas are of two different sizes. One measuring 25cm long with 12mm diameter, and the other one measuring 25cm long with 18mm diameter, and they have uterine angle and perforations on uterine portion. The perforations on fundal portion are large and longitudinal, and on cervical portion round and small. Smaller perforations were given on cervical portion to prevent blocking of cannula by cervical tissues when suction applied. 2. Thick walled (not easily collapsible) flexible plastic suction tube with 1.25cm diameters. 3. High vacuum suction machine with single bottle, or vacuum extraction pump which can produce negative pressure up to 650mm Hg. within 1mnt.

In vaginal delivery, if the bleeding did not stop by medical measures, women put in lithotomy position, vaginal exploration done to exclude traumatic PPH. A specially made stainless steel (PANICKERS PPH CANNULA) of 12 mm in diameter and 25 cm in length with multiple holes of 4 mm diameter at the distal 12 cm of the cannula was introduced into the uterine cavity through the vagina to reach the fundus. The cannula was connected to a suction apparatus, and a negative pressure of 700 mm mercury produced. The negative suction results in aspiration of all the blood collected in the uterine cavity. The quantity of blood sucked varied from 50–300 ml. When the collected blood is completely sucked out, the bleeding ceases. The suction pressure was maintained for 30 min. Then the cannula was taken out slowly after releasing the suction. Usually there was no further bleeding from the uterine cavity, and the uterus was well contracted.

In case of atonic PPH noted during caesarean section cannula was inserted into uterine cavity through incision site, suction tubings brought out through vagina via cervical os and the negative pressure is created.

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RESULTS

A total of 43 women were identified with atonic postpartum haemorrhage, all of whom were treated using Panicker's Suction Cannula at CIMS hospital Chamarajanagar, during the study period.

Table 1: Distribution of study population according to age

Age(Years)	No.of Patients	Percentage	Cumulative Percent
<20	4	9.3	9.3
21-25	19	44.2	53.5
26-30	14	32.6	86.0
31-35	6	14.0	100.0
Total	43	100.0	

Table no 1 was shows that Panicker's cannula application was higher in age group of 21-25 years (44.2%) and age group 26-30 years (32%) followed by age group 31- 35 year (14%), age group < 20 year (04%).

Table 2: Distribution of cases according to parity

Obstetric History	Number of patients	Percentage
P1	21	48.8%
P2	19	44.1%
P3	02	4.6%
P4	01	2.3%
>P5	00	00%
Total	43	100%

Table no 2 shows that 21(48%) cases were para-1 followed by 19(44%) Para-2, 2(4.6%) Para–3, and 1(2.3%) Para–4.

Table 3: Distribution of cases according to gestational age

Gestational age (weeks)	No. of patients	Percentage	Cumulative Percent
36-40 weeks	42	97.7	97.7
>40 weeks	1	2.3	100.0
Total	43	100.0	

Table no 3 was shows that 42 (97.7%) cases were delivered between 36–40 Weeks of gestational age and 1 (02.3%) patients had delivery beyond 40 Weeks of gestation.

Table 4: Distribution of cases according to time taken to stop bleeding

Bleeding time	No. of patients	Percent	Cumulative Percent
1	27	62.8	62.8
2	13	30.2	93.0
3	1	2.3	95.3
4	2	4.7	100.0
Total	43	100.0	

Table no 4 was shows that 27 (63%) cases stopped bleeding within 1 min followed by 13(30%) cases stopped bleeding between 1.1-2 min and 02(4.7%) patients stopped bleeding between 3.1-4 min. cumulatively 93% stopped bleeding with in 2 min, 95% within 3 min and 100% within 4 minutes of application of Panicker's cannula.

Table 5: Distribution of cases according to blood collected in bottle

Amount blood	No. of patients	Percent	Cumulative Percent
100	22	51.2	51.2
200	13	30.2	81.4
300	8	18.6	100.0
Total	43	100.0	

Table no 5 was shows that in 22 (51.2%) cases blood collected in bottle was <100 ml and in 13(30%) patients collected blood ranged between 100-200ml followed by 08(18.6%) cases in whom collected blood ranged between 201-300ml.

Table 6: Distribution of cases according to mode of delivery.

Amount blood	No. of patients	Percent	Cumulative Percent
100	22	51.2	51.2
200	13	30.2	81.4

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300	8	18.6	100.0
Total	43	100.0	

Table no 6 was shows that 20(80%) patients were delivered by vaginal route and 05 (20%) were by caesarean section.

Table 7: Distribution of cases according to number of PRBC transfusions required

Blood transfusion required	No of patients	Percent	Cumulative Percent
1PRBC	10	23.3	23.3
2 PRBC	3	7.0	30.2
NO	30	69.8	100.0
Total	43	100.0	

Table 7 shows that 30 (69%) of the patients did not require transfusion at all, 10(23%) Required 1 pint Prbc transfusion and 3(7%)patients required 2 pint PRBC transfusion.

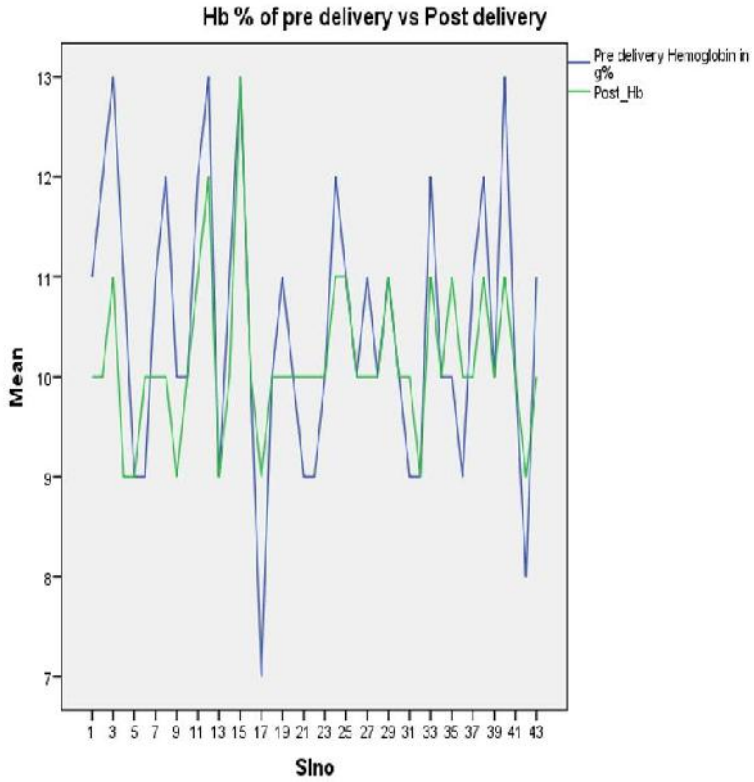

Figure1: The below graph shows the pre delivery and post delivery Hemoglobin values comparision of the study group.

Table 8: Distribution of cases according to risk factors for atonic PPH

Risk factors	Number of patients	Percentage
Poly-hydramnios	05	12%
Prolonged Labor	05	12%
Obstructed Labour	07	16%
Severe Precclampsia	05	12%
Abruption placentae	05	12%
Placenta previa	07	16%
Macrosomia	04	08%
Multifetal pregnancy	03	08%
Pre-Eclampsia	02	04%
Total	25	100%

Table no 8 was shows that obstructed labour 07(16%) and placenta previa and obstructed labour 07(16%) was the commonest indication for use of Panicker's cannula. Next common indication was Polyhydramniose 05(12%), prolonged labour 05(12%), Severe Precclampsia 05(12%), abruption placentae 05(12%) followed by fetal macrosomia 04(08%) and multifetal pregnancy 03(08%).

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Table 9: Panicker's Vaccum Suction Cannula utilization and outcome details

Patients status	Number of cases	Percentage
Survived	43	100%
Died	00	0%
Total	43	100%

In the present study table no 09 shows that none of the patient in whom PPH was managed using Panicker's cannula succumbed to death nor did they require peripartum hysterectomy.

In our department between 2019-2022 as many as 5-6 patients underwent peripartum hysterectomy in view of atonic PPH not controlled with all other measures. Utilization of Panicker's cannula has been a break through in the management of atonic PPH by preventing maternal morbidity and mortality

DISCUSSION

Postpartum hemorrhage is a major obstetrical emergency and is a leading cause of maternal death(28%)in countries like India. It is often sudden, frequently unpredictable and catastrophic. If timely action is not initiated maternal death can occur in very short period.. India's MMR is already down to 103, against a global MMR of 211 (2017).[1]

Simpler techniques like uterine massage, uterotonic drugs, and uterine packing and balloon tamponade can be practiced in low resource settings. Since some women slip into coagulation failure and MODS rapidly. We need easy, less time consuming and cost effective technique which can arrest bleeding or buy time until surgical management. Panicker's suction cannula is one such instrument which can be used for managing atonic PPH management as well as to reduce bleeding that can prevent catastrophic consequences and maternal death.[4]

When medical measures to control atonic PPH fails most of the time we resort to surgical method and may land up doing caesarean hysterectomy in order to save the mother, hence we intend to study the effectiveness of this novel technique of creating negative pressure inside the uterine cavity using this novel instrument – **Panicker's PPH cannula** and save lives of many women.[5]

In our study, vacuum retraction could stop bleeding in 43 women within 4 min of introducing the suction cannula. One of the other effective method used for severe atonic PPH refractory to uterotonic therapy is ballon tamponade.[6] In this technique condom balloon or Bakri balloon is inserted inside uterine cavity and inflated with saline. The balloon exerts constant pressure on underlying sinusoids and stops bleeding.[7] The draw backs with this technique is that it is time consuming, the mechanism of action is against the natural physiological mechanism of contraction and retraction. Organizing tamponade system needs training and takes time.and if there is delay profuse bleeding may result in a catastrophe. Sometimes the balloon gets expelled when the tone in the uterine wall increases if the vagina is not effectively packed with gauge.[7] In contrast the mechanisms involved in vacuum retraction include, the negative pressure created inside the uterine cavity results in physical constriction of uterus, and assists the natural physiological process of contraction and retraction. The soft cervical tissues around the cervical portion of the uterine cannula get sucked in to the perforations resulting in closed uterine cavity. In this technique blood collected in the uterine cavity gets sucked and collected in to the suction bottle and helps to measure the blood loss correctly. As this procedure needs little time and minimal skills, this procedure can be done in labor room settings as a first aid measure. As this is a simple technique, even ANMs at periphery can be trained, and the bleeding can be stopped without any delay. This life saving technique avoids laparotomy and other complex procedures to stop atonic bleeding, and helps to save the mother and her fertility function in low resource settings.

CONCLUSION

Prophylactic application of vacuum suction cannula in high risk women for atonic PPH averts catastrophic bleeding. Vacuum suction cannulas should be made part and parcel of normal delivery tray to facilitate quick application. This simple and cost effective technique, takes very little time to organize and can stop bleeding with in 4 minutes in atonic PPH as shown in this study. This lifesaving technique is useful in all settings especially in low resource settings. Its utilization in cases of inherited coagulopathies of pregnancy and DIC has to be further explored. The long term effects of ischemia on cervix and uterus due to vacuum effect has to be further explored.

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BRIEF COMMUNICATION

Vacuum Devices for Treating Postpartum Hemorrhage: Indian Innovation, Indian Pride

BHARTI KALRA*, KAMLESH DHINGRA†

ABSTRACT

Postpartum hemorrhage (PPH) is a major cause of maternal morbidity and mortality. We focus on two innovations by Indian gynecologists, the Panicker's vacuum suction cannula and the SR suction cannula. These effective devices are economical and easy-to-use, and help prevent and manage PPH. They can also be used to reduce bleeding in non-PPH indications. These Indian innovations are a matter of pride, and need to be studied extensively in diverse settings. This will help ensure that their benefits can be shared across the world.

Keywords: Atonic PPH, blood loss, India, LSCS, PPH, vaginal delivery

Postpartum hemorrhage (PPH) is a major cause of maternal morbidity and mortality.[1] This is especially true in developing countries, where maternal health resources may be limited. Many of the known risk factors for PPH, such as prolonged labor, anemia and delayed operative intervention, are more common in such settings. The greatest risk is conferred by prior PPH due to any cause, placenta previa, placental abruption, uterine rupture and multiple gestation. Newer risk factors including hypertension, diabetes and ethnicity are also emerging.[2]

Even though there is significant interest in the diagnosis and treatment of PPH, current management strategies leave much to be desired. Uterine massage, oxytocin and methylergonovine are the standard of care, along with hemostatic drugs.[3] In some cases, these do not prove sufficient hemostasis and invasive interventions such as internal iliac artery ligation and hysterectomy may be required. However, there is no concordance between various national guidelines[4] and more effort is required to develop effective means of management.

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IMPACT OF PPH

PPH is associated with a significant impact on maternal health, as well as on the healthcare system and healthcare costs.[1] This impact worsens as the hemorrhage continues. It is rational, therefore, to develop means of preventing, limiting and managing PPH in a time-bound and cost-effective manner. Researchers across the world have proposed novel ways of diagnosing and stratifying PPH, as well as limiting it.[5,6] Many of these methods and devices require technology, which is either inaccessible or unaffordable to persons working in resource-limited healthcare system. In such a situation, Indian innovations, the vacuum suction hemostatic devices, stand out as an efficient and extremely cost-effective method of preventing and managing PPH.

INNOVATION 1

Panicker[7] proposed that creating negative pressure within the uterine cavity, using a cannula made of stainless steel or plastic, results in stoppage of bleeding from the postpartum uterus in women with atonic PPH and abnormal uterine bleeding (AUB). He inserted a 25 cm long cannula, 12 mm in diameter, with multiple holes of 4 mm diameter over the distal 10 cm of the cannula, into the uterus, through the vagina, to reach the fundus (Fig. 1). He connected the cannula to a suction apparatus to produce and maintain negative pressure of 700 mm mercury. This approach was tried in 55 women (40 post-normal vaginal deliveries and 15 post-lower segment cesarean sections [LSCS]) who experienced PPH refractory to uterotonic drugs used as standard of care.[7]

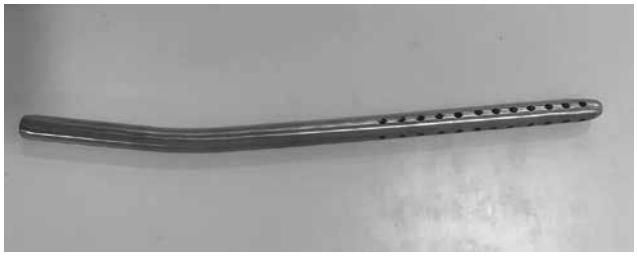

Figure 1.

Panicker reported his findings and highlighted the need to ensure accurate placement and care of the cannula, as well as to manage cervical and vaginal tears and lacerations concomitantly. The author also mentioned the limitations of the cannula, stating that it is effective only in managing uterine sources of bleeding. He suggested an improvisation in case a suction machine is not available, proposing the use of a mechanical suction unit of ventouse or manual vacuum aspiration (MVA) syringe.

INNOVATION 2

The Uterine Vacuum Retraction System, developed by HS Ram[8] uses the SR suction cannula to control PPH after vaginal delivery. Vacuum retraction is created by negative pressure within the uterine cavity, using a cannula made of stainless steel, various lengths of cannulae are available (Fig. 2). The appropriate model, based upon size of uterus and mode of delivery, is inserted in the uterus, through the vagina, to reach the fundus. The cannula is connected to a suction apparatus to produce and maintain negative pressure of 650 mm mercury for 15 minutes.

The SR suction cannula was used to manage atonic PPH in an observational study. The bleeding stopped within 3 minutes in 60 women (50%); in 38 women (31.7%) bleeding cessation occurred between 3 to 4 minutes and in 22 women (18.3%) it took 4 minutes for the bleeding to stop. In 75 (62.5%) women, negative pressure was applied only once, in 20 (16.7%) it was applied twice, while in 25 women (20.8%) the negative pressure had to be applied three times to stop the bleeding. Blood collected in bottle after SR Cannula Application ranged from 100 to 150 mL.[9]

These innovations have been tried in multiple patients at our hospitals, and we attest to the efficacy and efficiency of these economical tools (personal experience).

INTROSPECTION

It is surprising; however, to see minimal research published on Paniker's PPH cannula and SR vacuum suction cannula. Is this because these innovations are from resource-challenged medical care settings, and not from established "research" centers? Is it because these devices display their maximum benefit in peripheral centers, which do not have a "voice" in publications? Is it because the obstetricians who use these cannulae are so busy with their clinical work that they neglect publishing their data?

Figure 2.

INSIGHT

Whatever the reason, we should celebrate Indian innovations with pride, rather than with prejudice.[10] These innovative ideas deserve a fair chance, and must be studied in controlled settings, to assess their efficacy, safety and tolerability. The Indian vacuum devices are supported by experience and by eminence.

We suggest a pragmatic method of placing these devices in clinical practice (Table 1). The cannulae can be used for primary, secondary as well as tertiary prevention of atonic PPH, after both vaginal delivery and LSCS. Application of cannula helps clear the field of vaginal bleeding for better assessment and ease of stitching. As the cervical walls get apposed to the cannula, bleeding from cervical tear reduces and cervical stitching can be done in comfortable and clean environment.

We have used these devices in non-PPH indications as well. Small size cannulae can be used in endometrial

Table 1. Usage of PPH Vacuum Suction Devices

Clinical usage

- Primary prevention: Prophylactic insertion when risk factors are present
- Secondary prevention: Insertion of device when excessive PPH is anticipated, e.g., rise in shock index
- Tertiary prevention: Curative insertion if bleeding is excessive

Caveats

- Check patency of cannula holes
- Check placement of tip of cannula at tip of fundus
- Check degree and duration of negative pressure

Check points

- Hemodynamic monitoring
- Local monitoring of cannula

Concerns

- Does not address cervical/vaginal bleed
- Does not obviate need for good obstetric and nursing care

polyp removal, scar ectopic and post-abortal heavy bleeding. Once backed by robust published evidence, these economical interventions will certainly find utility in maternity centers across the world, and serve to improve maternal health.

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■■■■

Awake Prone Positioning Benefited Select COVID Patients

A meta-analysis reported in *Lancet Respiratory Medicine* stated that the awake prone positioning reduced the need for intubation in selected patients with severe COVID-19. The meta-analysis included data from a 2021 meta-trial with a total of more than 1,000 COVID-19 patients, mostly in ICU, which found awake prone positioning to decrease the need for intubation. It also included data from 7 randomized controlled trials (RCTs) which did not find a difference in intubation risk among almost 700 patients on conventional oxygen therapy. A total of 29 studies were included in the review, with 10 RCTs (1,985 patients) and 19 observational studies (2,669 patients). In 10 RCTs, awake prone positioning significantly reduced the need for intubation in the overall population, compared to supine position, especially among those patients who received advanced respiratory support at enrollment (relative risk [RR] 0.83 [0.71-0.97]) and those in the ICU (RR 0.83 [0.71-0.97]). No reduction was seen in patients receiving conventional oxygen therapy (RR 0.87 [0.45-1.69]) or in non-ICU settings (RR 0.88 [0.44-1.76]).

The study concluded that awake prone positioning should be encouraged among COVID-19 patients with acute hypoxemic respiratory failure, especially when the patients are in ICU and need advanced respiratory support. (*MedPage Today, March 17; Lancet Respiratory Medicine, March 16, 2022*)

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Comparison of Panicker PPH suction cannula with medical methods in case of intractable PPH

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Abstract:

Background: Postpartum hemorrhage (PPH) is the most dreadful obstetric emergency and is a leading cause of maternal mortality. It accounts for almost one maternal mortality every four minutes.

Aims and Objectives: The aims of the present study was to analyze the incidence of atonic PPH, the effectiveness of suction cannula in management of atonic PPH after failure of medical management and the maternal outcome after suction technique.

Material and Methods: This study was carried out in Department of Obstetrics and Gynecology, Muzaffarnagar Medical College and Hospital, Muzaffarnagar, Uttar Pradesh. All the patients who delivered in Muzaffarnagar Medical College by vaginal or caesarean delivery and underwent PPH were included in this study. Patients requiring PPH management were admitted to the obstetrics ward.

Results: This study included 48 patients out of which 30 patients with medical management in Group A and 18 patients managed with medical treatment and Panicker cannula in Group B. All the patients in group A stopped bleeding within a period of 4 minutes. However, in group B patients it took more than four minutes to stop bleeding. Statistical significance was not applicable here as the group B had nothing to compare with. Out of group A patients, 18 patients had loss of upto 250 ml and 12 patients had loss of 251-500 ml blood .Out of group B patients, 10 patients had loss of 501 - 1000 ml blood (Vaginal delivery) and 8 patients had loss of more than 1000 ml blood (Cesarean section). As per Guidelines, 500-1000 ml loss of blood is considered as PPH with vaginal delivery and more than 1000 ml loss of blood is considered as PPH with caesarean section.

Out of group A patients, 24 patients did not receive any transfusion and only four patients received one transfusion. Out of group B patients, 8 patients received two transfusions, four patients received three transfusions and six patients received more than three transfusions.

Conclusion:

Management of intractable PPH is made easier due to Panicker suction cannula. This study concludes that Panicker suction cannula is 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.

Keywords

Post-partum hemorrhage, Panicker cannula, suction cannula, negative intrauterine pressure suction device, active management of third stage of labour, blood loss, bleeding

Introduction

Postpartum hemorrhage (PPH) is the most dreadful 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 among 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. It accounts for almost one maternal mortality every four minutes. PPH contributes to nearly one-third of all maternal deaths worldwide. The maternal mortality rate (MMR) in Indian women stands at a figure of 97 per one lakh live births.[1,2] PPH still remains the leading cause of maternal mortality and morbidity, especially in low-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 cause of PPH are 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. The American College of Obstetrics and Gynecology (ACOG) defines PPH as the amount of blood loss that decreases the hematocrit by 10% or any amount of blood loss that necessitates a blood transfusion. For clinical purposes, any

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.

Material and Methods

This observational study was conducted in Department of Obstetrics and Gynecology, Muzaffarnagar Medical College and Hospital, Muzaffarnagar, Uttar Pradesh. All the patients who delivered in Muzaffarnagar Medical College by vaginal or caesarean delivery and underwent PPH were included in this study. Patients requiring PPH management were admitted to the obstetrics ward from December 2022 to November 2023 fulfilling all inclusion criteria like all the patients with atonic PPH who failed to respond to uterotonic drugs. The exclusion criteria included traumatic PPH, previous cesarean section with risk of scar dehiscence, morbidly adherent placenta, congenital coagulation disorder and HELLP syndrome.

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 does not stop by all routine medical measures, SR suction cannula was applied in lithotomy position, and the bladder was catheterized. Blood clots were removed from 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 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 pressure effect of suction. Because the wall of the uterine cavity was strongly sucked and held by the cannula the uterus

cannot expand and relax even in atonic PPH. The negative suction pressure was maintained for 30 minutes so that the clotting occurs 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 is a very simple and safe break through 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 the other end was inserted through the uterine wound and brought outside the vagina. If cervix was not well dilated, the small size cannula was used. The outer end of suction tube was connected to the suction machine. Uterine wound was closed when negative suction pressure was working.

The study comprised of total of 48 patient (30 patients with medical management and 18 patients managed with medical treatment and Panicker cannula).No surgical method was required after using Panicker cannula.

Picture 1: Uterus contracted well and bleeding stopped completely.

(Source: J Obstet Gynaecol India 2017 Apr ; 67(2) :150-151.

Results

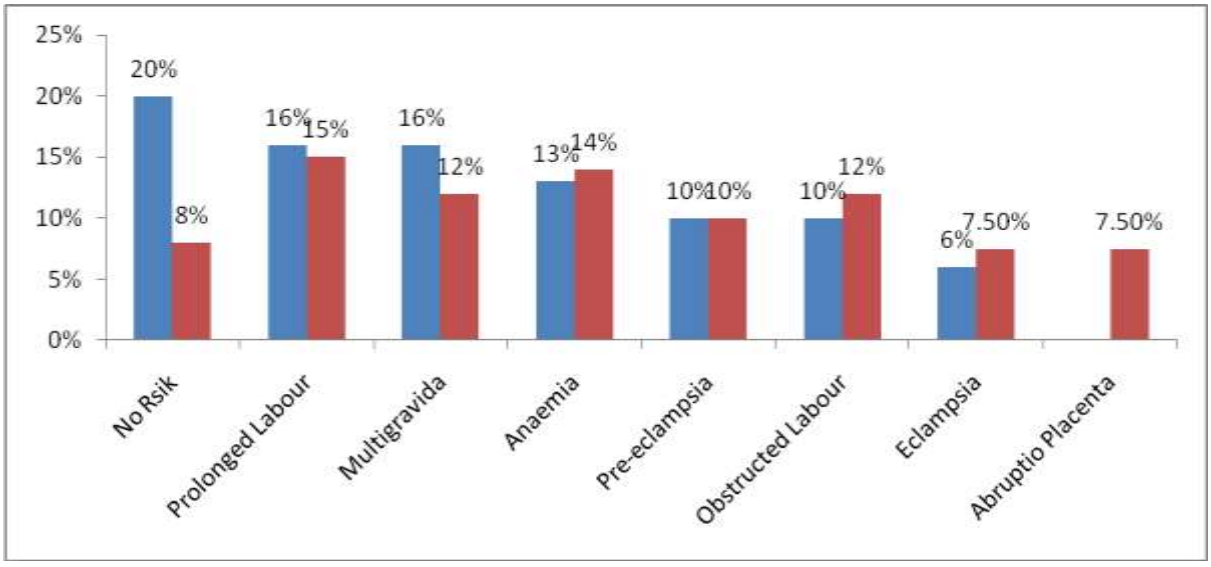
The study comprised of 48 patients (30 patients with medical management in Group A and 18 patients managed with medical treatment and Panicker cannula in Group B) during the period of December 2022 to November 2023 (one year period).

Figure 1: Age distribution of patients in the two groups

Age of the patients (Yrs)	Group A (30 Patients with medical management) Number (%) of patients	Group b (18 Patients managed with medical treatment and Panicker cannula) Number (%) of patients	Statistical Significance (p<0.05)
<20	4 (13.3%)	2(11.1%)	No Statistical significant difference between the groups
21-25	10 (33.4%)	5 (27.8%)	
26-30	6 (20%)	3 (16.7%)	
31-35	6 (20%)	4 (22.2%)	
>35	4 (13.3%)	4 (22.2%)	
Total	30 (100%)	18 (100%)	

In group A patients, majority of the patients were in age groups of 21-25, 26-30 and 31-35 years. However, in group B patients, majority of the patients were in age groups of 21-25, 31-35 and more than 35 years. There was no statistically difference between the groups.

Diagram 1 : Distribution of patients in groups A and B according to risk factors



Group A
– 20% had no risk factor,16% each had prolonged labour and multigravida,13% had anaemia,10% each had pre-eclampsia and obstructed labour and 6% had eclampsia

Group B –
8% had no risk factor,15% had prolonged labour,12% had multigravida,14% had anaemia, 10% had pre-eclampsia ,12% had obstructed labour ,7.5 % each had eclampsia and abruptio placenta

The above diagram shows risk factors associated with groups A and B patients. 20% patients in group A had no risk factor compared to 8 % in group B patients. Prolonged labour, multigravida, anaemia and pre-eclampsia risk factors were almost equal in both the groups. However, obstructed labour, eclampsia and abruptio placenta were more in group B in comparison to group A patients.

Figure 2: Distribution of patients as per mode of delivery in two groups

Mode of Delivery	Group A Number (%) of patients	Group B Number (%) of patients	Statistical Significance (p<0.05)
Vaginal	18 (60%)	10 (55.6%)	No Statistical significant difference between the groups
Operative Vaginal Delivery	7 (23.3%)	5 (27.8%)	
Caesarean Section	5 (16.7%)	3 (16.6%)	
Total	30 (100%)	18 (100%)	

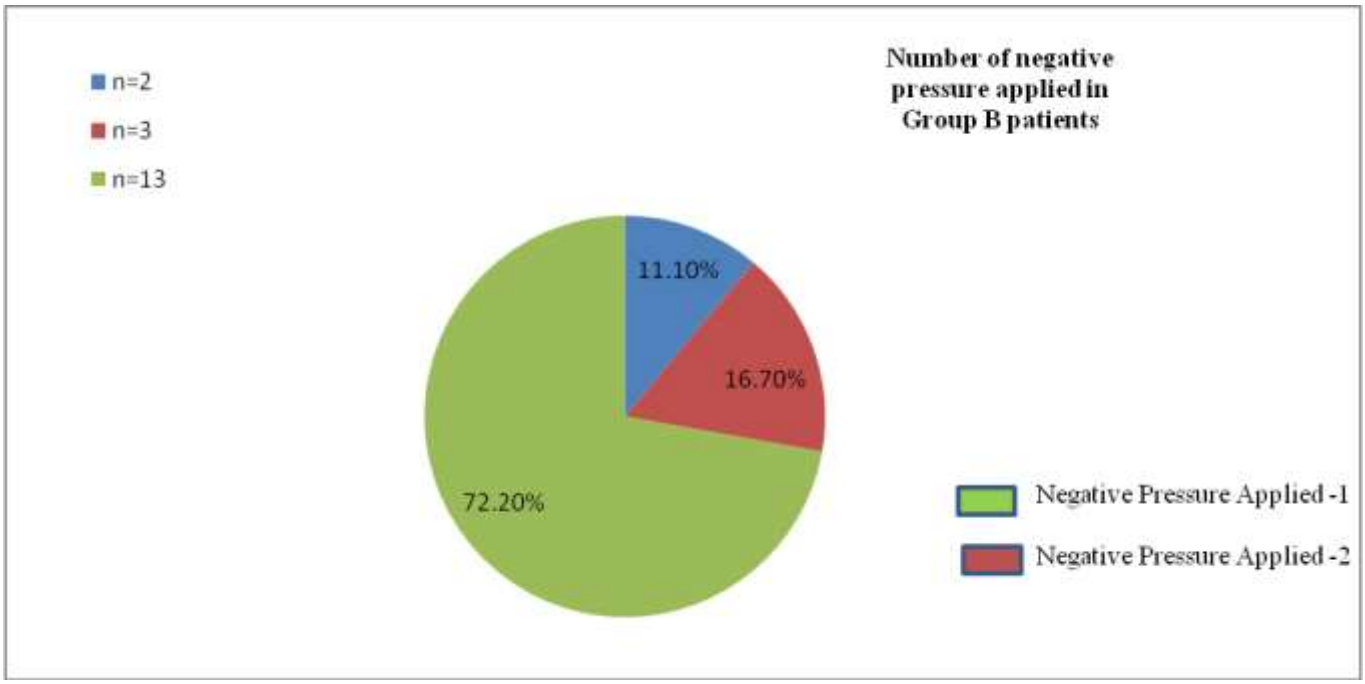
The patients in groups A and B delivered by vaginal, operative vaginal delivery and caesarean section. However, no significant statistical difference was observed between the groups.

Figure 3: Distribution of patients in two groups according to time taken to stop PPH bleeding

Time taken in minutes to stop bleeding	Group A Number (%) of Patients	Group B Number (%) of Patients	Statistical Significance (p<0.05)
<3 min	18 (60%)	-	No Statistical significant difference between the groups
3-4 min	12 (40%)	-	
>4 min	-	18 (100 %)	
Total	30 (100%)	18 (100%)	

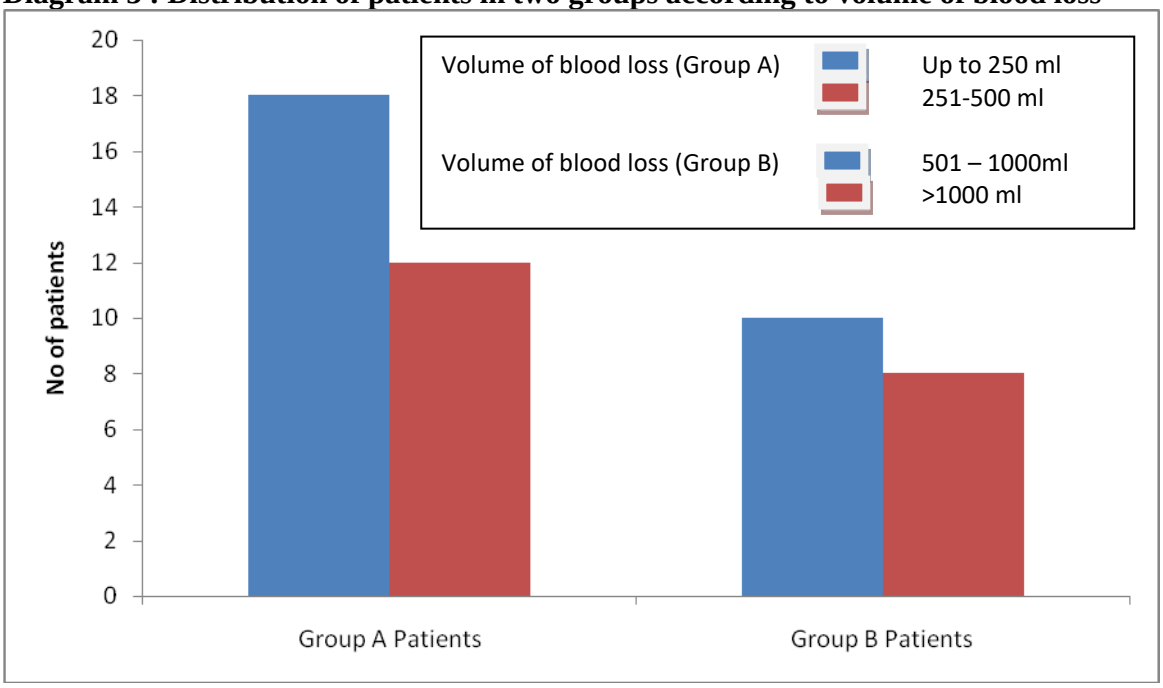
All the patients in group A stopped bleeding within a period of 4 minutes. However, in group B patients it took more than four minutes to stop bleeding. Statistical significance was not applicable here as the group B had nothing to compare with.

Diagram 2 : Distribution of patients in group B according to number of times of negative pressure applied



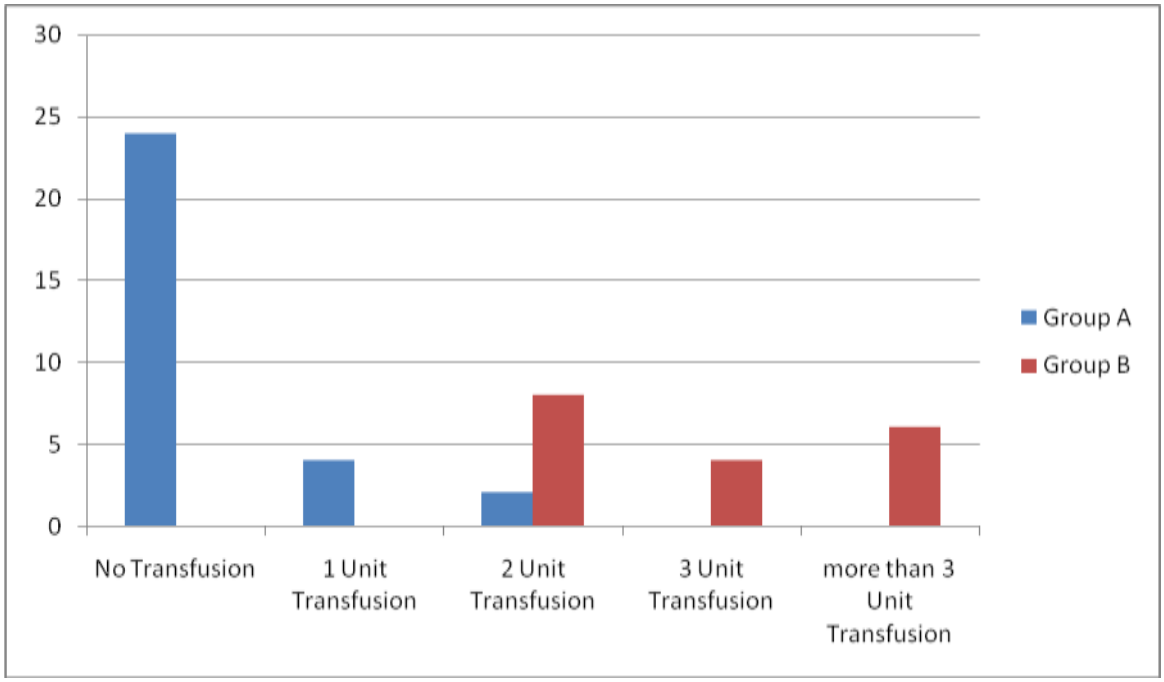
Group B comprised of 18 (100%) patients which did not respond to the medical treatment only and had to be cannulated in order to stop bleeding. Thirteen patients (72.2%) required negative pressure only once, three patients (16.7%) needed negative pressure only twice and two patients (11.1%) required three negative pressures to control bleeding.

Diagram 3 : Distribution of patients in two groups according to volume of blood loss



Out of group A patients, 18 patients had loss of upto 250 ml and 12 patients had loss of 251-500 ml blood .Out of group B patients,10 patients had loss of 501 - 1000 ml blood (Vaginal delivery) and 8 patients had loss of more than 1000 ml blood (Cesarean section). As per Guidelines, 500-1000 ml loss of blood is considered as PPH with vaginal delivery and more than 1000 ml loss of blood is considered as PPH with caesarean section.

Diagram 4 : Distribution of patients in two groups according to number of blood units transfused



Out of group A patients, 24 patients did not receive any transfusion and only four patients received one transfusion. Out of group B patients, 8 patients received two transfusions, four patients received three transfusions and six patients received more than three transfusions.

Figure 4 : Distribution of patients in two groups according to final outcome of the patients

Outcome	Group A Number of patients -30 (100%)	Group B Number of patients -18 (100%)
Survived	30	18
Died	Nil	Nil

All patients in group A and group B survived during the study.

Discussion

In our study in groups A and B, majority of patients were between 21-25 yr of age. In group A, 10 patients (33.4 %) belonged to 21-25 years age group, 6 patients each (20% each) belonged to 26-30 years and 31-35 years age groups, 4 patients each (13.3% each) belonged to less than 20 years and more than 35 years age . In group B,5 patients ((27.8%) belonged to 21-25 years age group, 4 patients each (22.2% each) belonged to 31-35 and more than 35 years of age groups. Three patients (16.7%) belonged to 26-30 year age group and 2 patients (11.1%) belonged to less than 20 year age group. No statistically significant difference was found between the groups.

In present study according to mode of delivery of patients,in group A patients,18 patients (60%) delivered by vaginal route. Seven patients (23.33%) delivered by operative vaginal delivery and five patients (16.67%) delivered by caesarean section. In group B patients, 10 patients (55.5%) delivered by vaginal route, 5 patients (27.8%) by operative vaginal route and three patients (16.7%) delivered by caesarean section. Comparison of the groups showed no stattistically significant difference.

Panicker TNV[5] stated that the strong negative suction produced in the uterine cavity by the special cannula resulted in sucking out all the blood and blood clots. The inner surface of the uterine cavity got strongly sucked by the cannula. All the bleeding vessels including arterioles and sinusoids get sucked into the holes of the cannula, thereby mechanically closing them. The bleeding points are permanently closed due to clot formation within 30–40 min. This is a very simple, safe, sure and inexpensive technique to control and cure PPH with absolute success. There were no complications and no failure observed by using this device. This life-saving procedure will have a key role in bringing down maternal mortality.

Priyanka D et al[6] studied the role of SR vacuum cannula for atonic PPH and reported that in 50% of the cases the bleeding stopped in less than 3 minutes, in 32 % of the cases the bleeding stopped in 3-4 minutes and in 18% cases the bleeding stopped in more than 4 minutes.

In our study, majority of the patients (60%) in group A took less than 3 minutes to stop bleeding and 40 % of patients took 3- 4 minutes to stop bleeding. No patient in group A took more than 4 minutes to stop bleeding. However, in group B patients who first were put on medication and then with use of catheter because of non-stoppage of bleeding, it took more than 4 minutes to control bleeding in 100 % of the patients.In our study, all patients in group A had no PPH. In group B patients, the bleeding did not stop after medical treatment and had to be cannulated.

Purwosunu Y et al[7] studied control of postpartum hemorrhage using vacuum-induced uterine tamponade. Their study showed that using vacuum-induced uterine tamponade, the device remained in place for a minimum period of 1 hour. In our study,within maximum period of 15 minutes of application of the cannula, the bleeding stopped in all cases.

In our study in group B patients, thirteen patients (72.2%) required negative pressure only once, three patients (16.7%) needed negative pressure only twice and two patients (11.1%) required three negative pressures to control bleeding. Study done by Samartha RH et al [8] showed that 68.2% patients needed negative pressure once only, 27.2% patients needed negative pressure twice only and 4.5 % patients needed negative pressure thrice only to control bleeding.

Sharma JC et al [9] studied application of a negative intrauterine pressure suction device for prophylactic management of atonic postpartum hemorrhage. The incidence of atonic PPH was reduced by more than 75% after the introduction of NIPSD (negative intrauterine pressure suction device) complementing routine AMTSL (active management of third stage of labor).As per Guidelines, 500-1000 ml loss of blood is considered as PPH with vaginal delivery and more than 1000 ml loss of blood is considered as PPH with caesarean section.

Out of group A patients,18 patients had loss of upto 250 ml and 12 patients had loss of 251-500 ml blood .Out of group B patients,10 patients had loss of 500 - 1000 ml blood (Vaginal delivery) and 8 patients had loss of more than 1000 ml blood (Cesarean section).

Study conducted by Shanthi C and Chitra KS[10] assessed blood loss in third stage of labour using vaccum retraction cannula and reported mean blood loss of 299 ml in AMTSL group compared to mean blood loss of 223.6 ml in AMTSL with cannula group which was statistically significant.

Conclusion

Management of intractable PPH is 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 one of the patients. This concludes that Panicker suction cannula is 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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