

DOI: <https://dx.doi.org/10.18203/2320-1770.ijrcog20241076>

Original Research Article

Evaluating the efficacy of metal suction cannula for atonic postpartum haemorrhage management in rural south Gujarat: a two-year observational study

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Received: 23 March 2024

Revised: 14 April 2024

Accepted: 15 April 2024

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ABSTRACT

Background: In resource-constrained regions characterized by limited healthcare infrastructure, low female literacy rates, and constrained access to medical resources, postpartum hemorrhage (PPH) remains a dire obstetric emergency. This research article investigates the effectiveness of metal suction cannula as a simple, safe and cost-effective technique for atonic PPH management in a private hospital in Rural South Gujarat. The primary aim of this study was to examine the effectiveness of the metal suction cannula in managing atonic PPH and the maternal outcome after suction technique.

Methods: This observational study was conducted in Shreeji hospital, a private multifacility hospital in rural south Gujarat over the period of two years, between June 2021-May 2023 and involved 148 patients who were admitted for labour and delivery but later developed atonic PPH after AMTSL. Metal cannula and high vacuum suction machine was used. Data like patient demographics, risk factors, and post-procedural outcomes were studied.

Results: Following application of the metal vacuum cannula technique, bleeding stopped within five minutes in 78 women (52.7%). For 53 women (35.8%), bleeding ceased between 5-10 minutes. In 17 women (11.4%), bleeding was effectively halted after more than ten minutes. In 87 women (58.8%), negative pressure was applied only once, resulting in successful hemorrhage control. 38 women (25.6%) required suction application two times and 25 women (20.8%) needed three applications of negative pressure to effectively stop the bleeding. The volume of blood collected in the bottle after metal vacuum cannula application ranged from 100 to 300 ml.

Conclusions: Factors such as ease of use, affordability, and improved clinical outcomes make suction cannulas an effective tool in the management of PPH in resource limited areas. It requires minimal training, conserves the uterus, is technically less challenging and reduces the requirement of blood and blood products.

Keywords: PPH, Suction cannula, Negative pressure

INTRODUCTION

Postpartum hemorrhage (PPH) is one of the most dreadful obstetric emergencies and is a leading cause of maternal death in low-income countries, with an incidence as high as one in 45 among low-resource settings. Every year, fourteen million women around the world suffer from the PPH.¹

The maternal mortality rate (MMR) in Indian women stands at a figure of 97 per one lakh live births.^{1,2} 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

PPH 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 caesarean section. The American college of obstetrics and gynecology (ACOG) defines PPH as the amount of blood loss that decreases the haematocrit 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 Estimates of blood loss at delivery are notoriously inaccurate, with significant underreporting being the rule. Limited instruction on estimating blood loss has been shown to improve the accuracy of such estimates.⁵ Also, a decline in hematocrit levels of 10% has been used to define PPH, but determinations of hemoglobin or hematocrit concentrations may not reflect the current hematologic status additional important secondary sequelae from hemorrhage exist and include adult respiratory distress syndrome, disseminated intravascular coagulation, acute renal failure, loss of fertility and pituitary necrosis.⁶

PPH is associated with a significant impact on maternal health, as well as on the healthcare system and healthcare costs.⁷ 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.^{8,9} Many of these methods and devices require technology, which is either inaccessible or unaffordable to persons working in resource-limited healthcare system. 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. This method has brought a renaissance to practical obstetrics in low resource countries, where the cost and availability of uterotonics or blood products are major health issues.

METHODS

This observational study 'evaluating the efficacy of metal suction cannula for atonic postpartum haemorrhage management in rural south Gujarat: A two-year observational study' was conducted in Shreeji hospital, a multifacility hospital in rural south Gujarat over a period of two years, between June 2021-May 2023 and involved 148 patients who were admitted for labour and delivery but later developed atonic PPH after AMTSL. Metal cannula and high vacuum suction machine were used.

PPH criteria used: Blood loss greater than 500 ml associated with vaginal delivery or greater than 1000 ml estimated blood loss associated with cesarean delivery (WHO 1989).

The uterine vacuum retraction system consists of: Suction cannula to control PPH after vaginal and caesarean delivery: 25 cm long with diameter 10 mm. High vacuum suction machine or vacuum suction pump which can

produce negative pressure up to 650 mmHg within 1 minute. It was applied in lithotomy position, and the bladder was catheterized. Blood clots were removed from uterine cavity by bimanual compression.

Under good source of light with wide blade vaginal speculum application, the anterior lip of cervix is grasped with sponge holding forceps, and the distal end of cannula is inserted into the uterine cavity up to the level of fundus. The outer end of cannula is connected to the suction machine through tubing. The left palm supports the fundus per abdomen, right hand finger grasps the outer end of cannula and pushes it gently up to the fundus keeping the cannula in this position (to prevent slipping out). Negative pressure of 650 mmHg is created by suction machine and maintained for 30 minutes.

After this, the negative pressure is created whenever there is a recurrence of bleeding, twenty-unit oxytocin in 500 cc ringer lactate iv drip/Inj Methergine or carboprost are used whenever needed. The cannula is kept in position as long as the threat of recurrence of bleeding is expected, or even up to 6 hrs.



Figure 1: Metal suction cannula.

Inclusion criteria

The study included all the patients who developed atonic PPH after AMTSL, and gave their consent.

Exclusion criteria

Patients with traumatic PPH, placenta previa beyond grade 1, morbidly adherent placenta, congenital coagulation disorder, HELLP syndrome and severe anaemia were excluded from the study.

Plan of action

Case was evaluated for exclusion criteria were taken after written informed consent. Detailed history (including menstrual history, obstetrical history, past and family history) was taken.

Statistical analysis

Data was entered in MS excel 2010 software and analysed using statistical for social sciences (SPSS).

RESULTS

In the current study, maximum number of patients (43.9%) were between 21-25 years of age. We had 49.3% primigravida and 50.7% multigravida.

Table 1: Distributions of study population according to age and gravidity.

Age (in years)	Primigravida, n (%)	Multigravida, n (%)	N (%)
<20	16 (21.3)	2 (2.7)	18 (12)
21-25	35 (46.6)	30 (41.1)	65 (43.9)
26-30	22 (29.3)	28 (38.3)	50 (33.7)
31-35	2 (2.6)	8 (10.9)	10 (6.7)
>35	-	5 (6.8)	5 (3.37)
Total	75 (49.3)	73 (50.7)	148 (100)

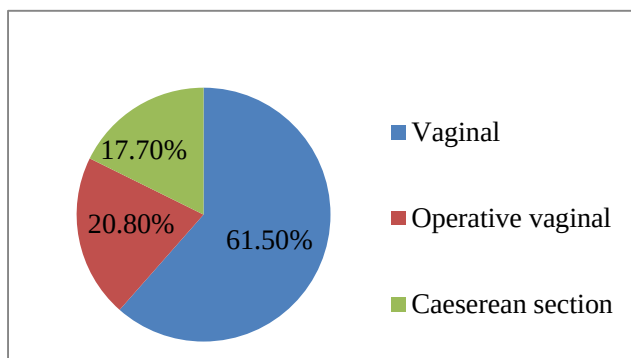


Figure 2: Mode of delivery.

The incidence of vaginal delivery in our study was 61.5% whereas that of caesarean section and operative vaginal delivery was 17.7% and 20.8% respectively

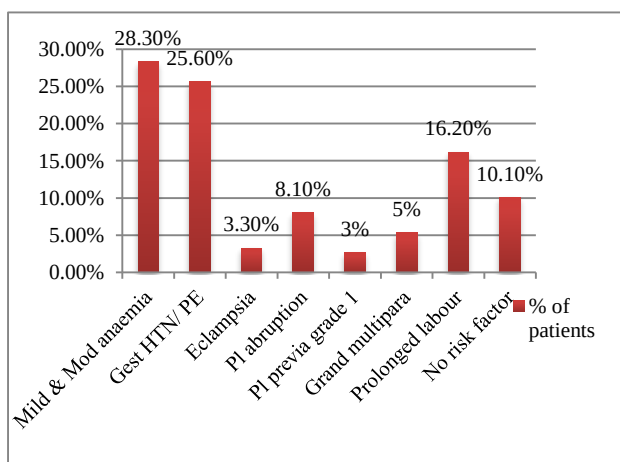


Figure 3: Risk factors in patients.

Figure 3 classifies patients on the basis of their risk factors. Anaemia and HDP (gestational HTN and preeclampsia) formed the majority with incidence being 28.3% and 25.6% respectively. Prolonged labour was seen in 16.2% patients. Only 10.1% patients were free of any risk factors

Table 2: Distribution according to time taken to stop bleeding.

Time taken	N (%)
<5 mins	78 (52.7)
5-10 mins	53 (35.8)
>10 mins	17 (11.4)
Total	148 (100)

In majority of the patients bleeding was stopped within five minutes. In 78 women (52.7%), bleeding stopped within 5 minutes, in 53 women (35.8%) bleeding was stopped between 5-10 minutes and in 17 women (11.4%) bleeding took >10 minutes to stop.

Table 3: Distribution according to amount of blood collected in bottle.

Amount of blood collected in bottle after cannula application	N (%)
<100 ml	78 (56.8)
101-200 ml	53 (30.5)
201-300 ml	12 (8.1)
>300 ml	05 (3.7)
Total	148 (100)

Blood collected in bottle after suction cannula application ranged from 100-200 ml. In 78 women (56.8%), <100 ml was collected in the bottle.

Table 4: Distribution according to number of times of negative pressure applied.

Application of negative pressure	N (%)
Once	87 (58.8)
Twice	48 (32.4)
Thrice	13 (8.7)
Total	148 (100)

In present study, in 87 (58.8%) women negative pressure was applied only once, in 48 (32.4%) women negative pressure was applied 2 times and 13 women (8.7%) negative pressure was applied three times to stop bleeding.

Table 5: Distribution according to need of blood and blood products transfusion.

No. of units transfused	N (%)
0	124 (83.8)
1	15 (10.2)
2	5 (3.9)
≥3	4 (3.4)
Total	148 (100)

The 15 women (10.2%) were transfused one-unit packed cell volume, 5 women (3.9%) were transfused 2-unit packed cell volume, 4 women (3.4%) transfused 3 or more-unit PCV, 124 (83.3%) women had no blood transfusion.

Table 6: Outcome of patients.

Outcome	N (%)
Survived	148 (100)
Died	0
Total	148 (100)

The present study recorded no mortality and all the patients survived.

DISCUSSION

According to the millennium development goal, maternal mortality reduction can be achieved if only PPH management is prioritized.¹⁰ The world health organization (March 2022) published recommendations on intrapartum care for a positive childbirth experience, which recommended oxytocin (10 IU, IM/IV) as the preferred uterotonic drug for the prevention of PPH. Other injectable uterotonics (ergometrine/methyl ergometrine) and oral misoprostol (600 µg) can be used when oxytocin is not available. Delayed cord clamping (not earlier than one minute after birth) and controlled cord traction by skilled birth attendants must be done. However, sustained uterine massage is not recommended as an intervention to prevent PPH in women who have received prophylactic oxytocin.¹¹ Samarthram et al conducted a case-control study including 16 normally delivered patients (NVD) and 4 caesarean (LSCS) delivered patients who developed atonic PPH and did not respond well to the routine use of injections of oxytocin, methergine, or carboprost. A cannula applied for 10 minutes every hour for three hours by creating a negative pressure of 650 mmHg resulted in complete cessation of bleeding associated with contraction and firm retraction of the uterus within four minutes after the initiation of the procedure, and blood collected in the suction bottle ranged from 150 ml to 250 ml.¹²

Panicker et al conducted a prospective interventional study on 40 women who had NVD and 15 who had LSCS and concluded that negative suction resulted in the aspiration of all the blood collected in the uterine cavity. The quantity of blood sucked varied from 50 to 300 ml. The suction was maintained for 30 minutes, which resulted in the contraction of the uterus.¹³

Damor et al conducted an observational study on 120 patients (74 NVD, 25 operative vaginal delivery, and 21 LSCS) and identified that in 50% of women, bleeding was stopped within three minutes, and in 31.7%, bleeding was stopped within 3-4 minutes. The blood collected in bottles ranged from 100 to 150 ml.¹⁴

Meena et al conducted a prospective observational study on 20 NVD women and 5 LSCS women who developed

atonic PPH. In 40% of cases, the bleeding stopped within 3 to 3.9 minutes of application of a suction retraction (SR) cannula for 10 minutes every hour for three hours with a negative pressure of 650 mmHg, and in 24% of cases, the bleeding stopped within 2.1 to 2.9 minutes, and in another 24% of cases, the bleeding stopped within two minutes after application of the cannula. The majority of cases, 23 (92%), survived following the use of the SR cannula.¹⁵

This study had a few limitations. It was a single-center, non-randomized study. The use of other uterotonics in the management could have been a confounding factor in the study. However, risking a life for the sake of a study would have been unethical. Large multicentric data and systematic reviews need to be conducted before formulating any guidelines.

CONCLUSION

In countries with low resources, complementing routine AMTSL with suction cannula in cases where atonic PPH is anticipated or happening can prove useful in decreasing the prevalence of PPH. It can also be used as a routine precautionary measure for all vaginal deliveries. Stress must be given on training the ground staff for better mindfulness and acceptance of this system. Still, large, long-term, multicentric randomized controlled trials with a huge sample size and different ethnical groups are demanded before drawing a solid conclusion.

Funding: No funding sources

Conflict of interest: None declared

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

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Cite this article as: Shrivastav R, Shrivastava R. Evaluating the efficacy of metal suction cannula for atonic postpartum haemorrhage management in rural south Gujarat: a two-year observational study. *Int J Reprod Contracept Obstet Gynecol* 2024;13:1256-60.