ORIGINAL ARTICLE

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

Inlo Miuli[1], Sendhil Coumary Arumugam[2], Swathy Srinivasan[3], Seetesh Ghose[4]

Received on: 09 February 2023; *Accepted on*: 27 February 2023; *Published on*: 16 September 2023

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.

Journal of South Asian Federation of Obstetrics and Gynaecology (2023): 10.5005/jp-journals-10006-2260

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.

[1–5]Department of Obstetrics & Gynaecology, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth University, Puducherry, India

Corresponding Author: Sendhil Coumary Arumugam, Department of Obstetrics & Gynecology, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth University, Puducherry, India, Phone: +91 9585475508, e-mail: sendhilcoumary1975@yahoo.in

How to cite this article: Miuli I, Arumugam SC, Srinivasan S, *et al*. Prevention of Postpartum Hemorrhage Using Vacuum Retraction Cannula during Cesarean Section in Major Degree Placenta Previa. J South Asian Feder Obst Gynae 2023;15(4):395–398.

Source of support: Nil

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.

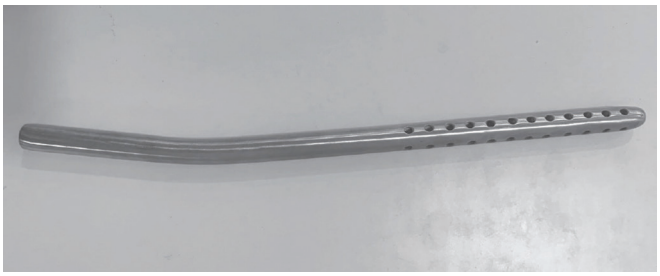


Fig. 1: Vacuum retraction cannula

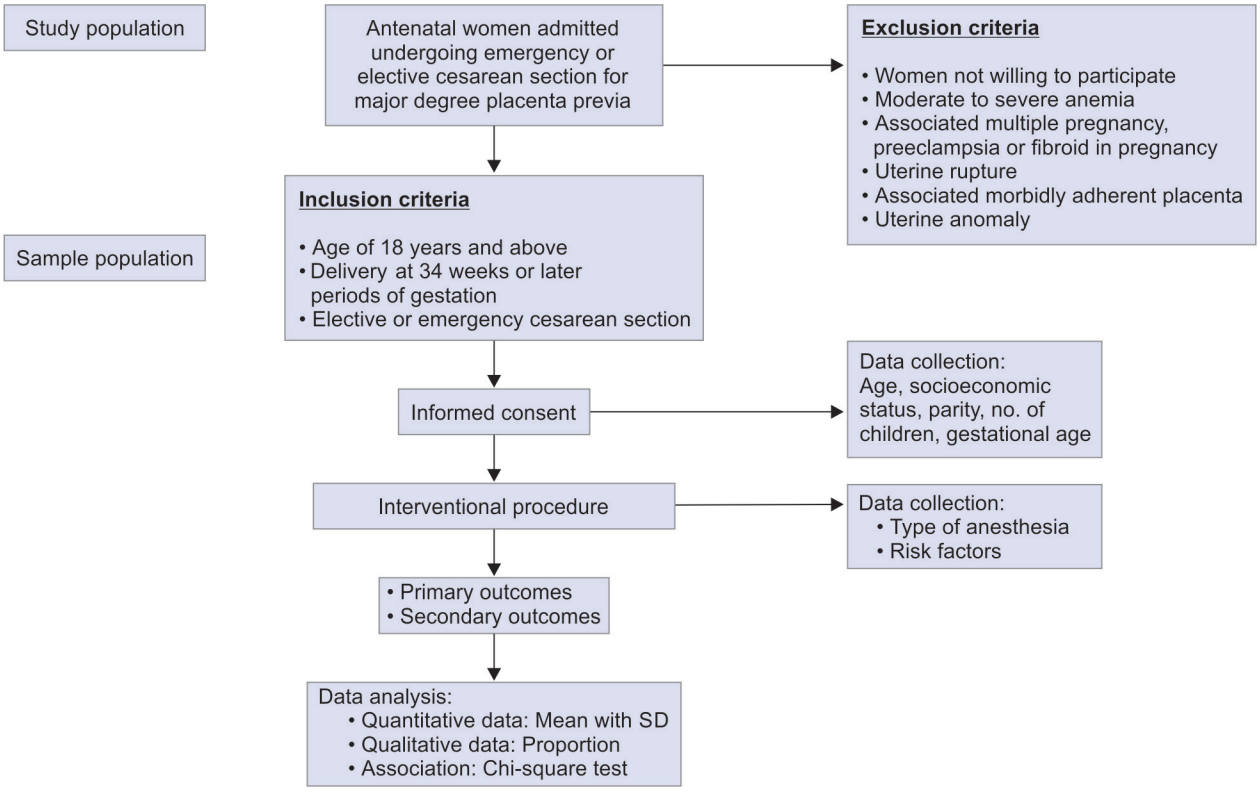
The parameters for objective analysis were as follows:

- 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.

Acknowledgment

The authors thank the department of anesthesia and blood bank officer in-charge for providing professional support during intraoperative and postoperative periods as and when required.

Orcid

Inlo Miuli https://orcid.org/0000-0002-2436-5624
Seetesh Ghose https://orcid.org/0000-0002-2465-555X

References

1. Fan D, Xia Q, Liu L, et al. The incidence of postpartum hemorrhage in Pregnant Women with placenta previa: A systematic review and meta-analysis. PloS One 2017;12(1):e0170194. DOI: 10.1371/journal.pone.0170194.
2. Kumari S, Singh B. Maternal and perinatal outcome of placenta previa in a tertiary care centre: An observational study. Int J Reprod Contracept Obstet Gynecol 201825;7(11):4701–4705. DOI: 10.18203/2320-1770.ijrcog20184533.
3. Krupa BM, Asha S, Padma, et al. Pregnancy outcomes in various types of placenta previa: A clinical study. J Gynecol Women's Health 2021:21(5):556073. DOI: 10.19080/JGWH.2021.21.556073.
4. Gibbins KJ, Einerson BD, Varner MW, et al. Placenta previa and maternal hemorrhagic morbidity. J Matern Fetal Neonatal Med 2018;31(4):494–499. DOI: 10.1080/14767058.2017.1289163.
5. Peng ZH, Xiong Z, Zhao BS, et al. Prophylactic abdominal aortic balloon occlusion: An effective method of controlling hemorrhage in patients with placenta previa or accreta. Exp Ther Med 2019;17(2):1492–1496. DOI: 10.3892/etm.2018.7066.
6. Ryu JM, Choi YS, Bae JY. Bleeding control using intrauterine continuous running suture during cesarean section in pregnant women with placenta previa. Arch Gynecol Obstet 2019;299(1):135–139. DOI: 10.1007/s00404-018-4957-4.
7. Suarez S, Conde–Agudelo A, Borovac–Pinheiro A, et al. Uterine balloon tamponade for the treatment of postpartum hemorrhage: A systematic review and meta-analysis. Am J Obstet Gynecol 2020;222(4):293.e1–293.e52. DOI: 10.1016/j.ajog.2019.11.1287.
8. Grange J, Chatellier M, Chevé MT, et al. Predictors of failed intrauterine balloon tamponade for persistent postpartum hemorrhage after vaginal delivery. PloS One 2018;13(10):e0206663. DOI: 10.1371/journal.pone.0206663.
9. Silver RM, Branch DW. Placenta accreta spectrum. N Engl J Med 2018;378(16):1529–1536. DOI: 10.1056/NEJMcp1709324.
10. Bingham D, Lyndon A, Lagrew D, et al. A state-wide obstetric hemorrhage quality improvement initiative. MCN Am J Matern Child Nurs 2011;36(5):297–304. DOI: 10.1097/NMC.0b013e318227c75f.
11. Panicker TNV. Panicker's vacuum suction haemostatic device for treating post-partum haemorrhage. J Obstet Gynecol India 2017;67(2):150–151. DOI: 10.1007/s13224-017-0963-x.
12. Meena M, Meena D. A clinical study of the use of SR vaccum suction cannula in the management of atonic PPH at tertiary care hospital. Int J Sci Res 2020;9(1):1812–1815. DOI: 10.21275/ART20204495.
13. D'Alton ME, Rood KM, Smid MC, et al. Intrauterine vacuum-induced hemorrhage–control device for rapid treatment of postpartum hemorrhage. Obstet Gynecol 2020;136(5):882–891. DOI: 10.1097/AOG.0000000000004138.