



Effectiveness of Intra-Aortic Ballooning Occlusion for Bleeding Control in Gravida Patients with Placenta Accreta

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Abstract

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INTRODUCTION: Morbidly adherent placenta cause significant maternal morbidity and mortality from postpartum hemorrhage. Intra-aortic balloon occlusion has been shown to reduce intraoperative hemorrhage effectively.

CASES PRESENTATION: We reported four cases of women who underwent cesarean section and hysterectomy with IABO. All four were multigravida, gestational age range was 37–39 weeks, MAP score range 6–8. Ultrasound examination showed placenta accreta. After the cesarean section and hysterectomy procedure with Intraoperative Aortic Balloon Occlusion, the bleeding was 600–800 cc.

CONCLUSIONS: Intra-Aortic Ballooning Occlusion is an effective method to reduce bleeding complications during and after cesarean section in pregnancies with placenta accreta.

Introduction

Morbidly adherent placenta (MAP) may cause significant maternal morbidity and mortality from postpartum hemorrhage (PPH), which accounts for ~29% of maternal mortality cases [1], [2], [3]. MAP includes placenta accreta, increta, and percreta because it penetrates through the decidua basalis into and through the myometrium. The clinical consequence of abnormal placentation is a failure of placental separation leading to massive postpartum hemorrhage with a significant increase in maternal morbidity and mortality [1]. It is estimated that around 25% of patients experience blood loss of more than 5L, and around 40% of patients require transfusion of 10 units Packed Red Cell (PRC) [4]. Treatment for these conditions is generally cesarean hysterectomy. In reducing the risk of these complications, balloon occlusion is also used to reduce regional perfusion pressure and limit the risk of bleeding [5], [6].

The previous studies reported the efficacy of using an occlusive balloon during surgical management of MAP in reducing blood loss, with the highest efficacy in the aortic balloon [7]. We report the use of an intraoperative aortic balloon occlusion (IABO) procedure for bleeding control in Gravida Patients with Placenta Accreta in our center. We reported up to post-procedure inpatient, without reporting follow-up after the patient was discharged.

Cases Presentation

We reported four cases of women who underwent a cesarean section (CS) and hysterectomy due to placenta accreta, increta, or percreta. The patient was consulted by the Obstetrics and Gynecology Department to the Cardiovascular Surgery Department of DR. Moewardi Hospital in January 2020–December 2021.

Patients who given consent to the IABO procedure and had complete data were reported.

The first patient was 26 years old, G4P2A1, 36 weeks gestation was referred with placenta accreta and anemia. The patient feels irregular contractions and fetal movement. The patient had a history of two cesarean sections, and there were no other comorbidities. General examination under normal condition and non-Stress Test showed category 1. Ultrasound examination revealed that placenta implantation in the corpus anterior did not cover the internal orifice of the uterus, and the estimated fetal weight was 2719 grams (Figure 1). The patient had a MAP score range of 6.

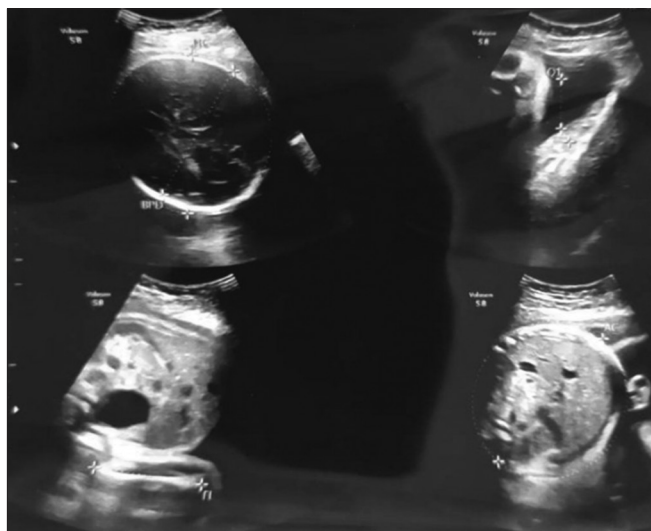


Figure 1: Ultrasound examination of the first case showed that placenta implantation in the corpus anterior did not cover the internal orifice of the uterus

The second patient was 40 years old, G3P2A0, 37 weeks gestation was referred with placenta accreta and chronic hypertension. The patient did not feel regular contractions and blood mucus discharge from the vagina. The patient had a history of two cesarean sections, and hypertension. General examination under normal condition and non-stress test showed Category 1. Ultrasound examination revealed that placenta implantation in the lower uterine segment and covers the internal orifice of the uterus, and the estimated fetal weight was 2994 g. The patient had a MAP score range of 8.

The third patient was 31 years old, G3P1A1, 38 weeks gestation was referred with placenta accreta, Intra Uterine Growth Restriction (IUGR), and oligohydramnios. The patient feels blood mucus discharge from the vagina since 3 days. The patient had history of a cesarean section, a miscarriage, and no other comorbidities. General examination under normal condition and non-Stress Test showed category 1. Ultrasound examination revealed that placenta implantation in corpus anterior and covers the internal orifice of the uterus, and the estimated fetal weight was 2383 g (Figure 2). The patient had a MAP score range of 7.

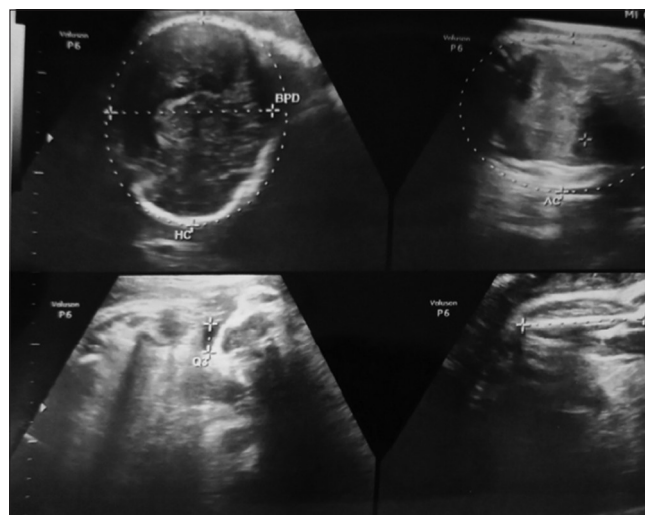


Figure 2: Ultrasound examination of the third case showed that placenta implantation in the corpus anterior did not cover the internal orifice of the uterus

The fourth patient was 35 years old, G3P2A0, 39 weeks gestation was referred with placenta previa totalis. The patient feels blood mucus discharge from the vagina since 3 days. The patient had no history and no other comorbidities. General examination under normal condition and non-stress test showed category 1. Ultrasound examination revealed that placenta implantation in corpus anterior and covers the internal orifice of the uterus, and the estimated fetal weight was 3900 grams. The patient had a MAP score range of 7.

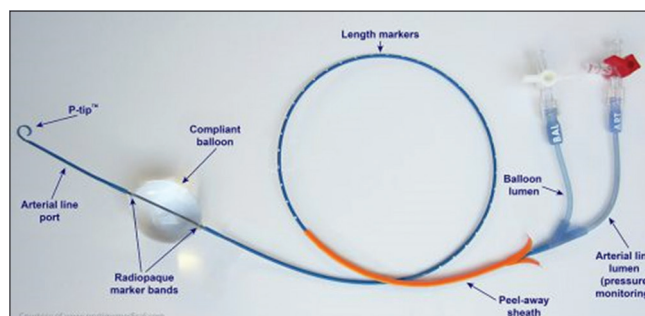


Figure 3: Intra-Aortic Balloon Catheter using ER-REBOA™

These patients were positioned supine under spinal anesthesia. The CS operation was performed for 15 min. The vascular surgery team sterilized the right inguinal area, made a vertical inguinal incision of about 3 cm, and the iliaca artery was identified. Then the artery was fixed, punctured, and a 0.035 Inch × 150 cm guide wire was inserted. An incision is made at 0.2 cm parallel to the wire and the aortic balloon, ER-REBOA™, is inserted. The C-Arm is used to ensure the positioning of the placed balloon. The balloon is inflated 6-9 cc when it reaches a position above the aortic bicurcate and below the renal artery (Figure 3). After confirming that the balloon was fully expanded and blocked the aortic lumen using C-Arm, the inferior limb saturation was assessed, and the ischemic time was calculated (Figure 4). The hysterectomy operation was then performed for 50 min (Figure 5). After the hysterectomy

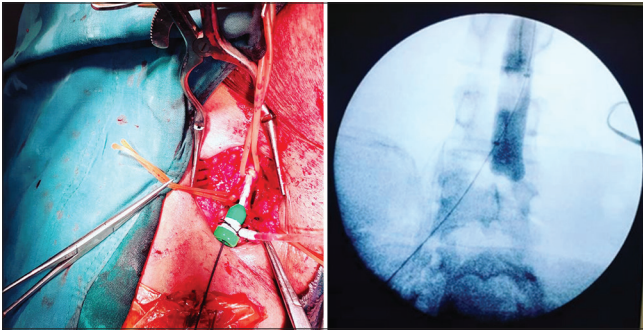


Figure 4: C-Arm examination showed the balloon was fully expanded and blocked the aortic lumen

was completed and the bleeding was controlled, the balloon occlusion was gradually reduced; every 5 min, the balloon was reduced by about 3–4 cc until the distal vascularization of the aorta returned to normal. The inferior limb was assessed clinically with oxygen saturation and capillary refill time. After surgery, the patient's condition was stable, and the bleeding during surgery the first to fourth patients in a row as many as 600 cc, 800 cc, 700 cc, and 600 cc. The patient was then transferred to the ICU room for 1 day for observation and then transferred to the ward.

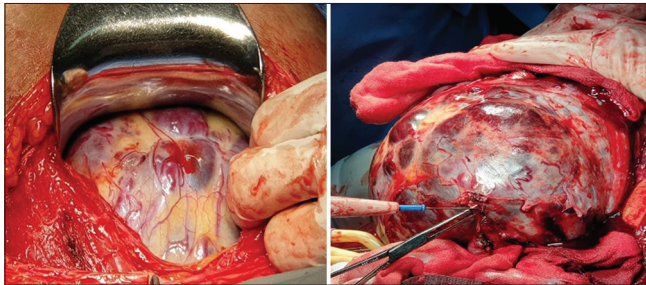


Figure 5: The hysterectomy procedure of the second case with 800 cc bleeding

Discussion

There were three classifications of adherent placentas: a) Placenta accrete: Placental villi are attached to the myometrium, b) placenta Incretta: Invasion of the placental villi into the myometrium, and c) placenta percreta: Placenta villi fully penetrate the myometrium [8]. The reported incidence of abnormal placentation varies widely, ranging from 1:93,000 to 1:111 pregnancies [9]. A deficit in the uterine wall thickness due to a scarred uterus or an abnormal placentation site in the lower segment is a major risk factor [10]. The increased incidence of abnormal placentation has been considered most likely related to much higher CS rates [10], [11].

Wang *et al.* reported median blood loss in IABO versus control group: 1000 ml versus 2000 ml ($p < 0.05$), PRC transfusion in IABO versus control

group: 1100 ml versus 2000 ml ($p < 0.05$), 33% of the control group experienced hemorrhagic shock with one patient had cardiac arrest, while there was no such occurrence in the IABO group ($p < 0.05$) [12].

For women with placenta accreta who wish to preserve fertility, alternative options include manual removal of the placenta with resection of the invaded area and conservative management of leaving the placenta in situ; the former approach carries a possible risk of massive bleeding on separation of the placenta, whereas the latter approach may be associated with secondary complications due to the prolonged retention of placental tissue [13], [14], [15], [16], [17]. Thus, intraoperative aortic balloon occlusion (IABO) has been shown to effectively reduce intraoperative hemorrhage in major pelvic surgical procedures [16]. Recently, obstetricians have introduced this technique during CS in patients with placenta accreta and placenta previa because it might not only control bleeding during hysterectomy but may also decrease the likelihood of hysterectomy [18], [19].

However, pernicious placenta previa complicated with placenta increta/percreta can lead to serious long-term complications after a CS. Endometrial damage, poor scar healing at the incision, endometrial defects, and other factors can cause the villi and the placenta to invade the muscularis and serosa layer and possibly the bladder and pelvic walls, which are susceptible to forming placenta previa and placenta accreta [8]. Placenta accreta and intractable hemorrhaging are two characteristics of pernicious placenta previa. Angstmann *et al.* [9] pointed out that the average amount of bleeding during the CS of patients with pernicious placenta previa can be as high as 3000–5000 mL, and the hysterectomy rate has been reported to be as high as 55–75% [10], [11]. Therefore, to guarantee the safety for the mother and newborns, the surgical treatment of pernicious placenta previa complicated with placenta increta/percreta requires a treatment team consisting of a senior physician with experience in placenta implantation treatment, anesthesiologist, pediatricians with experience in preterm infants, operation room personnel, blood bank personnel, and so on.

In addition, there are many methods for treating dangerous placenta previa. At present, many studies focus mainly on internal iliac artery embolization (IIAE), uterine artery embolization (UAE), abdominal aortic balloon occlusion, and so on [15], [16], [17], [18], [19], [20], [21]. There is an especially heavy focus on abdominal aortic balloon occlusion because although there are no uniform guidelines, there are great advantages in controlling intraoperative bleeding and preserving the uterus. Because of X-ray-mediated occlusion limitations, Zhang *et al.*'s [19] study demonstrated a hysterectomy rate as high as 18%, mainly due to a large amount of postoperative bleeding. Therefore, Zhang thought that it was related to an incomplete occlusion or occlusion failure.

Moreover, hemodynamic changes during the procedure should be of great concern to the anesthesiologist. Nitroglycerin administration is considered to relieve vasospasm better than Calcium Channel Blocker and papaverine. However, it is not recommended to give nitroglycerin as prophylaxis [22]. The multidisciplinary management from obstetricians, vascular surgery, and anesthesiologists provides more comprehensive management. It is crucial in reducing the morbidity associated with placenta accreta.

Conclusion

The intra-aortic balloon occlusion procedure is an effective method to reduce bleeding complications during and after cesarean section in pregnancy with placenta accreta. In these cases, we found better patient clinical outcomes, less bleeding, and shorter post-operative intensive care.

Ethical Approval

This type of study does not require any ethical approval by our institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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