

# Prophylactic balloon occlusion of the internal iliac arteries in two cases of placenta accreta syndromes\*

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## ABSTRACT

Placenta accreta syndrome results from the abnormal adherence of the placenta to the myometrium due to the absence of the decidua basalis and imperfect development of the Nitabuch layer. It causes serious obstetric morbidity due to the risk of massive hemorrhage. Balloon occlusion of internal iliac arteries has been used prophylactically to decrease hemorrhage in cesarean hysterectomy for placenta accreta. In this paper, two cases of placenta accreta syndromes wherein bilateral internal iliac artery balloon occlusion was done prior to cesarean hysterectomy are presented. Case 1 is a 50-year-old G4P0 (0030) pregnancy uterine who came in at 33 3/7 weeks age of gestation for fetal surveillance. Case 2 is a 38-year-old G4P2 (2012) pregnancy uterine who came in at 33 4/7 weeks age of gestation for decreased fetal movement. Both cases were successfully delivered via cesarean hysterectomy with prophylactic balloon occlusion under a multidisciplinary team in a tertiary care center.

*Keywords: internal iliac arteries, balloon occlusion, placenta accreta*

## INTRODUCTION

**P**lacenta accreta refers to abnormal placental implantation wherein the placenta firmly adheres to the myometrium due to the partial or total absence of the decidua basalis and imperfect development of the fibrinoid or Nitabuch layer. They are classified based on the depth of trophoblastic growth: 1) placenta accreta, wherein the villi are attached to the myometrium; 2) placenta increta, wherein the villi invade the myometrium; and 3) placenta percreta, wherein the villi penetrate through the myometrium and to or through the serosa. It is a serious problem in obstetrics as it poses risk of significant third trimester bleeding secondary to uteroplacental neovascularization.<sup>1,2</sup>

Intraoperative blood loss in a cesarean hysterectomy for placenta accreta is common and may reach up to 3,000 ml or more, often necessitating blood transfusion.<sup>3</sup> Hence, adjunct procedures have been developed to address this. One of these is balloon occlusion of the internal iliac arteries. It is a minimally invasive procedure done preoperatively to decrease blood loss in the management of placenta accreta. Occlusion of the internal iliac arteries decreases blood loss during surgery by reducing blood

flow to the uterine arteries and other collateral vessels from the anterior division of the internal iliac artery.

There is still lacking evidence to make a firm recommendation on the use of balloon catheter occlusion according to local and international society guidelines, although there is an increasing number of studies in the literature regarding the use of this technique as part of the management of placenta accreta. No local study is currently available pertaining to its use.

In this paper, two cases of placenta accreta syndromes managed with bilateral internal iliac artery balloon occlusion prior to cesarean hysterectomy are presented.

## CASE REPORT

### CASE 1: VD

A 50-year-old G4P0 (0030) pregnancy uterine came in at 33 3/7 weeks age of gestation for fetal surveillance. She has had a history of primary infertility for 20 years, two spontaneous abortions for which she underwent completion curettage, and one ectopic pregnancy for which she underwent left salpingostomy in 2007. With a different partner, she underwent 3 failed intrauterine inseminations and 1 in-vitro fertilization (embryo transfer 04/04/2017) resulting to this pregnancy. She had been diagnosed with anti-phospholipid antibody syndrome prior to this pregnancy for which she was given aspirin since the first trimester. Surgical history also revealed a previous laparoscopic myomectomy, the date of which was unrecalled by the patient.

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At 16 2/7 weeks age of gestation, pelvic ultrasound showed an anterior placenta, grade I, totally covering the os with an anterior overlap of 5.6 cm. Serial ultrasound was then done. At 33 4/7 weeks age of gestation, Doppler velocimetry still showed previa but now with invasion of the upper 1/3 of the posterior cervix and irregularity of the serosa-bladder interface (at the right lower aspect) to consider placenta increta, suspicious for percreta.

On admission, the patient was given a single repeat course of betamethasone, and referred to the following services: Maternal Fetal Medicine, Gynecology, Surgery, Urology, Interventional Radiology, Anesthesiology, and Neonatology. A family conference was held to discuss the situation and the approach to management.

Patient eventually underwent bilateral internal iliac artery angiogram and placement of balloon catheters, cystoscopy, bilateral ureteral stenting, and primary classical cesarean section with total abdominal hysterectomy with bilateral salpingo-oophorectomy under combined spinal-epidural anesthesia. Bilateral internal iliac artery angiogram and placement of balloon catheters were done at the catheterization laboratory. The technique was done under fluoroscopic guidance via bilateral transfemoral approach using 5F Cordis Cobra catheters and Admiral Extreme 8 x 80 cm and 9 x 130 cm balloon catheters. The balloon catheters were placed on the proximal segments of the internal iliac arteries under catheter-guidewire exchange technique. Preliminary balloon inflation on both sides were satisfactory. The procedure lasted for 1 hour. The patient was then transferred to the adjoining operating theater where definitive surgery was performed. A live baby boy was delivered with an Apgar score 4,6,9, birth weight 1600 grams, birth length 42 cm, Ballard Score 33 weeks, appropriate for gestational age. Intraoperatively, there was note of an anterior placenta, totally covering the internal cervical os. The placenta was left in-situ. On cut section of the uterus, the placenta was noted to have invaded the anterior myometrial wall, with intact uterine serosa.

Patient underwent routine postoperative care and was eventually discharged on post-operative day 5 without reported complications. Histopathology showed presence of placenta accreta.

#### *Histopathology Report of Case 1.*

Uterus, Cervix, Bilateral Fallopian Tubes and Ovaries, Placenta In-Situ, CS Hysterectomy with Bilateral Salpingo-Oophorectomy:

1. Uterus: Placenta accreta. Leiomyomas with hyaline degeneration, intramural. Cervix: chronic cervicitis with Nabothian cysts.
2. Placenta: Singleton, Third Trimester Placenta. No chorioamnionitis, villitis or funisitis. Three-vessel

umbilical cord (2 arteries, 1 vein)

3. Ovaries, Right and Left: Unremarkable
4. Fallopian Tubes, Right and Left: Unremarkable; Paratubal Cyst, Left

#### **CASE 2: AI**

A 38-year-old G4P2 (2012) pregnancy uterine came in at 33 4/7 weeks age of gestation for decreased fetal movement. She is a known asthmatic since 21 years old, with no prior maintenance medications. She was diagnosed with gestational diabetes mellitus at 24 weeks age of gestation based on an elevated OGTT. She was initially on Metformin and referred to an endocrinologist who started her on Insulin. She also has primary immune reproductive disorder at 9 weeks age of gestation based on an immunodeficiency panel that showed slightly decreased natural killer cell count and markedly decreased CD8 count. She was given SMOFLIPID infusion oral prednisone for 6 weeks and started on Tinzaparin daily. Surgical history revealed a primary cesarean section (in 2005) for non-reassuring fetal heart rate pattern and the second was a repeat cesarean section. Her third pregnancy was a spontaneous abortion with no completion curettage done. At around 22 weeks age of gestation, a disruption in the hyperechoic bladder serosa surface was noted in her congenital anomaly scan; with abnormal placental lacunae, hypervascularity of placenta-bladder interface, and placenta totally covering the os to consider accreta. She was referred to a perinatologist and advised close follow-up. In the interim, there was note of perceived uterine contractions for which she was prescribed a short course of oral tocolytics as outpatient. At 24 2/7 weeks age of gestation, she was given 2 courses of betamethasone, 8 weeks apart. At 27 3/7 weeks age of gestation, Doppler study showed the placenta previa totalis persisted, now with sonologic features suspicious of placenta percreta.

On admission, she reported decreased fetal movement associated with occasional perceived uterine contractions but no blood or watery vaginal discharge. Vital signs were stable and non-stress test was reassuring. Patient was referred to a multidisciplinary team. She was given tocolytics, blood products were prepared, and lab work-up done. On the fourth hospital day, she underwent bilateral internal iliac artery angiogram and placement of balloon catheters, cystoscopy, bilateral ureteral intubation, and primary classical cesarean section with total abdominal hysterectomy under combined spinal-epidural anesthesia. Bilateral internal iliac artery angiogram and placement of balloon catheters were done at the catheterization laboratory. The technique was done under fluoroscopic guidance via bilateral transfemoral approach using 5F Cordis Cobra catheters and Boston Scientific Mustang 8 mm x 20 mm balloon catheters. The

balloon catheters were placed on the proximal segments of the internal iliac arteries under catheter-guidewire exchange technique. Preliminary balloon inflation on both sides were satisfactory. The procedure lasted for 1 hour. The patient was then transferred to the adjoining operating theater where definitive surgery was performed. A live baby girl was delivered with an Apgar score 9,9, birth weight 2100 grams, birth length 42 cm, Ballard Score 34 weeks, appropriate for gestational age. Intraoperatively, the lower uterine segment was converted into a bulging mass with engorged vessels and varicosities visible from the uterine serosa. The varicosities extended up to the bladder caudally.

Patient underwent routine postoperative care and was eventually discharged on post-operative day 3 without reported complications. Histopathology showed presence of placenta percreta.

#### Histopathology Report of Case 2.

- A. Uterus, Cervix, and Placenta, Cesarean Section with Total Abdominal Hysterectomy:
  - Placenta Percreta
  - Third Trimester Placenta with Infarct (20-30%)
  - Three-vessel umbilical cord (2 arteries and 1 vein)
  - No chorioamnionitis, deciduitis nor villitis
- B. Detached Cervix, Total Abdominal Hysterectomy:
  - Placenta Previa
  - Nabothian Cysts

Internal iliac artery balloon occlusion patient procedures and outcomes.

Variable	Case 1	Case 2
Age	50 years old	38 years old
OB Score	G4P0 (0030)	G4P2 (2012)
Risk factors	History of myomectomy, curettage 2x	History of previous CS 2x
Hemoglobin prior to OR	12.7 g/dl	10.6 g/dl
AOG at diagnosis	20 weeks	21 3/7 weeks
AOG on admission	33 3/7 weeks	33 4/7 weeks
AOG at delivery	33 4/7 weeks	34 weeks
Operation	Primary classical cesarean section with total abdominal hysterectomy with bilateral salpingo-oophorectomy	Primary classical cesarean section with total abdominal hysterectomy
Cystoscopy, Bilateral Ureteral intubation	Yes	Yes

Route of anesthesia	Spinal-epidural	Spinal-epidural
Total OR time (excluding Urology and Interventional Radiology procedures)	2 hours 18 minutes	2 hours 20 minutes
Estimated blood loss	3,500 ml	2,000 ml
Blood transfusion	4 units packed RBC, 4 units FFP, 3 units platelet concentrate	2 units packed RBC
Post-operative hemoglobin	11.4 g/dl	9.9 g/dl
Post-operative complications	None	Partial small bowel obstruction secondary to post-op adhesions
Histopathology	Accreta	Percreta
Baby, sex and weight	Baby boy 1600 grams, appropriate for gestational age	Baby girl 2100 grams, appropriate for gestational age
Apgar score, Ballard score	4,6,9 34 weeks	9,9 34 weeks
Length of post-operative hospital stay	5 days	3 days (Re-admission after 7 days;; admitted for 6 days)
Follow-up	Recovered	Recovered

#### CASE DISCUSSION

The use of balloon occlusion to decrease hemorrhage during cesarean section hysterectomy was first described in 1995 by Paull et al. using an infrarenal aortic balloon.<sup>4</sup> It was followed in 1997 when Dubois et al. described 2 cases that first occluded the internal iliac arteries before CS hysterectomies.<sup>5</sup>

In recent decades, there has been an increasing incidence of placenta accreta. A study by Wu et al. (2005) spanning 20 years has pegged the incidence of placenta accreta at 1 in 533 pregnancies.<sup>6</sup> Most cases of placenta accreta arise from a defect in the endometrium, most commonly caused by previous uterine trauma such as cesarean delivery, curettage or myomectomy. There is partial or total absence of the decidua basalis and abnormal development of the Nitabuch layer, causing the placental villi to attach to the smooth muscle fibers instead of the decidual cells.<sup>1</sup> Important risk factors are an

associated placenta previa and a prior cesarean delivery, particularly that with a classical hysterotomy incision. Other risk factors include advanced maternal age, multiparity, uterine anomalies, history of invasive placenta during previous pregnancies, uterine irradiation, endometrial ablation, Asherman syndrome, uterine leiomyomata, smoking, and hypertensive disorders of pregnancy.<sup>1,2,7</sup> Both of our cases involve multigravids aged >35 years old with a history of previous uterine surgery. The first case had myomectomy and 2 previous curettages while the second one had two previous cesarean section. Placenta accreta with co-existing placenta previa may present with bleeding, although none of the cases presented with such during the previous trimesters. Both were diagnosed with placenta accreta around 20 weeks. Placenta accreta is usually diagnosed in the second or third trimester based on the following ultrasound findings: loss of normal hypoechoic retroplacental zone; multiple vascular lacunae (irregular vascular spaces) within the placenta (giving “moth-eaten” or “Swiss cheese” appearance); blood vessels or placental tissue bridging uterine-placental margin, myometrial-bladder interface, or crossing uterine serosa; retroplacental myometrial thickness of <1 mm; and numerous coherent vessels visualized with 3-dimensional power Doppler in basal view.<sup>2,7</sup> MRI is helpful in cases of inconclusive ultrasound findings, posterior placenta accreta, and evaluation of parametrial invasion and ureteral involvement.<sup>2</sup>

The management of choice for placenta accreta is extirpative surgery – a planned preterm cesarean classical hysterectomy with the placenta left in situ in a tertiary-care facility between 34 and 37 weeks under the care of a multidisciplinary team. In our cases, both patients were admitted at 33 weeks age of gestation, given betamethasone courses, and referred to different subspecialties. They both underwent planned classical cesarean hysterectomy with preoperative balloon occlusion of the bilateral internal iliac arteries under spinal-epidural anesthesia at 33-34 weeks age of gestation. The estimated blood loss for the first case was 3,500 ml while the second case had 2,000 ml. Based on the studies that reported reduction in blood loss with the use of occlusive balloon catheters, the range of mean blood loss is 846.67 ml to 2,240 ml.<sup>8</sup> The estimated blood loss in the second case was comparable to that which is reported; however, the estimated blood loss in the first case might be attributed to the rich collateral blood supply of the uterus in spite of the balloon placement.<sup>8</sup> Case 1 had a drop of 1.3 g/dl post-operatively while Case 2 had a drop of 0.7 g/dl only. Both cases required blood transfusion: 4 units of packed RBC, 4 units of fresh frozen plasma, and 3 units of platelet concentrate for Case 1 and 2 units of packed RBC for Case 2. Although the Apgar score of the baby in the first case was initially poor (heart rate <100 bpm, blue, with poor respiratory effort), it eventually

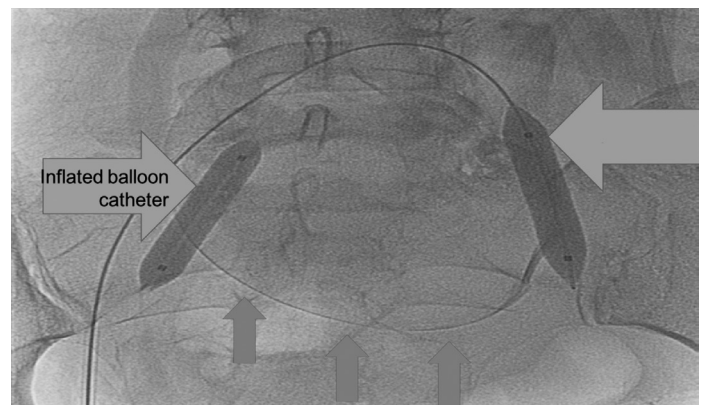
improved after appropriate intervention.

Overall, there is an estimated 5% risk of serious thromboembolic events associated with the technique and surgical complication rate is estimated at 6 to 16%.<sup>8</sup> Complications reported in literature include hematoma, arterial thrombosis, and leg ischemia. Long-term effects of radiation exposure to the fetus is also unstudied. No fetal abnormality has been so far associated with this technique.<sup>8</sup>

No maternal or fetal complication directly arising from the technique was seen in both of our cases.

## SUMMARY

In both cases, the use of prophylactic balloon occlusion of the internal iliac arteries prior to cesarean hysterectomy have been successfully applied under a competent and multidisciplinary team approach in the setting of a tertiary care center. Although its use at present is neither recommended or discouraged by society guidelines and its application is dependent on the presence of a properly trained team and appropriately equipped facility, the attending physician is advised to consider the merits of employing the technique in managing patients with placenta accreta syndromes. ■



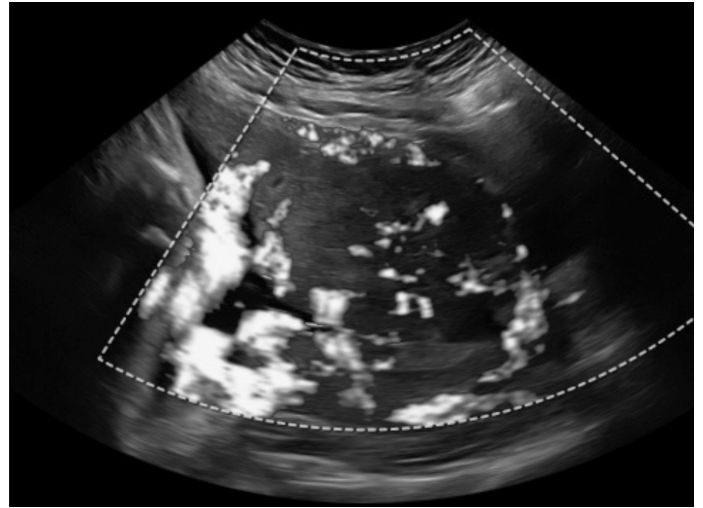
**Figure 1.** Case A with inflated balloon catheters and fetal skull (red arrows)



**Figure 2.** Case B with inflated balloon catheters and fetal skull (red arrows)



**Figure 3.** Doppler scan of Case A showing placenta previa



**Figure 4.** Doppler scan of Case B showing placenta previa

Ultrasound Results of Case 1.

Date	AOG by LMP	AOG by Ultrasound	Result
November 8, 2017	33 4/7 weeks	32 weeks	<p>Cephalic, 1859 grams, 143 bpm, AFI = 16.5 cm, placenta anterior, grade II, (+) previa and increta, myoma uteri Mild fetal pelvocaliectasia, to consider placenta increta (cannot totally rule out percreta)</p> <p>Placental completely covering the internal cervical os with multiple varied sized placental lakes with rich color flow at the bladder serosal interface and also with rich color flow at the posterior serosa of the uterus. Anterior edge of the placenta is located 6cm below the umbilicus. Placental appears to invade the upper 1/3 of the posterior cervix. No placental invasion evident on the right side of the uterine wall near the psoas muscle. There is irregularity of the serosa-bladder interface (at the right lower aspect), myometrial wall not appreciated in this region, but there is still no bulging into the urinary bladder, to consider placenta increta, suspicious for percreta.</p>
November 3, 2017	32 6/7 weeks	31 3/7 weeks	<p>Cephalic, 1722 grams, 146 bpm, AFI = 16.2 cm, placenta anterior, grade II, (+) previa and increta, Mild pelvocaliectasia, left kidney With intramural myomas as ff: 1) mid- anterior, 3.7 x 2.5 x 2.2cm; 2) upper anterior, 3.6 x 3.1 x 1.9cm;; 3) left upper anterior, 3.3 x 3.0 x 1.8cm Left kidney, 2.08 x 2.06cm, pelvis 0.55, pk 0.35 Right kidney, 2.4 x 2.4cm, pelvis 0.55, pk 0.23 Placental Grade 2, totally covering the internal cervical os with multiple varied sized placental lakes, with rich color flow at the bladder serosal interface, and also with rich color flow at the posterior serosa of the uterus. There is irregularity at the serosa-bladder interface (at the right lower aspect) to consider placenta increta</p>

Ultrasound Results of Case 2

Date	AOG by LMP	AOG by Ultrasound	Result
November 11, 2017	27 2/7 weeks	27 3/7 weeks	<p>Cephalic, 1114 grams, 153 bpm, AFI = 10.9 cm, placenta anterior, grade II, previa totalis, with sonologic features suspicious of placenta percreta, placental edge extends anteriorly 12 cm beyond the internal os, cardiac re-evaluation suspicious for inlet VSD</p> <p>2D Gray scale assessment:                      loss of the retroplacental sonolucent zone (+)                      Irregular retroplacental sonolucency (+) Thinning or disruption of hyperechoicserosa/bladder interface (+) Abnormal placental lacunae (+)</p> <p>Color Doppler assessment:                      Diffuse or focal lacuna flow pattern (+) Hypervascularity of serosa-bladder interface (+)                      Markedly dilated vessels over peripheral subplacental zone (+)</p> <p>Other findings:                      Stomach = 2.6 x 1.3 x 1.3 cm, normal stomach bubble (+) inlet VSD = 0.25</p>
September 26, 2017	20 5/7 weeks	21 3/7 weeks	<p>Breech, 412 grams, 134 bpm, SVP 7.2 cm, placenta anterior, grade II, totally covering the os strongly consider placenta accreta, no obvious gross anomaly seen in this scan. Suggest repeat scan at 28 weeks to re-evaluate heart, stomach, and placenta</p> <p>CAS shows an intact cranium and intracranial structures; nuchal fold not thickened; normal facial features; no neck mass; intact spine; Normal 4-chamber heart view outflow tracts and 3 vessel view; stomach bubble in the left and below the heart and diaphragm; 3-vessel cord with intact cord insertion; normal kidneys with urine filled urinary bladder;; complete and well-aligned extremities.                      LV: 5.91mm, TCD: 23.4mm, CM: 4.66mm, NT: 4.74mm, Nasal bone: 7.5mm Cardiac axis: 31.26° (less than 45°), CT Ratio: 0.43</p> <p>Fetal stomach slightly dilated Longitudinal diameter = 2.2cm (NV: 1.6 +/- 0.5), 4.76% above normal                      Transverse diameter = 1.2cm (NV: 0.9 +/- 0.2), 4% above normal                      AP diameter = 1.6cm (NV: 0.8 +/- 0.2), 60% above normal (+) muscular VSD = 0.13                      Disruption hyperechoic bladder serosa interface                      Abnormal placental lacunae, to consider placenta accreta                      Hypervascularity of placenta bladder interface</p>

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