

Perioperative Transcatheter Bilateral Internal Iliac Artery Balloon Occlusion in Cases of Morbidly Adherent Placenta – A Case Report from Interventional Radiology

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Abstract:

Bilateral internal iliac artery occlusion is a procedure performed by the interventional radiologist in the cardiac catheterization laboratory (Cath lab). Parturients with abnormal placentation (placenta accreta, increta, percreta, and a few types of placenta previa) are candidates who can benefit with this intervention. Bilateral femoral arteries are punctured under local anaesthesia, and balloon-tipped catheters are placed in bilateral internal iliac arteries under minimal fluoroscopic guidance after placing lead shield over the parturient to prevent radiation exposure to the fetus. The parturient is then anesthetized in the operation theater. The balloons are inflated manually once the umbilical cord is clamped by the obstetrician during lower segment caesarean section.

This intervention decreases the uterine blood supply significantly which leads to a reduced blood loss during cesarean hysterectomy, less blood and blood products transfusion, a lesser surgical time, and an overall reduced stay in the Intensive Care Unit and Hospital. In several situations, an obstetric hysterectomy can also be avoided if the placental tissue is removed completely from the uterus. The amount of radiation exposure is minimal. Fetal blood flow is not affected as the balloons are inflated only after clamping the umbilical cord. Here in this article we describe a case of a 30 year old gravida three with low lying placenta accreta who underwent perioperative bilateral internal iliac artery occlusion.

Internal iliac, Balloon Occlusion, Placenta Previa, Accreta.

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I. Introduction.

Placental adhesion including accreta, increta, and percreta is a serious complication of pregnancy, associated with major adverse outcomes of pregnancy, including life-threatening maternal hemorrhage, large-volume blood transfusion, peripartum hysterectomy and maternal and neonatal morbidity and mortality [1,2]. However, over the last 50 years, the incidence has increased 10 fold with a reported rate of one case every 2,500 deliveries [1,3,4]. The risk factors for developing morbidly adherent placenta includes advanced maternal age, multiparity, previous caesarean sections and repeated D&C.

Pathophysiology and Types of Adherent Placenta.

The types of morbidly adherent placenta are more in lower uterine implantation on the anterior aspect. Placenta accreta is placenta attached to the myometrium. Placenta increta is placenta with evidence of myometrial invasion, Placenta percreta is placenta which has perforated through the myometrium and reaching the serosal surface. Normal human placenta is hemochorioendothelial type and is contributed by the chorionic frontosum of the fetal embryo and decidua basalis of the maternal endometrium. Lower segment caesarean scar increases incidences of low implantation of the placenta in subsequent pregnancies. Lack of Nitabuch's membrane in low lying placenta increases the risk of uncontrolled placental invasion into the myometrium. [3,4]

Morbid adherent placenta

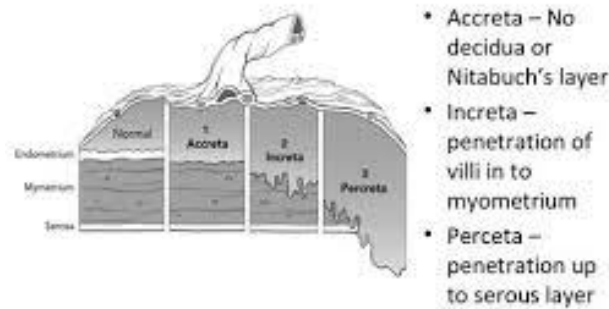


Fig 1: This schematic diagram demonstrates the types of morbidly adherent placenta according to the depth of penetration of myometrium.

Diagnosis of Adherent Placenta.

Antenatal diagnosis of adherent placenta can be successfully made by ultrasound and MRI examination. MRI has a high sensitivity and specificity for diagnosis of adherent placenta. sequences include sagittal T1 and T2 weighted gradient echo sequences. Findings of adherent placenta in MRI includes uterine bulging, heterogeneous signal intensity within the placenta, dark intraplacental bands, focal interruptions to the myometrial wall, and invasion of pelvic structures by placental tissue in patients. Gadolinium contrast is not recommended in diagnosis as it is a Class C drug.[6,7,8]

Antenatal ultrasound shows irregular, thin uterine wall, prominent placental vessels and lacunae sign in placental spaces, and disruption of the bladder to the myometrial interface. Lack of the clear retroplacental space of less than 1mm is definite sign of adherent placenta. Transvaginal scan must be done with caution as it increases the risk of bleeding. Doppler evaluation shows abnormal vascular channels before the presenting part with thinned out myometrium and lack of placental interface with bladder. Spectral wave form shows low resistance maternal arterial flow within the vessels.[9,10]

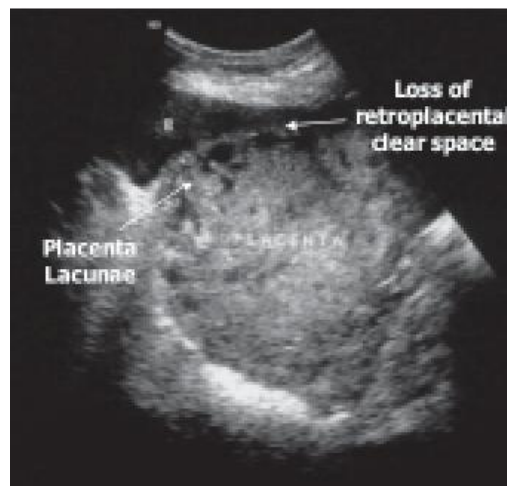


Fig 2: This image of a transabdominal sagittal section of the lower uterine segment and bladder demonstrates the loss of retroplacental clear space with prominent placental lacunae consistent with diagnosis of placenta percreta.



Fig 3: Sagittal T2 weighted MRI sequence of a 32 weeks old Gravid patient shows a low lying placenta completely covering the internal os with thinned out myometrium showing lack of interface with placenta which is seen abutting the posterior wall of the urinary bladder. These features suggest morbidly adherent placenta and increases risk of intra and post operative haemorrhage.

Treatment overview

The highly vascular nature of the placenta, along with increased adherence of chorionic villi to the myometrium in placenta accreta and variants can lead to life-threatening uterine hemorrhage. As a result, planned preterm cesarean section with hysterectomy is the general recommendation from the American College of Obstetricians and Gynecologists (ACOG).[11,12]

The general treatment outline provided by the 2012 ACOG committee opinion article recommends patients with strong suggestion of abnormal placental invasion on prenatal ultrasound be treated in a tertiary care center with adequate blood bank supply and adequate availability of subspecialty and support personnel.[6]. As defined by ACOG, a multidisciplinary team may consist of an anesthesiologist, obstetrician, maternal-fetal medicine specialist, urologist, neonatologist, hematologist, and interventional radiologist.

Prophylactic Internal Iliac Artery Balloon Occlusion Overview.

Patients with placenta accreta usually have delivery by caesarean section at about 34-35 weeks of gestation to avoid intrapartum haemorrhage. The risks of intrapartum haemorrhage and maternal and fetal mortality is high with 60-80 percent of women requiring post- partum hysterectomy. The goal of intravascular balloon occlusion is to reduce postpartum blood flow to the uterus.

Transcatheter balloon occlusion is done in Cath lab or Hybrid OT by interventional radiology team. Bilateral femoral arteries are punctured under ultrasound guidance and vascular access secured with 5fr sheath.4F cobra catheter is introduced into the contralateral iliac artery with a 035 terumo guidewire and angiogram of internal iliac arteries is performed. Selective cannulation of anterior division of internal iliac arteries is performed. The wire and catheter is exchanged for stiff Teflon wire and 4x5cm balloon is placed in the desired portion of anterior division of internal iliac arteries. The balloons are manually inflated with saline and contrast usually 3-5ml.

Fetal radiation dose is minimised by pulsed fluoroscopy and placing a lead shield over the abdomen. The amount of contrast used should also be minimal. In our institute we use diluted non ionic contrast (Visipaque).

The balloons are deflated and the patient is shifted to operating room for emergency caesarean section under general anaesthesia. The interventional radiologist manually inflate the balloons after the cord is clamped and maintained till the delivery of placenta. If the placental deliver is unsuccessful, the patient is planned for hysterectomy and the balloons are removed in the post operative period. In case placental removal is possible and uterus is saved, then the patient is shifted back to cath lab after closing caesarean wound for bilateral uterine artery embolization with 300-500 microns PVA particles to reduce post partum haemorrhage. Risk of fetal hypoxia is reduced as the balloon is only inflated after clamping the cord.

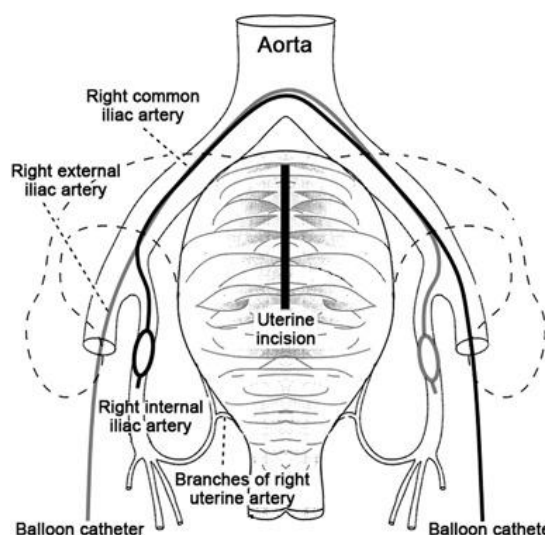


Fig 4: Schematic diagram depicting the preoperative position of occlusive balloons in the anterior division of internal iliac arteries. Balloon's are placed on the ipsilateral side through contralateral femoral artery puncture.

Post operative care.

Pressure is applied to the femoral puncture site for 20minutes and tight compressive dressing given to prevent hematoma formation. Alternatively closure devices or Angioseal can be used. The limb is immobilised for 12 hours. The patient is monitored in a multidisciplinary intensive care unit and fluid resuscitation and blood transfusion is done. Continuous flushing of the sheath is done using heparinised saline to prevent clot formation.

Procedural Complications.

Complications of the procedure include pelvic vein thrombosis, Pulmonary embolism, Deep Vein thrombosis of leg veins, Amniotic fluid embolism and Blue leg syndrome due to distal embolization of clots. Low molecular weight heparin is only administered post partum to prevent clot formation. Puncture site complications include hematoma formation, pseudoaneurysm and femoral artery dissection. Rare complication of internal iliac artery rupture has also been reported.



Fig 5: Cross sectional CT image of the patient taken in arterial phase post procedure shows thrombus around the sheath in left femoral artery due to improper heparin saline flush.

Case Report

A 30 year old Gravid three para two live two was referred to us at 35 weeks of gestation with antenatal diagnosis of morbidly adherant placenta on antenatal ultrasound. She had previous two caesarean sections. No associated antenatal pregnancy complications were present. The lady was well built and nourished with no anaemia. Systemic examination of the female was unremarkable. Obsteric examination shows a healthy fetus in

vertex presentation showing normal Doppler indices with ultrasound showing lower segment anteriorly implanted placenta with thinned out myometrium and possible bladder wall infiltration. Laboratory investigations revealed a haemoglobin of 8gm/dl and platelets of 1.2lakhs . PT and INR was within normal limits. Urine examination was unremarkable and renal and liver function tests were normal. Serum fibrinogen level was high at 387 mg/dl.

The patient underwent bilateral internal iliac artery balloon occlusion at 34weeks followed by emergency caesarean delivery of a healthy male baby of 3.2kgs birth weight. Moderate intraoperative blood loss was there. The placenta was found to be adherent to bladder surface and the patient underwent postpartum hysterectomy.

Postpartum, the patient was monitored and resuscitated in multidisciplinary intensive care unit. The patient developed acute thrombosis of the left common iliac artery and she underwent emergency thrombolysis. She made a speedy recovery and was discharged on the fourth day.



Fig 6: Fluoroscopic image depicting the cannulation of the left internal iliac artery after right femoral puncture using 4Fr Cobra Catheter and 035' Terumo guide wire.



Fig 7: Fluoroscopic image in AP projection shows cannulation of right internal iliac artery after left femoral puncture with angiogram depicting the anterior division of internal iliac artery and uterine artery branch. Adjacent outline of fetal skull can be made out in the superior aspect.

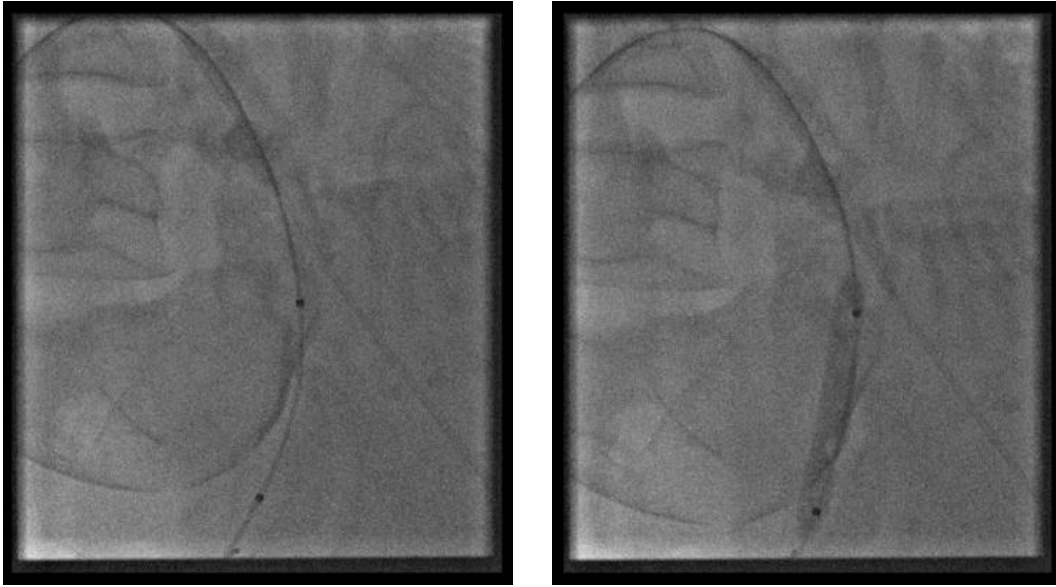


Fig 8: This image depicts fluoroscopic position and test inflation of the occlusive balloon in left internal iliac artery.

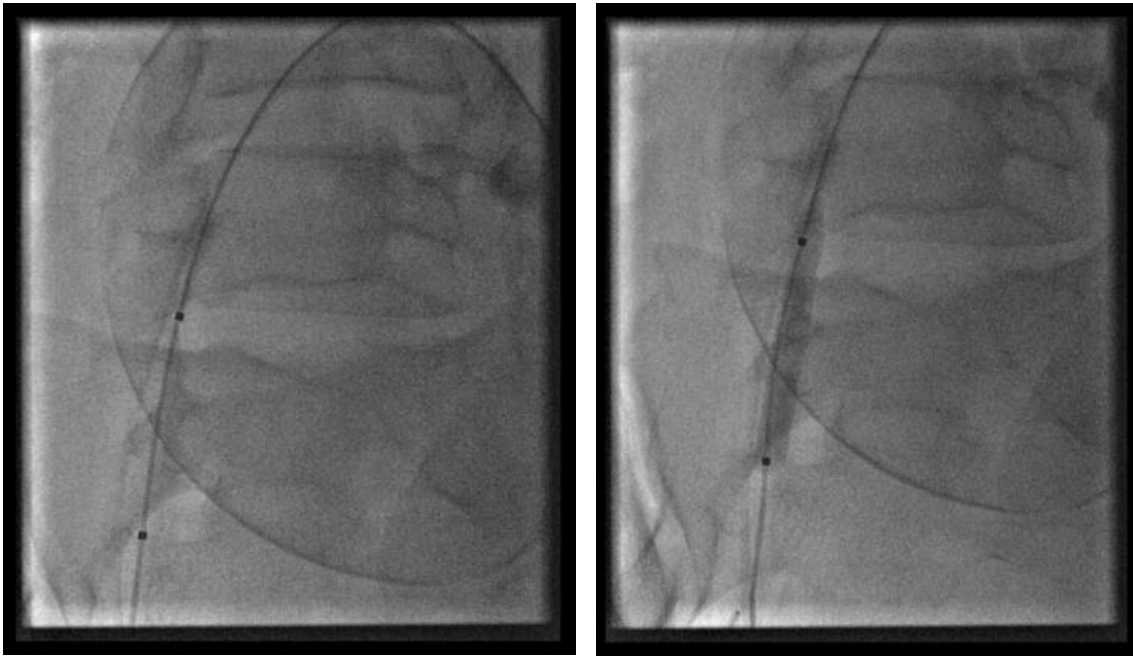


Fig 9: This image depicts fluoroscopic position and test inflation of the occlusive balloon in left internal iliac artery.

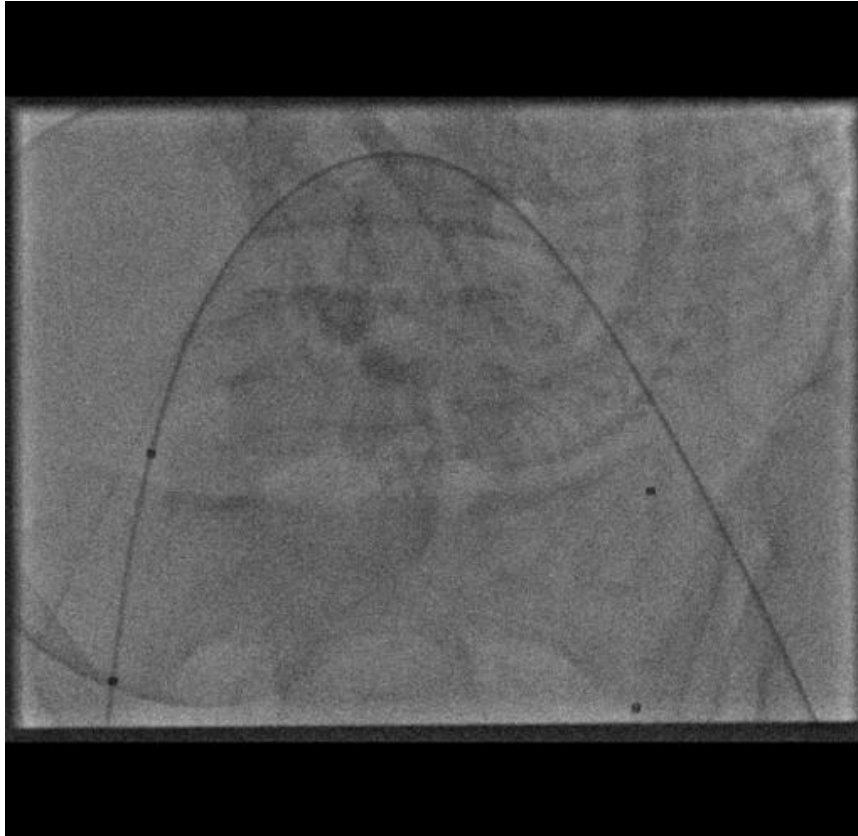


Fig 10: Fluoroscopic image in AP view demonstrating the final position of the balloons within the internal iliac arteries in the pelvis.

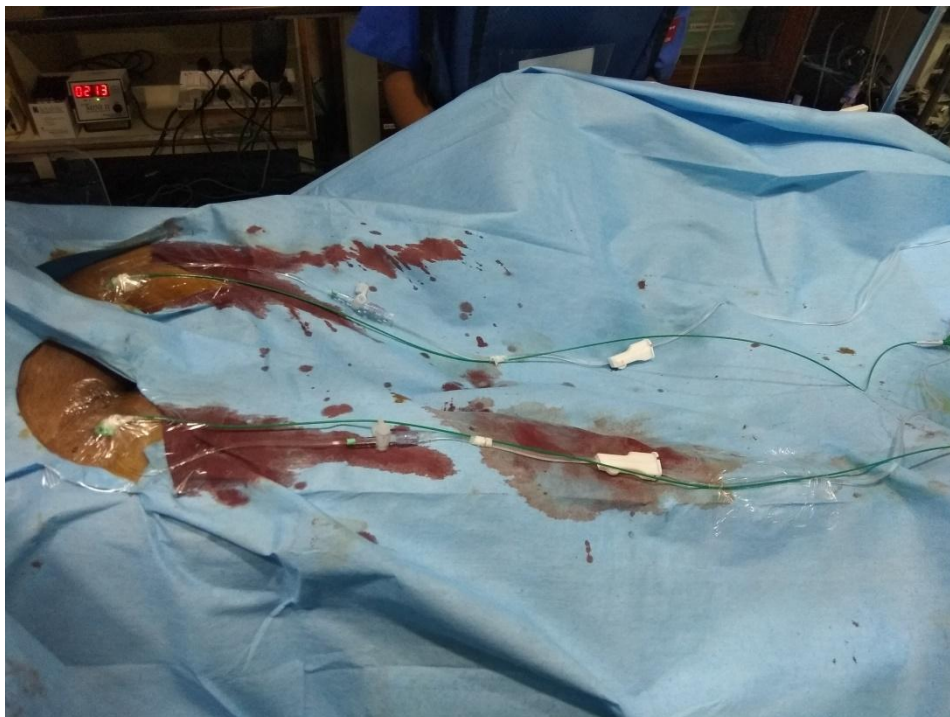


Fig 11: Photograph showing the post procedure balloons with sterile drapes and dressings before shifting the patient to operating room for emergency caesarean section.

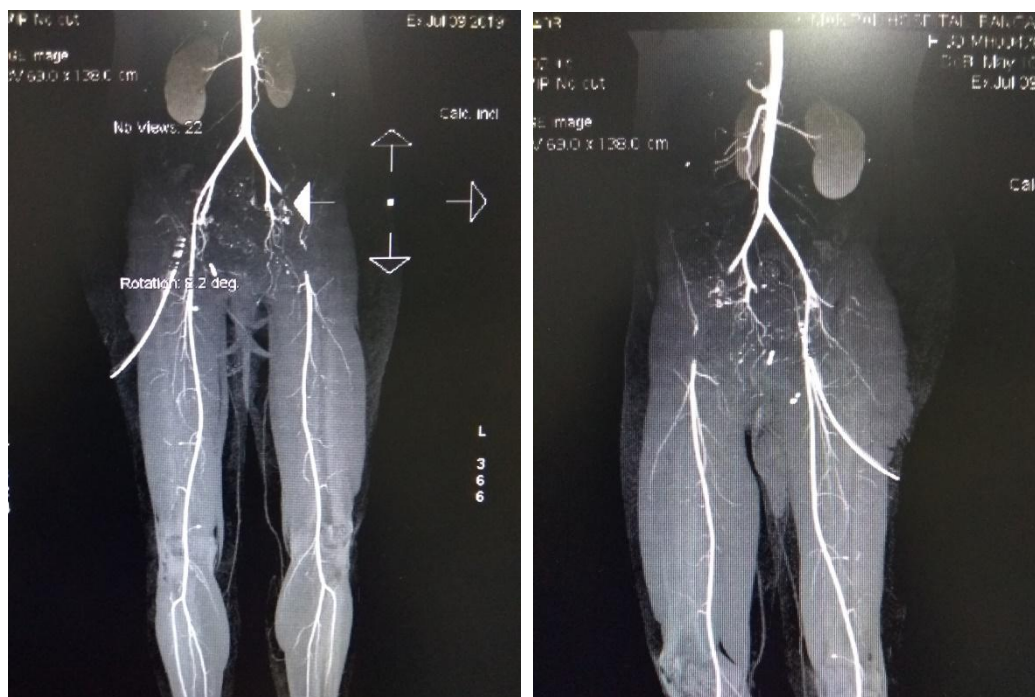


Fig 12: Post procedure CT Angiogram of the patient in Maximum intensity projection shows complete thrombosis of the left common iliac artery. The thrombus was retrieved and the patient made a speedy recovery

II. Discussion.

Prophylactic internal iliac artery balloon occlusion has been performed as an adjunctive therapy aimed at reducing intraoperative blood loss during cesarean section or in the setting of a uterine sparing approach in the setting of placenta accreta and its variants. A number of investigators have come to differing conclusions regarding the efficacy of prophylactic internal iliac artery balloon occlusion based on studies with small numbers enrolled patients. For example, a study by Tan et al [12,13] showing decreased postpartum hemorrhage. Alternatively, a study by Levine et showed no statistically significance in mean postpartum blood loss. To date, there are no published prospective, randomized, large scale studies evaluating the efficacy of internal iliac artery balloon occlusion for intraoperative blood loss following cesarean section in the setting of placenta accreta or its variants. Despite the increasing rate of placenta accreta and its variants, it remains a relatively rare entity, making recruiting for large clinical trials difficult. [14,15]

Diagnosis or diagnostic findings suspicious for placenta accreta or its variants should prompt patient referral to a tertiary care center with adequate blood bank supply and adequate availability of subspecialty and support personnel.[16] The multidisciplinary team can include anesthesiology, obstetricians, maternal-fetal medicine specialist, neonatologist, and interventional radiology.

III. Conclusion

Placenta accreta and its variants can lead to significant morbidity and mortality as a result of postpartum uterine hemorrhage. Prophylactic internal iliac artery balloon occlusion serves as an adjunctive therapy to reduce intraoperative blood loss and achieve postpartum hemostasis in patients with placenta accreta and its variants.

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