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# Placental Malformation: Accreta and Beyond

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## Abstract

Abnormal placentation is a noncommon but life-threatening obstetric condition that requires a multidisciplinary approach. It is a spectrum of disorders that seems to parallel the increasing rate of cesarean sections. Imaging findings have a crucial role in detecting this abnormality early in the pregnancy and subsequently guiding and alerting the surgeon. Between accreta and percreta, the difference is huge; thus, they are managed with a different degree of radicality. The surgeon tends to treat more radically cases of placenta percreta with cesarean hysterectomy and needs to have special expertise in pelvic surgery, inter alia, and gynecologic oncology. While extrapolation does not find its way in every case of abnormally invasive placenta, a new inspired technique from gynecologic oncology surgeries and adapted to percreta cases seems to be applied safely and effectively in all circumstances of percreta. Conservative treatment is also an alternative but is limited to selected cases of placenta accreta.

**Keywords:** abnormally invasive placenta, cesarean hysterectomy, safety, radical, conservative, multidisciplinary

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## 1. Introduction

Placenta accreta, placenta increta, and placenta percreta represent a spectrum of placental adhesive disorders (PAD) and occur when a defect of the decidua basalis allows the invasion of chorionic villi into the myometrium. PAD is classified on the basis of the extent of adherence to and invasion of the myometrium. Placenta accreta is the least severe of the three entities with superficial invasion of the basalis decidua by the chorionic villi (approximately 75% of cases). Placenta increta is penetration of the myometrium by the chorionic villi, while

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placenta percreta is the most severe with invasion of uterine serosa or adjacent pelvic organs [1, 2]. It is worth noting that when the myometrium becomes very thin especially at the level of the cesarean section, difference between accreta and increta is obsolete.

The frequency of abnormal invasive placentation (AIP) has risen in the last 30 years parallel to the increase in cesarean delivery rate [3, 4]. Other common risk factors for abnormal placentation include placenta previa, prior myomectomy or other uterine surgery, and advanced maternal age [5].

AIP is a life-threatening condition due to massive hemorrhage and urgent need for blood transfusion, the need for peripartum hysterectomy, damage to adjacent organs due to placental invasion, and the need for admission to the intensive-care unit [4, 6, 7]. For these reasons and their consequence of decreasing the burden of maternal morbidity-mortality, it is essential to accurately diagnose the degree of placental invasion. The major predicting determinant of the outcome of women affected of AIP is the depth of placental invasion [3].

## 2. Imaging findings

Imaging in the antepartum should be performed with minimal risk to both the mother and developing fetus. Noninvasive techniques such as ultrasound (US) and magnetic resonance imaging (MRI) that do not use ionizing radiation are thus the preferred imaging techniques. The advantages of MRI are superior soft-tissue contrast resolution, multiplanar imaging capabilities, wider field of view, and image quality independent of the mother's size or fetus positioning. Thus, it may be superior to US in some settings [1, 2].

However, US remains the primary method of imaging the placenta. Also, its high negative predictive value for placental abnormalities assigns MRI to a supporting role reserved for equivocal US findings or incomplete evaluation as in cases of posterior placenta [5].

### 2.1. Ultrasound

Ultrasonography is the primary screening tool for placental invasion in women at high risk of AIP usually performed during the second and third trimesters of pregnancy [8–10]. Its sensitivity for the diagnosis of AIP ranges from 77 to 93% and specificity from 71 to 97% according to a recent review [6, 8, 11], but its sensitivity and specificity may increase to 100% when applied to a high-risk population [3].

Many US signs are described for the diagnosis of abnormal placental invasion. These signs include the following [3, 8, 9]:

1. Loss or irregularity of the hypoechoic plane in myometrium underneath placental bed (“the clear zone”) or retroplacental myometrial thinning <1 mm
2. Multiple placental lacunae, often containing turbulent flow visible on grayscale or color Doppler US

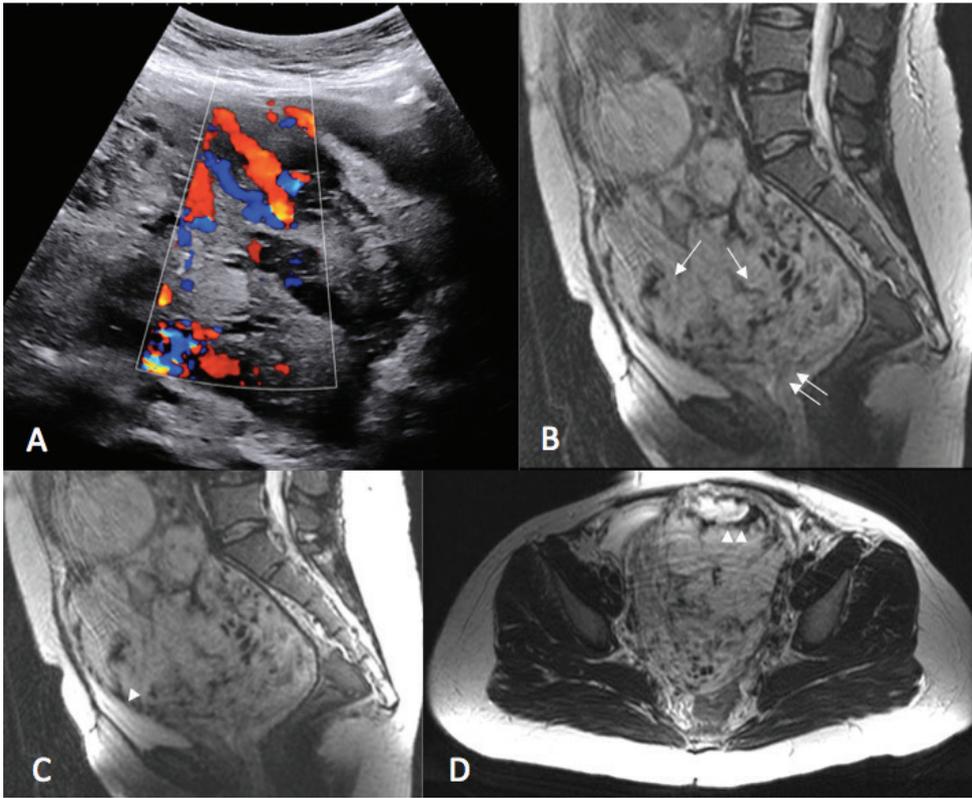
3. Bladder wall loss or interruption or irregularity (loss of hyperechoic band or “line” between uterine serosa and bladder lumen)
4. Uterovesical hypervascularity, defined as striking color Doppler signal observed between myometrium and posterior wall of bladder, including vessels bridging uterine-placental margin, across myometrium and beyond serosa into the bladder or other organs; running perpendicular to the myometrium
5. Invasion of the cervix, resulting in abnormal cervical shape, cervical lacunae, and placenta previa
6. Vascular invasion of the parametria, defined as the presence of hypervascularity extending beyond the lateral uterine walls and involving the region of the parametria

In addition, we should emphasize on the US limitations especially regarding the difficult access to posterior placental locations, the evaluation of the degree of placental infiltration, or the presence of associated myometrial lesions [4, 10, 12, 13].

## 2.2. Magnetic resonance imaging (MRI)

MRI is a secondary diagnostic tool for AIP and indicated when US is limited and inconclusive or in cases of a posterior placenta [4, 6, 7, 10, 14]. The examination typically is made between 24 and 32 weeks of gestational age, in a supine position, but if not tolerated it can be made in left lateral decubitus or oblique position. The bladder is partially distended during the study. MRI protocol is essentially based on three-plane T2 sequences for the placental assessment (single-shot T2-weighted fast spin echo sequences or T2-weighted TSE); a T1-weighted sequence can be acquired, and recently, the utility of diffusion-weighted imaging is discussed in many studies [6]. Although contrast-enhanced imaging can improve the diagnostic accuracy of placental invasion while improving the contrast between the myometrium and the placenta, gadolinium usage during pregnancy should be avoided [6, 7]. MRI signs suggesting AIP include the following [4, 6, 10, 15]:

1. Myometrial thinning or focal interruption of the myometrium by placenta
2. Presence of dark intraplacental bands on T2-weighted imaging running perpendicular to the myometrium
3. Tenting of the bladder
4. Uterine bulging defined as a focal outward contour or a loss of the pear shape of the uterus
5. Direct visualization of focal exophytic mass breaking through uterine serosa and invading pelvic structures
6. Heterogeneous intraplacental signal intensity but can be a subjective sign depending on the gestational age of the placenta
7. Abnormal intraplacental vascularity (**Figure 1A-D**)



**Figure 1.** A 26-week-old fetus with placenta praevia showing: **A.** An increased vascularity seen in the lower uterine segment and the interface with the bladder seen on a sagittal image on US. **B.** On 1.5 MRI, sagittal sequence T2WI: a heterogeneity in the placenta (arrow) overlying the internal os (double arrows) with involvement of surrounding structures and focal myometrial interruption with extension into the bladder wall (C, arrowhead). **D.** On axial sequence T2WI: a heterogeneity in the placenta with dark intraplacental bands (double arrowheads). This was consistent with percreta on surgery and histopathology.

### 3. Surgical management

Identifying a PAD preoperatively will give the surgeon the chance to plan and modify the surgical technique in order to reduce morbidity [16]. In addition, a prenatal diagnosis or suspicion of placenta percreta can alert the obstetrician in charge to the need for an experienced pelvic surgeon in critical cases. A preoperative preparation is essential in accreta cases and requires multidisciplinary efforts. It is mandatory to involve all specialized peers in the preoperative assessment as well as in operative management: obstetrics anesthesiologist, gynecologic oncologist, urologist, vascular surgeon, and interventional radiologist [16]. This was also emphasized on in the Committee Opinion 29, where the American College of Obstetrics and Gynecologists (ACOG) has advocated the involvement of a multidisciplinary team in the

management of morbid placental adherence to minimize potential maternal or neonatal morbidity and mortality [17]. Coordination with the blood bank before beginning the procedure is essential to ensure adequate supplies of red cells, platelets, and fresh frozen plasma [16]. In their study, Brennan et al. have also specified that the early presence of a gynecologic oncologist at delivery is a key predictor of reduced blood loss and transfusion requirements when abnormally invasive placenta is suspected [18]. Furthermore, other authors have reported that outcomes are improved if delivery takes place in centers with multidisciplinary expertise and experience in PAS disorders [19].

Cesarean hysterectomy in cases of placenta percreta is often technically challenging due to the anatomic and physiologic changes of pregnancy, including a massive increase in blood flow to the uterus at term. The vessels that supply the uterus, ovaries, and bladder are substantially larger and more tortuous in pregnancy than they are in the nonpregnant state. Meticulous care in the manipulation of clamps, cutting of pedicles, and placement of sutures is required to prevent severe bleeding. Scarring from previous surgery, particularly previous cesarean sections, is a common complicating feature of cesarean hysterectomy [20]. These cesarean hysterectomies often require difficult dissection of poorly defined tissue planes, particularly of the bladder interface, and partial bladder resection is often required [21]. All these factors make this procedure associated with a higher risk of complications in comparison with abdominal hysterectomies performed for benign indications [22].

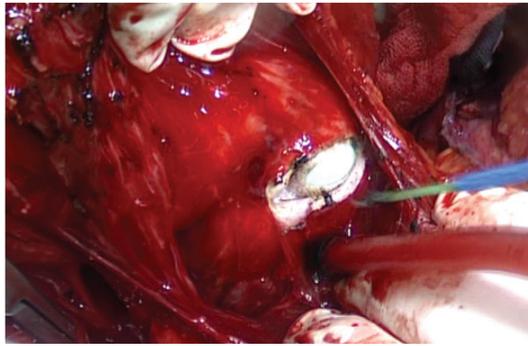
### 3.1. Surgical technique

In the literature, few reports of a well-standardized technique describe the steps of a cesarean hysterectomy among women with placenta percreta who need radical treatment. When performing such a procedure, the major concern is to prevent ureteral lesions in a pelvis with a distorted anatomy and to reduce blood loss. A recent study has demonstrated the effectiveness and safety of a well-standardized approach for managing all cases of placenta percreta and in all circumstances [23].

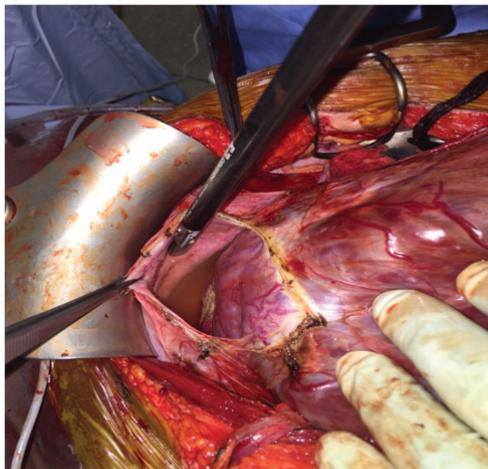
It is preferable to schedule cesarean hysterectomy in case of placenta percreta starting at 34 weeks of gestational age. However, cesarean is sometimes carried out as an emergency procedure irrespective of gestational age in cases of heavy bleeding or fetal distress.

The technique that we intend to describe was developed based on collected experience in gynecologic oncology. First of all, the placement of ureteral stents is not necessary according to this technique since it is not always possible especially during emergencies in cases with massive bleeding [24]. The surgeon starts with a vertical midline incision under general anesthesia. A peroperative US is performed to localize the placenta and to guide the surgeon while performing the hysterotomy. After delivery of the baby, the surgeon proceeds with a closure of the uterine incision with Vicryl® "0" hepatic needle sutures (Ethicon, Johnson and Johnson Companies, Somerville, NJ, USA). In a next step, the surgeon approaches the retroperitoneum just lateral to the adnexal ligaments to secure the ureters and to clip the uterine arteries at their origin after opening the paravesical space. The uteroadnexal ligaments also need to be ligated as close as possible to the uterus. After clipping the uterine arteries, these are lifted up

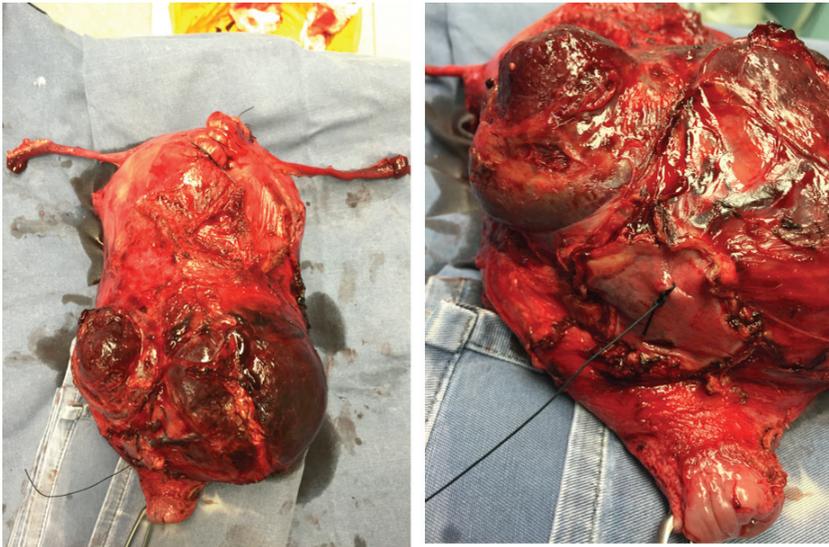
to expose the underlying uterine veins, which are also clipped. This is followed by a freeing of the ureters from their crossing with the uterine arteries. A crucial following step is to dissect the rectovaginal space and to perform a posterior vaginal incision aided with a flat retractor in the posterior vaginal fornix (**Figure 2**). This will aid the subsequent lifting of the uterus through this posterior incision. The bladder is filled to identify the right plane, and then it is cautiously dissected and separated. After exposing the bladder-vaginal interface, an anterior vaginal incision is done aided by placing the vaginal retractor in the anterior cul-de-sac. Subsequently, the surgeon will be able to position his index and middle fingers through both anterior and posterior incisions, to lift the uterus and to place the clamps alongside the cervix after making sure that ureters are at distance. In case of severe adherence or bladder invasion, a cystotomy or partial bladder resection might be needed [23, 24], (**Figures 3 and 4**). Of note, this procedure should not be performed by any surgeon; only a surgeon with appropriate expertise in pelvic surgery should operate on these critical cases [25]. Otherwise, the operating surgeon will be compromising the safety of the patient.



**Figure 2.** After filling the bladder helping its separation and dissection, incision of the anterior vagina is done right on the inserted fingers.



**Figure 3.** In this case, dissection was impossible so partial cystectomy was performed.



**Figure 4.** The specimen of hysterectomy with placenta percreta anteriorly is on the left side. A more close view on the right side allows to see the vesical patch that was resected in a case of placenta percreta invading the bladder.

On a similar note, the absence of ureteral injuries is guaranteed when performing a cesarean hysterectomy according to the aforementioned steps [23]. To prevent the development of vesicovaginal fistulas, an omentoplasty is recommended after bladder reparation [23].

Another technique was described in the literature based on a posterior approach but was criticized for the ligation of the anterior division of the internal iliac artery with the concomitant risk of bladder devascularization [23, 26]. Also, the fact of grasping a gravid cervix, as described in the latter technique, will lead to massive bleeding and is not always feasible in case of cervical effacement. However, positioning the surgeon's fingers through anterior and posterior vaginal incision will prevent hazardous bleeding as well as cervical tears.

#### **4. Conservative management**

While a radical treatment in terms of cesarean hysterectomy is often the standard of care in case of abnormally invasive placenta, conservative treatment may be applied in limited cases and when women wish to conserve fertility. This is to mention that conservative management is not an approach that fits all cases. Actually, such an alternative can be attempted in cases of placenta accreta or increta where the placenta is adhering partially or totally to the myometrium without invading the whole uterine wall.

Conservative management consist of two options: (1) to attempt prudent delivery of the placenta, applying moderate cord traction to reduce the risk of leaving a normal placenta in situ, or (2) to leave the entire placenta in situ for resorption or spontaneous delivery hoping to reduce the risk of subsequent hemorrhage by making no attempt to remove the placenta [27]. First of all, placental separation can only be attempted when obstetricians are well

experienced. They need to be able to identify whether placental separation can be attempted in an individual and to perform hysterectomy immediately after failure of placental separation to rescue the patient [28]. According to ACOG committee's opinion, placental separation by gentle external uterine massage is reasonable in selected women in whom no obvious signs of placenta accreta are seen based on the visual examination of the uterus [29]. Furthermore, placenta separation can be attempted in three situations: (1) the surgeon is unconfident with the preoperative diagnosis of abnormally invasive placenta, (2) the intraoperative US does not confirm the diagnosis, and (3) the aberrant vessels are less severe than expected [28].

Second, the entire placenta can be left in situ with or without postoperative administration of methotrexate and the placental expulsion will be expected after that. These patients might be subject to severe bleeding that may require emergent uterine embolization. This approach seems to be associated with severe long-term complications. According to a review of 119 women who had placenta left in situ, 61% (22 out of 36 cases) had complications occurring later than 24 hours postoperatively, compared with 12% of those who initially had a hysterectomy or local resection. The most frequently reported complications in these cases were secondary hysterectomy (58%, 21 out of 36 cases) and postoperative hemorrhage (44%, 16 out of 36 cases) [30].

## 5. Recommendations and future directions

The path to a reduced morbidity and mortality in women with AIP starts with an accurate antenatal diagnosis. However, we are not yet able to define specific US sign or set of signs when assessing the depth of placental malformation [31, 32]. Although many efforts were made to standardize the imaging description of PAD [33, 34], more prospective studies are needed to study the correlation between antenatal imaging findings and histopathology [35].

When suspecting a PAD prenatally, it is mandatory to refer the patient to a center of excellence with a dedicated multidisciplinary team and care plan [36]. Although the described techniques in the literature have shown satisfactory results in terms of safety and effectiveness, the reproducibility of the results might be improved by an analysis and an application of these techniques on larger case series in the future.

Obstetricians and gynecologists need to be counseled and advised about the indications and the situations where a conservative approach could be attempted. Case-control studies on large populations should be conducted to help the surgeon in making the decision when tending to a conservative management.

## 6. Conclusion

In front of such an individualized problem, a surgeon managing a case of abnormally invasive placenta should be well experienced to master this challenge but also to win it with less maternal and neonatal morbidity and mortality. While concrete standards still lack in terms of management, there are evidences that accreta and percreta are different. This difference

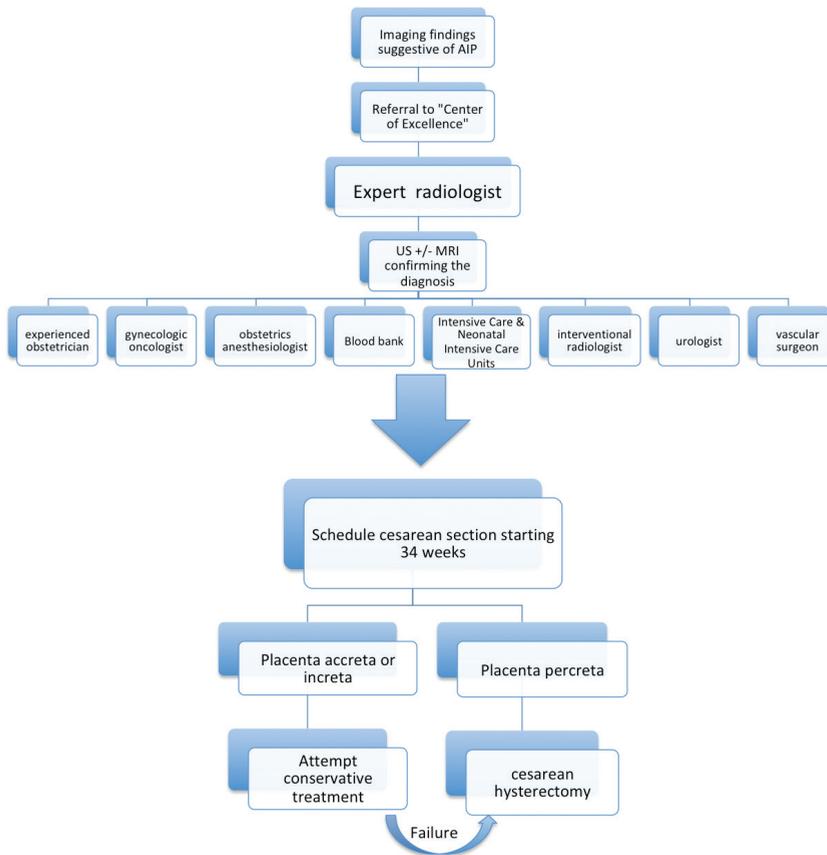


Figure 5. Schematic steps to be followed in the management of an abnormal invasive placentation (AIP).

is very important in selecting the strategy and in involving a multidisciplinary team when dealing with these critical situations. Gynecologic oncology has added a lot of value to the surgical techniques applied in cesarean hysterectomy and adapted to percreta cases. Also, we should not also underestimate the important role of the radiologist in suspecting early the diagnosis, alerting the surgeon, and subsequently inducing a cascade of preoperative preparation (Figure 5).

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