Placenta Accreta—An Updated Approach to Diagnosis and Management

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INTRODUCTION

Morbidly adherent placenta involves a spectrum of abnormal placental implantation. Placenta accreta occurs when chorionic villi attach to the myometrium. Placenta increta refers to the invasion of villi into the myometrium. Placenta percreta is defined by invasion extending deep beyond the uterine serosa. It may also involve adjacent organs, commonly the urinary bladder. Placenta accreta and its associated spectrum are often collectively described in the literature.

Placenta accreta is associated with substantial maternal risks, including life-threatening obstetric haemorrhage, dilution or consumptive coagulopathy, massive transfusion and reactions, injuries to surrounding organs, prolonged hospitalization, and increased risks of intensive care admission. It accounts for 38–50% of emergency peripartum caesarean hysterectomies. It is a leading cause of maternal morbidity and mortality. Inevitably, there is high demand for health resources as well as concerns about adverse obstetric outcomes.

The two most important risk factors of placenta accreta are previous caesarean section and placenta praevia. The risk increases with the number of previous caesarean sections. Repeated dilatation and curettage and other corrective uterine surgeries may result in myometrial trauma and scarring, contributing to the risk of developing abnormal placentation adherence. Advanced maternal age has been identified as an independent risk factor. Other risk factors include smoking, uterine anomalies, grand multiparity, and recurrent miscarriages.

The incidence of placenta accreta continues to rise with increases in caesarean section rates worldwide, espe-
pecially in developed countries. In the US, the incidence of placenta accreta was reported to be 8.3 per 10,000 deliveries and had doubled over a 12-year period.\textsuperscript{15} It is anticipated to continue as a growing health problem.

Women at risk for placenta accreta at term are also at risk in earlier gestations. Placenta accreta has been reported but occurs less frequently in the first trimester. This is usually a retrospective diagnosis, when massive bleeding is noted during dilatation and curettage procedures and placental invasion of the myometrium is found.\textsuperscript{16} At any gestation, prior scarring from uterine incision can result in myometrial thinning. Women may present with uterine rupture, acute abdomen, and shock.\textsuperscript{17,18}

Reliable antenatal diagnosis of placenta accreta is needed as unexpected encounter of morbidly adherent placenta can lead to catastrophic outcomes as described above. It is also essential in allowing both patients and physicians to prepare for the potential complications of pregnancy and delivery.

**DIAGNOSTIC APPROACH**

A careful review of history and a high index of suspicion are necessary in alerting health care providers to the possibility of placenta accreta. Various types of imaging modalities have been utilized in an attempt to predict placenta accreta.

**Ultrasonography**

Ultrasonography is a non-invasive, widely available, and cost-effective modality for diagnosis of placenta accreta in clinical practice. Transvaginal ultrasonography overcomes the limitations of transabdominal approach due to maternal body habitus and suboptimal view of the lower uterine cervix or placental invasion. Its use and safety in placenta praevia have been well accepted.\textsuperscript{19} Over the years, numerous ultrasound imaging techniques, including greyscale, colour, and three-dimensional power Doppler sonography, have been developed to assist in diagnosing morbidly adherent placenta antenatally. Nowadays, ultrasonography is the recommended first-line investigation with a sensitivity of 77–93%, specificity of 71–97%, and positive predictive value of 65–88%.\textsuperscript{1,20,21}

Sonographic features suggestive of placenta accreta include the following: obliteration of the retroplacental sonoluent zone, presence of vascular lacunae (large, irregular ‘Swiss cheese’ appearance), myometrial thinning (less than 1 mm), interruption of bladder line, and presence of extraterine placental parenchyma in extreme cases.\textsuperscript{3,5,9,22} While obliteration of retroplacental sonoluent zone in isolation has a high false-positive rate—up to 50% is reported—\textsuperscript{23} the combination of vascular lacunae and myometrial thinning is rather predictive of morbidly adherent placenta, with sensitivity reaching 100%, specificity 72–79%, and positive predictive value 73%.\textsuperscript{3,9,24} Given that none of these sonographic signs is pathognomonic, they should be interpreted with caution in a clinical setting.

Application of colour Doppler further improves the diagnostic accuracy. Features include presence of diffuse or focal lacunar flow and markedly dilated vessels over the peripheral subplacental zone. In particular, turbulent high-velocity flow (> 15 cm/s) extending from the placenta into the surrounding tissues was found to be sensitive in identifying individuals with placenta accreta.\textsuperscript{16,19,25,26} Hypervascularity of the vescicouterine serosa interphase also increases the possibility of placenta accreta, although bladder varicosities from previous caesarean sections can give rise to false positives.\textsuperscript{26} Using three-dimensional power Doppler, visualization of ‘numerous coherent vessels’ in the basal view was the best single criterion for the diagnosis of placenta accreta, with sensitivity of 97% and specificity of 92%. Inseparable cotyledonal and intervillous circulations, chaotic branching, and detour vessels may also be observed on lateral view.\textsuperscript{27,28}

**Magnetic Resonance Imaging**

Magnetic resonance imaging (MRI) and ultrasonography are comparable in diagnosing placenta accreta. Magnetic resonance imaging carries additional value in detecting the depth of placental invasion and depicting posterior placenta accreta, and in cases where ultrasonography is inconclusive.\textsuperscript{9} Uterine bulging, heterogeneous signal intensity within the placenta, dark intraplacental bands on T2-weighted images, tenting of the bladder, and direct visualization of placental invasion into pelvic structures have been reported as the MRI features of placenta accreta.\textsuperscript{29,30} Nonetheless, the use of MRI does not seem to improve the management and obstetric outcome. There is insufficient evidence to support its routine use in sonographically suspected placenta accreta.\textsuperscript{9,20,31,32}

**OBSTETRIC MANAGEMENT STRATEGIES**

**Antenatal Management**

Treating placenta accreta is a real obstetric challenge. Anticipation and identification of risk factors form the cornerstones of safe management strategies in placenta accreta. It has been recommended that women with previous caesarean section should have placental...
localization to exclude placenta praevia and further investigation to identify accreta, if necessary. Women who have had previous caesarean section and placenta praevia, especially anterior placenta, should be managed as if they have placenta accreta until proven otherwise.

A multidisciplinary care bundle for placenta accreta has been advocated. Elements of good care consist of preoperative planning by a multidisciplinary team, involvement of the consultant obstetrician and consultant anaesthetist for planned and directly supervised delivery, possible input from urology, gynaecological oncologist, and vascular surgeons, availability of blood bank and blood products, intensive care, and discussion and consent including possible interventions.

While maternal haemorrhage is likely and blood product transfusion is anticipated, it is beneficial to prevent anaemia and optimize the haemoglobin level antenatally. Oral iron supplementation should be considered to improve the iron stores and oxygen-carrying capacity.

Delivery should ideally be planned under elective and controlled conditions, with adequate ancillary support. Optimal timing of scheduled delivery depends on various clinical factors. Emergency preterm delivery may be necessary because of obstetric complications, for instance, antepartum haemorrhage. The maternal benefits of earlier elective delivery must be balanced against the neonatal morbidity associated with premature birth. In the absence of antepartum hemorrhage or pregnancy complications, elective late preterm delivery at around 36–37 weeks of gestation (with potential corticosteroid cover) is an acceptable compromise to reduce the likelihood of emergency delivery at term.

Detailed preoperative counselling is essential. Involvement of the partner is advisable. They should be counselled on the risks of operation, including life-threatening haemorrhage and visceral injuries. Possible perioperative interventions, such as hysterectomy, cystotomy, ureteric stenting, and conservative measures (cell salvage, leaving placenta in situ, interventional radiological procedures), should be discussed as well. Fertility wish and acceptance of the extent of procedures should be explored. Adoption of conservative versus early resort to radical treatment is an important decision to be made during the planning process. A standardized information sheet and preoperative check list would be helpful in the management, confirmation of necessary communication and understanding, preparation, and identification of the contact persons in case perioperative assistance is required.

Intrapartum Period
Rapid mobilization of trained operating...
team and assistant staff is essential, especially in the event of emergency. In many institutions, surgeries are performed in the main operating room as opposed to labour and delivery wards. Proper equipment should be in place before the commencement of an operation.35

Dorsal lithotomy positioning with hip abduction but limited flexion enables direct evaluation of vaginal bleeding during the operation and allows placement of the uterine balloon, if necessary.9

Anaesthetic considerations include large-bore venous access, availability of high flow rate infusion and suction devices, central and peripheral haemodynamic monitoring capabilities, avoidance of hypothermia, and thromboembolic prophylaxis.3,36 The decision of anaesthetic technique is individualized. Regional anaesthesia is of fetal advantage but limits the manipulation of abdominal contents. General anaesthesia may be appropriate in most cases because of the likelihood of prolonged operating duration and severe haemorrhage.3,35

It is good practice to have preoperative ultrasound mapping of the placental location to guide the surgical decisions. When placental invasion to the parametrium is suspected, major obstetric haemorrhage is likely to further increase struggle in ureteric identification, and risk of injury is high. Cystoscopy and prophylactic retrograde stenting may be considered.35 Midline skin incision is often preferred, in preparation for possible exploration of the upper abdomen. Careful inspection of the abdominal cavity allows identification of the site and extent of placental invasion (Figure 1). Anatomical distortion and the difficulty in subsequent surgical dissection of the bladder plane and in the isolation of the ureters or pelvic vasculature should be anticipated. Uterine incision should be made away from the placenta during entry into the uterine cavity. One should avoid incision through the placenta and subsequent haemorrhage. It is also unwise to attempt to remove the placenta at this juncture, as it can lead to disruption of the highly vascular lower uterine segment and the infiltrated placental bed, and increase maternal morbidity.9

Traditionally, caesarean hysterectomy is the gold standard for treating placenta accreta. In women who have completed their family, a lower threshold for hysterectomy is desirable. It is sensible to complete the delivery of the infant and proceed to the closure of the hysterotomy and planned hysterectomy with placenta in situ expeditiously to control ongoing blood loss.34 Total, rather than subtotal, hysterectomy is advocated because of risks of haemorrhage from lower-segment invasions. There is also the concern of carcinoma developing in the cervical stump and the need for continuation of cervical screening after subtotal hysterectomy. In cases in which subtotal hysterectomy is performed, peritoneal
closure over the cervical stump should be avoided as further haemorrhage may be concealed and go unnoticed.\(^1\)

With advancements in obstetric care and interventional modalities, it is now feasible to offer conservative management to women who wish to retain fertility rather than to adopt an aggressive surgical approach.\(^37\) Conservative management aims to avoid hysterectomy by leaving a part or the whole placenta *in situ*, with or without additional measures, such as application of compression sutures, arterial embolization, and segmental resection of the myometrial tissues, followed by repair of the defect or uterine reconstruction. This lowers the risk of subsequent hysterectomy from 85% to 15%.\(^1\) Prerequisites include haemodynamic stability without significant blood loss, wish to preserve fertility, possibility of preoperative consultation, and the availability of resources and expertise to follow up and manage late postpartum complications. Careful selection and preoperative counselling are essential.\(^9\)

Various haemostatic methods can be applied to control postpartum haemorrhage. Placement of compression sutures and pelvic devascularization can be used accordingly. Compression sutures, such as B-Lynch\(^38\) or Cho square,\(^39\) are particularly effective in dealing with uterine atony in general. Hwu *et al*\(^40\) described two parallel vertical sutures, which were placed in the lower segment to compress the anterior and posterior walls, that may be more effective in targeting the source of bleeding in placenta accreta.

Interventional radiology serves an important role in managing placenta praevia accreta. It offers prophylactic measures to reduce uterine flow and prevent ongoing haemorrhage. Preoperative placement of a catheter in the internal iliac or uterine arteries, with or without balloon inflation at the time of delivery, or embolization after caesarean section can be performed. A recent systematic review of uterus-preserving treatment modalities reveals that uterine artery embolization for placenta accreta could achieve a subsequent menstruation rate of 62%, pregnancy rate of 15%, and secondary hysterectomy rate of 18%.\(^41\) Most of these studies are limited by their small series, and so larger prospective series are awaited.

It is worth noting that, in placenta praevia accreta, there are additional arterial supplies by the cervical, vaginal, and inferior vesical arteries to the lower uterine segment. Internal iliac artery ligation alone or embolization is associated with significant risks of failure.\(^1\)

Balloon tamponade acts by exerting an inward-to-outward pressure that is greater than systemic arterial pressure to prevent continual bleeding. Of the balloon tamponade devices, the Bakri balloon was specifically designed for postpartum haemorrhage and was first described in the management of placenta praevia accreta during caesarean section. It is least invasive, relatively easy to apply, effective, and rapid in action. It carries the advantage of having a large-bore drainage channel, which is less likely to be blocked by fibrin formation. Substitutes include Sengstaken-Blakemore tube and Rusch balloon, uterine Foley or condom tamponade can be considered in resource-limited settings.\(^42,43\)

In contrast to leaving the placenta *in situ*, resection of the invaded myometrium together with the placenta and repair or reconstruction of the non-invaded myometrial defect can be practically performed. Lack of comparative studies also resulted in wide variation in the surgical approaches adopted.\(^1\)

Transfusion is unavoidable and constitutes a key step in managing ma-
jor obstetric haemorrhage. Although cell salvage could theoretically re-infuse fetal debris and possibly result in alloimmunization, its use and safety in obstetrics have been supported. Use of other tissue sealants or even mesh has been reported; but to date, there is insufficient evidence on their effectiveness and safety. Recombinant factor VIIa has been approved for use in patients with haemophilia A and with inhibitors of coagulation. It induces coagulation at sites of active bleeding in the presence of tissue factor. However, it is associated with high cost and significant thrombotic risk, and should therefore be reserved as a last resort.

**Postpartum Period**

Patients with placenta accreta and major postpartum haemorrhage are at risk for intrapartum hypotension and persistent coagulopathy. Close monitoring of vital signs and organ functions postoperatively is of utmost importance. Input from intensive care physicians is invaluable. Further imaging by computed tomography or MRI is necessary should there be alteration in haemodynamics or signs of haemoperitoneum. Exploratory re-laparotomy must not be delayed if clinically indicated. Physicians should be alerted of possible unrecognized urinary tract injury, which may present as persistent haematuria or anuria. Sheehan syndrome, transient or permanent, is a known complication of massive postpartum haemorrhage. Hyponatraemia may be an early sign for this.

Methotrexate, a folate antagonist, has been proposed as a conservative medical measure for retained placenta with morbid adherence. It is effective against proliferating trophoblasts, but its action on degenerative placenta after delivery remains questionable. In general, outcomes do not differ significantly with or without the use of methotrexate. Methotrexate is contraindicated in breastfeeding and is not routinely recommended for use.

**CONCLUSION**

Placenta accreta is an evolving challenge in modern obstetrics. It is an iatrogenic consequence of change in obstetric practice and increasing caesarean section rates. Patients undergoing caesarean section should be well informed about this complication risk, especially if the operation is not the only delivery option. Identification of risk factors, accurate antenatal and preoperative diagnostic imaging, dedicated multidisciplinary team management, and appropriate counselling will all aid in the overall management of women with placenta accreta, and their importance cannot be emphasized enough. Elective caesarean delivery at near-term should be arranged in an institute with adequate intrapartum anaesthetic, haematological, and interventional radiological support. Early resort to hysterectomy may help to avoid further haemodynamic deterioration while combating a major maternal haemorrhage. Conservative management may be considered for women who desire to retain fertility. Women should ideally be closely monitored in intensive care or high-dependency unit postoperatively and followed up for late complications. A designated care bundle and local protocol would be beneficial for management of this high-risk obstetric condition.

Last but not least, psychological assessment and appropriate support after major obstetric events are often overlooked in busy clinical settings. Debriefing sessions with the patient and family at appropriate intervals, provision of adequate explanation, and effective communication would help to reduce patient dissatisfaction and risks of medical litigation.

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