Update on Management of Placenta Previa and Placenta Accreta Spectrum

Al Shymaa M. Abd El Hadi [1,*], Amal M. Al Anwar [1], Manal M. Beheiry[1], Waleed Abd Allah [1], Basem M. Hamed [1]

[1]Department of Obstetrics and Gynecology, Faculty of Medicine, Zagazig University, Egypt

[*]**Corresponding author:** Al Shymaa M. Abd El Hadi

obgyns90@gmail.com, Amahassan@medicine.zu.edu.eg

Abstract

Background: Placenta previa is a major risk factor for postpartum hemorrhage and can lead to morbidity and mortality of the mother and neonate. This situation prevents a safe vaginal delivery and requires the delivery of the neonate to be via cesarean delivery. The presence of placenta previa can also increase a woman's risk for placenta accreta spectrum (PAS).**Objectives**: In this article; we aimed to review the update on management of placenta previa and placenta accreta spectrum, **Methods**: These databases were searched for articles published in English in 3 data bases [PubMed – Google scholarscience direct] and Boolean operators (AND, OR, NOT) had been used such as [Diagnosis of Placenta Accreta and Placenta Accreta Spectrum OR PAS] and in peer-reviewed articles between June 2005 and February 2023. Documents in a language apart from English have been excluded as sources for interpretation was not found. Papers apart from main scientific studies had been excluded: documents unavailable as total written text, conversation, conference abstract papers and dissertations. **Conclusion**: The timely diagnosis of abnormal placentation is of great importance since, the earliest diagnosis implies less risky, less costly and successful management. Ultrasonography may successfully achieve this goal. Furthermore, MRI imaging, in cases of diagnostic dilemmas may be particularly useful and lead to safer and more precise diagnosis.

Keywords: Placenta Accreta, MRI, Ultrasonography, Placenta Previa, Management.

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Introduction

The recent rapid increase in caesarean delivery (CD) rates has changed the epidemiology of placenta accreta spectrum (PAS) worldwide from a rare, serious, pathological condition to an increasingly common major obstetric complication. The risk of placenta previa increases following CD, and women presenting with a low lying/placenta previa and history of CD are at the highest risk of PAS (previa PAS) **(1).**

Current several clinical hemostatic techniques have been described in the literature for controlling massive bleeding associated with placenta previa cesarean sections. The optimal management of PAS remains controversial. However, in practice, the conservative methods sometimes are incapable of stopping the bleeding from the placental attachment site. There is increasing evidence that the management of women with PAS disorders by multidisciplinary teams and antenatal diagnosis decrease maternal morbidity and mortality **(2).**

The prevalence of placenta previa is significantly overestimated due to the practice of routine mid-pregnancy scan, and many women currently undergo a repeat scan in late pregnancy for placental localization **(3).** Recent reports support limiting third-trimester scans to only those cases where the placental edge either reaches or overlaps the internal cervical os at 20-23 weeks of pregnancy. In some cases of mid-trimester placenta previa, the placental edge is more likely to

"migrate" than others, and it appears that ultrasound may be useful to predict this process. At term, women with placental edge within 2 cm of the internal cervical os require a Caesarean section for delivery, whereas an attempt at vaginal birth is appropriate if this distance is more that 2 cm. Ultrasound also has a role in the diagnosis and management of both vasa previa and placenta accrete **(4,5).**

Epidemiology

Placenta accreta was first described nearly 80 years ago as a clinicopathological condition in which the placenta fails to separate partially or totally from the uterine wall **(6).** The term PAS is the preferred term for the different grades of abnormal placental adherence and invasion as the degree of villous adhesion or invasion is rarely uniform throughout the placenta. Alternate terms were considered non-inclusive. In particular, "morbidly adherent placenta," which was used to describe simple placental retention. Likewise, the term "abnormally invasive placenta (AIP) suggests the requirement of invasion **(7).**

The estimated incidence of placenta praevia at term is 1 in 200 pregnancies. The prevalence is several folds higher around 20 weeks of gestation (as high as 2 percent) than at birth because most previas identified early in pregnancy resolve before delivery. Over the last 40 years, cesarean delivery rates around the world have risen from less than 10% to over 30%, and almost simultaneously a 10-fold increase in the incidence of placenta accreta spectrum (PAS) has been reported in most medium- and high-income countries **(8).**

The incidence of PAS is increasing worldwide with a reported prevalence of between 0.01% and 1.1% of pregnancies. The rate of (PAS) increases from 0.3% in women with one previous cesarean delivery to 6.74% for women with five or more cesarean deliveries **(9).**

In the setting of a placenta previa and one or more previous cesarean deliveries, the risk of PAS dramatically increases. For women with placenta previa, the risk of placenta accrete is (3%, 11%, 40%, 61%, 67%) for the first, second, third, fourth, and fifth or more cesareans, respectively **(10).**

Pathophysiology of PAS

Several concepts have been proposed to explain why and how it occurs. In the past, it was thought that a primary defect of the biological function of the trophoblast would lead to excessive invasion beyond the physiological decidual–myometrial junction zone **(11).** The current prevailing hypothesis is that a defect of the endometrium–myometrial interface, typically at the site of a prior hysterotomy, leads to a failure of normal decidualization in the corresponding uterine area. This allows extravillous trophoblastic infiltration and villous tissue to develop deeply within the myometrium, including its circulation, and to sometimes reach the surrounding pelvic organs **(12).** The cellular changes in the trophoblast observed in accreta placentation are probably secondary to the unusual myometrial biological environment, and not to a primary defect of trophoblast biology leading to excessive invasion of the myometrium **(13).**

Several theories have been proposed to explain why and how PAS occurs. The prevailing hypothesis is that an iatrogenic defect of the endometrium–myometrial interface leads to a failure of normal decidualization at the site of a uterine scar, enabling abnormally deep trophoblast infiltration **(14).** The decidua potentially regulates trophoblast invasion, as demonstrated by the aggressive invasion of the muscular and serosal layers seen when ectopic implantation occurs in areas where the decidua is physiologically absent, such as the fallopian tube or the abdominal cavity **(15).**

Disruption of the decidua, for example by a previous cesarean delivery incision, may result in loss of the inherent regulation and uncontrolled invasion of extravillous trophoblast through the

entire depth of the myometrium. The extent of penetration of the villous tissue within the myometrium is likely to be related to the degree of the deciduo-myometrial damage. Conditions like manual removal of the placenta, uterine curettage, and endometritis **(15)** are more likely to result in abnormally adherent placentation (accreta). On the other hand, a full thickness surgical scar is associated with both the absence of endometrial re-epithelialization and vascular remodelling around the scar area, and this may lead to abnormally invasive placentation (increta/percreta) **(16).**

One additional mechanism has been recently suggested in studies investigating the role of in vitro fertilization as a risk factor for PAS A characteristic hormonal milieu at the time of implantation and placentation resulting from IVF may enhance trophoblast invasion and cause PAS **(17).**

Aberrant placentation may be the effect of elevated serum estrogens at the time of embryo implantation, which may lead to excessive trophoblastic invasion through the endometrium. Alternatively, lower serum estradiol levels together with the presence of a thinner decidualized endometrium may result in abnormal trophoblastic growth leading to PAS **(18).**

In normal placentation, extravillous trophoblast cells undertake a remodeling process of uterine arteries leading to the progressive loss of myocytes and their internal elastic lamina, which are replaced by fibrinoid material. Consequently, the terminal coils of the spiral arteries are dilated by an approximately 4-fold increase in their diameter at the myometrial–endometrial interface and within the distal myometrium. Conversely, the segment just below the myometrial-endometrial interface represents the limit of physiological trophoblast invasion and the arteries below this point remain highly vaso-reactive throughout pregnancy **(19).**

One additional finding observed in cases of abnormally invasive placentation is an unusual uteroplacental vasculature in which physiological changes are present in large arteries deeper in the myometrium in comparison with normal pregnancies **(20).**

Ultrasound imaging and macroscopic observation at delivery of the hyper-vascularity of the placental bed in cases of invasive placentation suggest a phenomenon of neovascularization in the area of uterine scar in addition to the vasodilatation of the uterine vessels **(21).**

Management:

The antenatal diagnosis of placenta accreta spectrum is critical because it provides an opportunity to optimize management and outcomes. Optimal management involves a standardized approach with a comprehensive multidisciplinary care team accustomed to management of placenta accreta spectrum **(22).** Such an approach most frequently includes having an identified team available for early collaboration. This team will likely include, but is not limited to, experienced obstetricians and maternal-fetal medicine subspecialists, pelvic surgeons with advanced expertise (often, but not exclusively, gynecologic oncologists or female pelvic medicine and reconstructive surgeons), urologists, interventional radiologists, obstetric anesthesiologists, critical care experts, general surgeons, trauma surgeons, and neonatologists **(23).**

In addition, established infrastructure and strong nursing leadership accustomed to managing high-level postpartum hemorrhage should be in place, and access to a blood bank capable of employing massive transfusion protocols should help guide decisions about delivery location. Delivery in highly experienced maternity centers that have this type of coordinated care team and the ability to garner additional expertise and resources in cases of severe hemorrhage appears to improve outcomes. Perhaps no condition fits this conceptual framework more than antenatally diagnosed placenta accreta spectrum **(24).**

Management Strategies

The depth of placental invasiveness is one of the main factors affecting maternal outcome. Therefore, in order to identify the best strategies for the management of PAS, a correct assessment of the degree of the invasion at the time of delivery, stratification of women according to this, and a precise correlation between prenatal imaging, intra-operative and pathological aspects are of utmost importance when comparing data from different studies **(25).** However, due to the relative rarity of this condition, and given the ethical issues that randomized trials would face, high quality studies dealing with the management of PAS disorders are still lacking. Most of the information to guide the management are taken from retrospective cohort studies, case series, and opinion papers. As a result, different strategies for the management of PAS have been described, with some clinicians opting for the traditional radical approach, and some others proposing conservative techniques **(26).**

One of the cornerstones of the management of PAS is to avoid any attempt to remove the placenta, either in the conservative or in the radical approach. In fact, in abnormally invasive placentation, any attempt to forcibly remove the placenta will leave placental fragments within a very deficient myometrium, resulting in uncontrolled major obstetric hemorrhage. Making no attempt to remove any of the placenta, either during conservative management or prior to cesarean hysterectomy, is associated with decreased levels of hemorrhage and a reduced need for blood transfusion **(27).**

One more challenge when dealing with PAS is to define the best time of delivery in order to optimize maternal and neonatal outcome. Earlier elective cesarean delivery may reduce the risk of bleeding or labor, leading to an emergency delivery, which has been associated with higher maternal complications; **(28)** however, earlier delivery will also increase the risks to the neonate related with prematurity. Several management strategies have been proposed, suggesting planned elective delivery ranging from 34–38 weeks, further demonstrating that there is still insufficient evidence to recommend one gestational age over another **(29).**

One reasonable approach could be to tailor the timing of delivery based on the individual woman's risk of emergent delivery. Expectant management until after 36+0 weeks can be considered a safe option for women with no previous history of preterm delivery and who are stable with no vaginal bleeding, preterm premature rupture of the membranes (PPROM), or uterine contractions suggestive of preterm labour **(29).** On the contrary, planned delivery at around 34+0 weeks' gestation should be arranged for women with a history of previous preterm birth, multiple episodes of small amounts of vaginal bleeding, a single episode of a significant amount of vaginal bleeding, or PPROM. Antenatal steroids prophylaxis should be administered in accordance based to the current local guidelines for the specific gestation at delivery **(31).**

Traditional Surgical Management

Cesarean hysterectomy is considered the gold standard for the treatment of invasive placentation. However, also this radical approach is associated with high rates (40–50%) of severe maternal morbidity, mostly related to hemorrhage and insult to surrounding organs during surgery, and mortality rates as high as 7% due to massive untreatable hemorrhage **(31).** However, a recent meta-analysis suggested that when prenatal diagnosis and multidisciplinary expert management are available, rates in the range of 0.05% are achievable. In a recent systematic review and meta-analysis almost 90% of antenatally suspected cases of PAS underwent cesarean hysterectomy **(32).**

A vertical skin incision is the preferred option for many clinicians, as it allows adequate access to the uterus and pelvic walls. However, large transverse incisions, such as a modified Maylard,

have been reported and might be preferred due to a faster healing as well as for cosmetic reasons. There is no strong evidence to recommend one type of skin incision over another. Therefore, the decision should be made in accordance to the preference of the operating team taking into consideration the location of the placenta, the degree of invasion suspected, the likelihood of intraoperative complications, the maternal body habitus, and the gestational age **(33).**

The uterine incision should be performed avoiding placental transection in order to reduce maternal morbidity related to blood loss from the placental bed. This is a fundal incision in many cases. Intraoperative ultrasound of the exposed uterus, undertaken in a sterile manner, can be considered to identify the upper placental edge and guide the decision regarding the site of hysterotomy **(34).**

Cesarean hysterectomy in women with PAS is technically challenging, and the reported risk of adjacent organ injury is relevant. Urinary tract injuries are described in 29% of the procedures performed in women with PAS, with a reported rate of 76% for bladder lacerations, 17% for ureteral injuries, and 5% for genitourinary fistulas **(35).** The main risk factors for urinary tract injury are reported to be the depth and extension of placental invasion, the intraoperative blood loss, and the number of previous cesarean deliveries. The occurrence of injury to other abdominal organs, such as the bowel and the pelvic vessels and nerves, has also been reported, but these complications are less common **(36).**

Delayed hysterectomy is an alternative radical surgical management strategy for PAS. This involves the delivery of the baby, then closure of the uterus with the placenta left in situ, and closure of the maternal abdomen. A planned hysterectomy can then be scheduled 3–12 weeks postpartum **(31).** The rationale of this approach is that the uterine perfusion reduces after delivery, even with the placenta in situ, and involution of the uterus and reduction of the vascularity will make later surgery less risky for the woman **(31).**

One more scenario where delayed hysterectomy should be applied is the case of unsuspected highly invasive PAS diagnosed at the opening of the abdomen for an elective repeat cesarean section. A high degree of invasion of surrounding structures would mean an extremely difficult cesarean hysterectomy. If the surgeon has limited experience in performing complex surgical procedures and both mother and baby are stable, the cesarean section should be delayed to wait for trained staff and adequate resources or to arrange maternal transfer to a center of excellence **(37).**

Conservative Management

Conservative management of PAS consists of any approach whereby hysterectomy is avoided. The conservative approach might be considered in two circumstances: 1) when the intraoperative findings suggest that hysterectomy will be likely complicated and associated with a high risk of massive hemorrhage or adjacent tissue injury that may be reduced by leaving the placenta in situ; and 2) for women who desire future childbearing, or whose fertility is inextricably linked with social status and self-esteem **(38).**

In the conservative approach, the umbilical cord is ligated close to its placental insertion after delivery, and without any attempt of removal, the placenta is left in-situ adherent to the myometrium. The use of adjunctive measures to reduce blood loss and to speed up the process of placental resorption has been reported. Among them: methotrexate, compression sutures, balloon tamponade, uterine artery embolization and/or uterine artery ligation. No efficacy for any adjunct has been proven, in fact they may be correlated to adverse outcomes. Several case reports exist of uterine necrosis in conservative management with uterine artery embolization **(39).**

Overall, these data suggest that leaving the placenta in situ may be a promising option for women who desire to preserve their fertility. However, when opting for conservative management, adjuvant therapy should be avoided and women must be appropriately counseled about the risks, and the need for potentially lengthy follow-up in centers with expertise **(40).**

Local surgical resection, namely the removal of the areas of the myometrium where the placenta is abnormally attached, has been proposed as a conservative technique for the management of PAS. Many different surgical techniques have been described by many authors, making interpretation of the available evidence difficult **(41).**

Ureteric Stents and Cystoscopy

Ureteric stents may be beneficial in preventing ureteric injury and early morbidity, however, the evidence is not strong enough to recommend routine placement of ureteric stents for all suspected cases of PAS **(40).** Therefore, placement of ureteric stents should be limited to cases where hysterectomy is anticipated to be highly complex. Routine preoperative cystoscopy is not recommended, as it was not demonstrated to improve maternal outcomes. If preoperative cystoscopy is performed for insertion of ureteric stents, the appearance of the bladder should not change the planned management based on the prenatal imaging **(41).**

Prophylactic Endovascular Balloon Catheters

Endovascular balloon occlusion of the pelvic vessels has been proposed as a method to reduce intraoperative blood loss, in order to improve maternal outcome related to hemorrhage and to allow the surgeon to operate in a cleaner field with improved visibility **(42).**

However, PAS is associated with extensive aberrant neovascularization, and in such cases, occlusion of some of the pelvic vessels might lead to increased blood loss from the collateral vessels. In addition to this, endovascular balloon occlusion has been associated with significant maternal morbidity, mainly related to vessel rupture and thromboembolism. Two small randomized controlled trials found no differences in the number of packed RBC units transfused in women with antenatally suspected PAS who underwent placement of balloon catheters into the iliac arteries compared to those who did not **(43).**

Conclusion

Placenta previa and PAS is a potentially life-threatening condition. Given the increasing rates of cesarean section worldwide, the incidence of PAS will be likely to increase further over time. Therefore, clinicians should be aware of the difficulties related with the diagnosis and the challenges associated with the management of this condition. Future research should focus on the collection of data for prospective studies on the diagnosis and management of PAS providing correlation between prenatal imaging, clinical grading of PAS at the time of delivery, and histopathology. This is of paramount importance to provide the best screening, diagnosis, and management options to women affected by PAS disorders.

This review addresses screening for placenta previa. A simple and pragmatic ultrasound classification of placenta previa and low-lying placenta is proposed. Caesarean section is recommended for delivery in cases of placenta previa. Women with a low-lying placenta have at least 60% chance of a vaginal birth, but should be monitored for post-partum haemorrhage. Vasa previa is a rare complication but antenatal diagnosis is possible. It should particularly be suspected in in-vitro fertilization conceptions, and where the placental edge covers the os in mid-pregnancy but recedes later on. Prenatal diagnosis of placenta accreta should be based on the placental lacunae signs rather than the absence of retro-placental clear space.

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