

Therapeutic methods for pregnancy complicated by *placenta praevia* and abnormally invasive placenta – a retrospective analysis

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Abstract

Placenta praevia with placenta accreta spectrum constitutes a challenging obstetrical pathology. Antenatal diagnostic protocol using ultrasonography and MRI allows an optimal therapeutic plan, ideally managed in a specialized tertiary center, with a multidisciplinary team involved. The therapeutic management usually implies caesarean hysterectomy. We conducted a retrospective study in the University Emergency Hospital Bucharest over a five-year period, with the aim to evaluate the therapeutic methods applied for placenta praevia with abnormal adherence. Through this study, we want to highlight the antenatal diagnostic protocol, but also the surgical therapeutic management. Twenty-six cases were identified. The mean maternal age was 35.46 years old, and the mean gestational age at delivery was 34 weeks. Eighteen cases were managed electively, while seven patients required emergency management. The treatment for placenta percreta and placenta increta consisted of caesarean hysterectomy in all of our cases, while five cases of placenta accreta were managed conservatively without hysterectomy.

Keywords: placenta accreta spectrum, placenta praevia, invasive placenta, caesarean hysterectomy, multidisciplinary team

Rezumat

Placenta praevia ce asociază aderență placentară anormală constituie o patologie obstetricală provocatoare din punct de vedere terapeutic. Protocolul de diagnostic prenatal folosind evaluare ecografică și RMN permite planificarea optimă a conduitei terapeutice, astfel de cazuri fiind în mod ideal gestionate într-un centru terțiar, cu implicarea unei echipe multidisciplinare. Managementul terapeutic presupune de obicei operație cezariană completată direct cu histerectomie. Am realizat un studiu retrospectiv în Spitalul Universitar de Urgență din București, pe o perioadă de cinci ani, cu scopul de a evalua metodele terapeutice aplicate pentru placenta praevia cu aderență anormală. Prin acest studiu dorim să evidențiem protocolul de diagnostic prenatal, dar și managementul terapeutic chirurgical din clinica noastră, discutând totodată și complicațiile. Au fost identificate 26 de cazuri. Vârsta maternă medie a fost de 35,46 ani și vârsta gestațională medie la naștere a fost de 34 de săptămâni. Optsprezece cazuri au fost gestionate electiv, în timp ce șapte pacienți au necesitat management de urgență. Tratamentul pentru placenta percreta și placenta increta a constat în histerectomie de necesitate, în timp ce cinci cazuri au fost tratate conservator (fără histerectomie în grupul cu placenta accreta).

Cuvinte-cheie: placentă cu aderență anormală, placenta praevia, placentă invazivă, histerectomie de necesitate, echipă multidisciplinară

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Introduction

Abnormally invasive placenta, also known as *placenta accreta* spectrum disorder (PAS), represents a complex life-threatening obstetrical pathology, with an increasing incidence in recent years worldwide. PAS is defined as an abnormal invasion of the trophoblast in the uterine

myometrium, sometimes exceeding the uterine serosa, with invasion in the neighboring organs⁽¹⁾.

According to the degree of penetration at the level of the myometrium, there are three subtypes of PAS defined: *placenta accreta* (FIGO grade 1), when placental villi invade the decidual layer, *placenta increta* (FIGO

grade 2), when more than half of the myometrium is invaded, and *placenta percreta* (FIGO grade 3), when placental villi fully invade the myometrium and breach the uterine serosa, frequently extending to adjacent organs, most commonly the urinary bladder⁽²⁾.

In recent years, approximately 90% of PAS cases occurred in women who have undergone previous caesarean sections, although a history of endometrial interventions is also important. *Placenta praevia* and scarred uterus after caesarean section are independent risk factors for this pathology. Furthermore, the risk of PAS increases progressively with the number of caesarean sections⁽³⁾.

Maternal morbidity and mortality occur as a consequence of massive antepartum and intraoperative hemorrhage, sometimes leading to hypovolemic shock and requiring blood transfusions and hysterectomy^(4,5).

Considering the extensive range of consequences and complications that can arise from *placenta accreta* spectrum, it is preferable for the diagnosis to be established antepartum. Early antenatal diagnosis by obstetrical ultrasound and magnetic resonance imaging (MRI) allows a tailored management, since to guide such cases in a third- or fourth-degree maternity is of great importance⁽⁶⁾. The next step is represented by the formation of a multidisciplinary team and the optimization of preoperative and intraoperative measures⁽⁷⁾.

The optimal gestational moment for performing a caesarean delivery in a stable patient is between 34 0/7 and 35 6/7 weeks of gestation, with corticosteroid treatment for 48 hours before surgical intervention^(2,4). Delayed birth beyond 36 0/7 weeks of gestation does not show benefits, in approximately 50% of PAS cases significant hemorrhage occurring⁽⁸⁾.

The most common approach globally used for PAS cases is caesarean hysterectomy after delivering the baby with the placenta left *in situ*, given the risk of massive hemorrhage⁽⁹⁾. Expectant management is an alternative therapeutic method, preserving the uterus and keeping the placenta partially or totally *in situ*.

In the event of a massive hemorrhage, intraoperative measures include ligation of the hypogastric artery (although collateral circulation diminishes the technique effectiveness)^(10,11) and multivessel embolization (in case of diffuse bleeding). Intrauterine tamponade with the Bakri balloon, the BT-Cath balloon or the Sengstaken-Blakemore probe can also be used⁽¹²⁾.

Materials and method

We performed a retrospective analysis regarding the abnormally invasive *placenta praevia* in patients admitted to the University Emergency Hospital Bucharest over five years (between January 2017 and January 2022). We analyzed our clinic database to obtain information regarding the therapeutic approach to PAS. This analysis was part of the national, single-center, investigational, retrospective clinical research study entitled "Therapeutic methods regarding the pregnancy complicated by *placenta praevia* and abnormally invasive placenta" (study number 75121/08.12.2021), carried out in the Obstetrics-Gynecology Clinic of the Emergency University Hospital Bucharest, for the aforementioned period of five years. The purpose of this project was to study different types of surgical interventions applied in our clinic for PAS associated with *placenta praevia*, discussing the cases' particularities. Secondly, we compared our clinic results with the existing data in the literature.

Results

During the aforementioned period of five years, we treated 26 patients with *placenta praevia* and PAS. One of the patients included in the study was transferred to our clinic for complications after an initial surgical treatment performed for *placenta percreta* in a different clinic. We had similar number of each PAS subtype: eight cases of *placenta percreta*, nine cases of *placenta increta*, and nine cases of *placenta accreta*.

The average age of the patients included in the study was 35.46 years old. Regarding the average age by the

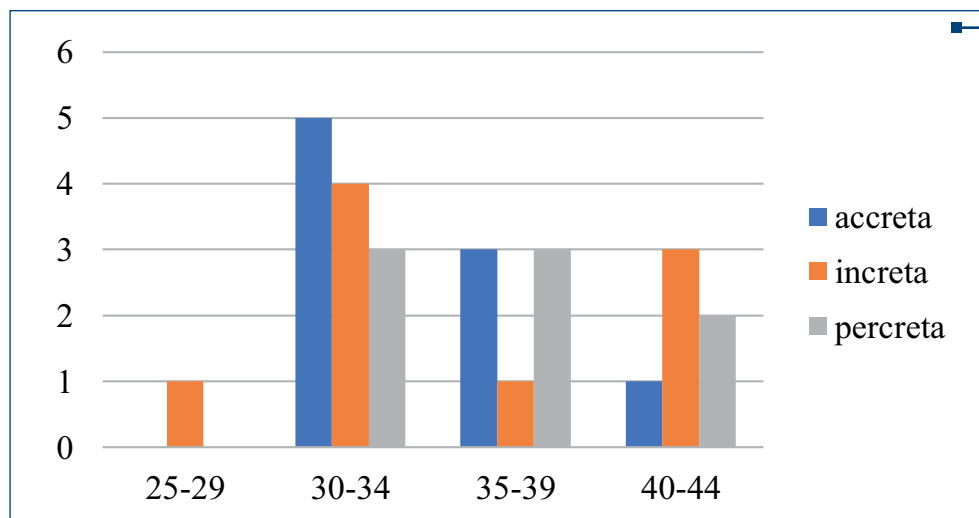


Figure 1. Distribution by age of PAS, showing the maximum incidence for all PAS subtypes in patients aged 30-34 years old

subtype of PAS, this was 36.25 years old in the *placenta percreta* group, 35.22 years old in the *placenta increta* group, and 35.46 years old in the *placenta accreta* group. The youngest patient was 26 years old and presented *placenta increta*, while the oldest patient was 42 years old and had *placenta percreta*. The distribution of PAS cases by age is detailed in Figure 1.

In terms of imaging diagnosis, ultrasonography represented the essential diagnostic modality in PAS for our patients (example in Figure 2). The usefulness of this imaging tool increases in the second and third trimesters, when most cases of PAS were diagnosed. Regarding antenatal ultrasound diagnosis of PAS, we had one case of *placenta percreta* and one case of *placenta accreta* which presented as emergencies, without previous monitoring. In our study, ultrasound detected 92.39% of PAS and *placenta praevia* cases.

Another imaging modality used for the diagnosis of *placenta accreta* spectrum is represented by the magnetic resonance imaging (MRI). In our study, 69.2% of all patients were scanned by MRI (examples in Figures 3, 4 and 5) and the evaluation was performed at 28 weeks as mean gestational age. The MRI findings were represented by heterogeneous placenta, abnormal vascularity of placenta, focal disruption of myometrium, invasion of the adjacent structures, loss or thinning of the retroplacental dark zone and placenta bulge⁽¹³⁾. We analyzed the accuracy of MRI diagnosis in our PAS and *placenta praevia* cases. All the results were confronted with the pathology results and showed that 69.23% of the scans described correctly the placental abnormal adherence.

Cystoscopy was performed for 23.07% of the cases for diagnostic purpose and only 19.23% of the patients

received ureteral catheterization. The most severe case of bladder invasion was correctly objectified by cystoscopy. Regarding PAS subtype characterization, double J stents were prophylactically placed in five cases, out of which two cases were *placenta percreta*, other two were *placenta increta*, and only one case of *placenta accreta*.

Most of the patients in our study presented one caesarean scar, although similar studies report a mean number of two previous caesareans⁽¹⁴⁾. The number of previous caesarean sections did not correlate with the degree of placental invasion. We also found 7.69% of the PAS patients having no history of previous caesarean section. We treated *placenta praevia* and *placenta increta* in a primigesta with an arteriovenous malformation previously treated by embolization, as well as a patient with history of one uterine curettage. Another case appeared in pregnancy after vaginal deliveries in a multiparous patient.

The global mean gestational age at delivery was 34.5 weeks, similar among the three PAS subtypes. Antenatal corticosteroid therapy for fetal maturation with dexamethasone was prophylactically administered in 71.42% of the patients.

Caesarean hysterectomy was the surgical approach of choice in our clinic for PAS cases. Eighteen cases were managed electively, while seven patients required emergency management. The majority of our cases (73.07%) received total hysterectomy, while 3.86% were treated by partial hysterectomy. For all the patients in the *placenta percreta* and *placenta increta* group, caesarean hysterectomy was the technique of choice, while in the *placenta accreta* group, in five cases caesarean alone secured the bleeding. One patient in the *placenta accreta*



Figure 2. Obstetrical ultrasound performed at 28 weeks in a patient with history of one caesarean section, showing placenta praevia and placenta percreta. Abnormal placental adherence is suggested by the reduced myometrial thickness and the loss of retroplacental clear space, with suspected area of bladder invasion (arrows). The collection of the Obstetrics and Gynecology Clinic of the University Emergency Hospital Bucharest



Figure 3. Axial oblique T2 section in pelvic MRI in a case of placenta percreta. The placenta is developed in the form of two paramedian lobes in intimate contact with the bladder wall, without a fatty border of demarcation; the millimeter-thick linear T2 signal is erased on the right side; between the two placental lobes a bundle of blood vessels with fast flow is also evident. The collection of the Obstetrics and Gynecology Clinic of the University Emergency Hospital Bucharest

group presented intraperitoneal hematoma requiring reintervention and hysterectomy.

In the *placenta percreta* group, a single case did not present bladder invasion, all others requiring urologic intervention. For the same group, the ligation of the hypogastric artery was performed in three patients and adnexal damage had the same occurrence rate.

From our analysis, we found that the number of hospitalization days weren't in linear correlation with the placental invasion degree, as seen in Figure 6. A possible explanation for this fact could be the prolonged hospitalization of PAS and *placenta praevia* cases due to high maternofetal risk antepartum, rather than a prolonged hospitalization due to postpartum complications.

In terms of treatment success, we recorded zero maternal mortality and only one stillbirth. The cornerstone of our results is multidisciplinary prompt collaboration, with collaboration between obstetrician, urologist, anesthesiologist and neonatal pediatrician.

From the perspective of complications associated with *placenta accreta* syndrome (PAS), in our group of patients we recorded one case of intraperitoneal hematoma, one case of sepsis and one case of vesical fistula.

One patient with *placenta accreta* required reintervention for intraperitoneal hematoma after conservative caesarean section, treated by total hysterectomy and unilateral salpingo-oophorectomy. The patient later developed a retroperitoneal hematoma at the level of the aortic bifurcation that was successfully treated.

One patient with *placenta increta* and chorioamnionitis required prolonged therapy in the intensive care unit (ICU) for the treatment of sepsis.

In the *placenta percreta* group, we had a patient who addressed our hospital with placenta left *in situ*, presenting vaginal bleeding and disseminated intravascular coagulopathy seven weeks after caesarean section. The patient received intensive care measures and blood product replacement, along with surgical treatment with hysterectomy, unilateral salpingo-oophorectomy and bladder repair with good outcome. Another patient in this group presented postoperative fistula in a case of *placenta percreta* with extensive bladder invasion and was referred to a urology clinic for definitive treatment.

Discussion

The main hypothesis for the appearance of *placenta accreta* spectrum disorder is that changes occur at the interface between the endometrium and myometrium, with a defect in the basal decidua, causing failure of normal decidualization and abnormal growth of placental villi and trophoblast infiltration into the myometrium. The most frequent PAS subtype is *placenta accreta*, which amounts to approximately 70-75% of PAS cases⁽⁴⁾. In our study, the number of cases was similar for each PAS subtype.

The main independent risk factors for abnormally invasive placenta are *placenta praevia* and previous caesarean section^(15,16). We selected for our study only the *placenta praevia* that also presented abnormal adherence.



Figure 4. Sagittal T2 weighted MRI image in a *placenta increta* case shows focal bulge at the lower uterine segment with extension of the heterogeneous placenta through the serosal surface to the dome of the urinary bladder. The collection of the Obstetrics and Gynecology Clinic of the University Emergency Hospital Bucharest



Figure 5. *Placenta accreta* undiagnosed by MRI scan, identified in the operating room and confirmed on histopathologic evaluation of the uterus in a 41-year-old patient. On sagittal T2 weighted MRI image, the myometrium appears globally thick, but no interruption of myometrial was noted by the radiologist. The collection of the Obstetrics and Gynecology Clinic of the University Emergency Hospital Bucharest

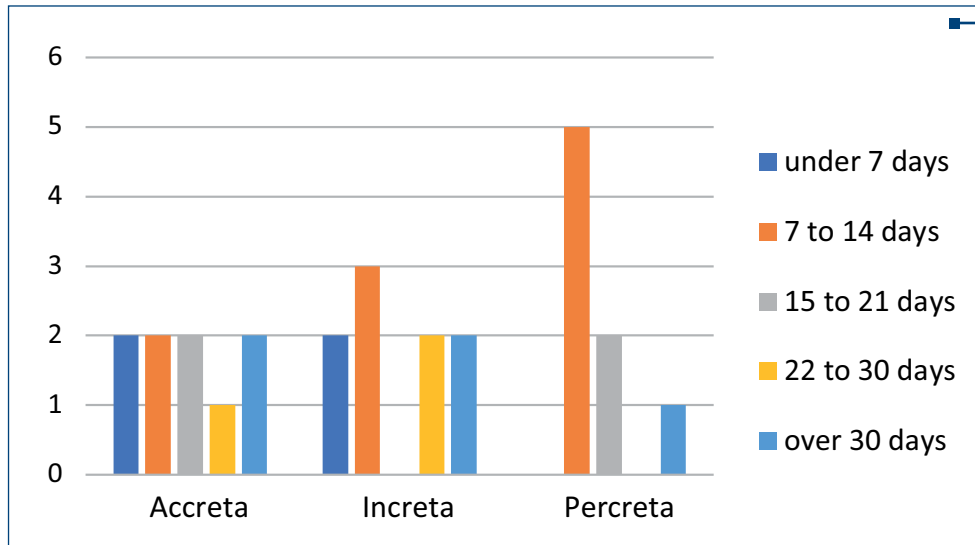


Figure 6. Distribution of patients in our study by the number of inpatient days for each PAS subtype

A study from the United States of America found that the risk of PAS increases with the number of previous caesarean births, so that in the first caesarean operation the risk was 3%, in the second it was 11%, in the third it was 40%, in the fourth it was 61%, and for more than that, the risk was 67%⁽¹⁴⁾. Caesarean scar pregnancy is frequently associated with PAS and can be diagnosed by ultrasound from the first trimester of pregnancy^(17,18). Half of our patients had one previous caesarean operation and we found no correlation between the number of caesareans and the grade of placental invasion. In the *placenta percreta* group, six out of eight patients had one previous caesarean section, one patient had two caesarean sections and one patient had three caesarian sections.

Other risk factors that increase the incidence of PAS are the history of hysteroscopy, abortion, aspiration uterine curettage, endometrial ablation and *in vitro* fertilization⁽¹⁹⁾. Yet, there are rare cases of PAS in nulliparous women who have never undergone any surgical intervention⁽¹⁹⁾. We treated *placenta praevia* and *placenta increta* in three patients without caesarean scar.

Regarding the age of the patients included in this study, our results related to the mean age correlates with the results from literature, the diagnostic rate of PAS being the highest among patients aged 34.4 ± 1.6 years old⁽²⁰⁾.

Many studies support birth between 34 and 35 weeks of gestation, which encompass the results from our study⁽²¹⁾. The gestational age at delivery being an important aspect in the morbidity and mortality of premature newborns, the administration of antenatal corticosteroid therapy for fetal lung maturation is essential⁽²²⁾.

The diagnosis for *placenta praevia* and PAS involves proficient clinical examination, as well as imaging techniques and serological tests. Postpartum diagnosis is definitive with the histopathological examination of the placenta⁽⁴⁾.

In our clinic, ultrasonography represented the essential diagnostic modality in PAS. The most common ultrasound signs of *placenta accreta* spectrum are: neovascularization, multiple, large vascular lacunae, reduced myometrial thickness less than 1 mm, placental bulge, loss of retroplacental hypoechoic zone, signs of the extension into bladder, serosa, myometrium⁽¹⁷⁾. Ultrasound scan revealed two cases presented as second-trimester pregnancies lacking previous obstetrical evaluation and both admitted for chorioamnionitis.

Another imaging modality used for the diagnosis of *placenta accreta* spectrum is represented by the MRI with the ideal period for MRI ranging between week 24 and week 30 of gestation⁽¹³⁾. The method's sensitivity and specificity are similar to those of ultrasonography, but it is more useful in complicated cases of PAS with extrauterine invasion⁽²³⁾.

Cystoscopy is used to assess the severity of the *placenta accreta* spectrum when there are proximity ratios to the bladder. The method also permits prophylactic implantation of ureter stents to prevent intraoperative ureter injury⁽²⁴⁾. The insertion of ureteral stents before establishing the birth by caesarean hysterectomy can prevent the occurrence of injuries in the genitourinary tract. The are studies revealing a decrease in genitourinary lesions in the group of patients with ureteral stent compared to the control group⁽²⁵⁾. In our study, no ureteric injury was recorded, although ureteric catheterization was performed in five PAS cases.

Preoperatively, in the patient diagnosed with *placenta accreta* spectrum, it is necessary to establish the blood group and the Rh, considering the frequent need for blood transfusions⁽²⁶⁾. For our patient, preoperative hemoglobin optimization involved parenteral iron or blood product replacement.

The patients with PAS confirmed intraoperatively are usually candidates for resorting to a caesarean hysterectomy. This is the definitive strategy to secure hemostasis

in most cases, and our results are consistent with the literature data in this regard.

In recent years, there has been a growing interest for expectant management either to minimize emergency hysterectomy-related maternal complications or to preserve the fertility potential of the patient. Several observational research reported successful expectant management in selected cases^(27,28). None of our monitored patients was treated by expectant management, except for the case of *placenta percreta left in situ* coming from a different center⁽²⁹⁾. Delayed hysterectomy is preferred when fertility is not a priority, as well as the cases when the woman is not eligible or the setup is not conducive to perform an immediate hysterectomy. Prophylactic surgical or radiologic measures are usually recommended to prevent postpartum hemorrhage. Some procedures selectively performed include uterine devascularization (major arteries ligation, arterial embolization, occlusion of the major arteries by placing

intraarterial balloon), uterine compression sutures or intrauterine balloon tamponade devices⁽³⁰⁾. Delayed elective hysterectomy can be considered, but the indication of discontinuing the conservative management should consider the risk of hemorrhage, hematuria, fistula or disseminated intravascular coagulation in the absence of spontaneous placental absorption.

Conclusions

The *placenta praevia* abnormally invasive is a complex condition of pregnancy that requires early diagnosis and multidisciplinary management. The surgical treatment is challenging and requires a careful allocation of resources. To limit the extension of hemorrhagic complications, as well as maternal peripartum morbidity from extensive genitourinary injuries, the *placenta accreta* spectrum disorders are best managed in a centralized, tertiary high-volume center with access to a variety of medical subspecialties. ■

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