World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(REVIEW ARTICLE)

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Comprehensive management of placental abruption: An interprofessional approach

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World Journal of Advanced Research and Reviews, 2024, 22(03), 350–356

Publication history: Received on 27 April 2024; revised on 02 June 2024; accepted on 05 June 2024

Article DOI: https://doi.org/10.30574/wjarr.2024.22.3.1719

Abstract

Placental abruption (PA) is a major obstetric complication characterized by the premature separation of the placenta from the uterine wall, typically occurring between 20 weeks of gestation and delivery. This condition results from the rupture of decidual vessels, leading to hemorrhage within the placental bed, and poses serious risks to both maternal and fetal health, including maternal hemorrhage, preterm delivery, fetal growth restriction, and perinatal mortality. Despite variations in incidence worldwide, PA remains a leading cause of maternal morbidity and adverse neonatal outcomes. The etiology of PA involves a combination of chronic processes, such as vascular pathology and defective deep placentation, and acute triggers, including mechanical forces exerted on the abdomen. Clinical presentation can range from abdominal pain and vaginal bleeding to uterine contractions and fetal distress, with diagnosis requiring differentiation from other causes of late pregnancy bleeding, such as placenta previa. Effective management of PA necessitates prompt medical intervention, with treatment strategies tailored to the severity of maternal and fetal distress. An interprofessional healthcare team approach is critical, involving obstetricians, anesthesiologists, midwives, radiologists, hematologists, intensivists, and neonatologists to ensure optimal outcomes. The prognosis is heavily influenced by the timing of hospital admission, with early recognition and immediate intervention being paramount to reduce the morbidity and mortality associated with this condition. This narrative review provides a comprehensive overview of PA, highlighting the importance of integrated care to improve maternal and neonatal health outcomes.

Keywords: Placental Abruption; Epidemiology; Risk factors; Maternal and Neonatal Complications; Treatment and Management; Interprofessional Care

1. Introduction

Placental abruption (PA), also known as abruptio placentae, is a major obstetric complication characterized by the premature separation of the placenta from the uterine wall between 20 weeks of gestation and prior to delivery [1,2]. This condition results from the rupture of decidual vessels and subsequent hemorrhage within the placental bed. Abruption can present as either revealed, with visible vaginal bleeding, or concealed, where the hemorrhage is confined behind the placenta. The etiology of PA is not fully understood, but it is possibly part of a broader placental syndrome associated with underlying vascular pathology and defective deep placentation [3]. This condition poses serious risks to both the mother and the fetus, including maternal hemorrhage, preterm delivery, fetal growth restriction and perinatal mortality. The incidence of PA varies worldwide, with reported rates ranging from 0.4% to 1% of all pregnancies; yet, it remains a leading cause of maternal morbidity and adverse neonatal outcomes [1,2,4].

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Despite significant advancements in prenatal care, the morbidity and mortality associated with PA remain alarmingly high, underscoring the critical need for ongoing research in this area. This narrative review aims to comprehensively elucidate the multifaceted aspects of PA, including its epidemiology, pathophysiology, classification, clinical evaluation, risk factors, maternal and neonatal complications, treatment and management strategies, diagnosis, and prognosis. Furthermore, the review highlights the pivotal role of the interprofessional care team in the effective management of this obstetric emergency. By integrating current knowledge and identifying gaps in understanding, this review seeks to inform and guide future therapeutic interventions, ultimately improving outcomes for both mothers and their infants.

2. Epidemiology

An analysis by Ananth et al. (2015) indicated that the incidence of PA has generally declined in most developed countries, ranging from 0.4 to 1% [4]. The prevalence is higher in the United States and Canada compared to northern European countries [5]. In contrast, developing countries report higher risks, particularly among multiparous women and those with a history of cesarean sections, previous abortions, or prior PA [1,6]. PA can also occur during labor, affecting approximately 0.3% of all term deliveries [7], and accounts for approximately 30% of cases of vaginal bleeding during the third trimester of pregnancy [8]. This complication is responsible for 10% of perinatal deaths in developed countries [1].

Individuals who experience an abruption in one pregnancy face up to a 10-fold increased risk of recurrence in subsequent pregnancies [1,5,6]. Pregnant women with chronic hypertension have a 3- to 4-fold increased risk of abruption, while those with preeclampsia are at a 4- to 6-fold higher risk [5]. Tobacco smoking is associated with a 1.7- to 2-fold increase in the risk of abruption, with a notable dose-response relationship correlated with the quantity of cigarettes smoked daily [1,5].

3. Pathophysiology

The etiology of PA is multifaceted, involving a combination of chronic processes and acute triggers, which may act independently or synergistically to lead to the condition [5].

Chronic conditions that increase the risk of PA include thrombosis, inflammation, infection, as well as decidual and uteroplacental vasculopathy [5]. Most instances of placental disorders are associated with irregularities in the vascular and immune systems [1]. While the immunological changes observed in PA remain largely unexplored, some have been identified. Disturbances in the balance of natural killer (NK) cells and T cells - maternal immune cells housed in the decidual stromal cells within the endometrium - during the implantation phase may potentially lead to preterm PA [1]. Other experts suggest that inadequate immunosuppressive activity of the decidua may result in a cumulative cytotoxic response, which may be associated with PA [9,10]. These conditions may cause placental insufficiency that initiates during placental implantation, and uteroplacental ischemia, where the placenta receives an inadequate blood supply [1]. Chronic alterations increase the risk of abruption and other placenta-related disorders, such as fetal growth restriction (FGR) and preeclampsia, which often develop weeks or months before clinical symptoms become apparent [1,5].

Acute causes of PA are primarily attributable to mechanical forces exerted on the abdomen. Incidents such as abdominal trauma can precipitate this condition. Additionally, rapid decompression of the uterine cavity, following procedures such as amniotomy or the vaginal delivery of a first twin, can also induce PA. The rupture of maternal decidual vessels leads to hemorrhage, which accumulates at the decidual-placental interface, causing the placenta to detach from the uterine wall. Due to uterine distension from the fetus, inadequate myometrial contractions fail to effectively constrict the bleeding vessels and sinuses at the placental bed. This decidual bleeding results in the release of excess thrombin. When substantial amounts of thrombin enter the bloodstream, it can lead to consumptive coagulopathy or disseminated intravascular coagulation (DIC), potentially increasing the risk of maternal morbidity and mortality [5].

4. Classification

Maternal bleeding associated with PA can be classified as peripheral, central, or a combination of both, depending on whether the blood is confined within the uterine cavity. Peripheral detachment occurs when the outer edges of the placenta separate from the uterine wall, allowing blood to escape through the cervix and manifest as vaginal bleeding. This type of bleeding is typically visible and can vary in intensity, presenting either a bright red or darker color, depending on the duration and extent of the hemorrhage. On the other hand, central detachment involves separation at the central attachment point of the placenta. In this scenario, the bleeding is concealed as the blood accumulates

between the placenta and the uterine wall, unable to exit through the cervix. This internal accumulation of blood can create a retroplacental hematoma, which is often not immediately visible. The absence of external bleeding can make early diagnosis of central detachment more difficult, as the clinical signs may be less obvious, despite the potentially severe underlying hemorrhage. In many cases, a combination of peripheral and central detachment may occur, where blood both accumulates within the uterine cavity and escapes through the cervix [8].

Another classification system for PA assigns scores ranging from 0 to 3, each reflecting the severity of the condition and its clinical manifestations. A score of 0 represents asymptomatic women who, upon examination after delivery, are found to have small retroplacental clots on the placental surface. These cases are typically subclinical and discovered incidentally, often without any noticeable symptoms during pregnancy or delivery. A score of 1 indicates a mild degree of PA. Women in this category experience vaginal bleeding accompanied by uterine tenderness or tetanic contractions. Although these symptoms are alarming, they do not necessarily indicate severe compromise of maternal or fetal health at this stage. A score of 2 is assigned to cases where there is vaginal bleeding alongside signs of fetal distress, but without signs of maternal shock. This level of abruption is more severe, as the fetus begins to exhibit signs of distress due to impaired placental function, although the mother's hemodynamic status remains relatively stable. The most severe classification, a score of 3, indicates a critical condition characterized by significant vaginal bleeding, uterine tetany, persistent abdominal pain, and signs of maternal shock. At this level, fetal demise is often observed, and approximately 30% of cases exhibit maternal coagulation disorders, uterine tetany, and intrauterine fetal death. This score highlights the severity of the situation, necessitating immediate and aggressive medical intervention to manage both maternal and fetal risks [11].

5. Clinical Evaluation

The clinical presentation of PA is characterized by a spectrum of symptoms, the severity of which may not always be immediately apparent. Common symptoms of PA include abdominal pain, observed in approximately 70% of cases, vaginal bleeding, reported in 35–80% of instances, as well as uterine contractions or tenderness, and abnormalities in the fetal heart rate, noted in about 75% of cases [1,5]. Hemorrhage originating from centrally located, larger arteries can lead to fetal distress or demise, necessitating immediate clinical interventions to mitigate associated morbidity. Conversely, bleeding from peripherally located, smaller veins may not demand urgent clinical evaluation and management, although continued surveillance and timely delivery remain essential to prevent adverse fetal outcomes [5]. The study by Mei et al. (2018) further underscores the significance of PA's clinical manifestation, particularly when accompanied by abdominal pain, as it is associated with worse outcomes for both the mother and the fetus [12].

Concealed PA may manifest in pregnant individuals with clinical signs such as abdominal pain and uterine contractions, often without noticeable vaginal bleeding or with minimal bleeding evident. Despite the absence of overt external hemorrhage, this type of abruption may indicate a severe underlying pathology, potentially leading to fetal death and coagulopathy [5].

Peripheral PA is characterized by the presence of vaginal bleeding as maternal blood escapes through the cervix, originating from the uterine lining and the maternal side of the placenta. This bleeding usually occurs suddenly, ranging in intensity from mild to severe, and may exhibit varying shades of red, depending on the timing and extent of the detachment. Accompanying symptoms may include diffuse abdominal pain, mild uterine tenderness, or lumbar discomfort. The occurrence of fetal distress depends on factors such as the extent of placental detachment and the volume of hemorrhage. In cases of substantial blood loss, oligemic cataplexy may occur, precipitating a notable reduction in renal circulation, acute tubular necrosis, and ultimately renal failure. Oliguria often serves as the initial alarming sign in such cases [13].

6. Risk Factors

Various clinical and non-clinical risk factors have been identified in association with PA, including medical and obstetric factors, obstetric history, sociodemographic characteristics, genetic predispositions, and behavioral patterns.

Medical and obstetric risk factors include chronic hypertension, preeclampsia [1,3,5], eclampsia [5], diabetes [3,5], polyhydramnios [1,5], oligohydramnios [5], premature rupture of membranes, chorioamnionitis, multiple pregnancy [1,5], placenta previa [1,3], non-vertex presentation and fetal growth restriction [1]. Obstetric history factors include previous history of PA [1,5,6], preeclampsia, fetal growth restriction or small for gestational age fetuses, and previous cesarean sections [1,6]. Sociodemographic factors comprise advanced or young maternal age [1,3], parity, single marital status, and ethnicity. Genetic factors involve thrombophilia [1,3,5], MTHFR gene mutation, and hyperhomocysteinemia

[1,5]. Behavioral risk factors include illicit drug use [1,3,5], tobacco smoking during pregnancy, alcohol consumption, low maternal body mass index [1,3], heavy physical exertion [1], depression or anxiety, anger or outbursts, stress [1], iron deficiency anemia, folic acid supplementation, assisted reproductive technologies [1,5], and intimate partner violence [1].

7. Maternal and Neonatal Complications

PA poses significant risks to both maternal and fetal health, necessitating prompt medical intervention to mitigate potential complications.

Maternal complications attributed to PA include severe bleeding and postpartum hemorrhage requiring blood transfusions or substitutes, hypovolemic shock, renal failure, peripartum hysterectomy, and mortality. Additionally, PA may have lasting effects on long-term maternal health outcomes, contributing to increased morbidity and mortality [1]. According to Downes et al. (2017), it can also elevate the risk of sepsis, amniotic fluid embolism, acute kidney injury, severe respiratory distress, encephalopathy, and maternal intensive care unit admission [14]. Long-term implications may include increased risk of mortality from cardiovascular disease over a decade [1]. A rare complication of PA, known as Couvelaire uterus, may also occur, characterized by extensive blood infiltration into the uterine myometrium, typically detected during a cesarean section [5]. Early recognition and rapid intervention are imperative for effective management of this emergency [15].

Furthermore, PA is associated with a range of complications for the newborn, mainly associated with increased rates of prematurity, perinatal asphyxia, and its subsequent outcomes. These include lower Apgar scores, reduced birth weight, elevated neonatal morbidity, prolonged hospitalization, increased likelihood of admission to the neonatal intensive care unit (NICU), and elevated mortality [1].

8. Treatment and Management

The management of PA is highly dependent on the severity of the abruption, the gestational age of the fetus, and the presence of maternal or fetal distress. Prompt recognition and intervention are critical to improve outcomes for both mother and fetus.

8.1. Assessment and Stabilization

The initial management of a patient with suspected PA requires:

- Advanced Life Support: Immediate transfer to a hospital with integrated obstetric and neonatal care capabilities is essential. Intravenous (IV) fluids with crystalloids should be administered as necessary, and oxygen supplementation should be provided to maintain adequate oxygen saturation [13,14].
- Monitoring: Monitoring involves the continuous assessment of maternal and fetal well-being, along with a detailed history and comprehensive physical examination [13,14].
- Laboratory Tests: A comprehensive laboratory assessment for diagnosing PA includes a complete blood count, a detailed coagulation profile, blood typing and Rh factor determination. Additionally, an Apt test and the Kleihauer-Betke stain can provide valuable information in specific cases [13].

8.2. Conservative Management

Women diagnosed with a class 1 or mild PA, without symptoms of maternal or fetal distress and with a pregnancy of less than 37 weeks' gestation, can be treated conservatively. Typically, these patients are admitted to the obstetric unit for close monitoring of both maternal and fetal well-being. Key elements of their care plan include the establishment of intravenous access and blood tests for type and cross-match purposes. Continuous monitoring of the mother-fetus dyad continues until any alteration in status or until fetal maturity is attained [13].

8.3. Active Management

In cases where the assessment indicates a class 2 (moderate) or class 3 (severe) classification, and the fetus is alive, prompt delivery is imperative. Vaginal delivery may occur rapidly due to hypertonic contractions, and is generally preferred due to its reduced maternal risk profile, particularly regarding potential coagulopathy [13]. In the absence of evidence of fetal or maternal distress, vaginal delivery remains the preferred course, when the fetus is mature, in cephalic presentation, and labor is actively progressing, or in cases of fetal demise [3].

However, if there are signs of compromised fetal oxygenation and/or significant maternal blood loss, an emergency cesarean section is warranted to safeguard the fetus, as observed in approximately 90% of cases [3]. During surgery, precise management of fluid administration and circulatory volume is of paramount importance. The presence of a neonatal team in the delivery room ensures immediate care for the newborn following delivery. Postoperatively, diligent monitoring for postpartum hemorrhage and alterations in the clotting profile is essential [13].

9. Diagnosis

The diagnosis of PA is determined through a comprehensive clinical evaluation, including a medical history, physical examination and diagnostic tests. A thorough medical history is necessary to identify risk factors associated with PA and report symptoms such as vaginal bleeding, abdominal pain, uterine contractions or changes in fetal movements, which provide critical diagnostic information. Clinical examination may reveal signs indicative of PA, while diagnostic methods such as ultrasound, electronic fetal monitoring and laboratory tests are used to confirm the diagnosis and measure the severity of PA. According to Elsasser et al. (2010) the clinical diagnosis of PA should encompass one or more of the following criteria: the presence of retroplacental bleeding or clots, sonographic confirmation of abruption, or painful vaginal bleeding accompanied by non-reassuring fetal status or uterine hypertonicity [16].

Regarding laboratory tests, a complete blood count is essential to determine hematocrit, hemoglobin, and platelet count, providing insight into the patient's overall blood status and possible anemia. Additionally, a detailed coagulation profile, including prothrombin time, partial thromboplastin time, fibrinogen level, and fibrinogen degradation products (D-dimers), is necessary to evaluate the patient's blood clotting ability and identify any coagulation disorders that may complicate the abruption. Additionally, blood typing and Rh factor determination are also imperative to facilitate crossmatching and the preparation of blood units, ensuring readiness for any necessary transfusions. Furthermore, an Apt test may be requested to detect the presence of blood in the amniotic fluid, which can provide further evidence of PA. Moreover, the Kleihauer-Betke stain is used to identify transplacental hemorrhage, particularly in Rh-negative women with a history of premature PA in a previous pregnancy. Although this test has limited sensitivity, it can provide valuable information in specific cases [13,14].

9.1. Differential Diagnosis

The diagnosis of PA necessitates a thorough clinical evaluation to rule out other potential causes of vaginal bleeding. Among these, placenta previa is the most common differential diagnosis. Therefore, particular attention will be given to distinguishing between PA and placenta previa.

Differentiation between PA and placenta previa is crucial for effective patient management, and the diagnosis involves several key factors. Firstly, the onset of symptoms differs significantly between the two conditions. PA typically presents with a sudden and intense onset of symptoms, whereas placenta previa manifests gradually and insidiously. Additionally, pain characteristics also help to distinguish between these conditions. Intense and acute pain is commonly associated with PA. On the other hand, placenta previa tends not to induce pain, which can sometimes lead to a delay in diagnosis, if bleeding is not immediately apparent. Moreover, patterns of bleeding are another differentiating factor. In PA, bleeding may be either visible or concealed, complicating the clinical assessment. However, bleeding in placenta previa is typically external and visible. Furthermore, uterine tone provides further diagnostic clues. In PA, the uterine tone is firm and board-like, in contrast to the soft and relaxed uterus observed in placenta previa. Finally, the severity of anemia or shock associated with these conditions varies. In PA, the degree of anemia or shock is often greater than what is indicated by the visible blood loss, due to the potential for concealed bleeding. In placenta previa, the severity of anemia or shock corresponds more directly to the amount of visible blood loss, allowing for a more straightforward clinical assessment [13].

Any bleeding in late pregnancy should be considered as a possible indication of either PA or placenta previa until a definitive diagnosis is established. Therefore, it is imperative that vaginal examination is avoided until placenta previa has been ruled out. Once placenta previa has been excluded, vaginal examination with the use of appropriate vaginal dilators may be considered, especially if there is an indication for immediate surgical intervention.

10. Prognosis

The prognosis of PA is largely influenced by the time of the patient's admission to the hospital. Prompt medical intervention is critical, as ongoing bleeding poses serious risks to both maternal and fetal life. In cases of partial PA, the mortality rate is lower compared to complete abruption; however, the potential for fetal demise remains significant in both scenarios, if an emergency cesarean section is not performed promptly. This condition currently accounts for 5%

to 8% of all maternal deaths. Early recognition and prompt intervention is paramount to improve outcomes for both mother and child, highlighting the importance of early access to integrated obstetric care [13].

11. Interprofessional Care Team

PA is a critical obstetric emergency condition that requires the coordinated efforts of an interprofessional healthcare team. The midwife plays a key role in the early identification of this condition, ensuring that the patient is admitted immediately and the emergency department's obstetrician is informed without delay. Given the severity of PA, transferring the patient to an Intensive Care Unit is strongly recommended to facilitate close monitoring and advanced care. Simultaneously, it is essential to have the patient's blood cross-matched and typed in preparation for potential transfusions, given the high risk of significant hemorrhage. The management of PA necessitates seamless collaboration between the anesthesiologist, the obstetrician, the midwife, the hematologist, the radiologist, the intensivist and the neonatologist to ensure optimal outcomes. Operating room staff should be notified to prepare the surgery room for possible emergency procedures. In cases where the fetus is premature, notifying the Neonatal Intensive Care Unit team is critical to provide immediate specialized care for the newborn. A coordinated team approach is essential to reduce the morbidity and mortality associated with this disorder [13].

12. Conclusions

PA is a severe obstetric emergency with significant implications for maternal and fetal health. Despite advances in prenatal care, the high morbidity and mortality rates associated with PA underscore the need for early diagnosis and immediate intervention. Effective management of PA requires a thorough understanding of its epidemiology, pathophysiology, and clinical manifestations, as well as the ability to differentiate it from other causes of late pregnancy bleeding, such as placenta previa. Key to improving outcomes is the early identification of risk factors, comprehensive laboratory evaluations, and the timely implementation of appropriate therapeutic strategies. The prognosis of PA depends primarily on the rapid medical response, emphasizing the necessity for an integrated interprofessional care team that includes obstetricians, anesthesiologists, midwives, radiologists, hematologists, intensivists, and neonatologists. Such a coordinated approach ensures that both the mother and fetus receive the critical care required to mitigate the severe complications associated with this condition. The continued research and refinement of management protocols for PA are vital to reducing its impact and improving maternal and neonatal outcomes.

Compliance with ethical standards

Disclosure of conflict of interest

All authors declare that they have no conflicts of interest.

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