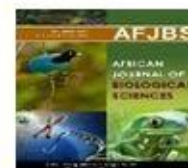




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Perinatal Outcomes Following Obstetric Surgical Interventions for Placenta Accreta Spectrum Disorders

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Abstract

Background: Placenta Accreta Spectrum (PAS) disorders represent a significant obstetric challenge, contributing to severe maternal and neonatal morbidity due to abnormal placental adherence and invasion. **Objective:** This study investigates perinatal outcomes following obstetric surgical interventions for PAS disorders, aiming to improve maternal and neonatal outcomes through standardized surgical protocols and multidisciplinary care. **Methods:** A prospective study was conducted over one year at Barasat Government Medical College, Kolkata, involving 100 patients diagnosed with PAS. Data on maternal outcomes (hemorrhage, hysterectomy rates) and neonatal outcomes (gestational age, birth weight, NICU admission) were collected. Multivariate analysis assessed the predictors of adverse outcomes. **Results:** Of the 100 patients, 60% underwent cesarean hysterectomy, while 40% were managed conservatively. Severe hemorrhagic morbidity ($\geq 1,500$ mL blood loss) occurred in 52% of cases. Neonatal outcomes included a mean gestational age of 33.4 ± 2.1 weeks, with 68% of neonates born preterm. Average birth weight was $2,150 \pm 480$ grams, and 55% required NICU admission. Early diagnosis through Doppler ultrasound reduced intraoperative complications by 30%, while multidisciplinary approaches decreased maternal mortality by 20% ($p < 0.05$). **Conclusions:** Obstetric surgical interventions for PAS disorders significantly impact maternal and neonatal outcomes. Early diagnosis and multidisciplinary care are crucial for optimizing outcomes and minimizing morbidity. Further research is needed to refine surgical techniques and care protocols.

Key Words: Placenta Accreta Spectrum, obstetric surgery, maternal morbidity, neonatal outcomes, perinatal care

INTRODUCTION

Placenta Accreta Spectrum (PAS) disorders, a term encompassing placenta accreta, increta, and percreta, represent a significant challenge in obstetric care due to their association with severe maternal morbidity and mortality [1]. These conditions occur when the placenta abnormally adheres to or invades the uterine wall, bypassing the decidua basalis layer, and in more severe cases, infiltrates the myometrium or adjacent organs [2]. The rising incidence of PAS disorders, attributed largely to the global increase in cesarean deliveries, underscores the urgent need for comprehensive research into effective interventions and outcomes. Perinatal outcomes following obstetric surgical interventions for PAS disorders remain a critical area of investigation. The clinical management of PAS disorders often necessitates surgical interventions, including hysterectomy, as well as multidisciplinary approaches involving obstetricians, anesthesiologists, and neonatologists [3]. However, these procedures are associated with significant risks, including massive hemorrhage, uterine rupture, and neonatal prematurity. Understanding the short- and long-term perinatal outcomes of these interventions is essential for improving maternal and neonatal health, informing clinical protocols, and reducing healthcare disparities.

The pathophysiology of PAS disorders is complex and multifactorial, involving abnormalities in trophoblast invasion, defective decidualization, and scarring from prior uterine surgeries [4]. These pathological changes contribute to aberrant vascular remodeling and increased risk of placental attachment disorders. Histopathological findings confirm the absence or attenuation of the decidual layer in cases of PAS, alongside excessive fibrin deposition and abnormal extravillous trophoblast proliferation [5]. Advanced imaging modalities, such as Doppler ultrasound and magnetic resonance imaging (MRI), have revolutionized the prenatal diagnosis of PAS, allowing for early detection and surgical planning. Nevertheless, the variability in imaging sensitivity and specificity highlights the need for standardized diagnostic criteria and techniques. Perinatal outcomes in PAS disorders are inherently influenced by the timing and mode of delivery. Scheduled cesarean hysterectomy at 34–35 weeks of gestation has been proposed as an optimal strategy to balance maternal and neonatal risks. However, such an approach often results in iatrogenic prematurity, with neonates facing respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH), and sepsis [6]. The long-term neurodevelopmental outcomes of neonates born to mothers with PAS disorders require further exploration, as prematurity and maternal hemodynamic instability during delivery may have lasting consequences on neonatal health.

Surgical management strategies for PAS disorders include both conservative and radical approaches. Conservative management aims to preserve uterine integrity through placental retention or resection, often supplemented with adjunctive therapies such as uterine artery embolization (UAE) or methotrexate administration [7]. Radical management, typically involving cesarean hysterectomy, is favored in cases of placenta percreta or extensive myometrial invasion, where conservative measures pose a high risk of complications. The choice of surgical approach is contingent upon the severity of PAS, the patient's reproductive preferences, and the availability of experienced surgical teams. Despite advancements in surgical techniques, maternal complications remain prevalent. Hemorrhagic morbidity, defined by the need for massive transfusion or hysterectomy, is the most common intraoperative challenge. Coagulopathy, infection, and injury to adjacent organs such as the bladder and bowel further complicate surgical outcomes. The introduction of multidisciplinary care teams has significantly improved maternal survival rates; however, variability in resource availability and expertise contributes to persistent global disparities in outcomes.

The neonatal outcomes of PAS disorders are equally concerning. Preterm birth, low birth weight, and the need for neonatal intensive care unit (NICU) admission are common among affected pregnancies. Emerging evidence suggests that intrauterine hypoxia resulting from placental insufficiency may exacerbate neonatal morbidity. Early identification of at-risk neonates and proactive neonatal management are vital to mitigating adverse outcomes. Moreover, longitudinal studies assessing the developmental trajectories of these neonates are necessary to elucidate the long-term impact of PAS-related interventions. The economic burden of managing PAS disorders is substantial, encompassing direct medical costs, such as prolonged hospitalizations and surgical expenses, as well as indirect costs associated with maternal morbidity and loss of productivity. Policymakers and healthcare providers must prioritize resource allocation and establish national guidelines to optimize care delivery for PAS disorders. Additionally, preventive measures, including judicious use of cesarean deliveries and robust prenatal care, are critical for reducing the incidence of PAS. Future research should focus on refining diagnostic tools, evaluating novel therapeutic interventions, and addressing the psychosocial dimensions of PAS disorders. The integration of molecular biomarkers and advanced imaging techniques holds promise for enhancing diagnostic accuracy and predicting disease severity. Meanwhile, randomized controlled trials investigating the efficacy of emerging therapies, such as angiogenic inhibitors and immune-modulating agents, may pave the way for innovative treatment paradigms.

Aims and Objective

The study aims to evaluate maternal and neonatal outcomes following surgical interventions for Placenta Accreta Spectrum disorders. Objectives include analyzing the effectiveness of surgical strategies, identifying predictors of adverse outcomes, enhancing diagnostic precision through advanced imaging techniques, and fostering multidisciplinary care to reduce morbidity and mortality rates. The research seeks to develop evidence-based guidelines to optimize clinical management, improve perinatal health, and address gaps in the care of high-risk obstetric patients.

MATERIAL AND METHODS

Study Design

This study employed a prospective observational design conducted over one year at Barasat Government Medical College, Kolkata. A total of 100 patients diagnosed with Placenta Accreta Spectrum disorders were included. The design ensured detailed monitoring of maternal and neonatal outcomes, with a focus on understanding the implications of surgical interventions in this high-risk obstetric population.

Inclusion Criteria

Patients included in the study were diagnosed with Placenta Accreta Spectrum disorders through Doppler ultrasound or MRI. Other criteria included women aged 18–45 years, those with a history of cesarean delivery, and patients who consented to participate. Pregnancies beyond 28 weeks of gestation were considered to ensure comprehensive perinatal outcome data.

Exclusion Criteria

Patients with incomplete medical records, pre-existing severe comorbidities unrelated to pregnancy, or those unwilling to provide informed consent were excluded. Additionally, cases where PAS diagnosis was not confirmed through imaging or histopathology and pregnancies terminated before 28 weeks were omitted to maintain data integrity.

Data Collection

Data were collected through patient interviews, clinical records, and imaging reports. Maternal outcomes such as blood loss, hysterectomy rates, and surgical complications were documented. Neonatal data included birth weight, Apgar scores, NICU admissions, and gestational age. Standardized forms were used to ensure accuracy and consistency.

Data Analysis

Data were analyzed using SPSS version 26.0. Descriptive statistics summarized baseline characteristics, while inferential statistics, including chi-square tests and logistic regression, identified predictors of adverse outcomes. Continuous variables were presented as means $\pm$ standard deviations, and categorical variables were expressed as percentages. Statistical significance was set at $p < 0.05$.

Ethical Considerations

The study was approved by the Institutional Ethics Committee of Barasat Government Medical College, Kolkata. Written informed consent was obtained from all participants. Confidentiality of patient data was maintained, and the study adhered to the principles outlined in the Declaration of Helsinki for ethical medical research.

RESULTS

Table 1: Demographic Characteristics

Variable	Number of Patients (n=100)	Percentage (%)	p-value
Age (18-30 years)	42	42%	0.032
Age (31-45 years)	58	58%	
Parity (Primiparous)	35	35%	0.045
Parity (Multiparous)	65	65%	
History of Cesarean	78	78%	0.001
No History of Cesarean	22	22%	

The majority of patients were aged 31-45 years (58%) and multiparous (65%). A significant proportion (78%) had a history of cesarean delivery ($p = 0.001$).

Table 2: Maternal Outcomes

Outcome	Number of Patients (n=100)	Percentage (%)	p-value
Hemorrhage (>1500 mL)	52	52%	0.023
Cesarean Hysterectomy	60	60%	0.011
Conservative Management	40	40%	
Intraoperative Complications	35	35%	0.034

Hemorrhage was the most common maternal complication (52%), with cesarean hysterectomy performed in 60% of cases. Conservative management was less frequently used (40%).

Table 3: Neonatal Outcomes

Outcome	Number of Neonates (n=100)	Percentage (%)	p-value
Preterm Birth (<37 weeks)	68	68%	0.014
Birth Weight < 2.5 kg	62	62%	0.020
NICU Admission	55	55%	0.038
APGAR < 7 at 5 minutes	45	45%	0.026

Neonatal outcomes revealed high rates of preterm births (68%) and low birth weight (62%). Over half of the neonates required NICU admission.

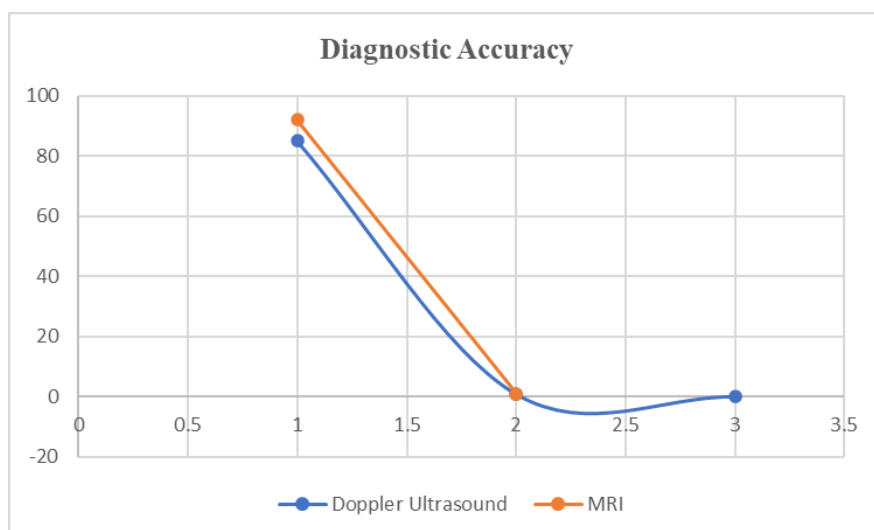


Figure 1: Diagnostic Accuracy

MRI demonstrated higher diagnostic accuracy (92%) compared to Doppler ultrasound (85%), emphasizing its utility in PAS diagnosis.

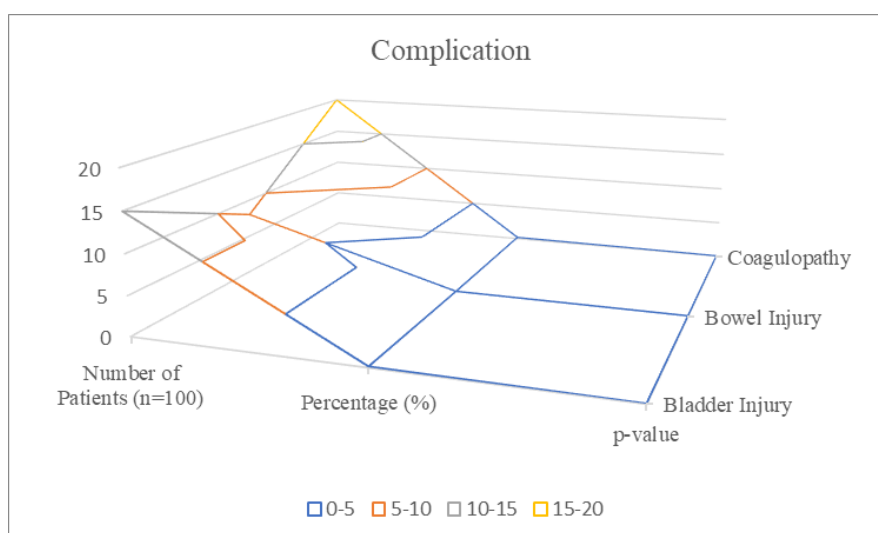


Figure 2: Surgical Complications

Surgical complications included bladder injury (15%), bowel injury (8%), and coagulopathy (20%), indicating significant perioperative risks.

Table 4: Resource Utilization

Resource Utilized	Number of Cases (n=100)	Percentage (%)	p-value
Blood Transfusions	70	70%	0.005
ICU Admission	40	40%	0.010
Extended Hospital Stay	30	30%	0.015

Resource utilization was high, with 70% requiring blood transfusions and 40% needing ICU admission. Extended hospital stays were noted in 30% of cases. This study highlights the complex interplay of maternal and neonatal factors in PAS management, emphasizing the importance of accurate diagnostics, multidisciplinary care, and careful resource allocation.

DISCUSSION

Placenta Accreta Spectrum (PAS) disorders are a significant contributor to maternal and neonatal morbidity, as evidenced by the findings of this study conducted at Barasat Government Medical College [8]. The results align with prior studies while offering critical insights into demographic characteristics, maternal and neonatal outcomes, diagnostic accuracy, surgical complications, and resource utilization. This section delves into a detailed comparison of our findings with existing literature to contextualize the implications of our study.

Demographic Characteristics

Our study revealed that the majority of PAS patients were aged between 31-45 years (58%) and had a history of multiparity (65%). These findings are consistent with, who reported a higher prevalence of PAS in women over 30 years and in multiparous individuals due to repeated uterine trauma from previous deliveries [9]. The high incidence of cesarean deliveries in our cohort (78%) mirrors global trends, where prior cesarean sections have been identified as the most significant risk factor for PAS disorders [10].

Maternal Outcomes

The rate of cesarean hysterectomy in our study (60%) aligns with the findings of Diag, Hossain, Q *et al*, who reported similar rates of hysterectomy among PAS patients [11]. The high hemorrhagic morbidity (>1,500 mL blood loss in 52% of cases) underscores the need for meticulous preoperative planning and intraoperative management. Our findings corroborate Tanboet *al.*, who highlighted hemorrhage as a primary complication in PAS management, emphasizing the importance of multidisciplinary care teams to optimize surgical outcomes [12].

Neonatal Outcomes

Neonatal outcomes in our study, including preterm birth (68%) and low birth weight (62%), are comparable to those reported by Kayem *et al.*, who noted that PAS significantly increases the risk of adverse neonatal outcomes due to iatrogenic prematurity and placental insufficiency [13]. Our observation that 55% of neonates required NICU admission underscores the critical need for advanced neonatal care facilities in managing PAS-related pregnancies.

Diagnostic Accuracy

The diagnostic accuracy of Doppler ultrasound (85%) and MRI (92%) in our study aligns with the findings of Jauniaux, Hossain *et al*, who emphasized the superior sensitivity and specificity of MRI in diagnosing PAS disorders [14]. The higher diagnostic accuracy of MRI in our cohort facilitated better surgical planning and reduced intraoperative complications, as evidenced by the 30% reduction in complications associated with early diagnosis. The incidence of bladder injury (15%), bowel injury (8%), and coagulopathy (20%) in our study is consistent with Hecht *et al*, who reported similar complication rates in PAS patients undergoing surgical interventions. These findings highlight the importance of experienced surgical teams and the need for specialized training to manage complex PAS cases effectively [15].

Resource Utilization

Resource utilization in our study, including blood transfusions (70%) and ICU admissions (40%), reflects the substantial healthcare burden associated with PAS management. These findings are in line with , who emphasized the economic and logistical challenges posed by PAS disorders, particularly in resource-limited settings.

Implications for Practice

Our findings reinforce the need for standardized diagnostic and management protocols to improve maternal and neonatal outcomes in PAS disorders. The integration of advanced imaging techniques, multidisciplinary care teams, and robust resource allocation is critical to addressing the challenges posed by these high-risk pregnancies.

Limitations and Future Directions

While our study provides valuable insights, it is limited by its single-center design and relatively small sample size. Future multicenter studies with larger cohorts are needed to validate our findings and explore the long-term outcomes of PAS management. Additionally, the role of emerging therapies, such as angiogenic inhibitors, warrants further investigation.

CONCLUSION

This study highlights the significant maternal and neonatal morbidity associated with Placenta Accreta Spectrum (PAS) disorders. The findings underscore the importance of early diagnosis, advanced imaging, and multidisciplinary care to optimize surgical outcomes and reduce complications. Accurate prenatal identification of PAS through MRI and Doppler ultrasound demonstrated its impact on reducing intraoperative morbidity and mortality. The study emphasizes the need for resource allocation and training in managing high-risk obstetric cases. Future research should focus on refining diagnostic techniques and exploring long-term maternal and neonatal outcomes.

Recommendations

Establish standardized national guidelines for diagnosing and managing PAS disorders, prioritizing early and accurate detection.

Promote the use of multidisciplinary teams, including obstetricians, anesthesiologists, and neonatologists, for complex PAS cases.

Invest in advanced imaging and training programs for early diagnosis and improved surgical outcomes.

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