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# Optimising fetomaternal outcome in placenta accreta spectrum in previous c- section delivery - A clinical study with review of current guidelines

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**Abstract**
**Introduction:** Placenta Accreta Spectrum (PAS) disorders are a major cause of severe maternal morbidity and mortality, particularly in cases with a history of previous caesarean sections. The increasing global incidence of PAS highlights the need for evidence-based strategies to optimize fetomaternal outcome. This study evaluates clinical outcomes in PAS cases managed at our institution while reviewing current guidelines to identify best practices for improving perinatal and maternal care.
**Materials and Methods:** A prospective observational study conducted among 39 pregnant women with previous Caesarean section with placenta previa and PAS, from Sri Siddhartha Medical College and Hospital and district hospital Tumkur from November 2023 to December 2024. Data was collected from the medical departmental records of the obstetric department, of pregnant women with previous cesarean section diagnosed with PAS and treated at our institution.
**Results:** This study included 39 patients. Placenta previa and placenta accreta were noted among 92.3% and 15.4% cases respectively. 23.1% had undergone caesarean hysterectomy with placenta left insitu. Bladder injury and DIC occurred among 7.7% and 38.5% cases respectively. 38.5% cases had prolonged duration of surgery ≥ 2 hours. 92.3% cases had undergone blood transfusion and required ICU admission. Majority had preterm birth with 92.3% cases, 23.1% cases had an Apgar score <7 at 5 minutes, and 7.7% had neonatal mortality. Also the fetomaternal outcome of cases with previous ≥ 2 LSCS had more complications when compared to previous 1 LSCS cases with significant P- value.
**Conclusion:** Optimizing the management of PAS requires a multidisciplinary approach, timely diagnosis, and adherence to evidence-based guidelines. Our study highlights key factors influencing maternal and neonatal outcome and underscores the importance of standardized protocols in reducing complications. A review of current guidelines further provides insights into refining clinical practice for better fetomaternal outcome in PAS cases.

**Keywords:** Placenta accreta spectrum (PAS), lower segment caesarean section (LSCS), disseminated intravascular coagulation (DIC)

## Introduction
Placenta accreta spectrum (PAS) is a disorder of abnormal placentation. An increase in the incidence of PAS has been seen with an increase in caesarean deliveries in the last four Decades. The other risk factors for PAS include other uterine surgery, including repeated endometrial curettage or a history of accreta in a previous pregnancy, previous history of retained placenta, and advanced maternal age [1].
Pathologically PAS is divided into placenta accreta (where extravillous trophoblast [EVT] directly attaches to myometrium), increta (where EVT invades into myometrium) and percreta (where EVT invades to the serosa and/or adjacent structures).
About 60% and 70% of cases were accrete [2]. Abnormal placentation causes incomplete separation of the placenta after delivery which leads to massive obstetric haemorrhage with associated morbidities such as risk of hysterectomy, difficulty in extraction of fetus, infection and even maternal death [3].
Risks are increased with the extent of invasion; case fatality rates with placenta percreta have been reported to be as high as 7% [4]. Accurate antenatal diagnosis of PAS, allowing multidisciplinary management at the time of delivery, has been shown to improve maternal and fetal outcomes [5].

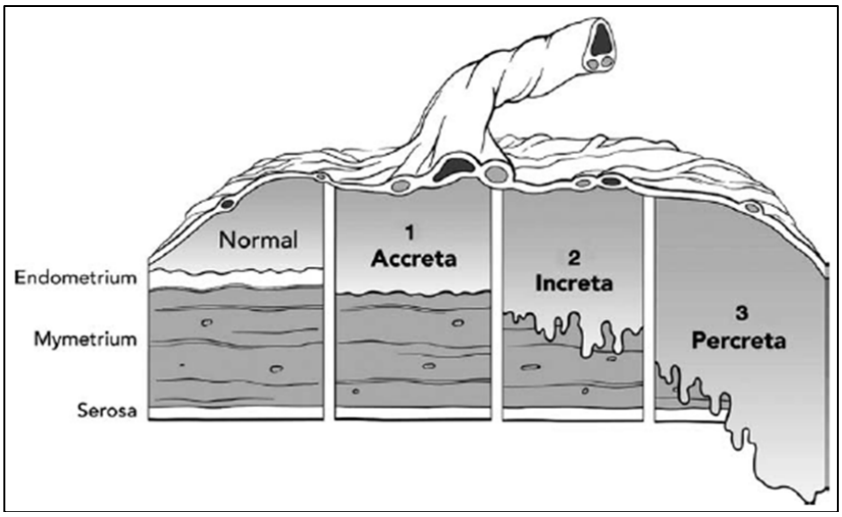


**Fig: 1** Figure showing PAS

**Well-recognised risk factors for PAS are**

- Prior uterine surgery with breach of the endometrium.
- Implantation of the placenta over the surgical scar.

The commonest risk factors are previous CS and anterior placenta praevia. The chance of PAS increases with the number of previous CS [6].

There is no consensus single approach for the management of PAS disorders, if these cases are managed by a multidisciplinary team with immediate access to blood products and ICU facilities, maternal and neonatal morbidity and mortality can be reduced, hence such a study is required to know any feto maternal abnormal outcome in cases of PAS.

**Aim of the study**

To optimize fetomaternal outcome in placenta accreta spectrum in previous C- section delivery.

**Objectives of the study**

1. To assess the maternal outcome in women with Placenta accreta spectrum disorders with previous caesarean section.
2. To assess the fetal outcome in women with placenta accreta spectrum disorders with previous caesarean section.

**Materials and Methods**

A prospective observational study conducted among 39 pregnant women with previous Caesarean section, at Sri Siddhartha Medical College and Hospital and district hospital Tumkur from November 2023 to December 2024**.** Data was collected from the pregnant women with previous cesarean section diagnosed with PAS and placenta previa and treated at our institution, after detailed analysis of the cases, to satisfy the inclusion and exclusion criteria

- Demographic data (maternal age, body height (cm), body weight (kg), parity, gravidity, nationality) were noted.
- Maternal outcomes in terms of intraoperative and post-operative complications in a woman with previous caesarean section including placenta accreta, placenta previa, Bladder injury, caesarean section with placenta left insitu followed by hysterectomy, prolonged duration of surgery (hours), massive hemorrhage causing irreversible hemorrhagic shock which results in multiple organ dysfunction syndrome (MODS) and disseminated intravascular coagulation (DIC), need for icu admission were noted.
- Neonatal data like gestational age at birth, birth weight, Apgar score below 7 at five minutes, NICU admission, fetal death (IUD), still birth, Neonatal death, were noted.

**Inclusion criteria**

1. All antenatal patients with previous C- section delivery, identified as having placenta previa, placenta accreta, increta, or percreta by USG.
2. All patients whose placenta was found adherent intraoperatively and required active management.

**Exclusion Criteria**

1. All antenatal patients without placenta previa and placenta accreta spectrum.
2. Multiple pregnancy.
3. Vaginal delivery.

**Statistical analysis**

The data were presented using frequencies, percentages for categorical variables, means, and standard deviations for continuous variables using basic descriptive statistics. All data analysis was performed using IBM SPSS Statistics for Windows, Version 20.0.

**Results**

Out of 1023 caesarean deliveries conducted from November 2023 to December 2024 at Sri Siddhartha Medical College and Hospital and District Hospital tumkur, 356 are primary c- section due to various indications, history of previous 1LSCS, 2 LSCS, 3 LSCS were noted among 359, 249 and 59 cases respectively. Among them placenta previa was noted in 9 cases of previous 1LSCS, 21 cases of previous 2 LSCS and 3 cases of previous 3 LSCS and 3 cases with antenatal scan showing PAS. Total 39 cases were included in the study after confirmation of inclusion and exclusion criteria.

The demographic characteristics of patients with Placenta Accreta Spectrum (PAS) in this study reveal key risk factors associated with the condition shown in table.1. The majority of the study population (61.5%) was aged ≥30 years, while

38.5% were younger than 30 years. The most common parity category was 2 previous deliveries (61.53%), followed by one delivery (23.07%), and more than two deliveries (15.38%). 30.8% of cases had one previous LSCS, while 61.5% had two previous LSCS, and 7.7% had three or more LSCS. A significant majority of Placenta previa cases (92.3%) resulted in preterm delivery (<37 weeks), while only 7.7% delivered at term (≥37 weeks).

The clinical and intraoperative characteristics of the study participants were shown in table.2. The majority of patients (58.9%) were admitted for elective LSCS, 33.3% were admitted to due to vaginal bleeding, while only 7.6% were admitted due to an antenatal diagnosis of PAS. Among the study population, 92.3% were confirmed cases of placenta previa, (only 8% (3 of 36) of placenta previa had PAS), 6 out of 39 (15.4%) were of placenta accreta among which 3 cases were found intraoperatively, with adherent bladder wall. 76.9% of patients underwent cesarean section with placental removal, while 23.1% required CS with placenta left in situ followed by a cesarean hysterectomy. Bladder injury occurred in 7.7% of cases. Disseminated intravascular coagulation (DIC) was reported in 38.5% of cases. 61.5% of surgeries lasted between 1-2 hours, while 38.5% exceeded 2 hours.92.3% of patients required blood transfusion and ICU admission.

The comparison of maternal and neonatal outcomes between women with one previous lower segment cesarean section (LSCS) and those with two or more previous LSCS shown in table.3.

Women with one previous LSCS had a mean age of 31.0 years, while those with ≥2 LSCS had a mean age of 29.2 years. Women with one LSCS delivered at a mean gestational age of 36.0 weeks, whereas those with ≥2 LSCS delivered at a mean of 34.0 weeks. Newborns in the 1 LSCS group had a mean birth weight of 2.7 kg, whereas those in the ≥2 LSCS group had a significantly lower mean birth weight of 2.0 kg. Babies born to mothers with one LSCS had a mean APGAR score of 8.3, whereas those in the ≥2 LSCS group had a significantly lower mean score of 5.4. at 1 minute of life. Infants in the 1 LSCS group had a mean APGAR score of 9.3, whereas those in the ≥2 LSCS group had a lower mean score of 7.0. at 5 minutes of life.

The neonatal outcomes of pregnancies complicated by Placenta Accreta Spectrum (PAS), focusing on Apgar scores, NICU admission, respiratory support, and neonatal mortality, shown in table.4.

23.1% of newborns had an Apgar score <7 at 5 minutes, 76.9% of neonates had an Apgar score >7 at 5 minutes. 15.38% of neonates required oxygen support through nasal prongs, while 15.38% needed higher ventilator support, indicating significant respiratory distress in these newborns. The high percentage of 38.46% requiring CPAP. 7.7% of neonates died in the postnatal period, which is concerning and indicates the high perinatal mortality risk in PAS pregnancies.

The relationship between the number of previous lower segment cesarean sections (LSCS) and intraoperative/postoperative complications in placenta previa and Placenta Accreta Spectrum (PAS) cases as shown in table.5 Placenta previa was observed in 100% cases with ≥ 2 LSCS, compared to 75% in 1 LSCS cases. Placenta accreta was observed in 22.2% of cases with ≥2 LSCS but was absent in cases with only 1 LSCS. Bladder injury occurred in 11.1% of women with ≥2 LSCS but in none of the 1 LSCS cases. Disseminated Intravascular Coagulation (DIC) was seen in 44.4% of women with ≥2 LSCS, compared to 25.0% in 1 LSCS cases. 100% of women with ≥2 LSCS required blood transfusions, compared to 75% of women with 1 LSCS ($p = 0.007$, significant). ICU admission was needed in all (100%) cases with ≥2 LSCS, compared to 75% in 1 LSCS cases. Cesarean section with placental removal was performed in 100% of 1 LSCS cases but only in 66.7% of ≥2 LSCS cases. Cesarean hysterectomy was required in 33.3% of ≥2 LSCS cases but in none of the 1 LSCS cases. Surgery lasted >2 hours in 44.4% of cases with ≥2 LSCS, compared to 25% of 1 LSCS cases.

**Table 1:** Demographic characteristics of study population with PAS.

| Variables | Range | Frequency(N) | Percentage (%) |
|---|---|---|---|
| Maternal Age | <30 | 15 | 38.5 |
| | ≥30 | 24 | 61.5 |
| Parity | 1 | 9 | 23.07 |
| | 2 | 24 | 61.53 |
| | >2 | 6 | 15.38 |
| Previous LSCS | 1 | 12 | 30.8 |
| | 2 | 24 | 61.5 |
| | 3 | 3 | 7.7 |
| Gestational Age | <37 | 36 | 92.3 |
| | >37 | 3 | 7.7 |

**Table 2:** Intraoperative and post-operative data of study participants:

| S. No | Variables | | Frequency(N) | Percentage (%) |
|---|---|---|---|---|
| 1 | Reason for admission | Vaginal bleeding | 13 | 33.3 |
| | | Antenatal diagnosis of PAS | 3 | 7.6 |
| | | Elective LSCS for placenta previa | 23 | 58.9 |
| 2 | Placenta previa | | 36 | 92.3 |
| 3 | Placenta accreta spectrum | | 6 | 15.4 |
| 4 | Mode of delivery | CS with placental removal | 30 | 76.9 |
| | | CS with placenta left insitu followed by caesarean hysterectomy | 9 | 23.1 |
| 5 | Intra op complications | Bladder injury | 3 | 7.7 |
| | | DIC | 15 | 38.5 |
| 6 | Duration of surgery | 1-2 HOURS | 24 | 61.5 |
| | | ≥ 2 HOURS | 15 | 38.5 |
| 7 | Need for ICU admission | | 36 | 92.3 |
| 8 | Need for blood transfusion | | 36 | 92.3 |

**Table 3:** Comparison of outcome variables

| Variables | No. of Previous LSCS | N | Mean | Std. Deviation | T | P-value |
|---|---|---|---|---|---|---|
| Maternal age | 1 LSCS | 12 | 31.0 | 5.4 | 1.492 | 0.144 |
| | ≥ 2 LSCS | 27 | 29.2 | 2.1 | | |
| Period of gestation | 1 LSCS | 12 | 36.0 | 1.5 | 2.531 | 0.016 |
| | ≥ 2 LSCS | 27 | 34.0 | 2.5 | | |
| Birtweight | 1 LSCS | 12 | 2.7 | 0.3 | 5.193 | <0.001 |
| | ≥ 2 LSCS | 27 | 2.0 | 0.4 | | |
| APGAR at 1 min | 1 LSCS | 12 | 8.3 | 0.5 | 8.573 | <0.001 |
| | ≥ 2 LSCS | 27 | 5.4 | 1.1 | | |
| APGAR at 5min | 1 LSCS | 12 | 9.3 | 0.5 | 6.378 | <0.001 |
| | ≥ 2 LSCS | 27 | 7.0 | 1.2 | | |

**Table 4:** Neonatal outcomes

| Variables | | Frequency (N) | Percentage (%) |
|---|---|---|---|
| Apgar score | <7 at 5 min | 9 | 23.1 |
| | >7 at 5 min | 30 | 76.9 |
| NICU admission | O2 | 6 | 15.38 |
| | CPAP | 15 | 38.46 |
| | VENTILATOR | 6 | 15.38 |
| Neonatal death | | 3 | 7.7 |

**Table 5:** Association of Previous LSCS with Intraoperative and Postoperative Outcomes

| Variables | | PREVIOUS LCS | | Total (n)% | Chi-Square, P-value |
|---|---|---|---|---|---|
| | | 1 LSCS (n) % | ≥ 2 LSCS (n)% | | |
| Placenta previa | | 9(75.0%) | 27(100%) | 36(92.3%) | 7.312, 0.007 |
| Placenta accreta spectrum | | 0(0.0%) | 6(22.2%) | 6(15.4%) | 3.152, 0.076 |
| Bladder injury | | 0(0.0%) | 3(11.1%) | 3(7.7%) | 1.444, 0.229 |
| Disseminated coagulation | | 3(25.0%) | 12(44.4%) | 15(38.5%) | 1.327, 0.249 |
| Need for blood transfusion | | 9(75.0%) | 27(100%) | 36(92.3%) | 7.312, 0.007 |
| Need for ICU admission | | 9(75.0%) | 27(100%) | 36(92.3%) | 7.312, 0.007 |
| Mode of delivery | CS with placental removal | 12(100%) | 18(66.7%) | 30(76.9%) | 5.200, 0.023 |
| | Cesarean hysterectomy | 0(0.0%) | 9(33.3%) | 9(23.1%) | |
| Duration of surgery | 1-2 HR | 9(75%) | 15(55.6%) | 24(61.5%) | 1.327, 0.249 |
| | ≥2 HR | 3(25%) | 12(44.4%) | 15(38.5%) | |

## Discussion

Placenta Accreta Spectrum (PAS) disorders pose significant challenges in obstetric care due to their association with high maternal morbidity and mortality. Optimizing feto-maternal outcomes requires a multidisciplinary approach, early diagnosis, and individualized management strategies.

In the present study, the feto maternal outcome, in PAS disorders with previous caesarean section were determined. The study includes 39 cases, among which majority were >30 years of maternal age (61.5%), multiparous women with para 2(61.5%), >para 2(7.7%), and with ≥2 LSCS 27 cases (69.2%) The data highlights trends in maternal age, parity, previous lower segment cesarean section (LSCS), which are crucial in understanding the predisposition to PAS. In a study by Silver *et al* in 2006 [5], placenta accreta was found in 0.24% of the population at the first caesarean, 0.31% at the second, 0.57% at the third, 2.13% at the fourth, 2.33% at the fifth, and reached values of 6.74% in the sixth caesarean section, according to a cohort study of repeated caesarean deliveries(6), Repeated pregnancies may contribute to uterine scaring and structural changes that predispose to abnormal placental adherence, which indicates that the risk of PAS escalates with each additional caesarean delivery.

A majority (58.9%) of patients in our study were admitted for an elective LSCS, while 33.3% presented with vaginal bleeding, a common antenatal complication of placenta previa and PAS. However, only 7.6% of cases had an antenatal diagnosis of PAS, but intraoperatively 6 cases were noted with placenta accreta, 3out of 6 cases were missed antenatally, underscoring the challenges in accurately identifying these high-risk cases before delivery. This low detection rate may be attributed to limitations in ultrasound sensitivity, lack of standardized screening protocols, or delayed referral of suspected cases to specialized centers. The sensitivity of ultrasound testing has grown to about 90%. The rate of prenatal detection is affected by the ultrasound signs employed, the operator's experience, the scanning settings, the equipment used, and the gestational age [7].

In our cohort, 76.9% of patients underwent cesarean section with placental removal, while 23.1% required cesarean hysterectomy due to morbid placental adherence, necessitating placenta left in situ.

In a study by Varlas VN *et al*, in the great majority of cases (83.4%), a cesarean hysterectomy with preservation of ovaries was performed [8].

The decision to perform hysterectomy is often influenced by factors such as severity of placental invasion, intraoperative bleeding, and maternal hemodynamic stability. The relatively high rate of hysterectomy in our study reflects the challenges of conservative management in cases with extensive placental invasion. However, hysterectomy of necessity following a planned cesarean section at 34-35

weeks with placental abandonment in situ is the ACOG-recommended procedure for PAS [9].

The study findings highlight significant maternal morbidity associated with PAS. Bladder injury, a recognized complication due to abnormal placental invasion into the lower uterine segment, occurred in 7.7% of cases. A strikingly high incidence (38.5%) of disseminated intravascular coagulation (DIC) was observed, likely linked to massive obstetric hemorrhage and consumptive coagulopathy. This underscores the critical need for meticulous surgical planning, intraoperative hemostatic measures, and access to blood products for resuscitation. Studies report the following incidence of surgical complications in women with PAS - bladder injury: 5-40%, ureteral injury: 0-18%, bowel injury/obstruction: 2-4%, venous thromboembolism: 4%, surgical site infection: 18-32%, maternal mortality: 1-7%, large-volume blood transfusions: 5-40%. [10] However no case of maternal mortality and surgical site infection, bowel and ureteric injury occurred in our study.

The duration of surgery was prolonged in a substantial proportion of cases, with 38.5% lasting more than two hours, reflecting the complexity of surgical intervention in PAS cases. Furthermore, 92.3% of patients required ICU admission and blood transfusion. In a study by Birendra R *et al* blood transfusion needed for 100% of cases and ICU admission done for 68.5% cases, duration of surgery more than two hours for 62.5% cases [1].

Our study results emphasize the intensive postoperative care needed for these high-risk deliveries. The high rate of ICU admissions aligns with existing literature that suggests PAS is associated with significant perioperative morbidity requiring advanced critical care support. The RCOG and ACOG protocols recommend judicious transfusion monitoring of blood loss, correction of coagulation disorders, as well as hydro electrolytic disorders. Follow-up of the patient postoperatively in the intensive care unit continues the correction of vital parameters [8].

In our study the mean maternal age of women with ≥ 2 LSCS was 29.2 years, mean gestational age at birth was 34 weeks with a significant p valve 0.016, whereas mean birth weight was 2.0kg, mean Apgar score at 1 min was 5.4, and mean Apgar score at 5 min was 7 with a very significant p valve <0.001.

In a study by Varlas VN *et al* the mean birth weight was 2.696kg [8], where in a study by Shlomi Toussia-Cohen *et al*, it was 2.660kg [11].

In our study, 23.1% of neonates had an Apgar score of <7 at 5 minutes, suggesting a notable rate of birth asphyxia. This is consistent with previous literature, which indicates that neonates born to mothers with PAS are at increased risk of perinatal compromise due to factors such as prematurity, intraoperative complications, and placental insufficiency.

In a study by Birendra R *et al* 50% of neonates had an Apgar score < 7 at 5 minutes. [1] In a study by Shlomi Toussia-Cohen *et al*, 8.3% cases had an Apgar score <7 at 5 minutes [11].

However, the majority (76.9%) had an Apgar score >7 at 5 minutes in our study, indicating that most neonates achieved adequate postnatal adaptation.

Neonatal respiratory distress was a major concern, with 15.38% of neonates requiring oxygen support through nasal prongs, 15.38% requiring higher ventilator support, and a striking 38.46% needing CPAP.

In a study by Birendra R *et al*, NICU admission required for 43.75% cases [1], where as in a study by Varlas VN *et al*, NICU admission required for 8.33% cases [8]. In a study by Shlomi Toussia-Cohen *et al*, 29.8% cases required NICU admission and 9.8%of neonates requires mechanical ventilation [11].

This high rate of respiratory support reflects the vulnerability of neonates born in PAS pregnancies, likely due to factors such as iatrogenic preterm birth (often necessary to optimize maternal outcomes), fetal distress, and perinatal hypoxia. These findings underscore the critical need for neonatal resuscitation preparedness, especially in tertiary centers managing PAS cases.

The neonatal mortality rate of 7.7% in our study is concerning and highlights the high perinatal risk associated with PAS pregnancies. In a study by Birendra R *et al*, 12.5% cases had neonatal death [1], whereas 0.4% neonatal death noted in a study by Shlomi Toussia-Cohen *et al*. [11].

The underlying causes of neonatal mortality may include extreme prematurity, birth asphyxia, and complications related to respiratory distress syndrome (RDS). These outcomes reinforce the importance of a well-coordinated perinatal care approach, including optimal timing of delivery, antenatal corticosteroid administration, and immediate neonatal intensive care support.

In our study when compared the cases with previous 1 LSCS and previous ≥ 2 LSCS, Placenta previa was universally present (100%) in women with ≥2 LSCS, compared to 75% of women with 1 LSCS. Furthermore, placenta accreta was observed in 22.2% of cases with ≥2 LSCS but was absent in women with only one previous cesarean, reinforcing the progressive risk of PAS with increasing cesarean deliveries. The underlying pathophysiology likely involves repeated uterine scarring and endometrial disruption, predisposing to abnormal placental adherence in subsequent pregnancies [12].

Bladder injury was reported in 11.1% of cases with previous ≥2 LSCS but was absent in previous 1 LSCS cases. This is consistent with previous literature suggesting that repeated cesarean sections increase the risk of surgical complications due to dense pelvic adhesions and altered anatomy, making bladder dissection more challenging [10].

Cesarean hysterectomy was required in 33.3% of cases with ≥2 LSCS but in none of the 1 LSCS cases. This trend aligns with existing evidence that the risk of hysterectomy increases with the number of prior cesareans due to PAS and intractable hemorrhage., likely due to increased PAS severity requiring more extensive surgical management.

Furthermore, the study underscores the necessity of patient counseling on the risks of repeat cesarean sections. Efforts to promote vaginal birth after cesarean (VBAC) where feasible and to minimize unnecessary primary cesareans may help reduce the incidence of PAS and associated complications in the future.

**Clinical implications**

Early identification of PAS through advanced imaging techniques, particularly ultrasound and MRI, enhances preparedness and allows for the development of a comprehensive delivery plan.

**Diagnosis**

Ultrasound is accurate in diagnosing PAS when performed by a well-trained operator [13]. USG features of PAS: 1)

Anormal placental lacunae, 2) Loss of retroplacental hypoechoic space, 3) Abnormalities of uterus - bladder interface - a. Bulge, b. Focal exophytic mass. 4)Myometrial thinning.

The PAS is more likely if more features are present, and likely more the invasion is increta or percreta. PAS is excluded in the absence of any ultrasound feature [14]. The ultrasound features of PAS helps the definitive prenatal diagnosis by 28 weeks' gestation (rather than 32 weeks) and allows timely patient counselling and planning of care.

Transabdominal scans are sufficient enough to make a diagnosis of PAS, few studies reported diagnosing placenta accreta by the use of TVS [12]. Transabdominal scans can be improved by selecting a higher frequency (5-9 MHz) transducer (linear if possible), and carefully 'walking' the scar from one end to the other, keeping the transducer perpendicular to the uterine wall.

Ultrasound examination must be carried out with a full bladder, as bladder outline is vital to identify the lower uterine segment, the presumed location of the previous caesarean delivery scar, thereby making the assessment of the placental position in relation to the presumed site of the scar possible. Without a full bladder, signs of bladder wall interruption, placental bulge and utero-vesical hyper vascularity cannot be assessed accurately [15]. Moderate probe pressure during TAS should be used as excessive pressure over probe can lead to a loss of retroplacental clear zone.

MRI has been used for the prenatal diagnosis of PAS. The Main MRI Features of PAS are 1) Uterine bulging, 2) Heterogeneous signal intensity within the placenta, 3) Dark intraplacental bands on T2-weighted imaging, 4) Focal interruption of myometrium, 5) Tenting of the bladder.

Raised suspicion of PAS, should trigger an early referral to a specialist centre with an experienced surgeon. Advanced planning should be made for management of delivery with immediate access to blood products, adult intensive care unit and neonatal intensive care unit by a senior multidisciplinary team approach including obstetrician, anaesthetist and gynaecologist with an experience in complex pelvic surgeries.

**Treatment**

Planned delivery from 35+0 to 36+6 weeks of gestation, in the absence of other risk factors provides the optimal balance between maternal and neonatal health [13] [16]. Massive haemorrhage, blood transfusion, risk of hysterectomy, lower urinary tract damage, infection and even maternal death are the risks associated with PAS, which could not be reduced by neither methotrexate nor arterial embolization, hence neither is recommended routinely. Following a decision of leaving the placenta in situ, delayed haemorrhage requiring hysterectomy has also been reported [17]. The role of conservative management in selected cases remains a topic of debate and the risks must be weighed against benefits.

Caesarean hysterectomy following extraction of baby with placenta in situ is the most widely practiced treatment for PAS, as attempts to its removal are associated with a considerable risk of haemorrhage [16]. It is associated with less morbidity 36% vs. 67% compared to those with attempted manual placental removal, henceforth antenatal diagnosis is very crucial in PAS [18].

Currently, there are three treatment options for PAS. The first is an elective hysterectomy. The second is expectant management (leaving the placenta in place). The third is conservative management (removing the placenta). Elective hysterectomy is the gold standard management but it may not be a preferable choice by some women. Expectant approach is associated with unacceptable high rate of morbidities, re-exploration and maternal death [19].

The conservative management includes resection of part of the myometrium, internal iliac artery embolization/ligation, and uterine sutures. More recent conservative approach is the Triple P approach.

It includes

- Perioperative placental localization,
- Pelvic devascularization by embolization of internal iliac arteries, and
- Placental non-separation and myometrial resection.

In the modified Triple P approach, ligation of the internal iliac vessels is used instead of embolization. The frequency of hysterectomy in women who had the modified triple P approach was 5/35 (14.28%) [20].

**Peripartum hysterectomy:** It is the last resort for uncontrolled PPH when all other methods fail. It is often indicated in placenta accreta, uterine rupture, or severe bleeding and is associated with significant morbidity and mortality.

There are of two types: subtotal hysterectomy and total hysterectomy.

Steps for Peripartum hysterectomy

1. **Preoperative Preparation**: Stabilize the patient with aggressive fluid resuscitation and blood product transfusion. Ensure availability of cross-matched blood, surgical team, and anaesthesia support.
2. **Surgical Access:** Perform a vertical midline or transverse Pfannenstiel incision to provide adequate exposure of the pelvic cavity.
3. **Control of Haemorrhage:** Temporarily compress or clamp uterine arteries using vascular clamps or surgical sutures to reduce active bleeding.
4. **Dissection of Uterine Attachments:** Divide and ligate the round ligaments bilaterally to mobilize the uterus. Open and dissect the broad ligaments, identifying and safeguarding the ureters. Mobilize the bladder downward by incising the vesicouterine peritoneum and separating the bladder from the lower uterine segment.
5. **Uterine Vessel Ligation:** The clamp, cut, drop technique in sequentially clamping, cutting, and ligating vascular pedicles to control bleeding efficiently is to done. This stepwise approach is critical in managing massive hemorrhage and ensuring rapid hemostasis during the procedure.
6. **Uterine Removal:** For subtotal hysterectomy, amputate the uterus at the level of the cervix, leaving the cervical stump in situ. For total hysterectomy, dissect and ligate the cardinal and uterosacral ligaments, and excise the uterus along with the cervix.
7. **Hemostasis and Inspection:** Ensure meticulous hemostasis by inspecting all pedicles, ligatures, and suture lines for bleeding. Use additional sutures, if necessary, to secure hemostasis.
8. **Abdominal Closure:** Irrigate the abdominal cavity to remove blood clots and confirm no retained tissue.

Close the abdominal incision in layers after placing appropriate drains if indicated.

9. **Postoperative Monitoring**: Transfer the patient to an intensive care unit for close monitoring of hemodynamic status, coagulation parameters, and organ function.

## Conclusion

Optimizing feto-maternal outcomes in PAS requires a proactive, multidisciplinary approach. Standardized protocols, early diagnosis, and individualized management strategies are crucial in reducing maternal morbidity and improving neonatal survival. Future research should aim to bridge existing gaps in knowledge and enhance access to specialized care worldwide.

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**Conflicts of interest:** None.

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