Original Research Article

Pregnancy Outcomes in Patients with Placenta Previa Due to Site of Placentation

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Abstract

***Background*:** The aim of this research is to evaluate pregnancy outcomes in patients with placenta previa due to the site of placentation. ***Method*:** This retrospective study included 105 cases conducted in the OBG department of Al AIN hospital for three years (January 2015 to October 2018). All cases of placenta previa admitted during this period were included in the study. Case records were obtained from the medical record section and carefully analyzed to find out the incidence, various types of placenta previa, its clinical presentation, and its outcome in relation to mode of delivery, birth weight, and maternal and perinatal morbidity. ***Results*:** Placental attachment site influenced the outcome of pregnancy. Placental attachment to the anterior wall was associated with shorter gestational age, low birth weight, low Apgar score, higher prenatal bleeding rate, increased postpartum hemorrhage, longer duration of hospitalization, higher blood transfusion and higher hysterectomy rates compared to cases with lateral/posterior wall placenta. Placental attachment at the incision site of previous cesarean section significantly increased the incidence of complete placenta previa compared with placental attachment at a site without incision, but did not significantly influence pregnancy outcomes. Placental attachment to the anterior wall was an independent risk factor for postpartum hemorrhage in patients with placenta previa. ***Conclusion*:** The site of placental attachment in patients with placenta previa influences the pregnancy outcome. When the placenta is located on the anterior wall, clinicians should pay attention to the adverse pregnancy outcomes and the possibility of massive postpartum hemorrhage.
Keywords: pregnancy, Placenta previa, Placentation, OBG department, transabdominal.

INTRODUCTION

Placenta previa is defined as a situation of the placenta partially or wholly in the lower uterine segment of the uterus [1], The estimated incidence of placenta previa at term is 1 in 200 pregnancies [5, 9] and this increase correlates to rising rates of cesarean deliveries, increased maternal age, and use of assisted reproductive technology (ART), placing greater demands on maternity-related resources. For pregnancies, at more than 16 weeks of gestation, the term low-lying placenta should be used when the placental edge is less than 20 mm from the internal os on transabdominal or transvaginal scanning (TVS). If the placenta is thought to be low lying (less than 20 mm from the internal os) or previa (covering the os) at the routine fetal anomaly scan, a follow-up ultrasound

examination including a TVS is recommended at 32 weeks of gestation to diagnose persistent low-lying placenta and/or placenta praevia.

Placenta previa is a major cause of maternal morbidity and mortality because of the associated massive antepartum and intrapartum hemorrhage. In previa patients, postpartum hemorrhage is substantial, which increases maternal complications. Placenta previa is also associated with abnormal placentation and preterm delivery.

In recent years, an increasing number of researchers believe that the placenta previa position has an important influence on the pregnancy outcome [2, 3]. During the course of clinical treatment of placenta previa, obstetricians should be aware of not only the

types of placenta previa (complete /partial or marginal placenta previa) but also the position of placental attachment (e.g., anterior uterine wall, posterior wall, whether the placenta overlaps a surgical scar from a previous cesarean section). The highest rates of complication for both mother and newborn are observed when these conditions are only diagnosed at delivery.

Placenta accreta is a spectrum disorder ranging from abnormally adherent to deeply invasive placental tissue. (Introduced by FIGO in 2018 [4]) Luke *et al.,* [5]. This terminology is misleading as 'morbidly adherent' does not encompass the abnormally invasive end of the accreta spectrum (increta and percreta), which usually have the worst clinical outcomes [16, 17]. In order to overcome these difficulties, the terms 'placenta accrete spectrum' or 'abnormally adherent and invasive placenta' should be used to include both the abnormally adherent and invasive forms of accreta placentation [18]. In the 1990s, the maternal mortality of placenta percreta was reported to be as high as 7% of cases [19]. More recent large series have reported lower rates of maternal death and this is likely to be further improved by screening for placenta accreta spectrum in women at high risk and in planning the delivery in specialist centers [20–22]. Women with anterior placenta are at increased risk of blood loss [5, 8]. Placenta previa covering the internal cervical os and anterior placentation are independent risk factors (OR 4.1 and OR 3.5, respectively) for massive hemorrhage during cesarean section. US case–control study from the National Institute of Child Health and Human Development (NICHD) Maternal-Fetal Medicine Units (MFMU) Network Cesarean Section Registry has shown that maternal hemorrhagic morbidity is more common in women with previa (19% versus 7%, adjusted RR 2.6, 95% CI 1.9–3.5) and the main factors associated with maternal hemorrhage include pre-delivery anaemia, thrombocytopenia, diabetes and magnesium use. The risk of massive hemorrhage together with the possibility of needing a blood transfusion has been estimated to be approximately 12 times more likely in a caesarean section for placenta previa than in caesarean delivery for other indications [18, 20].

Need for the Study
Placenta previa is a major cause of maternal morbidity and mortality because of the associated massive antepartum and intra-partum hemorrhage. This study is conducted to know the various clinical presentations and feto-maternal outcome in cases of placenta previa in a teaching hospital.

Patient Selection
This retrospective study reviewed the records of 105 pregnant women who had been admitted to Al Ain Hospital from January 2015 to October 2018. All cases of placenta Previa were diagnosed clinically or by ultrasound, were included in the study. Among the cases of placenta previa, cesarean section was the mode of delivery. All case records were obtained from medical record section and were carefully analyzed to find out the prevalence, risk factors attributing to the etiology of placenta previa, various clinical presentations, and types of placenta previa, intra-operative findings, management including perinatal and maternal outcome. It included the following:

- Age of the Patient (Higher maternal age).
- Rate of PPH. (Postpartum hemorrhage) and Blood Transfusion Rate.
- Number of previous cesarean section.
- Higher gravidity (multigravida) Parity.
- Age at Diagnosis of placenta Previa.
- APH (Antepartum Hemorrhage) at which trimester? (2nd or 3rd Trimester).
- Birth weight (BW) at the time of delivery.
- Mode of delivery (Either had Normal vaginal delivery or Cesarean section).
- Type of Placentation (Either Anterior/Posterior).

METHODS
Statistical Analysis
Data were analyzed using Statistical Package for Social Sciences (SPSS) version 21.0 for Windows. Data analyzed using descriptive statistics were presented as the means and standard deviations (means ± SD) to determine the risk factors for Placental Accreta Spectrum (PAS) disorders and postpartum hemorrhage in patients with placenta previa and to evaluate the effect of the placental attachment position on the pregnancy outcome.

Factors affecting the placental attachment site in placenta previa
As shown in Table 1, several factors influence the placental attachment site in placenta previa, including multi-gravidity, number of uterine cavity operations, and previous cesarean section. Age did not influence the site of placental attachment. Higher gravidity, number of uterine surgeries, and the presence of previous cesarean section were all associated with a greater possibility of placental attachment to the anterior wall.

Table: 1

	Multigravida	Previous cesarean section	Placenta previa diagnosed at which gestation	APH at which trimester
Valid	105	105	105	105
Missing	0	0	0	0
Mean	16	18	11.75	25.25

	Multigravida	Previous cesarean section	Placenta previa diagnosed at which gestation	APH at which trimester
Median	13.5	19	12.5	23
Mode	15	No mode	No mode	No mode
STD. Deviation	4.24	3.16	4.65	6.85

Effect of placentation on pregnancy outcomes in placenta previa patients

To exclude the influence of placental attachment to the site of the previous incision, we compared the pregnancy outcomes in cases of placenta previa where the patient had no history of cesarean section. A total of 105 patients met the requirements, including 48 cases of placenta located in the anterior wall, 7 cases of the placenta in the lateral and 38 posterior wall.

The results are shown in Table 2. There were no differences in the rate of PAS disorders or the incidence of complete placenta previa between the anterior and posterior walls. However, site of placenta previa significantly influenced the pregnancy outcome; placental attachment to the anterior wall was associated with shorter gestational age, low birth weight, lower Apgar score, higher prenatal bleeding rate, increased postpartum hemorrhage, longer duration of hospitalization, and higher blood transfusion and hysterectomy rates compared to cases with placental attachment to the posterior wall, and the differences between the two groups were significant.

Table: 2

Placenta previa type			
	1.Anterior Placenta previa	**2.posterior Placenta previa**	**3.low lying/Central placenta previa**
Valid	105	105	105
Missing	0	0	0
Mean	12	10.75	2
Median	12	9.5	2
Mode	13	No mode	2
STD. Deviation	1.15	5.12	0.82

Table: 3

	No of total placenta previa	**No of cases ended in cesarean section**	**Normal of cases ended in normal delivery**
Valid	105	105	105
Missing	0	0	0
Mean	10.75	20.25	5
Mode	9	No mode	No mode
Median	9	21	4
STD. Deviation	3.5	8.66	4.32

Effect of placental attachment to previous cesarean section incision site on pregnancy outcomes in patients

Here we studied cases of placental attachment to the anterior wall/Posterior wall/Lateral wall. The results showed placental attachment to the incision site had little effect on the pregnancy outcome. However, the incidence of complete placenta previa and PAS disorders was significantly higher in patients with placental attachment to the incision site compared to patients with no attachment to incision site.

Risk factors for postpartum hemorrhage in patients with placenta previa

According to the 2015 American College of Obstetricians and Gynaecologists (ACOG) guidelines [9], intraoperative bleeding ≥1000 mL is the diagnostic criterion for postpartum hemorrhage. We performed logistic regression analysis to study the risk factors for postpartum hemorrhage in patients with placenta previa. The maternal age, number of uterine cavity operations, number of cesarean sections and abortions, PAS disorders, placental attachment site (anterior wall, lateral wall, or posterior wall), and placenta previa types were used as the independent variables. The logistic regression analysis revealed three independent risk factors for postpartum hemorrhage in patients with placenta previa: PAS disorders, placenta previa types, and placental attachment site. Therefore, we concluded that placental attachment to the anterior wall was an independent risk factor of postpartum hemorrhage in patients with placenta previa.
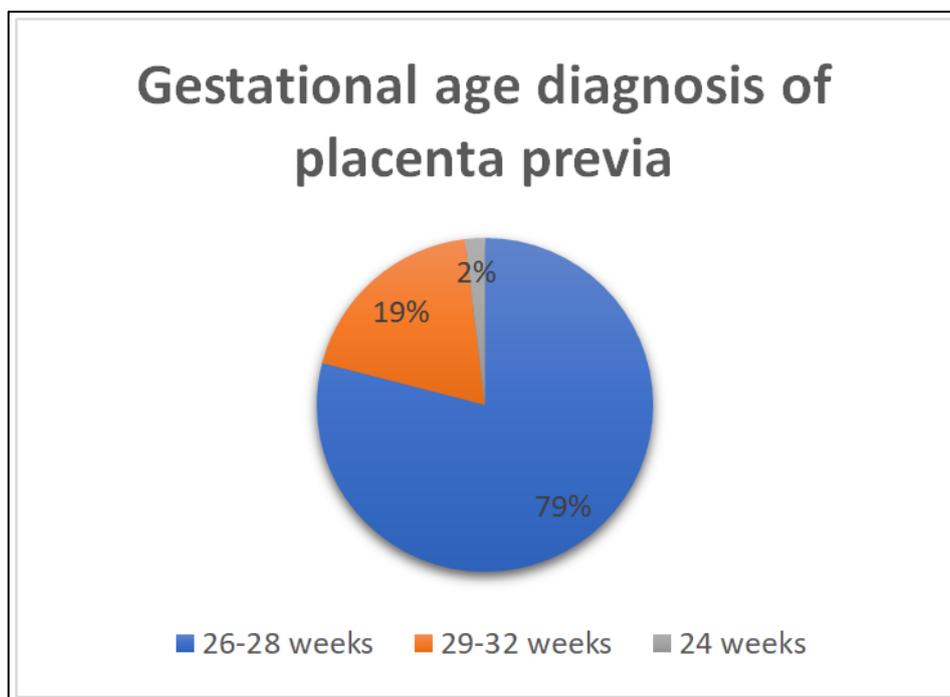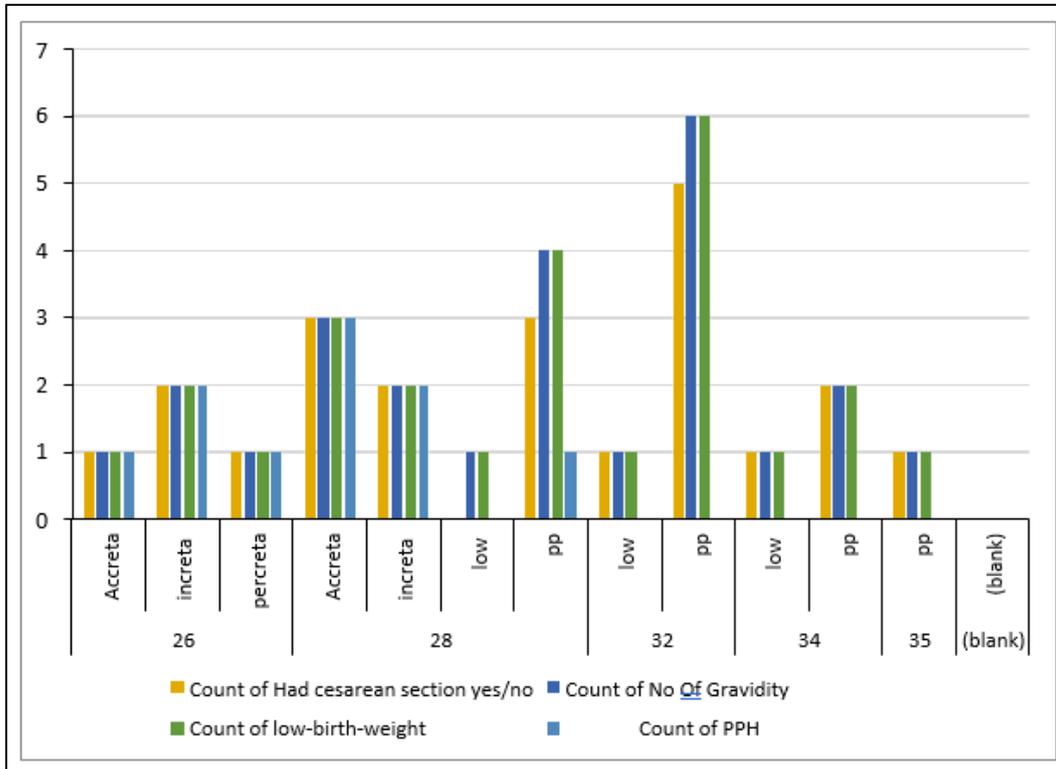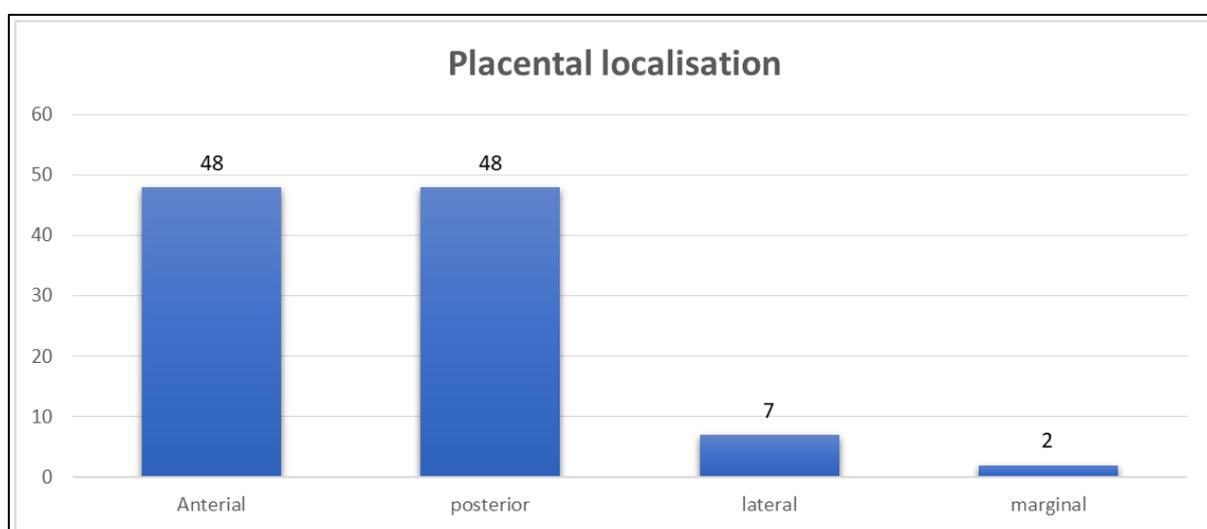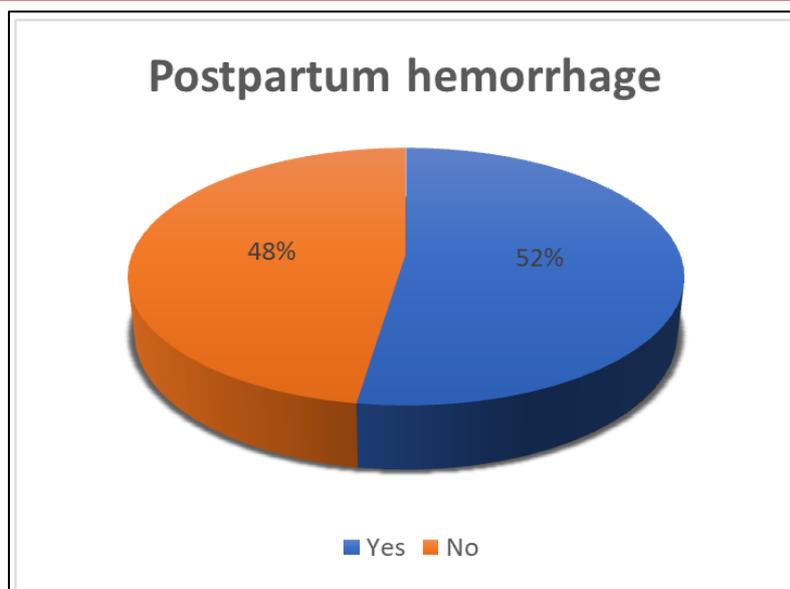
RESULTS

Placental attachment site influenced the outcome of pregnancy. Placental attachment to the

anterior wall was associated with shorter gestational age, low birth weight, low Apgar score, higher prenatal bleeding rate, increased postpartum hemorrhage, longer duration of hospitalization, higher blood transfusion and higher hysterectomy rates compared to cases with lateral/posterior wall placenta. Placental attachment at the incision site of previous cesarean section significantly increased the incidence of complete placenta previa compared with placental attachment at a site without incision, but did not significantly influence pregnancy outcomes. Placental attachment to the anterior wall was an independent risk factor for postpartum hemorrhage in patients with placenta previa.

Figure: Summary of the Findings

Postpartum hemorrhage

Placental localisation

DISCUSSION

Placenta previa is a well-established complication of pregnancy associated with high maternal and perinatal complication rates [4–9]. The risk of an emergent bleed associated with placenta previa has been reported to be 4.7% by 35 weeks of gestation, 15% by 36 weeks of gestation, 30% by 37 weeks of gestation and 59% by 38 weeks of gestation [3, 7].

All epidemiological studies of the last 2 decades have shown a direct association between the increase in cesarean deliveries and the incidence of placenta accreta spectrum (abnormally adherent and invasive placenta) in subsequent pregnancies worldwide [21]. The 2016 Nordic Obstetric Surveillance Study found that the risk of invasive placentation increases seven-fold after one prior caesarean section [22]. A meta-analysis of five cohorts and 11 case– control studies reported a summary OR of 1.96 (95% CI 1.41– 2.74) for placenta accreta spectrum after a caesarean

section [23]. The risk of placenta accreta spectrum increases with the number of previous cesarean sections. A systematic review reported an increase in the incidence of accreta placentation from 3.3–4.0% in women with placenta praevia and no previous cesarean delivery, to 50–67% in women with three or more cesarean deliveries. When stratified for the number of previous cesarean sections, the OR for placenta accreta spectrum in a subsequent pregnancy ranges between 8.6 (95% CI 3.536–21.078)111 and 17.4 (95% CI 9.0–31.4) for two previous cesarean sections, and 55.9 (95% CI 25.0– 110.3) for three or more cesarean sections. Placenta previa is another important risk factor for placenta accreta spectrum A large multicentre US cohort study noted that for women presenting with placenta previa and prior cesarean section the risk of accreta placentation is 3%, 11%, 40%, 61% and 67% for one, two, three, four, and five or more cesarean deliveries, respectively. The incidence of placenta accreta spectrum increases from 1.7 per 10 000 women overall to 577 per 10 000 in women with both a

previous cesarean section and placenta previa [24]. Other additional risk factors include maternal age and ART, in particular in vitro fertilization Advanced maternal age (35 years or more) in women without a previous caesarean section increases the OR by 1.30 (95% CI 1.13–1.50) for every 1-year increase in age [25].

Maternal complications in placenta previa are primarily the result of massive hemorrhage. Median estimated blood loss in cohorts ranges from 2000 to 7800 ml and the median number of units of blood transfused is 5 units [26]. Antenatal diagnosis of placenta accrete spectrum reduces maternal and peripartum hemorrhage and morbidity [27]. Multidisciplinary management in a maternity unit with access to maternal and neonatal intensive care is often required for women with a placenta accreta spectrum. For such care to be organised, when diagnosis made antenatally.

Women diagnosed with placenta accreta spectrum should be cared for by a multidisciplinary team in a specialist center with expertise in diagnosing and managing invasive placentation. Delivery for women diagnosed with placenta accreta spectrum should take place in a specialist center with logistic support for immediate access to blood products, an adult intensive care unit and NICU by a multidisciplinary team with expertise in complex pelvic surgery. The elective delivery of women with placenta accreta spectrum should be managed by a multidisciplinary team, which should include senior anesthetists, obstetricians and gynecologists with appropriate experience in managing the condition and other surgical specialties if indicated.

Effect of placenta previa on pregnancy outcomes in anterior/Posterior placentation

The rate of complications in placenta previa patients was higher when the placenta was attached to the anterior wall than when it was attached to the posterior wall. Liu J *et al.,* [10] the placental attachment site affects the maternal prognosis in patients with placenta previa. They found that anterior placentation led to a significant increase in bleeding and hysterectomy rates compared to posterior placentation However, placenta previa significantly influenced the pregnancy outcome. Anterior placentation was associated with significantly lower gestational age, low birth weight, lower Apgar score, higher rate of antepartum and postpartum hemorrhage, longer hospitalization time, and higher blood transfusion and hysterectomy rates compared to posterior placentation. In addition, placental attachment to the anterior wall was an independent risk factor for postpartum hemorrhage in patients with placenta previa. This result is similar to the previous study by Baba Y *et al.,* [11].

Effect of placenta previa on maternal outcomes when the placenta is attached to the anterior/Posterior wall

When the placenta is attached to the anterior wall, hemorrhage may occur due to the location of the uterine incision. When the placenta is embedded at this location, it cannot be completely avoided during a cesarean section. Pushing off the placental tissue or creating a hole in the placenta during childbirth will lead to a large amount of bleeding in a short time.

After the uterine muscle is cut, the destruction of the uterine muscle fiber integrity also leads to poor uterine contractions, resulting in increased bleeding. To prevent the placenta from crossing into the uterine cavity in patients with anterior placentation, the caesarean section incision may occasionally be made closer to the uterine body. Increased bleeding may be associated with increased uterine tissue thickness. Additionally, anterior placentation will lead to an increased number of blood vessels near the incision. Intraoperative incision of these vessels may lead to severe bleeding [12]. Therefore, we speculated that the increased number of blood vessels near the incision may be another reason for postpartum hemorrhage. More vessels are involved in anterior placentation than in posterior placentation; therefore, surgical incisions resulting in rupture of blood vessels can cause increased bleeding in the former case. In this study, logistic regression was used to analyze the correlation between anterior placentation and postpartum hemorrhage. We found that anterior placentation was an independent risk factor for postpartum hemorrhage in patients with placenta previa. This finding suggests that we should be more cautious in treating placenta previa when the placenta is attached to the anterior wall. The reassessment in surgery is equally important.

Especially when it is found that the uterine vessels in the lower segment are significantly dilated and even the placenta is visible through the serosa, it is necessary to invite experienced obstetricians and obstetricians to participate in the operation. The position of surgical incision should avoid the main attachment of the placenta as far as possible.
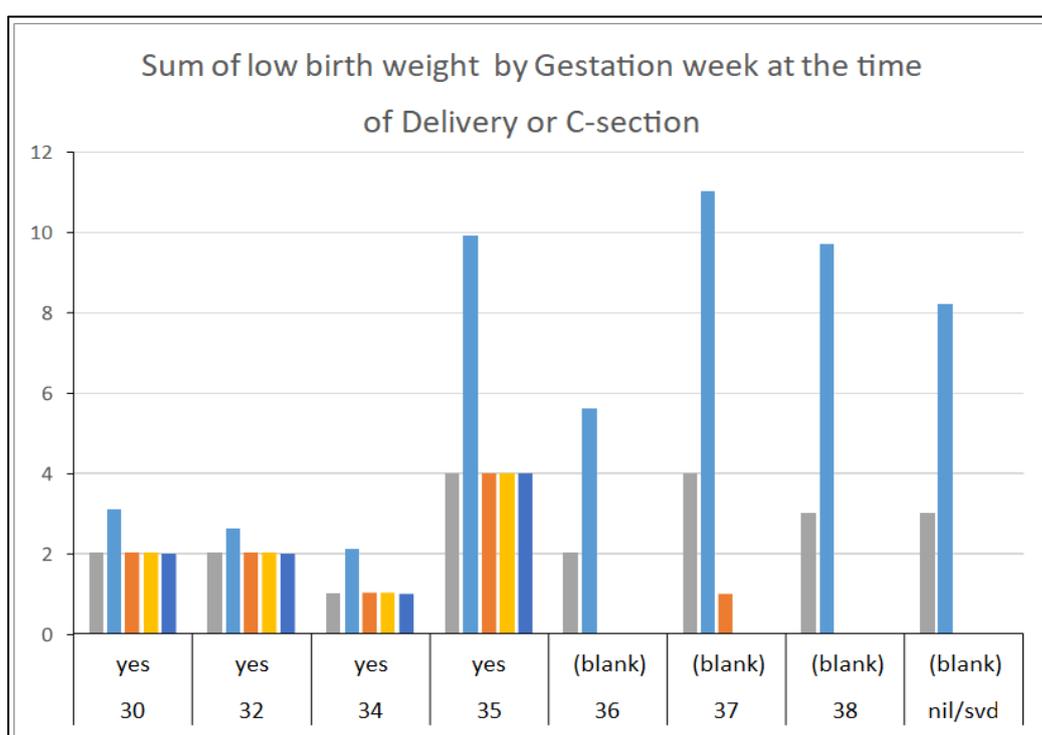
Adequate blood preparation and active cooperation between anesthesiologists and intensive care units should be done before the operation, to avoid the occurrence of acute hemorrhagic shock and multiple organ dysfunction, and to reduce hysterectomy rate as much as possible.

Effect of placenta previa on neonatal outcomes

The neonatal outcomes of placenta previa patients are closely related to the amount of bleeding. Vaginal bleeding during pregnancy leads to the insufficient blood supply to the fetus, resulting in fetal distress. When patients with placenta previa experience severe antepartum hemorrhage, the pregnancy often needs to be terminated in advance to save the lives of

the mother and fetus, resulting in an iatrogenic preterm birth that could harm both the mother and the baby. Yeniel *et al.,* [15] showed that the premature delivery rate was significantly higher and the fetal weight was lower in patients with placenta previa, indicating that placenta previa can seriously affect fetal health. In this study, we found that the antepartum hemorrhage rate was higher in placenta previa patients with anterior placentation than in those with placental attachment at the lateral or posterior walls. Antepartum hemorrhage affects the placental blood supply, which can cause intrauterine fetal hypoxia. Moreover, repeated vaginal bleeding can increase the chances of genital infection. Antepartum hemorrhage can also lead to a higher rate of iatrogenic preterm labor. All these situations are undesirable for a good neonatal outcome. Additionally,

placental tissue cannot be completely avoided during caesarean section when patients with placenta previa have anterior placentation. During delivery, a large volume of blood loss will occur within a short period of time, inevitably causing neonatal blood loss. Therefore, newborns whose placentas are located on the anterior wall have a higher rate of respiratory distress syndrome and a lower Apgar score, and attention should be paid to the safety of the mother and newborn in such cases. In cases of placenta previa with anterior placentation, it is necessary to prolong fetal age by inhibiting uterine contraction, reduce and treat prepartum hemorrhage in time, promote fetal maturity and terminate pregnancy at the right time, in order to ensure perinatal mother and child safety.

Relationship between placental attachment to the uterine incision and central placenta previa

Studies have shown that patients with a history of cesarean section have a significantly higher incidence of placenta previa [16]. In this study, the rate of complete placenta previa in patients with placentation at the incision site was 39. This finding is possibly due to endometrial defects and chronic inflammation caused by the uterine scar. The blood supply to the scar is not sufficient to meet the needs of the placenta; therefore, it will stimulate the expansion of the placenta into the lower part of the uterus or even cause progression to central placenta previa. The scar in the lower uterine segment affects isthmus uteri extension in the third-trimester pregnancy, upward migration of the placenta will be blocked, causing the placenta to remain in the lower uterine segment, resulting in abnormal placental adhesion [21, 22].

Relationship between placental attachment to the uterine incision and placental implantation

The primary mechanism underlying placental implantation is believed to be the development of decidual dysplasia and excessive trophoblast invasion [23]. Because the uterine scar possesses both these characteristics, embryos can easily become implanted in the front wall incision of the womb during a repeat pregnancy. This process results in defects in the endometrium and myometrium. When the embryo is implanted at the incision site, the villi and placenta can easily invade the myometrium and even the serosal layer, resulting in placental implantation [24]. Additionally, a meta-analysis by Roberge *et al.,* reported that the uteri of more than half of women who previously underwent caesarean sections exhibited sections of thinning and loss of continuity [28]. Some

researchers believe that [29] angiogenic factors and factors conducive to the secretions of the invading trophoblast cells are the primary factors that influence implantation [29]. The present study found that the incidence of PAS disorders was significantly higher when the placenta was attached to the incision site.

The Limitations of this Study

For a retrospective study, with a single source and limited sample, there may be a bias of selection. In summary, it is considered the placental attachment site in placenta previa has a major influence on the pregnancy outcome. We should be aware of the potential for postpartum hemorrhage in cases of placenta previa where the placenta is attached to the anterior wall of the uterus. Because the adverse outcomes of patients with placenta previa are mainly related to the amount of bleeding, uterine contractions should be inhibited to reduce antepartum hemorrhage and to prolong the gestational age of the fetus. Full risk assessment should also be performed before the operation to develop an individualized surgical plan to reduce intraoperative bleeding and improve the perinatal outcomes. Patients with placental attachment to the uterine incision should be highly alert regarding the potential for PAS disorders. The cooperation of healthcare professionals from multiple disciplines is necessary to ensure comprehensive preoperative communication between doctors and patients, to prepare for emergency rescue, and to reduce the incidence of intraoperative bleeding and perioperative complications, which will ultimately reduce the mortality rate of pregnant women.

CONCLUSION

The site of placental attachment in patients with placenta previa has an important influence on the pregnancy outcome. When the placenta is located on the anterior wall, clinicians should pay attention to the adverse pregnancy outcomes and possibility of massive postpartum hemorrhage.

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