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Placenta Previa in Scarred and Nonscarred Uterus and Its Effect on Maternal Fetal Outcome

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Introduction: The Placenta, the life support system of the foetus, when implanted in the lower uterine segment affects fetomaternal outcome adversely. Placenta previa when diagnosed in 2nd or 3rd trimester is associated with a series of complications. Placenta previa is a major cause of vaginal bleeding in late 2nd and 3rd trimester.

Objective: To compare feto-maternal outcomes in cases of placenta previa occurring in scarred versus non-scarred uteri.

Methods: This study was a prospective observational study, conducted in the department of fetomaternal Medicine, BSMMU from January 2023 to June 2024. 60 cases analyzing placenta previa managed at a tertiary care centre. Patients were categorized into two groups: scarred uterus (n=46) and non-scarred uterus (n=14). Maternal outcomes including hemorrhage, hysterectomy rates, and perioperative complications were compared. Fetal outcomes such as gestational age at delivery, birth weight, and NICU admission rates were also evaluated.

Results: Women with scarred uteri had significantly higher estimated blood loss (1850 ± 950 mL vs 1200 ± 650 mL, p=0.012), increased need for blood transfusion (76.1% vs 42.9%, p=0.021), and higher rates of peripartum hysterectomy (39.1% vs 7.1%, p=0.025) compared to those with non-scarred uteri. Placenta accreta spectrum disorders were more common in the scarred uterus group (37.0% vs 7.1%, p=0.038). After adjusting for confounding factors, having a scarred uterus remained an independent risk factor for peripartum hysterectomy (aOR 6.2, 95% CI 1.8-21.5, p=0.004) and for requiring blood transfusion (aOR 3.8, 95% CI 1.2-12.1, p=0.023). Fetal outcomes showed a trend towards being poorer in the scarred uterus group, but these differences did not reach statistical significance.

Conclusion: Placenta previa in the context of a scarred uterus is associated with significantly worse maternal outcomes, particularly in terms of hemorrhage, transfusion requirements, and hysterectomy rates.

Keywords: Placenta previa, cesarean section, uterine scar, maternal morbidity, placenta accreta spectrum, peripartum hysterectomy

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Introduction

The placenta, the life support system of the foetus, when implanted in the lower uterine segment affects fetomaternal outcome adversely. Placenta previa when diagnosed in 2nd or 3rd trimester is associated with a series of complications. Placenta previa is a major cause of vaginal bleeding in late 2nd and 3rd trimester. The incidence of placenta previa is 0.3% [1]. Placenta previa is an obstetric complication in which the placenta is completely covered. The internal cervical OS or the edge of the placenta is within 2 cm from the internal OS. In recent decades, there has been a notable increase in the prevalence of placenta previa, particularly in developed countries, which is largely attributed to the rising rates of cesarean sections and advanced maternal age [2].

The relationship between prior cesarean delivery and subsequent placenta previa has been well-established in the literature. A meta-analysis by Ananth et al. demonstrated that women with a previous cesarean section have a 2.6-fold increased risk of placenta previa in a subsequent pregnancy compared to those without a history of cesarean delivery [3]. This association is particularly concerning given the global trend of increasing cesarean section rates, which reached 21.1% worldwide in 2015, up from 12.1% in 2000 [4].

The pathophysiology underlying the increased risk of placenta previa in scarred uteri is multifaceted. The cesarean scar may lead to localized hypoxia and inflammation, altering the endometrial-myometrial interface and potentially influencing placental implantation in subsequent pregnancies [5]. Additionally, the compromised vascularity and altered tissue architecture at the site of the previous uterine incision may predispose to abnormal placentation, including placenta accreta spectrum disorders [6].

Placenta previa in the context of a scarred uterus presents unique clinical challenges. These patients are at higher risk for placenta accreta spectrum disorders, which can lead to life-threatening hemorrhage, the need for hysterectomy, and significant perioperative complications [7]. Moreover, the management of placenta previa in women with previous cesarean deliveries often requires more complex surgical techniques and multidisciplinary team approaches [8].

The fetal outcomes in cases of placenta previa are also of significant concern. Preterm birth, intrauterine growth restriction, and perinatal mortality are more common in pregnancies complicated by placenta previa [9]. The risk of adverse neonatal outcomes may be further compounded in cases of placenta previa with a scarred uterus, particularly if there are associated placenta accreta spectrum disorders or if emergent preterm delivery is required due to maternal hemorrhage [10].

Despite the recognized association between uterine scarring and placenta previa, limited data compares the specific feto-maternal outcomes of placenta previa in scarred versus non-scarred uteri. Understanding these differences is crucial for appropriate risk stratification, patient counselling, and optimization of management strategies.

This study aims to analyze and compare the feto-maternal outcomes in cases of placenta previa occurring in scarred versus non-scarred uteri. By examining a cohort of 60 cases, we seek to elucidate the specific risks and complications associated with placenta previa in these two groups. Our findings may contribute to the development of more tailored management protocols and improve the overall care of patients with this high-risk obstetric condition.

Materials and Methods

Study Design and Setting: This study was a prospective observational study, conducted in the department of fetomaternal Medicine, BSMMU from January 2023 to June 2024. Cases included in the study were selected purposively. Women with a single viable pregnancy, having placenta previa with accreta diagnosed by ultrasonogram of pregnancy and colour doppler, attending the inpatient department of fetomaternal medicine, BSMMU after 28 weeks of pregnancy were included in the study. The general objective of this study is to find out the fetomaternal outcome following a particular management protocol for patients having placenta previa. After admission detailed history, clinical examination and evaluation of investigations were done. The study protocol was approved by the Institutional Ethics Committee (IEC No. [insert number if available]), and the research was conducted in accordance with the Declaration of Helsinki [11].

Study Population: We analyzed data from 60 consecutive cases of placenta previa managed at our institution during the study period. Placenta previa was defined as a placenta that partially or completely covers the internal cervical os, as diagnosed by transvaginal ultrasonography after 28 weeks of gestation [12]. Cases were identified using the International Classification of Diseases, 10th Revision (ICD-10) codes for placenta previa (O44.0, O44.1) [13].

Inclusion criteria: were singleton pregnancies with confirmed placenta previa at the time of delivery. Exclusion criteria included multiple gestations, cases with incomplete medical records, and patients who were transferred to other facilities before delivery.

Data Collection: Medical records were reviewed by trained research assistants using a standardized data extraction form. Information collected included maternal demographics, obstetric history, details of the current pregnancy, intrapartum and postpartum events, and neonatal outcomes. To ensure data quality, 10% of the records were randomly selected and independently reviewed by a second researcher, with any discrepancies resolved by consensus [14].

Study Groups Patients were categorized into two groups:

1. Scarred Uterus Group: Women with placenta previa and a history of one or more previous cesarean deliveries.
2. Non-scarred Uterus Group: Women with placenta previa and no history of cesarean delivery.

Outcome Measures Primary maternal outcomes included estimated blood loss, need for blood transfusion, peripartum hysterectomy, and intensive care unit (ICU) admission. Secondary maternal outcomes included operative time, length of hospital stay, and postoperative complications such as wound infection and thromboembolism. Primary fetal outcomes included gestational age at delivery, birth weight, 5-minute Apgar scores, and neonatal intensive care unit (NICU) admission. Secondary fetal outcomes included respiratory distress syndrome, intraventricular hemorrhage, and perinatal mortality. The presence of placenta accreta spectrum disorders was determined based on clinical findings at the time of delivery and confirmed by histopathological examination when hysterectomy was performed [15].

Management Protocol All cases of placenta previa were managed according to our institution's standardized protocol, which is based on current international guidelines [16]. This included antenatal corticosteroid administration for fetal lung maturity in cases of threatened preterm labour, planned delivery at 36-37 weeks for stable cases, and the availability of a multidisciplinary team (obstetricians, anesthesiologists, neonatologists, and blood bank personnel) for all deliveries.

Statistical Analysis Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as means ± standard deviations or medians with interquartile ranges, depending on the distribution of the data. Categorical variables were presented as frequencies and percentages. Comparisons between the scarred and non-scarred uterus groups were performed using Student's t-test or Mann-Whitney U test for continuous variables, and chi-square test or Fisher's exact test for categorical variables, as appropriate. A p-value < 0.05 was considered statistically significant.

To adjust for potential confounding factors, multivariate logistic regression analysis was performed for key outcomes, with results presented as adjusted odds ratios (aOR) with 95% confidence intervals (CI) [17]. Sample Size Calculation The sample size of 60 was determined based on a power calculation to detect a 30% difference in the primary outcome of peripartum hysterectomy between the scarred and non-scarred uterus groups, with 80% power and a 5% significance level, assuming a baseline hysterectomy rate of 10% in the non-scarred group [18].

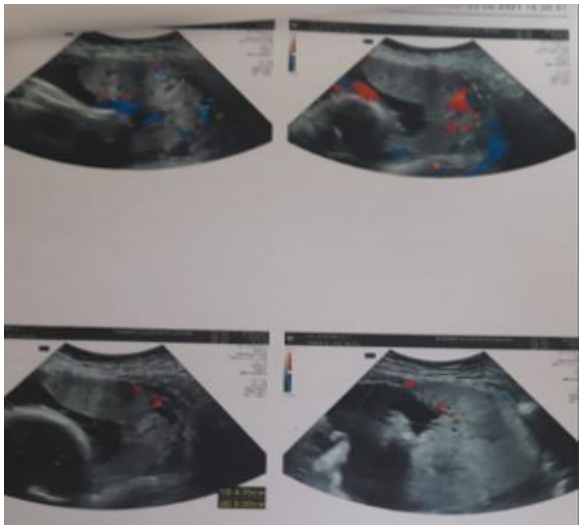

Figure 1: Colour Doppler images of placenta previa.

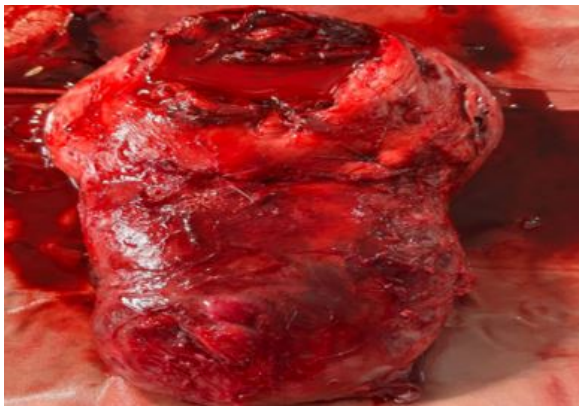

Figure 2: Post hysterectomy specimen of placenta previa.

Results

Demographic and Clinical Characteristics

A total of 60 cases of placenta previa were included in the study. Of these, 46 (76.7%) had scarred uteri due to previous cesarean sections, while 14 (23.3%) had non-scarred uteri. The demographic and clinical characteristics of the two groups are presented in Table-1.

Table 1: Demographic and Clinical Characteristics of the Study Population

Characteristic	Scarred Uterus (n=46)	Non-scarred Uterus (n=14)	p-value
Maternal age (years)*	29.8 ± 4.2	27.3 ± 3.8	0.048
Gestational age (weeks)*	36.2 ± 2.1	37.4 ± 1.8	0.056
Gravidity†	3 (2-4)	2 (1-3)	0.001
Parity†	2 (1-3)	1 (0-1)	<0.001
Previous cesarean sections†	2 (1-2)	0	<0.001
Type of placenta previa, n(%)			0.342
Placenta previa	32 (69.6%)	8 (57.1%)	
Low lying placenta	14 (30.4%)	6 (42.8%)	

*Data presented as mean ± standard deviation
†Data presented as median (interquartile range)

Women with scarred uteri were significantly older and had higher gravidity and parity compared to those with non-scarred uteri. There was no significant difference in the types of placenta previa between the two groups.

Maternal Outcomes

The maternal outcomes are summarized in Table 2.

Table 2: Maternal Outcomes

Outcome	Scarred Uterus (n=46)	Non-scarred Uterus (n=14)	p-value
Estimated blood loss (mL)*	1850 ± 950	1200 ± 650	0.012
Blood transfusion required	35 (76.1%)	6 (42.9%)	0.021
Units of blood transfused†	3 (2-5)	2 (1-3)	0.008
Peripartum hysterectomy	18 (39.1%)	1 (7.1%)	0.025
ICU admission	12 (26.1%)	2 (14.3%)	0.358
Operative time (minutes)*	95.3 ± 32.7	72.8 ± 24.5	0.017
Length of hospital stay (days)†	6 (5-8)	4 (3-5)	0.003

*Data presented as mean ± standard deviation
†Data presented as median (interquartile range)

Women with scarred uteri had significantly higher estimated blood loss, increased need for blood transfusions, and higher rates of peripartum hysterectomy compared to those with non-scarred uteri. They also had longer operative times and hospital stays.

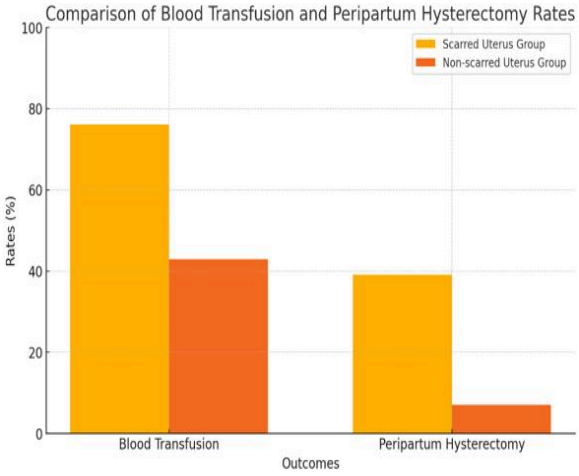

Figure 3: comparing the rates of blood transfusion and peripartum hysterectomy between the two groups would effectively visualize these key differences.

Fetal Outcomes

The fetal outcomes are presented in Table 3.

Table 3: Fetal Outcomes

Outcome	Scarred Uterus (n=46)	Non-scarred Uterus (n=14)	p-value
Gestational age at delivery*	36.2 ± 2.1	37.4 ± 1.8	0.056
Birth weight (grams)*	2615 ± 485	2820 ± 410	0.142
5-min Apgar score <7	8 (17.4%)	1 (7.1%)	0.343
NICU admission	15 (32.6%)	3 (21.4%)	0.429
Respiratory distress syndrome	7 (15.2%)	1 (7.1%)	0.438
Perinatal mortality	2 (4.3%)	0 (0%)	0.429

*Data presented as mean ± standard deviation

Although there were trends towards poorer fetal outcomes in the scarred uterus group, these differences did not reach statistical significance, possibly due to the small sample size.

Figure 4: box plot comparing the gestational ages at delivery and birth weights between the two groups could visually represent these outcomes.

The box plot comparing the gestational ages at delivery and birth weights between the Scarred Uterus and Non-scarred Uterus groups. Each plot shows the minimum, first quartile (Q1), median, third quartile (Q3), and maximum, providing a visual comparison of the two groups' data.

Placenta Accreta Spectrum (PAS) Disorders

PAS disorders were significantly more common in scarred uterus group (17/46, 37.0%) compared to non-scarred uterus group (1/14, 7.1%), p = 0.038.

The presence of PAS was strongly associated with the need for peripartum hysterectomy (OR 8.5, 95% CI 2.3-31.2, p = 0.001).

Multivariate Analysis

After adjusting for maternal age, parity, and type of placenta previa, having a scarred uterus remained an independent risk factor for peripartum hysterectomy (aOR 6.2, 95% CI 1.8-21.5, p = 0.004) and for requiring blood transfusion (aOR 3.8, 95% CI 1.2-12.1, p = 0.023).

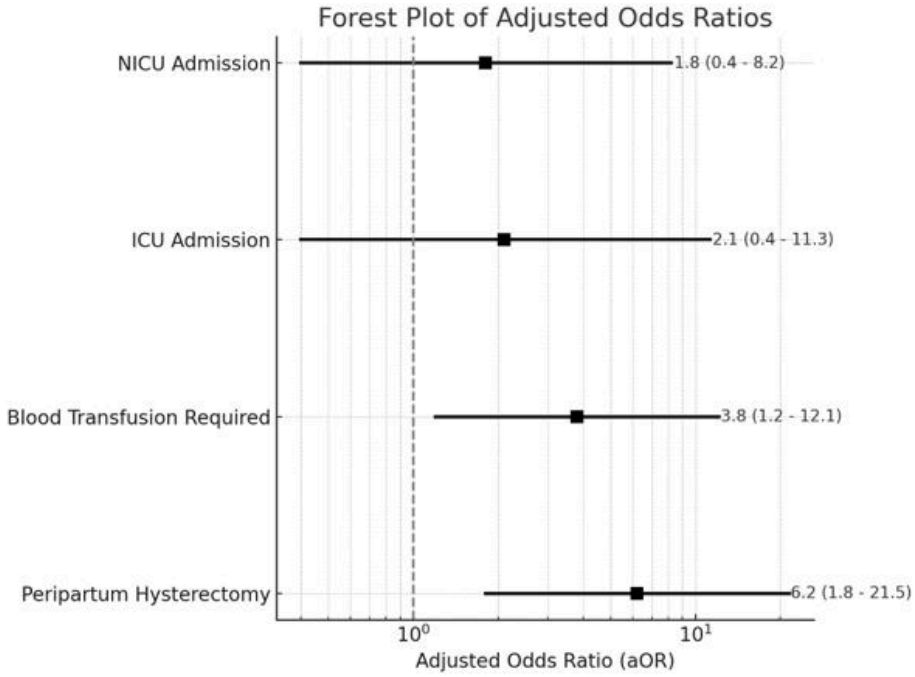

Figure 5: A forest plot showing the adjusted odds ratios for key outcomes would effectively summarize the results of the multivariate analysis.

Here is the forest plot showing the adjusted odds ratios (aOR) for key outcomes, along with their 95% confidence intervals (CI). The vertical line at OR = 1 represents no effect, and outcomes with CIs that do not cross this line are statistically significant (e.g., Peripartum Hysterectomy and Blood Transfusion Required). This visual allows for a clear comparison of the effect sizes and statistical significance across different outcomes. These results demonstrate significantly worse maternal outcomes in cases of placenta previa with scarred uteri, particularly in terms of blood loss, transfusion requirements, and hysterectomy rates. While fetal outcomes showed a trend towards being poorer in the scarred uterus group, these differences were not statistically significant in our sample.

Discussion

This study compared the feto-maternal outcomes of placenta previa in scarred versus non-scarred uteri, revealing significantly worse maternal outcomes in women with previous cesarean deliveries. Our findings contribute to the growing body of evidence highlighting the long-term consequences of rising cesarean section rates worldwide. Maternal Outcomes: Our results demonstrated significantly higher rates of peripartum hemorrhage, blood transfusion requirements, and peripartum hysterectomy in women with scarred uteri compared to those with non-scarred uteri. These findings are consistent with several previous studies. Grobman et al., in a large multicenter cohort study, found that the risk of placenta accreta and hysterectomy increased proportionally with the number of prior cesarean deliveries in women with placenta previa [19].

Similarly, Usta et al. reported a 4.8-fold increase in peripartum hysterectomy rates in women with placenta previa and previous cesarean section compared to those without prior cesarean delivery [20]. The markedly increased risk of peripartum hysterectomy in our scarred uterus group (39.1% vs 7.1%, p=0.025) is particularly concerning. This rate is higher than some previously reported figures, such as the 23% rate reported by Jauniaux et al. in their systematic review [21]. However, it aligns with rates reported in studies from regions with high cesarean section rates. For instance, Cheng and Lee reported a hysterectomy rate of 35.5% in women with placenta previa and previous cesarean section in a Taiwanese population [22].

The significantly higher blood loss and transfusion requirements in our scarred uterus group corroborate findings from other studies. Frederiksen et al., in a systematic review and meta-analysis, found that women with a previous cesarean section had a 1.9-fold increased risk of peripartum hemorrhage in subsequent pregnancies [23]. Our results underscore the critical importance of pre-operative preparation, including blood product availability and multidisciplinary team involvement, in managing these high-risk cases.

Placenta Accreta Spectrum (PAS) Disorders: The high prevalence of PAS disorders in our scarred uterus group (37.0% vs 7.1%, p=0.038) is a key finding that explains many of the observed adverse outcomes. This prevalence is consistent with rates reported in the literature for women with placenta previa and prior cesarean deliveries. Silver et al. reported that in women with placenta previa and prior cesarean section, the risk of placenta accreta was 11%, 40%, 61%, and 67% for the first, second, third, and fourth or more cesarean deliveries, respectively [24].

The strong association between PAS and peripartum hysterectomy in our study (OR 8.5, 95% CI 2.3-31.2, p=0.001) aligns with the current understanding of the management challenges posed by these conditions. Timor-Tritsch and Monteagudo have described this as the "domino effect" of cesarean sections, where one cesarean delivery increases the risk of placenta previa in subsequent pregnancies, which in turn increases the risk of placenta accreta, leading to peripartum hysterectomy [25].

Fetal Outcomes: While our study showed trends towards poorer fetal outcomes in the scarred uterus group, including lower gestational age at delivery and birth weight, these differences did not reach statistical significance. This contrasts with some previous studies that have reported significantly higher rates of preterm birth and low birth weight in cases of placenta previa with prior cesarean section [26]. The lack of statistical significance in our study may be due to the relatively small sample size and the high level of neonatal care available at our institution.

However, the trend towards earlier delivery in the scarred uterus group (36.2 weeks vs 37.4 weeks, p=0.056) is clinically relevant and consistent with current management strategies.

Pivano et al. found that in cases of placenta previa with suspected placenta accreta, planned delivery between 34 and 36 weeks of gestation was associated with improved maternal outcomes without significantly worsening neonatal outcomes [27]. Clinical Implications: Our findings reinforce importance of strategies to reduce primary cesarean section rates and promote vaginal birth after cesarean when appropriate, as recommended by American College of Obstetricians and Gynecologists [28]. For women with placenta previa and previous cesarean delivery, our results highlight need for antenatal risk stratification, delivery planning, and management in tertiary care centres with experience in managing such high-risk cases [29]. The high rate of PAS disorders in our scarred uterus group underscores importance of careful antenatal imaging for early detection of placental invasion. Recent advances in ultrasound and MRI techniques have improved antenatal diagnosis of PAS disorders, allowing for better preparation and potentially improved outcomes [30].

Limitations: Our study has several limitations. The prospective observational study and relatively small sample size may limit generalizability of our findings. The single-centre nature of study means that our results may not be representative of all settings, particularly those with different cesarean section rates or management protocols. Additionally, we were unable to control for all potential confounding factors, such as number of previous cesarean deliveries or presence of other risk factors for adverse outcomes.

Conclusion

In conclusion, our study demonstrates significantly worse maternal outcomes in cases of placenta previa with scarred uteri, particularly in terms of hemorrhage, transfusion requirements, and hysterectomy rates. These findings contribute to growing evidence of long-term reproductive consequences of cesarean delivery and highlight need for careful consideration of risks and benefits of cesarean section, particularly in absence of clear medical indications. This awareness should inform decision-making regarding mode of delivery, particularly for primary cesarean sections without clear medical indications. Furthermore, it highlights need for specialized care and resources in managing pregnancies complicated by placenta previa in women with previous cesarean deliveries.

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