J. Perinat. Med. 39 (2011) 693–696 • Copyright © by Walter de Gruyter • Berlin • Boston. DOI 10.1515/JPM.2011.086

Risk factors for emergent preterm delivery in women with placenta previa and ultrasound findings suspicious for placenta accreta

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Abstract

Aim: To identify factors associated with emergent preterm delivery in women with placenta previa and suspected accreta.

Methods: Pregnancies with placenta previa and ultrasound findings suspicious for accreta were identified. Demographic information and obstetric and neonatal outcomes were obtained from electronic medical records. Mann-Whitney *U*, Fisher's exact test, and Kaplan-Meier analysis were used. Continuous data are expressed as median (interquartile range).

Results: Twenty-one patients with placenta previa and suspicion for accreta delivered at a median of 34 weeks [32–37]. Fourteen bled prior to delivery, 10 at <32 weeks. Fifty-seven percentage of deliveries were planned at a median gestational age of 36.5 weeks [34–37] vs. 32 weeks [29.5–32.5] for emergent deliveries ($P<0.001$). Emergent delivery was associated with transfusion of a median of nine units packed red blood cells (PRBCs) [4–16] compared to 4.5 units [1–7] with planned delivery ($P=0.05$).

Conclusion: Planned late perterm delivery is reasonable and likely women with placenta previa and ultrasound findings suspicious for placenta accreta who do not experience antepartum bleeding. Those women with multiple episodes of antepartum bleeding or bleeding prior to 32 weeks gestation are at increased risk of emergent preterm delivery.

Keywords: Placenta accreta; placenta previa; preterm birth.

Introduction

Placenta accreta refers to a placenta that is abnormally adherent to the uterus and is thought to be due to an absence of Nitabuch's layer, the spongiosus layer of the decidua. Histology usually demonstrates trophoblast invasion into the myometrium without intervening decidua [8]. This abnormal implantation prevents normal placental separation and subsequent mechanisms of hemostasis resulting in massive hemorrhage. Average blood loss at delivery ranges from 3000–5000 mL, and maternal mortality has been reported as high as 7% in cases of placenta accreta [6, 7].

The incidence of placenta accreta has been increasing, likely due to the increasing rate of cesarean delivery (CD) [5]. The number of prior cesarean sections exponentially increases the risk of placenta accreta, especially in the presence of placenta previa [13]. Several sonographic features are highly suggestive of placenta accreta and can aid in the prenatal identification of this entity. These features include placental lacunae which may give the placenta a ''moth-eaten'' appearance and may demonstrate turbulant flow on power and color doppler, thinning of the myometrium overlying the placenta, loss of the retroplacental ''clear space,'' protrusion of the placenta into the bladder, and increased vascularity of the uterine serosa-bladder interface [3].

Antepartum diagnosis of placenta accreta and planned cesarean hysterectomy without attempted removal of the placenta have been shown to decrease the hemorrhagic morbidity associated with this entity [2, 4]. Despite this, clear guidelines for the timing of planned delivery do not exist. An expert review suggests scheduling delivery at 36–37 weeks of gestation after documented fetal lung maturity or by 38 weeks in the absence of labor or hemorrhage [8]. In order to reduce the likelihood of unscheduled emergent deliveries at term, a recent clinical opinion published by the Society for Maternal Fetal Medicine recommends planned late preterm delivery in those cases without antepartum bleeding or other pregnancy complications [9]. Given the ongoing risk of hemorrhage with delayed delivery, identifying those women at highest risk for emergent preterm delivery would be beneficial. This study was designed to identify risk factors for emergent preterm delivery in women with placenta previa and sonographic findings suspicious for accreta.

Methods

We conducted a retrospective cohort study of all pregnancies evaluated in our ultrasound unit from January 2002 to January 2010 with third trimester evidence of placenta previa and sonographic findings suspicious for placenta accreta. Cases of suspected accreta without placenta previa were not included. Pregnancies with suspected congenital anomalies and those that did not deliver at our institution were excluded.

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It is standard practice in our unit to evaluate placental location with transabdominal ultrasound during the routine fetal anatomic survey conducted at approximately 20 weeks gestation. If the placenta appears in close proximity to or covering the cervical os, follow-up imaging at approximately 28 weeks' gestation to evaluate placental location is recommended. For those cases of placenta previa with a history of uterine scar, namely prior cesarean section, intramural myomectomy or multiple dilation and curretages, we routinely evaluate the placental/myometrial interface in the setting of a full bladder during the third trimester ultrasound. Placenta accreta is suspected in the presence of placental lacunae and decreased myometrial thickness between the placenta and the bladder. Increased vascular flow is usually noted in the lacunae, and occasionally there is protrusion of the placenta into the bladder. Follow-up evaluation with magnetic resonance imaging (MRI) is done at the discretion of individual practitioners. Our ultrasonography unit is accredited by the American Institute of Ultrasound in Medicine, and all ultrasonographers are certified by the American Registry of Diagnostic Medical Sonographers.

Demographic information, including maternal age, parity, and risk factors for preterm birth (PTB), as well as antepartum course and delivery information were extracted from electronic medical records. Risk factors for PTB that were assessed included a history of prior PTB, history of cervical excision (e.g., cold knife cone or loop excision electrocautery surgery), limited prenatal care, short interpregnancy interval, obesity, and assisted reproductive techniques. Bleeding sufficient to warrant admission and occurring prior to the day of delivery was considered ''antepartum bleeding.'' Bleeding resulting in non-scheduled delivery at the time of presentation was not considered ''antepartum bleeding.'' Deliveries occurring at least 24 h prior to a scheduled cesarean section were categorized as emergent deliveries. Maternal steroid administration to promote fetal lung maturity, amniocentesis to assess fetal lung maturity, need for neonatal intensive care unit (NICU) admission and assisted ventilation were also noted.

Obstetrical management was at the discretion of individual practitioners. In general, women with suspected placenta accreta underwent planned cesarean hysterectomy between 36 and 37 weeks gestation.

Statistical analysis was performed with Fisher's exact test, Mann-Whitney *U*-test, Spearman's ρ (correlation), logistic regression, and Kaplan-Meier log rank analysis. Continuous data are presented as median (interquartile range). The Statistical Package for Social Science (SPSS, Chicago, IL, USA) was used for statistical analysis.

This study was approved by the Institutional Review Board of Weill Cornell Medical College.

Results

Placenta previa was identified in 154 patients, 21 of whom had imaging findings suspicious for accreta. Hysterectomy was required in all 21 patients, and accreta was confirmed by pathology in each case. Of the 133 cases of placenta previa without imaging findings suspicious for accreta imaged in our unit over the same time period, three cesarean hysterectomies were required, one for persistent atony during a term scheduled CD, and two that ultimately demonstrated pathologic evidence of placenta accreta. Both cases of accreta involved a complete posterior placenta previa. One woman had a history of a prior CD, a dilation and evacuation, and a laparoscopic myomectomy, but she had no antepartum sonographic or MRI suggestion of accreta. The other had a history of a prior CD with no suggestion of accreta on antenatal ultrasound evaluation. Cesarean hysterectomy was performed for persistent hemorrhage from the lower uterine segment, and focal accreta in the posterior lower uterine segment was noted on pathologic evaluation.

Thus, the sensitivity and specificity of ultrasound findings for placenta accreta in the setting of placenta previa were 91.3% and 100%, respectively, and the positive and negative predictive values were 100% and 98.5%.

Table 1 depicts the baseline characteristics of the women in the study. There was no difference in age, ethnicity, risk factors for preterm delivery, placental location, number of prior CDs, or other uterine surgeries between those women who underwent planned versus emergent deliveries. Except for one patient with a surgical history notable only for two dilation and curretages, each woman had at least one prior lower transverse cesarean section. The only twin gestation in the series underwent an emergent delivery at 32 weeks for bleeding.

MRI was performed at the discretion of the treating obstetrician. Only 38% of patients with suspected placenta accreta underwent MRI evaluation. There were no cases of sonographically-suspected placenta accreta that did not have findings consistent with placenta accreta on MRI. There was no correlation between placental location (anterior, posterior, or central) and performance of MRI ($P = 0.08$). All cases of suspected placenta accreta with placenta previa had loss of the retroplacental clear space. Placental lacunae was the most

Table 1 Maternal characteristics for women with ultrasound findings of placenta previa and accrete.

	Planned delivery	Emergent delivery	P-value
Age (median)	37	35	0.38
Ethnicity			1.0
Caucasian	9	7	
African American	1	0	
Hispanic	2	0	
Asian	0	1	
Asian Indian	0	1	
Risk factor for PTB			0.67
None	8	5	
Prior PTB	3	2	
Obesity	1	1	
Uterine anomaly	0	1	
Placental location			0.67
Central	4	4	
Anterior	8	5	
Prior CD			0.32
Zero or one	8	8	
Two or more	4	1	
Other uterine surgery			0.61
Myomectomy	2	1	
Metroplasty	0	1	
Septum resection	0	1	

PTB = preterm birth, CD = cesarean delivery.

common sonographic finding present in 20 of 21 patients followed by thinning of the myometrium in the area over the placenta in 15 of the 21, while increased vascularity at the myometrial-bladder interface occurred with the least frequency in only 2 of 21 cases. The majority of cases (71%) were suspected based on a combination of placental lacunae, absent retroplacental clear space, and thinning of the overlying myometrium.

Median gestational age at delivery was 34 weeks (32–37). There were 12 planned deliveries (57%) at a median gestational age of 36.5 weeks (34–37) vs. nine emergent deliveries (43%) at a median gestational age of 32 weeks (29.5–32.5) ($P<0.001$). Fourteen patients (67%) had at least one bleeding episode prior to the time of delivery, 10 of whom bled at <32 weeks. The median interval between first bleed and delivery was 30 days. Kaplan-Meier analysis revealed earlier delivery in those patients with bleeding at <32 weeks ($P=0.04$) as depicted in Figure 1. Among 11 patients who did not experience bleeding prior to 32 weeks, three required emergent delivery for bleeding, two at 32 weeks and one at 34 weeks.

Bleeding prior to 32 weeks' gestation was associated with a higher rate of emergent delivery compared to those without bleeding remote from term, though the difference was not statistically significant (60.0% vs. 27.3%; $P=0.20$). Those with multiple bleeding episodes were significantly more likely to undergo emergent delivery compared to those with a single episode or no antepartum bleeding, 80.0% vs. 9.1% ($P=0.002$).

Emergent delivery was associated with transfusion of a median of nine units PRBCs (4–16) compared to 4.5 units (1–7) with planned delivery ($P=0.05$). The number of patients with anemia (hematocrit <30%) prior to delivery was similar for both emergent and planned deliveries (17% vs. 22%; $P=1.0$).

Neonatal follow-up was available for all 21 cases. There were no stillbirths or neonatal deaths. Our NICU admits neonates based on gestational age, birth weight, and frequently for observation. Therefore, we considered mechanical ventilation to represent significant neonatal morbidity. Seven neonates required mechanical ventilation, six of whom were delivered emergently between 28 and 32 weeks gestation. The seventh was a planned delivery at 34 weeks who required mechanical ventilation after a bradycardiac event of unclear etiology. Emergent delivery (67% vs. 8%; $P=0.02$) and gestational age ($r=-0.73$, $P<0.001$) were significantly associated with mechanical ventilation whereas antepartum steroid administration and amniocentesis for fetal lung maturity did not affect need for mechanical ventilation.

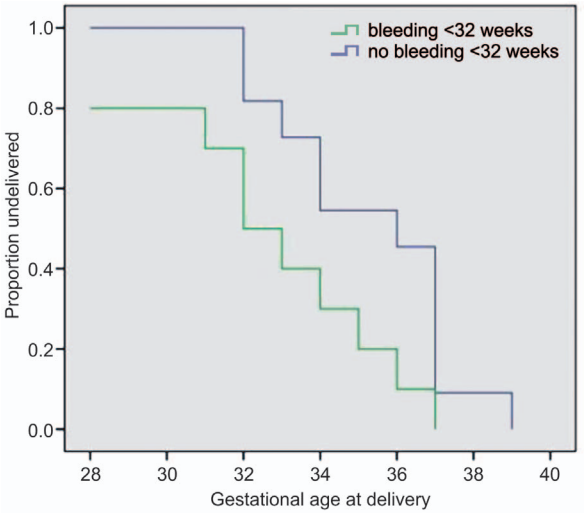

Figure 1 Comparison of placenta accreta with and without antepartum bleeding at <32 weeks.

Discussion

The incidence of placenta accreta is increasing with the rate of CD. Routine obstetric ultrasound has improved the prenatal detection of placenta accreta allowing for the opportunity of planned cesarean hysterectomy. Planned delivery maximizes the availability of personnel and resources required to manage obstetric hemorrhage, leading to a decreased rate of complications related to hemorrhage [11, 12].

Our data suggests that women with suspected placenta accreta who experience antepartum bleeding prior to 32 weeks will deliver at earlier gestational ages and that multiple bleeding episodes is associated with a very high probability of emergent preterm delivery. While those with bleeding early in the third trimester or multiple episodes of antepartum bleeding are at highest risk, the absence of bleeding does not indicate a minimal risk of emergent delivery. In our patients, three of 11 patients without bleeding prior to 32 weeks underwent emergent preterm delivery prior to 36 weeks.

Our findings are consistent with those of earlier studies. In a recent retrospective study, 35% (22/62) of prenatally diagnosed placenta accreta required emergent delivery [12]. Cesarean hysterectomy was typically scheduled for 34–35 weeks of gestation in this cohort, so emergent delivery occurred prior to 34 weeks. Antepartum bleeding accounted for 80% of these emergent deliveries, but the particular gestational ages at which bleeding and delivery occurred were not included. Eller et al. described 56 cases of prenatally suspected placenta accreta [4]. Forty percent had scheduled deliveries at a mean gestational age of 35.4 weeks while 60% required emergent delivery at a mean gestational age of 32.2 weeks. Additionally, 63% (22/35) of the emergent deliveries were performed for vaginal bleeding. The major limitation of Eller's study is that 28% of antenatally suspected cases of placenta accreta were not confirmed on histopathological evaluation, and the distribution of these unconfirmed cases amongst the scheduled and emergent deliveries was not addressed. Given the risk of hemorrhage and the associated maternal and neonatal morbidity, our findings support the conclusion of a recent decision analysis that the preferred gestational age at which to electively deliver

women with placenta accreta lies between 34 and 37 weeks [10].

The strength of our study lies in the prenatal diagnosis of placenta accreta. Our sonographers routinely assess women with a prior uterine scar and anterior placenta or placenta previa for placenta accreta. Pathology findings consistent with placenta accreta for all patients in this study confirmed the accuracy of our sonographic assessment.

Nevertheless, the small sample size and retrospective nature of this study introduce several limitations. The small number of cases included in the present study limits our ability to assess the risks and benefits of expected management versus delivery at any particular gestational age. Our finding that those with bleeding prior to 32 weeks were more likely to require emergent delivery compared to those without early third trimester bleeding (60.0% vs. 27.3%) was not statistically significant. *Post-hoc* power analysis revealed a power of only 33% to detect a magnitude of this difference at a P-value of <0.05. Our series of 21 patients over eight years is consistent with the rate of antenatally suspected placenta accreta described by other institutions; Warshak et al. included 62 cases over 18 years, Eller et al. reported on 56 cases from a 12-year period, and Angstmann et al. described 23 cases in nine years [1, 4, 12].

In addition, the antepartum bleeding that was considered sufficient to require hospital admission was not objectively calculated, and there is likely to be significant variation between individual obstetricians regarding the necessity of hospitalization. It is possible that some patients not admitted for antepartum bleeding did experience bleeding as outpatients. The study is also limited by lack of uniform management of placenta accreta; decisions regarding timing of delivery were made by individual practitioners, yet it likely represents the range of standard practice at most large institutions.

In conclusion, in women with placenta previa for whom there are ultrasound findings suspicious for placenta accreta, antepartum bleeding is associated with earlier delivery compared to those who do not bleed. For those women without antepartum bleeding scheduled delivery at 34–37 weeks is reasonable. Given the increased risk of emergent preterm delivery in cases with multiple episodes of vaginal bleeding or bleeding prior to 32 weeks gestation, delivery prior to or at 34 weeks gestation should be considered.

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The authors stated that there are no conflicts of interest regarding the publication of this article.

Received March 14, 2011. Revised June 17, 2011. Accepted June 23, 2011. Previously published online July 30, 2011.