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Abnormal placentation: Twenty-year analysis

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KEY WORDS

Placenta accreta
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Objective: This study was undertaken to determine whether the rate of abnormal placentation is increasing in conjunction with the cesarean rate and to evaluate incidence, risk factors, and outcomes.

Study design: Cases from 1982-2002 were identified by histopathologic or strong clinical criteria. Risk factors were assessed in a matched case-control study, and analyzed using conditional logistic regression models.

Results: There were 64,359 deliveries, with cesarean rates increasing from 12.5% (1982) to 23.5% (2002). The overall incidence of placenta accreta was 1 in 533. Significant risk factors for placenta accreta in our final analysis included advancing maternal age (odds ratio [OR] 1.13, 95% CI 1.089-1.194, $P < .0001$), 2 or more cesarean deliveries (OR 8.6, 95% CI 3.536-21.078, $P < .0001$), and previa (OR 51.4, 95% CI: 10.646-248.390, $P < .0001$).

Conclusion: The rate of placenta accreta increased in conjunction with cesarean deliveries; the most important risk factors were previous cesarean delivery, previa, and advanced maternal age.
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The reported rate of cesarean delivery (CD) in the United States increased dramatically from 4.5% in 1965, to the current rate, 26.1%, reported for 2002.^{1,2} Of great concern is that the incidence of placenta accreta has also increased at an alarming rate from less than 1 in 30,000 deliveries in the 1930s through the 1950s to 1 in 2500 in 1980.³ Prior uterine surgery, myomectomy, and curettage, in addition to cesarean section, have all been associated with abnormal placentation, but more ominously, placenta previa has been associated with a high risk of placenta accreta.

Because the increasing rate of CDs may contribute significantly to the rising incidence of abnormal placen-

tal adherence, we wanted to first determine whether the CD rate at our center reflects an increased number of cases with abnormal placentation, in particular placenta accreta, increta, or percreta, and secondly, we sought to determine the greatest risk factors for gestations complicated by placenta accreta.

Material and methods

Data were abstracted from: OB File (delivery case records), ICD-9 codes, University of Chicago pathology database, and the Obstetrics and Gynecology ultrasound database, from January 1, 1982, to December 31, 2002. Abnormal placentation was defined histopathologically as well as clinically by one of the following: (1) histopathologic confirmation, criteria unchanged over a 20-year period, on a hysterectomy specimen; (2)

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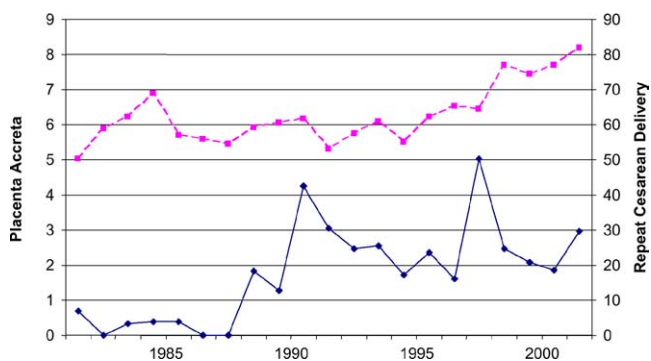


Figure 1 Rates of placenta accreta (solid line) and repeat cesarean delivery (dashed line) per 1000 deliveries at the University of Chicago, 1982-2002. Note that different scales for placenta accreta (left axis) and repeat CD (right axis) are used. ◆, Rate of accreta; ■, rate of repeat cesarean.

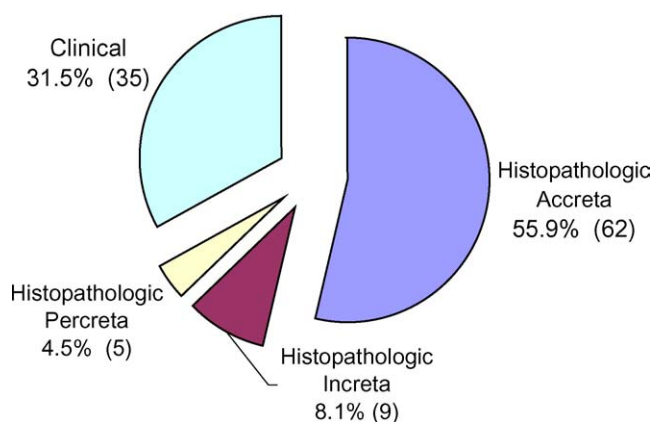


Figure 2 Diagnosis of abnormal placentation.

Table I Risk factors for cases and controls

	Case (n = 111)		Control (n = 339)		Conditional logistic regression P value
	No.	%	No.	%	
Prior CD	55	49.55	50	14.75	< .0001
Age > 35 y	36	32.43	34	10.03	< .0001
Previa	35	31.53	3	0.88	< .0001
Multiparity ≥5	44	39.64	74	21.83	< .0001
History of abortion	52	46.85	124	36.58	.048
Prior curettage	27	24.32	111	32.74	.086
Myomectomy	0	0	4	0.294	*

P < .05 is significant.

* No cases had myomectomy.

difficult manual, piecemeal removal of the placenta, performed if there was no evidence of placental separation 20 minutes after parturition, despite active management of the third stage of labor (ie, intravenous oxytocin, massaging the uterus, drainage of blood from placenta, and gentle, controlled traction of the umbilical cord); (3) heavy continued bleeding from the implantation site of a well contracted uterus after placental delivery during CD. Patients with myomatous uteri or malignancy were excluded. Predictor variables included maternal age, gravidity, parity, prior CDs, previa, prior uterine surgery, and prior curettage or abortions.

After describing our case series, we performed a matched case-control analysis, matching on year of delivery. Three controls were randomly selected for each case by a computer technician, not involved in this study, who performed a random number generator program to query the OB File database on a yearly basis during the 20-year study period. Power analysis was focused on the odds ratio (OR) of developing placenta accreta in women with or without prior cesarean delivery. Assuming low correlation in exposure

between cases and controls (20%), and a 15% or 20% rate of prior cesarean delivery among the controls, we would have 80% power ($\alpha = .05$) to detect an OR of 2.3 and 2.1, respectively, using 3 matched controls. The power gained by 4:1 matching would have been approximately 3%, and is small relative to the cost of collecting data for an additional 110 controls. Cases that were gravida 1 were excluded (n = 7), as they had no exposure to the risk of CD or abortion. Risk factors for placenta accreta were analyzed by using conditional logistic regression models, and OR, 95% CI, and P-values ($P \leq .05$ significant) were calculated.

Results

There were 64,359 deliveries at the University of Chicago during the study period, 7921 primary CDs and 4047 repeat CDs. Figure 1 illustrates the incidence of placenta accreta per 1000 deliveries in relation to the repeat CD rate. Overall incidence of placenta accreta was 1 in 533; 436 potential cases were identified and 121

Table II Risk factors for placenta accreta identified using conditional logistic regression (University of Chicago Hospitals, 1982-2002)

Risk factor	OR	95% CI	P value
Age	1.14	1.08-1.19	< .0001
Previous cesarean deliveries			
1	2.16	0.96-4.86	.064
≥2	8.62	3.53-21.07	< .0001
Previa	51.42	10.65-248.39	< .0001

confirmed to have abnormal placentation by disease or strong clinical criteria. Of the 121 cases, 7 cases that were gravida 1 were excluded as well as 3 additional cases that were excluded because of lack of information, giving a total of 111 cases in this study. Seventy-six cases (68.5%) were determined histopathologically, 35 cases (31.5%) were determined by the 2 clinical criteria. Of these 35, 23 (65.7%) were diagnosed by clinical criteria 2, and 12 (34.3%) were diagnosed by clinical criteria 3. There were 339 controls that were selected.

Table I presents risk factor characteristics for both cases and controls. Final diagnoses for abnormal placentation are presented in Figure 2. With the use of multivariate conditional logistic regression, statistically significant risk factors for placenta accreta were advanced maternal age, prior CD, and presence of previa (Table II). After adjusting for prior CD, age, and presence of previa, no other factors were found to be significant.

Comment

The incidence of placenta accreta in our cohort is high, 1:533 for the period 1982-2002, much greater than previous reports ranging from 1:4027 in the 1970s to 1:2510 in the 1980s.^{4,5} As we believe this might be explained by a rising CD incidence, we demonstrated simultaneous increase of both placenta accreta and CD incidences at the University of Chicago. However, as these observations might arise from chance, we proceeded with logistic regression models of risk factors for placenta accreta, confirming that risk of placenta accreta with 2 or more prior cesarean scars is increased 8-fold. The odds for those with previa are increased 51-fold, correlating with previous work that noted a similar increase.³ In the presence of multiple prior CDs plus previa, the odds of placenta accreta might increase up to 400-fold, though previously documented odds were never higher than 50-fold.^{5,6} The risk for gravid women with 1 prior CD was more than 2-fold greater and approached significance ($P = .064$). In fact, Clark et al² found that with 1 prior CD and previa, the risk of placenta accreta was 24%, increasing to 67% with 4 or

more prior CDs. Advancing maternal age was significantly correlated with placental abnormality, increasing 14% with each year beyond 20 years of age, confirming previous work.⁴⁻⁸ Surprisingly, a prior history of curettage or of abortion was not significant and at odds with other reports.^{7,8} Effect of prior myomectomy on placenta accreta could not be evaluated, because there were no patients in our cohort with myomectomy.

One pitfall encountered in studying placenta accreta is the definition used. Although previous work has defined placenta accreta by clinical criteria,^{3,8,9} there may be discordance between suspected and histologically confirmed cases as demonstrated by Miller et al⁵ in hysterectomy specimens. Histologic examination of the placenta may also be unreliable with incidental findings of placenta accreta in asymptomatic patients,⁹ or clinically suspected cases with negative histology.⁷ Thus, both strong clinical or histopathologic criteria were used in our work.^{3,6,9}

Our analysis may suffer from some problems inherent in any retrospective review. Because there were multiple medical personnel recording and entering data, accuracy cannot always be verified and various clinicians diagnosing placenta accreta over time may not be consistent. There could be more cases of placenta accreta not identified. Conditional logistic regression, using an OR, may overestimate risk compared with relative risk. However, because there are large effects of previous cesarean and previa, calculating relative risk would result in the same conclusions.¹⁰

In summary, the incidence of placenta accreta has increased, probably explained by the increasing rate of CDs. This is concerning because current trends toward increased CDs, particularly cesarean on demand, may not take into account counseling gravid women regarding long-term consequences, including morbidity and even mortality, that may be associated with placenta accreta, though not addressed in our work. Counseling of women undergoing CD should include the risks of abnormal placentation and subsequent morbidities.

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