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Maternal outcomes in unexpected placenta accreta spectrum disorders: single-center experience with a multidisciplinary team

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Abstract

OBJECTIVE: In a 2015 Maternal-Fetal Medicine Units Network study, only half of placenta accreta spectrum cases were suspected before delivery, and the outcomes in the anticipated cases were paradoxically poorer than in unanticipated placenta accreta spectrum cases. This was possibly because the antenatally suspected cases were of greater severity. We sought to compare the outcomes of expected vs unexpected placenta accreta spectrum in a single large US center with multidisciplinary management protocol.

STUDY DESIGN: This was a retrospective cohort study carried out between Jan. 1, 2011, and June 30, 2018, of all histology-proven placenta accreta spectrum deliveries in an academic referral center. Patients diagnosed at the time of delivery were cases (unexpected placenta accreta spectrum), and those who were antentally diagnosed were controls (expected placenta accreta spectrume). The primary and secondary outcomes were the estimated blood loss and the number of red blood cell units transfused, respectively. Variables are reported as median and interquartile range or number (percentage). Analyses were made using appropriate parametric and nonparametric tests.

RESULTS: Fifty-four of the 243 patients (22.2%) were in the unexpected placenta accreta spectrum group. Patients in the expected placenta accreta spectrum group had a higher rate of previous cesarean delivery (170 of 189 [89.9%] vs 35 of 54 [64.8%]; $P < .001$) and placenta previa (135 [74.6%] vs 19 [37.3%]; $P < .001$). There was a higher proportion of increta/percreta in expected placenta accreta spectrum vs unexpected placenta accreta spectrum (125 [66.1%] vs 9 [16.7%], $P < .001$). Both primary outcomes were higher in the unexpected placenta accreta

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spectrum group (estimated blood loss, 2.4 L [1.4–3] vs 1.7 L [1.2–3], $P = .04$; red blood cell units, 4 [1–6] vs 2 [0–5], $P = .03$).

CONCLUSION: Our data contradict the Maternal-Fetal Medicine Units results and instead show better outcomes in the expected placenta accreta spectrum group, despite a high proportion of women with more severe placental invasion. We attribute this to our multidisciplinary approach and ongoing process improvement in the management of expected cases. The presence of an experienced team appears to be a more important determinant of maternal morbidity in placenta accreta spectrum than the depth of placental invasion.

Keywords

abnormally invasive placenta; antenatal diagnosis; center of excellence; depth of invasion; morbidly adherent placenta; multidisciplinary management; placenta accreta; placenta accreta spectrum disorder

Placenta accreta spectrum (PAS) disorder (previously called morbidly adherent placenta/abnormally invasive placenta) is known to be associated with significant maternal morbidity/mortality usually because of hemorrhage and an emergent need for blood product transfusion.[1] Over the past few decades, the rate of cesarean delivery (a major risk factor) has increased significantly, resulting in a 10-fold increase in the incidence of PAS disorder, a situation expected to worsen over the next few years, given that true effects of the increased rate of cesarean delivery may be delayed for years.[2]

Multiple studies have shown that a significant number of PAS cases (between one third and two thirds) are unsuspected at the time of delivery.[3–5] Such unexpected cases are less likely to be managed in a PAS center with multidisciplinary team in which specialized care may lower maternal morbidity and mortality.[6–9]

In a 2015 multicenter study from the Maternal-Fetal Medicine Units Network, almost 50% of PAS cases reported were unexpected. Furthermore, in that study, patients known to have PAS had poorer outcomes than those with unexpected PAS. This result may be attributed to the fact that patients receiving prenatal care at a university center may have been referred there because of their greater degree of placental invasion.[10]

In this study, we sought to compare the characteristics and outcomes of expected PAS vs unexpected PAS in a single large university-based referral center in the United States with multidisciplinary management protocol.

Materials and Methods

This is a retrospective analysis of all patients treated at Baylor College of Medicine–affiliated hospitals between Jan. 1, 2011, and June 30, 2018. All cases had histology-confirmed PAS. Medical records were reviewed retrospectively by experienced senior physicians and demographics, clinical characteristics, and outcomes were recorded.

In 2011, we introduced a multidisciplinary approach for the management of known PAS in our center, the details of which have been previously published.[11] The surgical approach

involved a simple abdominal hysterectomy in women whose invasion was confined to the uterus, and a modified radical hysterectomy (with bladder resection, as necessary) for invasion beyond the uterus.

All patients with known PAS were managed by the same team of experienced physicians using a standardized protocol, while patients in whom PAS was determined only at the time of delivery were managed, at least initially, by their primary physician, with or without the eventual help of on-call physicians consulted emergently at the time of diagnosis. The study was approved by our institutional review board (H-28609).

Patients diagnosed only at the time of delivery were designated as cases (unexpected PAS [uPAS]), while those with an antenatal diagnosis of PAS formed the control group (expected PAS [ePAS]). The depth of invasion was reported in terms of accreta or increta/percreta based on the pathology report.

The primary outcome was the number of red blood cell (RBC) units transfused during the surgery and within the first 24 hours postoperatively. The secondary outcome was the estimated blood loss. Other outcomes recorded were the number of units of platelets and fresh frozen plasma transfused, and the volume of crystalloid infused (over the same time period used to calculate the number units of RBCs transfused), and the length of hospital stay after the delivery.

All continuous variables were tested for normality using descriptive statistics for skewness and kurtosis, visual evaluation of histograms, and the Kolmogorov-Smirnov test. Continuous data are reported as median (interquartile range). Categorical data are reported as proportions and percentages. Comparisons between ePAS and uPAS were made using the Mann-Whitney U test, and the χ^2 or Fisher exact test, as appropriate, using SPSS software (version 23.0; SPSS Inc, Chicago, IL). A value of $P < .05$ was considered statistically significant.

Results

A total of 243 histology-proven subjects was included in this study: 54 (22.2%) cases in the uPAS group and 189 (77.8%) controls in the ePAS group. Estimated gestational age at delivery was lower in the ePAS control group (34 [32–35] vs 37 [32–39] weeks; $P < .01$). More control patients in the ePAS group than cases in the uPAS group had (1) a history of previous cesarean delivery (170 of 189 [89.9%] vs 35 of 54 [64.8%]; $P < .001$] and (2) an antenatal diagnosis of placenta previa (135 [74.6%] vs 19 [37.3%]; $P < .001$].

The median number of prior cesarean deliveries was 2 (1–3) in ePAS controls and 1 (0–2) in the uPAS cases ($P < .001$). Severe PAS (ie, increta/percreta) was more common in the ePAS control group (125 of 189 [66.1%]) than in the uPAS case group (9/54 [16.7%]; $P < .001$). Table 1 shows the characteristics of the study subjects per group in greater detail. Following delivery of the infant and discovery of an abnormally adherent placenta, the PAS team was consulted intraoperatively in 33 of unexpected cases (61.1%) and assumed primary surgical oversight for the remainder of the procedure.

The primary outcomes were significantly higher in the uPAS cases when compared with the ePAS controls (estimated blood loss, 2.4 L [1.4–3.0] vs 1.7 [1.2–3.0]; $P = .04$) and RBC units transfused (4 [1–6] vs 2 [0–5]; $P = .03$). Table 2 shows all the maternal outcomes for each study group.

Comment

Principal findings

Our data demonstrate better maternal outcomes in the expected than in the unexpected PAS group, despite the higher proportion of women with more severe forms of PAS disorder and the need for more extensive surgical resection in the former group of patients. Because the PAS team was ultimately consulted intraoperatively for definitive resection in most cases of uPAS, we attribute the increased morbidity seen in these women to blood loss at the time of hysterotomy for delivery and prior to initiation of hysterectomy.

This finding serves to emphasize the importance of the initial, specialized, virtually bloodless hysterotomy technique we have previously described and prompt initiation of definitive hysterectomy in minimizing blood loss and associated morbidity in PAS cases.[11,12]

Results

According to recent studies, a significant number of PAS cases are undiagnosed at delivery.[3–6,10] This may be attributed to the fact that the major known risk factors for PAS (ie, placenta previa and multiple previous cesarean deliveries) are not always present, and our data confirm this observation.

In addition, even in the presence of known risk factors, the antenatal diagnosis of PAS with less severe degrees of invasion may be challenging. Prenatal ultrasound, which is the most common modality used to diagnose PAS, is subjective and requires specialized expertise both in performing the examination and in interpreting the findings. Our study also suggests that multiple gestation may make the antenatal diagnosis of PAS more difficult, and we believe that special attention should be paid to placental invasion in multiple pregnancies, especially when risk factors for PAS exist.

The results of the present study are consistent with the findings of Warshak et al[13] who in 2010 reported on the outcomes of 99 consecutive cases of placenta accreta, highlighting the association between predelivery diagnosis and decreased maternal hemorrhagic morbidity.

This is in contrast to the findings of the Maternal-Fetal Medicine Units (MFMU) Network who published on the outcomes of 158 women with PAS treated in 25 hospitals in the United States between 2008 and 2011.[10] Their study showed worse outcomes in the patients who were antenatally diagnosed as having PAS, and this was attributed to the fact that in their setting the more of the clinically significant cases are likely to be antenatally diagnosed.[10]

Clinical implications

Although our results are in agreement with Bailit et al regarding the severity of invasion in ePAS vs uPAS, our data show poorer outcomes in unexpected PAS cases despite the lesser severity of invasion. These disparate findings can perhaps be explained by the fact that our patients (and those of Warshak et al[13]) were all treated in a single institution by a team with extensive experience and a standard management protocol.[9]

Other differences between our study and the study by Bailit et al[10] are the fact that, unlike the present study, the authors included the women who did not undergo hysterectomy (30%) and therefore, pathological confirmation was not an inclusion criterion. The rate for ePAS in their cohort was also 50% compared with 78% in ours.[10]

Our findings suggest that the experience of the management team is more important in determining perioperative morbidity than the depth of placental invasion, highlighting the importance of referral to a center with an experienced team, even in cases in which shallow abnormal placentation is suspected.[9]

Research implications

Future collaborative studies are needed to be done by centers with multidisciplinary management protocols for placenta accreta spectrum to have a better understanding of the characteristics and the outcomes of the disease in the setting of a standardized approach.

Strengths and limitations

Our study has a number of strengths. The sample size is large. All of the subjects included in this study have histologically confirmed PAS (and accurate classification of the degree of myometrial invasion), and thus, selection bias dependent on inaccurate antenatal ultrasound diagnosis has been avoided. Patients in both study groups were managed in a single institution and thus, the observed differences in outcome can be reliably related to differences in management at the time of delivery rather than substantive differences in human or facility resources. Finally, although this was a retrospective chart review, data abstraction was performed by physician-researchers and was cross-validated by experienced senior physicians blinded to patient groups.

Our study has the same limitations of any retrospective study design. We used histological confirmation as the gold standard for the diagnosis of PAS. However, in cases when the placenta is removed and pathological sectioning misses a small area of trophoblastic invasion, the final diagnosis can be biased.

We also acknowledge that histology-negative subjects with antenatal diagnosis of PAS who underwent hysterectomy are not addressed in this study, while they may be a real-world scenario in some centers.

In addition, given the referral nature of our center, the rate of undiagnosed PAS in our study may not be assumed to be representative of the general population.

Conclusions

In conclusion, our data show that despite greater severity of invasion, improved outcomes can be expected in patients with a known diagnosis of PAS as compared with those in which the diagnosis is made at the time of delivery under less than optimal circumstances. This is attributed to the availability of a multidisciplinary and a specialized surgical team using a standardized approach in a high volume and experienced PAS center, combined with ongoing process improvement and focus on prenatal diagnosis.

Acknowledgments

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References

1. Belfort MA. Placenta accreta. Am J Obstet Gynecol 2010;203:430–9. [PubMed: 21055510]
2. Solheim KN, Esakoff TF, Little SE, Cheng YW, Sparks TN, Caughey AB. The effect of cesarean delivery rates on the future incidence of placenta previa, placenta accreta, and maternal mortality. J Matern Fetal Neonat Med 2011;24:1341–6.
3. Fitzpatrick KE, Sellers S, Spark P, Kurinczuk JJ, Brocklehurst P, Knight M. The management and outcomes of placenta accreta, increta, and percreta in the UK: a population-based descriptive study. BJOG 2014;121:62–70; discussion 70–1.
4. Thurn L, Lindqvist PG, Jakobsson M, Colmorn LB, Klungsoyr K, Bjarnadottir RI, et al. Abnormally invasive placenta-prevalence, risk factors and antenatal suspicion: results from a large population-based pregnancy cohort study in the Nordic countries. BJOG 2016;123: 1348–55. [PubMed: 26227006]
5. Bowman ZS, Eller AG, Kennedy AM, et al. Accuracy of ultrasound for the prediction of placenta accreta. Am J Obstet Gynecol 2014;211:177.e1–7. [PubMed: 24631709]
6. Eller AG, Bennett MA, Sharshiner M, et al. Maternal morbidity in cases of placenta accreta managed by a multidisciplinary care team compared with standard obstetric care. Obstet Gynecol 2011;117(2 Pt 1):331–7. [PubMed: 21309195]
7. Shamshirsaz AA, Fox KA, Erfani H, et al. Multidisciplinary team learning in the management of the morbidly adherent placenta: outcome improvements over time. Am J Obstet Gynecol 2017;216:612.e1–5. [PubMed: 28213059]
8. Shamshirsaz AA, Fox KA, Erfani H, et al. Outcomes of planned compared with urgent deliveries using a multidisciplinary team approach for morbidly adherent placenta. Obstet Gynecol 2018;131:234–41. [PubMed: 29324609]
9. Shamshirsaz AA, Fox KA, Erfani H, Belfort MA. The role of centers of excellence with multidisciplinary teams in the management of abnormal invasive placenta. Clin Obstet Gynecol 2018;61:841–50. [PubMed: 30198918]
10. Bailit JL, Grobman WA, Rice MM, et al. Morbidly adherent placenta treatments and outcomes. Obstet Gynecol 2015;125:683–9. [PubMed: 25730233]
11. Shamshirsaz AA, Fox KA, Salmanian B, et al. Maternal morbidity in patients with morbidly adherent placenta treated with and without a standardized multidisciplinary approach. Am J Obstet Gynecol 2015;212:218.e1–9. [PubMed: 25173187]
12. Belfort MA, Shamshirsaz AA, Fox K. Minimizing blood loss at cesarean-hysterectomy for placenta previa percreta. Am J Obstet Gynecol 2017;216:78.e1–2. [PubMed: 27984036]
13. Warshak CR, Ramos GA, Eskander R, et al. Effect of predelivery diagnosis in 99 consecutive cases of placenta accreta. Obstetr Gynecol 2010;115:65–9.

AJOG at a Glance

Why was this study conducted?

To compare the outcomes of expected vs unexpected placenta accreta spectrum in a single large US center.

Key findings

Patients in the expected group had a higher rate of increta/percreta but lower estimated blood loss and required less red blood cell transfusion.

What does this add to what is known?

Our data contradict the Maternal-Fetal Medicine Units results and instead show better outcomes in the expected placenta accreta spectrum group. Presence of an experienced team appears to be a more important determinant of maternal morbidity than the depth of placental invasion.

TABLE 1

Characteristics of the study participants in the two study groups

Variables	ePAS (n = 189)	uPAS (n = 54)	*P*value
Age, y, median [IQR]	33 [29–37]	33 [28–40]	.360
BMI, kg/m^2, median [IQR]	30 [25–35]	29 [24–34]	.200
Gravidity, median [IQR]	4 [3–6]	4 [3–5]	< .010[a]
First pregnancy, n, %	3 (1.6)	4 (7.5)	.040[a]
EGA at delivery, week, median [IQR]	34 [32–35]	37 [32–39]	< .010[a]
Mode of delivery, n, %			< .001[a]
Vaginal	0	7 (13.0)	
Planned CD	102 (54.0)	30 (55.6)	
Urgent CD	87 (46.0)	17 (31.5)	
Reason for urgent CD, n, %			< .010[a]
Contraction	31 (35.6)	2 (11.8)	
Bleeding	29 (33.3)	8 (47.1)	
Contraction and bleeding	26 (29.9)	4 (23.5)	
Severe abdominal pain	1 (1.1)	0	
Preeclampsia	0	3 (17.6)	
Hysterectomy, n, %			< .001[a]
Modified radical	175 (92.6)	32 (59.3)	
Total	14 (7.4)	22 (40.7)	
Previous CD, n, %	170 (89.9)	35 (64.8)	< .001[a]
Number of previous CDs, median [IQR]	2 [1–3]	1 [0–2]	< .001[a]
Twin gestation, n, %	8 (4.2)	9 (16.7)	< .010[a]
In vitro fertilization, n, %	6 (3.2)	11 (20.4)	< .001[a]
Depth of invasion, n, %			

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Variables	ePAS (n = 189)	uPAS (n = 54)	*P*value
Accreta	64 (33.9)	45 (83.3)	< .001[a]
Increta/percreta	125 (66.1)	9 (16.7)	
Placenta previa, n, %	135 (74.6)	19 (37.3)	< .001[a]
Multidisciplinary approach, n, %	175 (92.6)	0 (0)	< .001[a]

Variables are reported as median [IQR] (Mann-Whitney *U* test) and n (percentage) (χ^2/Fisher exact test).

BMI, body mass index; *CD*, cesarean delivery; *EGA*, estimated gestational age; *PAS*, placenta accreta spectrum.

[a]Statistically significant.

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TABLE 2

Maternal outcomes in the 2 study groups

Outcomes	ePAS (n = 189)	uPAS (n = 54)	*P*value
Primary			
RBC units transfused, median [IOR]	2 [0–5]	4 [1–6]	.03[a]
Secondary			
EBL, L, median [IOR]	1.7 [1.2–3.0]	2.4 [1.4–3.0]	.04[a]
Other			
Platelet units transfused, median [IOR]	0 [0–0]	0 [0–1]	.01[a]
FFP units transfused, median [IQR]	0 [0–2]	0 [0–4]	.19
Crystalloid infusion, L, median [IQR]	3.6 [2.8–4.5]	3.5 [2.8–4.5]	.74
Length of hospital stay, days, median [IQR]	5 [4–7]	4 [3–6]	.02[a]
Reoperation, n, %	4 (2.1)	1 (1.8)	.99
Readmission, n, %	3 (1.6)	4 (7.4)	.04[a]
Unintentional cystotomy, n, %	7 (3.7)	2 (3.7)	.99
Vesicouterine fistula, n, %	2 (1.1)	0	.99
Acute kidney injury, n, %	0	0	—
DVT or PE, n, %	0	0	—
DIC, n, %	22 (11.6)	5 (9.3)	.62
Maternal death, n, %	1 (05)	1 (1.8)	.40

DIC is calculated as per the definition of the International Society of Thrombosis and Homeostasis. Variables are reported as median [IQR] (Mann-Whitney *U* test) and n (percentage) (χ^2/Fisher exact test).

DIC, disseminated intravascular coagulation; *DVT*, deep vein thrombosis; *EBL*, estimated blood loss; *FFP*, fresh-frozen plasma; *ICU*, intensive care unit; *PAS*, placenta accreta spectrum; *PE*, pulmonary embolism; *RBC*, red blood cell.

[a]Statistically significant.

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