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Research Presentation

Abstracts

Poster Presentations – Sun, Oct 27, 2024 at 8-10am CDT – Listed alphabetical by Abstract Title

*Denotes presenting a featured oral presentation in addition to the poster

Case series and review of coagulopathy associated with placenta accreta managed conservatively

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Objective: Coagulopathy is a potentially serious complication of retained tissue. This is best described in obstetrics with fetal demise, but also occurs in conservative management of placenta accreta spectrum disorder (PAS). The objective was to describe the management and outcome of coagulopathy in conservative management of PAS.

Study Design: This was a multicenter case series of conservatively managed PAS resulting in coagulopathy with fibrinogen <200 mg/dL.

Results: Included were three cases of antenatally diagnosed with PAS managed by scheduled cesarean delivery and leaving the placenta in situ. Deliveries were uncomplicated with an estimated blood loss between 200ml-1000ml, though one patient had low fibrinogen 288mg/dL identified before delivery which was treated with fresh frozen plasma transfusion during delivery. The patients represented between 1 and 9 weeks after delivery with either vaginal bleeding or abdominal cramping. At the time of presentation, fibrinogen was between 83 and 151 mg/dL, prothrombin time and **partial thromboplastin time** were normal, platelets were between 130 and 158 × 10^3/µL, and hemoglobin between 11.6 and 12.2 g/dL. No patient had evidence of infection or active hemorrhage. Fresh frozen plasma was transfused to all patients, and all three subsequently underwent uterine artery embolization to correct the coagulopathy. One patient, who represented at 9 weeks postpartum, underwent uterine artery embolization followed by robot-assisted total abdominal hysterectomy five days after coagulopathy was identified, with an estimated blood loss of 3 liters. The other two patients, who represented at 1 and 7 weeks postpartum, recovered with immediate correction of coagulopathy after transfusion and uterine artery embolization and did not require hysterectomy due to coagulopathy, though one underwent robot-assisted total abdominal hysterectomy two weeks later for endomyometritis with estimated blood loss 100mL.

Conclusion: Conservative management of PAS carries a risk of coagulopathy. In our cases, two of the three had resolution of the coagulopathy with transfusions and uterine artery embolization. The patient who underwent immediate hysterectomy while being treated for coagulopathy had significant hemorrhage during surgery. Avoidance of hysterectomy in the setting of coagulopathy from PAS is possible, but data are limited, and more information is needed to define and treat coagulopathy.

Changing the Paradigm: Placenta Accreta Spectrum (PAS) Center Managed by an Experienced OBGYN Hospitalists Team

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Objective: To validate the effectiveness of a dedicated OB/GYN Hospitalist Accreta team following planned cesarean hysterectomy at 34-35 weeks gestation in patients with PAS. The maternal quality outcomes analyzed included: Quantitative Blood Loss, Blood Transfusions, Intensive Care Unit admission, Bladder Injury, Maternal Morbidity and Mortality, Interventional Radiology, Length of Procedure, Length of Hospital Stay.

Study Methods: Retrospective review of the outcomes of 42 PAS patients with planned cesarean hysterectomy at 34-35 weeks gestation managed by the OB Hospitalist led multidisciplinary team from November 2018 to May 2023 in the same institution.

Results:

- **50%** (21/42) FIGO Grade 2 or 3 PAS on pathology specimen.
- ***QBL:*** 100-4701mL, mean 1367mL, median 775mL, SD 1221.79
- ***BT:*** 10 patients (23.8%), average of 3.4 units per transfused patient. Only FIGO Grade 2 or 3 patients received BT
- ***No maternal deaths occurred, and maternal morbidity was only 11.9%.***
    - Intraoperative complications were almost exclusively with FIGO Grade 3 PAS patients(4/5).
- ***ICU Admission:*** One ICU admission occurred with a FIGO Grade 3 PAS patient.
- ***Interventional Radiology (IR):*** No patient required use of IR.
- ***LOP:*** 47 min-279 min, mean 129.4 min, median 130 min, SD 44.05
- ***LOS:*** 2-6 days, mean 3.87days, median 4 days, SD 0.79

Conclusion:

- An Accreta Multidisciplinary Center can be led and managed successfully by an experienced group of OBGYN Hospitalists.
- Our surgical approach and technique (Fernandez-Lense Technique) has decreased mean and median blood loss compared to Wright et al's norm of 3 liter blood loss with a transfusion rate of 5 units PRBCs per patient.
- PAS patients with FIGO grade 2 or 3 diseases have increased mean blood loss.
- Grade 3 PAS patients are at increased risk for intraoperative complications.
- The low maternal morbidity and no maternal deaths further reinforces the effectiveness of the Fernandez-Lense Technique as well as an OB/GYN Hospitalist led PAS team.

Creating a State-Level Hospital Network to Enhance Placenta Accreta Spectrum Management: A Preliminary Survey Study

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Objective: With the ACOG recommendation to refer patients with suspected PAS to level 3 or 4 maternal level-of-care hospitals, state-level hospital communication and system organization is warranted. The Mass General Brigham (MGB) network of Massachusetts includes 8 hospitals that provide maternity care. Here we describe our preliminary efforts to explore maternal levels of care, delivery volumes, and current referral patterns between facilities in the MGB network for patients with suspected PAS.

Study Design: A preliminary intake survey was created by multidisciplinary single-site consensus (OBGYN, obstetric anesthesia, and research) at Brigham and Women's Hospital (BWH). The survey was tailored to both obstetric anesthesiologist and OBGYN physicians involved in PAS care. The survey was administered by email via a secure web-based survey (REDCap; Vanderbilt University) to service chiefs for obstetric anesthesia and OB GYN at all 8 MGB network maternity hospitals Brigham and Womens (BWH), Massachusetts General Hospital (MGH), Newton-Wellesley Hospital (NWH), Cooley Dickinson Hospital (CDH), Martha's Vineyard Hospital (MVH), Nantucket Cottage Hospital (NCH), Salem Hospital (SH), and Wentworth-Douglass Hospital (WDH). Survey questions included hospital delivery volume, number of scheduled and unscheduled cesarean deliveries and PAS cases in the year 2023, and whether patients with suspected PAS are managed on site or transferred, Management regarding blood transfusion and mode of anesthesia was also queried.

Results: Five out of 8 hospitals responded to the survey, including 6 anesthesiologists and 3 OBGYNs. The network contains maternity levels of care 2 through 4, with delivery volumes varying from 600 to 7,000 per year. Rates of scheduled and unscheduled routine and PAS cases were not available from respondents in this preliminary survey. All hospitals confirmed the capacity for major blood transfusion. PAS anesthesia management was variable.

Conclusion: Our preliminary survey reveals considerable heterogeneity in infrastructure and PAS management practices among the hospitals in the MGB network. We aim to continue our network communication about PAS management. Our goal is to enhance collaboration, improve patient outcomes and standardize care for patients with PAS delivering within the MGB network.

Current situation of Placenta Accreta Spectrum in Tunisia : Multi-centric study

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Objective: Placenta accreta spectrum (PAS) refers to a group of conditions where the placenta abnormally attaches to the uterine wall, with varying degrees of severity.
Each PAS case is a unique challenge in pregnancy and childbirth.
The aim of this multi-centric study on placenta accreta spectrum is to comprehensively investigate and document the epidemiology, risk factors, clinical presentation, diagnostic methods, management strategies, and outcomes across a diverse population in a low-medium income country , Tunisia .

Study design: This is a retrospective, descriptive study conducted in 20 university gynecology and obstetrics departments in Tunisia over a 3-year period from January 1, 2021 to December 31, 2023.

Results: In this study we enumerated 304 cases of placenta accreta among the 20 departements.
The total number of deliveries was 158364 with 49,3% of caesarean sections.
Placenta accreta thus accounted for 1,92‰ of all deliveries.
The average age of our patients was 34,3 years., 93,8 with a scarred uterus .
Placenta accreta was diagnosed antenatally during pregnancy in 81,6% of cases, 38,2% with MRI .
The median term of pregnancy on the day of diagnosis was 31 WG .
With regard to ultrasound data, the placenta was found non-praevia in 15,2% of cases .
The median term of delivery was 35 WG.
99,01% of patients were delivered by caesarean section(n=301).
Caesarean section was planned in 46,6% of cases (n=27), and performed as an emergency in 53,4% .
Surgical treatment was radical, with hemostasis hysterectomy in 172 cases (56,7%).
It was associated with hypogastric ligation in 21,3% with 10,1% of bladder wounds.
Among our patients, 52,3% required a transfusion and 8,3 % of cases required a stay in intensive care.
No maternal deaths were observed.

Conclusion: This study demonstrates the frequence and impact of PAS in a low-medium income country causing significant maternal and foetal morbidity .
This rate could be mitigated mainly by reducing the rate of caesarean sections.

Decreased Blood Loss in Placenta Accreta Deliveries with Implementation of Stapler for Hysterotomy Entry

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Objective: Massive blood loss and requirement for blood transfusion are common in cesarean hysterectomy performed for placenta accreta spectrum disorder (PAS). Surgical innovation such as utilization of stapler devices to provide hemostasis for hysterotomy may decrease intraoperative blood loss and maternal morbidity. Our objective was to evaluate blood loss and blood transfusion after implementation of stapler hysterotomy technique.

Study Design: Retrospective cohort of all scheduled cesarean hysterectomies completed for PAS from January 1st 2022 – April 1st 2024 at a single academic center. Routine use of stapler for hemostatic uterine incision started May 2023. We included scheduled cesarean hysterectomy completed for PAS from January 1st 2022 – April 1st 2024. We excluded emergent cases, cases without hysterectomy, cases conservatively managed at the time of delivery of infant, and any case where surgical procedure involved attempt of removal of placenta prior to proceeding with hysterectomy. Primary exposure was utilization of stapler for hysterotomy compared to traditional scalpel hysterotomy. Primary outcome was EBL (ml). Secondary outcomes were EBL >1500 mL and receipt of packed red blood cell (pRBC) transfusion.

Results: 31 cases met inclusion criteria, 13 (41.9%) utilized the stapler and 18 (58.1%) utilized scalpel hysterotomy. Blood loss was numerically, though not statistically, less in cases that utilized the stapler (median 1200ml versus 1963ml, p=0.14). Stapler use was associated with reduced blood loss > 1500mL (23% vs. 61%, p=0.04). The frequency of pRBC transfusion in stapler group was 31% compared to 50% in scalpel group P = 0.3.

Conclusion: Utilization of a commonly available surgical stapler device for hysterotomy entry in PAS cases likely decreases surgical blood loss to a clinically significant magnitude. Given heterogenous practices in PAS management and low volumes at single sites, multicenter studies and randomized control trials are necessary to test best practices and identify opportunities for surgical innovation to continue to reduce significant maternal morbidity with this condition.

Table 1: Primary and Secondary Outcomes. Primary outcome perioperative EBL/QBL Median (IQR), Secondary Outcomes N(%), Pearson's Chi-squared test; Fisher's exact test

	Stapler N= 13	Scalpel N=18	P Value
EBL/QBL ml	1,200 (700,1500)	1,963 (1,000-2,875)	0.14
EBL/QBL >1500ml	**3(23%)**	**11(61%)**	**0.04**
EBL/QBL			0.3
Frequency EBL/QBL < 1000ml	6(46%)	4(22%)	
Frequency EBL/QBL 1000-1500ml	4(31%)	3(16.7)	
Frequency EBL/QBL 1501-3000ml	2(15%)	7(39%)	
Frequency EBL/QBL >3000ml	1(7.7%)	4(22%)	
Frequency of perioperative pRBC transfusion	4(31%)	9(50%)	0.3

Describing the impact of a multidisciplinary program on outcomes in the setting of placenta accreta spectrum disease – 16-year experience at an academic community network

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Objective: Our institution developed a formal, multidisciplinary Placenta Accreta Spectrum Program (PASP) in 2012 with the goal to standardize the management of patients with a prenatal suspicion of abnormal placentation. An IRB registered database of peripartum hysterectomies is updated annually at our institution. The objective of our study is to update our experience on the impact of PASP on maternal and neonatal outcomes.

Study Design: Single center retrospective cohort study of women undergoing peripartum hysterectomy for pathologically confirmed placenta accreta spectrum from December 1, 2007 - September 7, 2023. Maternal and neonatal outcomes of pregnancies enrolled in PASP were compared to those not enrolled. Primary outcomes were maternal transfusion and NICU admission. Secondary outcomes included planned (vs. unplanned) procedure, prenatal diagnosis of accreta spectrum, maternal and neonatal outcomes, and surgical complications. Data were analyzed using univariate and multivariable techniques.

Results: 113 patients underwent peripartum hysterectomy, with 63 enrolled in PASP. 16 women delivered after program implementation were not enrolled due to unplanned delivery, transport from another hospital, or undiagnosed accreta. PASP group was more likely to have had a prenatal diagnosis of abnormal placentation [100% PASP vs. 56% not in PASP, p<0.001]. Maternal transfusion rate was lower [36.5% PASP vs. 70.0% not in PASP, p<0.001] and NICU admission rate was higher [90.5% PASP vs. 58.0% not in PASP, p=0.001] in PASP patients. Patients enrolled in PASP were also delivered earlier [34.6 weeks PASP vs. 35.1 weeks not in PASP, p=0.03] and experienced longer median surgical time with routine embolization and ureteral stents (291 minutes PASP vs. 195.5 minutes not in PASP, p<0.001). After adjustment for planned (vs. unplanned) hysterectomy and delivery after PASP implementation (which may have influenced management of all patients regardless of PASP enrollment), a preoperative plan to perform a hysterectomy at the time of delivery was associated with a reduction in transfusion rate [AOR 0.27 (0.09,0.52), p=0.001].

Conclusion: A formalized, multidisciplinary approach for patients with placenta accreta spectrum decreases the risk of maternal morbidity such as massive blood loss and need for transfusion likely as a result of a shared mental model and standardization of care.

Does the addition of MRI for antenatal diagnosis of suspected PAS impact maternal surgical outcome?

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Objective: Placenta accreta spectrum (PAS) disorders are increasing and associated with poor maternal outcomes, especially when undiagnosed at the time of delivery. The ability to predict and diagnose PAS before delivery has been associated with improved outcomes. This study aimed to evaluate whether the addition of MRI to sonographically suspected PAS cases improves surgical outcomes.

Study Design: Multicenter retrospective cohort study of histopathologically confirmed PAS cases between 1/1/2013 - 6/30/2022 at four New York academic institutions. All patients with sonographic concern for PAS prior to delivery were included and subdivided into those with and without an adjunctive MRI. Primary outcome was composite maternal surgical morbidity (CMSM) (transfusion of >4u PRBC, >1 vasopressors, mechanical ventilation, ICU admission and injury to surrounding organs). Outcomes were analyzed using univariable and multivariable logistic regression adjusting for confounders.

Results: 165 patients were included, 126 (46.0%) and 39 (54.0%) with and without MRI, respectively. There were no significant differences in patient demographics between the two groups; however, there were institutional differences (p=0.02) [Table 1]. 81(49%) patients had grade 1 PAS, 32 (24%) had grade 2 and 36 (27%) had grade 3. There was no significant association between adjunctive MRI and CMSM when controlling for placental location and depth of invasion (aOR 1.1, Cl 0.9-1.3) [Table 2].

Conclusion: This study found no significant association between adjunctive MRI and CMSM for patients with sonographically suspected PAS, regardless of placental location and PAS FIGO grade. The data supports previous studies indicating that antenatal MRI does not impact surgical outcomes, even when controlling for the degree of invasion with PAS. This study suggests the need for further prospective research to determine the optimal use of MRI as an adjunct to ultrasound for antenatal diagnosis.
1975 Characters | 286 Words (350 max word count)

Table 1. Baseline demographics and characteristics of patients with and without PAS.

	***Adjunctive MRI* N = 126 (%)**	***No MRI* N = 39 (%)**	***p*-value**
Baseline Demographics			
Maternal Age at Delivery (median, IQR)	36.0 (6.2)	34.9 (9.7)	0.59
Maternal BMI at Delivery (median, IQR)	30.0 (7.2)	34.8 (10.9)	0.02
Institution			0.02
Institution 1	3 (2)	0	
Institution 2	49 (39)	26 (67)	
Institution 3	52 (41)	11 (28)	
Institution 4	22 (18)	2 (5)	
Smoking History	9 (7)	4	0.77
Parity (median, IQR)	2 (2)	2 (2.5)	0.42
History of Dilation and Curettage	33 (26)	14 (35)	0.33
History of Cesarean Delivery	119 (94)	36 (92)	0.92
Number of Prior Cesarean Deliveries (median, IQR)	2 (2)	2 (2)	0.76
History of Myomectomy	12 (10)	4 (10)	1
Fibroid Uterus	25 (20)	7 (18)	0.98
Placenta Previa at Delivery	91 (72)	31 (79)	0.48
Assisted Reproductive Technologies	11 (9)	4 (10)	1
Delivery and Outcome Characteristics			
Gestational Age at Delivery, weeks (median, IQR)	34 (2)	34 (3.5)	0.65
Estimated Blood Loss at Delivery (median, IQR)	2000 (2500)	2500 (1450)	0.09
FIGO Grade			0.36
Grade 1	58 (46)	23 (59)	
Grade 2	32 (25)	8 (20.5)	
Grade 3A-E	36 (29)	8 (20.5)	
Placental Location			0.1
Anterior	56 (45)	10 (26)	
Posterior	47 (37)	21 (54)	
Other	23 (18)	8 (20)	
Gynecologic Oncology Involvement	115 (91.3)	34 (87.2)	0.66

Table 2. Composite maternal surgical morbidity comparing MRI vs. No MRI using logistic regression

				Univariable	***Multivariable ****
	Adjunctive MRI (N = 126) No. (%)	**No MRI** (N = 39) No. (%)	*p*-value	**OR (95% Cl)**	**aOR (95% Cl)**
Composite Maternal Surgical Morbidity	102 (81.0)	31 (79.5)	1	1.1 (0.4, 2.6)	1.1 (0.9, 1.3)
Transfusion of >4u pRBC	52 (41.3)	17 (43.6)	0.94	0.9 (0.4, 1.9)	1.1 (0.9, 1.3)
>1 Vasopressor Use	67 (53.2)	14 (35.9)	0.09	2.0 (0.9, 4.3)	1.2 (0.9, 1.4)
Mechanical ventilation or intubation	57 (45.2)	22 (56.4)	0.30	0.6 (0.3, 1.3)	1.0 (0.8, 1.2)
Admission to ICU	56 (44.4)	13 (33.3)	0.30	1.6 (0.8, 3.5)	1.2 (1.0, 1.5)
Surgical injury to organs	24 (19.0)	3 (7.7)	0.15	2.8 (0.9, 12.4)	1.1 (0.9, 1.3)
Maternal mortality	---	---		---	---

*Controlling for age, pre-pregnancy BMI, parity, history of cesarean delivery, ART, history of myomectomy, history of D&C, health care institution, placental location and depth of invasion

Evaluating TikTok Content on Placenta Accreta Spectrum: Popularity, Quality, and Resource Gaps

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Objective: Patients are increasingly looking to TikTok for health information. We evaluated content and quality of TikTok videos related to Placenta Accreta Spectrum (PAS).

Study Design: The top 50 TikTok videos (TikToks) related to PAS were identified using the search term "Placenta accreta". Data were gathered on video metrics. Three independent reviewers evaluated videos using standardized quality scales: a modified 5-point DISCERN scale, the Patient Education Maternal Assessment Tool for Audiovisual Materials (PEMAT A/V), and a 5-point Likert Global Quality Scale (GQS). TikToks were also graded on creator type, content, and themes. Exclusion criteria included non-English and unrelated videos.

Results: 50 TikToks created by 46 users were evaluated. Total views for all TikToks were 6.2 million. The most viewed patient-created TikTok had 1.8 million views, and the most viewed medical professional-created TikTok had 327,000 views. TikToks were saved a total of 9,824 times and shared 3,630 times. 68% of content was created by patients and 26% was created by medical professionals. 48% discussed the diagnosis of PAS and 70% discussed delivery. 20% mentioned risk factors and 42% mentioned possible complications. 50% of patient videos mentioned birth trauma. The mean mDISCERN score was 1.0 (SD 1.1). The mean PEMAT A/V understandability score was 61.4% (SD 27.8), and the mean actionability score was 15.8% (SD 28.3%). The mean GQS was 1.7 (SD 0.9). Videos mentioning birth trauma had higher numbers of views, likes, saves, and shares (p=0.04).

Conclusions: TikToks related to PAS are highly viewed, liked, and shared, but of varying quality. A majority of content was posted by patients and half of these videos mentioned birth trauma. Most videos did not cite additional sources and had low actionability scores, indicating viewers searching TikTok for PAS may not have easy access to further resources. About a quarter of content was created by medical professionals, and although many of these TikToks mentioned risk factors and possible complications, few cited resources or further actions a patient can take to seek out information. These data support a need and demand for more high-quality content and patient resources related to PAS on TikTok.

Table 1: Metrics for selected TikTok videos

Video metrics (n=50)	**Average**
Length (seconds), median [IQR]	20 [11; 89]
Views, median [IQR]	14,050 [3099; 43,475]
Likes, median [IQR]	261 [77; 1408]
Comments, median [IQR]	31 [9; 56]
Saves, median [IQR]	17 [3; 62]
Shares, median [IQR]	7 [1; 30]

Table 2: Evaluation data for selected TikTok videos

Evaluation criteria	**Videos (n=50)**
Source/Creator, n (%)	
Medical	13 (26%)
Patient/personal	34 (68%)
Other/unclear	3 (6%)
Content, n (%)	
Antepartum/diagnosis	24 (48%)
Delivery	35 (70%)
Postpartum	13 (26%)
Other/not specified	3 (6%)
Mentions risk factors, n (%)	10 (20%)
Mentions possible complications, n (%)	21 (42%)
mDISCERN (0-5), mean (SD) *	1.0 (1.1)
PEMAT A/V understandability score (0-100%), mean (SD) †	61.4% (27.8%)
PEMAT A/V actionability score (0-100%), mean (SD) †	15.8% (28.3%)
Global Quality Scale score (1-5), mean (SD)	1.7 (0.9)

* Modified DISCERN (mDISCERN): Assesses aims, sources, bias, resources, and uncertainty. Scale 0-5, with 5 the highest rating
†PEMAT A/V score: Assesses understandability of content in terms of language, narration, readability, as well as actionability. For each score, scale 0-100%, with 100% the highest rating
§ Global Quality Scale score (GQS): Assesses overall quality of content and usefulness to patients. Scale 1-5, with 5 the highest rating

Table 3: Evaluation of patient-created video themes

Content type	**Videos (n=34)**
Mentions birth trauma, n (%)	17 (50%)
Delivery complications, n (%)	
Uncomplicated	2 (5.9%)
Mild complications (Bleeding, blood transfusion)	3 (8.8%)
Significant complications (bladder/bowel injury, ICU admission)	6 (17.6%)
Unspecified	23 (67.6%)
Hysterectomy required, n (%)	
Yes	13 (38.2%)
No	2 (5.9%)
Unspecified	19 (55.9%)

Evaluation of single-site practices for documenting and follow-up of delivered placentas with pathologic accreta-related diagnosis

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Objective: Recent studies show that findings of microscopic placenta accreta spectrum (PAS) (so-called basal plate myofibers) on pathological examination of a delivered placenta carries an increased risk for PAS in subsequent pregnancy. Currently our institution has no standardized protocol for documentation and follow-up of an unexpected PAS diagnosis. The primary objective of this study was to evaluate current practices for documenting these pathology reports and follow-up with patients.

Study Design: This was a retrospective cohort study of 102 patients with PAS diagnosis on placental pathology between March 2015 - January 2023. Patients with prenatally suspected PAS were excluded. Demographics, result documentation, and rate of patient follow-up were evaluated. Apart from the pathology report, we defined result documentation as a clinician note, communication, or documentation in the problem list. We defined follow-up as a telephone encounter, patient message via the EMR, postpartum visit, or consultation with a MFM specialist. We evaluated outcomes for the following subgroups: (1) no clinical concern for PAS (N=29), (2) risk factors for PAS, but considered low risk at delivery, (N=25), and (3) intrapartum concern for PAS (N=48).

Results: Overall, 37.2% had no EMR documentation of the PAS diagnosis beyond the pathology report and 42.1% had no documented patient follow up. In subgroup analyses, 72.4% of patients with no clinical concern, 28% of patients with prenatal clinical concern, and 20.8% of patients with intrapartum concern had no documentation of their PAS diagnosis in the EMR system (apart from pathology report). 58.6% of patients with no clinical concern, 44% of patients with prenatal concern, and 31.3% of patients with intrapartum concern had no documented follow-up of their pathology results.

Conclusion: Documentation and follow-up after PAS-related placental path diagnoses was inconsistent at our center. Patients with risk factors or intrapartum concern for PAS were more likely to have documentation of their placental pathology result and follow-up. Quality improvement measures are needed to increase results communication for complete postpartum and preconception counseling.

Evaluation of the relationship between placenta accreta spectrum disease and nontubal ectopic pregnancies

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Objective: Non-tubal ectopic pregnancies (NTEP) occur when an embryo does not implant in the uterine cavity and instead implants in the interstitium [INT], cesarean scar [CSP], or cervix [CER]. CSP and placenta accreta spectrum (PAS) are thought to exist along a common disease continuum. The relationship between PAS and other NTEPs is less well understood. Thus, we sought to determine the association between NTEPs and PAS noted on pathological evaluation.

Study Design: In this retrospective study, we sought patients with NTEPs managed surgically at a tertiary center between 1/2010 and 4/2024 (n=46). Pathology reports were examined, and the cohort was divided into two groups: NTEP without PAS (NO-PAS) (n=33) and NTEP with PAS or microscopic accreta (PAS) (n=13). Clinical, laboratory, and imaging data were abstracted from the medical record. Data analysis was performed using SAS.

Results: Table 1 shows the NTEP characteristics. NTEPs varied by location: INT (n=21), CSE (n=20), or CER (n=5). 13 (28.3%) of 46 NTEPs had an associated accreta diagnosis on the pathology report. When comparing the NO-PAS and PAS groups, rates of spontaneous conception (70% vs. 83.3%) and rates of conception via in vitro fertilization (10% vs 16.7%) were similar. There were no differences in rates of accreta in relationship to NTEP location [INT: n= 5 (29.4%); CSE: n=7 (35.0%); CER: n=1 (20.0%)]. Of the patients who did not undergo hysterectomy (n=39), 38.5% had a documented subsequent live birth (NO-PAS 31% vs. PAS 60%; p=0.14).

Conclusion: Pathological evaluation of NTEP specimens unexpectedly revealed histopathologic PAS in all three types of NTEP. Subsequent live birth rates between individuals desiring fertility with prior NTEPs with and without PAS findings are comparable. While PAS is often described in CSE pregnancies, the association of PAS pathology findings with INT and CER NTEPs is novel, indicating a potential common mechanistic pathway.

Table 1. Nontubal ectopic pregnancy characteristics

Characteristic	**NO-PAS** *N = 33*	**PAS** *N = 13*	***P*-Value**
Age (*y)*	35 (23-41)	31 (23-45)	
# of previous Cesarean deliveries	1 (0-3)	1 (0-4)	
Accreta Diagnosis			N/A
Microscopic Accreta	-	2	
PAS	-	11	
Location			0.74
INT + CER	20 (60.6)	6 (46.2)	
CSE	13 (39.4)	7 (53.8)	
Conception			0.99
Spontaneous	7 (70)	5 (83.3)	
IVF	3 (10)	1 (16.7)	
Hysterectomy	4 (12.1)	3 (23.1)	0.39
Subsequent live birth	9 (31.0)	6 (60.0)	0.14

Data are median (range) or *n* (%).

PAS, placenta accreta spectrum. y, years. INT, interstitium. CER, cervix. CSE, cesarean scar ectopic. IVF, *in-vitro fertilization.*

P < 0.05 significant.

False negative MRIs in patients with PAS: are the patient outcomes any different?

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Objective: Assess outcomes between false negative MRI as compared to true positive MRI for placenta accreta spectrum (PAS).

Study Design: This was a retrospective exploratory analysis of patients who had undergone antepartum MRI prior to planned cesarean hysterectomies with pathology confirmed PAS from 2019-2024 at a single center. The primary exposure was MRI detection of PAS. The primary outcomes were estimated blood loss (EBL) and units of packed red blood cells (pRBCs) transfused. Secondary outcomes included MRI features, surgical pathology, operative time, and complication rates.

Results: 68 patients were included for analysis. 60 patients' MRIs were positive for PAS, while 8 patients' MRIs were falsely negative. Demographics were similar between groups (Table 1). Of those patients with negative MRI, 4 out of 8 (50%) reported dark intraplacental bands, while other MRI features were significantly less prevalent in this group (Table 3). There were no surgical complications in patients with false negative MRI, while 15 (25%) of those with positive MRIs had surgical complications (p=0.18). EBL was not significantly different between groups, with true positive MRI median EBL 1500cc (IQR 675-2500cc), and false negative MRI EBL 1000cc (IQR 725-1350cc) (p=0.33). Transfusion rates were similar between groups (50% for false negative MRI, 51.7% true positive MRI). A median of 5.0 units of pRBCs was transfused for true positive MRI patients (IQR 3-7.5), as compared to 2.0 for false negative MRI (IQR 1.5-3.5) (p=0.19). For false negative MRIs, 25% had an accreta on pathology and 75% had an increta. For true positive MRIs, 21.7% had an accreta, 53.5% had an increta, and 21.7% had a percreta (p=0.53).

Conclusion: Although not statistically significant, there was a clinical trend towards lower EBL, units transfused, and surgical complications for patients with false negative MRIs. No percretas had false negative MRI results. Dark intraplacental bands on MRI were identified in half of false negative MRIs, indicating this is a high sensitivity MRI feature. More research with a larger sample size is needed to further investigate outcomes and features of patients with false negative MRIs.

Table 1 – Patient demographics

Demographic	Total N		True Positive MRI	False Negative MRI	p
			N = 60	N = 8	
Maternal Age	68 (100.0)	Mean (SD)	36.2 (3.8)	34.5 (7.1)	0.52
Gestational age at delivery	68 (100.0)	Median (IQR)	34.3 (33.7 to 34.9)	34.3 (33.5 to 34.6)	0.81
BMI	68 (100.0)	Mean (SD)	31.9 (6.2)	31.1 (3.7)	0.59
Race/Ethnicity	68 (100.0)	Hispanic or Latinx	15 (25.0%)	0 (0.0%)	0.03
		Non-Hispanic Asian	1 (1.7%)	1 (12.5%)	
		Non-Hispanic Native Hawaiian or Other Pacific Islander	0 (0.0%)	0 (0.0%)	
		Non-Hispanic Black or African American	6 (10.0%)	2 (25.0%)	
		Non-Hispanic White	22 (36.7%)	2 (25.0%)	
		Non-Hispanic Multiple Races	0 (0.0%)	1 (12.5%)	
		Unknown	14 (23.3%)	0 (0.0%)	
Insurance	68 (100.0)	Medicaid	27 (45.0%)	3 (37.5%)	>0.99
		Private	33 (55.0%)	5 (62.5%)	

Table 2 – Prior pregnancy history

History characteristic	Total N		True Positive MRI	False Negative MRI	p
			N = 60	N = 8	
Interval since last pregnancy (years)	57 (83.8)	Median (IQR)	3.5 (2.0 to 5.2)	2.0 (1.0 to 2.0)	0.09
Total number of prior cesarean sections	68 (100.0)	Median (IQR)	2.0 (1.0 to 3.0)	1.0 (1.0 to 3.0)	0.45
Asherman's syndrome	68 (100.0)	No	58 (96.7)	7 (87.5)	0.32
		Yes	2 (3.3)	1 (12.5)	
Prior cesarean section	68 (100.0)	No	2 (3.3)	0 (0.0)	>0.99
		Yes	58 (96.7)	8 (100.0)	
Prior d&c/d&e or hysteroscopy for retained products of conception	68 (100.0)	No	49 (81.7)	7 (87.5)	>0.99
		Yes	11 (18.3)	1 (12.5)	
Prior chorioamnionitis	68 (100.0)	No	57 (95.0)	7 (87.5)	0.40
		Yes	3 (5.0)	1 (12.5)	
Prior retained placenta/uterine dehiscence	68 (100.0)	No	54 (90.0)	6 (75.0)	0.24
		Yes	6 (10.0)	2 (25.0)	

Table 3 - MRI Features

MRI feature	Total N		True Positive MRI	False Negative MRI	p
			N = 60	N = 8	
Placental thickening	68 (100.0)	No	25 (41.7)	8 (100.0)	0.002
		Yes	35 (58.3)	0 (0.0)	
Signal Intensity	68 (100.0)	heterogenous	38 (63.3)	1 (12.5)	0.009
		homogenous	22 (36.7)	7 (87.5)	
Dark intraplacental bands	68 (100.0)	No	10 (16.7)	4 (50.0)	0.0502
		Yes	50 (83.3)	4 (50.0)	
Placenta uterine interface	68 (100.0)	Thick nodular contour	43 (71.7)	1 (12.5)	0.002
		Normal	17 (28.3)	7 (87.5)	
Placental myometrial margin	68 (100.0)	Absent/loss	46 (76.7)	2 (25.0)	0.006
		Normal	14 (23.3)	6 (75.0)	
Bladder wall	68 (100.0)	No	14 (23.3)	8 (100.0)	<0.001
		Yes	46 (76.7)	0 (0.0)	

Table 4 - Outcomes

Outcome	Total N		True Positive MRI	False Negative MRI	p
Pathology	68 (100.0)	Accreta	13 (21.7)	2 (25.0)	0.53
		Increta	32 (53.3)	6 (75.0)	
		Percreta	12 (21.7)	0 (0.0)	
		PAS (unspecified)	2 (3.3)	0 (0.0)	
EBL	68 (100.0)	Median (IQR)	1500.0 (675.0 to 2500.0)	1000.0 (725.0 to 1350.0)	0.33
Transfusion§	68 (100.0)	No	29 (48.3)	4 (50.0)	>0.99
		Yes	31 (51.7)	4 (50.0)	
Units of pRBCs transfused	68 (100.0)	Median (IQR)	1.0 (0.0 to 5.0)	0.0 (0.0 to 1.2)	0.25
Units of FFP transfused	68 (100.0)	Median (IQR)	0.0 (0.0 to 4.0)	0.0 (0.0 to 0.0)	0.09
Any surgical complication*	68 (100.0)	No	45 (75.0)	8 (100.0)	0.18
		Yes	15 (25.0)	0 (0.0)	
Uterine incision to skin closure time (minutes)	32 (47.1)	Median (IQR)	179.5 (132.2 to 203.5)	127.5 (123.0 to 149.2)	0.21
Any postpartum complication †	68 (100.0)	No	41 (68.3)	8 (100.0)	0.09
		Yes	19 (31.7)	0 (0.0)	
Readmission	68 (100.0)	No	54 (90.0)	8 (100.0)	>0.99
		Yes	6 (10.0)	0 (0.0)	

§ pRBC or FFP

* Bladder injury, re-operation, post-operative abscess

† Acute kidney injury, ileus, colonic pseudo-obstruction, cellulitis, hernia, VTE/PE, edema, pulmonary edema, heart block, spinal headache

Table 4a – Transfusion outcomes, for patients who were transfused with pRBCs

Outcome	Total N		True Positive MRI	False Negative MRI	p
			N = 31	N = 3	
Units of pRBCs transfused	34 (100.0)	Median (IQR)	5.0 (3.0 to 7.5)	2.0 (1.5 to 3.5)	0.19

Table 4b – Transfusion outcomes, for patients who were transfused with FFP

Outcome	Total N		True Positive MRI	False Negative MRI	p
			N = 26	N = 1	
Units of FFP transfused	27 (100.0)	Median (IQR)	4.0 (3.0 to 6.0)	3.0 (3.0 to 3.0)	0.63

Four Cesarean Scar Pregnancies Managed at Accreta Center of Excellence at Medical City Dallas Hospital: A Case Series

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Objective: Cesarean Scar Pregnancy results from pathologic implantation of a gestational sac into a hysterotomy scar. This rare disease continues to increase in incidence due to the rise of Cesarean delivery in the United States. Current management recommendations by the Society of Maternal Fetal Medicine (SMFM) include termination of pregnancy, or in rare instances, hysterectomy.

Study Design: This case series examines four patients diagnosed with Cesarean Scar Pregnancies that either declined termination or were unable to receive abortion services in the first trimester, and who were managed at the Accreta Center of Excellence at Medical City Dallas Hospital. This novel management strategy included admission to the inpatient antepartum service between 30 and 32 weeks gestation, delivery at 34 weeks gestation via planned cesarean hysterectomy (or sooner as indicated) with the Accreta team utilizing Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA), and infant NICU admission.

Results: All four patients were delivered with viable neonates, received cesarean hysterectomy, and had less than 2500mL of blood loss at delivery.

Conclusion: This case series seeks to examine the current recommendations for cesarean scar pregnancies and propose a safe alternative protocol for CSP expectant management within the Accreta centers of excellence.

Healthcare utilization and cost of care of patients with unrecognized placenta accreta spectrum undergoing hysterectomy after a vaginal delivery.

Alexandre Buckley de Meritens, Katherine Yoh, Mirella Mourad, Eve Overton, John Ilagan, Lawrence Ring, Yongmei Huang, Koji Matsuo, Jason Wright

Objective: While Placenta Accreta Spectrum (PAS) is usually treated with cesarean delivery (CD), patients with unrecognized PAS may undergo vaginal delivery (VD) and require subsequent hysterectomy. We compared health care utilization and cost of care for patients with PAS undergoing a VD followed by hysterectomy to patients with PAS and standard CD-hysterectomy.

Study Design: Using the Premier database, we identified 7,169,590 deliveries between 2016 and 2020. We included 4337 patients with CD and immediate hysterectomies and 308 patients with VD and hysterectomy within 60 days. Descriptive and comparisons analysis were conducted using chi-square or the Fishers' exact tests and Mann-Whitney U tests.

Results: 89% of hysterectomies in the VD group occurred on the day of delivery and 11% occurred 1 to 5 days after delivery. Compared to CD-hysterectomy group, VD occurred more frequently in rural (3.1% vs 9.1%), non-teaching (23.4% vs. 38.6%), and small hospitals (< 500 beds) (37.6% vs. 56.8%) (all P<0.05). The VD group had more full-term deliveries and less history of previous CD. Obstetrical complications were equally prevalent in vaginal and section deliveries.
A higher proportion of patients with CD had use of REBOA (1.8% vs 0%,), embolization (16% vs 4.5%), and ureteral stents (24.6% vs 3.6%) (all p<.05).
Patients delivered by VD had more severe maternal morbidity (SMM) (57% vs 49%), post-partum hemorrhage (90.3 vs 44.3%), DIC (9.1 vs 5.2%), shock (17.5 vs 8.8%) (all p<.05). Patients delivered by CD had a higher incidence of any surgical complication (26.3 vs 9.4%), surgical site complication (9.6% vs 5.5%), and bladder injury (17.6 vs 3.6%, p<.0001). There was no difference in use of ventilator, genitourinary injuries, reoperation. The median cost of hospitalization for the CD group was $24,599 and $23,129 for the VD (p<.05). The median length of stay was similar for both groups. There were more readmissions with CD (5.5% vs 2.6%) with a higher median cost ($7,611 vs $7,607) (both p<.05)

Conclusion: VD are more prevalent in rural, non-teaching, small hospitals, presumably due to undiagnosed PAS antenatally. Patients with VD had a higher rate of SMM. The cost of care is higher and surgical complications more common in the CS group.

Table 1. Demographics by mode of delivery

	All	Cesarean section	Vaginal delivery	P Value
	N (%)	N (%)	N (%)	
Delayed hysterectomy	33 (0.7)	0	33 (10.7)	
Immediate hysterectomy	4612 (99.3)	4337 (100)	275 (89.3)	
Age				0.003
15-29	975 (21)	885 (20.4)	90 (29.2)	
30-34	1620 (34.9)	1520 (35)	100 (32.5)	
35-39	1461 (31.5)	1375 (31.7)	86 (27.9)	
>=40	589 (12.7)	557 (12.8)	32 (10.4)	
Other/Unknown	421 (9.1)	391 (9)	30 (9.7)	
Race				0.0118
White	2738 (58.9)	2527 (58.3)	211 (68.5)	
Black	857 (18.4)	814 (18.8)	43 (14)	
Asian	207 (4.5)	196 (4.5)	11 (3.6)	
Other	627 (13.5)	593 (13.7)	34 (11)	
Unknown	216 (4.7)	207 (4.8)	9 (2.9)	
Insurance				0.0169
Medicaid	2340 (50.4)	2208 (50.9)	132 (42.9)	
Commercial	2069 (44.5)	1908 (44)	161 (52.3)	
Unknown	236 (5.1)	221 (5.1)	15 (4.9)	
Emergent Care	2050 (44.1)	1910 (44)	140 (45.5)	0.8544
Geographic area				<.0001
Urban	4484 (96.5)	4204 (96.9)	280 (90.0)	
Rural	161 (3.5)	133 (3.1)	28 (9.1)	
Teaching Hospital	3509 (75.5)	3320 (76.6)	189 (61.4)	<.0001
Hospital beds				<.0001
000-099	388 (8.4)	323 (7.4)	65 (21.1)	
200-299	314 (6.8)	283 (6.5)	31 (10.1)	
300-399	475 (10.2)	442 (10.2)	33 (10.7)	
400-499	628 (13.5)	582 (13.4)	46 (14.9)	
500+	2840 (61.1)	2707 (62.4)	133 (43.2)	
Region				0.0357
Northeastern	801 (17.2)	759 (17.5)	42 (13.6)	
Midwest	887 (19.1)	811 (18.7)	76 (24.7)	
South	2144 (46.2)	2002 (46.2)	142 (46.1)	
West	813 (17.5)	765 (17.6)	48 (15.6)	

Table 2. Clinical characteristics by delivery mode

	ALL	Cesarean section	Vaginal delivery	P Value
	N (%)	N (%)	N (%)	
Obese	880 (18.9)	845 (19.5)	35 (11.4)	0.0004
Multiples	174 (3.7)	167 (3.9)	7 (2.3)	0.1588
Severe preclampsia	182 (3.9)	160 (3.7)	22 (7.1)	<.0001
Mild preclampsia	100 (2.2)	80 (1.8)	20 (6.5)	
Gestational hypertension	245 (5.3)	223 (5.1)	22 (7.1)	0.1342
Gestational diabetes	693 (14.9)	661 (15.2)	32 (10.4)	0.0209
Diabetes	190 (4.1)	188 (4.3)	2 (0.6)	0.0016
Placenta previa	2271 (48)	2260 (52.1)	11 (3.6)	<.0001
PAS				<.0001
accreta	3257 (70.1)	2983 (68.8)	274 (89)	
increta	565 (12.2)	540 (12.5)	25 (8.1)	
percreta	823 (17.7)	814 (18.8)	9 (2.9)	
prior cesarean section	3375 (72.7)	3320 (76.6)	55 (17.9)	<.0001
Gestational age at delivery				<.0001
full-term	996 (21.4)	780 (18)	216 (70.1)	
extremely preterm (less than 28 weeks)	325 (7)	300 (6.9)	25 (8.1)	
very preterm (28 to less than 32 weeks)	540 (11.6)	528 (12.2)	12 (3.9)	
moderate to late preterm (32 to 37 weeks)	2749 (59.2)	2696 (62.2)	53 (17.2)	
unknown	35 (0.8)	33 (0.8)	2 (0.6)	
IUGR	225 (4.8)	204 (4.7)	21 (6.8)	0.0949
IUFD	75 (1.6)	55 (1.3)	20 (6.5)	<.0001
LGA	89 (1.9)	81 (1.9)	8 (2.6)	0.3667

Table 3. Ancillary services by mode of delivery

	All	Cesarean section	Vaginal delivery	P Value
	N (%)	N (%)	N (%)	
Cystoscopy	654 (14.1)	611 (14.1)	43 (14)	0.9506
Central line	86 (1.9)	81 (1.9)	5 (1.6)	0.7586
REBOA	80 (1.7)	80 (1.8)	0	0.0162
CPR	22 (0.5)	20 (0.5)	2 (0.6)	1
Artery embolization	711 (15.3)	697 (16.1)	14 (4.5)	<.0001
Ureteral stents	1080 (23.3)	1069 (24.6)	11 (3.6)	<.0001
Tranexamic acid	1825 (39.3)	1705 (39.3)	120 (39)	0.9028

Table 4. Outcomes by mode of delivery

	All	Cesarean delivery	Vaginal delivery	P Value
	N (%)	N (%)	N (%)	
SMM	2278 (49)	2103 (48.5)	175 (56.8)	0.0047
Any complication	1170 (25.2)	1141 (26.3)	29 (9.4)	<.0001
Operative complication	878 (18.9)	862 (19.9)	16 (5.2)	<.0001
Surgical site complication	435 (9.4)	418 (9.6)	17 (5.5)	0.0165
Postpartum hemorrhage	2198 (47.3)	1920 (44.3)	278 (90.3)	<.0001
Transfusion	1915 (41.2)	1786 (41.2)	129 (41.9)	0.8087
Postpartum hemorrhage and transfusion	3002 (64.6)	2715 (62.6)	287 (93.2)	<.0001
Ventilation	215 (4.6)	197 (4.5)	18 (5.8)	0.2934
Bladder injury	773 (16.6)	762 (17.6)	11 3.6)	<.0001
Ureteral injury	122 (2.6)	119 (2.7)	3 (1)	0.0606
DIC	255 (5.5)	227 (5.2)	28 (9.1)	0.0041
Shock	437 (9.4)	383 (8.8)	54 (17.5)	<.0001
Reoparation	90 (1.9)	84 (1.9)	6 (1.9)	0.989
Delivery hospitalization cost in 2023 dollars (median)	24,413	24,599	23,129	0.0252
Length of hospitalization stay(days/median)	6	6	5	<0.0001

Healthcare utilization and cost of care of primary cesarean hysterectomy versus delayed hysterectomy for patients with placenta accreta spectrum.

Alexandre Buckley de Meritens, Katherine Yoh, Mirella Mourad, Eve Overton, John Ilagan, Lawrence Ring, Yongmei Huang, Koji Matsuo, Jason Wright

Objective: Our objective was to compare health care utilization and cost of care for patients with placenta accreta spectrum (PAS) undergoing an immediate cesarean hysterectomy versus a delayed hysterectomy.

Study Design: We used the Premier database from 2016-2023 and included deliveries by cesarean section (CS) with a diagnosis of PAS and a hysterectomy within 60 days after delivery. Patients with vaginal delivery and missing delivery mode were excluded. We collected patients' demographics, hospital and clinical characteristics, use of ancillary services, cost of delivery hospitalization and readmissions within 60 days of CS. Descriptive and comparisons analysis were conducted using chi square or the Fishers' exact tests and Wilcoxon two-sample sum-rank tests.

Results: We identified 7,169,590 deliveries, including 4,392 deliveries by cesarean for PAS who had either an immediate (n=4337) or delayed (n=55) hysterectomy. Delayed hysterectomies occurred 1-42 days after delivery (74% occurred 1 day postpartum). A higher proportion of patients undergoing delayed hysterectomy were delivered in a rural hospital (9.1% vs 3.3%, p<.05). Placenta previa, prior CS, gestational age at delivery, were equally distributed in both groups. A higher proportion of patients undergoing a delayed hysterectomy had a cystoscopy (25.5% vs 14.1%, p<0.05) or an embolization (30.9% vs 16.1%, p<0.01) but there was no difference in the use of REBOA, ureteral stents or TXA.

Delayed hysterectomies had more severe maternal morbidity (67.3% vs 48.5%), surgical complications (40.0% vs 26.3%), post-partum hemorrhage or transfusion (85.5% vs 62.6%, p=.0005), use of ventilator (21.8% vs 4.5%), DIC (21.8% vs 5.2%), shock (34.5% vs 8.8%), and reoperation (12.7% vs 1.9%) (all p <0.05). The median cost of delivery hospitalization was higher for delayed hysterectomy ($46,806 vs $24,599, p<.0001) with a median length of stay of 7 vs 6 days (p=.0003), respectively. There was no difference in the number of readmissions but the cost ($36,672 vs 7,611, p<.05) and length of stay (16 vs 4 days, p=.05) were higher for delayed hysterectomies.

Conclusion: Patients with delayed hysterectomy utilize more hospital resources, have more complications and a higher cost of care during their admission for delivery and readmissions.

Table 1. Demographics by mode of delivery

	All	Delayed hysterectomy	Immediate hysterectomy	P Value
	N (%)	N (%)	N (%)	
Age				0.2581
15-29	898 (20.4)	13 (23.6)	885 (20.4)	
30-34	1532 (34.9)	12 (21.8)	1520 (35)	
35-39	1396 (31.8)	21 (38.2)	1375 (31.7)	
>=40	566 (12.9)	9 (16.4)	557 (12.8)	
Race				0.052
White	2557 (58.2)	30 (54.5)	2527 (58.3)	
Black	819 (18.6)	5 (9.1)	814 (18.8)	
Asian	201 (4.6)	5 (9.1)	196 (4.5)	
Other	606 (13.8)	13 (23.6)	593 (13.7)	
Unknown	209 (4.8)	2 (3.6)	207 (4.8)	
Insurance				0.0699
Medicaid	2228 (50.7)	20 (36.4)	2208 (50.9)	
Commercial	1938 (44.1)	30 (54.5)	1908 (44)	
Unknown	226 (5.1)	5 (9.1)	221 (5.1)	
Emergent Care	1940 (44.2)	30 (54.5)	1910 (44)	0.1202
Geographic Area				
Urban	4254(96.9)	50 (90.9)	4204 (96.9)	0.0282
Rural	138 (3.1)	5 (9.1)	133 (3.1)	
Teaching Hospital	3360 (76.5)	40 (72.7)	3320 (76.6)	0.5063
Hospital Beds				0.3409
000-099	328 (7.5)	5 (9.1)	323 (7.4)	
200-299	289 (6.6)	6 (10.9)	283 (6.5)	
300-399	447 (10.2)	5 (9.1)	442 (10.2)	

400-499	585 (13.3)	3 (5.5)	582 (13.4)	
500+	2743 (62.5)	36 (65.5)	2707 (62.4)	
Region				0.4889
Northeastern	766 (17.4)	7 (12.7)	759 (17.5)	
Midwest	824 (18.8)	13 (23.6)	811 (18.7)	
South	2030 (46.3)	28 (50.9)	2002 (46.2)	
West	772 (17.6)	7 (12.7)	765 (17.6)	

Table 2. Clinical characteristics by delivery mode

	All	**Delayed hysterectomy**	**Immidiate hysterectomy**	**P Value**
	N (%)	**N (%)**	**N (%)**	
Placenta previa	2283 (52)	23 (41.8)	2260 (52.1)	0.1369
PAS	3021 (68.8)	38 (69.1)	2983 (68.8)	0.9285
accreta	3021 (68.8)	38 (69.1)	2983 (68.8)	0.9285
increta	546 (12.4)	6 (10.9)	540(12.5)	
percreta	825 (18.8)	11 (20)	814 (18.8)	
Prior cesarean section	3361 (76.5)	41 (74.5)	3320 (76.6)	0.7489
Gestational age at delivery	793 (18.1)	13 (23.6)	780 (18)	0.1341
Full-term	793 (18.1)	13 (23.6)	780 (18)	0.1341
Extremely preterm (< 28 weeks)	306 (7)	6 (10.9)	300 (6.9)	
Very preterm (28 to 32 weeks)	538 (12.2)	10 (18.2)	528 (12)	
Moderate to late preterm (32 to 37 weeks)	2721 (62)	25 (45.5)	2696 (62.2)	

Table 3. Use of ancillary services by delayed or immediate hysterectomy

	All	Delayed hysterectomy	Immediate hysterectomy	P Value
	N (%)	N (%)	N (%)	
Cystoscopy	625 (14.2)	14 (25.5)	611 (14.1)	0.0165
Central_line	84 (1.9)	3 (5.5)	81 (1.9)	0.0871
REBOA	80 (1.8)	0	80 (1.8)	0.6264
CPR	20 (0.5)	0	20 (0.5)	1
Arterial embolization	714 (16.3)	17 (30.9)	697 (16.1)	0.003
Ureteral stents	1084 (24.7)	15 (27.3)	1069 (24.6)	0.6537
Tranexamic acid	1730 (39.4)	25 (45.5)	1705 (39.3)	0.3543

Table 4. Clinical outcomes of delayed versus immediate hysterectomy

	All	Delayed hysterectomy	Immediate hysterectomy	p value
	N (%)	N (%)	N (%)	
SMM	2140 (48.7)	37 (67.3)	2103 (48.5)	0.0056
Any complication	1163 (26.5)	22 (40)	1141 (26.3)	0.0222
Operative complication	875 (19.9)	13 (23.6)	862 (19.9)	0.4877
Surgical site complication	429 (9.8)	11 (20)	418 (9.6)	0.0101
Postpartum hemorrhage	1961 (44.6)	41 (74.5)	1920 (44.3)	<.0001
Transfusion	1812 (41.3)	26 (47.3)	1786 (41.2)	0.3618
Postpartum hemorrhage and transfusion	2762 (62.9)	47 (85.5)	2715 (62.6)	0.0005
Ventilator	209 (4.8)	12 (21.8)	197 (4.5)	<.0001
Bladder injury	773 (17.6)	11 (20)	762 (17.6)	0.6381
Ureteral injury	121 (2.8)	2 (3.6)	119 (2.7)	0.2583

DIC	239 (5.4)	12 (21.8)	227 (5.2)	<.0001
Shock	402	19	383	<.0001
Reoperation	91 (2.1)	7 (12.7)	84 (1.9)	0.0001
Delivery hospitalization cost (dollars/median)	24,767	46,8066	24,599	<0.0001
Length of stay (days/median)	6	7	6	0.0003

Table 5. Readmissions

	All	**Delayed hysterectomy**	**Immediate hysterectomy**	**P Value**
	N (%)	**N (%)**	**N (%)**	
Readmission	241 (5.5)	3 (5.5)	238 (5.5)	1
Readmission cost (dollars/median)	7,769	36,672	7,611	0.0469
Length of stay (days/median)	4	16	4	0.0503

Healthcare Utilization, Complications, and Cost for Cesarean Hysterectomy for Placenta Accreta Spectrum

Alexandre Buckley de Meritens, Yongmei Huang, Katherine Yoh, Mirella Mourad, Eve Overton, John Ilagan, Lawrence Ring, Koji Matsuo, Jason Wright

Objective: To describe clinical practice patterns and cost for patients undergoing a cesarean hysterectomy for placenta accreta spectrum (PAS) in a nationwide administrative claims dataset.

Study Design: The MarketScan® Databases, which capture inpatient and outpatient services across the US, were used to identify PAS patients who underwent cesarean delivery (CD) with immediate hysterectomy from 2016-2022. This retrospective cohort study followed patients longitudinally from the estimated conception date to two months post-delivery discharge. We collected data on patients demographics, clinical characteristics, antenatal ultrasound and MRI usage, resource utilization (e.g. cystoscopy, pelvic vessel embolization, balloon occlusion catheters) during delivery, severe maternal morbidity (SMM), surgical complications, costs, and readmissions. The analysis was descriptive.

Result: Among 3.1 million deliveries from 2016-2022, 2458 involved a diagnosis of PAS and underwent CD. Of these, 509 patients had an immediate hysterectomy with continuous health insurance coverage during the study period. The median age of patients were 34 years (IQR:30-37) and the median gestational age was 35 weeks (IQR: 34-38). Placenta percreta was present in 20%, increta 14%, and accreta 66% of cases. Over 60% had placental previa, and 3.7% had low lying placental. More than three-quarters had a history of CD. The median number of obstetrics ultrasounds during the antenatal period was 7 (IQR:5-10), with 28% undergoing MRI. At delivery, 11% had cystoscopy, 13% had ureteral stents, and 6% had pelvic vessel embolization or balloon occlusion catheters. SMMs occurred in 31% of cases, with 22% experiencing surgical complications. Near half of patients had postpartum hemorrhage or transfusion, 12% had bladder injuries, and 4% had DIC. Approximately 20% were hospitalized antenatally, and 5.5% had readmissions within 60 days of delivery discharge. The median overall cost was $29,447 (IQR: 816-55,133), including $6,303 for antenatal visits, $19,090 for deliveries, and $415 for postpartum services.

Conclusion: Patients with PAS require high healthcare utilization and are at risk for severe complications. The cost of care is mainly driven by delivery cost. Future study should compare PAS-CD to normal CD in order to identify areas to improve clinical outcomes, health care utilization and reduce cost of care.

Placenta accreta risk classification using a novel scoring system; a useful tool for delivery planning

Safeya Thompson DO, Brittany Marinelli MD, Lindsay Celentano MD, Erin Myers MD, Julie Kang DO

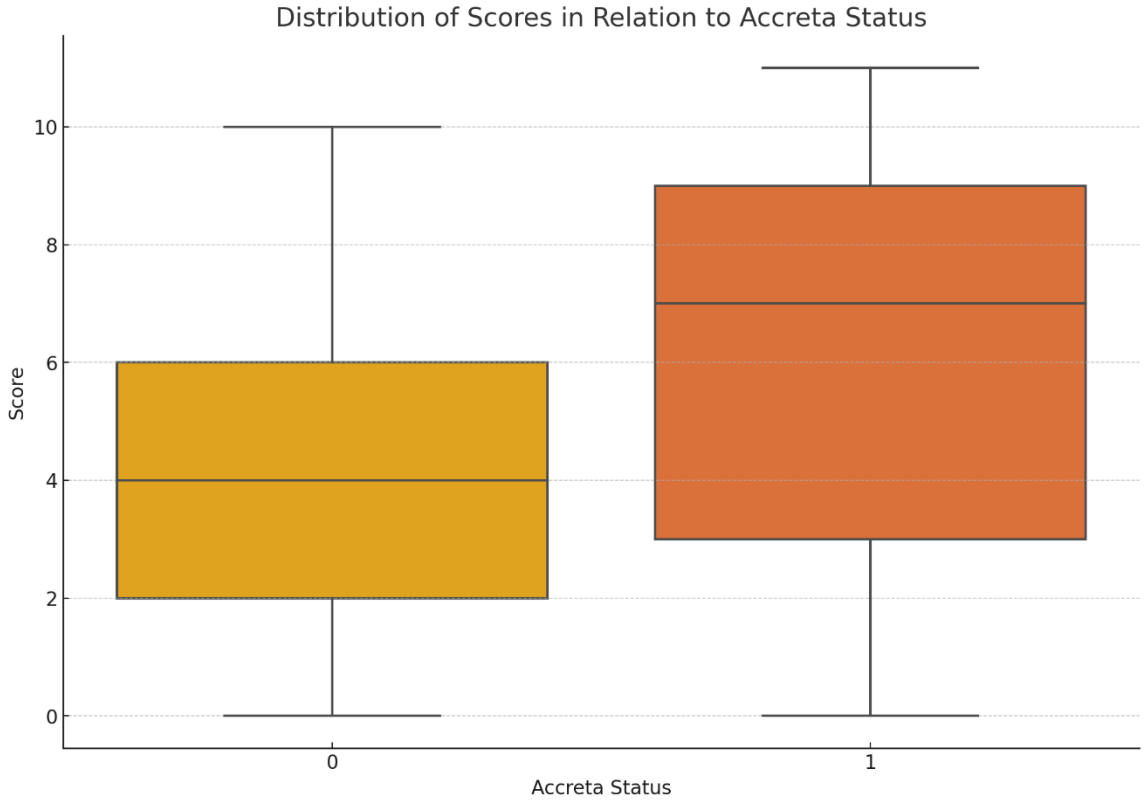
Objective: To develop and evaluate a novel scoring system for classifying the risk of placenta accreta to aid in delivery planning and improve maternal and fetal outcomes.

Methods: We conducted a retrospective analysis of patient data to identify significant predictors of placenta accreta. Variables included previous C-section, previous uterine surgery, placenta previa, assisted reproductive technology, prior placenta accreta spectrum, irregular vasculature, loss of echogenicity, and uterine wall thinning. The scoring system was developed by assigning points to each variable based on its statistical association with placenta accreta, resulting in a total score ranging from 0 to 12. Patients were then classified into three risk categories: low (0-4), moderate (5-8), and high (9-12).
The scoring system is as follows:
- Previous C-section: 2 points
- Previous uterine surgery: 1 point
- Placenta previa: 2 points
- ART/Scratch: 1 point
- Prior placenta accreta spectrum: 1 point
- Irregular vasculature: 2 points
- Loss of echogenicity: 2 points
- Uterine wall thinning: 1 point

Results: The scoring system was applied to the dataset, and the sensitivity and specificity were calculated. The sensitivity of the scoring system was 58.47%, and the specificity was 70.89%. A risk stratification chart was created, showing the distribution of patients across the three risk categories. A boxplot (see Figure 1) illustrated the relationship between the total scores and the presence of placenta accreta.
Comparison with Existing Systems
Compared to existing risk assessment tools, our scoring system uniquely integrates multiple sonographic and historical variables into a single, easy-to-use format. Existing systems often rely on a limited set of variables or qualitative assessments, potentially overlooking important predictive factors. Our system's balanced approach offers a more comprehensive risk assessment, as evidenced by its satisfactory sensitivity and specificity. Additionally, the scoring system is straightforward to implement in clinical settings, facilitating more informed decision-making for delivery planning.

Conclusion: Our novel scoring system effectively stratifies patients into low, moderate, and high-risk categories for placenta accreta. This tool can be instrumental in delivery planning, enabling healthcare providers to anticipate and manage potential complications associated with placenta accreta more effectively. Further prospective studies are recommended to validate and refine this scoring system.

Figure 1


Distribution of Scores in Relation to Accreta Status
Score
10
8
6
4
2
0
0
1
Accreta Status

Placental migration in the setting of second-trimester placenta previa and placenta accreta spectrum

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Objective: To provide a comprehensive longitudinal assessment of the appearance of "placental migration" in patients with second-trimester placenta previa and compare patients who did and did not subsequently develop placenta accreta spectrum (PAS).

Study Design: Multicenter longitudinal retrospective cohort at seven sites in the Perinatal Research Consortium. Inclusion criteria: placenta previa or low-lying placenta in the second trimester and an available third-trimester scan in addition to known cases of PAS. One author (DWS), blinded to outcomes, reviewed all de-identified second and third-trimester ultrasound images (endovaginal preferentially) to measure the shortest distance between the inferior placental edge and the internal cervical os. Days between scans and the difference between the measurements were used to calculate a "migration rate." PAS was diagnosed by difficulty in removing the placenta in the operative report or pathology showing PAS. Exclusion criteria included the inability to determine the presence of PAS. Migration was compared between those who did and did not develop PAS.

Results: Results for the full cohort showed nulliparity in 113/217 (52.1%), a prior cesarean in 61/217 (28.1%), and vaginal birth in 49/217 (18.1%). In patients who subsequently developed PAS, there was less migration distance and a significantly lower migration rate ($P < 0.01$; Table).

Conclusions: In the setting of second-trimester placenta previa, placental migration appears to be more limited in patients who subsequently develop PAS.

Demographics, ultrasound findings, and placental migration in cases of second-trimester placenta previa or low-lying placenta in patients with and without the subsequent development of placenta accreta spectrum

	Full Cohort (n = 217)	Any PAS (n = 197)	No PAS (n = 38)	P-value
Race/ethnicity				
White	83	9	74	
Black	20	3	17	
Hispanic	14	4	10	
Asian	61	18	43	
Other	37	6	31	
Nulliparity	113/217 (52.1)	16/217 (7.4)	97/217 (44.7)	
Prior cesarean	61/217 (28.1)	13/217 (6.0)	48/217 (22.1)	
2nd trimester distance (cm)		-3.1 (-4.0, 0.0)	0.0 (-2.1, 0.0)	
3rd trimester distance (cm)		0.0 (-3.3, 1.1)	1.4 (0.0, 2.8)	
Distance moved up (cm)		0.3 (0.0, 3.2)	2.1 (0.3, 3.7)	

Scan interval (days)	59 (45, 85)	83 (60, 98)	
Migration rate (cm/day)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	
Placental migration distance			
Migration negative	5/27 (18.5)	10/142 (7.0)	
Migration positive	16/27 (59.3)	113/142 (79.6)	0.051
Migration zero	6/27 (22.2)	19/142 (13.4)	
Migration distance			
>1 cm	10/16 (62.5)	90/113 (79.6)	0.20
0-1 cm	6/16 (37.5)	23/113 (20.4)	
>2 cm	9/16 (56.3)	73/113 (64.6)	0.58
0-2 cm	7/16 (43.7)	40/113 (35.4)	
>4 cm	5/16 (31.3)	28/113 (24.8)	0.55
0-4 cm	11/16 (68.7)	85/113 (75.2)	
Placental migration rate			
Rate negative	4/17 (23.5)	10/139 (7.2)	
Rate positive	8/17 (47.1)	109/139 (78.4)	< 0.01
Rate zero	5/17 (29.4)	20/139 (14.4)	
Migration rate			
≥0.01 cm/day	5/17 (29.4)	94/139 (67.6)	< 0.01
<0.01 cm/day	12/17 (70.6)	45/139 (32.4)	
≥0.05 cm/day	1/17 (5.9)	25/139 (18.0)	0.31
<0.05 cm/day	16/17 (94.1)	114/139 (82.0)	
≥0.1 cm/day	1/17 (5.9)	2/139 (1.4)	0.29
<0.1 cm/day	16/17 (94.1)	137/139 (98.6)	

PAS= placenta accreta spectrum. Any PAS = accreta, increta or percreta. Data are shown as median (IQR) or n (%). Negative numbers indicate how far the placenta extended past the internal os (overlap) when there was a complete placenta previa. Lack of perfect correlation in numbers represents missing data. 2nd and third trimester distances are from the lower placental edge to the internal cervical os. Negative migration distance means the overlap of placenta over the internal os became more pronounced. Negative migration rate means the placenta appeared to move closer to the os

Prophylactic Resuscitative Endovascular Balloon Occlusion in the Management of Placenta Percreta

Monica Rodriguez, DO, MPH; Nicole Tenzel, MD; Rachel Russo, MD; Robert Cohen, MD

Background: Few reports exist on the prophylactic use of resuscitative endovascular balloon occlusion of the aorta (REBOA) and its application for prolonged occlusion times exceeding 60 minutes during cesarean hysterectomy in placenta accreta spectrum disorders.

Case: In the case of suspected placenta percreta, the prophylactic placement of a REBOA catheter before cesarean hysterectomy provided prompt life-saving post-arrest resuscitation and 166 minutes of occlusion time without any REBOA-related complications.

Conclusion: Prophylactic REBOA catheter placement is a groundbreaking approach with the potential to revolutionize the management of obstetric hemorrhage. This case underscores the efficacy of prolonged endovascular occlusion, using both partial and complete aortic occlusion techniques and core aortic blood pressure monitoring to assess hemodynamic status.

Subsequent Mental Health Disorders and SSRI prescription among Patients with PAS compared to individuals with Cesarean

Alison Asirwatham MD, Lindsay Issokson, Katherine Leung PhD, Anna R Whelan MD

Objective: Previous research demonstrates an increased risk for postpartum mood and anxiety disorders among individuals with placenta accreta spectrum (PAS) disorders. However, there is limited longitudinal data on mental health disorders outside of the first year postpartum. We aimed to assess long-term risk of mental health disorders among people with a history of PAS compared to those with prior cesarean (without PAS).

Study Design: We performed a retrospective cohort study using data from the All of Us cohort. All of Us is a longitudinal cohort study of over 1 million individuals from diverse backgrounds across the US. Study data includes electronic health records (EHR), survey responses, biomarkers and genetics. Study group included people with EHR codes for PAS, control group was people with EHR code for cesarean (without PAS code). Subsequent diagnoses of mental health disorders and prescription of SSRIs were identified by presence of ICD code or SSRI prescription that occurred later than the date of delivery.

Results: There were 72 people with a history of PAS, and another 2322 with a prior cesarean without PAS in this cohort. Individuals with history of PAS were more likely to identify as Asian compared to those without PAS. Demographics were otherwise similar between groups (Table 1). Individuals with a history of PAS had similar rates of subsequent depression (11.1% vs 11.2%) and PTSD (8.3%vs 51%), but were less likely to be prescribed SSRIs (2.8% vs 7.2%) compared to individuals who had a prior cesarean without PAS (Table 2). Individuals with PAS had fewer interactions with general physicians in the past 12 months compared to those without PAS, however both groups had equal rates of interaction with mental health professionals (Table 2).

Conclusion: In long-term follow-up, mental health disorders were similar between individuals with a history of PAS compared to individuals with a prior cesarean without PAS. Further prospective research is necessary to identify how best to support the mental health of patients following care for PAS disorders.

	Cesarean Delivery (n=2322)	PAS (n=72)	p-value
Race			
Asian	35 (1.5)	6 (8.3)	<0.001
Black	421 (18.1)	11 (15.3)	0.74
MENA	22 (0.9)	0	-
White	761 (32.8)	28 (38.9)	0.20
Other	19 (0.8)	0	-
Currently has health insurance	2044 (95.8)	68 (94.4)	0.83
Education Level			0.89
Less than high school	308 (13.3)	17 (23.6)	
High school or equivalent	441 (20.4)	7 (9.7)	
Some college	660 (30.5)	19 (26.4)	
College graduate	427 (19.7)	13 (18.1)	
Advanced degree	286 (13.2)	15 (20.8)	
Marital Status			0.64
Married	1044 (48.2)	39 (54.2)	
Divorced	289 (13.3)	4 (5.6)	
Living with partner	177 (8.2)	11 (15.3)	
Separated	135 (6.2)	3 (4.2)	
Never married	402 (18.6)	13 (18.1)	
Widowed	49 (2.3)	0	
Data displayed as n(%) Chi-squared used for all analyses. Abbreviations: PAS = Placenta accreta spectrum, MENA = Middle Eastern and North African			

	Cesarean Delivery (n=2322)	PAS (n=72)	p-value
Depression	259 (11.2)	8 (11.1)	0.13
PTSD	118 (5.1)	6 (8.3)	0.46
SSRI prescription	167 (7.2)	2 (2.8)	0.02
Health care utilization in last 12 months			
Spoke to General Physician	735 (86.4)	13 (59.1)	0.003
Spoke to Mental Health Professional	216 (25.4)	7 (31.8)	0.92
Data displayed as n(%) Chi-squared used for all analyses. Abbreviations: PAS = Placenta accreta spectrum, PTSD = post-traumatic stress disorder, SSRI = selective serotonin reuptake inhibitor			

Trophoblast Adherence in Placenta Accreta Spectrum: The Role of Collagen Matrix in Scar-Driven Pathology

Lior Kashani Ligumsky, MD; Sohum Shah, MD; Anhyo Jeong, BS; Haley Marks, PhD; Guadalupe Martinez, BS; Laurent Bentolila, PhD; Deborah Krakow, MD; Yalda Afshar, MD, PhD

Introduction: Placenta accreta spectrum (PAS) is defined by excessive adherence of the placenta after birth. Despite robust clinical characterization, the pathophysiology remains poorly understood. Disorganized collagen fiber alignment is a hallmark of PAS. We hypothesized that the cesarean scar contributes to the formation of a disorganized fibrotic scaffold, accompanied by fundamental defects in the decidua. Our objective is to delineate changes in collagen architecture at the site of the scar using an in vitro PAS co-culture model.

Methods: Human uterine fibroblasts were decidualized (estradiol, medroxyprogesterone acetate, cyclic AMP) in-vitro and a (uterine) scar was made. Trophoblasts were introduced at the scar site and live cell imaging with Incucyte and fluorescence lifetime imaging microscopy (FLIM) were utilized to analyze cell migration, invasion, and characteristics with and without pre-treatment of a collagen matrix.

Results: Utilizing the in-vitro co-culture model of PAS, a collagen matrix enhances the wound healing process and facilitates uniform trophoblast distribution following a scar formation on decidualized fibroblasts. FLIM demonstrated that the fibroblasts endogenously create the collagen extracellular matrix (ECM), without contribution from the trophoblasts. However, the trophoblasts utilize the decidual ECM as a roadmap for adherence and proliferation.

Conclusion: Fibroblasts are responsible for the ECM that drive the heterotypic cell interaction with trophoblasts and disrupted collagen fibers at the repaired scar which is a hallmark of PAS at the site of trophoblast adherence. The scar creates a permissive environment for abnormal placental attachment. This in-vitro model has the potential to identify therapeutic intervention and surgical strategies for the treatment and prevention of PAS disorders.

Use of REBOA Aortic Balloon Catheter for Cesarean Hysterectomy in the Setting of Placenta Accreta Spectrum Disorder: A Retrospective Study

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2 - Dr. Ana Adams, DO
3 - Dr. Monica Rodriguez, DO, MPH
4 - Dr. Nicole Tenzel, MD
5- Dr. Michelle McCarroll, PhD
6 - Hannah Affleck, MPH
7- Dr. Tricia Shimer, MD

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Background: Placenta accreta spectrum (PAS) refers to a range of conditions where the placenta abnormally adheres to the uterine wall, posing significant risks for severe hemorrhage and related morbidity and mortality. Various strategies have been explored to manage uncontrolled pelvic hemorrhage, including the use of bilateral iliac artery balloon tamponade and Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA).

Study Design: This retrospective study involved patients who were antenatally diagnosed with suspected placenta accreta spectrum (PAS) disorder and referred to specialists at an Accreta Center of Excellence. All participants underwent scheduled cesarean hysterectomy, performed by a multidisciplinary team comprising specialists in urology, interventional radiology, anesthesia, obstetrics, and gynecology. The study included patients who were diagnosed intraoperatively with advanced PAS, had a REBOA catheter placed preoperatively, and experienced either partial or full balloon occlusion during surgery. Patients were excluded if they did not have a REBOA catheter placed preoperatively or if the balloon was not inflated during surgery. The prophylactic REBOA catheter was inflated following the delivery of the neonate Outcomes collected: number of packed red blood cell (PRBC) transfusion, and estimated blood loss (EBL), and pathology degree of invasion of placenta (increta, accreta, or percreta). Statistical analyses were conducted using SPSS version 28.0 software.

Results: The study team reviewed n=59 patients between 2018 and 2022. Of these, n=51 had a REBOA catheter placed, and n=33 of these patients had the REBOA inflated. Of those who had REBOA inflated, postoperative pathology diagnosed n=22 (67%) as placenta percreta, n=6 (18%) as increta, and n=5 (15%) as accreta. The average duration of REBOA inflation (either partial or total occlusion) was 56 minutes (± 23.7). The average EBL was 3,426 mL (±1,949) and the average PRBC was 8 units (± 4.6).

Conclusion: The prophylactic use of REBOA during cesarean hysterectomies shows promise as an advancement in managing advanced PAS. This retrospective study underscores the importance of specialized management for patients diagnosed antenatally with PAS. Further research comparing the efficacy of REBOA with alternative interventions, such as iliac artery stents, is essential for optimizing treatment strategies and improving patient outcomes.

Acknowledgement: We continue to collect data which will include n=100 additional patients.

VTE Incidence in Scheduled Cesarean Hysterectomies for PAS With and Without VTE Bundle

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Objective: To examine the impact of a prophylactic venous thromboembolism bundle (VTE) bundle on the rate of VTE in patients undergoing scheduled cesarean hysterectomy for placenta accreta spectrum (PAS).

Design: This is a retrospective cohort study of all scheduled cesarean hysterectomies performed for antenatal suspicion for PAS. Patients with active malignancy at the time of delivery were excluded. The primary exposure was receipt of complete VTE bundle defined as administration of SQH intraoperatively, postoperative anticoagulation started within 8 hours from procedure end, receipt of prophylactic anticoagulation through hospitalization and receipt of prophylactic anticoagulation prescription at discharge from delivery hospitalization. The primary outcome was incidence of VTE within 6 weeks of delivery. Secondary outcomes (wound dehiscence, emergency visits, readmission, reoperation) were evaluated independently and as a composite.

Results: 90 patients met inclusion criteria for our study. 20 (22.2%) patients received the complete VTE bundle. Of the 70 patients who did not receive the complete VTE bundle, 4 (5.7%) patients received no prophylactic anticoagulation in any phase of care, 20 patients (28.5%) had delayed post operative anticoagulation (administered > 8 hours from procedure end), and 46 (65.7%) had one or more missing components of the VTE bundle. VTE incidence in the total cohort was 2.22%. There was no difference in VTE in patients who received the complete and timely VTE bundle compared to those with incomplete/delayed/no VTE bundle (p=0.34). There was no statistical difference in individual or composite secondary outcomes between the two groups.

Conclusions: With a VTE incidence of 2.22% our cohort was 18 times more likely to have a VTE compared to published estimates of otherwise pregnant individuals (0.12%). Even a comprehensive VTE bundle is unable to prevent all VTE outcomes. Large multicenter studies are needed to evaluate the most effective strategy to reduce the risk of this important complication in patients with PAS.

Table: Primary Outcome, VTE Incidence Within 6 Weeks of Delivery

	VTE Complete Bundle N= 20	Incomplete/No VTE Bundle N= 70	*P* Value
Incidence of VTE within 6 weeks of delivery, n(%)	1(5%)	1(1.4%)	0.34