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Psychological Outcomes Associated with Severe Placenta Accreta Spectrum Disorder with Cesarean Hysterectomy: A Retrospective Survey Study

Madison P. Noall, MA, Annastacia R. Woytash, DO, Laura L. Sorabella, MD, Britany R. Raymond, MD, Lisa C. Zuckerwise, MD, Susanna Sutherland, PhD, MS, MEd, Holly B. Ende, MD, MS

This retrospective survey study assesses rates of postpartum depression (PPD) and postpartum post-traumatic stress disorder (PTSD) in patients with prior hysterectomy for severe placenta accreta spectrum. Half of the patients met the Edinburgh Postnatal Depression Scale threshold for PPD, and 35% met the Post-traumatic Stress Disorder Checklist-5 (PCL-5) threshold for PTSD. Patients who underwent a delayed hysterectomy were more likely to report symptoms of PTSD (75% vs. 8%, $p<0.01$) and had higher median PCL-5 scores than an immediate hysterectomy (51 [IQR 16,61]) vs. 11 [IQR 2,21], $p=0.01$). Larger, prospective studies are needed to confirm these findings and determine standardized interventions for patients at high risk of psychological sequelae.

This study was approved by the Vanderbilt University Medical Center Human Subjects Protection Program. The authors have no conflicts of interests to disclose. **Madison Noall, MA,** is a medical student at the University of Cincinnati College of Medicine. **Dr. Woytash** is an Instructor at Brigham and Women's Hospital and Boston Children's Hospital. **Dr. Sorabella** is an Assistant Professor of Anesthesiology and Medical Director of Obstetric Anesthesia at Vanderbilt University Medical Center. **Dr. Raymond** is an Assistant Professor of Anesthesiology and Obstetric Anesthesia Fellowship Program Director at Vanderbilt University Medical Center. **Dr. Zuckerwise** is the Division Chief of Maternal Fetal Medicine at the University of Virginia. **Dr. Sutherland** is an Assistant Professor in the Department of Physical Medicine and Rehabilitation at Vanderbilt University Medical Center. **Dr. Ende** is an Associate Professor of Anesthesiology and Division Chief of Obstetric Anesthesia at Vanderbilt University Medical Center. Address all correspondence to Madison Noall, noallmp@mail.uc.edu.

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Placenta accreta spectrum (PAS) describes a pathologic condition of abnormal placental invasion in which the trophoblastic tissue of the placenta invades the uterine myometrium. The incidence of PAS has increased as a consequence of rising cesarean delivery rates, now affecting up to 1 in 272 pregnancies (Marshall et al., 2011; Mogos et al., 2016). As the name implies, PAS represents a spectrum of conditions, from the least invasive form of placenta accreta (adherence to the myometrium) to the more highly invasive and severe forms of placenta increta (invasion into the myometrium) and placenta percreta (invasion through the myometrium and serosa with potential involvement of surrounding structures like the bladder and bowel) (Berhan et al., 2020). Severe PAS (placenta increta and placenta percreta) is associated with life-threatening hemorrhage, severe morbidity, and maternal mortality as high as 7% (O'Brien et al., 1996). While placenta accreta is typically managed by planned simultaneous cesarean delivery and hysterectomy, management of severe PAS can include either immediate hysterectomy or delayed hysterectomy, where the placenta remains in situ, and surgical resection occurs following placental involution over multiple weeks. Delayed hysterectomy may specifically benefit select patients at higher surgical risk, as interval delayed hysterectomy has been associated with lower total median blood loss, lower median units of packed red blood cells transfused, and fewer percentage of patients requiring transfusion (Society of Gynecologic Oncology, 2018; Zuckerwise et al., 2020).

Psychological sequelae of pregnancy, including postpartum depression (PPD) and post-traumatic stress disorder (PTSD), have been shown to occur more commonly following deliveries complicated by PAS and emergency peripartum hysterectomy (Tol et al., 2019). This may be due to fear of death or complications, perceived helplessness regarding the need for medical intervention, birth-related trauma, loss of fertility, or the overall emotional weight of such a significant diagnosis coupled with the birth of a child (Bartels et al., 2020; Grover et al., 2022). However, despite mounting evidence of this significant psychological burden, little is known regarding potential modifiable risk factors for PPD or postpartum PTSD. Specifically,

no current evidence demonstrates a difference between immediate versus delayed hysterectomy on these important psychological outcomes. Delayed hysterectomy could represent a risk factor for postpartum psychological conditions, given the ongoing threat to life in the weeks postpartum, prolonged hospitalization, and separation from the infant. This study aimed to provide additional data on rates of PPD and PTSD in a cohort of patients who underwent hysterectomy for severe PAS and to compare the rates of these psychological conditions among patients who underwent immediate versus delayed hysterectomy.

Methods

Following approval by the institutional Human Subjects Protection Program at Vanderbilt University Medical Center (Institutional Review Board #220868), we conducted a retrospective survey study evaluating self-reported psychological outcomes in patients with severe PAS (placenta increta or percreta) over ten years. Patients diagnosed prenatally with severe PAS who underwent cesarean delivery with either an immediate or delayed hysterectomy between January 2012 and May 2022 were identified by query of the institutional PAS database. We included patients only with severe PAS due to the association with greater morbidity and mortality and because those patients were eligible for our institution's best practice clinical pathway that allows for consideration of delayed versus immediate hysterectomy based on the clinical presentation. The clinical algorithm used in deciding between immediate versus delayed hysterectomy has been previously described by our group (Zuckerwise et al., 2020). We excluded patients who were deceased or who had insufficient (missing or inaccurate) contact information in the electronic health record.

After identifying the study cohort, eligible patients were initially contacted by phone. In cases where a patient's phone number was missing or inaccurate, we subsequently attempted contact via email. A total of three contact attempts were made before a subject was deemed not reachable, and no further contact attempts were made. Once phone contact was made, subjects were offered the option to participate or decline participation in the study. Those opting to participate provided written electronic consent via Research Electronic Data Capture (REDCap). REDCap is a secure, web-based software platform designed to support data capture for research

studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources (Harris et al., 2009; Harris et al., 2019).

Once subjects were enrolled in the study, they were offered the option to complete a brief survey via phone interview or independently via emailed hyperlink. Study data were collected and managed directly in REDCap. A full copy of the data collection survey is presented in Supplemental Material A. Baseline characteristics and delivery-related data were collected by study investigators via manual chart review. This included the type of hysterectomy (immediate or delayed), patient age at delivery, gravidity, parity, the urgency of cesarean delivery (elective, indicated, urgent, emergent), and the interval between hysterectomy and survey completion. The remainder of the questions were answered directly by subjects (either during phone interviews or electronically). Subjects were first asked about any baseline psychiatric diagnoses (e.g., preexisting depression or anxiety) or psychiatric treatment before, during, or within one year of the PAS-affected pregnancy. Subjects then completed three previously published and validated questionnaires on psychological diagnoses—the Edinburgh Postnatal Depression Scale (EPDS), the Post-traumatic Stress Disorder Checklist-5 (PCL-5), and the Life Events Checklist (LEC-5). Finally, subjects were asked to self-report at-tempted breastfeeding (yes/no) and the duration of successful breastfeeding.

PPD was assessed using the EPDS, a 10-item questionnaire with scores ranging from 0 to 3 for each question. A score $\geq$10 is considered significant for possible PPD. Postpartum PTSD was assessed using the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5), which is a 20-item questionnaire with scores that range from 0 to 4 for each question. A score of $\geq$31 is considered significant for possible PTSD (Orbach-Zinger et al., 2021). The LEC-5 evaluated for possible confounding life events, which could have accounted for differences between groups in PPD or PTSD. Participants were asked to retrospectively report their symptoms in the three months following cesarean delivery for all scales. Univariate comparisons between immediate and delayed hysterectomy were performed using Mann-

Whitney and Fisher's Exact tests, as appropriate. All statistical analyses were conducted using IBM SPSS Statistics version 28 (IBM Corp., 2021).

Results

Of the 47 patients considered for inclusion, 32 were successfully contacted, and 20 completed the survey (12 immediate hysterectomy and 8 delayed hysterectomy), giving a response rate of 43% (63% of those reached) (Figure 1). Baseline characteristics are reported in Table 1. There were no significant differences in baseline characteristics between immediate and delayed hysterectomy. Patient outcomes are reported in Table 2. Overall, 50% of patients (n = 10) with severe PAS met the EPDS threshold for PPD (score ≥10), with median scores in the overall cohort of 10 [6,21]. There was no statistically significant difference in median PPD scores between groups (immediate hysterectomy 8 [5,12] vs. delayed hysterectomy 24 [6,26], p = 0.08).

Considering postpartum PTSD, 35% (n = 7) of patients in the overall cohort met the PCL-5 threshold for PTSD (score ≥31). Patients who underwent delayed hysterectomy were more likely to retrospectively report symptoms of PTSD than those who underwent immediate hysterectomy (75% vs. 8%, $p < 0.01$). Median PCL-5 scores were also significantly higher in patients with delayed hysterectomy (51 [IQR 16,61] vs. 11 [IQR 2,21], p = 0.01). There were no significant differences between immediate and delayed hysterectomy groups regarding concurrent life events, as measured by the LEC-5 (p = 0.47). Rates of attempted breastfeeding and duration of breastfeeding were similar in both groups (Table 2).

Figure 1

Flow Chart of Study Participation

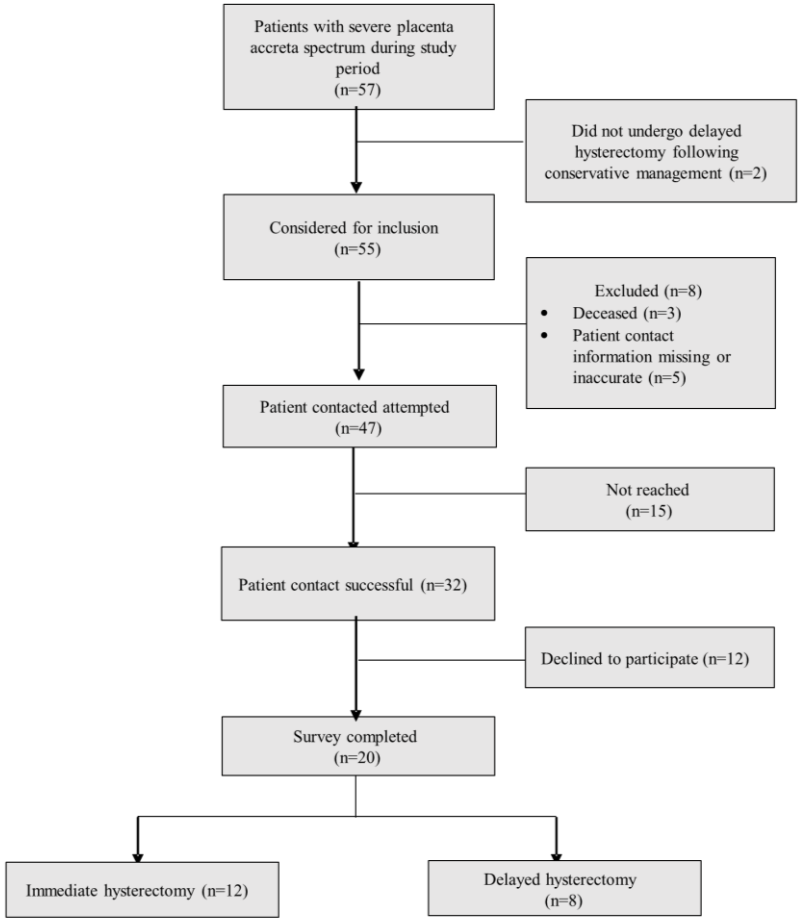

Table 1

Baseline Characteristics

	Full Cohort ($N = 20$)	Immediate Hysterectomy ($n = 12$)	Delayed Hysterectomy ($n = 8$)	p value
Patient age (years)	30 [27, 37]	30 [28,37]	31 [26,37]	0.92
Gravidity	4 [2,5]	4 [2,5]	4 [2,5]	0.85
Parity	2 [1,3]	2 [1,3]	2 [1,3]	0.85
Urgency of cesarean delivery Indicated Urgent Emergent	18 (90%) 2 (10%) 0 (0%)	11 (92%) 1 (8%) 0 (0%)	7 (88%) 1 (13%) 0 (0%)	0.76
Time interval between hysterectomy and survey completion (days)	1563 [1089,2676]	1563 [271,2166]	2110 [1157,2871]	0.21
Preexisting depression or anxiety	4 (20%)	2 (17%)	2 (25%)	1.00
Preexisting post-traumatic stress disorder	2 (10%)	1 (8%)	1 (13%)	1.00

Values reported as n(%) or median [interquartile range].

Table 2

Patient Outcomes

	Full Cohort (*N* = 20)	Immediate Hysterectomy (*n* = 12)	Delayed Hysterectomy (*n* = 8)	*p* value
Postpartum Anxiety				
Postpartum anxiety by patient report	4 (20%)	3 (25%)	1 (13%)	0.62
Postpartum Depression				
EPDS Score	10 [6,21]	8 [5,12]	24 [6,26]	0.08
Postpartum Depression by EPDS Score ≥10	10 (50%)	5 (42%)	5 (63%)	0.65
Postpartum depression by patient report	5 (25%)	4 (33%)	1 (13%)	0.60
Postpartum Posttraumatic Stress Disorder				
PCL-5 Score	18 [4,47]	11 [2,21]	51 [16,61]	0.01
Postpartum post-traumatic stress disorder by PCL-5 Score ≥31	7 (35%)	1 (8%)	6 (75%)	<0.01
Breastfeeding				
Breastfeeding attempted	15 (75%)	9 (75%)	6 (75%)	1.00
Duration of breastfeeding (months)	1 [0, 4]	3 [0,5]	0 [0,2]	0.11
Life Events				
LEC-5*	1 [0,2]	1 [0,2]	2 [1,2]	0.47

*There is no standard scoring for the LEC-5. Values recorded are median number of reports of an event "happening to me."
Values reported as *n*(%) or median [interquartile range].

Discussion

This retrospective survey study adds to a small body of literature describing the psychologic burden associated with severe PAS, with

unacceptably high rates of PPD and PTSD identified compared to the reported rates after uncomplicated cesarean delivery (Lin et al., 2022; Chen et al., 2020). Our findings also suggest an association between delayed hysterectomy and postpartum PTSD. Grover et al. (2022) previously reported on general health and quality of life at 6, 12, 24, and 36 months after delivery, collected via a prospective survey of patients after cesarean hysterectomy (immediate hysterectomy) for PAS. They found higher incidences of anxiety and depression at 12 and 36 months postpartum compared to those undergoing uncomplicated cesarean delivery, demonstrating the profound and long-lasting impact of PAS. Similarly, Tol et al. (2019) demonstrated significantly higher PTSD scores for women with PAS compared to uncomplicated cesarean delivery controls. Whether the psychologic impacts result from PAS itself or rather the peripartum hysterectomy is debatable, as the study also found no significant difference in PTSD scores between those with emergent peripartum hysterectomy for PAS versus other indications.

While all patients with severe PAS are at risk of psychological sequelae from the factors previously mentioned (fear, perceived helplessness, birth trauma, and loss of fertility) (Grover et al., 2022; Bartels et al., 2020), those with delayed hysterectomy may be at even greater risk due to prolonged hospitalization, separation from neonate, and ongoing risks to health and life while awaiting hysterectomy (Lefkowitz et al., 2010). Although previous studies have highlighted the potential benefits of delaying hysterectomy to allow placental involution prior to surgical resection (Zuckerwise et al., 2020), the psychological implications of these decisions must also be considered, including a potentially higher risk of PPD or PTSD. While this small, retrospective survey study of self-reported patient outcomes does not definitively address this question, it provides preliminary data to inform future larger studies of these outcomes.

Our study results present an opportunity to critically evaluate both clinical risk evaluations of peripartum patients and potential interventions aimed at altering outcomes. The psychological measures employed are widely accessible screening tools, easily integrated into established electronic medical record workflows. They do not require advanced psychological training to interpret and impose a relatively low burden on patients. Moreover, within the burgeoning field of behavioral medicine, efforts to advance the integration of psychological intervention in medical

settings require a nuanced understanding of risk pathways for the empirically driven development of interventions. Psychological interventions are efficacious in both preventing and treating post-traumatic stress following traumatic injury (Guimmarra et al., 2018) and are ripe for modification in this setting, with psychological interventionists for medically induced traumatic stress actively seeking collaboration and training across disciplines (McBain et al., 2023). For example, psychological interventions developed for cardiac surgery or cancer diagnoses that include coping skills or mindfulness instruction may well be appropriate for patients with PAS-related hysterectomy, but to the authors' knowledge, such interventions have not yet been tested in this population (Birk et al., 2019; Salama et al., 2023).

There are many limitations to consider when interpreting the results of our study. Most importantly, the study included a small sample size of 20 patients with PAS. That, coupled with a relatively low survey response rate, likely introduced some selection bias into our results, with patients who had negative experiences following delivery more likely to agree to be surveyed. Additionally, we surveyed patients up to 8 years after their hysterectomy; therefore, recall bias likely influenced the measured rates of PPD and PTSD. Importantly, the average time between hysterectomy and survey was no different between the immediate and delayed groups, so this was unlikely to have influenced the measured difference. Despite these limitations, patients' memories of potentially traumatic birth experiences months to years later are an important and patient-centered outcome that warrants reporting in the current study.

Conclusion

In this small retrospective survey study of patients undergoing cesarean delivery and either immediate or delayed hysterectomy for severe PAS, self-reported rates of PPD and PTSD in the three months following delivery were unacceptably high, with 50% and 35% meeting established screening criteria for PPD and PTSD, respectively. Furthermore, delayed hysterectomy was associated with a greater incidence of PTSD. Larger studies and cross-disciplined collaboration are needed to elaborate on our findings and explore ways to mitigate psychological sequelae of severe PAS.

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