

ORIGINAL RESEARCH ARTICLE

Opportunities for, and barriers to, uterus-preserving surgical techniques for placenta accreta spectrum

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Abbreviations: IS-PAS, International Society for Placenta Accreta Spectrum; PAS, placenta accreta spectrum.

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[Correction added on 08 August 2024, after first online publication: The supporting information Appendix text has been deleted and its text has been included in the main article in this version].

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Abstract

Introduction: Placenta accreta spectrum (PAS) can lead to major peripartum morbidity. Appropriate management approaches depend on the clinical severity, each individual's preference, and the treating team's expertise. Peripartum hysterectomy is the most frequently used treatment option. However, it can impact psychological well-being and fertility. We investigated whether conservative treatment with focal resection or leaving the placenta in situ is associated with comparable or lower maternal morbidity than hysterectomy in centers of excellence within the International Society for placenta accreta spectrum (IS-PAS). Furthermore, a survey was conducted to explore potential barriers to conservative management in antenatal counseling and intraoperative decision-making.

Material and Methods: Confirmed PAS cases in the prospective IS-PAS database from 22 registered centers between January 2020 and June 2022 were included in the analysis. A separate online survey with 21 questions was answered by the IS-PAS center experts about indications, diagnostic criteria, patient counseling, surgical practice, changes from the preoperative treatment plan, and why conservative management may not be offered.

Results: A total of 234 cases were included in the analysis: 186 women received hysterectomy and 38 women were treated by focal resection, and 10 by leaving the placenta in situ. Blood loss was lower in the focal resection group and in the placenta in situ group compared to the hysterectomy group ($p=0.04$). 46.4% of the women initially planned for focal resection, and 35.7% of those initially planned for leaving the placenta in situ were ultimately treated by hysterectomy. Our survey showed that the IS-PAS centers preferred hysterectomy according to a woman's wishes (64%) and when they expected less blood loss and morbidity (41%). Eighteen percent of centers did not offer focal resection at all due to a lack of experience with this technique. Reasons for not offering to leave the placenta in situ were avoidance of unexpected reoperation (36%), puerperal infection (32%), or skepticism about the method (23%).

Conclusions: Uterus-preserving treatment strategies such as focal resection appear to be safe alternatives to peripartum hysterectomy. However, less than half of the IS-PAS centers perform them. Acceptance of conservative treatments could be increased by standardized criteria for their implementation and by systematic training for PAS experts.

KEYWORDS

abnormally invasive placenta, cesarean, high-risk pregnancy, hysterectomy, placenta, surgical techniques, uterine scar

1 | INTRODUCTION

There are different surgical strategies for managing placenta accreta spectrum (PAS), depending on the grade, the pregnant individual's and doctors' preferences, and the clinical situation. Especially in higher grades of PAS (FIGO Grade 2–3c), hysterectomy is the most commonly practiced procedure.¹ However, the decision in favor of a hysterectomy deprives the woman of the possibility of future pregnancies. In addition, especially for young women, peripartum removal of the uterus constitutes a radical therapy that may also have an impact on mental health.^{2,3} Uterus-sparing techniques such as focal resection and repair or leaving

Key message

Placenta accreta spectrum is a serious condition that can be treated by different surgical strategies. Most IS-PAS centers prefer hysterectomy over conservative techniques. However, especially focal resection might be equally effective for women who want to keep their uterus.

the placenta in situ are well established.^{4–6} In observational studies, these approaches were associated with similar peripartum

blood loss, lower transfusion requirements, and shorter operative time compared to cesarean hysterectomy.^{5,7,8} We evaluated how often and where these two techniques were planned and used in the centers of excellence that have contributed cases to the database of the International Society for placenta accreta spectrum (IS-PAS). We compared blood loss, the number of red blood cell concentrates transfused, the necessity for hysterectomies at intervals, and the occurrence of postoperative maternal morbidities in women managed by peripartum hysterectomy. We also conducted an online survey among all participating centers to investigate their antenatal counseling, intraoperative decision-making, and specific surgical steps for PAS management. The aim of the survey was to identify opportunities for, and barriers to, conservative surgical techniques for PAS.

2 | MATERIAL AND METHODS

2.1 | Database analysis

The IS-PAS database contains prospectively collected obstetric and surgical data of pregnant women >14 gestational weeks with suspected and/or pathologically proven PAS. In total, 315 cases from January 2020 to June 2022 were included in the database. Data were collected from 23 centers of excellence in PAS treatment from 16 countries (European, Asian, and North and South American). FIGO clinical grades were assigned intraoperatively to identify degree of surgical complexity and placental involvement.⁹ Chart review with a standardized, secured, and password-protected online data collection platform was used (FetView, Zeitgeist Health SE, Prague, Czech Republic). It contained structured case data and reports. Of the 315 cases in the IS-PAS database, only confirmed PAS cases finally managed with peripartum hysterectomy, focal resection, or leaving the placenta in situ were included in this analysis.

2.2 | Survey of IS-PAS centers of excellence

An online survey was completed by members of the 23 registered IS-PAS centers of excellence which had submitted cases to the database. The survey contained a total of 21 questions about antenatal consultation and intraoperative decision-making (Appendix S1). We included questions about indications, principles of planned management, diagnostic criteria, and recommendations during antenatal consultation. Furthermore, we asked for the surgical steps involved in the different management strategies used at each center and possible situations in which the team might change treatment strategies intraoperatively. Current international guidelines about PAS management were reviewed to generate survey questions (Appendix S1). In some cases, respondents were able to select multiple answers, in other cases, participants had the option to submit free-text answers. The questionnaire was designed and distributed online through the LimeSurvey® platform (BPS Bildungsportal Sachsen GmbH, TU

Dresden, Germany). The questionnaire was online from April 12, 2023, to August 1, 2023. Reminders were sent to non-responding members after 2, 4, and 8 weeks. Implied consent was obtained by participating in the survey.

2.3 | Database: Statistical analysis

Comparisons between groups were performed using Mann–Whitney U test or Kruskal–Wallis test for continuous variables, and participants were first grouped based on the actual treatment performed after intraoperative assessment and staging. A second analysis was performed using an intention-to-treat analysis, whereby participants were grouped based on the preoperative planned surgery. Data are reported as median and interquartile range (IQR). Multiple comparisons were performed using the stepwise step-down procedure. Categorical variables were expressed as numbers (percentages) and compared with Fisher's exact test. Post hoc analyses of contingency tables were performed using the cell-wise residual analysis with Bonferroni correction.^{10,11} SPSS Version 28 (IBM, Chicago, USA) was used for statistical analyses. Two-tailed $p \leq 0.05$ was considered to indicate statistical significance.

2.4 | Survey: Statistical analysis

Descriptive statistics were used to describe rates and percentages of approaches used. Categorical variables were expressed as numbers (percentages) and compared with Fisher's exact test. SPSS Version 28 (IBM, Chicago, USA) was used for statistical analyses. Two-tailed $p \leq 0.05$ was considered to indicate statistical significance.

3 | RESULTS

3.1 | Database: Study population

Of the 315 cases in the database, 81 women were excluded: 68 women with manual removal of the placenta, 2 women with termination of pregnancy, 10 women with other treatments of PAS, and 1 false-positive case. After applying the inclusion and exclusion criteria, 234 cases from 22 centers were analyzed. A total of 186 women had been treated by cesarean hysterectomy, 38 by focal resection, and 10 by leaving the placenta in situ. A total of 128 (68.8%) hysterectomies were performed planned, while 49 (26.4%) were unplanned [missing information in 9 (4.8%) cases]. For the 49 unplanned hysterectomies (those performed urgently/emergently prior to the scheduled date, or when more conservative treatment was not clinically feasible), the following treatments had been planned initially: scheduled hysterectomy ($n=20$ [40.8%]), focal resection ($n=19$ [38.8%]), leaving the placenta in situ ($n=5$, [10.2%]), manual removal of the placenta ($n=4$ [8.2%]), and termination of pregnancy ($N=1$ [2.0%]). Peripartum hysterectomy was performed in 22 centers. Ten centers

TABLE 1 Study population and management.

Variable	Hysterectomy N=186	Focal resection N=38	Leaving the placenta in situ N=10	p-value
Characteristics at enrolment				
Maternal age [years] ^a	35 (31–39)	34 (30–37)	33 (33–39)	0.31
Gravidity ^a	3 (2–4)	3 (2–5)	3 (2–5)	0.54
Parity ^a	2 (1–3)	1 (0–3)	2 (1–3)	0.61
Number of previous cesarean deliveries ^a	2 (1–2)	2 (1–3)	2 (1–3)	0.96
Placenta previa ^b	160 (86.0)	23 (60.3)	8 (80.0)	<0.01
PAS suspected antenatally ^b	169 (90.9)	33 (86.8)	9 (90.0)	0.67
GA at delivery [weeks] ^a	35 (34–36)	36 (35–38)	37 (36–37)	<0.01
Grade of surgeon [N=233] ^b				
Junior	3 (1.6)	0 (0)	0 (0)	0.49
Senior	21 (11.3)	4 (10.5)	1 (10.0)	
Senior with special experience in PAS	162 (87.1)	33 (86.8)	9 (90.0)	
Additional intraoperative measures ^b				
Oxytocin	93 (50.0)	17 (44.7)	4 (40.0)	0.73
Misoprostol	8 (4.3)	3 (7.9)	0 (0)	0.64
Prostaglandin E2	12 (6.5)	15 (39.5)	0 (0)	<0.001
Tranexamic acid	117 (62.9)	24 (63.2)	3 (30.0)	0.13
Intravascular balloon	25 (13.4)	1 (2.6)	1 (10.0)	0.13
Embolization	4 (2.2)	0 (0)	4 (40.0)	<0.001
Uterine artery ligation	25 (13.4)	3 (7.9)	0 (0)	0.42
Internal iliac artery ligation	13 (7.0)	1 (2.6)	0 (0)	0.72
Intrauterine balloon	4 (2.2)	5 (13.2)	0 (0)	0.02

Note: For additional intraoperative measures, both prophylactic and therapeutic administration were included in the analysis. Statistically significant p-values (<0.05) are marked as bold text.

^aData presented as median (IQR) and analyzed with Kruskal–Wallis test.

^bData presented as n (%) and analyzed by Fisher exact test.

contributed cases treated with focal resection (range: 1–14 cases/center) and seven centers treated women by leaving the placenta in situ (range: 1–4 cases/center) (Table S1).

3.2 | Database: Demographic characteristics and perioperative management

Characteristics of the study population are shown in Table 1. The three study groups did not differ significantly in age, gravidity, or parity. The median number of previous cesarean deliveries was two in all groups. The placenta previa rate was significantly higher in the hysterectomy group and significantly lower in the focal resection group (86.0% vs 60.3%, $p<0.001$). Gestational age at delivery was significantly lower in the hysterectomy group, compared to both other two study groups (35 (34–36) vs. 36 (35–38) and 37 (36–37) weeks of gestation, $p<0.05$). All operations were mainly carried out by senior surgeons with special expertise in the treatment of PAS. Prostaglandin E2 and intrauterine balloons were used more often in the focal resection group. No prostaglandins were used when leaving the placenta in situ.

3.3 | Database: Clinical outcome by actual treatment group

Clinical outcome parameters are presented in Table 2. There were significantly more cases of FIGO Grades 3b and 3c in the hysterectomy group compared to the focal resection group (31.8% vs. 2.6%, $p<0.001$). Three (30.0%) of the cases treated with leaving the placenta in situ were graded as FIGO 3b/3c. Blood loss was lower in the focal resection group and the leaving the placenta in situ group compared to the hysterectomy group ($p=0.04$); however, the post hoc comparisons of the three groups did not reach statistical significance. There was a tendency toward fewer transfusions in the focal resection group ($p=0.05$). Intensive care unit admission was lowest in the leaving the placenta in situ group ($p=0.05$). Due to severe postpartum bleeding, one woman (2.6%) was managed with focal resection, and six women (60.0%) were treated by leaving the placenta in situ and receiving hysterectomies at intervals. The number of major maternal morbidities was highest in the hysterectomy group (36.0% vs. 7.9% vs. 20.0%,

TABLE 2 Outcome parameters.

Variable	Hysterectomy N=186	Focal resection N=38	Leaving the placenta in situ N=10	p-value
FIGO grade of invasion ^a				
Grade 1	21 (11.3)	10 (26.3)	1 (10.0)	<0.01
Grade 2	46 (24.7)	13 (34.2)	3 (30.0)	
Grade 3a	60 (32.3)	14 (36.8)	3 (30.0)	
Grade 3b	44 (23.7)	0	2 (20.0)	
Grade 3c	15 (8.1)	1 (2.6)	1 (10.0)	
Hysterectomy at interval ^a	n/a	1 (2.6)	6 (60.0)	<0.001
Blood loss in mL ^b	2000 (1400–3000)	1500 (1000–2500)	1600 (900–2800)	0.04
Red blood cells transfused (units) ^b	2 (0–4)	0 (0–4)	2 (0–5)	0.05
ICU admission ^a	76 (40.9)	20 (52.6)	1 (10.0)	0.05
Women with major maternal morbidity ^a	67 (36.0)	3 (7.9)	2 (20.0)	<0.001
Bowel damage	4 (2.2)	0	0	
Urinary tract or bladder damage	39 (21.0)	1 (2.6)	1 (10.0) ^c	
Vesicovaginal fistula	3 (1.6)	0	1 (10.0) ^c	
Thrombotic event	4 (2.2)	1 (2.6)	0	
Cerebrovascular accident	1 (0.5)	0	0	
Pulmonary edema	2 (1.1)	0	0	
Renal failure	5 (2.7)	1 (2.6)	0	
Sepsis	4 (2.2)	0	0	
Required ventilation	6 (3.2)	0	0	
Other	19 (10.2)	1 (2.6)	1 (10.0)	

Note: Blood loss rounded to 100 mL. Seventeen women developed more than one major maternal morbidity (maximum: 4 morbidities). Statistically significant *p*-values (<0.05) are marked as bold text.

Abbreviation: n/a, not applicable.

^aData presented as *n* (%) and analyzed by Fisher Exact test.

^bData presented as median (IQR) and analyzed by Kruskal–Wallis test.

^cUrinary tract damage and vesicovaginal fistula occurred in the same woman who had been managed initially by leaving the placenta in situ and eventually received a hysterectomy due to persistent vaginal bleeding.

$p < 0.001$), with urinary tract or bladder damage being the most common (39 cases [21.0%]). There was no maternal death. There were no significant differences in blood loss between the study groups when treatments were compared for each of the FIGO grades of invasion (Table 3). The median blood loss ranged from 1000 mL (FIGO 3a + leaving the placenta in situ) to 2900 mL (FIGO 3c + hysterectomy). Blood loss during hysterectomy for FIGO Grade 1 was 2600 (1500–3400) mL. Of these 21 hysterectomies, 15 (71.4%) were performed unplanned.

3.4 | Database: Intention-to-treat analysis

Table 4 shows an intention-to-treat analysis of planned and performed management in cases of PAS. Planned hysterectomies were carried out in 96.1% of cases. In 26 (46.4%) of 56 women for whom

focal resection had been planned, treatment had to be converted to hysterectomy due to the size of the PAS area or severe hemorrhage. Similarly, in 5 (35.7%) of 14 women for whom leaving the placenta in situ had been planned, surgeons intraoperatively decided in favor of hysterectomy due to heavy bleeding.

3.5 | Survey: Antenatal counseling

A total of 22 responses to the survey were received, representing a response rate of 96%. As some questions were optional, some items had a lower response rate. Table 5 summarizes the antenatal counseling offered by the participating IS-PAS centers of excellence. There is a trend toward recommending hysterectomy for FIGO Grades 3a–c ($p < 0.001$) and focal resection for FIGO Grades 1–2 ($p = 0.07$, $p = 0.27$). The strongest variation in counseling is

Variable	Hysterectomy N = 186	Focal resection N = 38	Leaving the placenta in situ N = 10	p- value
Grade 1 ^a	2600 (1500–3400) N = 21	1400 (800–2600) N = 10	200 ^c N = 1	0.06
Grade 2 ^b	1600 (1000–2000) N = 46	1500 (1000–1700) N = 13	1000, 1600, 4300 ^c N = 3	0.65
Grade 3a ^b	2200 (1500–3000) N = 60	1900 (1500–3100) N = 14	800, 1000, 3900 ^c N = 3	0.55
Grade 3b ^a	2400 (1200–3900) N = 44	n/a N = 0	500, 1800 ^c N = 2	0.16
Grade 3c	2900 (1200–4500) N = 15	3500 ^c N = 1	1800 ^c N = 1	n/a

Abbreviation: n/a, not available.

^aData presented as median (IQR) and analyzed with Mann–Whitney *U* test.

^bData presented as median (IQR) and analyzed with Kruskal–Wallis test. Blood loss rounded to 100 mL.

^cDue to small case numbers, individual blood loss in mL is presented.

TABLE 3 Peripartum blood loss in milliliters in relation to FIGO grade of invasion and surgical management.

TABLE 4 Intention-to-treat analysis of planned versus performed management in cases of PAS.

		Performed management		
		Hysterectomy N = 178	Focal resection N = 35	Leaving the placenta in situ N = 10
Planned management	Hysterectomy N = 153	147 (96.1)	5 (3.2)	1 (0.6)
	Focal resection N = 56	26 (46.4)	30 (53.6)	0 (0)
	Leaving the placenta in situ N = 14	5 (35.7)	0 (0)	9 (64.3)

Note: Data presented as *n* (%). Data were available for a total of 223 cases. The following cases are not shown: two cases planned as terminations of pregnancy and treated with hysterectomy and nine cases planned for manual removal of the placenta (three treated with focal resection and six treated with hysterectomy).

found in FIGO Grades 2 and 3c. The most important criteria for planning a hysterectomy antenatally were expected high blood loss and morbidity with uterus-preserving techniques and the woman's stated preference (both: 14 centers [64%], $p=0.09/<0.001$). The free-text comments about antenatal counseling are summarized in Table 6. Fourteen centers (64%) consider the size of the PAS area as a critical criterion to determine whether to counsel about focal resection ($p=0.17$). When asked about ultrasonographic findings or clinical situations that lead to the recommendation to leave the placenta in situ, nine centers (41%) report the size of the PAS area and expected increased blood loss or morbidity with hysterectomy or focal resection ($p=0.17/<0.001$). Four centers (18%) do not offer

focal resection to women because of the lack of experience in this management technique, fear of increased blood loss, or because the method is not requested by their patients.

Leaving the placenta in situ was not offered by eight centers (36%) because of the possible need for a sudden, unexpected reoperation, fear of puerperal infection (7 centers [32%]), or because the method is not accepted by their team (5 centers [23%]). Other barriers to offering the technique were as follows: "clinical logistics of managing women over a longer time in the postnatal period"; "this technique offers no advantages over the other options available"; "the 'problem' is not solved at delivery"; and "I don't believe in the value of routine use of this method."

TABLE 5 Survey: Antenatally recommended treatment and reasons for not offering focal resection and leaving the placenta in situ antenatally.

Survey item	Hysterectomy	Focal resection	Leaving the placenta in situ	p-value
Techniques offered				
In general	20 (91)	14 (64)	9 (41)	<0.01
For PAS Grade 1	3 (14)	9 (41)	3 (14)	0.07
For PAS Grade 2	10 (45)	9 (41)	5 (23)	0.27
For PAS Grade 3a	18 (82)	8 (36)	5 (23)	<0.001
For PAS Grade 3b	19 (86)	5 (23)	7 (32)	<0.001
For PAS Grade 3c	19 (86)	2 (9)	11 (50)	<0.001
Criteria for recommendation				
Woman's wish	14 (64)	7 (32)	8 (36)	0.09
Expected increased blood loss/morbidity with other techniques	14 (64)	2 (9)	9 (41)	<0.001
Location of the PAS area	13 (59)	9 (41)	5 (23)	0.06
Family planning	11 (50)	10 (45)	8 (36)	0.74
Woman's fear of increased blood loss/morbidity with other techniques	9 (41)	2 (9)	5 (23)	0.06
Size of the PAS area	8 (36)	14 (64)	9 (41)	0.17
Location of the placenta	7 (32)	5 (23)	2 (9)	0.22
Lack of surgical experience with uterus-preserving techniques	7 (32)	n/a	n/a	n/a
Maternal comorbidity	5 (23)	1 (5)	1 (5)	0.20
Reasons for not offering the approach				
The technique is not requested by the women	n/a	4 (18)	1 (5)	0.35
I fear increased blood loss	n/a	4 (18)	4 (18)	0.65
I have no practice	n/a	4 (18)	n/a	n/a
The method is not accepted in my clinic	n/a	3 (14)	5 (23)	0.70
I am not familiar with any corresponding technique	n/a	3 (14)	3 (14)	1.00
I fear risks for a subsequent pregnancy	n/a	1 (5)	3 (14)	0.61
I am not familiar with postpartum care	n/a	n/a	3 (14)	n/a
I fear sudden, unexpected need for reoperation	n/a	n/a	8 (36)	n/a
I fear puerperal infection	n/a	n/a	7 (32)	n/a

Note: Data presented as *n* (%) and analyzed by Fisher exact test. Statistically significant *p*-values (<0.05) are marked as bold text.

Abbreviation: n/a, not applicable.

3.6 | Survey: Intraoperative decision-making

PAS centers of excellence were surveyed about intraoperative decision-making regarding the surgical management of PAS. Sixteen centers (73%) reported that they would switch from planned focal resection or leaving the placenta in situ to hysterectomy if severe

bleeding occurred. If the intraoperative PAS grading was higher than antenatally expected, six centers (27%) would leave the placenta in situ rather than perform planned focal resection. Conversely, if intraoperative PAS grading was lower than antenatally expected, eight centers (36%) would perform focal resection instead of leaving the placenta in situ. One center mentioned "insufficient

TABLE 6 Survey: Antenatal criteria that prompted the consultants for a positive recommendation in favor of hysterectomy, focal resection, or leaving the placenta *in situ*.

Positive criteria for recommendation	Hysterectomy	Focal resection	Leaving the placenta <i>in situ</i>
Concerning the location of the PAS area	• “cervical or parametrial invasion of PAS” • “anterior placenta praevia” • “anterior placenta invading the bladder” • “posterior wall” • “any”	• “away off the cervix” • “distanced from bladder/parametrium” • “placenta anterior accreta” • “fundal, relatively high, medial (not near lateral vasculature, no lateral extension)” • “upper anterior uterine segment”	• “vesical, cervical or parametrial invasion of PAS” • “near bladder” • “posterior and impact the broad ligament and large vessels” • “any”
Concerning the size of the PAS area	• “>1/3 of the anterior wall” • “very big size, without healthy margin to leave” • “when healthy myometrium is not enough to do focal resection: less than 2 cm healthy myometrium below the PAS area; less than 50% of the uterine circumference with healthy myometrium”	• “medium size without impact of broad ligament or large vessels” • “small, able to access, healthy tissue all around” • “<1/3 of anterior wall” • “3–4 cm” • “focal lesions”	• “>1/3 of anterior wall, no focal resection possible” • “diffuse placenta increta” • “It must be the whole placental bed involved” • “large or impact the bladder, large vessels” • “any”
Concerning other factors	• “never decisions based on prenatal images, always operative staging”	• “bladder can be separated from the uterus”	• “If the team is not ready or trained for hysterectomy or partial resection, placenta <i>in situ</i> is an option”

Note: Comments were written in free-text boxes.

healthy myometrium to reconstruct the uterus after focal resection” as another criterion to abandon focal myometrial resection for hysterectomy.

Should PAS be unanticipated and diagnosed only at the time of delivery, 12 centers (55%) would consider focal resection. Eleven centers (50%) would consider leaving the placenta *in situ* in the same situation. One comment referred to leaving the placenta as a possible “bridging method” to definitive treatment. Another expert stated, “I always try to solve the problem in the first step.”

3.7 | Survey: Surgical steps

Table 7 summarizes the preferred surgical steps for hysterectomy and conservative management approaches for PAS.

4 | DISCUSSION

While hysterectomies were performed in nearly every IS-PAS center of excellence for the treatment of PAS between 2020 and 2022, only a subset of centers performed conservative treatment, including focal resections or leaving the placenta *in situ*. Less than half of the IS-PAS centers of excellence performed focal resections, and only two centers treated more than five cases in this 30-month timeframe (Berlin, Germany, and Cali, Colombia). In only 10 cases was the placenta left *in situ*, with a high rate of secondary hysterectomy (60.0%). With respect to blood loss, red blood cell transfusion,

emergency hysterectomies, and major maternal morbidity, focal resection appears to be a safe alternative to hysterectomy—even though it might not always be possible to complete treatment as planned. Our follow-up survey of centers revealed both differences and similarities in approaches to counseling and treating women with PAS. Recommendations are based on multiple factors, as is to be expected in a disorder with a broad spectrum and individual patient preferences and characteristics. Although uterus-preserving techniques may be an alternative to hysterectomy with comparable or even lower blood loss and maternal morbidity,^{8,10,11} two-thirds of the responding experts do not yet provide uterus-preserving treatment routinely because of the fear of a possibly increased blood loss. For several PAS grades of severity, there were major differences in the reported antenatal counseling. In cases of FIGO Grade 2, focal resection was most likely to be considered a valid alternative to hysterectomy by our experts. In cases of FIGO Grade 3c, leaving the placenta *in situ* was considered an option by half of the participating experts. Interestingly, only 1/17 cases of PAS Grade 3c (5.9%) was treated leaving the placenta *in situ* in this cohort.

There was significant lack of consensus among some components of antenatal counseling. For example, two (9%) centers stated that *cervical or parametrial invasion* is a contraindication to offering to leave the placenta *in situ* to a woman, while three (14%) centers mention this as a criterion for an explicit recommendation. The criteria *size* and *location* of the PAS area appeared to be the main factors that influence antenatal counseling toward a given management strategy. We saw a tendency toward focal resection in the antenatal recommendations in case of “*focal, small, 3–4 cm*,” “*medium*

TABLE 7 Survey: surgical steps.

Surgical step	Hysterectomy	Focal resection	Leaving the placenta <i>in situ</i>	p-value
General anesthesia from the beginning	6 (27)	1 (5)	1 (5)	0.04
Start with neuraxial/regional anesthesia and change to general anesthesia after child development	13 (59)	3 (14)	2 (9)	<0.001
Start with neuraxial/regional anesthesia and change to general anesthesia in case the woman becomes unstable or feels pain	2 (9)	11 (50)	7 (32)	0.01
Midline abdominal incision	10 (45)	4 (18)	4 (18)	0.10
Transverse abdominal incision	14 (64)	13 (59)	5 (23)	0.02
Amnion drainage	1 (5)	1 (5)	1 (5)	1.00
Exteriorization of the uterus	15 (68)	6 (27)	5 (23)	<0.01
Intraoperative ultrasound to visualize the location of the placenta	9 (41)	7 (32)	7 (32)	0.85
Preventive surgical uterine devascularisation	7 (32)	4 (18)	1 (5)	0.07
Preventive radiological uterine devascularisation	4 (18)	1 (5)	1 (5)	0.35
Separation of invaded uterine tissues from invaded vesical tissues	16 (73)	9 (41)	2 (9)	<0.001
Upper-segmental (fundal and vertical) hysterotomy	16 (73)	4 (18)	6 (27)	<0.001
Lower-segmental transverse hysterotomy (above the placenta)	8 (36)	10 (45)	4 (18)	0.19
Lower-segmental transverse hysterotomy (through the placenta if required)	n/a	5 (23)	n/a	n/a
Hysterotomy guided by intraoperative ultrasound	5 (23)	3 (14)	4 (18)	0.92
Uterotonics just before delivery of the fetus	0	0	0	n/a
Uterotonics after delivery of the fetus	11 (50)	14 (64)	3 (14)	<0.01
No uterotonics	10 (45)	1 (5)	6 (27)	<0.01
No attempt to remove the placenta	14 (64)	1 (5)	8 (36)	<0.001
Attempt to remove the placenta	5 (23)	9 (41)	n/a	0.33
Partial myometrial resection of invaded tissue	3 (14)	14 (64)	n/a	<0.01
Myometrial reconstruction: one layer	0	1 (5)	1 (5)	1.00
Myometrial reconstruction: two layers	4 (18)	14 (64)	3 (14)	<0.001
Total hysterectomy	18 (82)	n/a	n/a	n/a
Supracervical hysterectomy	7 (32)	n/a	n/a	n/a
Placental tissue invading the bladder is left <i>in situ</i>	2 (9)	1 (5)	n/a	1.00
Placental tissue invading the bladder is resected.	11 (50)	9 (41)	n/a	0.76
Compression sutures	n/a	6 (27)	0	0.02
Tamponades	2 (9)	3 (14)	0	0.36
Balloon tamponades	n/a	5 (23)	0	0.048
Radiological uterine devascularisation	n/a	n/a	3 (14)	n/a
Aortic balloon occlusion if needed	1 (5)	1 (5)	0	1.00
Chitosan-covered gauze	0	1 (5)	0	1.00

Note: Preferred steps of surgical PAS management. Data presented as n (%) and analyzed by Fisher exact test. Statistically significant p-values (<0.05) are marked as bold text.

Abbreviation: n/a, not applicable.

size, PAS of the, <1/3 fundal," or "upper anterior uterine segment," "away off the cervix," "distanced from the bladder," and "without impact of parametrium/broad ligament or lateral vessels," which is "able to access with healthy tissue all around." Leaving the placenta in situ was reported as a valid option in cases of "large" PAS with "vesical, cervical or parametrial invasion," impacting ">1/3 of anterior wall" and "posterior wall," where "no focal resection is possible" and in case of "diffuse placenta increta" with "the whole placental bed involved." Again, a lack of generally accepted, precise criteria for the recommendation to leave the placenta in situ is apparent. One expert described leaving the placenta in situ as a possible option, "if the team is not ready or trained for hysterectomy or partial resection." In this situation, the managing team needs to ensure the timely availability of sufficient expertise, as complications can also occur in the early postoperative period. Reported barriers to offering conservative management range from lack of expert training to women's informed refusal (e.g., too long follow-up time), expert skepticism (e.g., expected higher blood loss, infection, and sudden reoperation), and expert rejection ("I don't believe in the value of the routine use of this method.").

While there is almost consensus on the definitive surgical therapy of a hysterectomy in the case of heavy bleeding, our respondents differed in their approach when intraoperative grading differed from what was antenatally expected. Recommendations for the management of PAS based on the intraoperative findings are desirable, as no antenatal imaging is 100% sensitive or specific.^{12,13}

Focal resection can be considered when the PAS area involves less than 50% of the anterior wall of the uterus.¹⁴ Leaving the placenta in situ is generally considered an appropriate management strategy for women wishing to preserve their fertility and in cases where hysterectomy is considered to be at very high risk of surgical complications.¹⁴ In the PACCRETA study, only 22.1% of women whose placenta had initially been left in situ had to undergo secondary hysterectomy, as opposed to 6/10 (60.0%) women in this cohort.⁸ International PAS guidelines describe uterus-sparing approaches as appropriate management strategies based on the PAS grade, the expertise of the medical team, and the woman's wish. However, a clear recommendation on who should be offered these techniques is still lacking.^{10,15,16} Interestingly, our survey showed that although hysterectomy is often considered the gold standard for PAS disorders,¹⁷ two of the participating centers do not mention it as first-line treatment during antenatal counseling. Instead, they perform intraoperative staging and aspire to perform focal resection as often as possible. Palacios-Jaraquemada et al. have proposed a topographic classification of PAS based on the area of invasion.¹⁸ In a multicenter retrospective case series of 326 women with pathologically confirmed PAS, they were able to show that depending on the intraoperatively assigned classification, the uterus could be preserved in 0% (topographic type 4) to 81.5% (topographic type 1) of women treated (topography classification of Palacios-Jaraquemada et al.).¹⁸ Intraoperative criteria for focal resection have been published recently: the possibility of separating the bladder from the uterus, at least 2 cm of healthy

myometrium above the cervix (caudal to the area of abnormal placental migration) and a size of the affected myometrium of less than 50% of the axial circumference of the uterus.¹⁹ According to this survey, a higher proportion of focal resections performed could also contribute to a reduction in the rates of general anesthesia. PAS (FIGO Grade 3c) remains a condition in which focal resection might not be suitable.

Based on the results obtained, we see a gap between the reported desire to perform uterus-preserving operation techniques in PAS and the actual implementation in participating centers of excellence. Respondents from 17 centers (77%) would attend training for focal resection techniques and 13 experts who answered the survey (59%) would attend training for leaving the placenta in situ. Interestingly, two participating centers already offer simulation training for focal resection. In such training, individual surgical steps might also be taught, such as the reduction in uterine size by amniotic drainage and subsequent facilitated exteriorization, which can help to avoid midline abdominal incisions with a consequent lower risk of wound healing disorders.²⁰ It therefore appears necessary to establish expert consensus guidelines on antenatal counseling and intraoperative decision-making, which include exact sonographic and clinical criteria for focal resection and leaving the placenta in situ, especially the size and the location of the PAS area, to both homogenize and improve treatment. Furthermore, standardized and evidence-based training plans for PAS experts cover different surgical techniques. We believe that such approaches might help to overcome the skepticism about conservative management strategies of PAS, especially focal resection.

The study has several strengths. Our database contains a large cohort with 234 cases from 16 countries that were included in this analysis. It is the first multicenter study that reveals the fact that uterus-sparing techniques are not widely practiced as management for PAS, although established methods exist. The follow-up survey gives unique insights into barriers that keep obstetricians from offering and performing focal resections. However, the study also has some limitations. The small case number of placentae left in situ does not allow us to draw conclusions on the suitability of this management. The outcomes of focal resections might be biased, as only few centers perform this technique routinely. On the other hand, the positive results of this method might encourage other experts in the field to establish this method at their centers. Our analysis does not include the conservative management approach known as the extirpative method (forcible manual removal of the placenta). This technique has been described to be associated with a higher rate of massive postpartum hemorrhage and subsequent peripartum hysterectomy than conservative approaches.²¹⁻²³ There is currently no center in the IS-PAS that supports or carries out this procedure and therefore the IS-PAS database does not contain designated data on this approach. Furthermore, differentiating cases with successful forcible manual removal of the placenta and false-positive cases with uneventful manual removal of a normally implanted placenta on uterine dehiscence is difficult. Cases managed by "manual removal of the placenta" were therefore not included in the analysis. As for

the survey, results obtained from a voluntary survey should always be interpreted with caution. One of the main weaknesses of a survey is its susceptibility to both selection and recall biases, as it relies on self-reporting and cannot be controlled for accuracy. The opinions of experts involved in many cases are weighted equally to those of experts with significantly fewer annual treatments, thus skewing the results. While the overall response rate of 96% appears high, a subset of the questions was answered only by some of the participating centers, thus lowering the overall generalizability of some results. For example, not all centers took a position on the use of uterotonics in uterus-preserving management. The length of the survey, with 21 technical questions with many sub-questions, may also have been a deterrent factor influencing completion.

5 | CONCLUSION

Due to the clinical diversity of PAS, it is important that centers of excellence can offer different management strategies to ensure optimal individualized therapy for every woman. Conservative surgical techniques for PAS such as focal resection or leaving the placenta in situ are well-established methods that constitute safe alternatives to peripartum hysterectomy, for focal PAS disorders (especially FIGO Grades 1 to 3a). While the database analysis showed opportunities for conservative management, the questionnaire helped to identify barriers that keep centers from implementing these approaches. The main reasons for not offering conservative treatment were the fear of infection or the sudden need for re-operation, and less common was a lack of experience and the fear of increased blood loss. The acceptance of uterus-preserving treatment strategies could be increased by developing objective criteria on when and how to implement these methods and by providing systematic training (e.g., on models) for PAS experts.

AUTHOR CONTRIBUTIONS

Alexander Paping and Anja Bluth: Conceptualization, data curation, formal analysis, investigation, methodology, project administration, resources, visualization, and writing—original draft. Ammar Al Naimi, Mina Mhallem, Magdalena Kolak, Andrzej Jaworowski, Hubert Huras, Maddalena Morlando, George Daskalakis, Pedro Viana Pinto, Loïc Sentilhes, Heleen J. van Beekhuizen, Vedran Stefanovic, Karin A. Fox, Olivier Morel, and Charline Bertholdt: Resources, validation, writing—review & editing. Thorsten Braun: Conceptualization, methodology, project administration, and supervision. All IS-PAS Group collaborators contributed by filling the forms with own cases, giving suggestions during preparation of manuscript, and approved the final version.

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CONFLICT OF INTEREST STATEMENT

All authors have no conflicts of interest to declare.

ETHICS STATEMENT

All participating centers were responsible for contributing to clinical and scientific research under local IRB/ethics committee approval and operated under Data Use Agreements between individual centers and the IS-PAS. Details of these have been published previously.²⁴ Informed written consent was obtained from all the participants.

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REFERENCES

- van Beekhuizen HJ, Stefanovic V, Schwickert A, et al. A multicenter observational survey of management strategies in 442 pregnancies with suspected placenta accreta spectrum. *Acta Obstet Gynecol Scand*. 2021;100(Suppl 1):12-20. doi:[10.1111/aogs.14096](https://doi.org/10.1111/aogs.14096)
- Tol ID, Yousif M, Collins SL. Post traumatic stress disorder (PTSD): the psychological sequelae of abnormally invasive placenta (AIP). *Placenta*. 2019;81:42-45. doi:[10.1016/j.placenta.2019.04.004](https://doi.org/10.1016/j.placenta.2019.04.004)
- Bartels HC, Horsch A, Cooney N, Brennan DJ, Lalor JG. Living beyond placenta accreta spectrum: parent's experience of the postnatal journey and recommendations for an integrated care pathway. *BMC Pregnancy Childbirth*. 2022;22(1):397. doi:[10.1186/s12884-022-04726-8](https://doi.org/10.1186/s12884-022-04726-8)
- Chandrarahan E, Rao S, Belli A-M, Arulkumaran S. The triple-P procedure as a conservative surgical alternative to peripartum hysterectomy for placenta percreta. *Int J Gynaecol Obstet*. 2012;117(2):191-194. doi:[10.1016/j.ijgo.2011.12.005](https://doi.org/10.1016/j.ijgo.2011.12.005)
- Kilicci C, Ozkaya E, Eser A, et al. Planned cesarean hysterectomy versus modified form of segmental resection in patients with placenta percreta. *J Matern Fetal Neonatal Med*. 2018;31(22):2935-2940. doi:[10.1080/14767058.2017.1359535](https://doi.org/10.1080/14767058.2017.1359535)
- Palacios-Jaraquemada JM. Placental Adhesive Disorders. Walter de Gruyter GmbH Co.KG 2012.
- Schwicker A, van Beekhuizen HJ, Bertholdt C, et al. Association of peripartum management and high maternal blood loss at cesarean delivery for placenta accreta spectrum (PAS): a multinational

- database study. *Acta Obstet Gynecol Scand*. 2021;100(Suppl 1):29-40. doi:[10.1111/aogs.14103](https://doi.org/10.1111/aogs.14103)
8. Sentilhes L, Seco A, Azria E, et al. Conservative management or cesarean hysterectomy for placenta accreta spectrum: the PACCRETA prospective study. *Am J Obstet Gynecol*. 2022;226(6):839.e1-839.e24. doi:[10.1016/j.ajog.2021.12.013](https://doi.org/10.1016/j.ajog.2021.12.013)
 9. Jauniaux E, Ayres-de-Campos D, Langhoff-Roos J, Fox KA, Collins S. FIGO classification for the clinical diagnosis of placenta accreta spectrum disorders. *Int J Gynaecol Obstet*. 2019;146(1):20-24. doi:[10.1002/ijgo.12761](https://doi.org/10.1002/ijgo.12761)
 10. Sentilhes L, Kayem G, Chandrachan E, Palacios-Jaraquemada J, Jauniaux E. FIGO consensus guidelines on placenta accreta spectrum disorders: conservative management. *Int J Gynaecol Obstet*. 2018;140(3):291-298. doi:[10.1002/ijgo.12410](https://doi.org/10.1002/ijgo.12410)
 11. McCall SJ, Deneux-Tharaux C, Sentilhes L, et al. Placenta accreta spectrum—variations in clinical practice and maternal morbidity between the UK and France: a population-based comparative study. *BJOG: An Intern J O&G*. 2022;129(10):1676-1685. doi:[10.1111/1471-0528.17169](https://doi.org/10.1111/1471-0528.17169)
 12. Bhide A, Sebire N, Abuhamad A, Acharya G, Silver R. Morbidly adherent placenta: the need for standardization. *Ultrasound Obstet Gynecol*. 2017;49(5):559-563. doi:[10.1002/uog.17417](https://doi.org/10.1002/uog.17417)
 13. Fratelli N, Prefumo F, Maggi C, et al. Third-trimester ultrasound for antenatal diagnosis of placenta accreta spectrum in women with placenta previa: results from the ADoPAD study. *Ultrasound Obstet Gynecol*. 2022;60(3):381-389. doi:[10.1002/uog.24889](https://doi.org/10.1002/uog.24889)
 14. Collins SL, Alemdar B, van Beekhuizen HJ, et al. Evidence-based guidelines for the management of abnormally invasive placenta recommendations from the International Society for Abnormally Invasive Placenta. *Am J Obstet Gynecol*. 2019;220(6):511-526. doi:[10.1016/j.ajog.2019.02.054](https://doi.org/10.1016/j.ajog.2019.02.054)
 15. American College of Obstetricians and Gynecologists. Placenta Accreta Spectrum. Obstetric Care Consensus No. 7. *Obstet Gynecol*. 2018;132(6):e259-e275. doi:[10.1097/AOG.0000000000002983](https://doi.org/10.1097/AOG.0000000000002983)
 16. Jauniaux E, Kingdom JC, Silver RM. A comparison of recent guidelines in the diagnosis and management of placenta accreta spectrum disorders. *Best Pract Res Clin Obstet Gynaecol*. 2020;72:102-116. doi:[10.1016/j.bpobgyn.2020.06.007](https://doi.org/10.1016/j.bpobgyn.2020.06.007)
 17. Allen L, Jauniaux E, Hobson S, Papillon-Smith J, Belfort MA. FIGO consensus guidelines on placenta accreta spectrum disorders: nonconservative surgical management. *Int J Gynaecol Obstet*. 2018;140(3):281-290. doi:[10.1002/ijgo.12409](https://doi.org/10.1002/ijgo.12409)
 18. Palacios-Jaraquemada JM, Fiorillo A, Hamer J, Martínez M, Bruno C. Placenta accreta spectrum: a hysterectomy can be prevented in almost 80% of cases using a resective-reconstructive technique. *J Matern Fetal Neonatal Med*. 2020;35:275-282. doi:[10.1080/14767058.2020.1716715](https://doi.org/10.1080/14767058.2020.1716715)
 19. Nieto-Calvache AJ, Palacios-Jaraquemada JM, Aryananda R, et al. How to perform the one-step conservative surgery for placenta accreta spectrum move by move. *Am J Obstet Gynecol MFM*. 2023;5(2):100802. doi:[10.1016/j.ajogmf.2022.100802](https://doi.org/10.1016/j.ajogmf.2022.100802)
 20. Braun T, Weizsäcker K, Muallem MZ, et al. Abnormally invasive placenta (AIP): pre-cesarean amnion drainage to facilitate exteriorization of the gravid uterus through a transverse skin incision. *J Perinat Med*. 2019;47(1):12-15. doi:[10.1515/jpm-2017-0388](https://doi.org/10.1515/jpm-2017-0388)
 21. Kayem G, Davy C, Goffinet F, Thomas C, Clément D, Cabrol D. Conservative versus extirpative management in cases of placenta accreta. *Obstet Gynecol*. 2004;104(3):531-536. doi:[10.1097/01.AOG.0000136086.78099.0f](https://doi.org/10.1097/01.AOG.0000136086.78099.0f)
 22. Bretelle F, Courbière B, Mazouni C, et al. Management of placenta accreta: morbidity and outcome. *Eur J Obstet Gynecol Reprod Biol*. 2007;133(1):34-39. doi:[10.1016/j.ejogrb.2006.07.050](https://doi.org/10.1016/j.ejogrb.2006.07.050)
 23. Sentilhes L, Goffinet F, Kayem G. Management of placenta accreta. *Acta Obstet Gynecol Scand*. 2013;92(10):1125-1134. doi:[10.1111/aogs.12222](https://doi.org/10.1111/aogs.12222)
 24. Braun T, van Beekhuizen HJ, Morlando M, Morel O, Stefanovic V. Developing a database for multicenter evaluation of placenta accreta spectrum. *Acta Obstet Gynecol Scand*. 2021;100(1):7-11. doi:[10.1111/aogs.14085](https://doi.org/10.1111/aogs.14085)

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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