The fetal and maternal outcomes related to previous number of cesarean sections and uterus sparing surgery in women with abnormal placentation

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ABSTRACT

Objectives. We aimed to study the number of previous cesarean sections in cases diagnosed with placenta previa (PP) and placenta accreta spectrum (PAS), and maternal and fetal results in cases where we performed uterus-sparing surgery. *Materials and Methods*. PAS patients diagnosed with PP (PPAS) were included in this retrospective study. Postoperative hemogram values, blood transfusion amounts, hospitalization days, intraoperative and postoperative complication rates of all patients, APGAR scores (5-minute), mortality rates and birth weights were registered for all newborns on admission to the intensive care unit. *Results*. A total of 122 pregnant women were included in the study. In the comparison of hospitalization rates, there was a significant difference between CS ≤1 and CS =2 (p=0.01). When postoperative hemoglobin values were compared, there was significant difference between CS ≤1 and CS ≥3 (p<0.01). Neonatal intensive care admission rates increase as the number of CS increases. *Conclusions*. Uterus-sparing surgery in experienced clinics seems to be applicable, even if maternal and fetal morbidity increases. We suggest to consider CS numbers in PPAS group for fetal and maternal wellness while doing surgical planning.

Introduction

Placenta previa (PP) describes the placenta that is located in the lower segment, which covers either completely or partially the internal cervical orifice. PP and its complications increasing gradually due to the increasing number of cesarean (CS) rates [1]. This increase in the CS rates also causes increase in placenta accreta spectrum (PAS). PAS is used to identify abnormal decidualization and invasion associated with the defect on the previously formed endometrium-myometrium interface [2]. Histopathologically, the partial or complete absence of PAS decidua basalis with the coronary villus sticking to the lower scarred myometrium leads to accreta (myometrium touch), placenta increta (invading of myometrium), or placenta percreta (reaching to and passing the serosa) [3-5]. Since the diagnosis of PAS is hard, its incidence varies between 1/300 and 1/2000 [6]. While the presence of placenta previa in women who previously had single cesarean is associated with a 3% risk of PAS, the absence of placenta previa is associated with a 0.03% risk of PAS. In the last meta-analysis, PAS prevalence was found to be 0.01% and 1% [7]. Previous CS, PP, advanced maternal age, gravida, smoking, uterine surgeries, in vitro fertilization, endometritis, pelvic radiation, and removing the placenta by hand are the risk factors for PAS [8].

PP and PAS is associated with severe neonatal, maternal morbidity (60%) and mortality (7%). In both cases, severe maternal hemorrhage can be observed. Related to this, blood transfusion, admission to intensive care unit, hysterectomy, or even maternal deaths were reported. In all the previous studies, the relationship between placenta previa and abnormal placentation has been shown. In PP cases where CS numbers are high, the

rate of abnormal placentation increases [9]. Antenatal bleeding or early contractions contribute to increased neonatal morbidity and mortality due to prematurity [10]. While American College of Obstetricians and Gynecologists (ACOG) Association suggests labor for PP pregnancies at 360/7-376/7 weeks, to prevent the maternal catastrophic situations in PAS cases, they stated that the labor would be appropriate at 340-356/7 weeks [11]. Considering all these data, a multidisciplinary approach for the follow-up of PAS is accepted as the best option all over the world. Every clinic establishes a treatment modality according to its own experience and technical opportunity.

We aimed to share the number of previous cesarean sections in cases diagnosed with placenta previa (PP) and placenta accreta spectrum (PAS), and maternal and fetal results in cases where we performed uterus-sparing surgery.

Materials and Methods

PAS patients diagnosed with PP (PPAS) and applied to Necmettin Erbakan University (NEU) Meram Faculty of Medicine between the dates January 2016 and November 2021 were included in the study retrospectively. Demographic and obstetric histories of all patients were obtained from the file records. While defining the cases with PP; cases that the cervical os was covered by the placenta completely, that are placed in the lower segment with prenatal abdominal or vaginal ultrasonography and Doppler for PPAS, lost myometrial- vesical border, cases that the myometrial thickness was under 1mm, cases with several and irregular lacunas, increased vesical border hyper vascularity, that myometrial- vesical limit was bridging or its invasion to serosa, vesical or parametrium was observed, cases with Previa which postpartum pathology was confirmed were included (at least 3 of these criteria was required). Twin pregnancies were excluded from the study. Our hospital is privatized in PAS and operates as multidisciplinary since it is the only reference hospital of the region. All patients are evaluated by the same surgery team. The surgical operations are performed by the same surgical team. While cases diagnosed with prenatal were taken into planned operation, cases referred with bleeding, preterm labor or obstetric-maternal reasons were taken as emergency. All of the patients were operated with general or regional anesthesia after an anesthesia consultation. In our clinic, while weeks of labor was determined as 370/6 in PP cases, it was determined as 340/6 in PPAS cases. 2 gr of cefazolin is injected 30 minutes before the operation. Vertical abdomen incision is entered with fundal uterine incision to all PPAS cases. The general approach of our clinic is to apply uterus-sparing surgery to all patients as possible. Support of the placental bed sutures and uterine artery clamp in PPAS cases is taken for this (starting to vesical dissection from the lateral paracervical area, clamp is placed to bilateral uterine artery from the uterus isthmus level). After the clamping, uterine area where the placental bed placed is resected. The operation is terminated with uterus repairment. Total hysterectomy is performed to the cases whose bleeding cannot be controlled. All PPAS cases were divided into three sub-groups according to CS numbers as CS number being ≤ 1, = 2, and ≥ 3. Pre-operation and post-operation hemogram values, blood transfusion amounts as unit, placental bed sutures, hospitalization days, intra-operative and post-operative complication rates of all patients, APGAR (5. minute) scores, mortality rates, birth weights, admission to intensive care of all neonates were recorded. For this study, an approval was obtained from the Ethics Committee of NEU, with the decision numbered 2021/3529.

Descriptive statistics of continuous variables were expressed as mean, standard deviation, whereas categorical variables were expressed using frequency (n) and percentage (%). The normality assumptions of the variables were examined with Skewness and Kurtosis coefficients, Kolmogorov Smirnov test, and Histogram. One-way analysis of variance was used in situations where three groups showing normal distribution were compared. Levene test was applied first for the variant analysis. In cases where variance analysis results were found to be significant, Tukey test was conducted. Kruskal Wallis test was applied on the data that were not distributed normally in multiple groups. Then, Mann Whitney U test was carried out in the analysis of sub-groups. Chi-square and Fisher Exact tests were used for the analysis of the categorical variables. All analyses were performed using the IBM SPSS .22 program, and p<0.05 was accepted as the level of significance.

Results

A total of 122 pregnant patient were included in the study. 11 (9.01%) patients with no CS were present. Sub-groups of CS numbers as 43 (35.24%) as ≤ 1, 42 (34.42%) as = 2, 37 (30.32%) as ≥3 were formed. In the PPAS patient group, 15 (12.29%) patients were reported as accreta, 30 (24.59%) patients as placenta increta, and 77 (63.11%) patients as percreta by the pathology department. One patient got pregnant by invitro fertilization in the non-CS group. Miscarriage history was present in other 10 cases, and all of them were reported as accreta. According to the CS numbers, demographical data as age, parity, gravida, previous cesarean, vaginal delivery, miscarriage numbers, invitro fertilization experiences of all 3 groups are summarized in Table 1.

Hospitalization times, blood transfusion amounts, pre-operative and post-operative haemoglobin values, hysterectomy rates, vesical injury, postpartum wound site infection rates of all 3 groups are compared in Table 2. In

PPAS cases, cesarean hysterectomy was performed on 9 (7.37%) patients, and uterus-sparing surgery was performed on 113 (92.62%) patients. 105 (86.1%) cases were taken as planned case. 93 (76.2%) pregnant received general anesthesia. When hospitalization rates were compared, there was a significant difference between CS ≤1 and CS =2 (p:0.01), while there was no difference between CS =2 and CS ≥3 (p >0.05). When post-operative hemoglobin values were compared, there was no difference between CS =2 and CS ≥3 (p>0.05). Having hysterectomy rates of the groups were not different from each other (P>0.05).

Table 1. Comparison of demographic characteristics between groups (number of cesarean section)

	≤1 (n=43) mean±SD	=2 (n=42) mean±SD	≥3 (n=37) mean±SD	p value
Age**	30,19 ± 5,44	34,02 ± 4,88	33,84 ± 3,94	**,001**
Abortus*	0,81 ± 1,20	0,83 ± 1,08	0,43 ± 0,68	,270
Gravida**	2,79 ± 1,45	4 ,8± 1,18	4,95 ± 1,02	**,001**
Number of previous cesarean section*	0,74 ± 0,44	2 ± 0,00	3,38 ± 0,63	**,001**
BMI**	28,87 ± 4,46	28,84 ± 4,40	29,18 ± 3,99	,930
Number of vaginal delivery**	0,23 ± 0,57	0,17 ± 0,49	0,14 ± 0,41	,671
	<1 (n= 43) n (%)	2 (n=42) n (%)	≥3 (n=37) n (%)	p value
IVF pregnancy***	1 (2,3%)	0 (0%)	0 (0%)	,239
Trombofilia***	2 (4,7%)	4 (9,5%)	3 (8,1%)	,538
Diabetes mellitus***	6 (14,0%)	7 (16,7%)	5 (13,5%)	,971
Hypertension***	1 (2,3%)	6 (14,3%)	2 (5,4%)	,538
Maternal smoking***	4 (9,3%)	2 (4,8%)	1 (2,7%)	,203

*Kruskal Wallis test, **Anova test, ***Chi-square test, IVF: in vitro infertilization, BMI: body mass index

When neonatal results were considered, there was a significant difference between CS ≤ 1 and CS ≥ 3, only in terms of labor weeks (p: 0.001). Admission to fetal intensive care unit increased as CS number increased (Table 3).

Discussion

In our study, maternal and fetal morbidity was found to be significantly high in PPAS group. In addition, when the CS number is considered in the PPAS group itself, 2 and more of CS number increased morbidity significantly. We believe that PPAS diagnosis itself is not enough to decrease the catastrophic results of PPAS surgery, and pre-operative preparation should be done by considering the CS numbers.

Table 2. Maternal results according to the number of cesarean sections in the PPAS group

		≤1 (n= 43) mean±SD	=2(n=42) mean±SD	≥3(n=37) mean±SD	p value
Hospitalization**		5,47 ± 3,87	7,19 ± 4,11	7,70 ± 4,06	**,034**
Blood transfusion**		1,12 ± 1,74	2,12 ± 1,25	2,30 ± 1,63	**,001**
Postoperative hemoglobin*		9,57 ± 1,35	8,91 ± 0,94	8,80 ± 1,10	**,013**
Change of hemoglobin**		2,35 ± 1,12	2,73 ± 1,16	2,95 ± 1,07	**,053**
Preoperative hemoglobin*		11,92 ± 1,22	11,65 ± 1,01	11,75 ± 0,80	,616
		≤1 (n= 43) n (%)	=2 (n=42) n (%)	≥3 (n=37) n (%)	p value
Urinary tract injury***		7 (16,3 %)	18 (42,9 %)	19 (51,4%)	**,001**
Time of operations***	Planned	36 (83,7%)	37 (88,1%)	32 (86,5%)	,708
	Urgent	7 (16,3 %)	5 (11,9%)	5 (13,5%)	
Type of anesthesia***	General	31 (72,1%)	32 (76,2%)	30 (81,1%)	,349
	Spinal	12 (27,9%)	10 (23,8%)	7 (18,9%)	
Placental site suturation***		38 (88,4%)	39 (92,2%)	34 (91,9 %)	,570
Hysterectomy***		2 (4,7%)	4 (9,5%)	3 (8,1%)	,538
Wound infection***		0 (0%)	5 (11,9%)	3 (8,1%)	,126

*Kruskal Wallis test, **Anova test, ***Chi-square test, PPAS: placenta previa with placenta accreta

Table 3. Fetal results according to the number of cesarean sections in the PPAS group

		≤1 (n= 43) mean±SD	=2 (n=42) mean±SD	≥3 (n=37) mean±SD	p value
Gestational week**		35,21 ± 2,05	34,48 ± 2,63	33,35 ± 2,92	**,006**
Birth weight**		2673,02 ± 489,24	2680,52 ±630,44	2388 ± 665,36	,053
Apgar score (5 min)*		6,12 ± 1,31	5,45 ± 1,90	5,59 ± 1,36	,128
		≤1 (n= 43) n (%)	=2 (n=42) n (%)	≥3 (n=37) n (%)	p value
NICU hospitalization***		11 (25,6%)	10 (23,8%)	20 (54,1%)	**,009**
Fetal death***		0 (0%)	0 (0%)	1 (2,7%)	,194
Gender of fetus***	Female	15 (34,9%)	19 (45,2%)	17 (45,9%)	,308
	Male	28 (65,1%)	23 (54,8%)	20 (54,1%)	

*Kruskal Wallis test, **Anova test, ***Chi-square test, NICU: neonatal intensive care unit, PPAS: placenta previa with placenta accreta

It was stated that in the multicentered cohort study, the risk of PAS in cases with PP and previous CS history is 3%, 11%, 40%, 61%, and 67% who have one, two, three, four, five and more CS; respectively [12]. In another study, while PAS rate increases seven times with a previous CS history, this rate increases 56 times with three or more CS

[13]. In the literature, in cases with previous CS, previa and associated PAS were likely to be present, while in cases with miscarriage, the PAS in previa was found to be lower. This was attributed to the difference of defective endometrial area. While CS is the defective area lower segment, it can be the upper parts of uterus in miscarriage cases [14]. In our case series, 11 (9.01%) patients had no CS history, and 90.9% of miscarriage history were present in this group. Decreasing CS rates will decrease PAS and PP rates. Our number of placentas percreta is higher than the literature since we are a tertiary-center and have been specialized in this subject, thus the number of referrals is high.

Success rate of uterus-sparing surgery in the literature was stated as 78.4-80% [15,16]. We think that our 92.62% success of uterus-sparing surgery is a result of the multidisciplinary work of our team and the same team operating the surgical cases for a long time. A broad retrospective cohort study in Utah between 1996-2008 found that maternal morbidity decreased in women from PAS, who gave birth with multidisciplinary team approaches in tertiary centers compared to those who delivered standard obstetrical care in other hospitals [17]. The referral centers also demonstrate that clinical results continue to develop over time as multidisciplinary teams gain additional experience in managing PAS cases. This data provides a strong justification for regional maintenance for the women with PAS [18].

Recommendations for PAS-related placenta previa treatment are diverse and are mainly based on case series and reports, personal experience, expert opinion and clinical judgment. The fact that some patients want to continue their fertility has brought up conservative treatments. For this, uterus sparing surgery may be possible, with cases with Bakri balloons or advanced invasive, postpartum tracking options are available for extended periods of time by leaving the placenta in place [19]. Treatment options must be modelized according to the individual and the clinic. In recent years, increased CS numbers and rates of PP and PPAS have led clinicians to remove placenta, myometrial resection, and Triple-P procedures. The Triple-P procedure includes mapping the top level of the placenta, placing a balloon in the iliac arteries, and resection of the placental space with the myometrium below. The operation is terminated after the primer cut line repair [20]. In our cases, we do the procedure by placing clamp on the uterine artery, reducing the blood flow to the placental area. That way, even in placenta percreta cases, we have a low number of hysterectomy. We are trying to get to the invasion inside the bladder with cystectomy on cases with advanced invasion levels, to clean it up, and get the bleeding control through sutures. Unlike all these options, mandatory hysterectomy after planned cesarean at weeks 34-35 by leaving the placenta is the procedure recommended by ACOG for PAS [2,21]. More recently, Shamshirsaz et al. suggested that for patients with PAS and two or more previous CS cases, the birth (planned C-section hysterectomy) should be considered in early pregnancies of 33 to 34 weeks. This is due to higher complications (such as bleeding, premature birth, and the need for transfusion) when labor occurs in the following weeks [22]. Thurn et al. reported that almost 90% of women diagnosed as prenatal PPAS were moved to an elective or emergency C-section hysterectomy [23]. In our study, the number of patients who had hysterectomy was very low, although the number of CS increased in the PPAS group was high in maternal morbidity (blood transfusion, hemoglobin decrease, hospitalization time, bladder injury). Despite all this PAS-related studies, maternal morbidity is still high.

When neonatal results were evaluated, the labor week was significantly lower in PPAS group, while the patients with 2 and above CS were even lower. Among women with PAS or non-PAS placenta previa, it is known that women who had two or more cesareans have a higher risk of premature birth than women with less than two CS [24]. Preterm birth alone contributes to increased neonatal morbidity and mortality. In an extended meta-analysis, it was stated that there is a 5-times increase premature delivery, admission to NICU, and perinatal/neonatal death rate in patients with PP than patients with no PP, preterm labor for placenta previa and placenta accreta is 43.5% and 57.7%, respectively [25].

The fact that our study was held in a single-center, is retrospective, performed by a single surgical team experienced in this case, PAS sub-groups were not included because CS numbers were not high enough to form separate groups, patient numbers being low, hysterectomy numbers being low, no comparison was made with other methods used in PAS surgery (placenta being left in place or conservative other surgical options), are the limitation of our study. In this patient group, our post-operative results should be a separate study subject (such as fertility rates, menstrual patterns). We believe that in the future, prospective studies that is multi-centered and evaluate all surgical options are needed.

Conclusions

As a result, our rate of uterus-sparing surgery is pleasing. Identifying prenatal early risk factors in all cases requiring fertility preventive surgery with correct good planning and management will enhance maternal and fetal results. We suggest to consider CS numbers in PPAS group for fetal and maternal wellness while doing this planning. We believe that cesarean hysterectomy is not the only option in PAS cases at experienced clinics. PPAS cases will continue to be a nightmare for all clinicians and pregnancies as long as efforts to reduce the increased CS rates are insufficient.

Conflict of interest disclosure

There are no known conflicts of interest in the publication of this article. The manuscript was read and approved by all authors.

Compliance with ethical standards

Any aspect of the work covered in this manuscript has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

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