

Comparison of obstetric, neonatal, and surgical outcomes of emergency and planned deliveries in pregnancies complicated by placenta previa and in subgroups with and without placenta accreta spectrum

Plasenta previa ile komplike olan gebeliklerde ve plasenta akreta spektrumu olan ve olmayan alt gruplarda acil ve elektif doğumların obstetrik, neonatal ve cerrahi sonuçlarının karşılaştırılması

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Abstract

Objective: This study aimed to compare emergency and planned cesarean section cases in pregnancies complicated with placenta previa (PP) and subgroups with and without placenta accreta spectrum (PAS) in terms of obstetric, neonatal, and surgical outcomes.

Materials and Methods: This retrospective cohort study included 128 patients diagnosed with PP who underwent cesarean section. Obstetric, neonatal, and surgical outcomes of all cases with PP and subgroups with and without PAS were compared according to whether they were emergency or planned cesarean section.

Results: Of the 128 women with PP, 60 planned and 68 underwent emergency cesarean section. In all patients with PP and in the PAS and non-PAS subgroups, the neonatal outcomes of patients who underwent emergency cesarean section were more negative than those of patients who underwent planned cesarean section. It was observed that more hysterectomy were performed in the emergency group than in the elective group in all patients with PP and PAS patients (p=0.027 and p=0.012 respectively). It was observed that patients with PP and non-PAS were hospitalized after cesarean section for a longer period of time in the emergency group than in the planned group (p=0.044 and p=0.002 respectively).

Conclusion: Planned cesarean section leads to better obstetric, neonatal, and surgical outcomes compared with emergency cesarean section in pregnancies complicated by PP, especially in those with PAS. Our findings suggest that planned delivery strategies should be considered for patients with PP. Decisions regarding the timing of delivery should balance maternal risks and benefits with fetal and fetal risks and benefits.

Keywords: Placenta previa, placenta accreta spectrum, emergency delivery, hysterectomy, surgical outcomes

PRECIS: The current study investigated the obstetric, neonatal and surgical outcomes of emergency and planned delivery in patients with placenta previa.

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Öz

Amaç: Bu çalışmanın amacı, plasenta previa (PP) ile komplike gebeliklerde ve plasenta akreta spektrumu (PAS) olan ve olmayan alt gruplarda acil ve planlı sezaryen olgularını obstetrik, neonatal ve cerrahi sonuçlar açısından karşılaştırmaktır.

Gereç ve Yöntemler: Bu retrospektif kohort çalışması, sezaryenle doğum yapan PP tanısı almış 128 hasta ile yürütülmüştür. PP'li tüm olguların ve PAS'lı ve olmayan alt grupların obstetrik, neonatal ve cerrahi sonuçları, acil veya planlı sezaryen olmalarına göre karşılaştırılmıştır.

Bulgular: PP'li 128 kadından 60'ı planlı, 68'i ise acil sezaryenle doğum yapmıştı. PP'li tüm hastalarda ve PAS ve PAS olmayan alt gruplarda, acil sezaryenle doğum yapan hastaların neonatal sonuçlarının planlı sezaryenle doğum yapan hastalara kıyasla daha olumsuz olduğu gözlenmiştir. Acil grupta, elektif gruba kıyasla tüm PP hastalarında ve PAS hastalarında daha fazla histerektomi yapıldığı gözlemlendi (sırasıyla p=0,027 ve p=0,012). PP'li ve PAS olmayan hastaların sezaryen sonrası acil grupta, planlı gruba kıyasla daha uzun süre hastanede yattığı gözlemlendi (sırasıyla p=0,044 ve p=0,002).

Sonuç: PP ile komplike gebeliklerde, özellikle PAS'lı olanlarda, planlı sezaryenler acil sezaryenlere kıyasla daha iyi obstetrik, neonatal ve cerrahi sonuçlara yol açmaktadır. Bulgularımız, PP'li hastalarda planlı doğum stratejilerinin desteklenmesi gerektiğini göstermektedir. Doğum zamanlaması ile ilgili kararlar, anne riskleri ve faydaları ile fetüs veya yenidoğan için riskler ve faydaları dengelemelidir.

Anahtar Kelimeler: Plasenta previa, plasenta akreata spektrumu, acil doğum, histerektomi, cerrahi sonuçlar

Introduction

Placenta previa (PP) refers to the abnormal implantation of the placenta into the lower segment of the uterus, causing complete or partial closure of the cervix⁽¹⁾. Increased maternal, fetal, and neonatal morbidity and mortality in pregnancies complicated by PP. These pregnancies often present with painless, recurrent vaginal bleeding in the third trimester and are at increased risk of morbidity, including blood transfusion, peripartum hysterectomy, postpartum hemorrhage, infection, and longer hospital stays⁽²⁾. Placenta accreta spectrum (PAS; placenta accreta, increta, or percreta), that is, invasion of placental villi beyond the decidua basalis, may be observed in PP. This can lead to catastrophic bleeding, multiple complications, and even death^(2,3). Additionally, newborns born to patients with PP face problems such as prematurity, low birth weight, low Apgar scores, neonatal intensive care unit (NICU) requirements, and increased fetal mortality^(1,2).

Optimal timing of birth is important because of the potential morbidity risks of PP and PAS. However, there is no consensus in the literature regarding the optimal timing of childbirth for patients with PP⁽¹⁾. In general, women with uncomplicated PP are recommended to give birth at 36-37 weeks of pregnancy^(2,4,5). In cases of PAS, it has been stated in some studies that catastrophic bleeding is common after the 36th week and that planned birth at 34-35 weeks of pregnancy after antenatal steroids leads to a decrease in blood loss and blood transfusions^(5,6).

Identifying the differences between the obstetric, neonatal, and surgical outcomes of emergency and elective cesarean sections in PP cases and evaluating these differences between subgroups of patients with and without PAS will contribute to the literature in terms of determining the optimal timing of birth in PP patients with and without PAS.

The aim of this study was to compare emergency and planned cesarean section cases in pregnancies complicated with PP and subgroups with and without PAS in terms of obstetric, neonatal, and surgical outcomes.

Materials and Methods

This study retrospectively examined PP cases at Health Sciences University Turkey, Derince Training and Research Hospital between October 2012 and October 2022. Ethical approval for the study was given by the Health Sciences University Turkey, Kocaeli Derince Training and Research Hospital Clinical Research Ethics Committee (protocol number: 2022-145, date: 12/01/2023).

Women with singleton pregnancies who underwent cesarean delivery after 24 weeks of pregnancy with a diagnosis of PP were included in the study. Women who had a cesarean section elsewhere, whose PP diagnosis could not be confirmed during cesarean section, who had multiple pregnancies, and who had a miscarriage were excluded from the study.

One hundred and twenty-eight women with PP who met the inclusion criteria were included in the study. We recorded whether these women had PAS and whether they had an emergency or elective cesarean section. Whether the patients had PAS or not was decided according to the pathology results in patients who underwent hysterectomy or lower uterine resection, while in other patients, it was decided based on preoperative placental ultrasonography findings and intraoperative placental bleeding and observation. Of the 128 patients with PP, 54 were PAS and 74 were non-PAS.

The demographic characteristics and obstetric, neonatal, and surgical outcomes of all cases with PP and the subgroup of cases with and without PAS were compared according to whether they were emergency or planned cesarean section. Women who were followed up in the clinic and had a cesarean section at the planned time were considered "planned", while those who presented with symptoms requiring urgent cesarean section, such as bleeding, labor pain, fetal distress, and premature rupture of membranes, were considered "emergency". Additionally, demographic characteristics, obstetric outcomes, neonatal outcomes, and surgical outcomes of patients who underwent emergency cesarean section were compared according to PAS status.

The demographic and obstetric characteristics analyzed were age, gravidity, parity, number of abortions, number of vaginal

births and cesarean sections, time of birth, type of PP (total, partial, marginal and low-lying), and dominant localization of the placenta (anterior, posterior). Birth weight, first and fifth minute Apgar scores, NICU stay, and invasive mechanical ventilation were defined as neonatal outcome parameters. The amount of blood products transfused, the mother's treatment in the intensive care unit, the duration of hospital stay after birth, and interventions other than routine cesarean section (hysterectomy, internal iliac artery ligation, intrauterine sutures, Bakri balloon, compression sutures) were defined as surgical outcome parameters.

Statistical Analysis

Statistical analysis was performed using IBM SPSS 20.0 (IBM Corp., Armonk, NY, USA). Numerical variables were presented as mean ± standard deviation and median (interquartile range), whereas categorical variables were presented as frequency (percentage). Normality tests (Kolmogorov-Smirnov test, Shapiro-Wilk test) were applied to numerical variables. Numerical variables with normal distribution were analyzed with the Student-t test, and numerical variables with non-normal distribution were analyzed using the Mann-Whitney U test. Relationships between categorical variables were evaluated using a ch-square test and Fisher's exact test. To test two-sided hypotheses, p<0.05 was considered sufficient for statistical significance.

Results

One hundred and twenty-eight women diagnosed with PP during the research period were included in the study. Of these, 68 were in the emergency group and 60 were in the planned surgery group. Of the 128 patients with PP, 54 were PAS and 74 were non-PAS. Of the 74 non-PAS cases, 41 were in the emergency group and 33 were in the planned group. Of the 54 patients with PAS, 27 were in the emergency and 27 in the planned group. There were no significant differences between the emergency and planned groups in terms of the presence or absence of PAS (Table 1).

Table 1 shows a comparison of the demographic and obstetric characteristics between the emergency and planned groups. No significant difference was observed between the emergency and planned cesarean groups in terms of age, gravity, parity, dominant localization of the placenta, and type of PP (total or others). Of all PP patients included in the study, those who had a planned cesarean section gave birth on the 259.83rd day (approximately 37 weeks and 1 day) on average, and those who had an emergency cesarean section gave birth on the 235.25th day (approximately 33 weeks and 4 days) on average. In all patients with PP and in the subgroup of patients with and without PAS, the gestational period was shorter in patients who underwent emergency cesarean section, and birth rates before

the 37th and 34th weeks were higher in these patients. It was observed that both in all patients and in the PAS and non-PAS subgroups, those who had an emergency cesarean had a higher number of previous cesareans, whereas those who had a planned cesarean had a higher number of previous vaginal births. When 128 patients with PP were examined in the study, a weak but significant negative correlation was found between the number of previous cesarean sections and the duration of pregnancy. (r=-0.184 p=0.037 in Spearman analysis). Accordingly, the higher the number of previous cesarean sections, the earlier was the gestational age at birth.

Table 2 presents the comparison of neonatal outcomes between emergent and planned patients. In all patients with PP and in the PAS and non-PAS subgroups, the neonatal outcomes of patients who underwent emergency cesarean section were more negative than those of patients who underwent planned cesarean section. In all patient groups, newborns from patients who underwent emergency cesarean section had lower birth weights, 1st and 5th minute Apgar scores were lower, rates of admission to the NICU were higher, and rates of receiving invasive mechanical ventilation were higher compared with newborns from patients who underwent planned cesarean section.

The surgical outcomes between the emergency and planned groups are presented in Table 3. No significant difference was observed in terms of transfused blood products (total blood products, erythrocyte suspension, platelet suspension) between patients who underwent emergency and planned cesarean section, both in all patients with PP and in the PAS and non-PAS subgroups. Of the 128 patients with PP included in the study, 23 (17.9%) underwent hysterectomy along with cesarean section. Of the 23 hysterectomized patients, 2 were in the non-PAS group, and both patients were emergency cases. Twenty-one of the 23 patients who underwent hysterectomy, 21 had PAS. Among the 15 patients who underwent emergency cesarean section, 6 were included in the planned cesarean group. In all patients with PP and PAS, more hysterectomy were performed in the emergency group than in the elective group, which was statistically significant (p=0.027 and p=0.012 respectively). Of the 128 patients with PP included in the study, 30 had intrauterine sutures after cesarean section. Table 3 shows that in all patients with PP and PAS, intrauterine suturing was performed in statistically more patients in the planned group than in the emergency group (p=0.013 and p<0.001 respectively). No significant difference was observed between the emergency and planned groups in terms of intrauterine suture application in non-PAS patients. No significant differences were observed in all patients with PP, nor in the PAS and non-PAS subgroups, in terms of internal iliac artery ligation rates, bari balloon insertion rates, and compression suture placement rates between patients who underwent emergency and planned cesarean sections.

Table 1	Comparison of	f demographic and	obstetric characteristics between	the emergency and pla	nned group
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Total number of cases (n=128)	Planned (n=60)	Emergency (n=68)	р		
Age	31.62±6.07 / 32 (11)	31.78±5.13/33(7)	0.787*		
Gravidity	3.22±1.62/3(2)	3.04±1.04/3(2)	0.618*		
Parity	1.90±1.46/2(2)	1.72±1.19/2(1)	0.439*		
Number of previous abortions	0.30±0.67 / 0 (0)	0.32±0.60/0(1)	0.569*		
Number of previous vaginal births	0.8±1.41/0(1)	0.18±0.71/0(0)	<0.001*		
Number of Previous cesarean sections	1.05±1.06/1(2)	1.5±1.08/1(1)	0.024*		
Delivery time					
Delivery day	259.83±9.64 / 260 (13.8)	235.25±21.25/240 (14.8)	<0.001****		
Preterm birth (<37 weeks)	24 (40 %)	59 (86.8 %)	<0.001**		
Preterm birth (<34 weeks)	0 (0.0 %)	24 (35.3 %)	<0.001**		
Placenta previa					
Total placental previa	36 (60.0%)	48 (70.6 %)	0.200**		
Others (partial, marginal, low lying)	24 (40.0 %)	20 (29.4 %)	0.208		
Predominant placental					
Anterior	28 (46.7 %)	35 (51.5 %)	0.507**		
Posterior	32 (53.3 %)	33 (48.5 %)	0.387		
PAS status					
PAS cases	27 (45%)	27 (39.7 %)	0.545**		
Non-PAS cases	33 (55.0)	41 (60.3 %)	0.545		
Non-PAS cases (n=74)	Planned (n=33)	Emergency (n=41)	р		
Age	30.79±6.06/30(26-36.5)	31.17±5.7/32 (28.5-35.5)	0.781****		
Gravidity	3.12±2.02/3(3)	2.61±1.3/2(1)	0.317*		
Parity	1.76±1.87/2(2)	1.32±1.05/1(1)	0.476*		
Number of previous abortions	0.30±0.64/0(1)	0.32±0.61/0(1)	0.819*		
Number of previous vaginal births	1.24±1.75/0(2)	0.24±0.74/0(0)	<0.001*		
Number of Previous cesarean sections	0.58±0.94/0(1)	1±0.86/1(2)	0.015*		
Delivery time					
Delivery day	262.67±7.90/263 (11.5)	237.58±25.38 / 244 (27)	< 0.001 ****		
Preterm birth (<37 weeks)	10 (30.3 %)	33 (80.5 %)	<0.001**		
Preterm birth (<34 weeks)	0 (0.0 %)	17 (41.5 %)	<0.001**		
Placenta previa					
Total placental previa	17 (51.5 %)	26 (63.4 %)			
Others (partial, marginal, low lying)	16 (48.5 %)	15 (36.6 %)			
Predominant placental					
Anterior	12 (36.4 %)	17 (41.5%)	0.655**		
Posterior	21 (63.6 %)	24 (58.5%)	0.055		
PAS cases (n=54)	Planned (n=27)	Emergency (n=27)	р		
Age	32.63±6.05/33(11)	32.88±4.03 / 33.5 (6)	0.958****		
Gravidity	3.33±0.96/3(1)	3.69 ±1.16 / 3.5 (3-4.25)	0.227*		
Parity	2.07±0.73/2(1)	2.31±1.15/2(1.75-3)	0.543*		
Number of previous abortions	0.30±0.72 / 0 (0)	0.35±0.63/0(0-1)	0.567*		
Number of previous vaginal births	0.44±0.64/0(1)	0.08±0.39/0(0-0)	0.004*		
Number of previous cesarean sections	1.63±0.93/2(0)	2.23±0.95/2(1.75-3)	0.035*		
Delivery time					
Delivery day	256.37±10.56/258 (16)	239.31±13.32 / 238 (7.5)	<0.001****		
Preterm birth (<37 weeks)	14 (51.9 %)	26 (96.3 %)	<0.001**		
Preterm birth (<34 weeks)	0 (0.0 %)	7 (25.9%)	0.010***		
Placenta previa	1				
Total placental previa	19 (70.4 %)	22 (81.5 %)	0.340**		
Others (partial, marginal, low lying)	8 (29.6 %)	5 (18.5 %)	0.010		
Predominant placental					
Anterior	16 (59.3 %)	18 (66.7 %)	0.573**		
Posterior	11 (40.7 %)	9 (33.3 %)	0.575		

Variables are given as mean ± standard deviation / median (interquartile range) or frequency (percentage), *: Mann Whitney U test, **: Chi-square test, ***: Fisher exact test, ***: Student-t test, Bold / italics value signifies statistical significance, PAS: Placenta accreta spectrum

Table 2. Comparison of neonata	l outcomes between th	ne emergency and	planned groups
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Total number of cases (n=128)	Planned (n=60)	Emergency (n=68)	р
Neonatal birth weight (g)	2949.38±448.17	2368.73±693.55	< 0.001****
Apgar score			
1 st minute	7.88±0.64/8 (8-8)	6.40±1.67 / 7 (3)	<0.001*
5 th minute	9.40±0.74/9.5(1)	8.10±1.47 / 8 (2)	<0.001*
1 st minute <7	2 (3.3 %)	31 (45.6 %)	<0.001**
5 th minute <7	1 (1.7 %)	16 (23.5 %)	<0.001**
Neonatal intensive care unit	13 (21.7 %)	44 (64.7 %)	<0.001**
Neonatal invasive mechanical ventilation	6 (10 %)	26 (38.2 %)	<0.001**
Non-PAS cases (n=74)	Planned (n=33)	Emergency (n=41)	р
Neonatal birth weight (g)	2939.94±513 / 2810 (795)	2386.71±771/2440 (1015)	<0.001****
Apgar score			
1 st minute	7.82±0.72 / 8 (8)	6.44±1.75 / 7 (3)	<0.001*
5 th minute	9.39±0.86 / 10 (1)	8.17±1.44/9(2)	<0.001*
1 st minute <7	1 (3 %)	18 (43.9 %)	<0.001**
5 th minute <7	1 (3 %)	9 (22.0 %)	0.036***
Neonatal intensive care unit	6 (18.2 %)	25 (61 %)	<0.001**
Neonatal invasive mechanical ventilation	3.9% (9.1 %)	14 (34.1 %)	0.011**
PAS cases (n=54)	Planned (n=27)	Emergency (n=27)	р
Neonatal birth weight (g)	2960.93±362/2950 (550)	2340.38±563/2272.5 (830)	<0.001****
Apgar score			
1 st minute	7.96±0.52/8 (0)	6.27±1.56/6 (3)	<0.001*
5 th minute	9.41±0.57/9 (1)	7.92±1.49/8 (3)	<0.001*
1 st minute <7	1 (3.7 %)	13 (48.1 %)	<0.001**
5 th minute <7	0 (0.0 %)	7 (25.9 %)	0.010***
Neonatal intensive care unit	7 (25.9 %)	19 (70.4 %)	0.001**
Neonatal invasive mechanical ventilation	3 (11.1 %)	12 (44.4 %)	0.006**

Variables are given as mean ± standard deviation / median (interquartile range) or frequency (percentage), *: Mann Whitney U test, **: Chi-square test, ***: Fisher exact test, ***: Student-t test, Bold / italics value signifies statistical significance, PAS: Placenta accreta spectrum

There were no significant differences in the rates of admission to the maternal intensive care unit between patients who underwent emergency and planned cesarean section, both in all patients with PP and in those with PAS and non-PAS. It was observed that patients with PP and non-PAS were hospitalized after cesarean section for a longer period of time in the emergency group than in the planned group (p=0.044 and p=0.002 respectively). In patients with PAS, no significant difference was observed between the emergency and planned group in terms of hospitalization time after cesarean section.

Table 4 presents the demographic characteristics and obstetric, neonatal, and surgical outcomes of patients who underwent emergency cesarean section according to PAS status. Among patients with PP who underwent emergency cesarean section, those with PAS had a higher number of previous cesarean sections, gravida, and parity than those without (p<0.05 for all). There were no significant differences between the two

groups in the number of previous vaginal births. The pregnancy duration was similar between the two groups (average 239 days in PAS patients, average 237 days in non-PAS patients). There were no significant difference in PP type (total and other). The predominant placental location was more anterior in PASpositive emergency patients, whereas it was more posterior in non-PAS emergency cases (p=0.042). No significant difference was observed between the groups with and without PAS in emergency cases in terms of the neonatal outcomes examined (birth weight, Apgar score, need for neonatal intensive care stay, and need for invasive mechanical ventilation of the newborn). In emergency cases, the amount of blood products transfused, hysterectomy rate, internal iliac artery ligation rate, postoperative hospital stay, and maternal intensive care unit admission rate were higher in the PAS group than in the non-PAS group (p<0.05 for all).

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Total number of cases (n=128)	Planned (n=60)	Emergency (n=68)	p		
Total blood products (units)	0.68±1.56/0(0)	0.80±1.50/0(1)	0.466*		
Erythrocyte suspension (units)	0.47±0.99/0(0)	0.54±0.97/0(1)	0.477*		
Platelet suspension (units)	0.22±0.61 / 0 (0)	0.26±0.59/0(0)	0.324*		
Intervention other than routine cesarean section					
Hysterectomy	6 (10 %)	17 (25 %)	0.027**		
Internal iliac artery ligation	26 (43.3 %)	32 (47.1 %)	0.673**		
Intrauterine sutures	20 (33.3 %)	10 (14.7 %)	0.013**		
Bakri balloon	13 (21.7%)	13 (19.1 %)	0.721**		
Compression sutures (B-Lynch, etc.)	4 (6.7 %)	6 (8.8 %)	0.749***		
Postoperative hospital stay (days)*	3.12±1.63/2(2)	3.72±2.19/3(2)	0.044*		
Maternal intensive care unit	7 (11.7 %)	17 (25.0 %)	0.054**		
Non-PAS cases (n=74)	Planned (n=33)	Emergency (n=41)	р		
Total blood products (units)	0.15±0.71/0(0)	0.39±1.06 / 0 (0)	0.242*		
Erythrocyte suspension (units)	0.09±0.38/0(0)	0.24±0.62 / 0 (0)	0.234*		
Platelet suspension (units)	0.06±0.35 / 0 (0)	0.15±0.48/0(0)	0.266*		
Total number of cases (n=128)	Planned (n=60)	Emergency (n=68)	р		
Intervention other than routine cesarean section					
Hysterectomy	0 (0.0 %)	2 (4.9 %)	0.304***		
Internal iliac artery ligation	6 (18.2 %)	10 (24.4 %)	0.519**		
Intrauterine sutures	6 (18.2 %)	7 (17.1 %)	0.901**		
Bakri balloon	5 (15.2 %)	7 (17.1 %)	0.824**		
Compression sutures (B-Lynch, etc.)	0 (0.0 %)	3 (7.3 %)	0.249***		
Postoperative hospital stay (days)*	2.42±1.00/2(0)	3.37±2.22/3(2)	0.002*		
Maternal intensive care unit	0 (0.0 %)	4 (9.8 %)	0.124***		
PAS cases (n=54)	Planned (n=27)	Emergency (n=27)	р		
Total blood products (units)	1.33±2.04 / 0 (2)	1.50±1.83/0.5(3)	0.696*		
Erythrocyte suspension (units)	0.93±1.30/0(2)	1.04±1.22/0.5(2)	0.731*		
Platelet suspension (units)	0.41±0.80/0(0)	0.46±0.71/0(1)	0.552*		
Intervention other than routine cesarean section					
Hysterectomy	6 (22.6 %)	15 (55.6 %)	0.012**		
Internal iliac artery ligation	20 (74.1 %)	22 (84.5 %)	0.745		
Intrauterine sutures	14 (51.9 %)	3 (11.1 %)	0.001**		
Bakri balloon	8 (29.6 %)	6 (22.2 %)	0.535**		
Compression sutures (B-Lynch, etc.)	4 (14.8 %)	3 (11.1 %)	0.500***		
Postoperative hospital stay (days)*	3.96±1.85/3(2)	4.26±2.07 / 3 (3)	0.677*		
Maternal intensive care unit	7 (25.9 %)	13 (48.1 %)	0.091**		

Table 3. Comparison of surgical outcomes between the emergency and planned groups

Variables are given as mean ± standard deviation / median (interquartile range) or frequency (percentage), *: Mann Whitney U test, **: Chi-square test, ***: Fisher exact test, ***: Student-t test, Bold / italics value signifies statistical significance, PAS: Placenta accreta spectrum

Table 4. Examination of demographic characteristics and obstetric, neonatal, and surgical outcomes of patients who underwent emergency cesarean section according to PAS status

Emergency cases (n=68)	PAS (n=27)	Non-PAS (n=41)	р	
Age	32.88±4.03 / 33.5 (6)	31.17±5.7 / 32 (28.5-35.5)	0.232****	
Gravidity	3.69±1.16/3.5(3-4.25)	2.61±1.3/2(1)	0.006*	
Parity	2.31±1.15/2(1.75-3)	1.32±1.05/1(1)	0.006*	
Number of previous abortions	0.35±0.63/0(0-1)	0.32±0.61/0(1)	0.843*	
Number of previous vaginal births	0.08±0.39/0(0-0)	0.24±0.74/0(0)	0.441*	
Number of previous cesarean sections	2.23±0.95/2(1.75-3)	1±0.86/1(2)	<0.001*	
Delivery time				
Delivery day	239.31±13.32/238 (7.5)	237.58±25.38/244 (27)	0.321*	
Preterm birth (<37 weeks)	26 (96.3 %)	33 (80.5 %)	0.060**	
Preterm birth (<34 weeks)	7 (25.9%)	17 (41.5 %)	0.190**	
Placenta previa				
Total placental previa	22 (81.5 %)	26 (63.4 %)	0.110**	
Others (partial, marginal, low lying)	5 (18.5 %)	15 (36.6 %)		
Predominant placental				
Anterior	18 (66.7 %)	17 (41.5%)	0.0.40**	
Posterior	9 (33.3 %)	24 (58.5%)	0.042**	
Neonatal birth weight (g)	2340.38±563 / 2272.5 (830)	2386.71±771/2440 (1015)	0.723****	
Apgar score				
l st minute	6.27±1.56/6(3)	6.44±1.75/7(3)	0.826*	
5 th minute	7.92±1.49/8(3)	8.17±1.44/9(2)	0.549*	
l st minute <7	13 (48.1 %)	18 (43.9 %)	0.731**	
5 th minute <7	7 (25.9 %)	9 (22.0 %)	0.705**	
Neonatal intensive care unit	19 (70.4 %)	25 (61 %)	0.428**	
Neonatal invasive mechanical ventilation	12 (44.4 %)	14 (34.1 %)	0.393**	
Total blood products (units)	1.50±1.83/0.5(3)	0.39±1.06/0(0)	0.006*	
Erythrocyte suspension (units)	1.04±1.22/0.5(2)	0.24±0.62/0(0)	0.006*	
Platelet suspension (units)	0.46±0.71/0(1)	0.15±0.48/0(0)	0.035*	
Intervention other than routine cesarean section				
Hysterectomy	15 (55.6 %)	2 (4.9 %)	<0.001**	
Internal iliac artery ligation	22 (84.5 %)	10 (24.4 %)	<0.001**	
Intrauterine sutures	3 (11.1 %)	7 (17.1 %)	0.729***	
Bakri balloon	6 (22.2 %)	7 (17.1 %)	0.597**	
Compression sutures (B-Lynch, etc.)	3 (11.1 %)	3 (7.3 %)	0.675***	
Postoperative hospital stay (days)*	4.26±2.07 / 3 (3)	3.37±2.22/3(2)	0.029*	
Maternal intensive care unit	13 (48.1 %)	4 (9.8 %)	<0.001**	

Variables are given as mean ± standard deviation / median (interquartile range) or frequency (percentage), *: Mann Whitney U test, **: Chi-square test, ***: Fisher exact test, ***: Student-t test, Bold / italics value signifies statistical significance, PAS: Placenta accreta spectrum

Discussion

This study aimed to elucidate differences in obstetric, neonatal, and surgical outcomes between emergency and elective cesarean sections in pregnancies complicated by PP, including subgroups with and without PAS. Our results showed that planned cesarean section was associated with a reduced incidence of maternal complications, such as the need for emergency hysterectomies, particularly in PAS cases. These outcomes highlight the importance of careful prenatal management and timely intervention for pregnancies complicated by PP and PAS. In our study, we observed that the number of previous cesarean sections was higher in those who had emergency cesarean sections, both in all patients and in the PAS and non-PAS subgroups. In addition, we observed that as the number of previous cesarean sections increased, the gestational age at delivery also became earlier. Our findings are consistent with those of Ruiter et al.⁽⁷⁾, who found a history of cesarean section as a predictor of emergency delivery in patients with PP. Additionally, studies have shown that the presence of antepartum bleeding in patients with PP increases the risk of emergency cesarean delivery^(4,7,8). In the study by Pivano et al.⁽⁸⁾, 3 or more episodes of antepartum bleeding and the first antepartum bleeding occurring before the 29th week of gestation were associated with emergency cesarean section. Similarly, Oğlak et al.⁽⁴⁾ found that a first episode of antepartum bleeding occurring at or before the 28th week of pregnancy increases the risk of emergency cesarean section. We did not evaluate the relationship between emergency cesarean section and antepartum hemorrhage in our retrospective study because there was not enough information in the files regarding the number of antepartum bleeding episodes and when the bleeding episodes first started.

The optimal timing of delivery of PP is unclear. In a consensus study published in 2018, delivery was recommended between 34 and 356/7 weeks of gestation in stable PAS-positive patients. In this study, waiting beyond the 36th week in PAS-positive patients is not recommended because of the increased risk of bleeding⁽⁹⁾. In contrast, Wang et al.⁽¹⁰⁾ recommended planned surgery around 36-37 weeks of gestation for PAS-positive patients because their data showed that waiting until 36 weeks did not significantly increase the rate of emergency delivery. In another study describing the management of PP and accreta, elective cesarean delivery is recommended at 38 weeks of gestation when there is no antepartum hemorrhage in PAS cases, whereas elective cesarean delivery was recommended at 36 weeks of gestation to reduce the risk of emergency delivery in cases with a history of antepartum vaginal hemorrhage⁽¹¹⁾. Erfani et al.⁽¹²⁾ recommend planned surgery at 36-37 weeks in patients with PP without placental adhesion, provided that there is no significant bleeding.

In our study, the average gestational period for urgent cesarean sections was approximately 235 days (33 weeks and 4 days) in

all patients. We observed that the frequency of hysterectomy was increased, the postoperative hospital stay was prolonged, and maternal comorbidity was higher in patients with PP who underwent emergency delivery than in those who underwent planned delivery. Therefore, we believe that maternal morbidity can be reduced by planning earlier births in patients with PP compared to those with uncomplicated pregnancies. In our study, no significant difference was observed in terms of gestational age at delivery between emergency cases with and without PAS. However, among patients who had emergency deliveries, PAS cases had more frequent hysterectomies, required more blood transfusions, prolonged postoperative hospital stay, and higher rates of maternal intensive care unit admission compared with non-PAS cases. In other words, maternal morbidity was more frequent in patients with PAS who underwent emergency cesarean delivery. Therefore, we recommend that PAS cases be delivered earlier than non-PAS cases to reduce the number of emergency cesareans. Neonates born between 34 and 36 weeks of gestation are considered late preterm category^(13,14). Although they are at greater risk than term neonates, those born during this period are known as late preterm neonates because they have the closest physiological development to term. In cases of elective PAS, we recommend elective cesarean delivery at 34-35 weeks of gestation to avoid increasing the frequency of emergency cesarean sections and to wait at least until late preterm. Considering the neonatal problems caused by premature birth, we believe that this timing may vary depending on the patient's and fetus's condition (such as the presence of additional symptoms like bleeding or fetal development). We suggest choosing the most appropriate timing for delivery in which maternal risks, such as bleeding from delayed delivery, and fetal risks from early birth are balanced. Although we observed less morbidity in emergency cases without PAS spectrum, we recommend planning cesarean section before 38 weeks of gestation in cases of PP without PAS to ensure the comfort of the procedure in elective conditions. The concept of term in newborns begins at 37 weeks⁽¹⁴⁾. We believe that elective cesarean section between 37 and 376/7 weeks of gestation is appropriate to reduce the frequency of emergency cesarean section in cases with PP without PAS.

Our data showed that neonatal outcomes were significantly better in the planned cesarean group. Neonates born by emergency cesarean delivery had lower birth weights, worse Apgar scores, and higher rates of NICU admission and mechanical ventilation. This finding was likely due to the lower gestational age of the emergency cases. Adverse neonatal outcomes may also be attributed to the fetus being affected by the mother's adverse hemodynamics in the emergency setting. Similar to our study, in the study conducted by Durukan et al.⁽¹⁾ with 313 patients, newborns born by emergency cesarean section had lower birth weights, worse Apgar scores, and increased rates of NICU admission and mechanical ventilation. However, when the analysis was restricted to term neonates, no significant difference in NICU requirement was observed between the emergency and planned groups. Balayla et al.⁽¹³⁾ examined neonatal outcomes in PP and reported that early term (37^{0/7} and 38^{6/7} weeks of gestation) delivery in PP was associated with fewer complications and did not carry more risk than late preterm (34^{0/7} and 36^{6/7} weeks of gestation) delivery.

The surgical results of our study support the planning of cesarean section. The shorter hospital stay for planned procedures and lower incidence of emergency hysterectomies, especially in patients with PAS, suggest that elective surgeries allow for better preparation and management of possible complications. In their study comparing the maternal and neonatal outcomes of emergency and elective cesarean sections in patients with PP without PAS, Gedik Özköse et al.⁽²⁾ observed better results in the planned group in terms of preoperative and discharge hemoglobin levels, maternal intensive care unit admission rate, and hospital stay duration. A retrospective study of Asicioglu et al.⁽¹⁵⁾ reported that the rates of intraoperative estimated blood loss, bladder damage, uterine vessel injury, and hysterectomy were higher in cases of emergency delivery with PP and that more blood transfusion was required in emergency cases. A retrospective study conducted by Durukan et al.⁽¹⁾ observed that the amount of blood transfused in the emergency group of patients with PP was higher and the number of days the mother was admitted to the intensive care unit was higher. In a retrospective study by Taşgöz et al.⁽¹⁶⁾, complications, hysterectomy, and relaparotomy rates in patients with previa did not differ between emergency and planned deliveries, whereas admission to the adult intensive care unit and longer hospital stay were more common in emergency patients. Studies conducted to date, including our study, have shown that emergency delivery in patients with PP is associated with more adverse surgical and maternal outcomes than planned delivery. However, there is no clear consensus on whether serious adverse outcomes, such as hysterectomy, are observed more frequently in emergency cases. The retrospective nature of the studies conducted so far on this subject and the inadequacy of the sample size make it difficult to reach a clear conclusion in this regard.

In our study, we evaluated emergency cases separately according to the presence and absence of PAS. In emergency cases, we observed that patients with PAS required more transfusions, were hospitalized for longer periods, and required more maternal intensive care compared to patients without PAS. Therefore, we recommend a more careful approach, such as preparing more blood products and providing intensive care conditions before performing a cesarean section, in patients with PAS compared to patients without PAS, even in emergency situations.

Study Limitations

The retrospective nature and single-center design of this study may limit the generalizability of the findings. Another limitation of our study was that prepartum bleeding episodes and estimated blood loss were not evaluated. On the other hand, the evaluation of both PAS and non-PAS patients and the evaluation and treatment of all patients by an experienced surgical team in a tertiary center are strengths of the study.

Conclusion

In conclusion, our study suggests that planned cesarean sections in pregnancies complicated by PP, especially with PAS, lead to better obstetric, neonatal, and surgical outcomes compared with emergency cesarean sections. These findings advocate proactive prenatal management and planned delivery strategies to improve maternal and neonatal health in patients with PP and PAS. Decisions regarding the timing of delivery should balance maternal risks and benefits with fetal and fetal risks and benefits.

Ethics

Ethics Committee Approval: Ethical approval for the study was given by the Health Sciences University Turkey, Kocaeli Derince Training and Research Hospital Clinical Research Ethics Committee (protocol number: 2022-145, date: 12/01/2023). **Informed Consent:** Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: E.S., Concept: E.S., M.D., Design: E.S., M.D., Data Collection or Processing: E.S., Analysis or Interpretation: M.D., Literature Search: E.S., M.D., Ş.Ü., Ç.Y., A.Y., Writing: E.S., M.D., Ş.Ü., Ç.Y., A.Y.

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References

- Durukan H, Durukan ÖB, Yazıcı FG. Planned versus urgent deliveries in placenta previa: maternal, surgical and neonatal results. Arch Gynecol Obstet. 2019;300:1541-9.
- Gedik Özköse Z, Oğlak SC, Ölmez F. The comparison of maternal and neonatal outcomes between planned and emergency cesarean deliveries in placenta previa patients without placenta accreata spectrum. Ginekol Pol. 2022;93:217-23.
- 3. Fan D, Xia Q, Liu L, Wu S, Tian G, Wang W, Wu S, Guo X, Liu Z. the incidence of postpartum hemorrhage in pregnant women with placenta previa: a systematic review and meta-analysis. PLoS One. 2017;12:e0170194.
- Oğlak SC, Ölmez F, Tunç Ş. Evaluation of antepartum factors for predicting the risk of emergency cesarean delivery in pregnancies complicated with placenta previa. Ochsner J. 2022;22:146-53.
- Spong CY, Mercer BM, D'Alton M, Kilpatrick S, Blackwell S, Saade G. Timing of indicated late-preterm and early-term birth. Obstet Gynecol. 201;118:323-33.
- Warshak CR, Ramos GA, Eskander R, Benirschke K, Saenz CC, Kelly TF, et al. Effect of predelivery diagnosis in 99 consecutive cases of placenta accreta. Obstet Gynecol. 2010;115:65-9.

- Ruiter L, Eschbach SJ, Burgers M, Rengerink KO, van Pampus MG, Goes BY, et al. Predictors for emergency cesarean delivery in women with placenta previa. Am J Perinatol. 2016;33:1407-14.
- Pivano A, Alessandrini M, Desbriere R, Agostini A, Opinel P, d'Ercole C, et al. A score to predict the risk of emergency caesarean delivery in women with antepartum bleeding and placenta praevia. Eur J Obstet Gynecol Reprod Biol. 2015;195:173-6.
- American College of Obstetricians and Gynecologists; Society for Maternal-Fetal Medicine. Obstetric Care Consensus No. 7: Placenta accreta spectrum. Obstet Gynecol. 2018;132:e259-75.
- Wang Y, Zeng L, Niu Z, Chong Y, Zhang A, Mol B, et al. An observation study of the emergency intervention in placenta accreta spectrum. Arch Gynecol Obstet. 2019;299:1579-86.
- 11. Allahdin S, Voigt S, Htwe TT. Management of placenta praevia and accreta. J Obstet Gynaecol. 2011;31:1-6.
- 12. Erfani H, Kassir E, Fox KA, Clark SL, Karbasian N, Salmanian B, et al. Placenta previa without morbidly adherent placenta: comparison of

characteristics and outcomes between planned and emergent deliveries in a tertiary center. J Matern Fetal Neonatal Med. 2019;32:906-9.

- Balayla J, Wo BL, Bédard MJ. A late-preterm, early-term stratified analysis of neonatal outcomes by gestational age in placenta previa: defining the optimal timing for delivery. J Matern Fetal Neonatal Med. 2015;28:1756-61.
- Karnati S, Kollikonda S, Abu-Shaweesh J. Late preterm infants-changing trends and continuing challenges. Int J Pediatr Adolesc Med. 2020;7:36-44.
- Asıcıoglu O, Şahbaz A, Güngördük K, Yildirim G, Asıcıoglu BB, Ülker V. Maternal and perinatal outcomes in women with placenta praevia and accreta in teaching hospitals in Western Turkey. J Obstet Gynaecol. 2014;34:462-6.
- Taşgöz FN, Yenigül NN, Kender Erturk N, Kırşan İleri E, Yaşa FN. Comparison of maternal and neonatal outcomes between emergency and planned cesarean delivery in women with placenta previa. Eur Res J. 2022;8:359-67.