



Planned versus urgent deliveries in placenta previa: maternal, surgical and neonatal results

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Abstract

Purpose Placenta previa is abnormal localization of the placenta, associated with high rates of maternal–fetal morbidity and mortality. This abnormal implantation may also be in the form of invasion to surroundings defined as placenta accreta spectrum (PAS). The increasing rates of cesarean section raise the frequency of placenta previa and PAS in recent years. Although there are some recommendations, the optimal timing of caesarean delivery concerning fetal and maternal benefits is still unclear. The aim of this study is to compare maternal, surgical and perinatal outcomes of placenta previa cases who underwent emergency or planned surgery.

Methods The women who underwent cesarean section for placenta previa between October 2013 and February 2019 at a tertiary care center were retrospectively analyzed. They were divided into two main groups as planned and urgent, and into two subgroups as complicated (PAS) and uncomplicated (non-PAS).

Results Of the 313 women who met the inclusion criteria, 176 were planned and 137 were urgent cesarean sections. In the urgent group, gestational age, duration of surgery, maternal preoperative and pre-discharge hemoglobin levels, requirement of blood and blood product, additional surgical interventions, length of maternal postoperative intensive care unit and hospital stay, neonatal birthweight, Apgar scores, length of the follow-up in neonatal intensive care unit, invasive and non-invasive mechanical ventilation were significantly different.

Conclusions Maternal complication rates are increased in women who are operated on emergency conditions due to placenta previa. Perinatal outcomes are better in women who underwent planned surgery and in those with gestational age greater than 37 weeks.

Keywords Placenta accreta spectrum · Emergency delivery · Cesarean section · Hysterectomy · Maternal morbidity · Neonatal intensive care

Introduction

Placenta previa is abnormal implantation of placenta in the lower segment of uterus leading to a complete or partial closure of cervix [1]. With the increasing incidence and number of cesarean sections the frequency of placenta previa and its complications have increased [2, 3]. Other risk factor are advanced maternal age, multiparity, multiple

gestations, smoking, infertility, assisted reproductive techniques, and additional events that cause injury to decidua basalis and myometrium such as recurrent pregnancy losses, curettages, and manual removal of placenta [4, 5]. With the increasing incidence of placenta previa an increase in the risk of Placenta Accreta Spectrum (PAS: p.accreta, p.increta, p.percreta) is encountered [4]. The term “placenta previa” can be used to define placental location after the 16th gestational week via ultrasonography. RCOG recommends to determine placental location in routine anomaly scan, and clarification of the diagnosis in follow-up. Transvaginal ultrasonography is shown to be a safe and superior to abdominal ultrasonography in the diagnosis of placenta previa [6].

Placenta previa and PAS can highly be complicated with maternal–fetal morbidity and mortality. Affected mothers

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confront problems such as prominent vaginal bleeding and transfusion needs especially in the third trimester, postpartum bleeding, hysterectomy, requirement of adult intensive care unit (ICU), infections, and mortality. Affected newborns face problems such as prematurity, low Apgar scores, respiratory distress, requirements of neonatal intensive care unit (NICU), invasive and noninvasive mechanical ventilation, complications due to NICU follow-up, and three fold increased fetal mortality [7]. Another concern deteriorating clinical picture is preterm birth which can be related to risk factors such as antepartum bleeding episodes, massive hemorrhage, short cervix, and previous cesarean deliveries [8–10]. Because of these impending potential risks of placenta previa and PAS, optimal timing of birth is important. However, a consensus is not fully achieved besides recommendations. The aim of this study is to contribute to the knowledge via comparing the results of planned versus urgent cases with placenta previa.

Materials and methods

Placenta previa cases in Obstetrics and Gynecology Department of Mersin University Hospital between October 2013 and February 2019 were retrospectively analyzed. Ethics approval for this study was granted by the Clinical Research Ethics Committee of Mersin University on 20/02/2019 with the registration number: 2019/90. Before the operation, informed consent of all patients to cesarean section, possible application of Bakri balloon tamponade, additional surgical procedures, hysterectomy and retrospective use of the data in scientific research was obtained. Inclusion criteria were women with singleton pregnancies who underwent a cesarean delivery in our clinic after 24 weeks of pregnancy with an antenatal or preoperative diagnosis of placenta previa.

The diagnosis should be also intraoperatively confirmed. Women referred to our clinic after being operated elsewhere, multiple pregnancies, atony and abortions were excluded.

For placenta previa, the standard approach detailed below is used in our clinic. The women between 35 and 36 weeks are scheduled and prepared to undergo cesarean section usually after the completion of 38th week. The Pfannenstiel incision is used in vast majority. A transverse uterine incision is made just at the upper border of placenta if the placenta lies within the scar. In management of PAS, uterus is taken out of abdomen carefully without damaging placenta and two sutures are placed bilaterally on internal iliac arteries 2 cm distally after defining the bifurcation point through a peritoneal incision. Although difficult in posteriorly localized placentas, this procedure is completed in less than five minutes in any case. The placenta is then removed by blunt dissection or scraped sharply. If massive hemorrhage occurs, endouterine hemostatic sutures are placed in

placental bed. In cases which placenta reaches to serosa, this region is partially resected. If oozing type of bleeding persists, a Bakri balloon is inserted into uterus transabdominally. The uterus is then closed with double layers of sutures. Bakri balloon is filled (usually 180–240 ml) until the hemostasis is achieved and the cessation of bleeding is confirmed before closing the abdomen. If hemostasis efforts fail, surgery is proceeded with hysterectomy.

Routine antenatal care in Turkey

Since 2003, the Ministry of Health has been implementing the “Health Transformation Program” in Turkey. In this program, special attention was attached to mothers and infants. As a result of this program, maternal mortality rates decreased from 64 per hundred thousand live births in 2002 to 14.9 per hundred thousand live births in 2016 [11]. Hemorrhage, eclampsia, and cardiovascular problems are the first three causes of maternal mortality in our country. It is aimed to deliver quality, standard, safe, and qualified service by health care personnel throughout the country and to ensure the unity of application. For this purpose, the Emergency Obstetric Care Management Guideline has been prepared by the Ministry of Health. In the light of this guideline, nowadays, a pregnant woman is followed up in a qualified manner at least 4 times before delivery. The postpartum follow-up is carried out 6 times, 3 in hospital and 3 at home. A woman is followed up in the hospital for 24 h after normal delivery and for 24–48 h after cesarean section [11]. In Turkey, hospitals are structured as group A, B, and C. Group A hospitals are “Training and Research Hospitals” with the authority to provide education, and it is essential to provide multidisciplinary service 24/7. They include all infrastructure facilities and qualified personnel necessary for the management of an emergency patient, providing services such as blood bank, intensive care units, imaging, etc. The other two groups are hospitals where patients undergo uncomplicated surgical procedures or treatments. In case of emergency obstetric condition, regardless of the level of hospital that the pregnant woman applies to, the pregnant woman is expected to be referred to the highest level center with the condition of stabilization [11]. One million eight hundred thousand people live in the region we serve, and we serve as one of the two training and research hospitals in this region. As mentioned above, in emergency obstetric conditions, the patient is referred to our hospital with the condition of stabilization.

Patient population and study design

The women which were followed up in our clinic and operated at the scheduled time were assigned to “planned” group. Others, admitted with a symptom which

necessitated emergency cesarean delivery due to bleeding, labor pains, etc. were included in “urgent” group.

The women who did not require further surgical interventions besides cesarean section are classified as “uncomplicated” or non-PAS, and the ones who required additional surgical procedures to control bleeding were classified as “complicated” or PAS. Massive bleeding from the lower segment of uterus was attributed to placental invasion and clinically corresponds to the definition of placenta accreta spectrum [12]. However, it was not possible to provide tissue specimen for pathology in women who required additional interventions other than hysterectomy or lower segment resection. In the absence of pathological classification, cases were grouped according to their clinical features and additional interventions such as endouterine hemostatic sutures in placental bed, B-Lynch or compression sutures, internal iliac artery ligation, intrauterine Bakri balloon tamponade, partial resection of lower uterine segment, hysterectomy, and pelvic packing.

Parameters analyzed

Demographic and obstetric features were defined as age, conception method, gravidity, parity, abortions, live children, number of vaginal births, and cesarean sections, gestational age at delivery, type (total, partial, marginal, and low lying) and predominant localization (anterior, posterior, lateral, and in the balance) of the placenta. Surgical outcome parameters were defined as operation time, amount of blood and blood products, treatment in ICU, length of hospital stay after delivery, preoperative and pre-discharge levels of hemoglobin, intra- and post-operative complications (urinary tract and gastrointestinal tract injuries, intra-abdominal bleeding or hematoma formation, surgical wound infections, respiratory distress, peritonitis, sepsis), additional surgical procedures, reoperation, and maternal mortality. Fetal parameters were defined as birthweight, first and fifth minute Apgar scores, requirement and length of stay in NICU, length of invasive and non-invasive mechanical ventilation, and fetal mortality.

Statistical analysis

Distribution of normality was assessed using Shapiro–Wilk test. Hence the groups were not normally distributed according to the tested parameters, Spearman correlation and Mann–Whitney *U* were used where appropriate. *Z* test, Chi square test and Fischer’s exact tests were used in comparison of the tables and proportions. SPSS v15 Demo was used in statistical calculations and $p < 0.05$ was accepted significant.

Results

Total number of cesarean deliveries during the study period is 3990. Of those, 318 women were diagnosed to have placenta previa. Five multiple pregnancies were excluded and 313 of them were analyzed. There are 137 women in the urgent and 176 in the planned surgery groups. Gestational age at delivery of the urgent group is significantly smaller than those in the planned group. Most of the cases are spontaneous conceptions. Assisted reproduction is observed in only 5 cases of the urgent group and 6 cases of the planned groups. There are no significant differences between two groups regarding other demographic parameters (Table 1).

When the non-PAS placenta previa cases are analyzed, the only significant parameter is found to be gestational age at delivery between the urgent or planned subgroups. In PAS cases, gestational age and maternal age is significantly smaller in the urgent than in the planned subgroup (Table 1).

Statistically significant differences regarding the number of vaginal and cesarean births are observed between the urgent and the planned subgroups of both PAS and non-PAS cases (Table 2). A weak, but significant correlation is present between previous cesarean sections and gestational age, that the higher the number of previous cesarean sections the earlier the gestational age at delivery ($p < 0.05$).

Antenatal follow-up in 15 (4.8%) of the 313 women were outside our clinic. Thus, all are determined to be operated soon after admission with emergency complaints. Operation scheduling could not be made in 58 (19.5%) of the remaining 298 women, as they all admitted with emergency complaints before such arrangement. 240 women were scheduled for cesarean delivery; however, 64 (26.7%) were operated with emergency complaints before they reached the planned day of surgery. 75 women (54.7%) in the urgent group underwent surgery in the preterm period. There were only 5 women (2.8%) operated in the preterm period in the planned group and all were between 36⁰ and 36⁶ gestational weeks.

Total Placenta previa was determined in most ($n = 240$) of the women. As we grouped the women with partial, marginal, and low lying placentas into “others” group. There was a significant difference between urgent and planned cases regarding the types of placenta previa ($p < 0.001$). No significant relation was shown for placental localization. Women with PAS significantly presented with total placenta previa both in the urgent and in the planned subgroups (Table 3).

Major indications of emergency cesarean section in the urgent group were vaginal bleeding ($n = 83$, 60.6%), labor

Table 1 Demographic features of urgent and planned groups

<i>N</i> = 313	Urgent (<i>n</i> = 137) 43.8%	Planned (<i>n</i> = 176) 56.2%	<i>p</i>
Age	32.4 ± 5.8	31.5 ± 5.4	0.19
Gravidity	3.3 ± 1.7	3.1 ± 1.6	0.387
Parity	1.7 ± 1.4	1.6 ± 1.2	0.349
Abortus	0.4 ± 0.8	0.4 ± 0.8	0.732
Live children	1.6 ± 1.3	1.5 ± 1.2	0.896
Vaginal births	0.6 ± 1.1	0.5 ± 0.9	0.847
Cesarean births	1.2 ± 1.1	1.1 ± 1.1	0.545
Gestational age	36.0 ± 2.5	38.0 ± 0.6	< 0.001*
Non-PAS cases	Urgent (<i>n</i> = 47)	Planned (<i>n</i> = 88)	
Gestational age	36.0 ± 2.4	38.2 ± 0.6	< 0.001*
PAS cases	Urgent (<i>n</i> = 90)	Planned (<i>n</i> = 88)	
Age	33.0 ± 5.6	31.1 ± 5.5	0.038*
Gestational age	36.0 ± 2.5	37.9 ± 0.6	< 0.001*

Values are represented as mean ± standard deviation

*Statistically significant, Mann–Whitney *U* test

Table 2 Comparison of PAS and non-PAS groups

Planned group (<i>n</i> = 176)	Non-PAS (<i>n</i> = 88)	PAS (<i>n</i> = 88)	<i>p</i>
Parity	1.4 ± 1.2	1.7 ± 1.2	0.033
Living children	1.3 ± 1.1	1.7 ± 1.2	0.009
Vaginal births	0.7 ± 1.0	0.3 ± 0.8	0.024
Cesarean births	0.7 ± 0.9	1.4 ± 1.1	< 0.001
Gestational age	38.2 ± 0.6	37.9 ± 0.6	0.022
Urgent group (<i>n</i> = 137)	Non-PAS (<i>n</i> = 47)	PAS (<i>n</i> = 90)	<i>p</i>
Vaginal births	0.9 ± 1.2	0.4 ± 1.1	0.001
Cesarean births	0.6 ± 0.8	1.4 ± 1.1	< 0.001

pains (*n* = 41, 29.9%), and other reasons (*n* = 13, (9.5%), other reasons were [fetal distress (*n* = 5), anhydramnios (*n* = 3), premature rupture of membranes (*n* = 2), severe fetal growth restriction (*n* = 2), and intrauterine fetal demise (*n* = 1)].

Transfusion of blood and blood products were necessary in 154 women. The ratio of transfusion in the urgent group (59.9%, *n* = 82) is significantly higher than the ratio in the planned group (40.9%, *n* = 72, *p* = 0.001). Admission and pre-discharge hemoglobin levels of the women in the urgent group is significantly lower compared to the planned group. Quantities of total number of transfused blood products, red blood cell, and fresh plasma in the urgent group are significantly higher than those of the planned group. Follow-up in ICU was required in 26 women, 19 of whom were in the urgent group. The ICU requirement in the urgent group (13.9%) is significantly higher than the planned group (*n* = 7, 4%, *p* = 0.003). Maternal ICU stay in the urgent group is

also longer than the planned group. No maternal death was encountered. Surgical outcomes were presented in Table 4.

Follow-up in NICU is required in 54 (39.4%) of the urgent and in 16 (9.1%) of the planned cases (*p* < 0.001). Newborns in the urgent group have spent significantly more days in the NICU than the ones in the planned group. Considering all newborns, the first minute Apgar scores in 74.4% (*n* = 233) were 7 and above, 22.7% (*n* = 71) were between 4 and 6, and 2.9% (*n* = 9) were 3 and below. The rate of NICU admission according to these Apgar categories were 13.7% (*n* = 32), 43.7% (*n* = 31), 77.8% (*n* = 7) respectively. When we confine the analysis to term newborns, NICU requirement were not significantly different between the urgent and the planned groups. Number of admissions to NICU according to gestational ages are demonstrated in Table 5.

When we analyze PAS and non-PAS cases separately by dividing them into urgent or planned subgroups. There are significant differences in preoperative hemoglobin value,

Table 3 Types and localizations of placenta previa

Placenta type	Urgent (n = 137)	Planned (n = 176)	p
Total placenta previa	120 (87.6%)	120 (68.2%)	<0.001
Others (partial, marginal, low lying)	17 (12.4%)	56 (31.8%)	<0.001
			<0.001
Placental localizations	Urgent (n = 137)	Planned (n = 176)	
Anterior	30 (21.9%)	35 (19.9%)	0.663
Posterior	25 (18.2%)	52 (29.5%)	0.021
Lateral	9 (6.5%)	12 (6.8%)	0.930
In the balance	73 (53.3%)	77 (43.8%)	0.090
			0.129
Urgent group (n = 137)	Non-PAS (n = 47)	PAS (n = 90)	
Total placenta previa	36 (76.7%)	84 (93.3%)	0.005
Others (partial, marginal, low lying)	11 (23.4)	6 (6.7%)	0.005
			0.012
Planned group (n = 176)	Non-PAS (n = 88)	PAS (n = 88)	
Total placenta previa	49 (55.7%)	71 (80.7%)	<0.001
Others (partial, marginal, low lying)	39 (44.3%)	17 (19.3%)	<0.001
			<0.001

Table 4 Comparison of surgical and fetal outcomes between the urgent and the planned groups

	Urgent (n = 137)	Planned (n = 176)	p
Duration of surgery (min)	69.3 ± 39	58.6 ± 23	0.008*
Preoperative hemoglobin (g/dl)	10.9 ± 1.6	11.7 ± 1.4	<0.001*
Discharge hemoglobin (g/dl)	9.5 ± 1.4	9.8 ± 1.3	0.010*
Total blood products (units)	4.0 ± 6.0	1.7 ± 3.2	<0.001*
Erythrocyte suspension (units)	2.4 ± 3.1	1.1 ± 1.8	<0.001*
Fresh plasma (units)	1.4 ± 2.4	0.6 ± 1.2	<0.001*
Platelet suspension (units)	0.14 ± 1.0	0.1 ± 0.8	0.102
Cryoprecipitate (units)	0.02 ± 0.26	0.01 ± 0.15	0.855
Postoperative hospital stay (operation day is not included)	2.8 ± 1.7	2.1 ± 1.1	<0.001*
Maternal ICU stay (days)	2.3 ± 1.5	1.6 ± 1.1	0.001*
Neonatal birthweight (g)	2710 ± 580	3140 ± 360	<0.001*
First minute apgar	6.7 ± 1.8	7.6 ± 1.3	<0.001*
Fifth minute apgar	8.3 ± 1.4	8.9 ± 0.8	<0.001*
NICU stay (days)	3.96 ± 8.578	0.44 ± 1.798	<0.001*
Neonatal IMV (days)	0.45 ± 1.967	0.0 ± 0.0	<0.001*
Neonatal NIMV (days)	0.62 ± 1.926	0.13 ± 0.641	<0.001*

*Statistically significant, *ICU* intensive care unit, *NICU* neonatal intensive care unit, *IMV* invasive mechanical ventilation, *NIMV* noninvasive mechanical ventilation, values are represented as mean ± standard deviation

amount of transfused erythrocyte suspension, postoperative hospital stay, neonatal birthweight, Apgar scores, and NICU parameters between urgent and planned subgroups of non-PAS cases (Table 6). Similar and significant correlations were observed in above mentioned parameters in

addition to length of maternal ICU stay, total amount of transfused blood products and fresh plasma in PAS cases.

Additional interventions following cesarean section and re-operation counts are demonstrated in Table 7.

Table 5 Neonatal intensive care requirement according to gestational age

Gestational age (weeks)	Cases (n)	Neonates in NICU n (%)
34	7	4 (57%)
35	14	6 (43%)
36	34	16 (47%)
37	84	11 (13%)
38	131	9 (7%)

In 135 of the women no additional surgical intervention other than cesarean section was required. The rate of requiring additional procedures in the urgent group ($n = 90$, 65.7%) is significantly greater than their planned counterparts ($n = 88$, 50.0%, $p = 0.006$). Hysterectomy is performed in 45 (14.4%) of all cases. Rate of hysterectomy is significantly higher in the urgent group ($n = 27$, 19.7%) than in the planned group ($n = 18$, 10.2%, $p < 0.05$). There were no significant relations between the urgent and the

Table 6 Surgical and neonatal outcomes

Non-PAS	Urgent (n = 47)	Planned (n = 88)	p
Preoperative hemoglobin (g/dl)	11.3 ± 1.6	12.0 ± 1.3	0.016
Erythrocyte suspension (units)	0.6 ± 1.1	0.2 ± 0.6	0.032
Postoperative hospital stay (days) (operation day is not included)	1.9 ± 0.5	1.6 ± 0.8	0.001
Neonatal birthweight (g)	2660 ± 560	3190 ± 360	<0.001
First minute Apgar	6.8 ± 2.0	7.9 ± 1.1	0.001
Fifth minute Apgar	8.4 ± 1.7	9.1 ± 0.8	0.008
NICU stay (days)	5.4 ± 18.4	0.3 ± 1.4	<0.001
Neonatal IMV (days)	0.4 ± 1.5	0 ± 0.0	0.006
Neonatal NIMV (days)	0.2 ± 0.6	0.1 ± 0.6	0.007
PAS	Urgent (n: 90)	Planned (n: 88)	
Preoperative hemoglobin (g/dl)	10.7 ± 1.5	11.5 ± 1.4	<0.001
Total number of blood products (units)	5.7 ± 6.7	3.1 ± 4.1	0.001
Erythrocyte suspension (units)	3.4 ± 3.3	2.0 ± 2.1	0.001
Fresh plasma (units)	2.0 ± 2.7	1.0 ± 1.5	0.005
Postoperative hospital stay (days) (operation day is not included)	3.3 ± 2.0	2.6 ± 1.2	0.004
Maternal ICU stay	0.5 ± 1.2	0.1 ± 0.5	0.010
Neonatal birthweight (g)	2740 ± 600	3080 ± 360	<0.001
APGAR 1st min	6.1 ± 1.7	7.3 ± 1.4	0.004
APGAR 5th min	8.3 ± 1.3	8.8 ± 0.8	0.004
NICU stay (days)	4.5 ± 9.3	0.6 ± 2.1	<0.001
Neonatal IMV (days)	0.5 ± 2.2	0 ± 0.0	0.008
Neonatal NIMV (days)	0.8 ± 2.3	0.2 ± 0.7	0.004

M ± SD are given

Table 7 Operative interventions

	Urgent (n = 137)	Planned (n = 176)	p
Intraoperative interventions	90 (65.7%)	88 (50.0%)	0.006*
Hysterectomy	27 (19.7%)	18 (10.2%)	0.023*
Bakri balloon	47 (34.3%)	47 (26.7%)	0.172
Internal iliac artery ligation	33 (24.1%)	35 (19.9%)	0.408
Intrauterine Sutures	31 (22.6%)	39 (22.1%)	1.000
Uterine lower segment resection	13 (9.5%)	8 (4.5%)	0.110
B-Lynch or modifications	4 (2.9%)	2 (1.1%)	–
Abdominal packing	3 (2.1%)	1 (0.6%)	–
Re-operation	5 (3.6%)	2 (1.1%)	–

*Statistically significant

planned groups in terms of other parameters of intraoperative interventions. There were no intraoperative or postoperative complications in non-PAS cases.

Urinary system injuries were bladder injuries and observed in 12 of the women in the emergency group and in 7 in the planned group ($p=0.09$). Postpartum incision site infection was seen in 5 of the urgent and in 2 of the planned groups. Postoperative intra-abdominal hemorrhage and hematoma formation were seen in two cases who underwent hysterectomy (one in the urgent and one in the planned group). Adult respiratory distress syndrome was observed in one patient who underwent hysterectomy, internal iliac artery ligation, pelvic packing, and received massive blood transfusion. There was no gastrointestinal system injury, postoperative intra-abdominal infection, peritonitis or sepsis. There was no case of maternal death.

Discussion

In the current study, all women with placenta previa with PAS or without PAS are analyzed according to their admission types. It is recommended in the FIGO Consensus to avoid improper nomenclature such as “morbidly or perniciously adherent” for such spectrum of invasion in these placental implantation abnormalities [12].

Ultrasonography-based studies in the literature have reported that preoperative diagnosis of PAS reduces maternal and fetal morbidity. In a recent meta-analysis of PAS prediction, the diagnostic accuracy of ultrasonographic findings was 90.6%, 93.0%, 89.5%, and 81.2% for placenta accreta, increta, accreta/increta, and percreta, respectively [13]. However, the aim of our study was not the diagnostic prediction, but we evaluated the data and perinatal outcomes of our clinic for optimal operation timing in placenta previa cases. We also examined PAS cases as a subgroup.

There is a debate on optimal timing of delivery of placenta previa. In a consensus, it is recommended to take precautions for fetal lung maturation and to opt for delivery in 34–35 week [14], in another study surgery is recommended at around 36–37 week [15]. On the other hand, in a study 36–37 week was reported to be reasonable for women without signs of placental invasion [7]. Thirty-eighth week is also advocated for selected women without bleeding or findings that may cause preterm delivery [2]. In an experienced centers, it was also reported that cesarean deliveries are scheduled at or beyond 38th week [9]. In our clinic, we mostly intend for surgery by the completion of 38th week, albeit in some cases there are exceptions via individualized approach. The mean delivery time of the planned group is 38° and the urgent group is 36°. This distribution of gestational age seems to be unaffected by additional surgical interventions and is pretty much the same in women with PAS and non-PAS.

Preterm or unscheduled births mostly occurred after decision of surgeon due to bleeding or beginning of delivery. This can be partially iatrogenic or mostly as a consequence of coercing circumstances. The number of bleeding episodes and requirement of blood transfusion were reported to increase the risk of preterm delivery [9, 10]. The current study lacks data related to the episodes of antenatal bleeding. Another factor related to preterm delivery in placenta previa is reported to be the number of previous cesarean deliveries [9]. It was found in the current study that the more the number of previous cesarean deliveries, the earlier the women are operated.

Total placenta previa and anterior low lying placenta were reported to have high risk of massive obstetric bleeding and hysterectomy [6]. In the current study, the majority of the women have total placenta previa whose probability of urgent admission was greater than the others. The highest reason of admission was found to be vaginal bleeding. Symptomatic placenta previa is related to increased maternal-neonatal morbidity and mortality [16]. In our study, total amount of transfused blood and blood products, erythrocyte suspension, fresh plasma, and ICU requirement of women were found to be greater in the urgent group than those of the planned group. Preoperative and pre-discharge hemoglobin levels were lower in the urgent group than in the planned group and being lowest in the PAS—urgent subgroup. Similarly, in another study, relatively low values of hemoglobin were observed in complicated cases with placenta previa [1]. Women with placenta previa diagnosed at the admission for delivery were reported to have increased surgery related blood loss. Thus, they have increased rates of blood transfusions than their antenatally diagnosed counterparts [17, 18].

Due to technical difficulties and the retrospective design of our study, estimated or complete blood loss was incalculable; instead, hemoglobin values and transfusion data were given to be able to minimize bias. In women with placenta previa, it is recommended in prenatal care to correct the anemia [2]. All women treated in our outpatient clinic were prescribed iron supplementation.

In cases with placenta accreta spectrum, surgery was recommended in tertiary centers where early postoperative hemodynamic monitoring, intensive care facilities, and multidisciplinary evaluation are available [14]. In our study, ICU requirement and ICU stay of the mothers in the urgent group is higher than in the planned.

When we restrict the analysis to PAS cases and compare the planned and urgent subgroups, it can be concluded from the results that planned subgroup has better hemoglobin values, lower probability of transfusion of erythrocyte suspensions, shorter hospital stay, and better neonatal outcomes of birthweight and Apgar scores. Similar results are achieved when we repeat this analysis likewise in the non-PAS cases. The planned subgroups either in PAS or in non-PAS cases

have better outcomes in both maternal and neonatal aspects compared to their urgent counterparts. The worst scenario is in the PAS -urgent subgroup which has high hysterectomy and transfusion requirements. Therefore, it may be speculated that planned delivery may have better outcomes considering maternal morbidity. However, it was observed that approximately 40% of the women followed up and scheduled for operation in our clinic could not reach the scheduled time and were operated earlier.

In a study analyzing the results of placental previa without invasion, it was suggested that the operation could be delayed safely to 36–37 weeks without increasing maternal morbidity in tertiary centers with transfusion, blood bank, and emergency operating room availabilities [7]. In our clinic, we have a tendency to plan for cesarean sections beyond 38 weeks in concern of fetal lung maturation, since maternal mortality is very low. The increased requirement of NICU of the newborns in the urgent group is closely related to prematurity; however, this requirement did not differ between the groups when this comparison is confined to term pregnancies. The results of the current study can also be interpreted that timing of cesarean delivery in experienced centers may be delayed to term considering fetal benefits provided that it is individualized on a patient basis.

Antenatal corticosteroids were not used in the planned cases in our study population. The rates of NICU admissions of neonates in 34, 35, 36, 37, and 38 weeks were 57%, 43%, 47%, 13%, and 7% respectively. Antenatal corticosteroid use was reported to lower the risk of neonatal respiratory distress [19, 20]. Increased NICU admissions for the preterm newborns makes it reasonable for us to use antenatal corticosteroids when considering for scheduling deliveries in the late preterm.

Conclusion

The results of the current study show increased maternal and fetal morbidity in the urgent cases. It was found that increased number of previous cesarean sections increase complications and additional surgical interventions. The 24/7 availability of experienced team in placental invasion abnormalities and low maternal mortality led us opt for fetal benefits and delay the surgery in placenta previa cases to term pregnancy weeks. It should be kept in mind that scheduling delivery to advanced weeks of pregnancy has a probability of failure and a risk of an emergency admission. Early diagnosis in placenta previa is necessary to make a planned management. Operation timing should be individualized considering risks of preterm delivery beside antenatal corticosteroid use when necessary. Surgery for placenta previa should be made in tertiary centers where adult and neonatal ICU, experienced team, and

blood bank are available to reduce maternal-perinatal morbidity and mortality.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interests.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Before the operation, informed consent of all patients to cesarean section, possible application of Bakri balloon tamponade, additional surgical procedures, hysterectomy and retrospective use of the data in scientific research was obtained. Ethics approval for this retrospective study was granted by the Clinical Research Ethics Committee of Mersin University on 20/02/2019 with the Registration Number: 2019/90.

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