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Plasenta Previalı Gebelerde Acil Müdahalenin Risk Faktörleri Ve Sonuçları: Gözlemsel Bir Çalışma

Risk Factors And Outcomes Of Emergency İntervention İn Pregnant Women With Placenta Previa: An Observational Study

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Özet

Amaç: Plasenta previalı (PP) gebelerde acil müdahalenin risk faktörlerini ve sonuçlarını araştırmak.

Gereç ve yöntem: Bu retrospektif çalışma, Haziran 2015 ile Ocak 2021 tarihleri arasında yapıldı. PP'li gebeler cerrahi planlamaya göre acil ve planlı müdahale gruplarına ayrıldı. Gruplar demografik özellikler, antepartum kanama (AK) varlığı, operasyon özellikleri, anne ve yenidoğan sonuçları açısından karşılaştırıldı.

Bulgular: PP'li toplam 434 hasta analiz edildi. Çalışma süresince PP sıklığı %0,52 idi. 168 (%38,7) gebeye acil müdahale yapılırken, 266 (%61,3) gebeye planlı müdahale yapıldı. PP'lı gebelerin 208 (%47,9)'inde AK öyküsü vardı. Gebelerde AK öyküsünün olması acil müdahale riskinin 3.026 kat artmasıyla ilişkiliydi [%95 güven aralığı (GA), 1.990–4.603; p = 0.000]. Gebelikte kilo alımı acil müdahale riskinin 0,932 (%95 GA, 0,887–0,987; p = 0,004) kat azalmasıyla ilişkilendirildi. Acil müdahale grubunda, operasyon sırasında daha fazla ek cerrahi prosedür gerekti ve daha fazla masif transfüzyon yapıldı (p = 0.000 ve p = 0.000). Acil müdahale, olumsuz maternal sonuçlarda 3.064 (% 95 GA, 1.571-5.975) kat ve olumsuz fetal sonuçlarda 7.5 (%95 GA, 4.841–11.620) kat artışa neden oldu. Sonuç: PP'li gebelerde doğumda acil müdahale sıklığı yüksektir ve bu durum artan olumsuz maternal ve neonatal sonuçlarla ilişkilidir. Acil müdahalenin öngörülmesinde en etkili faktör AK'dir.

Anahtar kelimeler: acil müdahale, antepartum kanama, maternal ve neonatal sonuçlar, plasenta previa

Abstract

Aim: To investigate the risk factors and outcomes of emergency intervention in pregnant women with placenta previa (PP).

Material and method: This retrospective study was conducted between June 2015 and January 2021. Pregnant women with PP were divided into emergency and planned intervention groups according to surgical planning. The groups were compared in terms of demographic characteristics, presence of antepartum hemorrhage (APH), operation characteristics, and maternal and neonatal outcomes.

Results: A total of 434 patients with PP were analyzed. The frequency of PP was 0.52%. The emergency intervention was performed in 168 (38.7%) pregnant women, whereas planned intervention was performed in 266 (61.3%). APH was present in 208 (47.9%) patients; the presence of APH was associated with increased risk of emergency intervention by 3.026 [95% confidence interval (CI), 1.990–4.603; p = 0.000]-fold. The weight gained during pregnancy was associated with reduced risk of emergency intervention by 0.932 (95% CI, 0.887–0.978; p = 0.004)-fold. In the emergency intervention group, more additional surgical procedures and massive transfusion were performed during the operation (p = 0.000 and p = 0.000) Emergency intervention resulted in an increase in adverse maternal and fetal outcomes by 3.064 (95% CI, 1.571–5.975) and 7.5 (95% CI, 4.841–11.620)-fold, respectively.

Conclusion: The frequency of an emergency intervention is high in those with PP and is associated with increased adverse maternal and neonatal outcomes.The most effective factor in the prediction of emergency intervention is APH.

Keywords: antepartum hemorrhage, emergency intervention, maternal and neonatal outcomes, placenta previa

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The study was approved by the local ethics committee of Ankara Etlik Zübeyde Hanım Gynecology Training and Research Hospital (decision no. 21.12.2020-18/17)

Introduction:

Placenta previa (PP) is defined as the condition wherein the placenta is located on or very close to the internal cervical os in the lower uterine segment. In obstetric practise PP, which is observed with increasing frequency, is a cause of serious maternal and neonatal morbidity. The prevalence of PP in full term pregnancies is 0.2%–0.5% PP leads to adverse pregnancy outcomes by increasing the frequency of placental invasion anomalies, known as placenta accreta spectrum (PAS). Factors such as high antenatal bleeding rate in pregnancies with PP, more blood loss during C/S, excess need of blood transfusion, risk of hysterectomy during the operation and prematurity contribute to negative outcomes. [1-2]

The frequency of emergency delivery in pregnancies with PP is 25%–40%. Previous studies reported that the presence of antepartum hemorrhage (APH) in pregnant women with PP is a strong predictor of the need for emergency intervention. [3-5]

By presenting a retrospective evaluation of the data of our clinic, the present study primarily intended to contribute to predict the cases that may require emergency intervention in pregnancies complicated with PP and to reduce maternal and neonatal morbidity. In the light of the literatüre, the secondary aim was to analyze the data of our health care center, wherein multidisciplinary PP surgery can be performed at any time of the day.

Materials and Methods:

In this retrospective study, we included pregnant women who underwent C/S with the diagnosis of PP at Ankara Etlik Zübeyde Hanım Gynecology Training and Research Hospital between June 2015 and January 2021. The study was approved by the local ethics committee of Ankara Etlik Zübeyde Hanım Gynecology Training and Research Hospital (decision no. 21.12.2020-18/17). Due to the retrospective nature of the study, patient consent was waived. Patients were classified according to the planning method of C/S. While the emergency intervention group consisted of pregnant women whose operation was performed before the scheduled date, the planned intervention group was formed from the pregnant women whose operation was performed on the scheduled date.

PP was diagnosed in cases wherein the placenta partially or completely covers the internal cervical os, whereas low lying placenta (LLP) was diagnosed in those wherein its distance to the internal cervical os was <20 mm [1-2] As part of the routine prenatal follow-up of pregnant women with PP, the persistence of PP at 32 weeks of gestation was investigated in these patients. Ultrasonography was repeated at 36 weeks of gestation and C/S was planned at 37 weeks of gestational in pregnant women for whom PAS was not considered and APH was not observed Pregnant women who were not considered to have PAS were hospitalized a day before the operation and preoperative preparations were done. However, in cases wherein PAS was considered and no additional complications were observed [2-6] and delivery was planned between 34–36 weeks of gestation, patients were hospitalized 3–4 days before the operation and necessary preparations were done.

The approach to operations in pregnancies with PP was as described below. In cases wherein PAS was not considered, the abdomen was accessed with a pfannenstiel incision and a transverse incision was made on the uterus in a way to avoid the placenta, if possible; first the fetus and then the placenta were delivered. If massive bleeding occured after removal of the placenta, an appropriate additional surgical intervention was preferred. These procedures included uterine cavity suture, uterine compression sutures, Bakri balloon application, bilateral uterine artery ligation, bilateral hypogastric artery ligation, segmental uterine resection, and hysterectomy. In cases wherein PAS was considered after preoperative placental mapping with ultrasonography, the abdomen was accessed with a midline incision in lithotomy position, following the clinical observation, the uterus was carefully removed from the abdomen, the fetus was delivered with an incision made in the fundal region, the umbilical cord was tied, the placenta was left in the uterus, the uterine incision was closed, and finally hysterectomy was performed. Segmental uterine resection was performed in cases where it was deemed appropriate. The diagnosis of PAS was made histopathologically in pregnant women who have undergone hysterectomy or partial resection, whereas it was clinically made in cases without pathological specimens. In our center, all these procedures can be performed at any time of the day by a team of at least one specialist in maternal–fetal medicine.

The hospital's electronic database and patient files were used to create the study groups. The groups were analyzed for the clinical and demographic data including maternal age, gravity, parity, miscarriage, vaginal delivery and C/S numbers, method of conception, pregestational body mass index, weight gained during pregnancy, smoking, time since the last pregnancy, and placental position (anterior, posterior, or lateral), presence of APH, and gestational week at birth. Pathologically confirmed cases were included in the PAS group. The duration of operations, type of anesthesia, additional surgical procedures performed during the operation, transfusion of blood and blood components, need for massive transfusion, intraoperative and postoperative complications, need for adult intensive care, and postoperative hospital stay were analyzed. Massive transfusion was defined as transfusion of >4 units of packed erythrocyte suspension within 1 h or replacement of 50% of the total blood volume within 3 h if there was ongoing need [7-8] Maternal complications were identified to be postoperative bleeding, urinary and gastrointestinal system injuries, need for reoperation, presence of coagulopathy, surgical wound infections, pulmonary edema, and maternal death. A new pregnancy-specific scoring system developed by Erez et al. in 2014 was used to define coagulopathy [9] The presence of any of these complications was defined as an adverse maternal outcome. Neonatal parameters were defined as birth weight, Apgar scores at the 1st and 5th mins, need for neonatal intensive care (NICU), length of stay in the NICU, and neonatal death. Adverse neonatal outcome was accepted as an Apgar score of <7 at the 1st or 5th min or presence of any of the parameters indicating the need for NICU.

Statistical analysis was performed using SPSS 26 (Armonk, NY: IBM Corp). The normality distribution of the continious data was evaluated using the Kolmogorov-Smirnov test. The non-normally distributed continious data were compared using the Mann–Whitney's U test and expressed as median (interquartile range). The categorical data were compared using the chi-square test or Fisher's exact test and expressed as number (%). Logistic regression analysis was performed to identify the risk factors for the need for emergency intervention at birth. Odds ratios (OR) and 95% confidence interval (CI) were calculated. The reciprocal relationship in paired groups was determined using Spearman correlation analysis. P value of <0.05 was considered statistically significant.

Results:

During the study period, a total of 82890 births took place at our center; 434 (0.52%) pregnant women were operated with the diagnosis of PP; and 168 (38.7%) operations were performed as emergency and 266 (61.3%) were planned. The clinical and demographic characteristics of the groups and characteristics of those with APH are shown in

Table 1. Demographic and clinical characteristics of the study population (n = 434)

	Emergency Interventi n=168 (38.7%)	Planned intervention n=266 (61.3%)	p
MAD, year	33 (9)	31 (8)	.041[a]
Gravidy	3 (2)	3 (2)	.146[a]
Parity	1 (1)	1 (1)	.184[a]
Parity≥3	41 (24.4%)	42 (15.8)	.026
Miscarriage	0 (1)	0 (1)	.339[a]
Vaginal birth	0 (2)	0 (1)	.479[a]
Vaginal birth≥3	24 (14.3%)	18 (6.8%)	.010[b]
Cesarean birth	0 (1)	0 (1)	.865[a]
Interpregnancy interval (gravidy≥2), year	4 (5)	4 (4)	.881[a]
Previous uterine operations	60 (35.7%)	94 (35.3%)	.936[b]
Pregestational BMI	24.2 (6.1)	24.5 (5.2)	.474[a]
GWG, kg	9 (5)	10 (6)	.002[a]
Multiple pregnancy	9 (5.4%)	1 (0.4%)	.001[c]
IVF	9 (5.4%)	8 (3%)	.219[b]
Smoking	14 (8.3%)	22 (8.3%)	.982[b]
PAS	23 (13.7%)	36 (13.5%)	.963[b]
GAD, week	33.4 (4)	37 (1)	.000[a]
APH	110 (65.5%)	98 (36.8%)	.000[b]
Recurrent APH	86 (51.2%)	63 (23.7%)	.000[b]

APH: Antepartum hemorrhage; BMI: body mass index; GAD: gestational age at delivery; GWG: gestational weight gain; IVF: in vitro fertilization; n: number; MAD: maternal age at delivery; PAS: placenta accreata spectrum; PP: placenta previa
a: Mann-Whitney U test; b: Pearson chi square test; c: fisher's exact test:
Data were shown as median (interquatile range) or number (%).

There were significant differences between the emergency and planned intervention groups in terms of maternal age, weight gained during pregnancy, and rates of multiple pregnancies. The gravity and parity numbers were similar in the groups. However, when the parity was ≥3 and the number of vaginal deliveries was ≥3, the rate of emergency intervention increased by 1.722 (95% CI, 1.063–2.789) and 2.296 (95% CI, 1.205–4.375)-fold, respectively. In the entire cohort, 208 (47.9%) patients had at least one history of APH, whereas 149 (34.3%) had two or more bleeding episodes. The frequency of APH was higher in the emergency intervention group ($p < 0.000$). In addition, 34 (7.8%) patients whose antenatal follow-ups were not performed at our clinic were operated immediately after they presented with vaginal bleeding. As expected, the gestational week at birth was significantly lower in those with a history of APH ($p < 0.000$). A minor positive correlation was observed between the number of APH episodes and emergency intervention ($p = 0.041$, $r = 0.098$).

A binary logistic regression model was created to identify independent risk factors for the estimation of the need for emergency intervention in the presence of PP (Table 2).

Table 2. Logistic regression for the indicators for emergency intervention

Variables	Beta	Odds ratio	95% CI lower- upper	p
Maternal age (years)	0.023	1.023	0.983- 1.065	0.269
Gestational weight gain	-0.071	0.932	0.887- 0.978	0.004
Antepartum hemorrhage	1.107	3.026	1.990- 4.603	0.000
Multiple pregnancy	2.321	10.190	1.236- 83.999	0.031
Parity ≥ 3	0.210	1.234	0.612- 2.491	0.557
Vaginal birth ≥ 3	0.504	1.656	0.653- 4.199	0.288

CI: confidence interval.

As a result of the model, APH, weight gained during pregnancy, and multiple pregnancies were found to be important factors associated with emergency intervention. The presence of APH and multiple pregnancies increased the risk of emergency intervention (OR: 3.026, 95% CI: 1.990–4.603 and OR: 10.190, 95% CI: 1.236–83.999, respectively), whereas weight gained during pregnancy reduced the risk of emergency intervention (OR: 0.932, 95% CI: 0.887–0.978).

The characteristics of surgical operations and transfusion applications performed in the groups are shown in Table 3.

Tablo 3: Comparison of surgical procedures and transfusion requirements between the groups

	Emergency Intervention	Planned Intervention	p
Gestational age at surgery, w	33.4 (4)	37 (1)	.000[a]
Duration of surgery (min)	50 (34)	50 (30)	.266[a]
Spinal anesthesia only	120 (71.4%)	209 (78.6%)	.091[b]
Preoperative hb (g/dl)	11.50 (1.6)	11.55 (1.6)	.183[a]
Lowest hb level at the surgery	9.8 (2.2)	10.3 (2.2)	.000[a]
Additional surgical procedure	95(56.5%)	104(39.1%)	.000[b]
PAS	23(13.7%)	36(13.5%)	.965[b]
Any blood products transfusions	85(50.6%)	90(33.8%)	.001[b]
Total blood products (units)	1 (4)	0 (3)	.000[a]
Erythrocyte suspension (units)	0 (2)	0 (2)	.000[a]
Fresh plasma (units)	0 (2)	0 (2)	.000[a]
Platelet suspension (units)	0 (0)	0 (0)	.004[a]
Cryoprecipitate (units)	0 (0)	0 (0)	.056[a]
Massive transfusion	20(11.9%)	6(2.3%)	.000[b]
PAS (n=59)			
Gestational age at surgery, w	33.3 (3.4)	36.1 (1.86)	.000[a]
Duration of surgery (min)	132.5 (70)	120 (28)	.633[a]
Preoperative hb (g/dl)	11.35 (1.7)	11.60 (1.7)	.511[a]
Lowest hb level at the surgery	8.55 (1.7)	8.80 (2.6)	.226[a]
Total blood products (units)	9 (9)	5 (4)	.019[a]
Massive transfusion	12 (52.2%)	5 (13.9%)	.002[b]

APH: antepartum hemorrhage; hb: hemoglobin; PAS: placenta accreata spectrum; PP: placenta previa; w: week

[a]: Mann-Whitney U test; [b]: Pearson chi square test; [c]: fisher's exact test

Data are median (interquatile range) or n (%).

The amount of blood component replacement, and the needs for massive transfusion and additional surgical procedure were higher in the emergency intervention group. When these parameters were reanalyzed based on the presence of APH, the need for replacement of blood components was higher in patients who had emergency operation. A negative and minor correlation was observed between the gestational week at birth and the total number of replacement of blood components ($p < 0.000$, $r = -0.277$). This effect was more pronounced in pregnant women with PAS ($p = 0.002$, $r = -0.397$). Additional surgical procedures performed during the operation are shown in Table 4.

Table 4. Additional surgical procedures during operations

	Emergency Intervention	Planned Intervention	p
Additional surgical procedure	95 (56.5%)	104 (39.1%)	.000[a]
Intrauterine Sutures	43 (25.6%)	40 (15%)	.006[a]
B-Lynch or modifications	1 (0.6%)	5 (1.9%)	.412[b]
Bakri balloon	49 (29.2)	48 (18)	.007[a]
Uterine artery ligation	13 (7.7%)	18 (6.8%)	.710[a]
Hypogastric artery ligation	5 (3%)	8 (3%)	.985[a]
Partial uterine segment resection	0	7 (2.6%)	.047[b]
Hysterectomy	23 (13.7%)	29 (10.9%)	.384[a]
Re-operation	5 (3%)	1 (0.4%)	.034[b]

[a]: Pearson chi square test; b: fisher's exact test

Values are given as number (%).

In the emergency intervention group, additional surgical procedures were higher.

There were 59 (13.6%) patients with pathologically confirmed PAS in the study population. The distribution of PAS cases in the groups by the type of intervention and presence of APH was similar ($p = 0.963$ and $p = 0.523$). In PAS cases, the gestational weeks of delivery were 33.3 and 36.1 in the emergency and planned intervention groups, respectively.

Postoperative maternal outcomes and surgical complications are shown in Table 5.

Tablo 5: Maternal outcomes and complications related to surgery

	Emergency Intervention	Planned Intervention	p	OR 95% CI (lower-upper)
Hospital stay after surgery (d)	3 (2)	2 (1)	.003[a]	1.177 (1.057-1.311)
Discharge hb (g/dl)	9.8 (1.5)	10.1 (1.5)	.004[a]	0.773 (0.649- 0.920)
Adverse maternal outcome	26 (15.5%)	15 (5.6%)	.001[b]	3.064 (1.571-5.975)
Postoperative hemorrhage	9 (5.4%)	5 (1.9%)	.046[b]	2.955 (0.973-8.973)
Urinary tract injury	6 (2.5%)	6 (2.2%)	.379[c]	
Bowel injury	2 (1.2%)	0	.141[c]	
Surgical site infection	3 (1.8%)	1 (0.4%)	.151[c]	
Re-operation	5 (3%)	1 (0.4%)	.034[c]	8.129 (0.941-70.196)
Pulmonary edema	1 (0.06)	0	.376[c]	
Coagulopathy	10 (6%)	6 (2.3%)	.047[b]	2.743 (0.978-7.692)
Admission to MICU	3 (1.8%)	0	.057[c]	
Death	1 (0.06%)	0	.376[c]	

CI: confidence interval; d: day; hb: hemoglobin; MICU: maternal intensive care unit; OR:odds ratio

[a]: binary logistic regression; [b]: pearson chi square test; [c]: fisher's exact test

Values are given as median (interquatile range) or number (%).

Adverse maternal morbidity and mortality were defined as the presence of at least one of the following: postoperative hemorrhage, urinary tract injury, bowel injury, surgical site infection, re-operation, pulmonary oedema, coagulopathy, admission to MICU, maternal death.

In the emergency group, the risk of adverse maternal outcomes due to surgery was 3.064 (95% CI, 1.571-5.975) times higher than in the planned group. Postoperative bleeding, coagulopathy, and relaparotomy rates were higher in the emergency intervention group. Of the six reoperations performed in the entire cohort, five were in the emergency intervention group. The relaparotomies

performed were due to vaginal bleeding after C/S in four patients, and hysterectomy was performed on all. Other relaparotomies were due to mechanical ileus in one patient who underwent cesarean hysterectomy and due to cuff hematoma in another patient. Three patients were treated in the adult intensive care unit after the operation; of these, two were operated for diffuse placenta percreta, and the third was a patient operated at 27 weeks of gestation for severe preeclampsia accompanying PP and had postoperative pulmonary edema. Maternal death occurred in one patient in the emergency group. This patient was admitted by the emergency outpatient clinic for vaginal bleeding and preterm labor at 33+6 weeks of gestation. The patient underwent hysterectomy for diffuse placenta percreta 6 h after admission to the hospital and then underwent massive transfusion. The patient developed intracranial edema and cardiac arrest during the postoperative period.

The results of the newborns in the groups are shown in Table 6.

Table 6. Neonatal outcomes (except intrauterine fetal demise)

	Emergency Intervention	Planned Intervention	p
Neonatal birthweight (g)	2085 (928)	2850 (535)	.000[a]
Apgar score at 1 min	9 (2)	9 (0)	.000[a]
Apgar score at 5 min	10 (2)	10 (0)	.000[a]
NICU stay (days)	7 (19)	0 (0)	.000[a]
Neonatal death	13(7.8%)	1(0.4%)	.000[b]
Adverse neonatal outcome	110 (66.3%)	55 (20.8%)	.000[b]
	With APH	**Without APH**	**p**
Neonatal birthweight (g)	2475 (916)	2810 (608)	.000[a]
Apgar score at 1 min	9 (1)	9 (0)	.000[a]
Apgar score at 5 min	10 (1)	10 (0)	.000[a]
NICU stay (days)	1.50 (11)	0 (3)	.000[a]
Neonatal death	11 (5.3%)	3 (1.3%)	.021[b]
Adverse neonatal outcome	106 (51%)	59 (26.5%)	.000[b]

APH: antepartum hemorrhage; NICU: neonatal intensive care unit; PP: placenta previa

[a]: Mann-Whitney U test; [b]: Pearson chi square test; [c]: Fisher's exact test

Data are median (interquatile range) or n (%).

The emergency intervention group showed significant differences in neonatal outcomes. Emergency intervention and APH were associated with increased risk of adverse neonatal outcome by 7.500 (95% CI, 4.841–11,620) and 4.095 (95%CI, 1.126–14,890)-fold, respectively.

Discussion

The incidence of PP during the study period was 0.52%, which is consistent with the literature The frequency of emergency intervention was 38.7% in the overall population, and 38.6% and 39% in patients without and with PAS, respectively. In previous studies, the rates of emergency intervention were reported to be 25%–40% and 30%–46% in those with PP and PAS, respectively [3-5,10] The results of the present study are consistent with these data.

The main finding of our study is that APH is the most effective risk factor that can be used to predict emergency interventions in pregnancies with PP. About 2%–5% of all pregnancies are accompanied with APH, and it is an important cause of adverse maternal and fetal outcomes. APH, a strong predictor for emergency and preterm delivery, is often caused by placental disorders [11-14] APH in pregnant women with PP is one of the important risk factors that may cause emergency intervention [15-16] The incidence of APH in the present study was 47.9% in the entire cohort and 65.5% in the emergency intervention group. The presence of APH increased the risk for emergency intervention by 2.989-fold, and the mean week of delivery was 35.1 in these pregnant women. Our finding supports the recommendation that delivery should be scheduled before 37 weeks of gestation to reduce maternal and neonatal morbidity in those with PP and a history of APH As the number of APH episodes increased in the study population, the risk of emergency intervention increased; however, the correlation between the two was weak. Two recent studies reported a strong association between the number of bleeding episodes during the antenatal period and the need for emergency delivery [15-17]

When logistic regression analysis was performed to analyze the risk factors that could be used to predict emergency intervention, it was found that pregnancy weight gain and multiple pregnancies were among the contributing factors. A negative and minor correlation was observed between weight gained during pregnancy and both emergency intervention and APH. Low weight gain during pregnancy was associated with preterm birth [18-19] To the best of our knowledge, our study is the first to report the relation between weight gain during pregnancy and the need for emergency intervention in presence of PP. It is unclear whether low weight gain during pregnancy is a result of preterm birth or whether the frequency of emergency intervention or APH increases due to the low weight gain. We believe that the association between weight gain during pregnancy and pregnancy outcomes in women with PP should be investigated in prospective studies. In contrast to the results of two recent studies, the present study did not find an association between the number of C/S and frequency of emergency deliveries [17-20] However, the risk of emergency intervention increased in cases wherein the number of vaginal deliveries was ≥3 and parity was ≥3 ($p = 0.010$ and $p = 0.026$). In a meta-analysis conducted by Fun et al. in 2016, a significant relation was observed between multiparity and the prevalence of APH in pregnancies with PP. [21]

The gestational week at the time of delivery was 33.4 and 37 in the emergency intervention and planned intervention groups, respectively. These values are lower than the mean weeks of gestation reported by Ruiter et al (2016) and Durukan et al (2019) We explained this finding with the high rate of APH (65%) in the emergency intervention group, whereas in the planned intervention group, the deliveries were scheduled for weeks preceding 37 weeks of gestation in those with a history of APH and for the 37th week in those without a history of APH, in accordance with the current guidelines

When surgical operations were analyzed, although there was no difference in operation times between the groups, it was observed that blood and blood product replacement, massive transfusion, and the need for additional surgical procedures were more in the emergency group. In the overall population, the need for transfusion of blood components decreased as the week of gestation at the time of surgery progressed. This effect was particularly evident in the planned intervention group. Our finding is consistent with the study by Wang et al, who reported that blood loss during PAS surgery was lower as the week of gestation progressed In the emergency intervention group, the postoperative hospital stay and operational complications were higher, whereas the hemoglobin levels at discharge were lower. Although our center is a reference center for PP surgery and the patients are managed in a multidisciplinary manner, the high number of adverse maternal outcomes in the emergency intervention group is remarkable.

In the analysis of those with PAS in the present study, the rates of emergency intervention and APH were not different from the nonPAS population. In other words, the diagnosis PAS did not represent an additional risk factor for these complications. Despite the policy of iatrogenic preterm birth, emergency intervention was required in 39% of PAS cases. This rate is consistent with that reported in previous studies [5-10-23] A minor negative correlation was observed between gestational week at delivery and the need for transfusion in patients with PAS, which is consistent with the literature [5-23] Massive transfusions are one of the most important problems in PAS surgery [24-26] In the present study, 28.8% of patients with PAS required massive transfusion; this need was significantly higher in the emergency surgery group ($p = 0.002$). In the emergency intervention group, maternal mortality was observed in one patient of the PAS cases. In a 2016 meta-analysis by Akker et al, emergency peripartum hysterectomies were studied, and the maternal mortality rate was reported to be 5.2%. In the present study, this rate was 4.3% among those who underwent emergency hysterectomy. In the meta-analysis, no difference was observed between the etiologies leading to hysterectomy in those mortalities directly caused by hysterectomy [27]

In evaluating neonatal outcomes in our study, emergency interventions and APH were found to increase adverse neonatal outcomes. When these analyzes were repeated in term pregnancies, this situation was found to be primarily related to preterm birth, as there was no difference between groups in adverse neonatal outcomes.

Limitations of the present study include its retrospective nature and the fact that it was a single center. In addition, only the cases with the pathologically confirmed diagnosis were included in the PAS group. The strengths of this study are the

identification of risk factors for predicting emergency intervention and the analysis of results using a standard surgical approach used by a specialized team.

Conclusion:

The results of the present study show that APH is the most important factor that can be used in the prediction of emergency intervention, which is in line with the literature. The rate of emergency intervention was high in those with low weight gain during pregnancy.

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The study was approved by the local ethics committee of Ankara Etlik Zübeyde Hanım Gynecology Training and Research Hospital (decision no. 21.12.2020-18/17)