Erciyes Med J 2019; 41(4): 390–3 • DOI: 10.14744/etd.2019.81084
ORIGINAL ARTICLE – OPEN ACCESS

Predictors of Perinatal Mortality Associated With Placental Abruption: A Single Center Experience With 200 subjects

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ABSTRACT

Objective: Despite recent advances in prenatal diagnostic techniques, placental abruption (PA) remains one of the most significant causes of maternal morbidity and perinatal mortality. The purpose of the present study is to summarize the current knowledge concerning PA and to present maternal and fetal outcomes of the patients admitted to our clinic who underwent cesarean delivery for PA.

Materials and Methods: All the consecutive patients enrolled in our clinic and diagnosed with PA between January 2015 and December 2018 were enrolled in this retrospective study. Data regarding demographics, operation details, and the postoperative course included blood transfusions, development of maternal and fetal complications, and laboratory measurements were collected from the electronic institutional database.

Results: A total of 200 patients were recruited in this retrospective study. No maternal death was observed during the in-hospital course. Uterine rupture developed in 6 (3%) subjects, severe hemorrhage occurred in 28 subjects (14%), and fetal and neonatal mortality was observed in 10 (5%) subjects. Logistic regression analyses indicated that fibrinogen levels prior to delivery (p=0.039), gestational age (p=0.005), smoking (p=0.044), and maternal systolic blood pressure (p=0.013) were independent predictors for fetal and neonatal mortality.

Conclusion: The maternal and perinatal mortality observed in our study population is favorable as compared to previous results. Fibrinogen levels prior to delivery, gestational age, smoking, and maternal systolic blood pressure were independently predictive for fetal and neonatal mortality in subjects with PA.

Keywords: Abruptio placentae, postpartum hemorrhage, maternal mortality, fetal mortality

Cite this article as:
Yılmaz G, Akça A, Kıyak H, Salihoğlu Z. Predictors of Perinatal Mortality Associated With Placental Abruption: A Single Center Experience With 200 subjects. Erciyes Med J 2019; 41(4): 390-3.

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Submitted
10.04.2019

Accepted
26.08.2019

Available Online Date
08.11.2019

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INTRODUCTION

Placental abruption (PA) is the complete or partial separation of a normally implanted placenta before delivery, which causes vaginal bleeding in the second half of the pregnancy. Prevalence of PA varies between 0.4% and 1% (1). Although several risk factors are proposed to act in the development of PA, the etiopathogenesis appears multifactorial and is still not well understood. The strongest risk factors found in association with PA are smoking, preeclampsia, and history of previous placental abruption (2–5).

Despite recent advances in prenatal diagnostic techniques, PA remains one of the most significant causes of maternal morbidity and perinatal mortality. The maternal mortality rate is seven times higher in subjects with PA due to excessive blood loss, complications related to blood transfusions, disseminated intravascular coagulation, and renal failure (3, 6). Fetal outcome is also impaired as a consequence of intrauterine growth restriction, preterm delivery, asphyxia, and low birth weight (7). Perinatal mortality, which has been reported in the range of 9-12% in developed countries varies depending on the gestational age, the proportion of the involved placental surface, and adequacy of the neonatal facilities (8).

The purpose of the present study is to identify the predictors of fetal and neonatal mortality in subjects with PA. This study also aims to summarize the current knowledge concerning PA and presents the maternal and fetal outcomes of the patients admitted to our clinic who underwent cesarean delivery for PA.

MATERIALS and METHODS

All consecutive patients enrolled in our clinic and diagnosed with PA between January 2015 and December 2018 were enrolled in this retrospective study. All women whose pregnancies were complicated by PA were recruited. Written informed consent was obtained from all participants. Multiple gestation pregnancies and pregnancies obtained with assisted reproductive technology were excluded since these patients were likely to have a different risk profile for abruption (11 patients). Patients with any missing data (8 patients) and those with alcohol consump-

tion (1 patient) were not included in statistics and excluded from analysis. Data regarding demographics, operation details, and the postoperative course including blood transfusions, development of maternal and fetal complications, and laboratory measurements were collected from the electronic institutional database. Power calculations based on our pilot study with 40 patients revealed that (odds ratio for gestational age to predict fetal and neonatal mortality: 0.3, effect size 0.80, alpha error: 0.5 power: 0.95) at least 57 patients were required (9).

Statistical Analysis

Statistical analyses were carried out using SPSS for Windows, version 19 (SPSS, Chicago, IL, USA). Distribution of the variables was studied using the Kolmogorov-Smirnov test. Continuous variables were given as the mean±standard deviation and categorical variables were represented as a percentage. Comparisons preoperative and postoperative fibrinogen and hemoglobin levels were performed using the 2-tailed paired t-test. A multiple binary logistic regression model was used to identify the predictors of fetal and neonatal mortality. Two-sided p ≤0.05 was interpreted as statistically significant.

RESULTS

A total of 200 patients (mean age: 32±23 years, BMI: 30.9±2.7 years) with PA who underwent cesarean delivery were recruited in this retrospective study. Mean gestational age was 35±6 weeks. A definite cause for abruption placenta was detected in 16 patients. In those patients, preeclampsia was the leading cause for PA. A total of 56 subjects (28%) were smokers, 26 were diabetics (13%), and 38 were hypertensive (19%). A history of previous cesarean section was present in 31 subjects (15%) and proteinuria was detected in 38 of participants (14%). Mean gravida was 3.32±1.7 and the mean parity was 1.58±1.4. The mean duration of the surgery was 68±19 minutes. A total of 119 patients (60%) required perioperative blood transfusion and intravenous fibrinogen was administered in 16 of the subjects (8%). The postoperative fibrinogen level was significantly higher than the preoperative fibrinogen level (202±14 mg/dL vs. 161±13 mg/dL, p<0.001). In addition, the postoperative hemoglobin level was significantly lower compared to the preoperative level (10.1±1.7 g/L vs. 12.4±1.3 g/L, p<0.001). A total of 24 subjects (12%) required intensive care unit admission, 4 (2%) required mechanical ventilation, and none required hemodialysis. Mean Apache 2 score for subjects were admitted to the intensive care unit was 9.6±4.3. Uterine rupture developed in 6 (3%) and fetal/neonatal mortality was observed in 10 (5%) subjects. No maternal death occurred as observed during the in-hospital course. First minute Apgar score was 7.2±2.1 and the 5th minute Apgar score was 8.7±1.9 (Table 1).

Logistic regression analyses indicated that fibrinogen levels prior to delivery (OR: 0.994, 95%CI: 0.989–1.000, p=0.039), gestational age (OR: 0.306, 95%CI: 0.134–0.699, p=0.005), smoking (OR: 3.634, 95%CI: 1.004–13.161, p=0.044), and maternal systolic blood pressure (OR: 0.616, 95%CI: 0.920–0.903, p=0.013) were independent predictors for fetal and neonatal mortality (Table 2).

Table 1. Demographic features, operative details, and complications

	n=200
Age (years)	32±23
BMI (kg/m^2)	30.9±2.7
Gestational age (weeks)	35±6
Gravida (n)	3.32±1.7
Parity (n)	1.58±1.4
Smoking (n)	56 (28%)
Hypertension (n)	38 (19%)
Diabetes (n)	26 (13%)
Proteinuria (n)	31 (15%)
Operation time (minutes)	68±19
Perioperative blood transfusion (n)	119 (60%)
Fibrinogen administration (n)	16 (8%)
Fibrinogen prior to delivery (mg/dL)	161±13
Fibrinogen following delivery (mg/dL)	202±14
Hemoglobin prior to delivery (g/L)	12.4±1.3
Hemoglobin following delivery (g/L)	10.1±1.7
Complications	
Uterine rupture (n)	6 (3%)
Severe hemorrhage (n)	28 (14%)
Fetal and neonatal mortality (n)	10 (5%)
First minute Apgar score	7.2±2.1
Fifth minute Apgar score	8.7±1.9

BMI: Body mass index

Table 2. Independent predictors of fetal and neonatal mortality

	OR	95 % CI		p
Fibrinogen level prior to delivery	0.994	0.989	1.000	0.039
Hemoglobin level prior to delivery	0.821	0.466	1.447	0.495
Maternal age	1.004	0.957	1.054	0.859
Gestational age	0.306	0.134	0.699	0.005
Smoking	3.634	1.004	13.161	0.042
Gravida	0.675	0.190	2.403	0.544
Parity	2.648	0.640	10.961	0.179
BMI	1.041	0.789	1.373	0.776
Maternal SBP	0.616	0.920	0.903	0.013

BMI: Body mass index; SB: Systolic blood pressure

DISCUSSION

Placental abruption is defined as the premature detachment of the placenta from the uterine wall after 20 weeks of gestation, prior to delivery of the fetus. PA continues to render attention among obstetricians for its close relationship with maternal and prenatal mortality and morbidity. Despite the decline in the incidence of PA in Nordic countries and the US, it is still a common problem in some developing countries (10, 11). PA might lead to long-term maternal complications even in completely recovered subjects (12). Therefore, increasing the current knowledge on PA is crucial to adequately treat patients and prevent maternal and perinatal mortality.

Our results in a relatively wide population including 200 patients with PA indicates a satisfactory advancement in maternal mortality as compared to the previous reports. Although previous studies have revealed that 2% to 5% of maternal deaths were linked to placental abruption, we encountered no maternal death in our study population. In addition, maternal age was higher in our study subjects as compared to previous reports (13).

Fetal and neonatal mortality was observed in 5% of the study subjects which is somewhat similar to those indicated in previous reports demonstrating varying fetal mortality rates of 1% to 40% depending on the age of the fetus and extent of the placental separation (14–17). In the present study, the first minute Apgar score was 7.2±2.1 and the fifth minute Apgar score was 8.7±1.9, indicating a roughly healthy status of the newborn infant despite the results of the previous trails showing decreased lower Apgar scores in newborn infants born to mothers with PA (18). The favorable results observed in our study are probably a result of allocating all subjects to cesarean section, which provides fast delivery of the fetus without wasting time and thus reduce the rate of the fetal and neonatal complications.

Our findings also indicate that fibrinogen levels prior to delivery, gestational age, smoking, and maternal systolic blood pressure were independently predictive for fetal and neonatal mortality in subjects with PA. The association between fibrinogen levels and maternal and neonatal outcomes were recently studied by Wang et al. (19). In that study, the authors found that a decrease in fibrinogen levels to 155 mg/dL was associated with moderate hemorrhage and a decrease in fibrinogen levels to ≤250 mg/dL was associated with an umbilical artery pH <7.00 and Apgar score ≤3 at 5 minutes. Supporting their findings, our results demonstrate that fibrinogen level prior to delivery is predictive for fetal and neonatal mortality.

Smoking has long been accepted as a critical cause of PA, however, the impact of smoking on fetal outcome in patients with PA has not been clearly elucidated (20). Recent data indicate that mothers who stopped smoking experienced only about half as many fetal and neonatal deaths due to abruptio placenta than did the mothers who continued to smoke (21). However, the actual data regarding the role of smoking on fetal and neonatal mortality in PA is lacking. Our findings showing the role of smoking on perinatal mortality are, therefore, critical to establish the emphasis of smoking for both the development of PA and also perinatal mortality related to PA.

We also found that systolic blood pressure was an independent predictor of fetal outcomes in subjects with PA. Systolic blood pressure indirectly reflects the amount of blood loss and the success of compensatory mechanisms to maintain optimal hemodynamics in subjects with hemorrhage. Occasionally, despite a high amount of bleeding, compensatory mechanisms such as sympathetic activation and activation of the renin-angiotensin-aldosterone axis might be capable to maintain a stable blood pressure and conceal the existence of hemorrhage. However, in severe blood loss, these compensatory mechanisms become insufficient to keep the blood pressure in normal range. Therefore, a more radical effort to correct the fluid and blood loss might be required in patients with PA and decreased systolic blood pressure to avoid maternal and fetal complications.

The present study has some limitations. First, the study was not prospective and evaluated retrospective data. Second, some minor or atypical forms of PA that did not present clinically may have been be underreported due to the retrospective fashion of the study. Third, although recent data indicate that location of abruption and extent of PA surface are associated with neonatal outcomes, data concerning the above findings were lacking in our study (8). Finally, alcohol consumption, which might be associated with development of PA, were not recorded in patients charts and institutional database and, therefore, was not presented in this study.

CONCLUSION

The maternal and perinatal mortality observed in our study population is favorable as compared to previous results. Recent advances in diagnostic methods, implementation of cesarean delivery, and improved neonatal care are probably the major reasons for this improvement. Our findings indicate that fibrinogen levels prior to delivery, gestational age, smoking, and maternal systolic blood pressure are independently predictive for fetal and neonatal mortality in subjects with PA. We suggest that aggressive fluid and blood transfusion might prevent fetal and neonatal mortality in the presence of these predictors.

Ethics Committee Approval: The Ethics Committee of Kanuni Sultan Süleyman Training and Research provided the ethics committee approval for this study (Date: 06.12.2017-2017/20, No: KSSEAHKAEK/2019.07.164).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – GY; Design – GY; Supervision – ZS; Resource – AA; Materials – HK; Data Collection and/or Processing – AA; Analysis and/or Interpretation – AA; Literature Search – AA; Writing – GY; Critical Reviews – ZS.

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

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