

Evaluation of Maternal Hemorrhage in Placenta Accreta

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ABSTRACT

OBJECTIVE: The aim of the present study is to provide a retrospective evaluation of placenta accreta cases to identify the factors affecting the blood transfusion requirement, which stands as one of the most important causes of maternal mortality and morbidity.

STUDY DESIGN: A total of 110 patients who presented to the outpatient clinic of gynaecology and obstetrics of the Faculty of Medicine of Dicle University and were diagnosed with placental attachment before or during a caesarean section (C-section) between January 2006 and June 2015 were included in this study. The patients' data were collected from the hospital's records.

RESULTS: During the study period, 21674 births were realised and 110 (1/200) of these patients exhibited placenta accreta. 86 of these 110 patients (78,2%) received at least one unit of blood. The group of patients that had received blood transfusion exhibited significantly higher values in age, parity, number of C-sections, length of stay ($p = 0.003, 0.004, 0.024, 0.000$, respectively). Multiple logistical regression analysis led to the identification of a significant association between the length of stay and the blood transfusion requirements (OR 95% CI 2.005(1.213-3.314) $p = 0.007$).

CONCLUSION: Patients of advanced age as well as grand multiparous patients and patients with a history of multiple repeat caesarean deliveries should be evaluated more carefully during pregnancy. These patients should be referred to hospitals that provide multidisciplinary care and management before the delivery or even at the early stages of pregnancy in an effort to decrease maternal mortality and morbidity rates.

Keywords: Placenta accreta, Maternal hemorrhage, Morbidity

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Introduction

Placenta accreta is a general term used to describe the clinical condition when part of the placenta, or the entire placenta, invades and is inseparable from the uterine wall. Placenta accreta is one of the major causes of postpartum bleeding. Forty percent of such patients require massive blood transfusions (more than 10 units of erythrocytes) whereas maternal mortality is at 6-7%.¹ Placenta accreta is the abnormal invasion of myometrium by chorionic villi, and its manual removal during caesarean section (C-section) leads to a significant degree of bleeding.² Placenta previa, is the most important risk factor for the placenta accreta. Pregnant women with placenta previa experience serious bleeding, as the sub-uterine segment is dif-

ferent from the upper uterine segment in morphological and functional terms.³ Highly vascular sub-uterine segment causes significant bleeding and retracts slowly.⁴

Surgical intervention is used as a second option following the failure of uterotonic medicine to control bleeding. The most common procedures include suturing the bleeding sites, application of compression sutures on the uterus, ligation or embolization of hypogastric or uterine artery and placement of a balloon tamponade.⁵ Hysterectomy is frequently applied as a life-saving procedure depending on the degree of placental attachment and depth of invasion.⁶

Risk factors include advanced maternal age, smoking, recurrent abortions, and multiparity, but the strongest associations are with placenta previa and prior uterine surgery. Placenta accreta is commonly associated with placenta previa and a history of C-section. It is one of the main causes of caesarean hysterectomy in developed countries.⁷

Postpartum hemorrhage stands as one of the most significant factors affecting maternal mortality and morbidity. Obstetric hysterectomy is implemented either as an emergency procedure or electively for uncontrollable uterine haemorrhage. Most of the studies in the literature addressed risk fac-

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tors and treatment methods for placenta accreta. However, the aim of the present study is to identify the factors that affect blood transfusion requirement as one of the most significant causes of maternal mortality and morbidity in placenta accreta cases, thereby providing a means to reduce the blood transfusion requirements as well as mortality and morbidity rates.

Material and Method

A total of 110 patients who presented to the Outpatient Clinic of Gynaecology and Obstetrics of the Faculty of Medicine of Dicle University and were diagnosed with placental attachment before or during a C-section between January 2006 and June 2015 were included in this study. The patients' data were collected from the hospital's records. The study was performed following the provision of the local ethics committee approval.

Placenta accreta is a general term used to describe the clinical condition when part of the placenta or the entire placenta invades and is inseparable from the uterine wall. When the chorionic villi invade only the myometrium, the condition is called placenta increta. On the other hand, when they invade the myometrium and the serosa and occasionally the adjacent organs such as the bladder, it is called placenta percreta. Patients with placenta percreta that involved the serosa were included in this study. These patients had undergone caesarean hysterectomy due to the indication of placental invasion and been treated with conservative approaches such as suturing of the placental bed, placement of balloon tamponade in the uterus and ligation of the uterine or the hypogastric artery. Pregnancies completing less than 22 weeks were excluded from the study. There were two patients with the placenta left in the uterus by reason of placental invasion who were excluded from the study due to the unavailability of their long-term outcomes. Data on age, parity, gestational week, history of C-section, placental anomalies, volumes of blood transfusion, estimated amount of bleeding, length of stay, history of cystotomy, presence of intra-abdominal infections and coagulopathies (a platelet count of $\leq 100\ 000/\mu\text{L}$, an international normalized ratio of ≥ 1.2 , and/or a fibrinogen level of $\leq 200\text{mg/dL}$), requirement of re-operation and intensive care and incisional forms used during the C-section were obtained from the hospital's records.

The presence of at least one of the following findings, as shown by ultrasound and Doppler imaging (Voluson 730 Expert, 1.8 GHZ probe) (General Electric Healthcare Ultrasound, Austria) in the antenatal period, led to the diagnosis of placenta accreta:

- 1) Lacunas in the placenta; 2) Loss of hypoechoic area in the retroplacental space; 3) Irregularity or hypervascularisation along the line between the bladder and the uterine serosa; and 4) Myometrium behind the placenta with a thickness of less than 1 cm and extreme intraoperative vascularisation between the sub-uterine segment and the bladder.⁸

Clinical practices

According to our usual clinical practice, patients considered to have placental invasion by reason of obstetric history and ultrasound examinations are hospitalised at 34-35 weeks' gestation at the latest. C-section is performed under elective conditions between 35-37 weeks' gestation.⁹ Four units of erythrocyte suspension (ES) and 4 units of fresh frozen plasma (FFP) are retained at the blood centre to be used under emergency conditions. Patients that had been diagnosed with placenta accreta, but demonstrated significant vaginal bleeding before 35 weeks' gestation or were referred to the clinic from other hospitals due to vaginal bleeding are taken into emergency operation. In cases considered to suffer from placental invasion in the pre- or intra-operative stage, the abdomen is often made subject to Phannelstein's incision, and the visceral periton is evaluated specifically in terms of accreta or vascularisation at the level of plica vesicouterina. The uterine entry is preferably performed with a transverse incision opened at least 2 cm to the superior of the placental location. In cases with increased vascularisation indicating percreta in the visceral periton or deep placental invasion, a 18 F foley catheter is attached to the uterus at the cervical area and a preservation surgery applied following the delivery of the fetus. Patients where bleeding cannot be controlled in this manner undergo hysterectomy. The uterine-sparing surgery includes 1) suturing of the point of attachment of the placental bed and 2) bilateral sub-uterine artery ligation along with bilateral utero-ovarian ligament. 3) Bilateral internal iliac artery ligation (approximately 4 cm below the common iliac artery bifurcation) and 4) Retention of the placenta in the uterus (In our records, there are 2 patients who were excluded from the study due to the unavailability of long-term follow-up data).

Statistical Analysis

Statistical Package for the Social Science (SPSS 18) was used for data analyses. Data were presented as mean \pm standard deviation and/or median (minimum-maximum) values. Distribution pattern of the numerical data was assessed by Kolmogorov-Smirnov test. Differences between the two groups were tested by Student's t test for normally distributed data and by Mann-Whitney U test for skewed data. Chi-square test was used for categorical data. Kruskal-Wallis test was performed for the comparison of 2 or more groups. Pearson correlation analysis followed by multiple logistical regression analysis was conducted with the aim of identifying the most important factor affecting blood transfusion requirements. A p values smaller than 0.05 was considered statistically significant.

Results

During the study period, 21674 births were realised and 110 (1/200) of these patients exhibited placenta accreta. Ninety-four of these 110 patients (85.4%) suffered from placenta previa. In addition, 94 of the patients (85.4%) had a history of C-section. Thirty-nine of the patients (35.5%) under-

went hysterectomy and 71 (64.5%) uterine-sparing surgery. Of these 71 patients, 14 (19.7%) were treated with hypogastric artery ligation, 37 (52.2%) primary suturing, 4 (5.6%) devascularisation, and 16 (22.5%) intrauterine balloon tamponade. Furthermore, 86 of the patients (78.2%) received at least one unit of blood whereas 15 patients (13.6%) received 5 or more units. The demographic data are given in Table 1.

The classification of our patients in terms of the number of previous C-sections and status of placenta previa is specified in Table 2a and Table 2b.

Concerning the complications, 22 (20%) patients developed coagulopathy, 10 (9.1%) bladder injuries, and 14 (12.7%) infections. Twelve (10.9%) patients required intensive care (due to coagulopathy in 9 cases, acute renal failure in 2 cases, and intraoperative arrest in one case). One of the

patients requiring intensive care passed away on the 17th day due to DIC and multiple organ failure following intraoperative arrest and massive blood transfusion whereas another patient passed away at the 6th hour postoperatively due to a failure to restore hemodynamics (Table 3). Four (3.6%) patients underwent re-operation because of bleeding after uterine-sparing surgery (2 patients had balloon tamponade placed into the uterus and 2 primary saturation in the uterus). We did not have any patients that exhibited intestinal injuries.

Compared to patients without blood transfusion requirements, patients that received blood transfusion exhibited significantly higher values in age, parity, number of C-sections, length of stay, coagulopathy and abdominal entry with subumbilical median incision ($p=0.003$, 0.004 , 0.024 , 0.000 , 0.005 , and 0.035 , respectively) (Table 4).

Table 1: Evaluation of patients according to demographic data

	Mean±SD	Median (min-max)
Year	32.6±5.6	33 (17-49)
Parity	3.6 ±2.1	3 (0-11)
Gestational week	34.7±3.4	16-40 (35)
The number of cesarean delivery	1.8±1.1	2 (0-4)
Estimated blood loss (mL)	1715±1105	1500 (200-6000)
The number of blood transfusions	2.2±2.2	2 (0-14)
Number of days in hospital stay	5.3±3.4	4 (2-26)

Data were expressed in means ±standard deviations and median (min-max), SD: Standard deviations

Table 2a: Classification of patients in terms of the number of previous caesarean-sections

The number of cesarean delivery	n (%)
0	16 (%14.5)
1	32 (%28.1)
2	28 (%25.5)
3	24 (%21.8)
4	10 (%9.1)

Data were expressed as percent.

Table 2b: Classification of patients in terms of type placenta previa

Placenta previa	n (%)
Not observed	16 (%14.5)
Placenta previa totalis	79 (%71.8)
Placenta previa partialis	7 (% 6.4)
Marginal placenta previa	7 (% 6.4)
Low-line placenta	1 (%0.9)

Table 3: Morbidity and mortality rates in patients with placenta accreta in our clinic

Morbidity and mortality	Total:110 n (%)
Coagulopathy	22 (%20)
Cystotomy	10 (%9.1)
Infection	14 (%12.7)
Intensive care	12 (%10.9)
The number of patients who underwent blood transfusion	86 (%78.2)
The number of patients who underwent 5 units or more blood transfusion	15 (% 13.6)
Subumbilical median incision	14 (%12.7)
Relaparotomy	4 (%3.6)
Mortality	2 (% 1.8)

Data were expressed as percent.

Table 4: Comparison of demographic data of patients provided and not provided with blood transfusions

	Patients who underwent blood transfusion n:86 (% 78.1)	Patients that did not receive a blood transfusion n: 24 (%21.2)	p
Year	33.4±5.9	29.6±4.1	0.003
Parity	3.9±2.1	2.5±1.4	0.004
The number of cesarean delivery	1.9±1.1	1.3±1.2	0.024
Gestational week	34.4±3.6	35.5±1.8	0.426
Number of days in hospital stay	5.8±3.7	3.6±1.2	0.000
Placenta previa	77 (% 89.5)	20 (%83.3)	0.407
Coagulopathy	22 (% 20)	0	0.005
Cystotomy	10 (% 11.6)	0	0.081
Infection	13 (% 15.1)	1 (%4.2)	0.157
Intensive care	12 (%13.9)	0	0.054
Subumbilical midline incision	14 (% 16.3)	0	0.035

Data were expressed in means ±standard deviations. There are used student t test and nonparametric Mann-Whitney U test. Chi-square test was used for categorical variables. P values: P values denoting the outcomes of comparison of patients who underwent blood transfusion and did not receive a blood transfusion. P <0.05 was considered statistically significant.

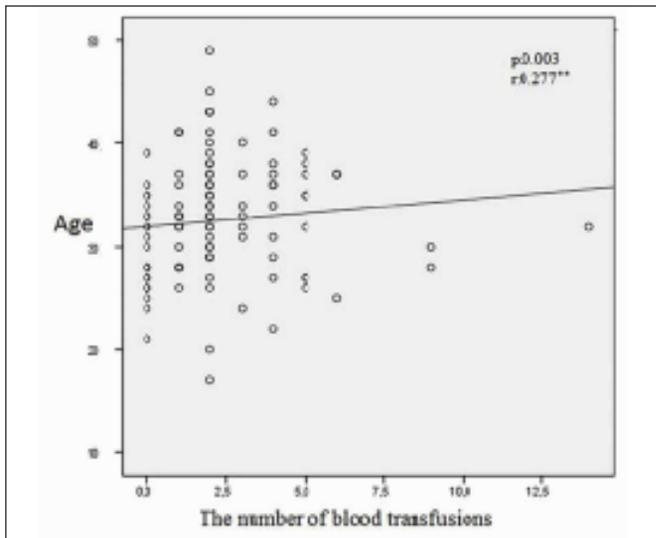


Figure 1a: Analysis results of the positive correlation between blood transfusion and age

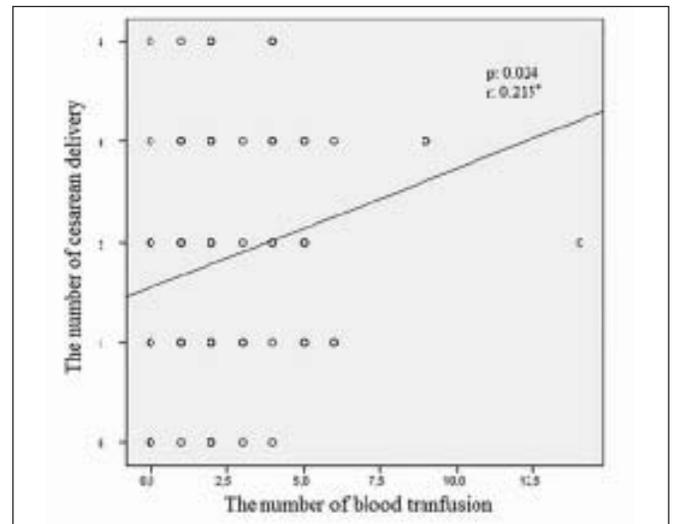


Figure 1c: Analysis results of the positive correlation between blood transfusion and number of caesarean-sections

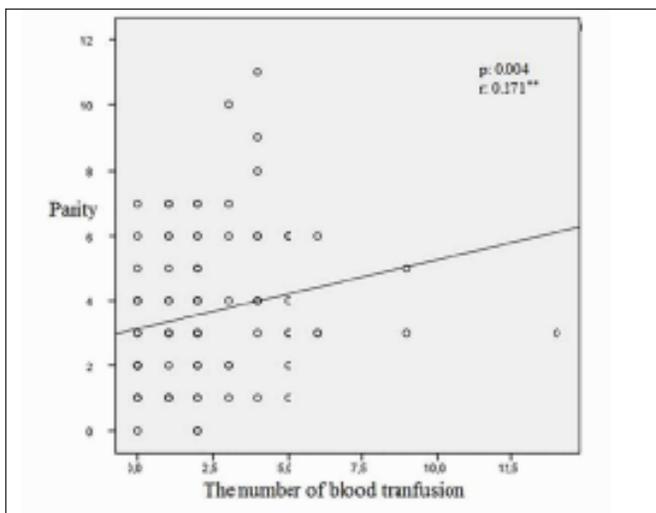


Figure 1b: Analysis results of the positive correlation between blood transfusion and parity

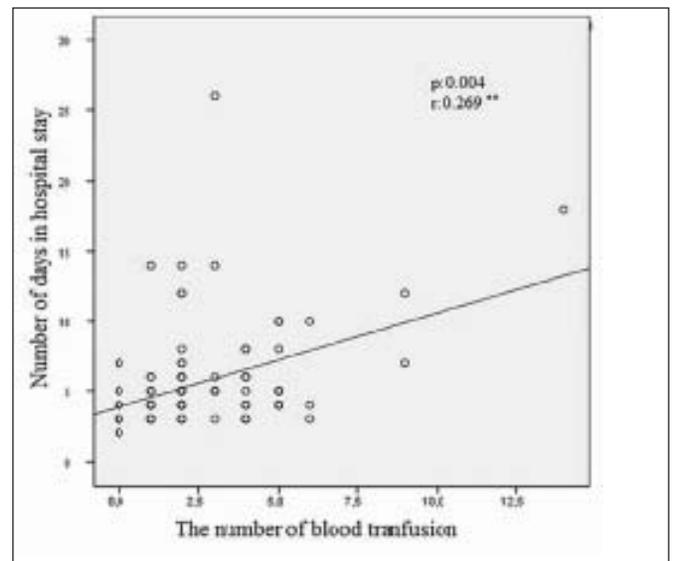


Figure 1d: Analysis results of the positive correlation between blood transfusion and length of stay

The results of the Pearson correlation analysis and multiple logistical regression analysis performed with the aim of identifying the factors affecting the blood transfusion requirements are demonstrated in Figure 1. The blood transfusion requirement increases in direct proportion to age (Figure 1a), parity (Figure 1b), and number of C-sections (Figure 1c) (r values = 0.277**, 0.271**, and 0.215*, respectively). A strong association was established between the blood transfusion requirement and the length of stay (r : 0.269 **, 95% CI OR 2.005(1.213-3.314)) (Figure 1d).

Discussion

The present study; blood transfusion requirement increases in direct proportion to age, parity, and number of C-sections. A strong correlation was established between the blood transfusion requirement and the length of stay.

The incidence of placenta previa increases in direct proportion to advanced maternal age and increased parity.¹⁰ Placenta accreta is observed in approximately 1 in every 2500 births. Whereas a previous placenta accreta study undertaken in our clinic in 2012 identified the incidence to be 1/426, the incidence in our study was 1/200, indicating almost a 2-fold increase.¹¹ The reason behind the higher incidence observed in our study than those specified in the literature stems from the transfer of patients to the clinic, which represents a tertiary hospital, from approximately 11 provinces.

The literature reports the incidence of placenta accreta in placenta previa cases that have not undergone uterine surgery as 5%. This incidence is 24% and 50% in cases with one and two previous C-sections, respectively, and increases to 67% in cases with four or more previous C-sections.¹² One-third of placenta accreta cases exhibit placenta previa and 25% of women have a history of C-section.¹³ Ninety-four (85.4%) of our patients exhibited placenta previa. In addition, 79 of the patients (71.8%) had placenta previa totalis, and 94 of the patients (85.4%) had a history of C-section. The present study established that the blood transfusion requirement increases with the number of previous C-sections in placenta accreta cases. Therefore, placenta accreta cases with a higher number of previous C-sections need to be transferred to and followed up and treated in a fully-equipped hospital with a multidisciplinary approach at the early stages of pregnancy.

Median blood loss is equivalent to 3000-5000 mL in cases with placenta accreta. Ninety percent of placenta accreta cases require blood transfusion, while 40% will need more than 10 units of blood.¹⁴ In the present study, blood loss was at a level of approximately 1500 mL. Four (3.6%) patients received more than 10 units of blood. The reason behind this lower level than those reported in the literature may be the fact that our hospital, a tertiary healthcare centre, is ready for such emergencies 24 hours a day. Our blood bank encounters no issues in supplying blood and blood products. Our operation

theatre keeps 2 units of 0 Rh (-) blood at all times for emergency situations.

The incidence of concurrent bladder invasion in placenta previa was reported in the literature as 1/10000, and the literature suggested that these patients might require a multidisciplinary approach.¹⁵ Twenty-nine percent of the patients with placental invasion demonstrated genitourinary injuries.¹⁶ In our study, 10 patients exhibited bladder injuries as complications. Intraoperative urological consultation was requested for these patients. One patient underwent ureteroureterostomy and bladder reconstruction. Nine patients were only subject to bladder repair. Whereas 94 (85.4%) of our patients had a history of C-section, the bladder injuries observed in this context are at a lower incidence than those reported in the literature. The reason behind this is the fact that our clinic operates with a multidisciplinary approach and preoperative urological consultation is requested for patients indicating a potential for bladder injury and, when needed, ensures that relevant specialists perform the operation together.

The rate of infections among placenta accreta cases that had received conservative treatment was identified to be 18.3% (11/60) in a study undertaken in 2007.¹⁷ In the present study, 4 (12.5%) of 71 patients that had undergone uterus-sparing surgery developed infections. With the inclusion of the group undergoing hysterectomy in the rate of infections, the resulting rate was 14/110 (12.7%) in the present study, which was similar to those reported in the literature.

In cases the placenta accreta, their postoperative infections we encounter; 3 patients with endometritis, wound infection in 9 patients (6 patients with subumbilical median incision, 3 patients with phannelstein's incision) and in 2 patients had over 38.5 degrees fever at the first 24 hours of postoperative period that was analyzed a fever of unknown origin.

The most important factor affecting the prognosis in placental invasion is the specification of the diagnosis in the antepartum period. The early specification of the diagnosis enables the operation to be undertaken by an experienced team of surgeons and anaesthetists under elective conditions.¹⁸ In addition, the completion of preoperative preparations in terms of blood products prevents the development of disseminated intravascular coagulation owing to the rapid transfusion of blood during the operation. In the present study, 12 patients kept in intensive care and 2 deceased patients had been taken into the operation under emergency conditions and transferred to our clinic following a pre-shock status. Therefore, if specialists working at the periphery restore haemodynamics of the patient and start the transfusion of blood and blood products during the transfer, these measures may reduce morbidities.

Early diagnosis is also useful in determining the appropriate form of incision before the operation. With the aim of preserving the placenta and providing a wide space for explo-

ration, most cases are made subject to median incision on the skin or conventional incision or high transverse incision in the uterus.¹⁹ At our clinic, the generally preferred incisions are Phannelstein's incision and conventional or high transverse incision in the uterus. Subumbilical median incision is performed in patients with a history of abdominal operations or C-sections. In the present study, 14 (12.7%) patients were made subject to subumbilical median incision, which indicates a rate much lower than those reported in the literature.

Gözükara et al.²⁰ indicated in a study undertaken in Turkey that the rate of obstetric hysterectomy was 32 (47.8%) among placenta accreta cases. The incidence of hypogastric artery ligation was 40 (59.7%). In a study evaluating internal artery ligation for postpartum haemorrhage, 12 (22.6%) of 53 patients underwent internal iliac artery ligation due to placenta accrete. In the present study, our obstetric hysterectomy and hypogastric artery ligation rates were lower than those specified in the literature with 39 (35.5%) and 14 (19.7%), respectively. The reason behind that is our primarily conservative clinical approach. Our tertiary healthcare centre serves the South-Eastern Anatolian Region. The fertility rate is quite high in the South-Eastern Anatolian Region, and our patients request uterine preservation regardless of their age. Therefore, the clinic adopts a conservative approach in cases where bleeding can be controlled.

Today, surgical management is still debated for patients with placenta accreta who wish to preserve their fertility.²¹ According to our clinical practices, we utilise uterine primary suturing for patients who wish to preserve their fertility unless we believe that invasion is at a deeper level. For patients with a deeper level of invasion who wish to preserve their uterus, we conduct hypogastric artery ligation upon connecting a 18 F foley catheter to the uterus from the cervical area with the aim of stopping bleeding acutely.

In multiparous women who do not have fertility desire, according to the authors, Caesarean hysterectomy without attempt of placental removal should be strongly considered in placenta accreta cases.²² The placement of a balloon catheter is undertaken at the same time as conservative management with the intention of avoiding hysterectomy with a view to preserving fertility.²³ In the present study, caesarean hysterectomy was performed in 39 (35.5%) patients. At the clinic, an interview is held with the patient before any operation in order to inform them of the possibility of hysterectomy and to request their consent on the basis of the depth of invasion, age of the patient and the patient's intention of having more children. In the present study, 16 (22.5%) patients wishing to have their uterus preserved were made subject to the placement of intrauterine balloon tamponade. Two patients that had insistently declared their intention for the preservation of their uterus and had undergone the placement of intrauterine balloon tamponade were taken into hysterectomy upon bleeding

through the balloon. The success rate in postpartum bleeding is around 80%.²⁴ In the present study, the success rate of the balloon tamponade was observed to be 14/16 (87.5%).

Relaparotomy is undertaken in placenta accreta cases at a rate of approximately 3% at multidisciplinary centres. This rate is around 16% in clinics offering standard care.²⁵ Our incidence of relaparotomy was identified to be 4 (3.6%) in placenta accreta cases by reason of the fact that our clinic is a fully-equipped hospital with a blood bank for the preparation of blood and blood products and an intensive care unit.

Fifty percent of placenta accreta cases experience bleeding, while serious postpartum bleeding is observed in 22.6% of the cases. The need for at least 1 unit of blood transfusion was observed to be at a rate of 77 (90.5%) in a study evaluating 85 placenta accreta cases in Turkey in 2013.²⁶ Eighty-six of our patients (78.2%) received at least 1 unit of blood whereas 15 (13.6%) cases received 5 or more units of blood. The rate of blood transfusion at our clinic is lower than those specified in studies performed in Turkey.

Studies reported mortality rates up to 7% with respect to such complications that may be observed in placenta accreta that may accompany placenta previa as intra- or post-operative massive blood loss and ureter damage arising from transfusion, infection, and fistula formation.²⁷ One patient developing DIC and sepsis following massive bleeding and transfusion was reported to have passed away on the 17th postoperative day in a relevant study. One patient with a history of four C-sections was taken into C-section at our clinic by reason of placenta percreta and passed away on the 6th hour postoperatively due to bleeding and unrestored haemodynamics. The mortality rate (1.8%) found in the present study was observed to be much lower than those specified in the literature. The reason for that may stem from the fact that our fully-equipped hospital is able to manage emergency cases with a multidisciplinary approach 24 hours a day.

The present study has a few limitations due to the different physicians undertaking the placenta accreta operations with different surgical bodies of experience. The present study is one of the rare ones in the literature where risk factors for blood transfusions are compared in placental invasion cases.

In conclusion, the rates of mortality and morbidity as well as the incidence of haemorrhage in placenta accreta cases managed at our clinic are lower than those reported in the literature. The reason for that lies in the operation of the hospital as a multidisciplinary healthcare centre. We suggest that follow-up and treatment of older patients, grand multiparous patients and patients with a history of multiple C-sections be carried out at a hospital providing multidisciplinary care and management before the operation and even at the early stages of pregnancy with a view to reducing maternal mortality and morbidity.

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