ORIGINAL ARTICLE

Influence of platelet counts on postpartum hemorrhage in elective cesarean section for Japanese twins

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Aim: We examined the relationship between admission platelet count and postpartum hemorrhage (PPH) in pre-labor near-term cesarean section (CS) for twin pregnancy.

Methods: The total population of women with twin pregnancy who underwent scheduled pre-labor CS at 36–37 weeks of gestation between April 2018 and November 2020 was reviewed.

Results: Seventy-two patients met the conditions of this study. Six of the 72 patients (8.3%) had PPH requiring transfusion. We found no significant influence of preoperative platelet counts on the incidence of PPH ($P = 0.08$).

Conclusion: As the relationship between the preoperative platelet count and PPH has not been clarified, further studies are needed.

Introduction

To date, pre-labor cesarean section (CS) for twin pregnancy depends on physician counseling and maternal request for elective CS to avoid combined vaginal-CS delivery.^{1–3} Postpartum hemorrhage (PPH) is one of the top 5 causes of maternal mortality in developed countries such as Japan.⁴ Current or previous CS of twin pregnancy was reported to be frequently accompanied by substantial blood loss and is a risk factor for PPH.^{5–7} For example, the 90th percentile of the blood loss volume during CS of multiple pregnancy was reported to be 2,300 ml, compared with 1,600 and 1,500 ml for vaginal delivery of multiple pregnancy and CS of singleton pregnancy, respectively.⁷ Massive bleeding increases maternal morbidity and mortality; however, the difficulty in estimating blood loss remains a problems in postpartum care of CS for twin pregnancy.¹

Numerous maternal and peripartum factors have been suggested to be associated with PPH in twin pregnancy.^{1,8,9} For example, in twin delivery, overdistention of the uterus may weaken contraction and retraction of the uterine muscles, leading to uterine atony and increasing the risk of substantial blood loss.⁸ Recently, an admission

platelet count $< 100,000/\mu\text{l}$ was identified as one of the risk factors for PPH in twin pregnancy.⁹

Therefore, we hypothesized that preoperative measurement of platelet counts is clinically useful for predicting the incidence of PPH in CS for twins. As optimization of maternal hematological parameters may reduce the risk of postpartum hemorrhage, we examined the relationship between the admission platelet count and PPH in pre-labor CS for twin pregnancy.

Materials and methods

The protocol for this study was approved by the ethics committee of the Japanese Red Cross Katsushika Maternity Hospital.

The total population of women with twin pregnancy who underwent scheduled pre-labor CS at 36–37 weeks of gestation at Japanese Red Cross Katsushika Maternity Hospital between April 2018 and November 2020 was reviewed. Cases of intrauterine demise of one fetus, patients with obstetric complications associated with PPH, such as hypertensive disorders, placenta previa, and suspected feto-placental circulation imbalance between the twins, were excluded from the analysis.

Table 1. Characteristics and obstetric outcomes of scheduled cesarean section for twins with and without postpartum hemorrhage requiring transfusion

	Postpartum hemorrhage requiring transfusion		
	Yes	No	P-value
Total number	6	66	
Maternal age (years)	32.8 ± 4.3	33.1 ± 4.3	0.73
Nulliparity	2 (33.3%)	29 (43.0%)	0.23
Monochorionic twin pregnancy	1 (16.7%)	18 (27.3%)	0.57
Maternal height (cm)	158 ± 5	157 ± 6	0.71
Maternal weight at pre-pregnancy (kg)	51.7 ± 5.7	54.1 ± 8.4	0.68
BMI at pre-pregnancy	20.8 ± 1.8	21.9 ± 3.3	0.39
Maternal weight at delivery (kg)	65.6 ± 7.2	69 ± 9.2	0.51
BMI at delivery	26.4 ± 2.8	27.9 ± 3.6	0.37
History of previous CS	1 (16.7%)	8 (12.1%)	0.44
Combined neonatal birth weight (g)	4,945 ± 460	4,916 ± 406	0.86
Blood test results on the day of CS			
Hemoglobin (g/dl)	10.0 ± 0.96	10.5 ± 0.95	0.34
Platelet count (10 ⁴ /μl)	14.8 ± 3.6	18.15 ± 4.6	0.083
Blood test results 2–4 weeks before CS			
Fibrinogen (mg/dl)	400 ± 88	468 ± 73	0.12
Anti-thrombin III (%)	90 ± 11	95 ± 11	0.25

Data are presented as the number or mean ± SD.
CS, cesarean section.

At our institute, elective CS is usually scheduled at 37 weeks of gestation at the patient's request. In rare cases, it was scheduled at 36 weeks due to social circumstances. If the hemoglobin level is less than 10.5 g/dl in the preoperative examination, chalybeate is prescribed. In all cases, hemoglobin and platelets were re-measured on the morning of CS. All CS for twins was performed under spinal anesthesia. Transfusion was started when the total blood loss volume was greater than 2,300 ml with continuous bleeding or/and the shock index (SI=heart rate/systolic blood pressure) was greater than 1.0 because a blood loss volume of 2,300 ml is the 90th percentile of bleeding during CS in twin pregnancy according to the Perinatal Committee of the Japan Society of Obstetrics and Gynecology.⁷⁾ In addition, in cases of continuous non-coagulated blood, transfusion is started even if the amount of blood loss is less than 2,300 ml.

We do not handle autologous blood transfusions at our institute. If transfusion is needed, allogeneic blood transfusion is required.

Demographic information and characteristics of labor were extracted from the medical records available for review. Potential factors associated with PPH were as follows: maternal age, parity, height, weight at pre-pregnancy and delivery, chorionicity, total neonatal weight of twins, hemoglobin and platelet counts on the CS day, and fibrinogen and anti-thrombin activities levels 2–4 weeks before CS. In this study, we compared these valuables between women with and without PPH

requiring transfusion.

Data are presented as the mean ± SD or number (%). Patients and controls were compared by Wilcoxon's test regarding categorical variables. Differences with $P < 0.05$ were considered significant.

Results

During the study period, the total number of twin deliveries beyond 22 weeks of gestation was 151. Of these, 75 (51.7%) met the conditions of this study. Of these, 3 were excluded from the study because of the inaccurate measurement of blood loss volume due to the difficulty in distinguishing the amount of amniotic fluid. Six (8.3%) of the remaining 72 patients had PPH requiring transfusion.

The maternal characteristics and obstetric outcomes in cases with and without PPH requiring transfusion are shown in Table 1. There were no significant differences in these valuables including the background factors between the 2 groups.

There was a significant difference in the average volume of blood loss during CS between the 2 groups with and without PPH requiring transfusion ($2,297 \pm 409$ vs. $1,430 \pm 478$ ml, $P < 0.01$). In the PPH group, the average volume of blood loss at the decision of transfusion was $2,889 \pm 602$ ml. In this study, we did not perform multivariate analysis because of the small sample size.

The number of patients with thrombocytopenia (platelet counts of $<150,000/\mu\text{l}$) was 20 (27.8%), including 1 (1.4%) whose platelet count was $<100,000/\mu\text{l}$.

Discussion

The current retrospective study mainly examined the relationship between platelet counts and PPH requiring transfusion in CS for twins at our institute. In this study, no significant influence of platelet counts on the incidence of PPH in CS for twins was noted.

Recently, Blitz et al.⁹⁾ examined the maternal risks for PPH in twin delivery. The rate of CS, maternal hematologic parameters (admission platelet count $\leq 100,000/\mu\text{l}$), and chronic medical conditions were associated with the incidence of PPH in twin pregnancy. However, in this study, the influence of platelet count on PPH was not significant ($P=0.08$). The number of patients examined in this study may have been insufficient to detect a significant difference if a weaker risk factor is associated with PPH requiring transfusion.

Reasons other than a small sample size leading to the current results should be discussed. First, Blitz et al.⁹⁾ hypothesized that the maternal hematological parameters affect the incidence of PPH associated with the potential preeclampsia/HELLP (hemolytic anemia, high liver enzymes, and low platelet count) syndrome and magnesium use, which were identified as risk factors for PPH in twin pregnancy in our previous studies.^{10,11)} However, in this study, we excluded patients with hypertensive disorders, including preeclampsia/HELLP. Second, in this study, the prevalence of pre-labor thrombocytopenia (platelet count of $<150,000/\mu\text{l}$) was 27.8%, which was higher than that in previous studies.^{12–14)} Previous studies on platelet count variation during pregnancy revealed that the lowest platelet level is pre-partum, and the prevalence of thrombocytopenia in pre-partum is between 4.4 and 15%.^{12–14)} In addition, the safe threshold for the platelet count in uncomplicated pregnancy for preventing PPH was suggested to be between $100,000/\mu\text{l}$ and $115,000/\mu\text{l}$.¹²⁾ In this study, we have limited the population to twin pregnancy, which is different from the previous studies on singleton pregnancy.^{12–14)} Furthermore, at our institute, only 47.6% of twin pregnancies were delivered by scheduled CS at at least 36 weeks of gestation, including one patient with a platelet count of $<100,000/\mu\text{l}$. Most patients with twin pregnancy with platelet counts $<100,000/\mu\text{l}$ may have underwent unscheduled CS by 36 weeks of gestation due to obstetric complications such as hypertensive disorders. Therefore, the same analysis of the factors associated with platelets may have produced different results using subjects with different characteristics from those in previous studies.^{12–14)}

The incidence of required transfusion of 8.3% at our institute is considered high. CS for twins is recognized as a risk factor for serious PPH.^{9,15–17)} Even if the risk is known, the rate of CS will not decrease in Japan^{17,18)} and it may be markedly difficult to avoid the risk of PPH due to CS for twins.

We understand that the sample size of the current study is too small to perform multivariate analysis as a serious limitation; however, this study was not able to clarify the relationship between the preoperative platelet count and PPH; therefore, a large study is needed in the future.

Disclosure of competing interests

The authors declare that they have no competing interests.

Ethical approval

The protocol for this study was approved by the ethics committee of the Japanese Red Cross Katsushika Maternity Hospital.

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The authors received no funding for this study.

Authors' contributions

All authors significantly participated in the study and made substantial contributions. YS and SS conceived the original idea and designed the study protocol. YS wrote the initial paper draft, and with MM, ZH, and SS, engaged in the analysis and interpretation of the data. All authors took part in revising the text and critically analyzing the content. All authors approved the final manuscript.

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