Postoperative care in the caesarean intensive care unit: experience from a tertiary maternity hospital

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Abstract

Objective: The aim was to determine whether follow-up in the intensive care unit (ICU) for the postoperative first eight hours was beneficial for early intervention in postpartum hemorrhage.

Material and Methods: In our hospital, all patients are admitted to the ICU for the first eight hours after cesarean section. Patients with postpartum hemorrhage after cesarean delivery who received medical and/or surgical treatment between 2016 and 2020 were reviewed in the presented study retrospectively.

Results: All cases (n=36,396) who underwent cesarean delivery were reviewed. Three hundred and fifty-nine patients with postpartum hemorrhage were identified and included. In the study group the time between cesarean section and diagnosis of postpartum hemorrhage was 10.1±19.1 hours, and the time between cesarean section and re-laparotomy was 9.26±23.1 hours. A total of three maternal deaths occurred after cesarean section in our hospital. In the last five years, the mortality rate in patients delivering by cesarean section was 3.9 per 100,000. The incidence of postpartum hemorrhage in cesarean deliveries at our hospital was calculated to be 1.0%, and the rate of obstetric near-miss events was calculated to be 0.6 per 1000 live births.

Conclusion: Follow-up of patients in the ICU in the first eight postoperative hours after cesarean section may result in a lower number of re-laparotomies due to postpartum hemorrhage, a shortened interval between cesarean section and re-laparotomy, and a lower maternal mortality rate. (J Turk Ger Gynecol Assoc 2023; 24: 42-7)

Keywords: Cesarean section, maternal mortality, postpartum hemorrhage, re-laparotomy

Received: 30 September, 2021 **Accepted:** 09 March, 2022

Introduction

Maternal mortality rate is one of the most important health and development indicators of a country and postpartum hemorrhage (PPH) is the most common cause of maternal mortality (1). The maternal mortality rate in our country was reported to be 13.1 per 100,000 live births (2). Approximately 50% of maternal mortality is caused by PPH, which occurs within 24 hours after delivery. Therefore, close monitoring of the patient in the first eight hours after delivery is essential (3). In 2017, the American College of Obstetricians and Gynecologists changed its definition of PPH from the classic definition described above to a cumulative blood loss ≥1000 mL or hemorrhage associated with signs/symptoms of hypovolemia within 24 hours of delivery, regardless of route of delivery (4).

The rate of cesarean deliveries has increased worldwide. Considering that postpartum complications are more common in cesarean deliveries than in vaginal deliveries, it is inevitable that postpartum complications will also increase accordingly (5). Among these complications, uterine atony, the inability of the uterine muscles to contract after delivery, is the most

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Journal of the Turkish-German Gynecological Association published by Galenos Publishing House.
DOI: 10.4274/jtgga.galenos.2022.2021-9-27

critical complication leading to maternal mortality. About 80% of PPH is caused by uterine atony. Many organizations have published guidelines for the prevention or prompt diagnosis of PPH, especially uterine atony (4,6). The incidence of uterine atony after cesarean section was 6% in a large cohort study (7). In the present study, the aim was to investigate whether the follow-up of patients in the intensive care unit (ICU) after cesarean section (cesarean ICU) leads to early detection or prevention of postoperative complications. Our research question was, "do postpartum complications differ in frequency in patients followed up in ICU after cesarean section compared with the literature?"

Material and Methods

This study was a retrospective, single-center, hospital-based study. The University of Health Sciences Turkey, Etlik Zübeyde Hanım Women's Health Training and Research Hospital Institutional Review Board approved the study (approval number: 02, date: 10/02/2021). From January 1, 2016, to December 31, 2020, patients who underwent a medical or surgical procedure in the first 24 hours after cesarean delivery were identified. In these patients, the interval between the diagnosis of PPH and the time to re-laparotomy were determined. The amount of red blood cell suspensions or other blood products transfused to the patients was obtained from the medical records, and these results were compared with the literature. Patients who were anemic before cesarean section and had received preoperative or intraoperative blood transfusions were not included. Although previous studies have included cases of uterine atony detected intraoperatively, we excluded intraoperative atony in the present study. Therefore, only those patients who developed PPH during follow-up in the cesarean ICU were eligible for the study.

Since the establishment of our hospital 30 years ago, all postpartum patients were observed in the post-cesarean ICU during the first eight hours. Fever, pulse, and blood pressure were measured every 15 minutes for the first two hours, every 30 minutes for the second two hours, and every 60 minutes for the last four hours. In the ICU, each patient could be attended by four nurses and a senior obstetrician. Complete blood count was obtained at the second and sixth hour postoperatively in the ICU, and uterine tone examination and vaginal bleeding control were performed every 15 minutes (8). The diagnosis of PPH was made when the amount of bleeding exceeded 1000 mL in cesarean deliveries; the diagnosis was supported by a deterioration in vital signs and a drop in hemoglobin levels. Since risk factors, such as the patient's age, the presence of concomitant diseases, or bleeding disorders, increase PPH, the attending nurse cares more intensively for these patients.

All patients received 20 international unit (IU) of oxytocin (Synpitan fort®, Deva Ilac, İstanbul, Turkey). Ten IU was administered intraoperatively, with the remainder administered over the eight hours in the ICU following CS. After completion of the first eight hours, women with an uneventful postpartum course were transferred to the normal patient room. If patients have PPH, additional oxytocin [up to 40 IU, intravenous (IV)], methyl ergonovine (Metiler®, Adeka, Samsun, Turkey, 0.2 mg, intramuscular), misoprostol (Cytotec®, Pfizer, Germany, 600-800 μg, peroral, rectal or sublingual), tranexamic acid (Transamin®, Daiichi Sankyo, Japan, 100 mL, IV) were administered in the cesarean ICU. In patients with PPH who did not respond to drug treatment, bimanual uterine compression and/or uterine balloon tamponades were performed as a secondary line of treatment or as a bridge to a second surgical procedure in case of uterine atony. The following data were extracted from the hospital database and medical records: age; parity; number of abortions; concomitant diseases; and risk factors for PPH. Data used for analysis also included type and amount of supplemental uterotonics, amount of blood transfusion and type of blood products transfused, interval between cesarean section and re-laparotomy, and surgical technique used during re-laparotomy. Neonatal data included gestational age at birth, birth weight, and neonatal Apgar scores. Our hospital's protocols used previously published criteria to define Intrauterine Growth Restriction (9). Preeclampsia was defined as sustained blood pressure above 140/90 mmHg in association with proteinuria, maternal signs, symptoms, or laboratory findings (10). Premature preterm rupture of membranes (PPROM) was defined as fetal rupture of membranes before labor at less than 37 gestational weeks. Placental abruption was defined as the detachment of the placenta from the implantation site before delivery. The total number of births during the study period was also obtained from the hospital database.

Statistical analysis

Statistical Package for Social Sciences software for Windows, version 23.0, was used for statistical analysis (IBM Inc., Armonk, NY, USA). Descriptive statistics used in the present study included mean, standard deviation, median, minimum and maximum, frequency, and percentages.

Results

During the study period, a total of 77,157 births were recorded in our hospital. Of these, 769 were stillbirths, 36,196 deliveries were by cesarean section, and 6,554 were considered high-risk pregnancies. The remaining 29,642 deliveries by cesarean section were low-risk pregnancies. Over a five-year period, a

total of three maternal deaths occurred after cesarean section at our hospital. The mortality rate after cesarean delivery was 3.9 per 100,000 live births during the study period. The incidence of PPH was calculated to be 1.0% (359 cases in 36,196 cesarean deliveries). The causes of maternal death after cesarean delivery were massive PPH in two patients and disseminated intravascular coagulation (DIC) in one patient.

Amongst the 36,196 cesarean deliveries, 359 patients received additional medical and/or surgical treatment for PPH. The mean age of the patients was 28 years, the mean parity was 1, and 12 patients (3.4%) required transfusion because of prepartum anemia. Of these patients, 157 had a previous cesarean section. The other indications for cesarean delivery are listed in Table 1. The gestational age at delivery in these patients was 36.9±3.2 weeks, while 54 women (15%) delivered between 34-37 weeks, and 45 (12.5%) women delivered before 34 weeks. There were 104 pregnant women classified as high-risk pregnancies. There were 33 twin pregnancies (9.2%). PPROM was diagnosed in 14 pregnant women (3.9%), preeclampsia in 21 pregnant women (5.9%), and 15 pregnancies ended in stillbirth (4.1%) (Table 2). In this cohort 21 women (5.9%) had neonates >4000 g, and 45 women (12.3%) had neonates <2500 g. The median 1-minute and 5-minute Apgar scores were 9 and 10, respectively, and 59 infants (16.4%) were admitted to the neonatal ICU (Table 2).

A total of 37 patients (10.3%) received supplemental oxytocin alone to treat postpartum hemorrhage, and 322 patients (89.7%) received combined medical therapy (oxytocin +/- misoprostol +/- methylergonovine) to treat postpartum hemorrhage, while 150 patients (41.7%) received tranexamic acid. Bakri balloon tamponade was performed in 23 patients (6.4%), and 265 patients (73.8%) received transfusion of blood and blood products. Across the whole cohort requirement for blood and blood product transfusion after cesarean section was 0.7% (265/36196*100). The surgical approach for postpartum hemorrhage after re-laparotomy was uterine artery ligation in seven patients (1.9%) and B-Lynch compression suture in 11 patients (3%). Hysterectomy was required in seven patients (1.9%). Our hysterectomy rate after cesarean section was 0.02% (7/36196*100).

The diagnosis of PPH was made 10.1±19.1 hours after the first operation. In cases in which surgical intervention was performed, the mean interval between re-laparotomy and the first operation was 9.26±23.1 hours. Two patients (0.6%) developed DIC, three patients (0.8%) posterior reversible encephalopathy syndrome, and two patients (0.6%) developed eclampsia during follow-up. There was a single case of acute fatty liver (0.3%) and venous thromboembolism (0.3%). Near-miss was noted in 53 patients, and 11 patients (3.1%) required anesthesia ICU. The rate of near miss was 0.6 per 1000 live births (Table 3).

Table 1. Characteristics of patients

	Study population, (n=359)
Age*	28 (16-45)
Gravida*	2 (1-9)
Parity*	1 (0-7)
Abortion*	0 (0-5)
Pre-partum transfusion	12 (3.4%)
Indications for caesarean	
Placenta previa	6 (1.7%)
Fetal distress	61 (17%)
Labor arrest	61 (17%)
Ablatio placenta	17 (4.7%)
Severe preeclampsia	11 (3.1%)
Macrosomic fetus	16 (4.5%)
Previous caesarean	157 (43.7%)
Non-vertex presentation	24 (6.7%)
Umbilical cord prolapsus	6 (1.7%)

*Data are given as median (minimum-maximum) or n (%)

Table 2. Obstetric and neonatal outcomes

	Study population, (n=359)
Gestational age	
Mean (± standard deviation)	36.9±3.2
34-37 weeks, n (%)	54 (15%)
<34 weeks, n (%)	45 (12.5%)
>37 weeks, n (%)	260 (72.4%)
High-risk pregnancies	
Twin pregnancy	33 (9.2%)
Preeclampsia	21 (5.9%)
Placenta previa	6 (1.7%)
PPROM	14 (3.9%)
IUGR	15 (4.1%)
Stillbirth	15 (4.1%)
Neonatal birth weight, grams	
Mean (± standard deviation)	(3064±727)
>4000	21 (5.9%)
<2500	45 (12.3%)
Neonatal Apgar scores	
1 minute*	9 (0-9)
5 minute*	10 (0-10)
NICU admission	59 (16.4%)

*Data are given as median (minimum-maximum) or n, %. PPROM: Premature preterm rupture of membranes, IUGR: Intrauterine Growth Restriction, NICU: Neonatal intensive care unit

Table 3. Treatment for postpartum bleeding

	Study population, (n=359)
Uterotonics	
Additional oxytocin	37 (10.3%)
Combined (oxytocin ± misoprostol ± methylergonovine)	322 (89.7%)
Tranexamic acid use	150 (41.7%)
Bakri balloon tamponade	23 (6.4%)
Blood and blood product transfusion	265 (73.8%)
Re-laparatomy	11 (3.1%)
Surgical procedures performed during re-laparatomy	
Uterine artery ligation	7 (1.9%)
Hysterectomy	7 (1.9%)
B-Lynch	11 (3%)
The interval between diagnosis and primary operation time, hours*	10.1±19.1
The interval between re-laparotomy and primary operation time, hours*	9.26±23.1
Postpartum complications	
DIC	2 (0.6%)
Eclampsia	2 (0.6%)
Acute fatty liver	1 (0.3%)
Venous thromboembolism	1 (0.3%)
PRES	3 (0.8%)
Near miss events	53 (14%)
Need for anesthesia intensive care unit	11 (3.1%)

*Data are given as mean ± standard deviation or n (%). DIC: Disseminated intravascular coagulation, PRES: Posterior reversible encephalopathy syndrome

Discussion

The present study showed that follow-up in the cesarean ICU is beneficial in early intervention of postpartum complications after cesarean section. The incidence of PPH after cesarean delivery in our series was 1.0%, which was lower than the previously published incidence of between 4-6%. We believe this is due in part to the immediate care provided in the first eight hours. Although 73.8% of these patients required transfusion of blood and blood products, the need for re-laparotomy was low compared with the literature.

In terms of health economics, monitoring patients in the cesarean ICU is less costly than direct room care because four nurses and one physician are sufficient to provide adequate care. However, it is more costly than direct room transfer because of staffing, medical equipment, devices, ventilators, electricity costs, etc.

PPH is the leading and preventable cause of maternal morbidity and mortality worldwide (6,11,12). Early diagnosis, prompt intervention for hemorrhage, and appropriate treatment play a key role in preventing maternal mortality (13,14). In addition to publications reporting an incidence of 4-6% PPH (12), there are publications indicating an incidence of massive hemorrhage of approximately 5-15% (15). However, the 5-year incidence of postpartum hemorrhage after cesarean section in our hospital is lower than the previously reported world average. This low incidence may be due to the exclusion of intraoperative atony cases and vaginal deliveries with a lower threshold for PPH.

Our results show that intensive care after cesarean section appears to result in a lower incidence and earlier diagnosis of PPH. Kalisa et al. (16) reported a blood transfusion rate of 32.5% versus a re-laparotomy rate of 21.4% and a maternal mortality rate of 13.1% (13). In our study, the transfusion rate was 73.8%, but the re-laparotomy rate was 3.1%, and the mortality rate after cesarean section was 3.9%. Although the transfusion requirement was higher, the need for repeat laparotomy and the low maternal mortality rate suggest that close monitoring and early treatment are effective; it may also be suggested that the rate of surgical intervention can be reduced by early diagnosis of PPH. We hypothesize that early diagnosis will increase the response to medical treatment and thus reduce the number of surgical procedures.

Although many prenatal and intrapartum risk factors have been identified that increase the risk of PPH, there is no identifiable risk factor for most cases (16). Consistent with the literature, conditions that are considered risk factors for hemorrhage, such as multiple pregnancies, macrosomia, preterm labor, and placenta previa, were common in our series.

In the literature, the need for blood transfusion after cesarean section is reported to be 1-7% (17). Although in our setting the need for blood and blood product transfusion after cesarean section was 0.7%, this rate was lower than that reported in the literature. However, 73.8% of these patients with PPH had blood and blood product transfusion. These results suggest that transfusion after cesarean section was lower than reported in the literature because the ICU allows patients to be diagnosed early and receive early medical intervention. Nevertheless, we are more aggressive with blood transfusions in patients who are diagnosed with PPH.

A study by Holleboom et al. (18) found that after cesarean section, 7.2% of patients required supplemental oxytocin. In our study, although the need for additional oxytocin was 10.3%, 89.7% of patients with PPH were controlled with combined uterotonics without further intervention or treatment. We used a combination of these drugs by treating the patient individually during PPH. The need for additional medical treatment is higher than suggested in the literature, possibly because of early PPH diagnosis and rapid treatment in the cesarean ICU.

Uterine balloon tamponades can temporarily control the bleeding until appropriate management is achieved (16,19). According to a meta-analysis, the rate of use of the Bakri™ balloon was 0.20%, and two-thirds (67%) of insertions occurred after cesarean delivery (20). In our study, the rate of copper balloon use in patients with PPH after cesarean delivery was 6.4%, but lower than previously published data. Uterine artery ligation is a procedure that is now out of favor for the treatment of PPH (21). It was observed that the effect was not feasible when the cervicovaginal and uteroovarian branches were not ligated. In our study, the incidence of uterine artery ligation was 1.9%. Although it is easy to apply, it is less preferred in re-laparotomy because it is only an anesthetic.

Joseph et al. (21) found that the rate of hysterectomies associated with PPH was 73%, but it was not stated whether peripartum hysterectomies were included. In our study, the rate of hysterectomies related to PPH was 1.9%. According to another study, the rate of postpartum hysterectomy was 0.38%, excluding peripartum hysterectomies (22), and our rate of hysterectomy after cesarean section was 0.02%, which is far lower than the literature. The low rate of our hysterectomy is probably due to the early diagnosis of patients in the cesarean ICU and the fact that peripartum hysterectomies were not included in the statistics.

Levin et al. (23) and Akkurt et al. (24) found that the time between cesarean section and re-laparotomy was (25.2±35.6 hours and 15.7±3.2) hours, respectively. The time between cesarean section and relaparotomy was less in our series compared to the delay reported in the literature, but cesarean intensive care does not prevent the need for relaparotomy. In addition, the time in the ICU was prolonged in patients who may need re-laparotomy, and their follow-up was continued in this unit until they were taken to the operating room. The incidence of re-laparotomy after cesarean section has been reported in the literature to be 0.2%, 0.5%, and 0.7% (25-28). In our study, the incidence of re-laparotomy after cesarean section was 0.03% among 36,196 cesarean deliveries. This low rate may be due to the fact that patients were in the ICU for the first eight hours after cesarean section. The number of patients who required repeat laparotomy may be low because we intervened early and had a high blood transfusion rate. The fact that intraoperative bleeding was not considered in this study and the definition of postpartum hemorrhage was >1000 mL also resulted in these data being lower than those reported in the literature.

A systematic review reported that PPH rates and associated mortality are higher in low- and middle-income countries. The rate of postpartum near-miss was 2.1 per 1000 live births. Our near-miss rate of 0.6 per 1000 live births after cesarean section was significantly lower than the literature (29). We believe that this lower rate is due to being able to diagnose and treat early as a result of the close monitoring in the ICU after cesarean section.

Study Limitations

Our study has some limitations. First of all, we do not have a control group because all patients were admitted to the ICU after cesarean section according to the protocol of our hospital. Not including cases with intraoperative atony may have resulted in a falsely low incidence of PPH. Future prospective randomized studies, including a control group, are needed to support our findings. Retrospective design and incomplete data were the other limitations.

Conclusion

Compared with published data, the advantage of cesarean section intensive care may be earlier detection of PPH, resulting in less blood loss and lower maternal mortality rate after cesarean section. Cesarean section intensive care may also be associated with a decrease in near-miss events.

Ethics Committee Approval: *The University of Health Sciences Turkey, Etlik Zübeyde Hanım Women's Health Training and Research Hospital Institutional Review Board approved the study (approval number: 02, date: 10/02/2021).*

Informed Consent: *Retrospective study.*

Peer-review: *Externally peer-reviewed.*

Author Contributions: *Surgical and Medical Practices: S.Y.E., D.İ., A.A., M.C.İ., B.T.Ç., T.K., S.E., C.T.İ., Ş.Ç., A.T.Ç., Y.E.Ü.; Concept: S.Y.E., D.İ., A.A., M.C.İ., B.T.Ç., T.K., S.E., C.T.İ., Ş.Ç., A.T.Ç., Y.E.Ü.; Design: S.Y.E., D.İ., A.A., M.C.İ., B.T.Ç., T.K., S.E., C.T.İ., Ş.Ç., A.T.Ç., Y.E.Ü.; Data Collection or Processing: S.Y.E., D.İ., A.A., M.C.İ., B.T.Ç., T.K., S.E., C.T.İ., Ş.Ç., A.T.Ç., Y.E.Ü.; Analysis or Interpretation: S.Y.E., D.İ., A.A., M.C.İ., B.T.Ç., T.K., S.E., C.T.İ., Ş.Ç., A.T.Ç., Y.E.Ü.; Literature Search: S.Y.E., D.İ., A.A., M.C.İ., B.T.Ç., T.K., S.E., C.T.İ., Ş.Ç., A.T.Ç., Y.E.Ü.; Writing: S.Y.E., D.İ., A.A., M.C.İ., B.T.Ç., T.K., S.E., C.T.İ., Ş.Ç., A.T.Ç., Y.E.Ü.*

Conflict of Interest: *No conflict of interest is declared by the authors.*

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

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