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Research Article

The Effect of Anesthesia Type on Hemodynamics and Bleeding in Pregnant Women with Anemia

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ABSTRACT

The aim of our study is to investigate and compare the effects of spinal and general anesthesia on maternal blood loss and hemodynamic data during cesarean section in pregnant women with anemia. 100 Patients with anemia who underwent cesarean section in our clinic were included. Age, gravida, body weight, gestational age, hemodynamic data, fibrinogen levels, hemoglobin levels at preoperative and postoperative 6th hour were recorded. There was no statistically significant difference between preoperative hemoglobin and postoperative hemoglobin values and the amount of bleeding ($p>0.05$). A statistically significant difference was found in the comparison of intraoperative 5th and 15th minute and postoperative diastolic blood pressures ($p<0.05$), and it was observed that the values of the spinal anesthesia group were lower. We found that the type of anesthesia did not affect the amount of perioperative and postoperative bleeding. The most common cause of maternal mortality is postpartum hemorrhage. Anemia should be corrected in the prenatal period to minimize the effect of postpartum hemorrhage. The most important factors in the choice of anesthesia method are the systemic problems and desire of the pregnant woman, the urgency of the operation, the preference of the surgeon and the experience of the anesthesiologist.

Key words: Nulla, dolor, velit, fermentum, sed

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INTRODUCTION

According to the World Health Organization (WHO) in 2001, anemia in pregnancy was defined as a hemoglobin value below 11 g/dL for all three trimesters. This definition is still valid today (WHO, 2001). Anemia causes an increase in maternal mortality with the effect of postpartum bleeding and infection, especially in low-income countries. Even a moderate bleeding in a pregnant woman with anemia may be fatal for the mother. According to WHO, anemia is directly or indirectly involved in 40% of maternal deaths (Brabin et al., 2001, Khan et al. 2006).

General anesthesia technique has been used in cesarean section operations for many years, but today, spinal anesthesia has become the method preferred by both the patient and the anesthesiologist (Lewis and Drife, 2004, Hughes et al., 2002). Both anesthesia techniques have advantages and disadvantages.

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Postpartum hemorrhage remains an important cause of maternal morbidity and mortality worldwide. The choice of anesthesia for cesarean section in placenta previa and abruption of placenta, which are causes of antepartum bleeding, requires caution. General anesthesia is generally recommended for vaginal bleeding of more than 1500 mL, a decrease in hemoglobin of more than 4 g/dL, and massive bleeding that carries a high risk for the patient requiring acute blood transfusion of more than 4 units (Tsen, 2009, Avery, 2007). The aim of anesthesia for cesarean delivery is to ensure delivery with minimal risk to mother and baby, and therefore it is important to compare fetal and maternal outcomes associated with different anesthesia techniques (NIH, 2008).

The aim of this retrospective study was to investigate and compare the effects of spinal and general anesthesia on maternal blood loss and hemodynamic data in pregnant women with anemia.

MATERIAL AND METHODS

After ethics committee approval was obtained from the ethics committee of Taksim Training and Research Hospital, the files of patients with anemia and cesarean section were retrospectively reviewed. Data were collected from the files of patients and hospital information management system. A total of 100 patients who met the criteria, had anemia, underwent elective cesarean section with spinal anesthesia (Group SA, n= 50) and general anesthesia (Group GA, n= 50), ASA II, and hemoglobin value below 11g/dL were included in the study. Pregnant women under 18 years of age, fetal deformities, malpresentation, emergency cesarean section, uterine fibroids, twin pregnancy and fetal distress were excluded. The ages (years), gravida, parity, body weights (kg), gestational weeks, indications for cesarean section, hemodynamic data, fibrinogen levels, preoperative and postoperative 6th hour hemoglobin/hematocrit (Hg/Hct) levels were recorded from the files of patients. In our clinic, cesarean section was performed in all cases in the same procedure through a pfannenstiel incision. General anesthesia is administered to the GA group with 2 mg/kg propofol and 0.6-0.8 mg/kg rocuronium. Intraoperative anesthesia is maintained with 1.5 lt/min air, 1.5 lt/min oxygen and 1-1.5 sevoflurane. In the SA group, 10-12 mg of 0.5% bupivacaine is administered into the subarachnoid space with a 26 G spinal needle in the sitting position to block anesthesia of the T4-T6 dermatomes. Ephedrine or atropine is injected in patients who develop hypotension or bradycardia after spinal anesthesia. Both groups routinely receive 20 units of oxytocin infusion in 1000 mL of fluid and 3000 mL of intravenous fluid for 24 hours after delivery.

Determining the amount of bleeding during labor is one of the major problems in obstetric practice. In this study, the amount of blood loss was determined according to both the decrease in hemoglobin/hematocrit value and the following formula defined by Shook et al. (9). Amount of Bleeding = [Calculated blood volume* x (PreopHct - PostopHct)/PreopHct] (mL) * Calculated blood volume = Body weight x 85 (mL).

Statistical Analysis

The data were analyzed using the SPSS 17.0 package program. Before the analysis, normality test (Kolmogorov-Smirnov) was performed and parametric test was applied after it was seen that the data were normally distributed. In the analysis of the data, frequency distributions, mean and standard deviation values were tabulated and independent samples t test was used to compare the groups.

RESULTS

There was no statistically significant difference in the age, weight, height and gestational age of the groups as shown in Table-1($p>0.05$).

In our study, no statistically significant difference was found in the comparison of preoperative systolic blood pressures ($p>0.05$). A statistically significant difference

Table 1. Distribution and comparison of descriptive characteristics of the groups

	General Anesthesia		Spinal Anesthesia		t	p
	Mean±SS	Min.-Max.	Mean±S.S	Min.-Max.		
Age	30.4±4.5	22-39	29.5±5.9	20-42	864	0.39
Weight (kg)	75.7±10.3	54-94	73.4±13.4	50-114	1.192	236
Height (cm)	158.3±5.8	149-171	158.1±5.9	148-171	0.17	865
Gestational Age (weeks)	38.6±1.7	29-40	39±0.8	38.8-1.4	-1.716	89

Table 2. Comparison of preoperative blood values of the group

Preoperative Value	Type of Anesthesia	n	Mean	SD	t	p
Hg (g/dL)	General Anesthesia	50	9.804	0.9547	-0.197	0.844
	Spinal Anesthesia	50	9.836	0.6337		
Htc (g/dL)	General Anesthesia	50	29.536	30.447	-0.247	0.805
	Spinal Anesthesia	50	29.664	20.352		
Plt (µL)	General Anesthesia	50	244.24	58.843	0.029	0.977
	Spinal Anesthesia	50	243.88	63.673		
Fibrinogen (mg/dL)	General Anesthesia	50	328.76	76.182	-0.687	0.494
	Spinal Anesthesia	50	339.16	75.254		

Table 3. Comparison of postoperative blood values of the groups

Preoperative Value	Type of Anesthesia	n	Mean	SD	t	p
Hg (g/dL)	General Anesthesia	50	9.268	0.8888	17.490	0.083
	Spinal Anesthesia	50	8.984	0.7266		
Htc (g/dL)	General Anesthesia	50	28.02	2.782	1.741	0.085
	Spinal Anesthesia	50	27.11	2.420		
Plt (µL)	General Anesthesia	50	200.48	48.242	1.249	0.215
	Spinal Anesthesia	50	186.80	60.613		
Fibrinogen (mg/dL)	General Anesthesia	50	282.40	63.013	0.021	0.983
	Spinal Anesthesia	50	282.12	67.931		

was found in the comparison of intraoperative 5th and 15th minute and postoperative diastolic blood pressures ($p<0.05$), and it was observed that the values of the spinal anesthesia group were lower. In our study, a statistically significant difference was found between the 15th minute pulse rate values ($p<0.05$) and the spinal anesthesia group had lower values.

There was no significant difference in the preoperative hemogram and fibrinogen values of the groups ($p>0.05$). It is shown in Table-2. The mean fibrinogen value was 328.76 mg/dL in the general anesthesia group and 339.16 mg/dL in the spinal anesthesia group.

There was no statistically significant difference in the postoperative hemogram and fibrinogen values of the groups ($p>0.05$). It is shown in Table-3.

There was no statistically significant difference between the preoperative hemoglobin and postoperative hemoglobin values and the amount of bleeding ($p>0.05$). It is shown in Table-4.

DISCUSSION

According to WHO, 810 women died every day in 2017 due to preventable causes related to childbirth and pregnancy. The most common cause of maternal mortality is postpartum hemorrhage. It is also the most important cause of birth-related morbidity with a rate of 18% in developed and developing countries (Hughes, 2002). Cesarean section is the most common major obstetric operation and bleeding is the most common complication during and after cesarean section.

Table 4. Comparison of preoperative and postoperative hemoglobin differences and bleeding amounts of the groups

	Type of Anesthesia	n	Mean	SD	t	p
Preop-Postop Hg Difference	General Anesthesia	50	536	15.322	-13.140	192
	Spinal Anesthesia	50	852	7.385		
Amount of Bleeding (mL)	General Anesthesia	50	128.86	415.354	-1.329	187
	Spinal Anesthesia	50	216.92	216.526		

We wanted to perform our study in pregnant woman with anemia who had undergone cesarean section, which is a risky group in terms of complications, because maternal anemia has been found to be associated with fetal complications including intrauterine growth retardation, preterm delivery, low birth weight and maternal complications including preeclampsia and eclampsia (Tsen, 2009). Therefore, anemia is an important health problem in terms of women's and maternal health. There is a need for studies that will contribute to the literature to reduce maternal mortality.

Both general and regional anesthesia have their advantages and disadvantages, although recently spinal anesthesia is more preferred in the management of anesthesia for cesarean section. There is no completely ideal method of anesthesia management. Systemic problems and desire of the pregnant woman, urgency of the operation, preference of the surgeon and experience of the anesthesiologist are the most important factors in the choice of anesthesia method (Reisner and Lin, 1999). While general anesthesia is superior to spinal anesthesia due to faster induction, better cardiovascular stability and a lower frequency of hypotensive episodes, spinal anesthesia has advantages such as the patient being conscious, no risk of aspiration and not depressing newborn respiration (Reynolds, 2010, Bucklin, 2005).

Richman et al. (2006) concluded that the estimated blood loss was significantly lower in patients who underwent spinal or epidural anesthesia than in patients who underwent general anesthesia or combined general-epidural anesthesia (Richman et al., 2006). According to the authors, spinal anesthesia causes sympathetic block and vasodilation and thus venous return decreases, peripheral vascular resistance decreases as central venous pressure decreases and consequently blood pressure decreases. In addition, the reduction of intraoperative blood loss reduced the need for transfusion and transfusion-related illnesses. Similarly, in this study, systolic and diastolic blood pressures were significantly lower in the spinal group. This may explain the low blood loss. However, the disadvantage of this study is that it included all surgical cases related to general anesthesia or spinal anesthesia, such as cesarean section, general surgery and orthopedic operations. In our study, only the obstetric patient group was included.

In addition, similar to this study, a statistically significant difference was found in the comparison of intraoperative 5th and 15th minute and postoperative diastolic blood pressures in our study. The values of the spinal anesthesia group were found to be lower. We think that this is due to the sympathetic block that occurs in spinal anesthesia.

In our study, the mean preoperative hemoglobin value was 9.804 g/dL in the general anesthesia group and 9.836 g/dL in the spinal anesthesia group. No intraoperative or recovery unit complications or transfusion requirement occurred in any patient. The study of Milman stated that iron deficiency anemia decreased the mother's tolerance to peripartum blood loss, increased the risk of cardiovascular failure and hemorrhagic shock, and impaired wound healing (Milman, 2011). Murray et al. reported that a 1 g/dL increase in hemoglobin caused a significant decrease in maternal mortality (Murray-Kolb, 2012). The retrospective nature of our study is a limitation and postoperative complications of the patients were not analyzed.

There was no difference between the groups in terms of bleeding in our study. Kim et al. concluded that there was a decrease in intraoperative blood loss in the spinal group compared to the general anesthesia group and there was no significant difference in postoperative blood loss (Kim et all., 2012). Aksoy et al. showed that spinal anesthesia was associated with a lower risk of operative blood loss than general anesthesia in low-risk patients undergoing elective cesarean section (Aksoy et al., 2015). In a study conducted in Taiwan, it was found

that the probability of postpartum hemorrhage in women receiving general anesthesia was approximately 8 times higher than in women receiving spinal/epidural anesthesia (Chang, 2011).

In our study, we did not include high-risk patients with potentially increased intraoperative bleeding (e.g. multiple pregnancy, macrosomia, polyhydramnios, coagulation disorders, placentation anomalies, hypofibrinogenemia). The most important advantage of this study is that we did not include patients with risk factors that could potentially increase the amount of bleeding. In our study, the mean difference between preoperative and postoperative hemoglobin values was 0.536 in the general anesthesia group and 0.852 in the spinal anesthesia group. There was no statistically significant difference between the preoperative and postoperative hemoglobin difference and the amount of bleeding. In the study by Yalınkaya et al. the mean difference between preoperative and postoperative hemoglobin values was found to be 1.65 for the general anesthesia group and 1.65 for the spinal anesthesia group (Yalınkaya et al., 2009). Batool et al. showed that spinal anesthesia resulted in less blood loss and a decrease in hemoglobin and hematocrit when compared with general anesthesia (Batool et al., 2016). While some researchers have stated that there is increased blood loss in cesarean section especially with high dose anesthetic drugs, some authors have stated that there is no increased risk in the amount of bleeding when high-risk cases are excluded (Afolabi et al, 2003).

Study Limitations

The retrospective nature of our study was one of the main limitations. We also have limitations in determining the amount of bleeding. In a prospective study, the amount of bleeding could have been calculated more precisely and more accurate results could have been obtained.

In conclusion the most common cause of maternal mortality is postpartum hemorrhage and anemia should be corrected in the prenatal period to minimize the effect of postpartum hemorrhage. In our study, we observed that the type of anesthesia had no effect on bleeding. The most important disadvantage of our study is that it was retrospective and prospective studies are needed to evaluate the effect of the type of anesthesia on postpartum hemorrhage.

ETHICAL APPROVAL

The presented study was conducted in accordance with the decision of Taksim Education and Research Hospital Clinical Ethics Committee dated 13/11/2019 and numbered 150..

AUTHOR CONTRIBUTIONS

Idea, concept and desing: NY
Data collection and analysis: ASŞ
Drafting of the manuscript: FÖ
Critical review: NY

CONFLICT OF INTEREST

The authors declare no conflict of interest

DATA AVAILABILITY

The data used to prepare this manuscript ara available from the corresponding author when requested.

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