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Maternal and fetal outcomes in non-obstetric surgery and anesthesia during pregnancy: A retrospective analysis of data in a territory university hospital

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Abstract

Aim: We aimed to evaluate the maternal effect of anesthesia in patients who underwent non-obstetric surgery during pregnancy. Our secondary aim was to investigate the fetal effects of anesthesia including time of birth and the newborn characteristics.

Materials and Methods: Patient data was obtained through the hospital information management system and anesthesia records. Records of the patients between January 1, 2017 and December 31, 2021 were reviewed. Pregnant patients who underwent a non-pregnancy surgical intervention were included in the study. Demographic characteristics of the patients, gestation week, anesthesia methods, anesthesia management, fetal and maternal complications were recorded. Neonates were assessed in the postoperative period using APGAR score.

Results: Records of 75 patients were included in the study 12 patients were excluded due to cesarean section or fetal operation in the same session. Sixty-three patients were analyzed. The mean age was 27.75±5.31 years. The mean gestational week was 17.79±8.07 weeks. 24 of the patients were operated in the 1st trimester, 29 were in the 2nd trimester, and 10 were in the 3rd trimester. General anesthesia was administered in 39 patients. Spinal block was implemented in 24 patients. We observed one fetal loss, the frequency of abortus was calculated as 1.58 %. The 1st and 5th minute APGAR score averages of babies born in our hospital were 8.75±0.64 and 9.78±0.62, respectively.

Conclusion: General and regional anesthesia techniques can be considered safe in patients undergoing non-pregnancy surgery. Newborn appear to be in good health, even if they are born prematurely. Although conducting large-scale randomized controlled studies in pregnant patients is not possible due to ethical considerations, further prospective observational studies are needed.

Introduction

Pregnancy is a special medical condition due to its unique physiological and pharmacokinetic changes [1]. The fact that most of the surgeries in pregnant are performed in emergency setting, makes the anesthesia procedures more complicated in this patient group [2]. For these reasons, non-obstetric surgical interventions in pregnant may cause additional concerns for the anesthesiologists.

The reported incidence of the non-obstetric surgical interventions during pregnancy is between 0.15-2% [3]. The most common reason is appendicitis, followed by cholecystitis and ovarian pathologies. In addition, trauma, urological interventions and, rarely, fetal surgeries are the other reasons [2]. In this group of patients, surgical intervention can be performed using the open abdominal technique or laparoscopic techniques. The type of anesthesia is mostly decided according to the surgical technique.

In this study, we aimed to evaluate the maternal effect of anesthesia in patients who underwent non-obstetric surgery during pregnancy. Our secondary aim was to investigate the fetal effects of anesthesia including time of birth and the newborn characteristics.

Materials and Methods

Local ethics committee approved the study (Sakarya University Faculty of Medicine Ethics Committee, Decision no: 2022/113310-61). Patient data was obtained through the hospital information management system and anesthesia records. Records of the patients between January

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1, 2017 and December 31, 2021 were reviewed. Pregnant patients who underwent a non-pregnancy surgical intervention were included in the study.

Records of 75 patients were included in the study We determined that 11 of these patients underwent surgical intervention in the same session as cesarean section, and one patient underwent intrauterine fetal surgery, thus these patients were excluded from the study.

Demographic characteristics of the patients, gestation week, anesthesia methods, anesthesia management, fetal and maternal complications were recorded. Neonates were assessed in the postoperative period using APGAR score.

Statistical analysis

We used the Statistical Package for Social Sciences (version 20.0) software (IBM Corp., Armonk, NY) for the statistical assessment of the study data. Categorical variables were expressed as numbers and percentages, while continuous variables were expressed as mean ± standard deviation. We implemented descriptive statistical methods (mean, standard deviation, frequency) to evaluate the results of the study. As we did not perform any hypothesis testing procedure, p values were not mentioned.

Results

Totally 63 patients were included in the study. All pregnant women were followed up with ECG, spO_2, NIBP and heart rate monitoring during the operations. None of the patients were premedicated.

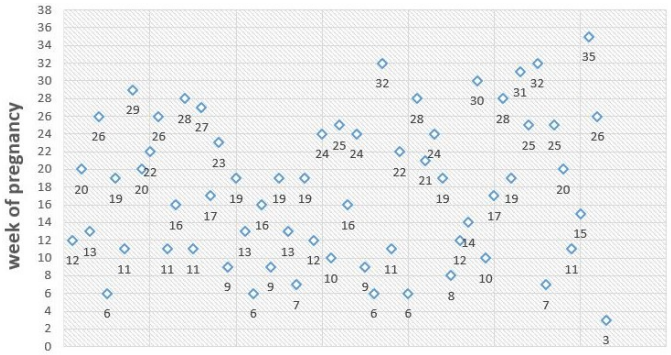

Figure 1. Surgical intervention week for each pregnant woman included in the study (dots represent patients, numbers represent intervention week).

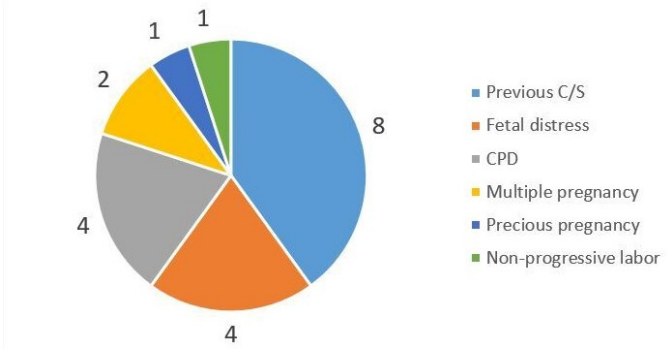

Figure 2. Numerical distribution of cesarean deliveries according to indications (C/S: Cesarean section, CPD: Cephalopelvic Disproportion).

The mean age of the patients was 27.75±5.31 years. The mean gestational week was 17.79±8.07 weeks. We observed that 24 of the patients were in the 1st trimester, 29 were in the 2nd trimester, and 10 were in the 3rd trimester. The surgical intervention week for each pregnant woman included in the study is given in Figure 1.

In the patients included in the study, abdominal (laparoscopic or open technique), orthopedic and endourological interventions and different surgical interventions were performed. The distribution of these interventions according to the patients and the details of the anesthesia method are given in Table 1. The mean anesthesia duration was calculated as 68.96±24.44 minutes.

General anesthesia was administered in 39 patients. Propofol 2-3mg/kg, rocuronium 0.6-0.9 mg/kg was used for anesthesia induction and sevoflurane was used in an oxygen-air mixture for anesthesia maintenance in all general anesthesia procedures (One patient was operated under sedo-analgesia). Neuraxial block was implemented in 24 patients (20 spinal, 3 combined spinal-epidural). Isobaric bupivacaine was used in one patient and hyperbaric bupivacaine was used in 22 patients. Dural punctures were applied using 25 G and 27 G spinal needle. Postspinal headache was not observed in any of the patients. IV paracetamol was used in all patients for postoperative analgesia. Tramadol was used in 5 patients in addition to paracetamol. NSAID was used in 5 patients, and NSAID+tramadol was given in one patient. Postoperative analgesia was provided with epidural catheters in 3 patients.

Fetal abortion occurred on the 3rd postoperative day in a 3-week pregnant who was operated under spinal anesthesia with the diagnosis of acute appendicitis. The frequency of abortus was calculated as 1.58 %. All of the remaining 62 patients were discharged with full recovery after the surgical procedures. Tocolysis was applied in two patients preventively and in two patients postoperatively.

We observed that 38 of our patients delivered in our hospital and the relevant birth records were also noted. The mean delivery week was 38.26±2.34 weeks. Of the deliveries, 20 were cesarean section. The indications for cesarean section are given in Figure 2. The earliest delivery week was observed in a 30-week pregnant. Laparoscopic appendectomy was performed under general anesthesia when this patient was 27 weeks pregnant. The newborn had an APGAR score of 6 and 7 in 1st and 5th minute respectively, and did not require further treatment.

One pregnant required blood transfusion who was at 27th gestational week and underwent appendectomy and myomectomy in a single session under general anesthesia. Three bags of erythrocyte and three bags of frozen plasma transfusions were given intraoperatively for this patient. This patient also underwent a cesarean section operation at the 40th week of pregnancy with the diagnosis of fetal distress. A healthy baby was delivered with a 1st and 5th minute APGAR score of 9 and 10, respectively. None of the other patients received intraoperative blood transfusion.

Table 1. The distribution of these interventions according to the patients and the details of the anesthesia method.

Surgery indication	Surgical technique	Number of patients	Anesthesia technique	Number of patients
Appendectomy	Open abdominal	13	General	1
	Laparoscopy	27	Spinal	12
			General	27
Ovarian pathology	Open abdominal	3	Spinal	2
	Laparoscopy	5	Combined spinal epidural	1
			General	5
Ureter J Stent placement	Endo-urologic	7	General	1
			Spinal	5
			Sedo-analgesia	1
Cholecystectomy	Open abdominal	0	General	3
	Laparoscopy	3		
Ileus	Open abdominal	1	General	2
	Laparoscopy	1		
Bone fracture		1	Combined spinal epidural	1
Bartholin cyst		1	Spinal	1
Appendectomy myomectomy	Open abdominal	1	Combined spinal epidural	1

The 1st and 5th minute APGAR score averages of babies born in our hospital were 8.75±0.64 and 9.78±0.62, respectively. No infant was admitted to the neonatal intensive care unit (NICU).

Discussion

Our retrospective cohort consisted of pregnant patients who underwent non-obstetric surgeries at different gestational weeks, and we confirmed that anesthesia applications did not lead to serious maternal and fetal complications in consistent with previous studies [1, 4–7].

The risk of maternal death is rare (<1/10.000) with the use of modern surgical and anesthetic techniques [5]. When standard doses of current anesthetic agents are used, it has been shown that no teratogenic effects occur in pregnant patients operated at any gestational age [4–6, 8]. Non-obstetric surgical procedures do not increase the risk of fetal anomalies and spontaneous abortion. However, non-obstetric surgical procedures may be related with increased fetal loss [5, 9]. Duncan et al. found a statistically significant increase in the risk of spontaneous abortion in the first and second trimesters (from 6.5% to 7.1%) in a study involving 2,565 pregnant patients [10]. However, most of the published studies examining the risks of pregnancy loss due to surgical operation are generally uncontrolled studies. Therefore the collected data cannot distinguish the effect of the disease, the effect of the surgical procedure and the effect of anesthesia procedure in pregnant patients [4]. A patient with a three-week pregnancy experienced fetal loss on the 3rd day after appendectomy under spinal anesthesia. Unfortunately, we cannot know whether this fetal loss is due to anesthesia or surgical procedure. We would like to emphasize the possibility of fetal loss up to 10% in patients who underwent surgical intervention in the first trimester [5].

There are different physiological and teratogenic conditions for the fetus and the mother in different gestational periods. The optimal timing for surgical intervention in pregnant patients has been reported as the second trimester [5]. It has been reported that the first trimester carries more risk due to the intense organogenesis in the fetus [1,5]. The third trimester also carries possible risk of preterm labor [2,5]. A disease requiring surgical intervention is generally occur in the 1st or 2nd trimester [1,11]. In our cohort, surgeries were most frequently performed in the 2nd trimester. Acute appendicitis is the most common cause of surgical intervention in all periods of pregnancy [1,2]. If we have focused on appendectomies in our cohort, we would have seen that 22 of our 40 appendectomy patients were in the first trimester; consistent with the current literature [1,2,5].

Preterm birth is also a major concern for patients and physicians when surgery is performed during the second and third trimesters of pregnancy. However, data on this negative outcome are confusing, as most published series base their reports on premature contractions rather than preterm labor [12]. No association was found between improved fetal outcome and any specific anesthetic technique. In order to minimize fetal drug exposure, we recommend using regional anesthesia instead of general anesthesia [4]. Nevertheless, the number of patients who underwent general anesthesia was higher in our study group due to the surgical techniques used. In our cohort, we found that 6 of our patients gave birth before the 37th week of pregnancy, which is defined as a preterm delivery. Of these patients, 4 were operated under general and 2 under spinal anesthesia. None of the 41 babies born as twins and triplets in our hospital were taken to the intensive care unit. The examinations performed by the neonatal team were recorded as "normal". It is recommended that fetal evaluations should be performed in the preoperative and postoperative period of the patients. All of our patients were evaluated by the obstetrics team in the preoperative and postoperative periods. Unfortunately, intraoperative

fetal monitoring was not performed in any of our patients. If the type of surgical intervention allows, intraoperative fetal monitoring is recommended [2,5].

In pregnant patients, regional analgesic techniques such as ultrasound guided peripheral nerve blocks may be preferable. Laparoscopic techniques may also reduce the postoperative opioid need [1]. All risks and advantages of general and regional anesthesia should be explained to the mother and her first-degree relatives when choosing the anesthesia method. It is also necessary to mention the possibility of teratogenicity [13]. In our study group, we saw that only the consent of the pregnant women was obtained. In most consent forms, consent was not obtained from first-degree relatives.

Blood transfusion during pregnancy is characterized by maternal physiological changes, fetal alloimmunization risk, and infectious complications [2]. In our study, one patient received three bags of erythrocyte suspension and three bags of fresh frozen plasma. We did not observe a negative effect of blood transfusion in this patient, who gave birth to a healthy baby at the 40th gestational week.

Multimodal analgesia should be considered, including the use of nonopioid drugs considered safe during pregnancy. Paracetamol is the analgesic of choice for the treatment of mild to moderate pain at any stage of pregnancy [2]. All of our patients used paracetamol postoperatively. One of the advantages of non-steroidal anti-inflammatory drugs is the effect of reducing uterine contractions [14]. However, non-steroidal anti-inflammatory drugs should be avoided due to their potential effects on the ductus arteriosus, especially after 28 weeks of gestation [15].

This study has several limitations. The first was a retrospective study based on medical records which may cause bias. Secondly, the cohort was small because it was a single-center study. In addition, only 38 of the 63 patients included in the study gave birth in our hospital. In a tertiary hospital, the overall incidence of high-risk pregnancies (preterm delivery and high-risk pregnancies) is likely to be high. Therefore, there may be a selection bias. Another limitation was that we did not have a comparison group of women who had not had any surgery during pregnancy.

Conclusion

In conclusion, general and regional anesthesia techniques can be considered safe in pregnant patients undergoing non-pregnancy surgery. Newborns appear to be in good health, even if they are born prematurely. Although conducting large-scale randomized controlled studies in pregnant patients is not possible due to ethical considerations, further prospective observational studies are needed in this patient group.

Ethical approval

Sakarya University Faculty of Medicine Ethics Committee Decision no: 2022/113310-61.

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