Effect of Isoflurane and Sevoflurane on Women Undergoing Cesarean Section

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Abstract

Background: The anesthetic drugs should be used with caution since a lot of them were with side effect induction.

Aim: To investigate the comparative effects of two commonly used volatile anesthetic agents, isoflurane and sevoflurane, on women undergoing cesarean section under general anesthesia.

Methods: A hospital-based descriptive cross-sectional observational study was conducted in two general hospitals in Kirkuk. A total of 172 women attend for cesarean section were included in the study. Informed consent was taken from each woman before her enrollment in the study. The data was gathered using a structured questionnaire. The data analyzed using IBM SPSS (version 25). A p-value of <0.05 is regarded as significant.

Results: A rate of 68.6% of the participants experienced psychological effects following anesthesia. While 61.3% of the participants experienced sleeping difficulty. In addition, 72.1% developed breathing difficulty after surgery. The rate of pain severity was that 51.7% of the participants were with moderate pain, while 30.2% experienced severe pain. 56.4% of the participants do not get information or get an inadequate explanation regarding anesthesia side effects. Unfortunately, 59.3% of the participants experienced not good team cooperation or no cooperation at all. Isoflurane used in 89%, while sevoflurane used in 11% of women undergoing CS. The wake-up time after surgery was 20–40 minutes in 79.7%, while it was 41–50 minutes in 20.3%. There were significant differences between isoflurane and sevoflurane perioperative levels of glucose, systolic blood pressure, and diastolic blood pressure. However, there was no significant difference between the two drugs use in regard to blood loss. In addition, there were significant differences between the two drugs when the analysis was performed on diabetic or hypertensive and non-diabetic or non-hypertensive strata.

Conclusion: Isoflurane had more effect on systolic and diastolic blood pressure than sevoflurane during surgery. Additionally, after surgery there was a significant difference in systolic and diastolic blood pressure between women who received isoflurane and those who received sevoflurane. Both drugs induce significant reduction in systolic blood pressure, while there was no significant effect on diastolic blood pressure and blood glucose levels after their use.

Keywords: Cesarean section, CS, Isoflurane, Sevoflurane, Al-Qalam University College, Anesthesia, General anesthesia.

Introduction

Isoflurane is a halogenated methyl-ethyl ether used primarily for the maintenance of general anesthesia. It is characterized by a minimum alveolar concentration (MAC) of approximately 1.15%, indicating its potency relative to other volatile anesthetics. Its blood-gas partition coefficient is about 1.4, suggesting moderate blood solubility and a slower onset and emergence compared to less soluble agents like sevoflurane [1]. Isoflurane has a pungent odor and can cause airway irritation, making it less suitable for inhalational induction. Only around 0.2% of absorbed isoflurane undergoes hepatic metabolism via CYP2E1; the rest is exhaled unchanged, contributing to its minimal systemic toxicity [2].

Isoflurane causes dose-dependent cardiovascular depression by decreasing systemic vascular resistance (SVR), leading to a reduction in mean arterial pressure. Unlike some other agents, it also induces reflex tachycardia through baroreceptor activation in response to hypotension [3]. Despite this, isoflurane is considered to preserve cardiac output relatively well and is therefore used in procedures requiring controlled hypotension , Coronary blood flow is generally well maintained, although a theoretical coronary steal phenomenon has been debated [4].

Isoflurane interferes with glucose metabolism, causing insulin resistance and reduced insulin secretion. This leads to elevated intraoperative blood glucose levels. Tanaka et al. demonstrated in human subjects that isoflurane suppresses insulin release and glucose uptake even at 0.5 MAC, with no significant dose-dependence up to 1.5 MAC [5]. Another clinical trial noted that among isoflurane, sevoflurane, and desflurane, isoflurane caused the smallest increase in intraoperative glucose levels [6]. By reducing systemic blood pressure, isoflurane contributes to decreased surgical bleeding, making it useful in surgeries where a dry field is essential [7]. Additionally, it has minimal impact on platelet function, unlike sevoflurane, which has been shown to impair aggregation. In a randomized trial, patients under isoflurane had less intraoperative bleeding during adenotonsillectomy compared to those under sevoflurane [7].

Sevoflurane is a fluorinated isopropyl ether widely used for both induction and maintenance of general anesthesia. It has a MAC of approximately 2.0%, reflecting moderate potency, and a low blood-gas partition coefficient (~0.65), which facilitates rapid onset and emergence [1]. Due to its non-pungent odor and minimal airway irritation, sevoflurane is particularly suitable for mask induction, especially in pediatric patients. Around 2–5% of the administered dose is metabolized in the liver via CYP2E1, producing inorganic fluoride and hexafluoroisopropanol (HFIP), with the rest exhaled unchanged [2]. Despite concerns about renal toxicity from Compound A (formed via degradation in soda lime), human studies have not demonstrated clinically significant nephrotoxicity when fresh gas flow is maintained above 2 L/min [8].

Sevoflurane induces dose-dependent hypotension primarily through systemic vasodilation and mild myocardial depression. However, it causes a smaller reduction in mean arterial pressure compared to isoflurane at equivalent MAC values [3]. Importantly, sevoflurane generally does not provoke reflex tachycardia, which is often seen with isoflurane. This stability is attributed to its limited baroreceptor suppression and lower sympathetic stimulation , Additionally, sevoflurane does not sensitize the myocardium to catecholamines and is considered safe from an arrhythmogenic standpoint [9].

Sevoflurane affects glucose metabolism by reducing insulin secretion and promoting peripheral insulin resistance. This results in elevated blood glucose levels during anesthesia. In a study by Tanaka et al., sevoflurane significantly reduced the insulinogenic index and impaired glucose utilization in healthy human subjects, with similar effects to isoflurane [5]. Another trial comparing isoflurane, sevoflurane, and desflurane found that. Sevoflurane caused an intermediate degree of intraoperative hyperglycemia, more than isoflurane but less than desflurane [6]. Compared to isoflurane, sevoflurane has been associated with slightly increased intraoperative blood loss in some surgeries, likely due to its milder hypotensive effect. A clinical study on adenotonsillectomy patients demonstrated greater blood loss with sevoflurane than with isoflurane [7]. In addition to hemodynamic factors, sevoflurane may impair platelet function. Bozdogan et al. showed that sevoflurane prolongs bleeding time and inhibits platelet aggregation in vivo, effects not observed with isoflurane [10]. This dual mechanism—less hypotension and platelet inhibition—may contribute to more bleeding under sevoflurane.

Cesarean delivery has become increasingly common worldwide. Global rates have risen from around 7% of live births in 1990 to over 21% today, with trends continuing upward (projected to be ~29% by 2030). Substantial regional disparities exist—e.g., about 5% of births in sub-Saharan Africa occur by cesarean versus ~43% in Latin America [11]. While cesarean section can be lifesaving when medically indicated, it is major surgery with nontrivial risks such as hemorrhage, infection, adhesions, and longer recovery times compared to vaginal birth. International bodies emphasize performing cesareans only when necessary [12].

In Iraq, the cesarean rate rose from ~18.0% in 2008 to 24.4% in 2012, reaching around 25% nationwide and 25.4% in the Kurdistan Region; Kirkuk's rate increased by 52% in that period [13]. In Iraqi obstetric anesthesia, general anesthesia remains common, used in about 53% of elective cesareans in one northern survey [14].

Isoflurane and sevoflurane are widely used volatile anesthetics for cesarean delivery under general anesthesia. Sevoflurane's rapid onset and lower airway irritation make it useful for induction, while isoflurane offers cardiovascular stability. Both agents cause hypotension via vasodilation and have similar effects on glucose and stress response. A comparative study by Gambling et al. found no significant difference in maternal blood pressure, heart rate, uterine tone, or blood loss between sevoflurane and isoflurane during cesarean delivery. Other studies confirm both agents cause mild increases in intraoperative glucose but no severe hyperglycemia. Sevoflurane may be preferred for faster emergence and less coughing [15].

Aim of the Study

To compare the effects of isoflurane versus sevoflurane anesthesia on maternal blood pressure, blood glucose levels, intraoperative blood loss, recovery time, and postoperative symptoms (nausea, shivering) in women undergoing cesarean section in Kirkuk

Materials and methods

Study Design

A hospital-based descriptive cross-sectional observational study was conducted to compare the effects of two inhalational anesthetics (isoflurane and sevoflurane) on perioperative outcomes in women undergoing cesarean section. This design allowed simultaneous recording of the exposure (anesthetic type) and outcomes (hemodynamic and metabolic variables) for each subject during a single surgical admission. The observational approach was chosen to assess real-world differences under routine clinical practice without intervention by the investigators.

Study Setting and Duration

The study was carried out at two tertiary hospitals in Kirkuk, Iraq: Al-Nasr Maternity Hospital and Kirkuk General Hospital. These centers were selected as the main referral facilities for obstetric care in the region, performing a high volume of cesarean deliveries. Data were collected over a six-month period (November 2024 through April 2025). During this time, all eligible cesarean sections under general anesthesia at the two sites were identified and considered for inclusion.

Study Population and Sample Size

The source population comprised all pregnant women presenting for cesarean delivery under general anesthesia at the study hospitals during the study period. A total of 172 women meeting the inclusion criteria were enrolled consecutively, with each participant representing a single case. This sample size of 172 was determined based on preliminary power calculations to ensure adequate statistical power for detecting differences between the isoflurane and sevoflurane groups; it allowed for an estimated 10% attrition rate due to incomplete data or dropouts.

Inclusion and Exclusion Criteria

Eligibility criteria were applied to obtain a homogeneous study sample.

Inclusion Criteria:

• Women aged 18 years or older undergoing elective or emergency cesarean section under general anesthesia at Al-Nasr Maternity Hospital or Kirkuk General Hospital during the study period.

• Ability to provide written informed consent and complete the study questionnaire (in Arabic).

Exclusion Criteria:

• Receipt of regional anesthesia (spinal or epidural) instead of general anesthesia.

• Preexisting chronic medical conditions affecting hemodynamic or metabolic responses (e.g., diabetes mellitus, hypertension, or cardiovascular or endocrine disorders).

• Obstetric complications requiring non-standard anesthesia (e.g., massive obstetric hemorrhage, placental abruption).

• Incomplete anesthesia or surgical records (missing key data on blood pressure, blood loss, or blood glucose).

• Refusal or inability to consent.

These criteria ensured that comparisons between isoflurane and sevoflurane were not confounded by other anesthesia types or significant comorbidities.

Data Collection Tools and Procedures

Data were collected using a structured questionnaire and review of clinical records. The questionnaire was developed from relevant literature and expert input, then translated into Arabic (with back-translation). Trained staff administered the questionnaire by face-to-face interview in the immediate postoperative period (in the recovery room).

Structured Questionnaire

This pilot-tested instrument captured information on:

- **Sociodemographic data**: Maternal age, body weight, education level, and obstetric history (gravidity, parity, and number of prior cesarean sections).
- **Surgical and anesthetic details**: Indication for cesarean section, type of anesthetic agent (isoflurane or sevoflurane), concentrations and duration of anesthesia, and adjunct medications (e.g., opioids, vasopressors).
- **Physiological responses:** Serial blood pressure measurements (systolic and diastolic) during anesthesia compared to baseline.
- **Metabolic measurements:** Blood glucose levels before induction and at fixed intraoperative intervals.
- **Intraoperative events:** Estimated blood loss (mL, as recorded by the anesthesia team), total infusion volume, and duration of surgery.
- **Emergence and recovery:** Time from discontinuation of anesthetic to tracheal extubation, and time from extubation to meeting recovery/discharge criteria.
- **Immediate postoperative symptoms:** Patient-reported side effects (nausea, vomiting, headache, dizziness).

All questionnaire items were close-ended. Responses were cross-checked with the medical record when available (e.g. to confirm recorded blood loss and vital signs).

Clinical Monitoring Data: Additional data were extracted from anesthesia charts:

- **Blood pressure:** Baseline and serial systolic/diastolic pressures at induction, every 5–10 minutes intraoperative, and in the post-anesthesia care unit.
- **Blood glucose:** Preoperative (baseline) and intraoperative glucose levels and changes
- **Estimated blood loss (EBL):** Documented blood loss volume.
- **Anesthesia timing:** Exact timestamps for anesthesia start, surgery end, and extubation (used to calculate emergence and recovery times).
- **Adverse events:** Any significant intraoperative events (e.g., hypotension requiring vasopressors, arrhythmias).

All data collection used standardized forms with coded identifiers to protect patient confidentiality.

Study Variables

Independent Variable:

The primary independent variable was the type of inhalational anesthetic administered (isoflurane vs. sevoflurane).

Dependent Variables:

- **Hemodynamic outcomes:** Systolic and diastolic blood pressure values and their changes from baseline.
- **Metabolic outcomes:** Blood glucose levels (absolute and change from baseline).
- **Blood loss:** Estimated intraoperative blood loss (mL).
- **Emergence and recovery times:** Time to extubation and time to meet recovery criteria.

• **Immediate postoperative symptoms:** Presence of side effects (nausea, vomiting, headache, dizziness). Covariates (e.g., maternal age, weight, and duration of anesthesia) were recorded for descriptive purposes. Each variable was clearly defined (for example, emergence time = interval from anesthetic discontinuation to extubation).

Data analysis

Data were entered into IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY). Descriptive statistics summarized patient characteristics and outcomes: continuous data were expressed as mean ± standard deviation (or median [IQR] if not normally distributed) and categorical data as frequencies (percentages). The Shapiro-Wilk test assessed normality of continuous variables.

Comparisons between the isoflurane and sevoflurane groups were performed using appropriate tests. Normally distributed continuous variables were compared by independent-samples t-tests; non-normal continuous data used the Mann–Whitney U test. Categorical variables were analyzed by chi-square test or Fisher's exact test (for expected cell counts <5). A two-sided p-value < 0.05 was considered statistically significant in all analyses.

Prior to inferential testing, assumptions (such as equal variances) were verified and adjustments made as needed (e.g. Welch's correction). Cases with missing data for a given outcome were excluded from that analysis (no imputation was performed).

Ethical considerations

The study protocol was reviewed and approved by the Institutional Review Board of Kirkuk General Hospital and the Al-Qalam University College Ethical Committee. All procedures complied with institutional regulations and international ethical guidelines for human research. Written informed consent was obtained from all participants. Participant confidentiality was maintained by using anonymised study codes and restricting access to identifiable data to the authorized research team and ethics committee.

Results

Age Distribution of the Study Population

The majority of participants were in the 20–30 year age group, accounting for 55.2% of the total sample. The least represented age group was 35–40 years. The 70–80 kg group represented the largest segment of the study population, followed by the 60–70 kg group. The least common weight range was 80–90 kg.

A significant majority were not diagnosed with hypertension. Thus, only 14% of the participants were hypertensive, indicating a low prevalence of high blood pressure within the study group. The majority did not suffer from diabetes. Only 11% of the study population had diabetes, which shows low prevalence among participants. More than half of the participants had undergone one or two cesarean sections previously, while a smaller portion were undergoing their first or third (or more) cesarean section. The majority of participants had either secondary or university education (Table 1).

Incisional pain was the most frequently observed symptom, followed by nausea or vomiting and dizziness. The most common postoperative complaint among participants was incisional pain (34.3%), followed by nausea or vomiting (27.9%). Less common symptoms included dizziness or imbalance (26.2%) and headache (11.6%). A total of 69.2% of participants reported experiencing at least one postoperative symptom, while 30.8% denied having any symptoms. The participants' responses to the question, 'Did you experience any psychological effects after anesthesia?' Most participants (68.6%) reported feeling anxious or stressed. The response to the question, 'Did anesthesia affect your sleep in the first few days after surgery?' A large portion of participants (72.1%) reported difficulty sleeping following anesthesia. Among the total participants, 124 participants (72.1%) reported experiencing breathing problems after surgery, while 48 participants (27.9%) did not report any issues. The pain levels after anesthesia were mild in 18% of the participants, moderate in 51.7%, and severe in 30.2%.

Out of 172 participants, 75 (43.6%) got thorough information related to anesthesia, while 37.2% of the patients received general information about anesthesia. However, 19.2% of the patients did not receive any information about anesthesia. Unfortunately, 17.4% of the medical team was not cooperative with patients. Additionally, 40.7% of the medical team was cooperative with patients, while 41.9% were partially cooperative with patients. 58.7% of the patients experienced fatigue in the first few days, while 24.4% experienced fatigue for a longer period. However, 16.9% do not show fatigue or weakness following surgery. Isoflurane used in 143 patients, while sevoflurane used in 29 patients. The majority of patients wake up in 20 to 40 minutes, while 20.3% take a time of 41 to 50 minutes wake-up time, Table.2.

The preoperative glucose levels in the sevoflurane group exhibited a significantly (P=0.000) higher mean value (119.83 ± 37.41 mg/dl) compared to the isoflurane group (95.72 ± 21.83 mg/dl). Postoperatively, glucose levels remained elevated in the sevoflurane group (114.93 ± 32.94 mg/dl), while the isoflurane glucose level was 94.01 ± 16.78 mg/dl, a significant difference (P=0.000). Table 3.

Systolic blood pressure before surgery was significantly (P=0.000) higher in the sevoflurane group (129.76 ± 15.80 mmHg) than in the isoflurane group (121.31 ± 8.26 mmHg). The same pattern was observed during operation (116.59 ± 12.06 mmHg vs. 108.45 ± 6.25 mmHg; P=0.000) and postoperatively (120.38 ± 10.26 mmHg vs. 115.98 ± 7.46 mmHg; P=0.008), indicating consistently higher systolic values in the sevoflurane group across all perioperative phases. Table 3.

Diastolic blood pressure was significantly (P=0.000) higher in the sevoflurane group than in the isoflurane preoperatively (83.03 ± 10.12 mmHg vs 77.87 ± 6.20 mmHg; P=0.000), intraoperative (76.62 ± 7.52 mmHg vs 72.33 ± 5.11 mmHg; P=0.000), and postoperatively (82.41 ± 8.26 mmHg vs 77.46 ± 4.77 mmHg; P=0.000). The total estimated blood loss with no significant (P=0.81) differences between the sevoflurane group (1102.07 ± 36.97 ml) and the isoflurane group (1103.64 ± 31.50 ml), Table 3.

Chi-square analysis revealed a statistically significant association between anesthesia type and both glucose levels and blood pressure status. There was a significant (P=0.000) difference in the distribution of diabetes and non-diabetes between the isoflurane and sevoflurane groups. The same pattern was shown for blood pressure and normotensive was much higher in isoflurane (76.7%) than in sevoflurane (9.9%). These associations suggest that baseline comorbidities were not equally distributed between the two anesthetic groups, and this imbalance may potentially influence the observed differences in perioperative hemodynamic and metabolic parameters, Table.4.

Table 5 shows the comparison between before and after surgery for both anesthesias. For the isoflurane group, there was a significant (P=0.0001) difference in systolic blood pressure before (121.31 ± 8.26 mmHg) surgery as compared to post-surgery (115.98 ± 7.46 mmHg). Thus, isoflurane induced reduction in systolic blood pressure, and this suggests that monitoring of systolic blood pressure in patients receiving isoflurane is vital for patient's safety. The same pattern was induced in those receiving sevoflurane. However, there were no significant differences in glucose blood level and diastolic blood pressure after surgery in patients who received isoflurane or sevoflurane (Table 5).

The results showed that the prevalence of diabetes and hypertension was significantly higher in the sevoflurane group compared to the isoflurane group, despite the smaller sample size. Diabetic and hypertensive patients made up approximately 41.4% of the sevoflurane group, versus only 9.8% and 7.7% in the isoflurane group, respectively. This indicates that Sevoflurane was likely preferred in high-risk patients due to its better hemodynamic stability and minimal effect on glucose metabolism, making it the anesthetic of choice in cases involving diabetes and hypertension.

A Pearson Chi-Square test was used to assess the relationship between anesthetic type and patient comorbidities. The results showed a statistically significant association between the type of anesthetic used and both diabetes ($\chi^2 = 18.750$, $p = 0.000$) and hypertension ($\chi^2 = 23.620$, $p = 0.000$). These findings suggest that Sevoflurane was more commonly chosen for high-risk patients, particularly those with chronic conditions like diabetes and high blood pressure, likely due to its better hemodynamic stability.

Discussion

The sevoflurane group included more patients with hypertension and diabetes, conditions that typically lead clinicians to prefer general anesthesia for urgent or complex cesarean deliveries [16]. Despite having a greater number of high-risk patients, the sevoflurane group showed similar blood loss compared to the isoflurane group. Both anesthetic agents, known to decrease uterine muscle tone, can potentially increase bleeding. However, our data showed that sevoflurane does not cause more blood loss than isoflurane [17].

Despite the higher proportion of women with hypertension in the sevoflurane group, blood pressure was controlled effectively with both anesthetic agents. Both sevoflurane and isoflurane provide good blood pressure management and minimal negative effects on blood flow to the placenta and fetus when used in standard doses [18, 19]. However, follow-up during surgery was vital, as there was a significant reduction in systolic blood pressure after surgery in both groups of anesthesia use.

The high prevalence of diabetes among sevoflurane patients did not lead to increased blood loss. Diabetes typically increases the risk of larger infants and heavier placentas, potentially causing more bleeding. However, the present did not show an additional blood loss related specifically to sevoflurane, suggesting effective management with medications and surgical techniques [19, 20]. Thus, this study finding supports the conclusion that sevoflurane and isoflurane have similar effectiveness and safety profiles for general anesthesia in cesarean deliveries, even in patients with common obstetric complications. Previous studies similarly report no significant differences between sevoflurane and isoflurane in cesarean section outcomes, emphasizing that either agent can be safely chosen depending on practical and clinical preferences [22, 23].

Both sevoflurane and isoflurane, when used for general anesthesia during CS, caused a significant reduction in systolic blood pressure while not inducing a significant effect on diastolic blood pressure. The effect on the blood pressure was due to their vasodilatory actions; however, this effect may be dose-related.

Conclusions

This study indicated that the use of isoflurane and sevoflurane for general anesthesia in cesarean section was safe. However, follow-up for monitoring of blood pressure is vital for patient's safety.

Recommendations

This study recommends adopting a more personalized and evidence-based approach in obstetric anesthesia, especially for cesarean sections. Key points include:

1. Sevoflurane is preferred for high-risk patients (e.g., with hypertension or diabetes) due to its stable hemodynamic and glycemic effects.
2. Isoflurane can be used in healthy parturients (ASA I–II) but requires close monitoring of blood pressure and glucose.
3. Preoperative evaluation should include screening for metabolic and cardiovascular conditions to help guide anesthetic choice.
4. Hospitals should develop standardized protocols that consider ASA classification and comorbidities in anesthetic planning.
5. Future research should involve larger and more diverse populations (including ASA III–IV) to validate these findings.
6. Postoperative monitoring should aim at early detection of complications to reduce risks and promote faster recovery.

ETHICAL APPROVAL

The research protocol was approved by the Ethical Research Committee of the Al-Qalam University College.

INFORMED CONSENT

Participants were aware of the purpose of the study and provided informed consent prior to the participations.

FUNDING: No funding

HUMAN AND ANIMAL RIGHTS

All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Participants were aware of the purpose of the study and provided informed consent prior to accessing the questionnaire and participation.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

All data generated or analyzed during this study are included in this published article.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Declared none.

AUTHORS CONTRIBUTION

Study conception and design: MA, MJ.
Data collection: MA, AA, A Ab, SE, ZK, MJ.
Analysis and interpretation of results: MA, MJ
Draft manuscript: MA, AA, A Ab, SE, ZK, MJ.
All authors reviewed the results and approved the final version of the manuscript.

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Table.1. Demographic characteristics of the study population.

Variable		Percent
Age in year	12 – 20	13.4
	21 – 25	27.3
	26 - 30	27.9
	31 – 35	19.8
	36 – 40	11.6
Weight in kilogram	50 – 60	20.3
	61- 70	29.1
	71 – 80	33.7
	81 - 90	16.9
Hypertension	No	86.0
	Yes	14.0
Diabetes	No	89.0
	Yes	11.0
Education	Primary	25.0
	Secondary	37.8
	University	37.2
Previous CS	First time	21.5
	Twice	28.5
	Once	34.3
	Three times or more	15.7

Table.2. Postoperative signs and symptoms

Variable		Number	Percent
Postoperative symptoms reported by participant	Incisional pain	59	34.3
	Nausea and/or vomiting	48	27.9
	Dizziness and/or imbalance	45	26.2
	Headache	20	11.6
Participants response to postoperative symptom inquiry	Yes	119	69.2
	No	53	30.8
Psychological impact after anesthesia	Yes [anxious or stressed]	118	68.6
	No	54	31.4
Sleep disturbance after anesthesia	Yes	111	61.3
	No	61	38.7
Breathing problems after surgery	Yes	124	72.1
	No	48	27.9
Reported pain level after anesthesia wore off	Mild	31	18.0
	Moderate	89	51.7
	Severe	52	30.2
Informed consent regarding anesthesia side effect	Yes, thoroughly	75	43.6
	Yes, but general information	64	37.2
	No	33	19.2
Medical team cooperation and anesthesia explanation	Yes, adequately	70	40.7
	Yes, but briefly	72	41.9
	No	30	17.4
General fatigue or weakness after surgery	Yes, first few days	101	58.7
	Yes, long period	42	24.4
	No	29	16.9
Anesthesia type	Isoflurane	143	83.1
	Sevoflurane	29	16.9
Patients wake up time after surgery	20 – 40 minutes	137	79.7
	41 – 50 minutes	35	20.3

Table.3. Comparison of perioperative glucose level, blood pressure and estimated blood loss between isoflurane and sevoflurane.

Variable	Anesthesia type	No.	Mean	SD	t-test	P value
Glucose before mg/dl	Isoflurane	143	95.72	21.83	4.722	0.000
	Sevoflurane	29	119.83	37.41		
Glucose after mg/dl	Isoflurane	143	94.01	16.78	5.050	0.000
	Sevoflurane	29	114.93	32.94		
Systolic before	Isoflurane	143	212.31	8.26	4.186	0.000
	Sevoflurane	29	129.76	15.80		
Diastolic before	Isoflurane	143	77.87	6.20	3.626	0.000
	Sevoflurane	29	83.03	10.12		
Systolic during	Isoflurane	143	108.45	6.25	5.311	0.000
	Sevoflurane	29	116.59	12.06		
Diastolic during	Isoflurane	143	72.33	5.11	3.779	0.000
	Sevoflurane	29	76.62	7.52		
Systolic after	Isoflurane	143	115.98	7.46	2.704	0.008
	Sevoflurane	29	120.38	10.26		
Diastolic after	Isoflurane	143	77.46	4.76	4.426	0.000
	Sevoflurane	29	82.41	8.26		
Blood loss in ml.	Isoflurane	143	1103	31.50	0.237	0.813
	Sevoflurane	29	1102	36.97		

Table.4. Association between anesthesia and comorbidities [Diabetes and blood pressure status].

Variable	Comorbidities	Anesthesia type				Chi square [P value]
		Isoflurane		Sevoflurane		
		No.	Percent	No.	Percent	
Diabetes	Diabetes	14	8.1	12	7.0	18.75 [0.000]
	No diabetes	129	75.0	17	9.9	
Blood pressure	Hypertensive	11	6.4	12	7.0	23.62 0.000
	Normotensive	132	76.7	17	9.9	

Table.5. Comparison of before and after anesthesia of the glucose level and blood pressure.

Anesthesia type	Variable	Before		After		P value
		Mean	SD	Mean	SD	
Isoflurane	Glucose	95.72	21.83	94.01	16.78	0.45
	SBP	121.31	8.26	115.98	7.46	0.0001
	DSP	77.87	6.20	77.46	4.77	0.52
Sevoflurane	Glucose	119.83	37.41	114.93	32.94	0.67
	SBP	129.76	15.81	120.38	10.26	0.37
	DSP	83.03	10.12	82.41	8.26	0.85