

COMPARISON OF THE EFFECT OF INHALATION ANESTHETICS (SEVOFLURANE AND ISOFLURANE) ON HEMODYNAMIC PARAMETERS IN PATIENTS DURING GENERAL ANESTHESIA

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ABSTRACT

Inhalation anesthetics such as sevoflurane and isoflurane are widely used in clinical practice due to their controllability, high efficacy, and relatively rapid recovery after surgery. However, their impact on hemodynamics during anesthesia is a critical factor in choosing the appropriate drug for specific patient categories.

Keywords: Anesthesia, inhalation anesthetics, Isoflurane, Sevoflurane, hemodynamic parameters.

INTRODUCTION

Inhalation anesthetics remain a key component of general anesthesia due to their high efficacy and ease in adjusting anesthesia depth. However, their use requires particular attention to their impact on hemodynamic parameters, as changes in blood pressure, heart rate, and myocardial contractility can significantly affect the course of surgery and postoperative recovery.

The comparison of sevoflurane and isoflurane is particularly significant, as these drugs are widely used in clinical practice but have different profiles regarding cardiovascular effects. Choosing the correct anesthetic is especially crucial for surgeries involving patients with cardiovascular diseases, where maintaining hemodynamic stability is vital to prevent complications such as myocardial ischemia, arrhythmias, or abrupt blood pressure changes. Moreover, with the increasing number of patients with comorbidities and aging patients, optimizing anesthesia is becoming increasingly relevant. Studying the impact of sevoflurane and isoflurane on hemodynamic parameters allows for enhancing the safety of anesthesia and improving surgical outcomes by minimizing complications.

Objective of the study: To investigate and evaluate the effects of inhalation anesthetics (sevoflurane and isoflurane) on hemodynamic parameters during multi-component inhalation anesthesia.

Materials and methods of the study:

In the surgical intensive care unit No. 1 of the multidisciplinary clinic of the Tashkent Medical Academy, we studied 40 patients during surgery (14 men and 26 women), with an average age of 39.2 ± 3.4 years. These patients, diagnosed with gallstone disease and chronic calculous cholecystitis, underwent general anesthesia during laparoscopic cholecystectomy.

The patients were divided into two groups: the control group, comprising 20 patients who received multi-component general inhalation anesthesia using isoflurane, and the

experimental group, also comprising 20 patients, who underwent surgery under multi-component general inhalation anesthesia using sevoflurane. The groups were randomized based on gender, age, standard examination characteristics, and type of surgery.

All patients underwent clinical and biochemical analyses, radiography, and computed tomography (CT). During therapy, parameters such as blood pressure (BP), mean arterial pressure (MAP), central venous pressure (CVP), body temperature, and venous (jugular) blood saturation were monitored.

Inclusion criteria:

1. Men and women aged 18 to 65 years with an ASA anesthesia risk score of I-II.
2. Patients undergoing surgeries such as cholecystectomy or ventral (postoperative) hernia repair.
3. Informed consent to participate.

Exclusion criteria:

1. Refusal to participate in the study.
2. Age over 65 years.
3. ASA anesthesia risk score of III-IV.

Results of the study:

Table 1. Characteristics of the recipient groups

Parameter	Isoflurane	Sevoflurane	P-value
Age, years	48 (41; 53.5)	46 (39; 50)	0.557
Gender (male/female)	7/13	7/13	
Height, cm	173 (170; 180)	169 (163; 175)	0.065
Body weight, kg	69.5 (64; 92.7)	70.5 (65; 82)	0.931

Induction of anesthesia was performed using propofol at a dose of 2–2.5 mg/kg in combination with fentanyl at 5 µg/kg, followed by administration of arduan at 50 µg/kg. After the introduction of the muscle relaxant, tracheal intubation and mechanical ventilation were initiated. Anesthesia was maintained using a Mindray WATO-X35 machine with a semi-closed circuit.

The inhalation anesthetics were delivered at the following concentrations:

- For sevoflurane: 4.0 vol% (gas flow in the circuit: 4 L/min)
- For isoflurane: 2.4 vol% (gas flow in the circuit: 4 L/min)

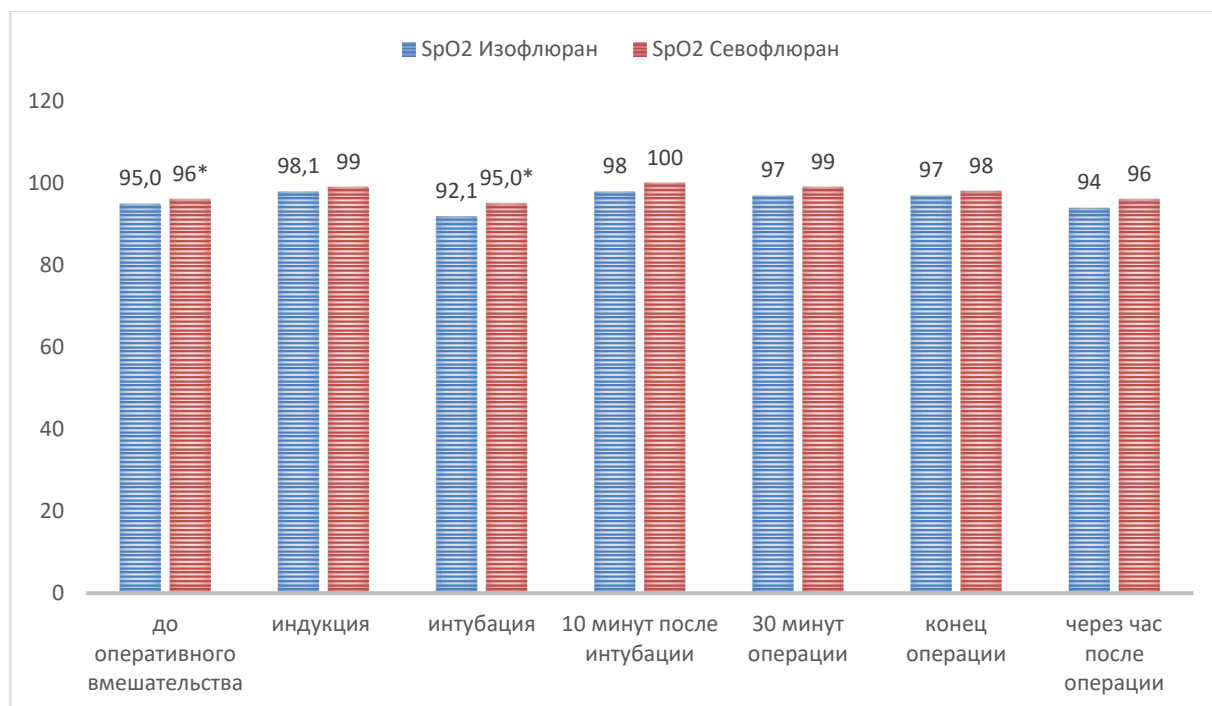
These concentrations were maintained until reaching 1.0 minimum alveolar concentration (MAC). After achieving MAC 1.0:

- In the sevoflurane group, the gas flow was reduced to 2 L/min.
- In the isoflurane group, the gas flow was reduced to 1.5 L/min.

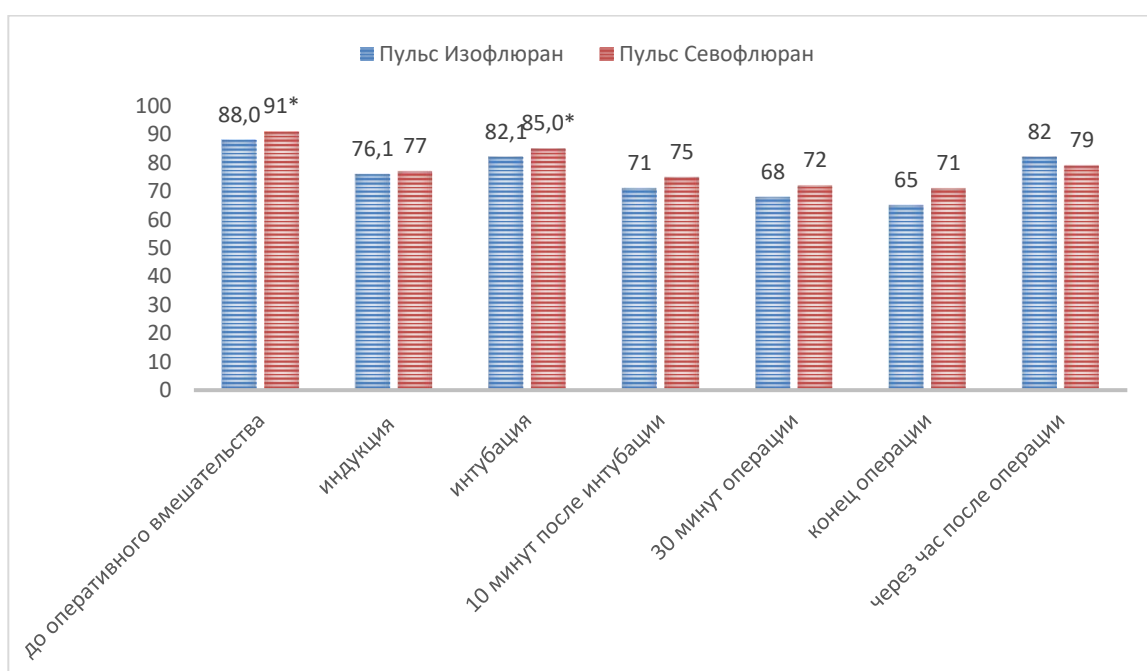
Hemodynamic parameters (heart rate [HR] and blood pressure [BP]) were monitored, and samples were analyzed for acid-base balance and water-electrolyte equilibrium. Additionally, pulse oximetry readings, episodes of arrhythmias, tachycardia (HR > 90 bpm), bradycardia (HR < 60 bpm), and hypotension (systolic BP < 80 mmHg) were recorded.

BP readings were documented during skin incision and until the end of the surgical intervention. Upon emergence from anesthesia, after decurarization (using atropine at 0.01 mg/kg), the following intervals were evaluated:

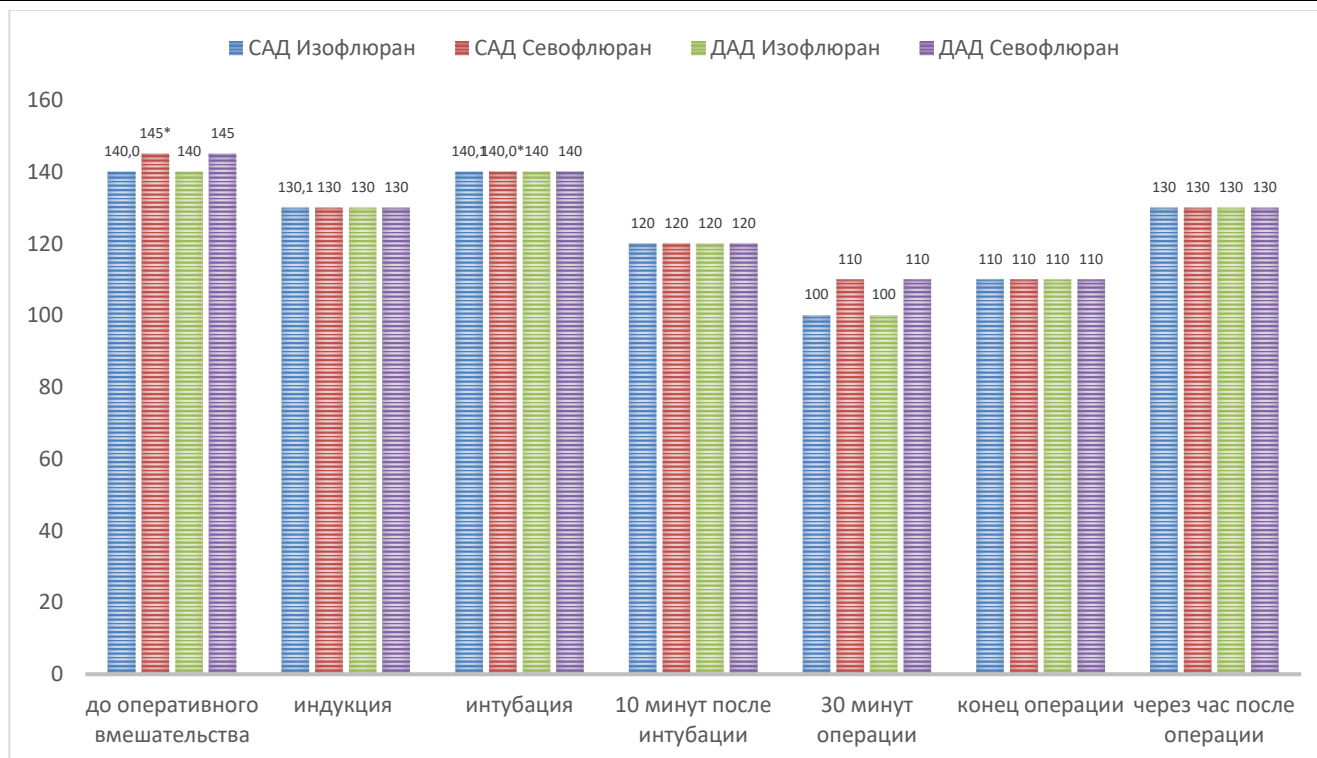
- Time to eye opening
- Time to hand squeeze
- Time to extubation
- Time to state date of birth



Graph 1. Dynamics of saturation in both groups over time



Graph 2. Dynamics of pulse in both groups over time



Graph 3. Dynamics of blood pressure in both groups over time

Table 2. Recovery time for consciousness and muscle tone after anesthesia

Parameter	Isoflurane	Sevoflurane
Eye opening, min	8,8 (3; 9)	5,7 (3; 7)
Hand squeeze, min	9,6 (4; 9)	6,4 (4; 9)
Extubation, min	10 (5; 10)	7,9 (4; 10)
Stating birthdate, min	11,3 (6; 12)	8,8 (6; 11)

Parameter Isoflurane Sevoflurane
 Eye opening, min 8.8 (3; 9) 5.7 (3; 7)
 Hand squeeze, min 9.6 (4; 9) 6.4 (4; 9)
 Extubation, min 10 (5; 10) 7.9 (4; 10)
 Stating birthdate, min 11.3 (6; 12) 8.8 (6; 11)

RESULTS

No significant deviations from the norm were observed in HR and BP at all stages of surgery, and these parameters did not statistically differ between the two groups. However, the recovery and awakening parameters after surgery showed differences. In the group where sevoflurane was used, recovery of spontaneous breathing, extubation time, and transfer to the surgical ward occurred significantly faster compared to the isoflurane group. Regarding postoperative complications, there were no statistically significant differences in the frequency of postoperative cough, nausea, or vomiting. In the isoflurane group, 20% of patients experienced postoperative agitation during awakening, whereas no such cases were observed in the sevoflurane group. These differences were statistically significant ($p < 0.05$).

CONCLUSION

The use of sevoflurane demonstrated faster recovery after anesthesia and the absence of postoperative agitation compared to isoflurane, with no difference in the frequency of postoperative cough, nausea, or vomiting. The use of sevoflurane in elective surgeries for adult patients ensures effective, adequate, and safe anesthesia.

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