ANESTHESIA IN EMERGENCY CARDIOLOGY

Joniev Sanjar Sukhratovich
PhD, Assistant at the Department of Anesthesiology, Reanimation and Emergency Medicine
Xudoyqulov Bekzod Ixtiyoriy o'g'li
Toshpo'latov Umidjon
Resident of Clinical Residency of the Department of Anesthesiology, Reanimation and Emergency Medicine
Samarkand State Medical University, Samarkand, Uzbekistan
jonievssh@mail.ru

Abstract. *The parametres of arterial blood pressure determined in standard conditions in three groups of patients while carrying out multicomponent endotracheal inhalation anaesthesia with halogen-containing volatile anesthetics have been analysed (halothane was used in the first group, isoflurane - in the second group, sevoflurane - in the third group). The control group was made by almost healthy people. Two subgroups depending on the ASA physical status were analyzed. The analysis took into account the systolic, diastolic and pulse arterial blood pressure. The authors offered to calculate coefficients of arterial blood pressure. The conclusion has been made that the integrative indicator of arterial blood pressure objectively reflects the quality of anesthetic protection at stages of anesthesia and can be used as a criterion of adequacy of anesthesia. It does not depend on age, estimation of the ASA physical status, and concrete halogen-containing volatile anesthetics.*

Key words: *emergency cardiology* ***cardiosurgery,*** *anaesthesia, haemodynamics, arterial blood pressure.*

Currently, an important problem in anesthesiology is the assessment of the adequacy of anesthesia. An analysis of the literature data showed that three groups of methods for determining the depth of anesthesia are most often used: 1) clinical [4]; 2) laboratory [2, 3];

3) neurophysiological [6, 7].

Clinical signs include motor responses, hemodynamic changes, and sympathetic activation [4]. Specific motor reactions are movements of the eyelids or eyes, swallowing, coughing, changes in facial expressions, movements of the limbs or head. Increased respiratory efforts are due to the activity of the intercostal and abdominal muscles, which are switched off at deep levels of anesthesia. When using muscle relaxants, motor reactions cannot provide information about the depth of anesthesia. Therefore, the assessment of the activation of the sympathetic system acts as an additional method for monitoring superficial anesthesia. Sympathetic reactions associated with surface anesthesia include mydriasis, lacrimation, sweating, and salivation. These signs are non-specific and can change under the influence of anesthetics, therefore, their presence or absence is an unreliable indicator. The use of muscle relaxants, especially in combination with nitrous oxide or opioids, may mask signs of surface anesthesia.

Hemodynamic changes with inadequate anesthesia are tachycardia and changes in blood pressure. However, systolic, diastolic, pulse and mean arterial pressure are in a certain relationship to each other. Their quantitative changes are interdependent, determining the optimal or disturbed state of the entire homeostasis system. In assessing the state of hemodynamics, there is no integrative indicator that combines the obtained data on blood pressure.

There are also laboratory methods for studying the “surgical stress response” [2, 3]. They are based on the study of the level of hormones of the hypothalamic-pituitary-adrenocortic system (ACTH, cortisol, catecholamines, etc.), as well as the study of the effect of these hormones on the body (the level of glycemia, lactate, lipid peroxidation, acid - basic state, etc.). These methods require the use of laboratory equipment and reagents, are laborious, and their widespread use is impossible due to high cost. They are suitable only for a retrospective assessment and on their basis it is impossible to make a timely correction of inadequate anesthesia.

Neurophysiological methods include electroencephalography, evoked potentials and techniques based on their information processing with the help of electronic computers. They can be used for monitoring the parameters of the body's vital activity in a continuous real-time mode (on-line) and have good prospects [6, 7]. The main disadvantage that limits their widespread use is the high cost of equipment and consumables (electrodes).

We have proposed to assess the adequacy of anesthesia, in addition to measuring systolic and diastolic blood pressure and calculating the mean and pulse blood pressure, to calculate blood pressure coefficients.

The purpose of this study is to analyze the features of changes in blood pressure during multicomponent endotracheal inhalation anesthesia with halogen-containing anesthetics in abdominal surgery based on the use of our proposed integrative indicator of the state of the components that determine blood pressure.

Materials and methods

A study was conducted in 146 patients during endotracheal inhalation anesthesia, who underwent surgery for diseases of the in cardiac surgery patients. Depending on the inhalation anesthetic used, all patients were divided into three groups. The first group included patients who used halothane as one of the components of anesthesia maintenance, the second group - isoflurane, the third group - sevoflurane. The anesthetic benefit was carried out according to the following plan. Induction into anesthesia in the first and second groups (patients using halothane or isoflurane) was carried out by the introduction of fentanyl 2.18±0.56 μg/kg and propofol 2.03±0.31 mg/kg. Induction into anesthesia in the third group (patients using sevoflurane) consisted of sequential administration of fentanyl (1.2 ± 0.6 μg/kg) and diazepam (0.12 ± 0.04 mg/kg), after which through the face The mask was supplied with a gas narcotic mixture - nitrous oxide with oxygen (FiO2 = 50%) and sevoflurane (2.9±0.55 vol%, 0.99±0.06 MAC). Tracheal intubation was performed after the administration of dithylin 1.5-1.8±0.3 mg/kg. Anesthesia was maintained in all those groups by inhalation of an anesthetic in a ferrous-oxygen mixture with an oxygen concentration of 40% and an additional bolus of fentanyl (5.2 ± 2.14 μg/kg). Halothane (0.6±0.17 vol%, 1.00±0.14 MAC) was used in the first group, isoflurane (2.0±0.4 vol%, 1.01±0.1 MAC), in the third - sevoflurane (1.4 ± 0.32 vol%, 1.03 ± 0.1 MAC). After intubation, myoplegia was maintained by administration of arcuron (0.04±0.01 mg/kg) or trakrium (0.45±0.01 mg/kg).

Intraoperative monitoring of the patient's condition included electrocardiography, heart rate, non-invasive blood pressure measurement, pulse oximetry, thermometry, control of the gas composition (oxygen concentration, nitrous oxide, inhalation anesthetic) in the inhaled and exhaled mixture, determination of the minimum alveolar concentration of inhalation anesthetic (MAC), concentrations of carbon dioxide during inhalation and exhalation, capnography. We also recorded ventilation parameters - tidal volume (Vt), minute breathing volume (MV), peak inspiratory pressure (Pmax), plateau pressure (Pplato), airway resistance (R), compliance (C). The quality of the neuromuscular block and the need for additional administration of muscle relaxants were determined by stimulation of peripheral nerves in the TOF mode. Electroencephalographic entropy (Entropy) was monitored to assess the level of the depth of anesthesia sleep. Taking into account all the above parameters, the course of anesthesia was regarded as adequate.

Blood pressure was measured using an ADU-5 anesthetic-respiratory monitor (Datex-Ohmeda, Finland-USA) at several stages: 1st - before anesthesia; 2nd - 5 minutes after tracheal intubation; 3rd - 10 minutes after intubation; 4th - 20-30 minutes after tracheal intubation (which corresponded to the main stage of the operation); 5th - the end of the operation; 6th - before extubation of the patient.

The first group: the number of examined people was 34, the average age was 52.1±15.6 years, the average body weight was 83.5±17.1 kg, among them there were 30 women (88.2%) and 4 men (11.8%. According to the ASA scale, 17 people belonged to the 1-2 class, 17 people - to the 3-4 class. The second group: the number of examined people was 100, the average age was 52.4±13.0 years, the average body weight was 82.1±16.5 kg, among them there were 77 women (77%) and 23 men (23 %). According to the ASA scale, 45 people belonged to grades 1-2, 55 people - to grades 3-4. The third group: the number of examined - 39 people, the average age of the examined was 51.9 ± 16.2 years, the average body weight was 79.9 ± 20.1 kg, among them there were 33 women (84.6%) and 6 men (15.4%). According to the ASA scale, 14 people belonged to grades 1-2, 25 people - to grades 3-4. As a control group, practically healthy people were examined, who at the time of the examination did not suffer from any pathology. The group consisted of 33 people, the average age was 31.7±7.6 years, among them were 21 women (63.6%) and 12 men (36.4%). The number of blood pressure measurements was 171. Blood pressure was measured automatically using a Philips heart monitor according to generally accepted rules [1].

In addition, all examined in three groups were divided into two subgroups depending on the initial assessment of the physical status according to ASA: the first - grades 1-2 according to ASA, the second - grades 3-4 according to ASA. In the first subgroup, the number of examined people was 76 people, the average age was 47.2±14.2 years, the average body weight was 81.7±18.1 kg, among them there were 60 women (78.9%) and 16 men (21.1 %). In the second subgroup, the number of examined people was 97 people, the average age was 59.8±11.0 years, the average body weight was 83.5±16.4 kg, among them there were 80 women (82.5%) and 17 men (17 ,5%).

To assess the state of hemodynamics, we proposed the following criteria [5]: the ratio of systolic blood pressure to diastolic blood pressure - coefficient 1 (K-1); the ratio of diastolic blood pressure to pulse blood pressure - coefficient 2 (K-2). Statistical data processing was carried out on a personal computer using Microsoft Excel, Statistica 6.0 programs. Data are presented as mean and standard deviation (Mean±SD), the distribution was standard (chi-square test was used to test for normality). A statistically significant difference in the means was assessed using analysis of variance, a significant difference in the means for specific groups was made according to the Newman-Keuls test.

Results and discussion

The calculation in the control group (healthy people) of the average value of the coefficient 1 was 1.67±0.18; the average value of coefficient 2 is 1.60±0.49. In patients during endotracheal inhalation anesthesia, the average values of the selected coefficients for each stage are presented in Table 1. We compared the values of coefficients 1 and 2 obtained by us for three groups at various stages of anesthesia with the values in the control group. At stages 2-6, coefficients 1 and 2 approach the values in the control group. At the 1st stage, the coefficients 1 and 2 significantly differ from the values of the control group in the groups of halothane, isoflurane and sevoflurane ($p<0.05$). At the second stage, in the group using isoflurane, there was a significant difference in coefficients 1 and 2 from the values of the control group ($p<0.05$).The relationship between the average values of the coefficients 1 and 2 in the three groups at the stages of inhalation anesthesia and the average values in the control group are shown in Figures 1 and 2. The results of comparing the average values of the coefficients in subgroups according to ASA are presented in Table 2. When comparing the entire population, significant differences for coefficients 1 and 2 were obtained at the first stage.

Table 1 - Values of coefficients 1 and 2 by groups.

anesthesia Stage .	Halotane (n=34) Isoflurane		Isoflurane (n=100)		Sevoflurane (n=39)	
	К-1	К-2	К-1	К-2	К-1	К-2
1	1,8±0,29*	1,41±0,55*	1,81±0,25*	1,35±0,45*	1,85±0,3*	1,32±0,5*
2	1,64±0,18	1,67±0,43	1,76±0,26*	1,43±0,4*	1,64±0,3	1,55±1,0
3	1,63±0,21	1,75±0,57	1,68±0,21	1,62±0,53	1,65±0,2	1,7±0,5
4	1,64±0,21	1,71±0,52	1,68±0,22	1,63±0,49	1,65±0,2	1,69±0,4
5	1,71±0,4	1,61±0,52	1,72±0,2	1,51±0,41	1,66±0,2	1,62±0,5
6	1,67±0,19	1,61±0,46	1,68±0,2	1,59±0,5	1,68±0,2	1,57±0,4

Note: * - significant differences from the control group.

Table 2 - Values of coefficients 1 and 2 in ASA subgroups.

ASA class. Stage anesthesia.	The whole set (n=173)		ASA 1-2 (n=76)		ASA 3-4 (n=97)	
	K-1	K-2	K-1	K-2	K-1	K-2
1	1,82±0,27*	1,35±0,49*	1,73±0,2	1,46±0,51	1,89±0,29*	1,26±0,45*
2	1,71±0,26	1,5±0,57	1,68±0,16	1,55±0,34	1,75±0,3	1,51±0,55
3	1,66±0,21	1,68±0,54	1,64±0,17	1,67±0,48	1,68±0,24	1,65±0,59
4	1,66±0,22	1,66±0,49	1,68±0,18	1,72±0,45	1,69±0,24	1,61±0,52
5	1,7±0,26	1,55±0,45	1,68±0,21	1,59±0,48	1,72±0,29	1,52±0,41
6	1,68±0,2	1,59±0,47	1,67±0,17	1,56±0,39	1,68±0,22	1,62±0,49

Note: * - significant differences from the control group.

ne ($p<0.05$). We compared the values of coefficients 1 and 2 obtained by us for ASA subgroups at various stages of anesthesia with the values in the control group. In the first subgroup (ASA 1-2), coefficients 1 and 2 approach the values in the control group. In the second subgroup (ASA 3-4), at the 1st stage, the coefficients 1 and 2 significantly differ from the values of the control group ($p<0.05$), at the subsequent stages, no significant differences were obtained.

The relationship between the average values of the coefficients 1 and 2 at the stages of inhalation anesthesia in the ASA subgroups and the average values in the control group are shown in Figures 3 and 4.

Conclusions

1. The integrative indicator of the state of arterial pressure proposed by us objectively reflects the quality of anesthetic protection at the stages of anesthesia and can be used as one of the criteria for assessing the adequacy of anesthesia.

2. The integrative indicator of the state of arterial pressure in patients during surgery with adequate anesthetic support is for a coefficient of 1 - 1.67 ± 0.18 rel. units and for coefficient 2 - 1.60±0.49 rel. units It does not depend on age, physical status assessment according to ASA, a specific halogen-containing anesthetic. The sensitivity of coefficient 1 is higher than that of coefficient

Literature

1. Aralov U.A. Joniev, S. Sh., Rakhimov, A.U. Aralov, S. Sh. Joniev, A. U. Rakhimov // Problems of biology and medicine. - 2015. - No. 1. - S. 11-14.

2. Joniev S.Sh., Rakhimov A.U., Comprarison of methods of preoperative preparation in theryoid gland / Joniev S.Sh., Rakhimov A.U., [Text] // VI International conference "Sharing the results of research toards closer global convergente of scientists ". - Ontario, Canada: 1807-150 Charlton av. East Hamilton, 2015. - pp. 38-43.

3. Joniev, S. Sh., Babazhanov, A. S. Kalkonsimon without pathology operationlarida operation oldi tayorgarligi va anesthesia samaradorligini bakholash / S. Sh. Joniev, A. S. Babazhanov [Text] // "XXI-acr - intellectual avlod asri" Samarqand hududiy ilmiy amaliy-conference and materiallari. - Samarkand, Uzbekiston: SamDCHTI nashriyoti, 2016. - S. 190-193.

4. Joniev S. Sh. Features of preoperative preparation and anesthesia in thyroid pathology [Text] / Joniev S.Sh. // British Medical Journal. - 2022. - No. Volume-2, No 4. - S. 212-215.

5. Joniev S. Sh. Anesthesiological allowance for operations for diffuse goiter [Text] / Joniev S.Sh. // Journal of education and research. - 2022. - No. Volume 1, Issue 5. - P. 19-26.

6. Joniev S. Sh. Improving the results of anesthesia in thyroid pathology [Text] / Joniev S.Sh. // Uzbek medical journal. - 2022. - No. Volume 3, Issue 3. - S. 23-28.

7. Joniev S. Sh., Pardaev Sh. K. Kalkonsimon without operationalarid umumiy kўpkomponentli anesthesiaing kўllanilishi [Text] / S. Sh. Joniev, Sh. K. Pardaev // Tibbiyotda yangi kun. - 2021. - No. 6 (38/1). — S. 443-479.

8. Joniev S. Sh. Determining the level of preoperative preparation and conducting anesthesia in patients with thyroid pathologies [Text] / Joniev S.Sh. // Danish Scientific Journal (DSJ). - 2022. - No. 59. - S. 19-23.

9. Joniev S. Sh. Improvement of the results of anesthesia in thyroid pathology [Text] / Joniev S.Sh. // Annali d'Italia. - 2022. - No. Vol 1. 30. - S. 78-82.

10. Joniev S.Sh., Yakubov I., Pormonov Kh., Daminov I., Ensuring adequate premedication in patients with thyroid pathology [Text] / Joniev S.Sh., Yakubov I., Pormonov Kh., Daminov I., // Norwegian Journal of development of the International Science. - 2022. - No. 86. - S. 17-20.

11. Joniev S.Sh., Tukhsanbaev S., Kurbanov K., Abdaliev D., Predicting the effectiveness of anesthesia in thyroid pathology [Text] / Joniev S.Sh., Tukhsanbaev S., Kurbanov K., Abdaliev D., // Polish journal of science. - 2022. - No. 51. - S. 30-34.

12. Joniev S.Sh., Ganiev A., Ibrokhimov Z., Melikboboev A., Analysis of the effectiveness of anesthesia methods in thyroid pathology [Text] / Joniev S.Sh., Ganiev A., Ibrokhimov Z., Melikboboev A ., // Znanstvena misel journal Slovenia. - 2022. - No. 67. - S. 32-35.

13. Joniev S.Sh., Pardaev Sh.K., Muhammadieva U., Analysis of methods of general anesthesia in thyroid surgery based on hemodynamic parameters [Text] / Joniev S.Sh., Pardaev Sh.K., Muhammadieva U. , // Turkish Journal of Physiotherapy and Rehabilitation. - 2021. - No. 32(3). - S. 7136-7140.