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## REACTION FEATURES OF CARDIOVASCULAR SYSTEM AT THE COMBINED ANESTHESIA WITH ISOFLURANE USAGE

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### Abstract:

The variability of the heart rate of thoracic patients in conditions of the combined anesthesia usage based on isoflurane was investigated. It is shown, that application of the vaporescent anesthetic combined with fentanyl or prolonged epidural block is characterized with the relative intraoperative vegetative stability without expressed prevalence of the sympathetic and parasympathetic parts.

### Key words:

cardiovascular system, surgical interventions, general anesthesia

### Introduction.

The decrement of heart productivity due to direct depression of myocardium inotropy and vasodepression influenced by anesthetics are the most typical changes from the cardiovascular system during the surgical interventions in conditions of the general anesthesia (Lebedinskiy K.M., 2003). Moreover, preparations for the anesthesia have two mechanisms that explain the expressed hemodynamic shifts: decrease of minute blood volume and depression of the general peripheral vascular resistance (Levshankov A.I., 2006). In this connection, from the point of view of an overall performance of heart, the preference is given to the preparations that put in balance the parity of cardio- and vasotropic effects, and ventriculoarterial interface appreciably has no changes (Barash P., Cullen B., Stoelting R., 2004). In this aspect, modern halogenated anesthetics, particularly isoflurane, deserves a special focus on it. For prediction of system blood circulation reactions for operational stress methods of transthoracic bioimpedance measurement, echocardiography and estimations of cardiac rate (Quzounian J.G., Masaki D.I., 1996; Kinsella S.M., Norris M.S., 1996; Zilber A.P., Shifman E.M., 1998), however, that allows to mark only single factors that contribute to hemodynamic change. Recently for the adequacy definition of anesthetic assistance concerning cardiovascular system the method of estimation of the vegetative nervous system condition with the variability analysis of the cardiac rate (VACR) is in study process (Vagin S.V., Zabashnyi S.I., Sorokina E.U., 1998; Cherniy V.I., Kuznetsova I.V., Egorov A.A., Vysotskiy A.G., 2004).

### Research objective:

To study with the frequency analysis of the VACR and Bayevskiy indexes the intraoperative changes of adaptive re-

The dynamics of VACR frequency parameters during the intraoperative period

Table 1.

Steps of research	Group	VLF, ms <sup>2</sup>	LF, ms <sup>2</sup>	HF, ms <sup>2</sup>	LF/HF
1. Induction	III	368,00±44,07	902,10±122,80	1017,00±111,10	0,82±0,04
	I	324,60±94,31#	536,70±166,67	285,16±99,95*	3,02±1,37*
	II	138,07±39,94*	263,66±89,47*	318,62±121,40*	3,90±2,30*
2. Intubation	I	234,28±153,35	94,78±59,74*	154,54±97,69*	1,10±0,54
	II	70,00±31,41*	22,19±9,22*	151,28±58,05*	0,44±0,25*
3. Discission	I	235,26±97,16	155,75±84,84*	165,58±41,33*	0,75±0,31
	II	72,14±29,27*	35,78±18,93*	110,99±32,42*	0,25±0,08*
4. Pneumothorax	I	175,97±70,02*	132,82±79,17*	210,19±80,56*	0,52±0,14*
	II	57,81±29,78*	22,56±8,42*	111,19±35,85*	0,64±0,49
5. Inspection	I	130,38±64,24*	75,32±23,62*	133,07±38,36*	0,79±0,25
	II	77,17±35,52*	23,01±9,91*	88,31±26,45*	0,67±0,44
6. Main step	I	90,79±48,54*	32,00±2,85*	69,38±3,93*	1,09±0,45
	II	59,90±24,63*	68,38±35,10*	174,62±50,94*	0,28±0,06*
7. Finishing the main step	I	34,32±6,91*	38,76±10,19*	119,28±25,09*	1,08±0,69
	II	34,32±6,91*	38,76±10,19*	119,28±25,09*	1,08±0,69*
8. Sealing	I	54,42±21,63*	47,92±20,98*	166,80±47,72*	0,38±0,11*
	II	108,24±78,88*	102,98±69,94*	189,96±60,16*	0,29±0,10*
9. Surgery end	I	64,90±38,52*	30,81±8,74*	143,72±32,24*	0,68±0,44
	II	59,02±22,23*	59,00±38,70*	143,94±57,41*	0,32±0,08*

Notes: \* - accuracy of differences in compare to control group, # - accuracy of differences between groups

actions of cardiovascular system with the usage of the combined anesthesia based on isoflurane.

### Material and methods.

Data of the statistical analysis of cardiac rate variability with the frequency parameters VACR definition and integral parameters variational pulse measurement - the index of vegetative balance (IVB), the adequacy of processes regulation parameter (APRP), the index regulatory systems pressure (IP) and the vegetative parameter of rhythm (VPR) (Bayevskiy R.M. et al., 2001), received at 44 patients with surgical thoracic pathology had been included in the work. The patients were divided in two main groups: the patients from group I (n=24) surgical intervention was made under effect of anesthesia, which based on isoflurane and fentanyl; the combination of isoflurane with prolonged epidural block (PEB) was used for group II (n=20). In both groups the Low Flow Anesthesia technique were used. The registration of VACR parameter was made during 5 minute intervals on different steps of surgery: 1 - induction in narcosis; 2 - after intubation of trachea; 3 - skin discission; 4 - pneumothorax;

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5 – inspection organs of thoracic cage; 6 – making main step of surgical intervention; 7 – after completion of main step of surgical intervention; 8 – raphe on pleura; 9 – finishing surgery. Comparison of the results, received from group I and II, was made with results of control group III (n=22).

#### Results and discussion.

The comparative characteristic of frequency parameters in the basic groups has shown, that capacity of very low-frequency component of the spectrum (VLF), that is the sensitive indicator of management of metabolic processes, in the I group was below control values on 4 - 9 stages. In the II group authentic decrease of VLF level, in comparison with norm, was marked at all investigation phases, e.g. from induction into narcosis and till the conclusion of the surgical intervention. The capacity of the low-frequency component of the spectrum (LF), that describe mainly a condition of the sympathetic center of vascular tone regulation, in the I group was essentially below the norm from 2 till 9 periods of supervision. In the II group the level of slow waves capacity was significant less, than in the control, over all investigation phases. The size of the spectral component that reflect the capacity of a high-frequency component of the spectrum (HF), has been lowered in the basic groups, since the introduction into narcosis and finishing the stage of end of operation. The estimation of the vegetative balance index, which defined on parity LF/HF, has shown that in both groups studied parameter was authentically above the norm only at the induction stage that testified of the prevalence of the central regulation contour activity above the autonomic. The reduction LF/HF ratio that specify the strengthening of parasympathetic influences, has been registered in the I group at the stages of the pleural cavity prosecution and the thorax sealing, and in the II group at 2, 3, 6, 7 and 9 stages.

The dynamics of Bayevskiy indexes during the intraoperative period

Table 2.

Steps of research	Group	IVB	APRP	IP	VPR
	III	97,50±14,80	35,17±2,27	318,19±36,98	2,84±0,31
1. Induction	I	228,49±63,69*	81,51±18,31*	345,04±61,79	12,47±4,58*
	II	234,92±53,96*	86,80±11,71*	254,06±54,83	10,41±1,86*
2. Intubation	I	323,72±48,35*	89,88±10,81*	285,57±50,15	16,17±2,55*
	II	371,97±58,29*	85,73±8,05*	287,67±54,01	17,32±3,68*
3. Discission	I	255,77±37,91*	66,74±6,57*	297,33±53,71	7,47±0,91*#
	II	433,65±49,33*	91,80±7,86*	395,57±53,20	16,81±3,27*
4. Pneumothorax	I	251,09±56,98*	70,60±10,59*	433,90±54,84*#	9,62±2,77*
	II	402,31±40,33*	83,12±7,56*	202,90±42,38*	13,15±2,64*
5. Inspection	I	333,98±48,89*	89,24±11,54*	233,10±65,92	12,48±3,12*
	II	353,91±59,68*	90,62±9,76*	322,12±56,63	14,14±2,46*
6. Main step	I	328,62±55,16*	80,63±8,08*	381,78±48,05	17,40±3,20*
	II	354,38±40,13*	93,61±7,60*	399,53±51,67	12,63±2,27*
7. Finishing the main step	I	313,33±44,87*	93,33±6,53*	338,03±49,51	12,11±2,03*
	II	372,63±48,93*	105,74±11,88*	396,09±51,49	18,18±3,74*
8. Sealing	I	349,21±36,75*	83,28±10,39*	308,77±56,91	12,92±3,17*
	II	364,82±42,92*	101,66±12,16*	370,24±55,24	19,30±4,03*
9. Surgery end	I	382,28±38,46*	90,50±9,98*	306,86±48,22	12,87±2,93*
	II	304,73±51,91*	108,13±13,43*	335,71±66,91	17,90±4,06*

Notes: \* - accuracy of differences in compare to control group, # - accuracy of differences between groups I & II

The analysis of Bayevskiy indexes in both groups has revealed the unidirectional increase of IVP, APRP and VPR during all the intraoperative period. At the same time the IP level in the groups remained within the limits of norm during all stages of the operation, except for a stage pneumothorax. And, in the I group at the stage 4 the IP increasing was observed, whereas in the II group, on the contrary, it was reduced. Thus, intraoperative changes from cardiovascular system at thoracic patients that was operated in conditions of the general anesthesia with isoflurane usage, are characterized by relative vegetative stability without expressed prevalence of the sympathetic and parasympathetic parts with participation of the central ergotropic humeral-metabolic mechanisms. The size of pressure index testifies the regulatory systems tension that was within the limits of norm.

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#### ОСОБЕННОСТИ РЕАКЦИИ СЕРДЕЧНО-СОСУДИСТОЙ СИСТЕМЫ ПРИ КОМБИНИРОВАННОЙ АНЕСТЕЗИИ С ИСПОЛЬЗОВАНИЕМ ИЗОФЛЮРАНА

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#### Аннотация:

У торакальных больных исследовали вариабельность сердечного ритма в условиях использования комбинированной анестезии на основе изофлюрана. Показано, что применение пареообразующего анестетика в сочетании с фентанилом или продленной эпидуральной блокадой характеризуется относительной интраоперационной вегетативной стабильностью без выраженного превалирования симпатического и парасимпатического звеньев.

#### Ключевые слова:

вариабельность сердечного ритма, комбинированная анестезия, изофлюран, торакальная хирургия

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#### TERMINABLE PARAMETERS OF THE HEART RATE VARIABILITY WITH DIFFERENT TYPES OF COMBINED ANESTHESIA

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#### Abstract:

Combined anesthesia based on isoflurane affects on terminable parameters of the cardio rhythm in thoracic patients. Combination of gaseous anesthetic and fentanyl accompanied by lower changes sympathetic activity markers in compare to using of isoflurane with prolonged epidural block.

#### Key words:

variability of cardio rhythm, combined anesthesia, isoflurane, thoracal surgery