

## HEMODYNAMIC STATE OF INDICES AT COMBINED ANESTHESIA WITH USE OF PROPOFOL IN CHILDREN

The work studies hemodynamic profile during propofol-ketamine anesthesia versus the propofol-promedol one. 159 acquired patients undergoing surgical correction with mean age  $5.5 \pm 2.6$ ;  $4.3 \pm 1.2$  subsequently were included. MAP, CI, HR, SI, EF, SVR were investigated. It is suggested that propofol-ketamine versus propofol-promedol general anesthesia provides stable hemodynamic profile during the surgery.

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### Introduction

Modern conception of general anesthesia is mainly based on such notions as the adequacy and competency of anesthesia (Voskerchan, 1966). In order to keep adequate anesthesia and to perform the principle of multi-competency in modern anesthesiology, various pharmacological means (corresponding to main components of anesthesia: hypnotics, analgesics, muscle relaxants) are used (Aitkenhead and Smith, 1994). The use of these means in anaesthesiological apparatus demand for high efficacy (possibly near to 100%) of these drugs, as the absence or insufficient effect can lead to severe complications (Babaev et al., 1998). Therefore, it appears understandable the interest to use of propofol as the medicine for in anesthesia. It causes sleeping fast, keeps switching off consciousness during medicine infusion; it interacts well with narcotic analgesics and neuroleptics and has fewer side effects in comparison with other intravenous anesthetics (Lekmanov and Saltanov, 2000). Propofol as a component of general anesthesia is used at different surgical interventions. Experience of propofol using has been accumulated in short-term operations and medical-diagnostic manipulations, in emergency abdominal surgery (Lekmanov et al., 1999). However, the several publications point to the possible undesirable displays of propofol during anesthesia, including the deterioration of some parameters of central hemodynamics, although the data on this issue is extremely controversial (Ostreykov et al., 1999; Lihvantsev, 1998).

The aim of this study was to determine the optimal combined use of propofol with ketamine or promedol in operations of various complexity and duration.

### Materials and methods

159 patients at the age from 3 to 14 years, being hospitalized various surgical pathology to clinic for planned operative interventions, were examined.

The distribution of patients into groups was made counting complexity and duration of surgery. 109 patients, who were assigned to small traumatic and/or short-term surgical interventions, received combined anesthesia using ketamine with propofol. General anesthesia combining propofol and promedol was made at the rest 50 sick children.

Premedication of the patients in both groups was standard; it carried out intramuscular introduction atropine sulfate 0.1% -0.01 mg/kg, sibazon 0.5% -0.3 mg/kg, ketamine 5% - 3 mg/kg 15 minutes before surgery.

TABLE 1. DISTRIBUTION OF THE PATIENTS ACCORDING TO NOSOLOGY

Nosology	Group 1	Group 2
Diseases anterior abdominal wall	50	
Developmental defects and diseases of genitourinary system	52	
Developmental defects and injuries traumas of locomotor apparatus	7	
Thoracic deformity		34
Congenital hip dislocation		16

Objective evaluation of functional state for cardiovascular system made use of echocardiography on the device Aloka SSD-260 with the analysis of end-diastolic size (EDS) and end-systolic size (ESS) of the left ventricle and RR interval (3.5 MHz transducer). For detailed evaluation functions of the left cardiac part the computer EchoCG was used, the indices of myocardial contractility and diastolic function of left ventricle (LV) were calculated. The cardiac index (CI), specific peripheral resistance (SPR), stroke index (SI), and ejection fraction (EF) were estimated by standard formulas.

On the base of linear LV parameters with the help of mathematical calculations there were calculated the indices of the heart morphometry, its pump function and myocardial contractility. Mean arterial pressure (MAP), saturation of oxygen (SaO<sub>2</sub>), heart rate (HR) were determined.

At taking general anesthesia to the patients of the first group the induction started from intravenous injection propofol in dose from 2.5 to 3 mg/kg, with the following intravenous anesthetic ketamine in dose 3 mg/kg. Anesthesia maintenance was carried out with propofol infusion from the account from 120 to 150 mcg/kg/min (depending on stage of operation). When it was necessary the ketamine was entered again in dose from 1 to 1.5 mg/kg. For all surgical intervention the spontaneous breathing was not marked in children.

At taking anesthesia the patients of the second group, the induction was began from an intravenous bolus of propofol entering in dose from 2 to 2.5 mg/kg, then analgesic promedol 2mg/kg intravenously. After introduction of muscle relaxant pipercuronium in dose 0.06 mg/kg and hyperventilation 100% oxygen, tracheal intubation was carried out. Artificial lungs ventilation was taken by anesthetic machine "Titus" in the regimen IPPV. The anesthesia maintenance was carried out with propofol infusion from the account 100 to 150 mcg/kg/min (depending on operation stage) and intravenous promedol introduction 1 mg/kg of body weight in every 50-60 minutes.

## Results and their discussion

Data on hemodynamics changes during delivering anesthesia in the first group are given in Table 2. When evaluating these results it was found that the original values of the studied parameters of the first group of patients are in the range of physiological variables.

After premedication it was marked the increase of MAP by 12% comparing to initial data. Such hyperdynamics of blood circulation was related to sympathomimetic action of ketamine. Reduction MAP parameter by 3% was noted on the background of induction (from  $97.4 \pm 3.7$  to  $94.5 \pm 3.2$ ). By the period of waking up it was marked reduction of SI by 7% comparing to stage of premedication (from  $42.7 \pm 1$  to  $40.7 \pm 0.3$ ). HR increased by 18% after premedication and at the period of induction it was reduced by 8%. At anesthesia maintenance it was observed the reduction of HR by 11%, and by the waking up the HR returns to initial meanings. SPR was reduced after premedication by 5% (from  $64.8 \pm 5.4$  to  $61.9 \pm 2.4$ ), statistically significant changes to the end of surgical intervention were not observed. From this, it can be concluded that there were not indices indicating

on peripheral vasodilatation and vasoconstriction. SI index on the stage of anesthesia remained on initial quantities. EF increased on the 2nd stage of anesthesia by 10% comparison with 1st stage. On the other stages EF kept normal initial meanings.

TABLE 2. HEMODYNAMICS INDICES ON ANESTHESIAS STAGES AT GENERAL ANESTHESIA WITH USE PROPOFOL AND KETAMINE

	Outcome	Premedication	Induction	Middle of an operation.	The end of the operation.
MAP (mm.Hg)	80.2±2.9	97.4±3.7	94.5±3.2	90.2±3.1	84.8±3.07**
SI (ml/m <sup>2</sup> )	42.7±2.3	40.7±2.45	40.4±2.7	39.3±2.6	40.3±2.7
CI (l/min/ m <sup>2</sup> )	4.4±0.9	4.9±0.69	4.5±1.02	4.2±0.9	4.1±0.9
SPR dina-s/(sm <sup>3</sup> -m <sup>2</sup> )	64.8±5.4	61.9±2.4	61.4±5.4	59.7±5.3	61.5±5.5
HR (bpm)	102.7±3.5	121.05±2.2	112.9±3.5	108.04±3.5**	102.3±3.3
EF (%)	72.8±2.03	74.4±2.13	74.9±2.1	74.9±2.1	73.7±2.2

Notes:\*\* p <0.01

In patients at the beginning induction period the hypoventilation developed due to action of propofol; manifestations of excitation and motor reactions were not observed.

Characteristics changes in hemodynamics indexes at anesthesiology combining promedol and propofol are shown in Table 3.

TABLE 3. HEMODYNAMICS AT THE STAGES OF ANESTHESIA WITH THE USE OF PROPOFOL AND PROMEDOL

	Outcome	Premedication	Induction	Middle of an operation.	The end of the operation.
MAP (mm.Hg)	67.3±2.5	74.6±2.6	73±2.2	74.3±2.2	78.1±2.2
SI (ml/m <sup>2</sup> )	40.7±3.5	45.3±3.5	40.6±3.8	35.9±3.8	47.7±3.7
CI (l/min/ m <sup>2</sup> )	4.3±0.9	5.5±1.1	4.8±1.2	4.0±1.1	5.7±1.1
SPR dina-s/(sm <sup>3</sup> -m <sup>2</sup> )	57.9±3.0	65.3±3.3	57.7±4.0	49.9±3.5*	68.6±3.5
HR (bpm)	114.7±6.3	124±3.6	121.9±3.7	117.1±3.67	122.8±3.7
EF (%)	68.1±2.1	74.1±2.3	70.0±2.5	68.6±2.7	73.9±3.1

Notes: \* p <0.05.

General anesthesia with use promedol and propofol that was taken in more large and long surgical interventions, were determined the next changes of hemodynamics indices on the stages of anesthesia (Table 3). After premedication it was marked the increase of HR by 8%, MAP by 10%, SI by 10%, CI 27%, SPR by 12% and EF by 8%. The notable hyperdynamia in the period of premedication was connected with M-cholinomimetic action of atropine and sympathomimetic action of ketamine. Minimum average heart rate for all time of study was  $117.1 \pm 3.67$ . Significant differences between the indices of heart rate were not revealed. Maximum meaning of MAP was  $78.1 \pm 2.2$  at the end of operation. SI at the stage of induction and during maintenance of anesthesia was reduced to 12% which witnesses on adequate tissues perfusion. Reduction of HR and SI caused considerable reduction of SI to 28%.

Metabolism tissue was improved; the necessity to oxygen had not increased. At the stage of induction SPR reduced by 12%, in the stage of anesthesia maintenance it decreased by 24%. At the end of operation it raised by 5%, possibly due to increased vessels tonus. Beginning from the second stage the tendency to reduction of EF index increased.

In comparison of HR, MAP and SI between two groups it is clearly distinguished the reduction of SI in the induction period and, more expressed reduction in the middle of operation at general anesthesia using propofol with promedol. By the end of operation SI became closer to the meanings of premedication period. Indices of MAP and HR at

general anesthesia combining propofol with ketamine were inclined to reduction, at the end of operation, these indices returned to initial meanings.

FIGURE 1. COMPARATIVE CHARACTERISTICS OF THE PARAMETERS OF HR, MAP AND SI IN THE GENERAL ANESTHESIA PROPOFOL KETAMINE AND PROPOFOL PROMEDOL

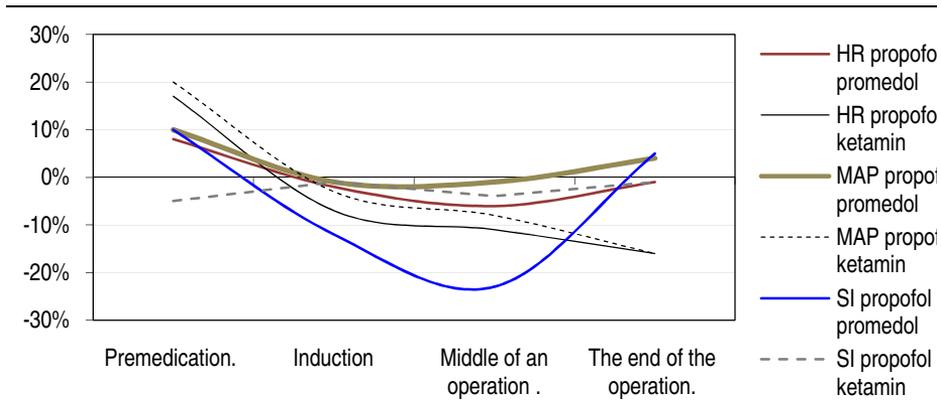
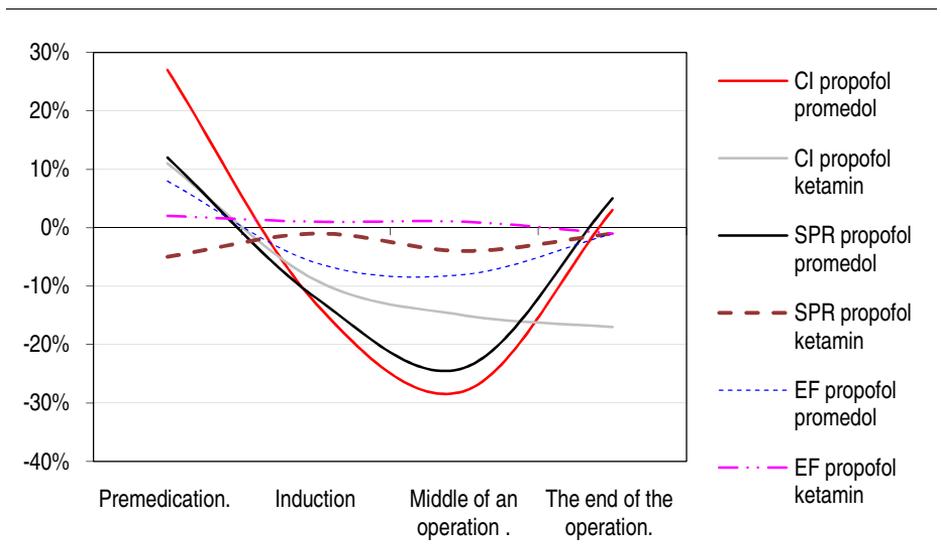


FIGURE 2. COMPARISON CHARACTERISTICS THE PARAMETERS CI, SPR, AND EF AT GENERAL ANESTHESIA, PROPOFOL KETAMINE, AND PROPOFOL PROMEDOL



In Figure 2 there is a clear reduction of CI and SPR in the middle of operation at general anesthesia using propofol with promedol. There is growing tendency to reduction of CI at general anesthesia using propofol with ketamine. PHI remains within normal limits in the first group when there is a decrease on stages of anesthesia combining propofol and promedol.

## Conclusion

Combination of propofol and ketamine allows specifying their some undesirable hemodynamic effects. Anesthesia with use propofol with combination ketamine or promedol ensured hemodynamic stability at all stages of surgery without reduction contraction ability of myocard. Combination propofol with ketamine at little traumatic operations and propofol with promedol at multi traumatic and long operations guarantee adequate anesthesia characterizing with stability of indices of central and peripheral hemodynamics.

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