Indices Changes of Central Hemodynamics at Carry Out Anesthesia with Keeping Independent Breathing at Children

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Abstract

Introduction: The aim of study was to research hemodynamic shifts in conditions of carry out combined anesthesia on the base of isoflurane with preservation of spontaneous breathing at small surgical operations in children.

Materials and Method: The research was carried out at 44 sick children at the age from 3 to 14 years with inguinal and inguinal hernias (41,7 %), hydrocele was (19,4 %) section of abscesses and suppurations were (38,9%). The duration of anesthesia benefit at 58,3 % patients was from 30 to 40 minutes, at 40,66 % it was about 60 minutes.

Results: The clinical monitoring was performed with study AP, HR and oxygen. For objective evaluation of cardiovascular functional condition, the echocardiography way was use. The first group patients were introduced intravenously the ketamine solution in doze 3 mgr/kg of body weight, propofole in dose 2 mgr/kg of body weight and izoflurane up to 3 ob % in 30-40 minutes after premedication. The second group patients were introduced intravenously the ketamine solution in dose 4-5 mgr/body weight and sibazone in dose 0,4 mgr/kg.

Conclusion: Complex clinical study and taken results of hemodynamic parameters showed the efficiency of carried out anesthesia with safety of independent breathing at small surgical operations at children.

Keywords: *Combined ànesthesia, small surgical operations, propofole, ketamine, sibazone, izoflurane.*

Introduction

Any operation, even small surgical intervention[2] or diagnostic manipulations are multicomponent stress which may be incompatible[3] with the life of many people[5].

The small surgical operations are more often performed in conditions of general anesthesia at children. The given necessity was proved by physiological peculiarities of child's organism, keeping safety of psychoemotial sphere, age features and severity of trauma. But these drugs in recommended doses often give the series negative effects including: suppression of independent breathing, and, the reducing amount of dose leads to non-adequate anesthesia[6]. The choice of anesthetics or their combinations depended on patient's

state, presence severe accompanied diseases, mainly, from the side of cardiovascular system, and also from pharmacodynamics and pharmacokinetic properties of drugs[7].

For solving the given problems some authors[1] offer to use several drugs of different action direction which allow to reduce their doses, and, at the same time to save the demanded level[4] of anesthesia[6].

Nowadays at carry out series small surgical operations in children the special place takes anesthetics, they are propofole and ketamine, which in combination with inhalation anesthesia isoflurane are matching with their pharmacological actions. These combinations of drugs have definite advantages of safe independent breathing[2].

In child's anesthesiology the increase dose and concentration of using drugs lead to depression contractive ability of myocardium[3], considerable changes in hemodynamic indices, which may lead to severe, and, in some cases to irreversible complications at patients with sharply reduced reserves of adaptation[8]. All the above mentioned have the definite actuality of searches more secure ways of anesthesia with safe independent breathing at children.

The aim of study is to research hemodynamic shifts in conditions of taking combined anesthesia on the base of izoflurane with keeping spontaneous breathing at small surgical operations at children.

Materials and Method

The study was carried out in 44 sick children at the age from 3 to 14 years with inguinal and scrotum hernias (41,7 %), hydrocele (19,4%) and at section of abscesses and suppurations.

The premedication was directed to remove vagal reflexes, anxiety, prevention of nausea and vomiting. The duration of anesthetic benefit at 58,3 % patients was to 30 minutes, at 40,66% persons to 60 minutes. Complex clinical study and taken physiological indices such as statistic parameters of cardiac rhythm allowed to evaluate objectively the level of functional shifts in child's organism at presence pain syndrome, which was necessary condition for choice adequate and effective anesthesia.

The patients' examinations were carried out at the following stages: before operation (outcome), after premedication, at introducing narcosis, at maintain period, at waking up time.

For objective evaluation of functional state for cardiovascular system the complex of bloodless electrophysiological ways of blood flow study were used. With this purpose the echocardiography way with analysis of final-diastolic size(FDS), final-systolic size(FSS) of left ventricle, R-R interval and expulsion time were used. The study was carried out on echocardiograph "Interscan 250" (Germany) with sensor 3,5 MHz. The systolic, diastolic and middle arterial pressures were measured by oscillographic method. With the purpose of more detailed and exact estimation the functions of left parts in heart with the help of computer analysis EchoCG the next indices of myocardium contraction ability and diastolic function of left ventricle: cardiac index (CI), beat index (BI), fraction of expulsion (FE), fraction of shortening (FS), specific peripheral resistance (SPR) were carried out.

The control after HR (heart rate) and AP (arterial pressure) were constantly carried out with monitor "Life Scope" (Japan). The index of oxygen saturation was determined with the method of pulse oxymetry.

During premedication the atropine sulfate 0,1 % - 0,01 mgr/kg body weight, dimedrol 1 % solution 0,1 mgr/kg body weight were prescribed, at open repositions for premedication enhancement: 0,5% solution of sibazone in dose 0,25 mgr/kg body weight and 5% ketamine solution in dose 2,5 mgr/kg body weight were additionally administered.

The patients of the first (main) group in 30 – 40 minutes after premedication ketamine solution in dose 3 mgr/kg body weight and propofole in dose 2 mgr/kg body weight and iziflurane inhalation to 3 ob% were introduced. The patients of the second group the ketamine solution in dose 4 – 5 mgr/kg body weight and sibazone in dose 0,4 mgr/kg were intravenously introduced. The maintain doses of drugs composed ½ part from the main ones.

Statistic processing of quantity indices, being taken at the result of special electrophysiological researches was carried out with the help of mathematical statistics. For statistically true results differences were taken only those meanings of "P" which were found in Student table and were less than 0,05. The factual material was given in relative meanings for leveling of age differences for homeostasis on the stage of study (initial data were

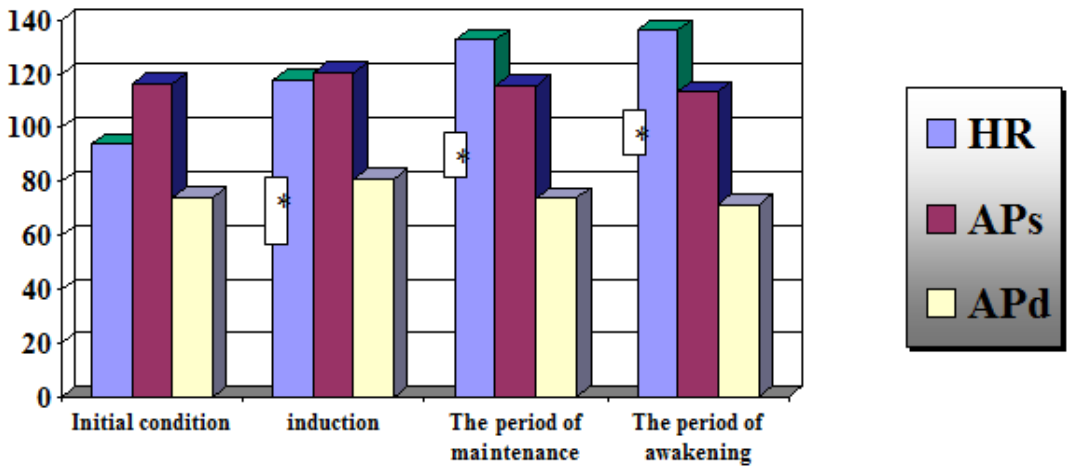
taken for 100%). The authenticity was calculated on the ratio to initial and previous stage of study.

Results

On the stage of introduction narcosis, the loss of consciousness became on the background of intravenous propofole introduction in dose 3 mgr/kg intravenously. After introduction ketamine the insignificant AP (arterial pressure) increase was marked on 5,5% from the level of initial one. RRM (respiration rate movement) was 22 – 36 times per minute. At performing operation more than 30 minutes the patients were intravenously introduced the second dose of ketamine and propofole composing 2/3 part of the main dose. Inhalation with izoflurane was to 1,5 ob%. In 40-50 minutes after carry out operation the patients answered questions in adequate way, orientated themselves in time and space, they recover consciousness in 1,5 hours after performing operation.

The indices of HR (heart rate), AP (arterial pressure) and oxygen saturation ($sP0_2$) at introduction period of anesthesia with use ketamine and propofole were characterized with stability. Smooth falling asleep was marked during 30-40 seconds after bolus introduction propofole, moreover, the disorder of breathing wasn't marked, skin coverings were warm and had usual color. The cornea was moist and shining, cornea reflex was moderately reduced, the eyeballs made swimming movements and they were fixed centrally. The pupils were moderately constricted with safe the reaction to light. The HR (heart rate) increased on 6,36%, there was tendency to increase APc on 3,2% and APd on 2,9% in comparison with their initial data. At introduction propopole in dose 3 mgr/kg the hypotension was observed to 5% from initial index only in 10% cases of observations. In other cases, AP wasn't changed, may be, in connection with ketamine action to increase AP. Thus, ketamine corrected propofole action and reduced hypotensive effect of propofole.

The waking up period was not long and continued 30-40 minutes it was depended on general dose, time of introduction the last sodium oxibutirate dose and individual features of patients. The extubation of trachea was performed at appearance adequate spontaneous breathing. The skin coverings were rose and warm, the vision, larynx, pharynx, coughing reflexes and moving activity were fast restored. APc reduced to 2,86%, APd to 3,49% in comparison with initial data.



* Authenticity of indices differences in comparison with primary ones (P<0,05)

Figure 1. Changes of indices APc, APd и HR at carry out combined anesthesia with ketamine and propofole

At use ketamine in combination with sibazone at children the fast and smooth induction was observed, moreover, depending on dose in that or another level the cardio-respiratory effect as decrease of arterial pressure and reducing breathing, sometimes apnea at fast introduction of drugs, were present. Together with it the sibazone doses for induction anesthesia and its maintain are various depending on age and way of induction (induction dose is from 3 to 5 mgr/kg weight).

Discussion

At combined anesthesia with use ketamine and sibazone the smooth falling asleep of patients was marked during 30 – 60 seconds after bolus introduction of ketamine in dose 5 mgr/kg and sibazone in dose from 3 – 5 mgr/kg body weight, moreover, the disorder of breathing wasn't marked, the skin coverings were warm and had usual color. It was marked the increasing HR on 8,24%, decreasing APc on 6,68% и APd on 4,76% in comparison with initial data (tabl.2).

After introduction calculated dose of ketamine and sibazone the sedative effect was observed. Children began falling asleep and didn't react upon external sounds. The eyeballs made slow swimming movements, the pupils were constricted, their alive reaction to light was saved, the cornea was moist and shining, corneal reflexes were saved. The relaxation of muscular tonus was marked. The respiration rate decreased to 2-3 cycles per minute, moreover, its depth wasn't changed. The tendon and skin reflexes, warm, tactile and pain sensitivity were decreased. In 2-3 minutes was the loss of consciousness. The expressed changes of AP weren't marked either. After introduction ketamine in dose 4-5 mgr/kg body weight, the pupils were sharply constricted with preservation weak reaction to light. The reflexes were depressed. The breathing was smooth and deep. At introduction period of anesthesia, the increase APc index was marked on 7,98% and HR on 32,68% (P<0,05) in comparison with their initial data. At the period of maintain anesthesia the clinical displays were characterized with stability of general symptoms, being marked at the period of introducing narcosis. At the most traumatic moments of operation the researching indices were unauthentic measured.

The results of hemodynamic researches at children at carry out combined ahesthesia with ketamine and propofole are given in table 1. In comparison with initial data on premedication background the increase HR was on 25,27% and specific peripheral resistance (SPR) was on 24,52%. Other indices were little changed. At introduction period of anesthesia, the decrease of CI was on 10,64%, increase of HR was on 15,46% and SPR was on 25,58%. The indices BI, SAP, CI were changed a little in comparison with previous period. During the anesthesia maintain the definite indices changes of central hemodynamics were also observed. Thus, at the most traumatic operation stages in comparison with previous period the tendency to decrease indices CI on 2,38%, BI on 2,97% and SPR on 7,55%, moreover, HR increased on 12,52%.

Table 1. Indices of central hemodynamics in children at carry out combined anesthesia with ketamine, propofole and izoflurane

Indices	Outcome	Premedication	Introduction period	Traumatic stage of operation	Final stage of operation
BI ml/m^2	41,54±1,22	40,49±3,15	41,74±2,01	40,5±3,68	39,63±4,19
SAP mm.m.c.	88,85±1,21	91,2±2,93	94,22±3,75	87,81±4,0	85,44±2,56
HR min^{-1}	94,0±2,38	117,75±2,87*	117,93±3,93*	132,7±8,41*	136,01±8,45*
CI l/min x m^2	4,7±0,4	5,0±0,5	4,2±0,2	4,1±0,4	4,0±0,4
SPR con.un.	40,42±5,31	50,33±7,74	50,76±5,85	46,93±5,17	48,16±7,56

Note: * Authenticity of different indices in comparison with initial meaning (P<0,05).

The data on analogical researches of central hemodynamics at carry out combined anesthesia with ketamine and sibazone are given in table 2.

Table 2. Indices of central hemodynamics in children at carry out anesthesia with ketamine and sibazone

Indices	Outcome	Premedication	Introduction period	Traumatic stage of operation	Final stage of operation
BI ml/m^2	44,86±0,79	51,12±2,14*	49,08±1,91	50,34±2,15*	53,54±6,91
SAP mm. m.c	72,42±2,27	77,03±2,29	77,03±2,4	75,97±2,78	73,03±2,06

HR min^{-1}	92,14±2,09	125,26±3,07*	122,25±2,13*	130,52±5,23*	143,75±7,93*
CI l/min. x m^2	4,83±0,35	5,11±0,21	4,91±0,19	6,63±0,48***	8,03±1,39*
SPR con.un.	71,18±4,74	88,1±10,6	82,24±8,69	83,72±10,6	72,88±4,87

Note: *Authenticity of different indices in comparison with initial meaning (P<0,05). ** authenticity of different indices in comparison with previous stage of study (P<0,05). *** authenticity of different indices in comparison with initial and previous stages of study (P<0,05)

At introduction period of anesthesia, the increase of HR on 32,68% (P<0,05), SPR on 23,77%, BI on 9,41% in relation to their initial meanings were observed. At the most traumatic stages of operation the increase of CI, HR, SI accordingly to 37,27%, 41,65% and 12,22% (P<0,05), and, in comparison with previous stage of study these indices were changed unauthentically. At the end of operation in comparison with the stage of traumatic moment for operation the indices of central hemodynamics were changed a little., which had unauthentical character.

At all main stages in two groups of combined anesthesia the increase SpO_2 index was marked.

Thus, the study clinical symptomatology and noninvasive hemodynamic indices allowed to state that the course of given kinds of anesthesia was accompanied minimum hemodynamic shifts that witnessed on adequacy of anesthesia course.

Conclusion

1. Combined anesthesia with use little doses of ketamine, propofole in combination with inhalation izoflurane at small surgical operations at children was characterized with smooth clinical course, fast waking up from narcosis.
2. In condition of carry out anesthetic benefit with use ketamine, propofole and isoflurane the moderate changes of main indices in central hemodynamics without decrease of the heart performance were marked in children.
3. Use combined anesthesia with ketamine, propofole in combination with izoflurane is optimum method of anesthesia and safe independent breathing at carry out small surgical operation in children.

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Consent: Written informed consent was obtained from all participants' parents of the research for publication of this paper and any accompanying information related to this study. A copy of the written consent is available for review by the authors.

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