

THE REPUBLIC OF AZERBAIJAN

On the rights of the manuscript

ABSTRACT

Of the dissertation for the degree of Doctor of Sciences

OPTIMIZATION OF ANESTHETIC GUIDE IN ONE-DAY SURGERY IN CHILDREN

Specialty: 3231.01 – Anesthesiology and resuscitation

Field of science: Medicine

Applicant: **Esmira Mirza Nasibova**

Baku – 2021

The dissertation work was carried out in the clinical bases and surgery clinic of the Department of Pediatric Surgery of Azerbaijan Medical University.

Scientific consultant: Doctor of Medical Sciences, professor
Isbandiyar Salimkhan Ismayilov

Official opponents: doctor of medical sciences
Vaqif Samad Rahimov

doctor of medical sciences, professor
Yuriy Stanislavovich Aleksandrovich

doctor of medical sciences
Irina Aleksandrovna Savvina

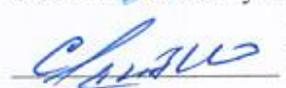
doctor of medical sciences, professor
Inna Georgiyevna Truxanova

Dissertation Council BED 4.06 of the Supreme Attestation Commission under President of the Republic of Azerbaijan, operating on the basis of the Azerbaijan Medical University

The chairman of the Dissertation Council:


doctor of medical sciences, professor
Surkhay Ismayil Hadiyev

Scientific Secretary of the Dissertation Council:


doctor of medical sciences, professor
Fariz Hidayat Jamalov

The chairman of the scientific seminar:


doctor of medical sciences, associate professor
Fuad Jalil Hasanov



İMZANI TƏSDİQ EDİRƏM

Azərbaycan Tibb Universitetinin
ELMİ KATİBİ

Fəhri elmləri doktoru, professor
Nazim Adil oğlu Pənahov


..27..10..21..
20..11

GENERAL DESCRIPTION OF WORK

The relevance of the problem. In the last decade, the interest in outpatient surgery, which is also called "one-day surgery", "one-day hospital", "day-case surgery", "outpatient surgery", has been growing quite widely.

According to Morgan et al. (2018), in the USA 60-70% of surgical interventions are performed on an outpatient basis, number of elderly patients and children operated on outpatient basis increases every year ¹. С.Е. Collins (2010) believes that up to 75% of pediatric surgeries can be performed on an outpatient basis ². The British Association for Day Surgery (BADs, 2019) has released a catalog of recommendations for one-day and short-term surgeries ³. The recommendation states that 50% of surgeries should be performed in a one-day hospital.

In recent years, the possibilities and scope of one-day surgery in children have significantly expanded ⁴. The interest in one-day surgery is due to such advantages as a short waiting time for surgical intervention, elimination of mental trauma from prolonged separation from parents, significant savings in patient treatment, high bed turnover, and a low level of secondary infection. Currently, this area of medicine is the most developing in the world ⁵⁶.

¹ Морган, Дж.Э. Клиническая анестезиология / Дж.Э. Морган, М.С. Михаил, М.Дж. Марри / Пер. с английского. - М.: Бином, - 2018. - 1216 с.

² Collins, С.Е. Challenges in pediatric ambulatory anesthesia: Kids are different / С.Е. Collins, L.L. Everett // *Anesthesiol Clin.*, - 2010. v. 28, no 2, - p. 315-328.

³ Guidelines from the Association of Anaesthetists and the British Association of Day Surgery (BADs), 2019

⁴ Большедворов Р.В. Определение оптимальных методов анестезии с сохраненным спонтанным дыханием для амбулаторной анестезиологии // *Анестезиология и реаниматология*, - 2009, № 6. - с. 32-38

⁵ Булатов И. Особенности современной амбулаторной анестезии. / Русский анестезиологический сервер, 2010. URL: https://online.zakon.kz/Document/?doc_id=30623548#pos=0;0

⁶ Джексон И. Седация в плановой и амбулаторной хирургии: препараты, методики, мониторинг и выбор пациентов / Пер. с англ. под ред. Недашковского Э.В.: - Милан, Италия, - 2009. - 789с.

Anesthesia carried out according to generally accepted rules with artificial ventilation of the lungs and leading to long-term post-anesthetic depression, dyspeptic disorders, emotional and psychological discomfort and other side effects when children are in the clinic of "one-day surgery" is not desirable. Many foreign authors are discussing the possibility of post-anesthesia observation of a patient, bypassing his transfer to the post-anesthesia care unit(PACU), the so-called fast track, and its introduction into the practice of one-day surgery hospitals for stable patients, in case if properly organization is provided ¹.

If patients had the fast track criteria (awakening after anesthesia, opening the eyes according to verbal instructions), 10 minutes after the termination of general anesthesia, they were transferred for observation to the fast track group, that is, directly to the usual postoperative observation ward, and when non-compliance with the fast track criteria, patients were transferred to the PACU for observation. Enhanced recovery after surgery (ERAS) or the so-called fast track is an important clinical approach; however, these programs have not found widespread use in one-day surgery in children. In the era of modern surgery, it is vital to provide high quality, resource and patient focused medical care. ERAS fast track is a concept designed to achieve these goals. The concept of "fast track" covers all phases of the perioperative period: preoperative, intraoperative and postoperative².

The preoperative strategy includes: 1) patient education - explanation and real information about the upcoming medical procedures, surgery, postoperative period, advantages of the "fast track" program, it is necessary to inform the patient about the results of the operation in advance; 2) no food restriction before surgery. Therefore, it is nec-

¹ Christopher P. Understanding Costs of Care in the Operating Room/ Childers, MD; Melinda Maggard-Gibbons, MD, MSHS // JAMA Surg. 2018;153(4):e176233. doi:10.1001/jamasurg.2017.6233

² Kehlet, H. The future of fast-track surgery // British Journal of Surgery, – 2012. v. 99, no 8, - p. 1025-1026

essary to improve the anesthetic management of pediatric outpatient surgery. The implementation of this issue has now become very urgent. The initial decision depends on the psychosomatic and laboratory status of the patient in the preoperative period, on the improvement of methods and on the choice of safe anesthesia, which affects both the length of his stay in the hospital and his condition in the next few days after the operation.

When selecting patients for one-day surgery, it is also necessary to pay attention to whether the patient has good social conditions and the possibility of organizing care for him at home during the rehabilitation period.

The analysis of numerous foreign and domestic literature showed that the issue of the types of anesthesia and combinations of intravenous, inhalation and regional anesthesia for “small” surgical interventions in children is insufficiently covered. Considering the above, one of the objectives of our research was to substantiate the combinations of different types of anesthesia, depending on the requirements for outpatient anesthesiology in children.

Thus, conflicting opinions about the optimal options for anesthesia in “day surgery” and the lack of clear criteria for choosing the best method of anesthesia in pediatric outpatient surgery prompted this study. The search for the best type of anesthesia in a “one day” hospital - effective, maximally safe and comfortable for the patient, convenient for both the surgeon and the anesthesiologist, has become urgent.

Object of study. The object of the study was 794 children aged 0 to 16 years with the risk of class I and II anesthesia according to ASA, who were operated in a planned manner under the conditions of one-day surgery in the departments of neonatal surgery, abdominal surgery, urology, maxillofacial, ophthalmology, and throat-nose surgery, neurosurgery, traumatology and orthopedics. All patients, depending on the type of anesthetic aid, were divided into 6 groups. All groups are comparable in gender, weight, age, volume and duration of surgical interventions. The groups were randomized by age: 0-3 years old, 4-7 years old, 8-16 years old.

Aim of study. To optimize the anesthetic aid for “small” surgical interventions in children under one-day surgery by comparing different methods of anesthesia, as well as using an internal medical audit based on the analysis of critical incidents.

Research Objectives:

1. To study the efficacy and safety of intravenous total anesthesia based on propofol, ketamine, midazolam, fentanyl for “small” surgical interventions in children.

2. Determine the advantages and disadvantages of modern inhalation anesthetics (halothane, isoflurane and sevoflurane), make recommendations for their use at various stages of general anesthesia. Assessment of the clinical features and safety of different methods ("bolus " and " stepwise ") of induction of anesthesia with sevoflurane and to develop an algorithm for their use in “small” surgical interventions in the conditions of one-day surgery in children; assessment of the clinical course and the period of awakening during inhalation anesthesia with halothane, isoflurane and sevoflurane.

3. Study the effectiveness of new minimally invasive methods of maintaining free airway patency (LMA and COPA) under general anesthesia for “small” surgical interventions in children, to systematize their advantages and disadvantages, to determine indications and contraindications for their use in children.

4. Compare the efficacy and safety, duration of caudal anesthesia with bupivacaine, ropivacaine and ropivacaine + dexamethasone used in “small” surgical interventions in a one-day surgery in children. Investigate the possibility of prolonging the analgesic effect with the combined introduction of ropivacaine and dexamethasone into the caudal canal.

5. Develop and introduce into clinical practice an effective and safe new modification of the caudal anesthesia method, to determine the advantages of its use in comparison with the classical one. Investigate stress markers - cortisol, glucose as criteria of adequacy in different variants of caudal anesthesia.

6. Compare the assessment of the efficacy and safety of intermediate-duration non-depolarizing muscle relaxants (atracurium besyl-

ate, cisatracurium besylate and rocuronium bromide) in patients of different age groups at all stages of general anesthesia based on neuromuscular monitoring on the TOF-Watch device. To establish the characteristic parameters of the studied muscle relaxants dose actions in patients according to the potentiating effect of sevoflurane and isoflurane.

7. Develop criteria for the safe transfer of patients from the operating room to the surgical ward and their inclusion in the fast track (ERAS) group (accelerated postoperative management).

8. Using internal medical audit, based on the analysis of critical incidents, to determine and substantiate the most effective and safe methods of anesthesia for “small” surgical interventions in the conditions of one-day surgery in children. To study and carry out a comparative assessment of our proposed different anesthesia schemes for “one-day” surgery in children of different ages. To identify the economic value of the various pediatric anesthesia treatments we have proposed and developed.

Research Methods:

- Research methods to determine the adequacy of anesthesia
- Methods for assessing the degree of sedation
- Methods for assessing pain
- Patient selection criteria
- Choice of anesthesia method
- Anesthesia techniques using a laryngeal mask
- Anesthesia technique using endotracheal tube
- Methods for assessing patient recovery after anesthesia
- Internal anesthesiology audit based on registration of critical incidents
- Study the action of muscle relaxants
- Assessment of neuromuscular conduction
- Pharmacoeconomic analysis
- Statistical processing methods

The main provisions of the dissertation submitted for discussion

1. The most effective and safe scheme for the use of inhalation

anesthesia in children under the conditions of one-day surgery is a quick “bolus” induction of sevoflurane and maintenance with isoflurane.

2. The introduction of an internal medical audit methodology based on the recording of critical incidents in the routine work of the Department of Pediatric Surgery reduces the incidence of anesthetic complications, thereby increasing patient safety.

3. The developed method of caudal anesthesia (technique without turning the needle) allows you to successfully perform anesthesia in all patients, without exception, in contrast to the classical technique (in 87.3% of cases), and is an effective and safe method of analgesia for “small” surgical interventions in children.

4. It was established that during caudal anesthesia with ropivacaine in combination with dexamethasone, a pronounced and lasting analgesic effect was obtained, as well as stability indicators of vital functions of the body.

5. Non-depolarizing muscle relaxants rocuronium bromide, atracurium and cisatracurium besilate are effective and safe when used in all age groups. To assess the depth of muscle relaxation, the use of the neuromuscular TOF-watch monitor in the intraoperative period is appropriate.

The inclusion of sevoflurane in the anesthesia scheme creates the conditions for the possibility of using low doses of muscle relaxants due to the fast and comfortable induction of anesthesia, a high elimination rate, and a powerful analgesic and muscle relaxant effect. Such a combination makes it possible to optimize the anesthetic management of short and intermediate duration of surgical interventions and provides early postoperative activation of patients.

Scientific novelty:

- In order to optimize the anesthesiology benefit in pediatric outpatient surgery, a comparative analysis of different multimodal anesthesia options for “small” surgical interventions in children of different ages will be carried out based on an in-depth study of the preoperative state of the indicators of the autonomic nervous system, hemodynamics, and clinical data, the adequacy of anesthesia and an

objective assessment of their effectiveness will be given.

- We found that the optimal method of anesthesia for “small” surgeries below the navel in one-day surgery in children is caudal anesthesia in combination with intravenous administration of propofol.

- A caudal anesthesia method has been applied and studied in children with a single dose of ropivacaine 3 mg / kg in combination with 0.1 mg / kg dexamethasone.

- A modified method of caudal anesthesia was developed and scientifically substantiated.

- The adequacy of different variants of caudal anesthesia was assessed based on their effect on the level of cortisol and glucose in the blood.

- A comprehensive assessment of the efficacy and safety of the use of sevoflurane, isoflurane and halothane for “small” surgical interventions in the conditions of one-day surgery in children was carried out.

- Algorithms for inhalation induction of anesthesia with sevoflurane in children have been developed using initially high concentrations of anesthetic in the respiratory circuit, which can significantly improve the quality of induction anesthesia, taking into account its effectiveness and safety.

- The parameters of the efficacy and safety of the use of LMA and the COPA were studied to maintain airway clearance during general anesthesia in children.

- Criteria for accelerated patient management in the postoperative period (fast track) in one-day surgery have been developed and tested; the possibility of transferring the vast majority of patients ($\approx 90\%$) directly to the ward of the surgical department without placement in the PACU has been established.

- A comparative characterization of the efficacy and safety of the studied drugs (non-depolarizing muscle relaxants atracurium besilate, cisatracurium besilate, rocoronium bromide) is given in patients of different age categories with balanced general anesthesia.

- A comparative analysis of the qualitative indicators of in-

traoperative myoplegia based on monitoring using the TOF-Watch device was carried out.

- The rate of development of neuromuscular blockade was established, adequate conditions for tracheal intubation were identified, the most effective duration of the relaxation period after the use of muscle relaxants (loading and maintenance doses) was determined, and the parameters of the surgeons' comfortable work were studied.

- The results of the study made it possible to develop recommendations for the inclusion of the studied muscle relaxants - sevoflurane or isoflurane in the general anesthesia scheme, to systematize the positive and negative aspects of this inclusion, to generalize the contraindications to their use in pediatric patients.

Practical significance:

- The main indicators of induction and the period of awakening during general anesthesia were studied on the basis of one of the inhalation anesthetics like sevoflurane, isoflurane or halotane.

- The criteria for the safe use of the endotracheal tube, LM and COPA airway in pediatric anesthesiology measures were studied.

- Recommendations on their use at different stages of anesthesia were developed, indications and contraindications, advantages and disadvantages of their use in children were determined.

- Criteria have been developed to assess the effectiveness of post-anesthesia awakening, which facilitate the fast track transfer of a patient after anesthesia directly to the ward of the surgical department without being placed in the post-anesthesia care unit (PACU).

- The practical significance of the use of dexamethasone in combination with ropivacaine in case of caudal anesthesia in children is determined by the prolongation and deepening of the analgesic effect proved in this work within 24 hours after the surgery. This improves the postoperative well-being of the patient, reduces the burden on the patient and medical personnel in the postoperative period (due to the reduction of labor costs for additional pain relief and control the complications caused by deeper post-narcotic depression after general anesthesia).

- During the study with the use of the TOF-watch neuromuscular

monitor, it was found that the use of non-depolarizing muscle relaxants such as atracurium and cisatracurium besylate, rocuronium bromide, with strict observance of the protocols for the use of these drugs, contributes to high efficiency and safety during open and laparoscopic surgeries.

- The feasibility of using the monitoring of neuromuscular conduction of TOF-Watch in routine practice during anesthesia with the use of muscle relaxants is substantiated.

Testing the dissertation. The main provisions of the dissertation were presented at conferences: XVII Republican Scientific Conference of Doctoral Students and Young Researchers (Baku, 2012); Scientific-practical conference dedicated to the 100th anniversary of T.E.D., Professor AM Alizade (Baku, 2015); T.e.d., Professor A.A. Scientific-practical conference dedicated to the 80th anniversary of Akhunbeyli (Baku, 2018); Scientific-practical congress on special pediatric surgery to the 80th anniversary of the Department of Pediatric Surgery of Azerbaijan Medical University (Baku, 2019), Actual problems of modern medicine. Materials of the IV International Scientific-Practical Conference of the Caspian littoral states (Astarkhan, 2019), 4th International Conference Anesthesiologists and Surgeons. (USA,2021, 26 march).

The initial discussion of the dissertation took place at a joint meeting of the departments of anesthesiology and ICU, pediatric surgery, I surgical diseases, general surgery, maxillofacial surgery, ENT diseases (March 28, 2019, protocol No. 9). The dissertation was approved for defense at the scientific seminar of the Dissertational Council BED 4.06 at the AMU (June 21, 2021).

Implementation of findings into practice. The results of the study were introduced into the clinical practice of the Department of Pediatric Surgery of the CMC in Baku and the Educational and Surgical Clinic of the AMU, as well as in the educational process of the Department of Pediatric Surgery of the AMU.

Publication on the materials of the dissertation. According to the main provisions of the dissertation, 63 scientific papers were published, including a textbook and a monograph “Pediatric anesthesiol-

ogy”.

Organization of the dissertation. The dissertation work was performed in the clinical bases of the Department of Pediatric Surgery and in the surgical clinic of the Azerbaijan Medical University.

The volume and structure of the work. The dissertation consists of an introduction (21.500 characters), 9 chapters (70.700 + 67.000 + 54.000 + 23.800 + 27.100 + 28.200 + 47.400 + 8.400 + 10.400 characters), conclusions, findings, practical recommendations (65.600 characters) and a bibliographic index. The dissertation text contains 424.100 characters, 90 tables, 32 graphics and 6 figures. References include 365 sources.

GENERAL CHARACTERISTIC OF PATIENTS AND RESEARCH METHODS

General characteristics of patients. The study was conducted in the clinical facilities of the Department of Pediatric Surgery and in the surgical clinic of the AMU from 2010 to 2018. The study included 794 children aged 0 to 16 years with a risk of ASA grade I and II anesthesia, operated on a routine basis in one-day surgery in the departments of neonatal surgery, abdominal surgery, urology, maxillo-facial, ophthalmology, ENT and neurosurgery. Depending on the method of anesthesia used, patients were divided into 6 groups:

Group I (n = 106). Induction anesthesia and maintenance of anesthesia in patients of this group was carried out by inhalation of sevoflurane through the facial mask and bolus administration of fentanyl. All patients were also breathing on their own with inhalation of an oxygen-air mixture ($FiO_2 = 0.5$) through a facial mask. Depending on age, this group was divided into 3 subgroups: IA (n = 56) age 0-3 years, IB (n = 24) - 4-7 years, IC (n = 26) - 8-16 years.

Group II (n = 58). Induction anesthesia in patients of this group was carried out by means of a bolus injection of propofol and fentanyl. Anesthesia was maintained by continuous infusion of propofol with a Perfusor Space Braun syringe pump or by bolus administration of fentanyl. All patients were breathing on their own with inha-

lation of an oxygen-air mixture ($FiO_2 = 0.5$) through a face mask or nasal cannula. Depending on the age of the children, this group was divided into 3 subgroups: IIA (n = 12) age 0-3 years, IIB (n = 33) - 4-7 years old and IIC (n = 13) - 8-16 years old.

Group III (n = 156). Induction anesthesia was carried out by bolus administration of propofol and fentanyl. After the introduction of intermedium-acting muscle relaxants, rocuronium bromide or atracurium besylate or cisatracurium besylate, intubated the trachea. Mechanical ventilation was carried out using a Dräger anesthetic-respiratory apparatus with an oxygen-air mixture ($FiO_2 = 0.5$) according to the Low-Flow technique in the normocapnia mode. Anesthesia was maintained by continuous infusion of propofol using a Perfusor Space Braun syringe pump or an isoflurane inhalation anesthetic and a fentanyl bolus. Group III was divided into 3 subgroups depending on the muscle relaxant used: IIIA (n = 52) with rocuronium bromide, IIIB (n = 52) with atracurium besylate and IIIC (n = 52) with cisatracurium besylate.

Group IV (n = 159). Induction into anesthesia was carried out by inhalation with halotane, or sevoflurane, or isoflurane, and maintenance of anesthesia with isoflurane or halotan. Depending on the type of airway provision, this group was divided into 3 subgroups: IVA subgroup (n = 66) - children with an endotracheal tube (ET), IVB subgroup (n = 26) - children with a laryngeal mask (LMA), IVC subgroup (n = 67) - children with COPA or S-shaped airway. Depending on the inhalation anesthetic used, the subgroups were also divided into: IVA₁ with halothane (n = 30), IVA₂ with isoflurane (n = 16), IVA₃ with sevoflurane (n = 20), IVB₁ with halothane (n = 10), IVB₂ with isoflurane (n = 5), IVB₃ with sevoflurane (n = 11), IVC₁ with halothane (n = 26), IVC₂ with isoflurane (n = 10), IVC₃ with sevoflurane (n = 31).

V group (n = 278). Induction anesthesia was carried out by bolus administration of propofol. After the patient was completely asleep, a caudal block was administered with the introduction of a local anesthetic (bupivacaine, ropivacaine and ropivacaine + dexamethasone) into the caudal canal. Maintenance of anesthesia was provided by

continuous infusion of propofol using a syringe pump or bolus injection. Depending on the type of local anesthetic used, the group was divided into three subgroups: VA (n = 34) caudal block with bupivacaine, VB (n = 100) caudal block with ropivacaine, VC (n = 140) caudal block in combination ropivacaine with dexamethasone.

Group VI (n = 37). Induction anesthesia in patients of this group was carried out by means of an intravenous bolus of ketamine at a rate of 2 mg / kg. 20 minutes before surgery, patients of this group were premedicated with midazolam 0.4 mg / kg orally or 0.3 mg / kg intramuscularly. Anesthesia was maintained by intravenous bolus administration of fentanyl 3 µg / kg and ketamine 1 mg / kg. All patients were breathing on their own with inhalation of an oxygen-air mixture (FiO₂ = 0.5) through the face mask. This group was divided into 3 subgroups depending on age: VIA (n = 12) - age 0-3 years, VIB (n = 13) - age 4-7 years and VIC (n = 12) - age 8-16 years old.

Research Methods. The effectiveness of intra- and postoperative analgesia was evaluated on the basis of hemodynamic parameters, as the most dynamic in terms of nociceptive reactions of the body, which were recorded at the following stages of the study: initial data (after premedication), the beginning of the operation (skin incision), the main stage (the most traumatic moment of the operation), the end of the operation (stitches on the skin), the postoperative period (pain occurs). We took the data of P.G. Murphy (1994) and M.M. Parker (1998) as the basis for assessing changes in systolic blood pressure (BP) and heart rate. A 20% increase above age target was considered a moderate increase, more than 20% - pronounced. To assess the adequacy of different options for anesthesiology benefits, we also used the RPP indicator - a double product. According to normal physiology, there is an inverse correlation between the level of systolic pressure and heart rate, i.e. with an increase in blood pressure, the heart rate decreases. To register this connection, the Robinson Index (BPs × HR / 100) was introduced into practice, which is also called the “double product” or RPP (rate pressure product). An increase in RPP is a sign of a violation of the baroreceptor control that develops under stress of any origin (in particular pain), and can

serve as an important indicator in the system for assessing the severity of the intra- and postoperative state of patients. To determine the adequacy of the applied methods of anesthesia, we studied the parameters of central hemodynamics. Physical-mathematical methods for calculating the parameters of hemodynamics, in particular, minute and stroke cardiac output, are the most effective and have advantages over others in childhood due to the absence of harm or any anxiety for the subject, the possibility of arbitrarily often determining these hemodynamic parameters. To determine the stroke volume of the heart, the Starr formula was used in children older than 7 years and the modified N.A. formula Romantseva in children under 7 years of age:

$$\text{HSV} = (40 + 0.5 \times \text{PP} - 0.6 \times \text{DBP}) - 0.2 \times \text{W} - \text{for children under 7 years' old}$$

$$\text{HSV} = (80 + 0.5 \times \text{PP} - 0.6 \times \text{DBP}) - 0.6 \times \text{W} - \text{for children over 7 years old.}$$

Total peripheral vascular resistance (TPVR) - the value of resistance to blood flow in the vessels is a derivative of blood pressure and volumetric blood flow velocity according to the Poiseuille law:

$$\text{TPVR} = \text{MAP} \times 1332 \times 60 / \text{MCV dyn} \times \text{sec} \times \text{cm}^{-5}.$$

$$\text{MAP} = \text{DBP} + 0.43 \times (\text{SBP} - \text{DBP}) \text{ mmHg}$$

To assess the adequacy of different methods of anesthesia, stress markers are determined. A marker of stress is the level of glycemia, which can increase due to the activation of the sympathoadrenal system, as well as a decrease in insulin activity under the influence of surgery and analgesia. In patients of all studied groups, the level of glycemia was measured with a glucometer at five stages of the study: 1- before surgery, baseline data, 2 - after skin incision; 3- at the traumatic stage of the operation and 4 - at the end of the operation, 5- at the time of pain. One of the essential criteria for the adequacy of

patient protection against operational stress is the state of corticosteroid activity of the adrenal glands. As a test that allows us to judge steroid secretion, we used the determination of the level of cortisol in the peripheral blood by the enzyme immunoassay using the Bio-test instruments ins. ELX800, (USA). Blood was collected in dry, chilled tubes at 5 stages of the study and immediately centrifuged: 1- before surgery; 2- at the beginning of the operation; 3- at the traumatic moment of the operation; 4 - after the application of skin sutures, 5 - in the postoperative period, at the time of the onset of pain. The serum was immediately transferred to dry polystyrene tubes, which were stored at 20 ° C until hormone testing. To evaluate pain in the postoperative period, different scales were used: Oucher scale, CRIES scale and visually analogue scale. To assess the degree of sedation in the preoperative period when using midazolam in premedication, the Ramsay sedation scale was used. Assessment of the degree of sedation was carried out 5, 10 and 20 minutes after premedication.

To conduct a comparative assessment of the effectiveness and safety of atracurium besylate, cisataracurium besylate and rocuronium bromide, dynamic monitoring of the indices of neuromuscular conduction by the accelerometric method was carried out. Monitoring of neuromuscular conduction by the TOF stimulation method (“traine of four”) was carried out using a TOF-watch instrument (Organon Teknika, Belgium) (Fig. 1).

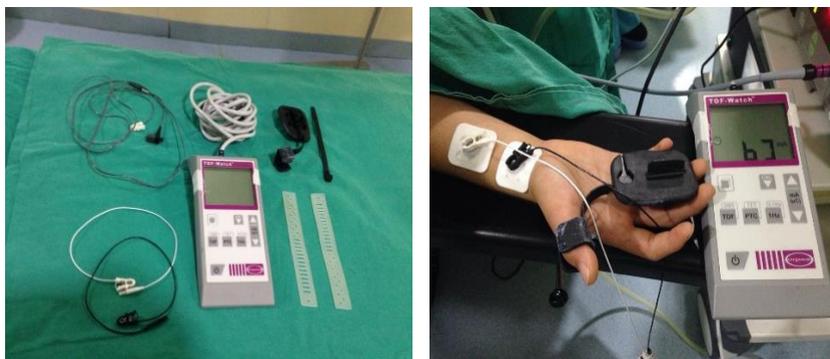


Fig. 1. Monitoring neuromuscular conduction.

The device is equipped with a piezoelectric transducer (accelerometer sensor), which is fixed on the inner surface of the distal phalanx of the thumb. The state of neuromuscular conduction was evaluated by measuring the electromyographic responses m. adductor pollicis in response to 4 consecutive supramaximal irritation of the ulnar nerve (a rectangular pulse of 0.2 ms duration, 2 Hz every 10 seconds) through stimulatory electrodes placed on the wrist - proximal (white) and distal (black colors). We measured the response to the first of 4 irritations (T_{initial}) before the introduction of muscle relaxants, the change in the value of T_1 relative to the initial level in percent (T_1 / T_{initial}) and the ratio of the value of the latter to the first response in percent (T_4 / T_1 or TOF). At amplitude of 25% of the initial value, the response to the 4th pulse (T_4) TOF disappears. Responses to the 3rd and 2nd impulses (T_3 and T_2) cease to be recorded at values of $T_1 = 20\%$ and $T_1 = 10\%$ of the amplitude, respectively. A clinically stable level of relaxation corresponds to at least 90% decrease in amplitude compared to the initial level ($T_1 \leq 10\%$). In this case, only one response to stimulation in the TOF mode is detected and satisfactory conditions for muscle relaxation are provided for mechanical ventilation and for the comfortable operation of surgeons. The block depth was calculated as the difference T_{initial} , taken as 100%, and T_1 / T_{initial} values at a given time. Evaluation of clinical criteria for recovery included: 1) the time of extubation – x_1 ; 2) eye opening time – x_2 ; 3) while ready to withdraw from the operating room – x_3 ; 4) the time from the moment of extubation to the readiness to withdraw from the operating room – $x_4 = x_3 - x_1$.

When performing tracheal intubation, a 4-point scale (H.S. Young et al., 1975) was used to assess the intubation conditions, which are traditionally divided into excellent, good, poor and impossible for intubation. At the stage of maintaining muscle relaxation, the following was assessed:

- 1) the interval between injections of maintenance boluses of muscle relaxants (time up to 10% T_1 recovery);
- 2) the quality of myoplegia and the comfort of work (subjective assessment of surgeons).

Improving patient safety by improving the quality of the anesthetic aid through the development of new protocols and conducting an internal medical audit based on the recording of critical incidents during anesthesia during minor pediatric surgeries was one of the main objectives of our study. As a result of this work, we have identified the following series of critical incidents:

- Laryngospasm
- Bronchospasm
- Hypoventilation RR<10
- Cough
- Critical hypoxemia
- Delayed motor activity and recovery of consciousness
- Difficult intubation
- Moderate hypoxemia
- Bradycardia
- Tachycardia
- Hypotension
- Motor excitement
- Nausea and vomiting
- Allergy
- Chills and muscle tremors.

The study conducted a quantitative and qualitative analysis of critical incidents. Critical incidents were recorded in the intra- and postoperative periods, adapted to the conditions of the day hospital. All identified incidents were entered into special protocols for subsequent statistical processing and further analysis of the results.

One of the objectives of our study was to determine the criteria for selecting patients for the “fast tracking” program. The objective of this part of the study was to assess the applicability of the developed criteria for inclusion of patients in the “fast tracking” group (ie, accelerated discharge of patients with their transfer from the operating room to the ward of the surgical department, bypassing the PACU).

The following indicators were monitored in the PACU:

- ECG with heart rate calculation;

- Blood pressure by non-invasive method;
- Spo₂.

Comparison of the effectiveness and safety of anesthesia methods, the course of the postoperative period was carried out on the basis of the concept of a critical incident. The following groups of critical incidents were identified:

1. Respiratory system disorders.
2. Disorders of the circulatory system.
3. Disorders of the central nervous system.

Respiratory system disorders.

The following variants of breathing disorders were distinguished:

1. Moderate hypoxemia - decrease in SpO₂ 91-93% when oxygen is supplied with a flow of 5 l / min. The reasons for this may be:
 - as a result of the residual effect of anesthesia medications which did not require the intervention of medical personnel, or it was enough just to call the patient.

2. Severe hypoxemia - a decrease in SpO₂ below 91% and the reason for this may be the retraction of the tongue. At the same time, auxiliary ventilation was not required, it was enough to perform the triple maneuver by Safar.

3. Severe hypoxemia with a decrease in SpO₂ below 91%, for the therapy of which assisted ventilation was required (early extubation, drug-induced respiratory depression, etc.).

Disorders of the circulatory system

1. Hypotension as a consequence of hypovolemia.
2. Hypotension as a result of side effects of the applied anesthetics.

3. Violation of the rhythm of the heart.

Disorders of the central nervous system.

1. Prolonged awakening - the appearance of consciousness later than 20 minutes after stopping the administration of propofol.

2. Postoperative delirium based on the following:

- severe lethargy;
- motor excitement;
- speech excitement;

- hallucinations;
- unreasonable and obsessive fear;
- persistent sleep disturbance in the absence of pain.

The study of the mental status was carried out in the postoperative period, the first signs (disorientation, motor and speech excitement, etc.) were assessed immediately after awakening. The final diagnosis of the presence or absence of postoperative delirium was made 2 hours after the end of anesthesia. The developed system of internal medical audit took into account the number of critical incidents: 1. For compared methods of anesthesia for the same type of surgery. 2. For postoperative patients who have passed through the PACU and bypassing it, etc.

Pharmacoeconomic analysis. To minimize the costs, a pharmacoeconomic analysis of anesthesia methods used in one-day pediatric surgery was carried out by calculating the costs of the most frequently used anesthetics. To determine the consumption of the used inhalation anesthetics, the formula proposed by Ehrewerth J., Eiskraft J was used:

$$\text{anesthetic agent flow rate (ml / h)} = 3 \times \text{FGF} \times \text{vol. \%}$$

where, FGF - fresh gas flow, l / min

about. % is the volumetric percentage on the evaporator.

This formula for the flow rate of the inhalation anesthetic is suitable for a quick and approximate calculation. We also used an inhalation anesthetic agent consumption calculator.

Methods of statistical processing of digital data. The obtained quantitative and qualitative data were statistically processed by biostatistical methods: variational (t-Student, U-Mann-Whitney, KU-Kraskel-Wallis), dispersive (test ANOVA, F-Fisher) and discriminant (Pearson Chi-Square) analyzes using statistical packages EXCEL-2013 and SPSS-21.

RESEARCH RESULTS

To determine the ideal anesthetic for small surgical operations in children, we conducted a comparative analysis between the I (sevoflurane + fentanyl) and II (propofol + fentanyl) groups. During the study, in patients of group I, inhalation anesthesia with sevoflurane was carried out according to two methods: 1) fast "bolus" induction with preliminary saturation of the respiratory circuit with a mixture of high (6-8%) sevoflurane concentration; 2) stepwise induction. Also, during the study, they tried to identify the advantages and disadvantages of two methods of induction of anesthesia with sevoflurane.

The study revealed that the time of the onset of the surgical stage of anesthesia (III₁) is characterized by a central location of the pupils and the lack of response to mild pain stimuli (venous puncture), with bolus induction of anesthesia, significantly less with the "step-by-step" method. So, loss of consciousness occurred within 30-40 seconds, while the appointment of midazolam before anesthesia, loss of consciousness during the induction period occurred in 15-20 seconds, practically by 4-5 breaths using the "over-pressure" method or by the end of 2-3 breaths with "bolus" induction. There was also a slight increase in heart rate and respiratory rate by 7.7% and 7.6%, respectively, of the initial values. In this case, contact children did not express feelings of pronounced discomfort when inhaling a gas-narcotic mixture. With "step by step" induction, the consciousness of children was lost for 2-3 minutes from the start of the sevoflurane delivery. Practically, all elderly contact children noted discomfort associated with prolonged inhalation of the drug mixture. The stage of excitation in the form of involuntary movements of the extremities was observed in almost all cases of anesthesia induction using this technique. In addition, the frequency and severity of the manifestations of arousal in children who underwent a "stepwise" induction of anesthesia with sevoflurane were significantly greater than with the "bolus" method. Thus, the method of stepwise induction of anesthe-

sia with sevoflurane was significantly inferior in speed and comfort before rapid inhalation induction of anesthesia. Therefore, we refused to conduct anesthesia induction with sevoflurane in a step-by-step manner and found it advisable to use "bolus" induction in the course of our work.

When assessing hemodynamics, it was noted that the difference between blood pressure indicators in all stages were statistically unreliable, with the exception of the values in the first minute after the start of sevoflurane inhalation. However, with respect to the initial value, in the first minute after the start of sevoflurane inhalation, the average blood pressure increased by 2.8% ($p < 0.01$), the heart rate increased and amounted to 7.7% ($p < 0.001$) from the initial values, and the total peripheral vascular resistance (TPVR) decreased by 4.2% ($p < 0.01$), respiratory rate (RR) increased by 7.6 ($p < 0.01$) and tidal volume decreased by 20.7% ($p < 0.001$). The increase in respiratory rate during the period of rapid inhalation induction of anesthesia by sevoflurane in children was compensatory in nature as a result of a decrease in tidal volume (more shallow breathing) under the influence of high sevoflurane concentrations in the first minutes of induction by this method, which is confirmed by the dynamics of the PetCO₂ concentration. Moreover, since the PetCO₂ and SpO₂ indices remained within the physiological values, it can be indirectly considered that this compensation was adequate.

Thus, the study of step-by-step and quick "bolus" methods of inhalation induction of anesthesia with sevoflurane showed that the latter is safe, comfortable and effective in children of different ages. When using the step-by-step technique of sevoflurane induction, the frequency of critical incidents in the form of excitation is higher than 1.5 times, the time of loss of consciousness and the time of the onset of the surgical stage are 2 times longer compared with the "bolus" technique. One of the objectives of our study was to conduct a comparative study of two methods of general anesthesia: 1) intravenous total anesthesia using propofol with fentanyl; 2) inhalation anesthesia using sevoflurane and fentanyl with preserved spontaneous breathing during small surgical interventions. At this stage of the study, we

evaluated not only the number and nature of critical incidents, but also the temporal characteristics of periods of anesthesia induction, awakening, and the second phase of recovery. During the study, we found that when applying total intravenous anesthesia using propofol and inhalation anesthesia using sevoflurane in time from the start of induction to the start of the operation, from the moment the patient stops administering the main anesthetic drug until his arousal, reaction to simple commands of anesthesiologist and up to a complete restoration of orientation in time and space do not differ significantly. So in patients of group I (sevoflurane + fentanyl) is 7 minutes, and in patients II (propofol + fentanyl) - 15 minutes.

Although, from the termination of the main anesthetic administration (propofol or sevoflurane) to the patient until the readiness and ability to leave the hospital in the group where total intravenous anesthesia (propofol + fentanyl) was used (group II) it was 30 minutes less than the patients in the group inhalation anesthesia (sevoflurane + fentanyl) (group I) and it is 2.39 and 2.69 hours, respectively.

In the analysis of pain in the postoperative period in the study groups, we found that the pain sensation in patients arose almost 3-4 times more often after using propofol than after using sevoflurane. So, pain was most often recorded in patients in the group where propofol was used as the main anesthetic (22.4% versus 4.7%), and therefore, analgesics in the postoperative period were used more in patients of group II (42.1% against 11.3%). Postoperative pain was assessed using the Hannalah score. So, 6 points (severe pain) in the immediate postoperative period was observed in 5 (4.7%) patients of group I and in 13 (22.4%) patients of group II, which required the introduction of painkillers. Perhaps this is due to the ability of sevoflurane to potentiate the analgesic effect of fentanyl.

The main reason impeded the patient to leave the surgery room in patients of group II (propofol + fentanyl) is the rapid development of postoperative apnea due to an increase in the dose of fentanyl. So, fentanyl consumption in patients of group II was greater (5 $\mu\text{g} / \text{kg}$) than in patients of group I (3 $\mu\text{g} / \text{kg}$). A difference was also found in

the quantity and quality of critical incidents in these groups. Thus, the number of critical incidents with propofol + fentanyl anesthesia was 55 ($0,95 \pm 0,13$ for 1 patient) versus 33 ($0,31 \pm 0,05$ for 1 patient) with sevoflurane + fentanyl anesthesia.

Analyzing the obtained results, it should be noted that anesthesia for small surgical interventions with propofol and fentanyl is not the optimal method (Table 1).

Table 1
Time characteristics of groups I and II

Indicators	I (sevoflurane + fentanyl)	II (propofol + fentanyl)
Time from the start of induction to the start of surgery (min)	5,0 (3,0-5,0)	5,0 (3,0-5,0)
The time from the cessation of the administration of anesthetic to the patient until the eyes open	6,0 (5,0-10,0)	10,0 (8,0-10,0)
The time from the cessation of the administration of the anesthetic to the patient to its full orientation in time and space (min)	7,0 (5,0-10,0)	15,0 * (10,0-15,0)
The time from the termination of the introduction of anesthetic to the patient until his readiness to leave the hospital	$2,55 \pm 0,52$	$2,85 \pm 0,58$

Note: * - statistical significance of the difference with the indicators of group I ($p < 0.001$).

Since at the most traumatic time of the operation, the dose of fentanyl had to be increased, and this leads to hypoventilation with the subsequent development of apnea, requiring correction. Also, because of the danger of life-threatening critical incidents, patients of these groups were not included in the “fast track” group.

One of the objectives of our study was a comparative study of the use of inhaled anesthetics such as halothane, isoflurane and sevoflurane and the choice of the ideal anesthetic to induce and maintain anesthesia. The effectiveness and safety of halogen-containing anesthetics in children was evaluated at the stage of in-

duction, maintenance and emergence from general anesthesia. Determination of the induction rate was carried out on the basis of the speed of achievement of III₁ (level of the operational stage of anesthesia). The concentration of halothane and isoflurane was increased smoothly: step by step and the interval of anesthetic was 0.2% for every 3 breaths. The fastest induction with inhaled anesthetics was achieved using the following anesthetics: sevoflurane > halothane > isoflurane. Comfort induction was evaluated on a 4-point scale. The most comfortable induction is 4 points, the least comfortable is 0 point. The following criteria were taken into account: psychomotor agitation: no - 1b, there is - 0b; irritation of the upper respiratory tract: no - 1b, there is - 0b; subjective sensations: pleasant or absent - 1b; unpleasant - 0b.

As a result of the study, it was found that the most comfortable induction in children was observed with inhalation of sevoflurane (3.7 ± 0.3 points) and halothane (3.3 ± 0.4 points). Compared with sevoflurane and halothane, isoflurane induction proceeded significantly less comfortably (2.4 ± 0.4 points), ($p < 0.01$). In most cases, this was due to irritation of the upper respiratory tract, which was observed in 26.7% of children in the subgroup with isoflurane, while in the subgroups of halo-tan and sevoflurane - only 10.7% and 6.2 % of cases, respectively. Thus, induction anesthesia with sevoflurane and halothane in children proceeds equally comfortable. In contrast, the use of isoflurane increases the probability of uncomfortable induction.

The smallest number of adverse effects was recorded with induction of anesthesia with sevoflurane (19.6%) and halothane (40.1%) and the largest with induction of anesthesia with isoflurane (96.0%). Irritation of the respiratory tract (cough, breath holding, laryngospasm) occupies a major place in the structure of adverse effects that occurs during pediatric inhalation induction. Cough and respiratory arrest during inhalation with isoflurane were recorded in 26.7% of patients, while with Sevoflurane 6.2% and halothane 10.7% of cases. Upon induction with isoflurane, laryngospasm occurred in 42.3% of cases, compared to sevoflurane (1.6%) and halothane

(1.5%). Psychomotor agitation and hypertonicity of skeletal muscles are at the second and third places, however, with induction by halothane, isoflurane and sevoflurane are equally rare ($p > 0.05$).

All of the above allows us to argue that sevoflurane is the anesthetic of choice for pediatric inhalation induction. In the absence of sevoflurane, halothane is the drug of choice from the point of view of comfort, safety and the speed of achieving the clinical effect. Isoflurane is not suitable for induction of anesthesia in children due to its pungent odor, which can lead to irritation of the upper respiratory tract, however, compared to halothane which has the advantage of a smaller effect on hemodynamics.

At the stage of emergence from general anesthesia, the following parameters were compared: 1) the speed of awakening and activation of patients; 2) the frequency of critical incidents. To determine the speed of awakening and activation of patients, the Aldrete's score system was used. Awakening criteria: opening of the eyes, restoration of consciousness, adequate spontaneous breathing, muscle tone and protective reflexes. It was found that the most rapid awakening and activation of patients occurs earlier with isoflurane anesthesia than with halothane. So, after anesthesia with isoflurane, patients weighing ≤ 24 kg open their eyes on average 1'16 " earlier than in the subgroup with halothane, are able to fulfill the doctor's command at 1'26 ", are transferred to the ward 1'79 " earlier. It was also revealed that regardless of the drug used, the awakening period in older children takes longer than in the middle and younger age groups ($p < 0.05$), which is associated with a larger total absorbed dose of the drug.

Thus, rapid awakening and early activation of children can be achieved using isoflurane. The smallest number of adverse effects and complications during the recovery from general anesthesia was recorded with the use of isoflurane in 24 children (77.4%), the largest - after anesthesia with halothane, 59 children (89.1%). Irritation of the upper respiratory tract during recovery is much less common than during induction of anesthesia ($p < 0.01$) and this is especially true for isoflurane. Most likely, this may be due to the adaptation of the tra-

cheobronchial tree to inhalation of anesthetic vapors. The total number of adverse effects associated with respiratory tract irritation at the stage of awakening was noted in a comparable number of patients, 9.6% in the subgroup with isoflurane, 7.5% in the subgroup with halothane. Muscular trembling or chills, as well as hypertonicity of skeletal musculature, are the phenomena that reliably more often occur after halothane anesthesia than isoflurane. Psychomotor agitation is also more common (9.1%) in the subgroup with halothane than in the subgroup with isoflurane (6.5%). The smallest number of adverse effects and complications in the first 12 hours after anesthesia was observed with isoflurane 22.6%, and the greatest after anesthesia with halothane 42.3%. Thus, the likelihood of certain adverse reactions in the postoperative period is significantly higher in those children who were anesthetized with halothane ($p < 0.05$). Nausea and vomiting are the most common painful symptoms in the postoperative period in children. When using halothane, they are more common (12.1% and 10.6%, respectively) than during anesthesia with isoflurane (6.5% and 3.2%). The greatest number of adverse reactions at the stage of withdrawal from general anesthesia is more likely for halothane than for isoflurane.

Thus, isoflurane should be selected as the drug of choice at the stage of maintaining anesthesia in children, since it contributes to a faster, safer and more comfortable awakening with a small number of side effects (Table 2).

Years of experience with inhaled anesthetics have allowed us to come to the conclusion that sevoflurane, isoflurane and halothane are effective, safe means for performing an analgesic anesthesia in the hands of skilled professional pediatric anesthesiologists.

To date, the most optimal method of pediatric inhalation anesthesia during “small” surgical interventions in children under one-day surgery is fast “bolus” induction by sevoflurane, and the maintenance of anesthesia with isoflurane.

Maintaining free airway during anesthesia is one of the main tasks of pediatric anesthesiology. Unlike the main methods of maintaining airway patency (traditional airway without a cuff, endotra-

cheal tube), LMA and COPA airway have been used recently. Therefore, one of the main objectives of our work was to conduct a comparative assessment of efficiency and safety, to determine the advantages and disadvantages, to develop recommendations for their application. This problem was solved during anesthesiological aid for patients of group IV. During the study, the following parameters were compared: ease of administration, convenience for the anesthetist and the frequency of complications in their use.

Table 2
The frequency of adverse reactions and complications
in the induction of halothane,
isoflurane and sevoflurane in children

Complications adverse effects	Halothan n = 66	Isoflurane n = 31	Sevoflurane n = 62	χ^2 ; p
Allergic reactions	–	–	–	–
Arrhythmia	5 (7,6%)	–	–	$\chi^2=7,274$; p=0,026
Skeletal muscle hypertonia	5 (7,6%)	2 (6,5%)	3 (4,8%)	$\chi^2=0,645$; p=0,724
Psychomotor agitation	8 (12,1%)	3 (9,7%)	5 (8,1%)	$\chi^2=11,862$; p=0,003
Critical hypoxemia	1 (1,5%)	2 (6,5%)	–	$\chi^2=6,071$; p=0,048
Moderate hypoxemia	4 (6,1%)	2 (6,5%)	–	$\chi^2=4,678$; p=0,096
Cough	4 (6,1%)	9 (34,6%)	2 (3,2%)	$\chi^2=23,437$; p<0,001
Laryngospasm	1 (1,5%)	11 (42,3%)	1 (1,6%)	$\chi^2=48,231$; p<0,001
Bronchospasm	–	1 (3,2%)	–	$\chi^2=5,147$; p=0,076
Hiccups	1 (1,5%)	1 (3,2%)	1 (1,6%)	$\chi^2=0,645$; p=0,724
Total	29 (40,1%)	28 (96,0%)	12 (19,6%)	$\chi^2=42,387$; p<0,001

LMA was introduced using standard techniques in children with hypertrophied tonsils and modified technique with LMA rotated 90 ° in the oropharyngeal region, and the installation of the COPA airway was rotated 180 ° in the oral cavity. LMA was established on the first attempt in 16 (61.5%) patients. In the remaining 10 (38.5%) patients, the administration of LMA was difficult: on the second attempt, it was successfully established in 8 patients, and on the third attempt, in 2 patients. There were no cases when the introduction of LMA was not possible at all. The introduction of the COPA airway was also not straightforward. So, the COPA airway was easily installed in 60 children. In the remaining 7 patients, the introduction of the COPA airway was difficult, but on the second attempt it was successfully established for all children. The reason for all repeated attempts at administration was the displacement of the COPA immediately after fixation with head straps, which entailed a partial obstruction of the airways. Thus, the COPA airway, in comparison with the LMA, is much easier to install ($p < 0.001$) and, first of all, this is due to the ease of mastering the method of introducing COPA. In the course of anesthesia using LMA, there was any need for additional measures to fix it in the correct position in none of the cases, and the hands of the anesthesiologist remained free. And in the group of COPA-airways, for most children 25 (47.7%) we had to take certain actions to keep the COPA from shifting: to maintain the lower jaw, to fix the head in a certain position. Therefore, LMA is definitely more convenient for an anesthetist than COPA. LMA installation is more invasive method of maintaining a free airway compared with COPA, since at the time of its installation, the probability of oropharynx injury, coughing, respiratory arrest and laryngospasm increases ($p < 0.01$). The most common reactions in response to the installation of LMA and COPA airway are respiratory arrest (2.8% and 0.8%, respectively), cough (4.2% and 1.4%), laryngospasm (1.2% and 0%) for resolution of which rocuronium bromide 0.45 mg / kg was administered intravenously. We explained all reactions to the LMA and COPA installation with an insufficient depth of anesthesia, which was quickly eliminated by deepening anesthesia by additional administration of

propofol. The COPA-airway has several advantages over the installation of LMA, so installing it is much simpler and does not require special skills, with its introduction and removal, complications arise much less frequently, and trauma of the oropharynx is also reduced. But at the stage of maintaining anesthesia, the COPA requires closer attention than LMA, since additional measures are necessary to fix it. Thus, the LMA and the COPA have significant advantages over the traditional cuff-free oropharyngeal and nasopharyngeal airways.

When using LMA, the airways were completely sealed in 83.5% of cases. And when using COPA, the airways were completely sealed only in 32.3% of cases. There were no cases of spontaneous rupture of the cuff of COPA and LMA during anesthesia. Our studies have shown that in pediatric patients, it is advisable to use LMA and COPA to maintain airway clearance during inhalation anesthesia.

Caudal anesthesia is the most popular regional type of blockade, successfully used in pediatric anesthesiology, which accounts for about half of the total number of blockades. The popularity of caudal anesthesia is explained by its high efficiency, the relatively rare occurrence of complications. Therefore, in our practice, caudal anesthesia is about 90% of all anesthesia performed. All surgical interventions below the navel were performed under caudal anesthesia. Failures in performing the caudal block were observed only at the beginning of our work. And at present, the failure of the caudal block in our daily work does not exceed 1%. In children, we performed the caudal block in the position of the patient on the left side with the hips and knees slightly brought to the stomach. When conducting caudal anesthesia, we adhered to the basic principle of pediatric anesthesiology and therefore sedated children with propofol. After complete falling asleep, the patient under the influence of propofol at a dose of 3-4 mg / kg we produced a caudal block. In order to expand the possibilities of caudal anesthesia in a large number of patients without exception, we developed and introduced into clinical practice a modified caudal block technique, the so-called “the no turn technique”, the essence of which is the swarm consisted of a puncture of the sacrococcygeal membrane at an angle of 60 ° without moving the

needle into the sacral canal. We studied this technique, which made it possible to carry out a caudal block in 99.9% of cases of its application, in contrast to the traditional one, where the percentage of successful punctures was 87.3%. In our practical work, we conducted a comparative analysis of the use of bupivacaine and ropivacaine with caudal anesthesia. As a result of many years of experience in the application of caudal anesthesia, titration doses of bupivacaine of 0.25% 2.5 mg / kg and 0.35% of ropivacaine 3 mg / kg were determined. To improve the quality and duration of the analgesic effect of caudal blockade, dexamethasone 0.1 mg / kg was introduced into the caudal space during work. The average duration of analgesia with bupivacaine was 5.1 ± 0.26 hours, and with ropivacaine 8.2 ± 0.31 hours and with the combined administration of ropivacaine with dexamethasone, 15.6 ± 0.45 hours. It is interesting to note that 189 (68.9%) patients from VC (n = 274) subgroups who used dexamethasone during caudal blockade did not require additional administration of analgesics in the postoperative period.

To clarify the adequacy of different options for caudal anesthesia, we conducted a comparative study of central hemodynamics at different stages of the study. So, at stage II of the study (skin incision after caudal blocking), a decrease in heart rate by 15.3%, 13.4% and 12.9% was observed in patients in the age subgroup 0-3 years in VA, VB and VC groups ($p < 0.001$), respectively, mean blood pressure by 10.8%, 11.1% and 15.4% ($p < 0.001$), systolic blood pressure by 11.4%, 12.9% and 13.6%, respectively and in stage III (the main stage of the operation) heart rate (HR) by 17.4% (VA), 15.3% (VB) and 15.2% (VC), MBP 10.8% (VA), 11.9% (VB) and 16.5% (VC), BP Syst. by 11.8% (VA), 14.2% (VB) and 18.2% (VC). Therefore, in all groups, the intraoperative period proceeded without signs of ineffectiveness of caudal anesthesia, which was confirmed by minor changes and stability of the studied parameters. A similar dynamics of changes in systemic hemodynamics was also observed in patients of other age groups. Throughout the entire period of surgical intervention, stability of hemodynamic parameters was noted, while the fluctuations of these indicators did not exceed 5-8% of the initial da-

ta. Significant changes in hemodynamic parameters were observed at stage V of the study, i.e. during the recovery period: the most noticeable changes were ($p < 0.01$) in heart rate and MBP in patients with VA group 6 hours after anesthesia. So, there was an increase in heart rate by 3.4%, MBP by 8.8%, RPP by 15.6% over this period of time and additional pain relief was required due to the resumption of nociceptive sensitivity, which was accompanied by distinct changes in hemodynamics and an increase values of the pain scale are more than 7 points on the Cries scale. In patients of the VB group, where ropivacaine was used as a local anesthetic 8 hours after the blockade, an increase in heart rate of 10.5% was noted, MBP - by 5.6%, RPP - by 23.3%, the total score on the Hannalach scale was 8-9 points, which testified to the appearance of severe pain and required the introduction of additional analgesics. At the fifth stage of the study, stability of hemodynamic parameters in patients of the VC group was observed. So, heart rate decreased by 3.7%, MBP increased by only 0.3%, and RPP decreased by 0.8% compared to the original data. In 68.9% of patients of this group, parameters remained stable and did not differ from the initial values even after 24 hours after the operation.

When studying the metabolic component of the surgical stress response under the conditions of three variants of caudal anesthesia, the level of glucose and cortisol in patients in the postoperative period was determined. As a result of the study, it was found that significant differences in the indices of cortisol and glucose in the different study groups were noted mainly at the V stage of the study 6, 12 and 24 hours after the operation (Figure 1). So, in patients of the VA group (caudal block with bupivacaine), 6 hours after the operation, a significant increase in cortisol level by 30.8% was noted compared with the initial data. And in patients of the VB group (with ropivacaine), only after 8 hours after surgery, against the background of the appearance of pain, an increase in cortisol level by 20.9% was observed, and in patients of the VC group (caudal block ropivacaine + dexamethasone) even after 16-24 hours after surgery, there was no increase in cortisol (a 6.0% decrease compared with stage I) and glu-

cose, which indicated the absence of pain (Chart 1).

The stability of the level of cortisol and glucose in children's blood serum at various stages of the study indicates more adequate protection of the body from operational stress during caudal anesthesia. Complications associated with the technique of performing caudal blockade were quite rare. Basically, they were associated with the impossibility of performing caudal blockade due to the anatomical features of the sacrococcygeal region, subcutaneous administration of the drug, lateralization, puncture of the vessels of the sacral space and the dura mater. In our study, a single vascular puncture of the caudal space occurred in 68 (24.9%) cases. Re-entry into the vessels of the caudal space was not recorded. The greatest number of critical incidents in patients of group V was observed in the postoperative period 59 (64.8%). Thus, critical incidents in the form of urinary retention 11 (12.1%) and motor activity 31 (34.1%) did not prevent the early discharge of patients, since they were eliminated independently two hours after anesthesia.

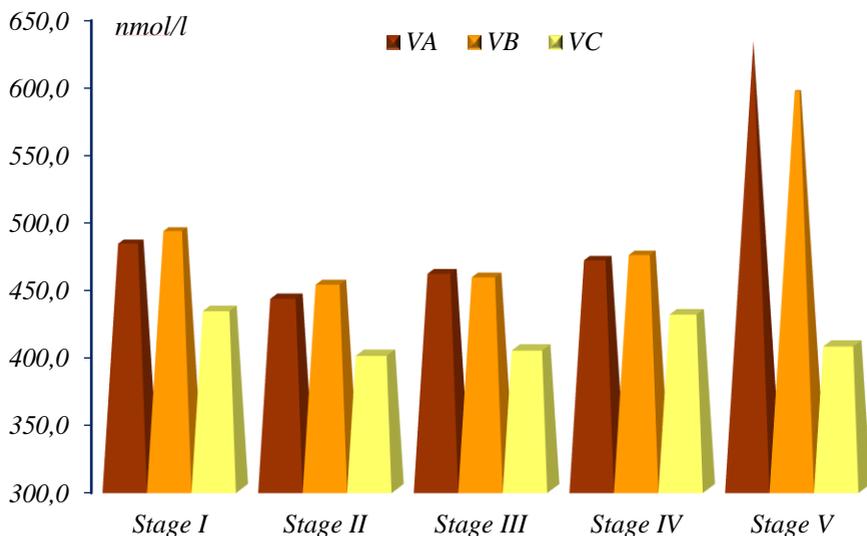


Chart 1. Change in cortisol concentration in patients of group V.

Thus, caudal anesthesia with local anesthetics is the most commonly used regional block during surgical interventions below the navel (Fig. 2).

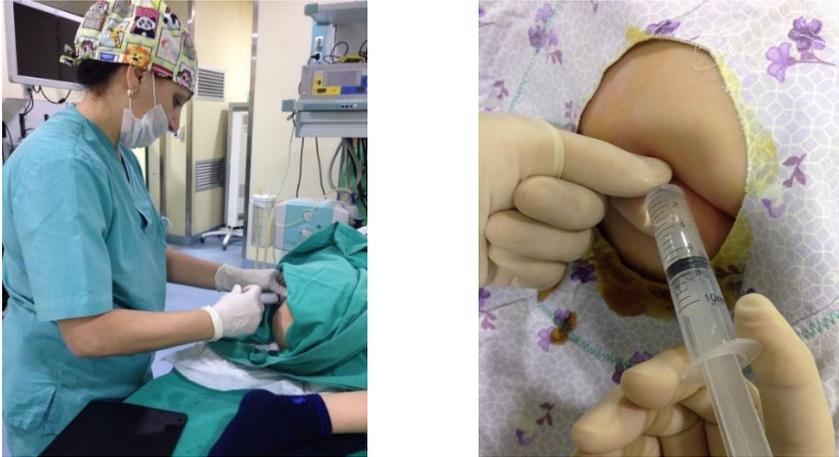


Fig. 2. Technique of caudal anesthesia.

Currently, the drug of choice for caudal anesthesia in children is ropivacaine, as the most powerful local anesthetic in capacity and duration of action. The addition of dexamethasone to ropivacaine with caudal administration significantly extended the duration of analgesia to 16 hours compared with ropivacaine alone up to 8 hours and bupivacaine up to 5 hours.

One of the important tasks of our study was to determine the ideal muscle relaxant in one-day surgery in “small” pediatric surgical interventions. The study included 156 children aged 0 to 16 years who underwent combined endotracheal anesthesia during surgery. During the study, all children were divided into 3 main groups based on the muscle relaxant used: IIIA (n = 52) - with the use of rocuronium bromide (Esmeron), IIIB (n = 52) - with the use of atracurium besilate (tracrium), IIIC (n = 52) - with the use of cisatracurium besilate (nimbex). Depending on the inhalation anesthetic used, includ-

ed in the general anesthesia scheme, these groups were divided into 2 subgroups: anesthesia based on isoflurane + fentanyl " + iso ", anesthesia based on sevoflurane + fentanyl " + sev ". The main groups were also divided into 2 age subgroups: children under 2 years of age – IIIA₁, IIIB₁, IIIC₁ and children from 2 to 16 years old – IIIA₂, IIIB₂, IIIC₂. To conduct a comparative assessment of the efficacy and safety of rocuronium bromide, atracurium, and cisatracurium besilate, we monitored the dynamics of neuromuscular conduction using the accelerometric method. Neuromuscular conductivity was evaluated on the basis of monitoring using the TOF stimulation method using a TOF-Watch instrument (Organon, Ireland). In our practice, isoflurane is one of the most widely used inhalation anesthetics at the stage of maintaining general anesthesia in children. The ability of isoflurane to have a sufficiently pronounced and reversible muscle relaxant effect was used by us to develop methods of general anesthesia using low doses of muscle relaxants. Analysis of the results of the study showed that in young children the maximum rate of development of neuromuscular blockade differed in the rocuronium bromide group at a dose of 0.45 mg / kg. Already after the first minute from the moment of administration, the average T₁ values amounted to 38.9 ± 0.6% of the initial level, with average TOF values –39.1 ± 1.1%. Due to the development of neuromuscular blockade, a decrease in muscle contraction by stimulation progressively increased in patients of this subgroup. And in the subgroup with cisatracurium IIIC at a dose of 0.12 mg / kg, the lowest rate, where after 1 minute from the moment of administration depression of neuromuscular conduction was observed, T₁ was still quite high and averaged 62.5 ± 0.6% from the initial level, with average TOF values of 64.5 ± 0.5%. The introduction of the main dose of 0.4 mg / kg atracurium besilate in the IIIB subgroup ensured T₁ suppression in most patients by the end of the first minute - 56.1 ± 0.6% of the initial level, with average TOF –63.0 ± 0.5%, which is less than that of rocurobromide, but more than cisatracurium besilate. In children older than 2 years, the dynamics of the development of neuromuscular blockade during the first 2 minutes from the time of administration had a simi-

lar picture with the younger age group, but was more extended in time. The decrease in the main doses of the studied muscle relaxants did not have a significant effect on the depth of development of neuromuscular blockade in children. The greatest depth of the neuromuscular block was also more pronounced in young children than in children of the older age group: $2.2 \pm 0.6\%$ in IIIA₁ subgroup, $3.0 \pm 0.4\%$ in IIIA₂, 0.8 in IIIB₁ $\pm 0.7\%$ and IIIB₂ $1.1 \pm 0.9\%$, IIIC₁ subgroup $0.4 \pm 0.1\%$ and IIIC₂ $0.6 \pm 0.4\%$, respectively. Consequently, cisatracurium besilate, then atracurium besilate and rocuronium bromide provided the greatest depth of neuromuscular blockade. Thus, in operations where surgeons require greater muscle relaxation, for example, during laparoscopic interventions, cisatracurium besilate should be preferred from the studied muscle relaxants, since it has a higher blocking effect. So, neuromuscular blockade developed using the maximum doses of the studied muscle relaxants and depended mainly on the age of the child. The best conditions for tracheal intubation were noted until the development of maximum neuromuscular blockade at T₁ of not more than 90%. The average time from completion of the introduction of the primary bolus with the drug atracurium besilate at a dose of 0.4 mg / kg to tracheal intubation was: in subgroup IIIB₁ - 1.4 ± 0.5 minutes, in subgroup IIIB₂ - 1.9 ± 0.9 minutes. Cisatracurium at a dose of 0.12 mg / kg provided the possibility of tracheal intubation in patients of subgroup IIIC₁ after 1.5 ± 0.5 minutes, and in subgroup IIIC₂ after 2.2 ± 0.6 minutes. After the initial administration of 0.45 mg / kg rocuronium bromide, tracheal intubation was performed after 1.2 ± 0.6 minutes. in subgroup IIIA₁ and after 1.6 ± 0.3 min. in subgroup IIIA₂. An analysis of the results showed that rocuronium bromide provided excellent conditions for tracheal intubation in children under 2 years of age in a large percentage of cases - 80.2%, in the remaining 19.2% the intubation was performed with a rating of "good", i.e. . the passage of the tube was accompanied by slight resistance or coughing. In the corresponding age subgroups with atracurium IIIB₁ and cisatracurium IIIC₁, the conditions of intubation were identical: " excellent " - 76.9%, " good " - 23.1% of patients. In the older age subgroups with rocuronium

bromide (III_{A2}), the conditions for intubation were as follows: "excellent" - 77.8%, "good" - 22.2% of patients. In subgroups III_{B2} and III_{C2}, conditions of tracheal intubation were assessed as "excellent" in 73.1% of patients. Poor intubation conditions were observed only in 2 (7.7%) patients in subgroup III_{B2}. At the time of tracheal intubation, these children noted moderate coughing resistance; the entrance to the trachea was not sufficiently disclosed due to reduction of the vocal cords. The maximum duration of deep neuromuscular blockade in all children of the subgroup with rocuronium bromide (III_{A1}) was 47.3 ± 5.6 minutes. The shortest duration of neuromuscular blockade in children under 2 years old was observed with atracuria besilate (III_{B1}), which provided a deep degree of relaxation on average 35.4 ± 6.4 minutes. In children of the III_{C1} subgroup, the average time of neuromuscular blockade was 45.6 ± 12.2 minutes. The average duration of deep neuromuscular blockade after administration of the initial dose in subgroup III_{B2} was 33.5 ± 6.6 minutes, in subgroup III_{C2} - 40.2 ± 7.6 minutes, and in subgroup III_{A2} - 21.1 ± 1.7 minutes (chart 2).

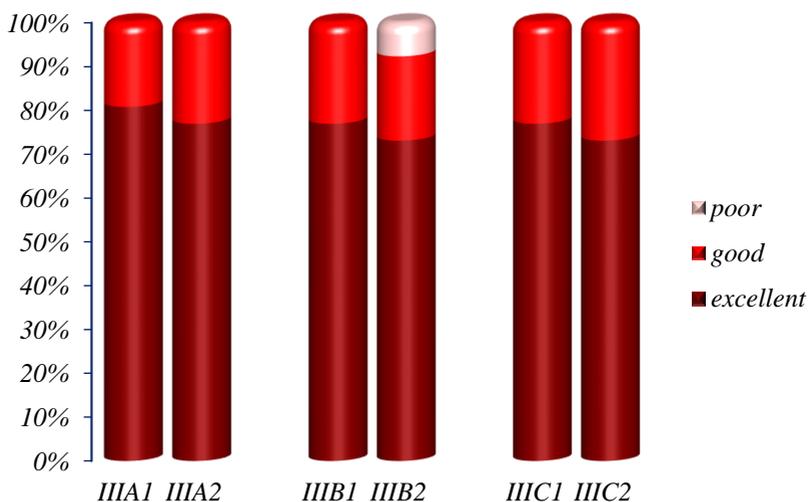


Chart 2. Conditions for tracheal intubation in children with " + iso ".

When isoflurane was included in the general anesthesia regimen, the main and maintenance doses of muscle relaxants were reduced: for atracuria besilate they were 0.4 mg / kg and 0.15 mg / kg, for cisatracuria besilate - 0.12 mg / kg and 0, 02 mg / kg, for rocuronium bromide - 0.45 mg / kg and 0.1 mg / kg, respectively. Thus, on the basis of the studies, it was found that a decrease in the main and maintenance doses of non-depolarizing muscle relaxants of rocuronium bromide, atracuria and cisatracuria besilate under conditions of combined anesthesia with 1.3 isoflurane MAK provides excellent and good conditions for tracheal intubation, high-quality intraoperative relaxation regardless of the methods of performing surgical interventions (open or laparoscopic).

In our work, we also studied the method of endotracheal general anesthesia based on sevoflurane with the use of low doses of rocuronium bromide, atracuria and cisatracuria besilate with various surgical interventions. The highest average rate of achieving maximum T₁ suppression with sevoflurane was observed in the rocuronium bromide subgroup (IIIA₂) - 2.4 ± 0.5 min., compared to the atracuria besilate (IIIB₂) subgroups - $3.0 \pm 1, 3$ min. and cisatracuria besilate (IIIC₂) - 3.5 ± 0.8 min. Compared to the " + iso " subgroup, the conditions for tracheal intubation somewhat worsened only in the older age subgroup (IIIC₂) with cisatracuria, where the number of patients intubated with a 'poor' rating increased to 2 (7.7%). The remaining children in all subgroups were intubated with excellent and good grades. The results of the study showed that a single administration of atracuria besilate at a dose of 0.3 mg / kg is most appropriate in order to ensure short-term surgical interventions requiring tracheal intubation in children under 2 years old. In children over 2 years old, the optimal muscle relaxant is rocuronium bromide at a dose of 0.3 mg / kg. When sevoflurane was included in the general anesthesia scheme, the main and supporting doses of the studied muscle relaxants were reduced as follows: atracuria besilate - 0.3 mg / kg and 0.15 mg / kg, cisatracuria besilate - 0.1 mg / kg and 0, 02 mg / kg, rocuronium bromide - 0.3 mg / kg and 0.1 mg / kg, respectively. Regardless of the type of muscle relaxant used, the process of tracheal

intubation in the main part of patients in all subgroups was carried out in the first 2 minutes from the start of administration. The ability to perform intubation in the first 2 minutes in children under 2 years of age remained " excellent " and " good ". Only rocuronium bromide at a dose of 0.3 mg / kg provided the possibility of tracheal intubation within the first 2 minutes with excellent and good results in children older than 2 years. For atracuria and cisatracuria besilate, this time was at least 3 minutes from the time of administration, while, the qualitative characteristics of the conditions of tracheal incubation practically did not deteriorate when compared with the subgroup " + iso ". Thus, it was determined that atracuria besilate provided almost the same, with a high degree of predictability, duration of deep neuromuscular blockade in children, regardless of age, so that it becomes the drug of choice in patients of the first year of life. When using cisatracuria besilate and rocuronium bromide, it was noted that the duration of deep neuromuscular blockade in children under 2 years of life is significantly higher compared to older children ($p < 0.001$). When compared with atracuria and cisatracuria ($p < 0.01$), the shortest duration of action of rocuronium bromide in children older than 2 years should also be noted. This fact makes it the main drug for ensuring myoplegia in children of this age during surgical interventions of short duration. When comparing the results in this subgroup " + sev" with the subgroup " + iso ", where higher doses of the studied muscle relaxants were used, there was no statistically significant difference in time from the moment of administration to 10% recovery of T_1 , which is explained by the powerful and fast onset potentiating effect of sevoflurane. The results of the study showed that the combination of sevoflurane and atracuria besilate at a dose of 0.3 mg / kg is most optimal to ensure short-term surgical interventions and manipulations requiring tracheal intubation in children under 2 years old, in children more than older - a combination of sevoflurane and rocuronium bromide at a dose of 0.3 mg / kg.

Also, cases of prolonged neuromuscular block, characteristic of muscle relaxants were not detected.

Thus, a comparative assessment of the effect on central hemody-

namics and the development of side effects showed that in the case of an aggravated allergic history in patients, it is advisable to use cisatracuria besilate, either in limited doses or together with antihistamines. It should be noted that when using rocuronium bromide, transient excitation can be observed. Extubation of the trachea after completion of surgical intervention and restoration of adequate spontaneous breathing was performed in all children (chart 3).

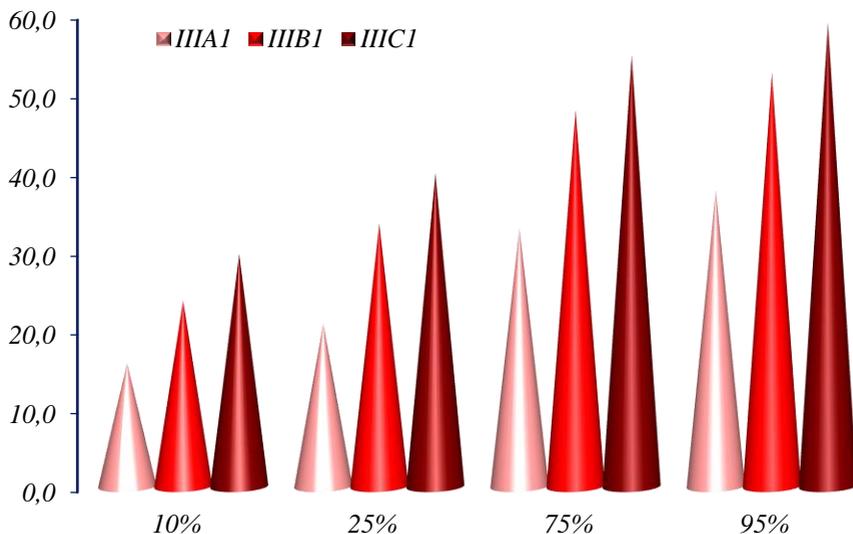


Chart 3. Dynamics of spontaneous recovery of neuromuscular conduction in children older than 2 years with " + sev ".

The total time of complete recovery of T_1 (0% -95%) in the atracuria besilate (IIIB₁) subgroup was the shortest and averaged 55.4 ± 1.8 minutes. The same time was longer in the subgroups of cisatracuria and rocuronium bromide and amounted to 62.5 ± 1.2 minutes and 61.8 ± 1.6 minutes, respectively. However, statistical analysis did not reveal significant differences between relaxants - $p > 0.05$. Rocuronium bromide has retained its leading position even under anesthesia with the inclusion of sevoflurane in children of the older age subgroup (IIIA₂). The average time of complete spontaneous restoration

of neuromuscular conduction (T_1 0% -95%) was 37.7 ± 1.6 minutes. According to the results of the study, the period of post-narcotic awakening in children of this age group after the use of cisatracurium besilate is somewhat longer than that of atracurium besilate, and this difference manifests itself at all stages of recovery from the beginning of tracheal extubation until the patient is ready to withdraw from the operating room (X_4): 9.3 ± 0.3 and 8.6 ± 0.3 minutes. However, no significant differences were found between benzyl isoquinoline relaxants (cisatracurium and atracurium). The onset of clinical signs of restoration of neuromuscular conduction in children of this age group most rapidly occurred in subgroup IIIA₂ (rocuronium bromide), where the average time (X_4) was 7.9 ± 0.2 minutes.

Thus, it is possible to ensure the effectiveness of anesthesia, the safety of the child, and the protection of his psychological stress with an adequate choice of muscle relaxation, optimization of drug doses relative to the anesthesia regimen, careful monitoring of neuromuscular conduction recovery. All of the above proves that general anesthesia is more manageable and contributes to the early activation of patients.

One of the objectives of our study was also to evaluate the clinical course of anesthesia with ketamine combined with midazolam and fentanyl in children operated on for an inguinal and umbilical hernia, dropsy of testicular membranes, cryptorchidism, and varicocele. Induction in ketamine anesthesia proceeded smoothly, horizontal nystagmus, isolated muscle twitches were noted. The total induction time into anesthesia was $155 \text{ sec.} \pm 12.6$. The ketamine anesthesia clinic was smoothed due to the oral administration of midazolam. During surgery and in the immediate postoperative period the following critical incidents were recorded: during induction of anesthesia, 5 (13.5%) children experienced short-term apnea or hypoventilation (8.8%), moderate hypoxia in 6 patients (16.2%), critical hypoxia in 3 patients (8.1%), in 6 children laryngospasm (16.2%), in 2 patients (5.4%) - bronchospasm, in 11 patients (29.7 %) - motor sweeping movements, in 7 children (18.9%) nausea and vomiting, in 8 patients (21.6%), prolonged secondary sleep and diplopia were observed in 4

(10.8%) patients.

Recovery after ketamine anesthesia was slow, reaction to the simple command of the anesthesiologist was noted after 839.1 ± 78.6 seconds, transfer of patients to the ward after 705 ± 45.6 on average. The level of anxiety in the postoperative period according to the Hannalah scale at the 10th minute after the operation was 1.18 ± 0.39 points, and after 30 minutes the indicator was 1.35 ± 0.31 points with a maximum value of 3 points and 1 hour after the operation - 1.6 ± 0.22 points with a maximum value in the group of 2 points. In the majority of patients in the postoperative period, a prolonged secondary sleep, disorientation in time and space, and dizziness were noted. However, all children were contact and adequate 3 hours after the operation. An analysis of the results of a hemodynamic study with intravenous total anesthesia was characterized by stability indicators. The most pronounced fluctuations in these indicators were observed at the most traumatic time of the operation. So, at this stage, the total peripheral vascular resistance significantly increased with a corresponding change in mean arterial pressure. Despite compensatory tachycardia, decrease in stroke volume of the heart and minute volume of blood circulation was noted. These changes were attributed to insufficient pain relief. The results obtained during the study indicate the insufficient depth of this anesthesia technique (ketamine min + midazolam + fentanyl) for small surgical interventions. The largest number of critical incidents, 141 (28.1%), was observed during intravenous total anesthesia with a combination of ketamine, midazolam and fentanyl. Therefore, this anesthesia scheme is not suitable for pediatric surgical interventions in one-day surgery. Based on the analysis of critical incidents, an internal medical audit is the most significant method that allows you to objectively compare different methods of anesthetic management. One of the objectives of our study was to conduct a quantitative and qualitative analysis of critical incidents observed during various types of anesthesia used in small surgical interventions in children. As a result of many years of work, we compiled a list of critical incidents encountered during the work of one-day surgery in children. In our study, 498 critical inci-

dents were recorded. Our epidemiological analysis showed that the incidence of critical incidents in one-day surgery was 0.63. The greatest number of critical incidents was noted at the stages of induction of anesthesia and the postoperative period (184 and 140, respectively). At the stage of maintaining anesthesia, the number of critical incidents is 2 times less than at the previous stages. Critical incidents involving respiratory disorders are most common during induction of anesthesia and during maintenance of anesthesia (70 and 24, respectively). Practice shows that the most formidable critical incidents are hypoventilation, respiratory apnea and critical hypoxemia, which are observed at the stages of induction anesthesia associated with inadequate ventilation and in the postoperative period due to untimely extubation of the patient. The most serious critical incident at the stage of induction of anesthesia in children is laryngospasm caused by insufficient depth of anesthesia (Table 3).

Table 3
The number of critical incidents (per 1 patient)

Indicator (quantity)	I Group n = 106	II Group n = 58	III Group n = 156	IV Group n = 159	V Group n = 278	VI Group n = 37
During anesthesia	20 0,19±0,04	37 0,64±0,10	3 0,02±0,01	88 0,55±0,06	32 0,12±0,02	68 1,84±0,22
In the postoperative period	13 0,12±0,03	18 0,31±0,07	13 0,08±0,02	74 0,47±0,05	67 0,24±0,03	65 1,76±0,22
Total	33 0,31±0,05	55 0,95±0,13	16 0,10±0,03	162 1,04±0,08	99 0,36±0,04	133 3,59±0,31

Critical incidents related to the cardiovascular system were recorded at all stages of the anesthetic aid, including the postoperative period. However, they were more often observed during induction of anesthesia (57) and maintenance of general anesthesia (38). The greatest number of critical incidents associated with a change in blood pressure, namely arterial hypotension in 31 cases, occurred at the stage of induction anesthesia. A change in heart rate in the form

of tachycardia was noted in 16 cases, and in the form of bradycardia in 20 of the total number of critical incidents related to the cardiovascular system. Thus, when conducting anesthesia in a one-day surgery, the most critical steps for an anesthesiologist are induction anesthesia and maintaining anesthesia. In our study, none of the critical incidents led to such serious complications as death, as they were stopped quickly and in a timely manner. Based on an analysis of the critical incidents observed with different versions of the anesthetic aid used for small surgeries in one-day surgery, we developed a list of 11 criteria for including patients in the fast track group. If any critical incident was detected in the patient during the perioperative period, they were transferred to the PACU after surgery.

Basically, all patients of the V group (propofol + caudal block) were included in the fast track program. So, all patients of this group, bypassing the PACU immediately after the operation, were transferred to the surgical room without any danger.

Thus, the reasonable inclusion of patients in the fast track group, operated in conditions of one-day surgery significantly saved their costs. And such savings make one-day surgery more affordable for a large category of patients.

CONCLUSIONS

1. In the conditions of one-day surgery, the most effective and safe scheme of inhalation anesthesia is rapid "bolus" induction with sevoflurane while maintaining anesthesia with isoflurane, which is confirmed by the following objective data: 1) induction anesthesia with sevoflurane proceeds for 3 minutes faster than with halothane and isoflurane and is comfortable 3.7 ± 0.3 points (with halothane 3.3 ± 0.3 points, with isoflurane 2.4 ± 0.4 points), the minimum number of critical incidents is 19.6% (with halothane 40.1%, with isoflurane 96.0%); 2) the use of isoflurane to maintain anesthesia contributes to the stability of hemodynamics, 1'16 " earlier than halothane and comfortable awakening from anesthesia with a small number of critical incidents 77.4% (with halothane 89.1%) in the postoperative period [10, 47, 48, 51].

2. Anesthesia with propofol and fentanyl is not the optimal method in a one-day surgery, because at the most traumatic moment of the operation, the dose of fentanyl has to be increased to $5 \mu\text{g} / \text{kg}$, and this leads to hypo-ventilation and critical hypoxemia with the subsequent development of apnea requiring correction. The number of critical incidents with the propofol + fentanyl anesthesia scheme was ($0,95 \pm 0,13$ for 1 patient) versus 33 ($0,31 \pm 0,05$ for 1 patient) with the sevoflurane + fentanyl anesthesia technique [2, 14, 17, 25].

3. Convenience, efficiency, safety, less invasiveness of LMA and COPA in ensuring free airway patency during surgical interventions in children in one-day surgery compared with tracheal intubation was established. Their main disadvantage is the risk of aspiration due to insufficient tightness of the entrance to the larynx. When using LMA, the airways were completely sealed in 83.5% of cases, and with COPA - in 32.3% of cases [39, 40, 41, 44, 52].

4. Caudal blockade in combination with intravenous sedation with propofol is the optimal method of anesthesia when performing surgeries below the umbilicus in a one-day surgery in children. The addition of dex-amethasone to ropivacaine with caudal administra-

tion significantly prolonged the duration of analgesia to 16 hours compared with ropivacaine alone up to 8 hours and bupivacaine up to 5 hours. Technique without turning the needle ("the no turn technique") made it possible to perform caudal block in 99.9% of cases of its application, in contrast to the traditional one, where the percentage of successful punctures was 87.3% [27, 28, 29, 30, 31, 38, 46, 61, 63].

5. Monitoring of neuromuscular conduction according to the TOF method - stimulation ("train of four") using the TOF-Watch device (Organon Ireland) made it possible to determine the onset, depth and duration of neuromuscular block in 90% of cases. When isoflurane was included in the general anesthesia regimen, the main and maintenance doses of muscle relaxants were reduced and amounted to: atracuria besylate - 0.4 mg / kg and 0.15 mg / kg, cisatracuria besylate - 0.12 mg / kg and 0, 02 mg / kg, rocuronium bromide - 0.45 mg / kg and 0.1 mg / kg. When sevoflurane was included in the general anesthesia regimen, the main and maintenance doses of the studied muscle relaxants were reduced as follows: atracuria besylate - 0.3 mg / kg and 0.15 mg / kg, cisatracuria besylate - 0.1 mg / kg and 0.02 mg / kg, rocuronium bromide - 0.3 mg / kg and 0.1 mg / kg, respectively [18, 20, 36, 43, 45, 60, 62].

6. The use of ketamine in combination with midazolam and fentanyl is not an optimal and desirable technique for one-day surgery due to the multitude of critical incidents 141 (28.1%) occurring at different stages of anesthesia [4, 6, 7, 51].

7. Based on the analysis of critical incidents observed with different variants of anesthetic treatment used for minor surgical interventions in the conditions of one-day surgery, a list of 6 criteria was developed for including patients in the fast track group (ERAS) (rapid discharge of patients with their transfer from the operating room into the ward of the surgical department, bypassing the PACU). The largest number of critical incidents was noted at the stages of induction of anesthesia 184 (36.9%) and the postoperative period 140 (28.1%) [13, 50].

8. In the pharmacoeconomic analysis, the least costly method is

caudal anesthesia (bupivacaine - 2.82 manat and ropivacaine - 5.64 manat), and the most expensive is general anesthesia based on sevoflurane - 22.5 manat per hour of surgery. An intermediate position is occupied by general anesthesia based on propofol - 10 manat [4, 5, 8, 23, 24].

PRACTICAL RECOMMENDATIONS

1. Surgical treatment in a one-day hospital should be preceded by careful selection, psychological preparation of children and their parents, as well as a comprehensive preoperative examination.

2. Determine the type of autonomic reactivity by calculating the Kerdo index. In children with a normal autonomic reaction, as well as in the normodynamic type of hemodynamics, elective induction (sevoflurane) or intravenous (propofol) anesthesia should be performed during planned surgical interventions.

3. Premedication by mouth is the least invasive method. The dose of midazolam 0.4 mg / kg when administered orally in a one-day hospital setting is safer and more effective.

4. The dose of propofol for induction of anesthesia in children with hyper-sympathicotonic type of autonomic reactivity is 4-4.5 mg / kg, and in children with normosympathicotonic and parasympathetic type, it is 3-3.5 mg / kg.

5. Children with a hypodynamic type of blood circulation are advised to induce anesthesia with ketamine in combination with midazolam and fentanyl.

6. In order to prevent psychological discomfort during surgical interventions under caudal anesthesia in children, deep drug sedation with propofol or midazolam is strictly indicated.

7. During surgical interventions below the navel, caudal anesthesia is recommended according to a modified technique - a technique without turning the needle, especially in obese children. By the combined introduction of ropivacaine 3 mg / kg and dexamethasone 0.1 mg / kg into the caudal space strengthening the analgesic effect of caudal anesthesia is achieved.

8. The drug of choice for inhalation induction in children is sevoflurane. Introductory anesthesia with sevoflurane, it is advisable to carry out the method of rapid "bolus" induction, which means a rapid increase in its concentration on the evaporator to 7-8 vol% within 1 minute from applying the facial mask. To avoid an overdose of the inhaled anesthetic of sevo-flurane at the end of the "bolus" induction period after reducing the concentration of sevoflurane on the evaporator from 8 vol% to 2 vol%, it is necessary to maintain a high gas flow (6 l / min) for 2 minutes to quickly reduce the concentration anesthetic in the respiratory circuit. In the absence of sevoflurane, halothane should be preferred.

9. If you plan to use isoflurane in the anesthesia regimen, then induction must be carried out with sevoflurane (in rare cases, halothane), or with propofol intravenously, followed by switching to isoflurane at the maintenance stage. When carrying out the induction of anesthesia with sevoflurane, one should take into account the likelihood of side effects, such as breath holding, coughing, agitation, stridor breathing, muscle hypertonicity, agitation.

10. The installation of LMA and COPA airway in children should be carried out only after reaching the surgical stage of anesthesia, when the larynx and pharyngeal reflexes disappear. Propofol induction increases the likelihood of apnea, the occurrence of cough and laryngospasm in response to the introduction of the LMA or COPA, so before installing them, it is advisable to deepen the anesthesia with fentanyl and one of the inhaled anesthetics (sevoflurane or halothane). LMA or COPA-airway in children must be removed after surgery on the operating table in the state of drug sleep, when the larynx and pharyngeal reflexes are not restored and in the presence of adequate spontaneous breathing. As there is a potential risk of airway obstruction due to larynx or an accidental displacement, you can't transfer a child with an installed LMA or COPA-airway to the department.

11. During emergency tracheal intubation, when using succinylcholine is strictly contraindicated, the drug rocuronium bromide in a dose of 0.4 mg / kg, which provides the maximum rate of develop-

ment of neuromuscular blockade, and also creates conditions for tracheal intubation, assessed as “excellent” and “good” within 1 minute should be used.

12. In the presence of liver or kidney dysfunction, the drug cisatracurium and atracurium besilate should be used for the purpose of anesthesia, for which an independent elimination organ is not characteristic. In order to achieve the safest conditions for the use of muscle relaxants, neuro-muscular function should be monitored during all stages of anesthesia using the TOF-Watch device.

13. Reasonable inclusion of patients in the fast track (ERAS) group operated in the conditions of one-day surgery, significantly saved their costs on the basis of the developed criteria.

**List of scientific papers,
published on the topic of the dissertation**

1. Насибова, Э.М. Оценка адекватности аналгезии с использованием метода сенсометрии при проведении сакральной анестезии во время выполнения проктологических операций // Клініна хірургія. - 2012, №5 (806), - с. 21-23.
2. Nasibova. E.M., Quliyev. C.B. The use of propofol in surgical interventions in children // Abstracts of XII international Euroasian Congress of surgery and Gastroenterolojy. - Baku, - 2011, - p. 265.
3. Насибова, Э.М. Современные аспекты общей анестезии у детей // Respublika Dövlət Mükafatı Laureatı, э.е.х., prof. Т.Ə, Əliyevin 90 illiyinə həsr edilmiş elmi-konfransın materialları. - Bakı, - 2011, - s.199.
4. Насибова, Э.М. Особенности детской амбулаторной анестезии / Э.М.Насибова, Ч.Б.Кулиев // Sağlamlıq, - 2011, №2, - с. 56-58.
5. Насибова, Э.М. Хирургия «одного дня» с пропофолом / Э.М.Насибова, Ч.Б.Кулиев // Сəğrahiyyə, - 2012, №1 (29), - с. 10-13.
6. Насибова, Э.М. Перспективы детской амбулаторной хирургии и анестезиологии / Э.М.Насибова, Ч.Б.Кулиев // Azərbaycan Təbabətinin Müasir Nailiyyətləri, - 2012, №1, - с. 102-106.
7. Насибова, Э.М. Неингаляционная анестезия у детей // Azərbaycan Təbabətinin Müasir Nailiyyətləri, - 2012, №2, - с. 65-71.
8. Насибова, Э.М. Особенности анестезии в педиатрической практике // Сəğrahiyyə, - 2012, №3 (31), - с. 78-88.
9. Насибова, Э.М. Особенности премедикации у детей // Azərbaycan Təbabətinin Müasir Nailiyyətləri, - 2012, №4, - с. 37-42.
10. Насибова, Э.М. Современные аспекты ингаляционной анестезии в педиатрии // Sağlamlıq, - 2012, №4, - с. 13-22
11. Насибова, Э.М. Особенности педиатрической амбула-

торной анестезии // Professor H.A.Sultanovun 80 illik yubileyinə həsr olunmuş elmi-praktik konfransın materialları. - Bakı, - 2012, - s. 9.

12. Насибова, Э.М. Современные аспекты предоперационной подготовки педиатрических больных // Sağlamlıq, - 2013, №1, - с. 166-170.

13. Насибова, Э.М. Внутренний медицинский аудит на основе регистрации критических инцидентов во время анестезиологических пособий при малых оперативных вмешательствах у детей // Харківська хірургічна школа, - 2013, №6, - с. 66-69.

14. Насибова, Э.М. Современные аспекты внутривенной тотальной анестезии в детской амбулаторной хирургии // Əməkdar elm xadimi, t.e.d., professor Z.T.Quliyevanın 90 illik yubileyinə həsr edilmiş elmi konfransın materialları. - Bakı, - 2013, - с. 230-231.

15. Насибова, Э.М., Джанахмедов, А.Х. Оптимизация анестезиологического пособия в стационаре «одного дня» у детей // Əməkdar elm xadimi, t.e.d. prof. B.X.Abasovun 90 illik yubileyinə həsr olunmuş beynalxalq iştiraklı elmi-praktik konfransın materialları. - Bakı, - 2013. – с.104-105.

16. Насибова, Э.М. Актуальные проблемы анестезиологического обеспечения однодневной хирургии у детей // Doktorantların və gənc tədqiqatçıların XVIII Respublika konfransının materialları. - Bakı, - 2013, - I cild, - s. 162-164.

17. Насибова, Э.М. Применение внутривенной тотальной анестезии при малых хирургических вмешательствах у детей // Клініна хірургія, - 2014, №2 (855), - с. 58-60.

18. Насибова, Э.М. Современные представления о мышечных релаксантах, применяемых в детской хирургии // Azərbaycan Təbabətinin Müasir Nailiyyətləri, - 2015, №2, - с. 24-32

19. Nasibova, E.M. Experience with Esmeron in day surgery in children / E.M.Nasibova, R.Sh Poluxov // Medical News of North Caucasus, - 2015, v. 10(2), - p. 137-140.

20. Насибова, Э.М., Насирова, С.С. Наш опыт применения эсмерона в однодневной хирургии у детей // T.e.d., professor

Ə.M.Əlizadənin anadan olmasının 100 illiyinə həsr olunmuş elmi-praktik konfransın materialları. - Bakı, - 2015, - s. 104.

21. Насибова, Э.М. Каудальная анестезия как компонент общей анестезии в «однодневной хирургии» у детей // Т.е.d., professor Ə.M.Əlizadənin anadan olmasının 100 illiyinə həsr olunmuş elmi-praktik konfransın materialları. - Bakı, - 2015, - s. 108.

22. Насибова, Э.М. Особенности анестезии у детей с церебральным параличом // Azərbaycan Təbabətinin Müasir Nailiyyətləri, - 2016, № 2, - с. 294-299.

23. Насибова, Э.М. Наша тактика ведения анестезиологического пособия при «малых» оперативных вмешательствах у детей / Российский вестник детской хирургии, анестезиологии и реаниматологии. Материалы II съезда детских хирургов России, - 2016, - октябрь, с 119.

24. Nasibova, E.M. Prospects for Anesthesia in Day Surgery in Children // Journal of Anesthesia & Intensive Care Medicine, - 2017, v. 4 (3), - p. 1-7.

25. Насибова, Э.М. Выбор анестезиологического пособия при эндоскопических исследованиях у детей // Azərbaycan Təbabətinin Müasir Nailiyyətləri, - 2017, №2, - с. 295-297.

26. Насибова, Э.М. Наш опыт применения каудальной анестезии при малых оперативных вмешательствах у детей / Э.М.Насибова, И.С.Исмаилов, Э.Р.Кулиев // Педиатрия и детская хирургия. - Казахстан, - 2017, №3, - с. 54-57.

27. Насибова, Э.М. Сравнительное изучение применения бупивакаина и ропивакаина при каудальной анестезии при малых оперативных вмешательствах у детей / Э.М.Насибова, Дж.Н.Пашаев // Medicus. International medical journal, - 2017, №5 (17), - с. 8-14.

28. Nasibova, E.M. Our Experience of using Caudal Anesthesia in "Small" Surgical Interventions in Newborns / E.M.Nasibova, R.Sh.Polukhov, I.S.Ismailov // International Journal of Anesthesiology & Research (IJAR). ISSN 2332-2780, - 2018, v.6 (8), - p. 543-544.

29. Nasibova, E.M. Caudal Anesthesia in Surgical Interventions of the Lower Extremities in children // International Journal of Anesthesiology & Pain Medicine. ISSN 2471-982X, - 2018, v. 4 (1-2), - p. 1-9.
30. Nasibova, E.M. The use of naropin with promedol for caudal anesthesia in new-born. // Pediatric Anesthesia and Critical Care Journal (PACCJ), - 2018, v. 6 (2), - p. 84-88 doi:10.14587 / paccj.2018.13.
31. Nasibova, E.M. Increasing the Effectiveness of Caudal Anesthesia by Combining Ropivacin with Dexamethasone in Surgical Interventions in Children // Annals of Clinical Anesthesia Research, - 2018, v. 2 (2), - p. 1.
32. Насибова, Э.М., Рагимов, В.С. Динамика лабораторных маркеров операционного стресса при «малых» оперативных вмешательствах у детей // Т.е.d., professor А.А.Ахунбейли anadan olmasının 80 illiyinə həsr olunmuş elmi-praktik konfransın materialları, - Bakı, - 2018, - с.266-267.
33. Насибова, Э.М. Наш опыт применения каудальной анестезии при «малых» оперативных вмешательствах у новорожденных // Международный научно - практический журнал Педиатрия. Восточная Европа, - 2018, т. 6 (3), - с. 396-401.
34. Насибова, Э.М. Современная анестезиологическая тактика введения больных с ДЦП при оперативных вмешательствах нижних конечностей // журнал Medicus, - 2018, №5 (23), - с.12-17.
35. Насибова, Э.М. Каудальный блок как компонент общей анестезии при оперативном лечении новорожденных с НЭК / Э.М.Насибова, А.Б.Гусейнова // Хирургия. Восточная Европа, - 2018, т. 7 (21), - с. 60-66.
36. Насибова, Э.М., Исмаилов, И.С., Мамедова, Г.Г., Кулиев, Э.Р. Оптимизация анестезиологического пособия при лапароскопических операциях у детей // Т.е.d., professor А.А.Ахунбейли anadan olmasının 80 illiyinə həsr olunmuş elmi-praktik konfransın materialları. - Bakı, - 2018, - s.263-266.
37. Насибова, Э.М. Каудальная анестезия при оператив-

ных вмешательствах на нижних конечностях у детей / Э.М.Насибова, И.С.Исмаилов, Ф.Г.Насибов, Н.С.Саттаров // Регионарная анестезия и лечение боли, - 2018, т.12, - с. 113-118.

38. Насибова, Э.М. Сравнительное изучение разных методов анестезии при трансректальной резекции толстого кишечника при болезни Гиршпрунга у детей раннего возраста / Э.М.Насибова, Р.Ш. Полухов // Казанский медицинский журнал, - 2018, т. 99 (3), - с.392-396.

39. Nasibova, E.M., Pashayev, D.N., Mustafaev, F.M., Khudakerimov, S.H., Bayramova, A.K., Yolchiyev, R. Our experience of using laryngeal mask in one-day surgery in children // Azerbaijan Society of Oral and maxillofacial Surgeons Ist International Scientific Congress. - Baku, - 2018, - [A17].

40. Nasibova, E.M. Comparative Study of Different Methods of Anesthesia with Transrectal Resection of the Large Intestine in Hirschsprung Disease in Young Children // SM Journal of Pediatrics. -2018; 3(1):1015, p.1-4.

41. Насибова, Э.М., Пашаев, Дж.Н., Мамедова, Г.Г., Абдурахманова, Н.М. Ларингеальная маска в детской анестезиологии // АТУ-нун Уşақ сәrrahlığı kafedrasının 80 illiyinə həsr olunmuş elmi-praktik konfransın materialları. - Bakı, - 2019, - s 91.

42. Насибова, Э.М. Оценка эффективности и безопасности применения ларингеальной маски и СОРА-воздуховода при «малых» оперативных вмешательствах у детей /Актуальные вопросы современной медицины. Материалы IV международной научно-практической конференции прикаспийских государств. - Астархань, - 24-26 октября, - 2019, - с.202-205

43. Насибова, Э.М., Пашаев, Дж.Н., Абасов, М.М. Применение дексмететомидина – новое направление в нейроанестезиологии // АТУ-нун Neürocәrrahlıq kafedrasının yaranmasının 50 illiyinə həsr olunmuş elmi-praktik konfransın materialları. – Bakı, - 2019, - с. 124-125.

44. Nasibova, E.M. Selection of Optimal Muscle Relaxants for Small Surgical Interventions in Children // Journal of Anesthesia & Research, - 2019, April, 2(1), p. 31-34.

45. Nasibova, E.M. Maintenance of airway patency with a laryngeal mask and COPA-airway during small surgical intervention in children // *Pediatric Anesthesia and Critical Care Journal*, - 2019, 7(1), p. 13-21.
46. Насибова, Э.М., Полухов, Р.Ш. Выбор оптимального миорелаксанта в однодневной хирургии у детей // АТУ-nun Uşaq cərrahlığı kafedrasının 80 illiyinə həsr olunmuş elmi-praktik konfransın materialları. - Bakı, - 2019, - s. 95.
47. Nasibova, E.M. Caudal blockade as the main component of general anesthesia during surgical interventions for necrotic enterocolitis in newborns / E.M.Nasibova, A.B.Quseynova // *Asploro Journal of Biomedical and Clinical Case Reports*, - 2019, 2 (2), - p. 52-57
48. Насибова, Э.М. Анализ оптимального ингаляционного анестетика в однодневной хирургии у детей // *Azərbaycan Tibb Jurnalı*, - 2019, №3, - s.35-40.
49. Nasibova E.M. The Benefits of Premedication for Small Surgical Interventions in One-Day Surgery in Children // *Journal of Anesthesia & Perioperative Management*. 2020; 4(1):1-5.
50. Nasibova, E.M. Our Experience with the Use of Sevoflurane Inhalation Anesthetic in One-Day Surgery in Children // *EC Paediatrics*, - 2020, 9(3), - p. 1-13
51. Nasibova, E.M. The Choice of Anesthesia for Reconstructive Surgery in Children with Cerebral Palsy” // *EC Anaesthesia*, - 2020, 6(3), - p. 01-04
52. Nasibova, E.M. Analysis of critical incidents identified with different options for anesthetic benefits used in one-day surgery in children // *Pediatric Anesthesia and Critical Care Journal*, - 2020;8(1):39-44.
53. Насибова, Э.М. Особенности премедикации у детей в условиях "однодневной хирургии" // *Azərbaycan Tibb Jurnalı*, - 2020, №1, - s.73-80.
54. Nasibova, E.M., Pashayev, C.N. Our experience with retrograde intubation in ankylosis of the temporomandibular joint in a child of six years // *Case Reports and Reviews: Open Access*

2020;1(1):105.

55. Nasibova, E.M. Propofol-In One-Day Surgery in Children // *Anaesthesia & Critical Care Medicine Journal*. 2020; 5(2):000178.

56. Nasibova, E.M. The choice of optimal modern muscle relaxants (rocuronium bromide, Atracurium Besilate and cisatracurium besilate) in One-day Surgery in Children // *An archive of organic and inorganic chemical sciences*. 2020; 4(4):552-562.

57. Nasibova, E.M. Propofol - In One-Day Surgery in Children. // *Austin J Anesthesia and Analgesia*. 2020; 8(2): 1091.

58. Nasibova, E.M. The choice of optimal modern muscle relaxants (rocuronium bromide, atracurium besilate and cisatracurium besilate) in one-day surgery in children // *International Journal of Clinical Anesthesia and Research*. 2020; 4:004-012.

59. Nasibova, E.M. Propofol - In One-Day Surgery in Children // *Global Journal Anesthesia & Pain Medicine*. 2020; 3(2):263-267.

60. Nasibova, E.M. The Benefits of Premedication for Small Surgical Interventions in One-Day Surgery in Children // *International Journal of Pediatric Surgery*. 2020; 1:1-9.

61. Насибова, Э.М. Наш опыт применения ингаляционного анестетика севофлюрана в однодневной хирургии у детей // *Клінічна анестезіологія та інтенсивна терапія, № 1 (15), 2020*. С.34-51.

62. Nasibova, E.M., Polukhov, R.Sh. Comparative study of the potentiating effect of isoflurane and sevoflurane on the duration of muscle relaxation during surgical interventions in one-day surgery in children // *Pediatric Anesthesia and Critical Care Journal*. 2021; 9(1): p.21-29.

63. Nasibova, E.M. Increasing the effectiveness of caudal anesthesia by combining ropivacain with dexamethasone in surgical interventions in children // *4th International Conference Anesthesiologists and Surgeons*. 2021;3: p.38.

List of abbreviations

ASA	– American Association of Anesthetists
BP	– blood pressure
BR	– breathing rate
CI	– critical incidents
CIF	– critical incident frequency
COPA	– cuffed oropharyngeal airway
EA	– endotracheal anesthesia
ET	– endotracheal tube
FT	– fast track
HFA	– high flow anesthesia
HR	– heart rate
HSV	– heart stroke volume
ISO	– isoflurane
IA	– inhalation anesthesia
LFA	– low flow anesthesia
LMA	– laryngeal mask
MBP	– mean blood pressure
NMB	– neuromuscular blockade
NMC	– neuromuscular conduction
PetCO ₂	– partial pressure of CO ₂ on the exhale
P _{in}	– inspiratory pressure
RA	– regional anesthesia
SEV	– sevoflurane
SpO ₂	– saturation
T ₁	– response amplitude to the first of four stimuli as a percentage of the initial level
TPVR	– total peripheral vascular resistance
TV	– tidal volume
V _{Tin}	– inspiratory tidal volume
MVC	– minute volume of blood circulation
MAC	– minimal alveolar concentration
TBA	– total intravenous anesthesia

The defense will be held on «29» November 2021 at «14.00» at the meeting of the Dissertation Council BED 4.06 Supreme Attestation Commission under President of the Republic of Azerbaijan of the basis of the Azerbaijan Medical University.

Address: AZ1022, Baku, F.Gasimzade str., 14 (conferees-hill).

Dissertation is accessible at the Azerbaijan Medical University library.

Electronic version of dissertation and its abstract are available on the official website of the Azerbaijan Medical University (amu.edu.az).

Abstract was sent of the required address on «29» October 2021.

Signed for print: 20.10.2021
Paper format: 60 x 84 1/16
Volume: 77.265 charters
Number of copies: 20