



SPECIFIC FEATURES OF ANESTHETIC MANAGEMENT IN PEDIATRIC
MAXILLOFACIAL SURGERY



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Abstract. The article examines the specific aspects of anesthetic management during maxillofacial surgical procedures in children. Particular attention is given to age-related anatomical and physiological characteristics, the structure of the pediatric airway, metabolic differences, and individual sensitivity to anesthetic drugs. Maxillofacial surgery requires careful anesthetic planning because the surgical field may interfere with airway access and create additional difficulties during intubation and maintenance of airway patency. The choice of anesthetic technique depends on the child's age and body weight, the type and duration of surgery, the presence of concomitant diseases, and the expected severity of postoperative pain. The article highlights the importance of comprehensive preoperative assessment, individualized selection of anesthetic agents, continuous monitoring of vital functions, appropriate fluid therapy, and adequate postoperative observation. Particular consideration should be given to maintaining effective ventilation and oxygenation throughout the perioperative period. A properly planned anesthetic approach contributes to patient safety, reduces the risk of perioperative complications, facilitates effective pain control, and supports comfortable recovery after surgery. The described principles may be useful for improving the organization of anesthetic care in pediatric maxillofacial surgery.

Keywords: children, maxillofacial surgery, anesthesiology, anesthetic management, general anesthesia, airway, intubation, monitoring, pain management, postoperative period.

Аннотация. В статье рассматриваются особенности анестезиологического обеспечения хирургических вмешательств на челюстно-лицевой области у детей. Особое внимание уделено анатомо-физиологическим особенностям детского организма, возрастным характеристикам дыхательных путей, особенностям метаболизма и индивидуальной чувствительности к лекарственным препаратам. Проведение операций в челюстно-лицевой области требует тщательного планирования анестезиологической тактики, поскольку хирургическое поле может ограничивать доступ к дыхательным путям и создавать дополнительные сложности при интубации и поддержании их проходимости. Выбор метода анестезии определяется возрастом и массой тела ребёнка, характером и продолжительностью оперативного вмешательства, сопутствующими заболеваниями и предполагаемой выраженностью послеоперационного болевого синдрома. В работе подчёркивается значение предоперационной оценки состояния пациента, индивидуального подбора анестезиологических препаратов, непрерывного мониторинга жизненно важных функций, адекватной инфузионной терапии и послеоперационного наблюдения. Рациональное анестезиологическое обеспечение способствует повышению безопасности хирургического



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лечения, снижению риска осложнений и обеспечению комфортного восстановления ребёнка после операции.

Ключевые слова: дети, челюстно-лицевая хирургия, анестезиология, анестезиологическое обеспечение, общая анестезия, дыхательные пути, интубация, мониторинг, обезбоживание, послеоперационный период.

Аннотация. Мақолада болаларда юз-жағ жарроҳлиги амалиётларини ўтказиш жараёнида анестезиологик таъминотнинг ўзига хос жиҳатлари ёритилган. Болалар организмнинг анатомик-физиологик хусусиятлари, ёшга боғлиқ нафас йўллари тузилиши, модда алмашинуви ва дори воситаларига сезувчанлиги анестезия усулини танлашда муҳим аҳамият касб этади. Юз-жағ соҳасидаги жарроҳлик аралашувлари нафас йўллари бошқариш, интубация қилиш ва операция давомида ҳаво йўлларининг ўтказувчанлигини таъминлашга алоҳида эътибор қаратишни талаб қилади. Шунингдек, боланинг ёши, тана вазни, жарроҳлик амалиётининг давомийлиги ва мураккаблиги, қўшимча касалликлар ҳамда операциядан кейинги оғриқ синдроми анестезиологик тактикани белгилайди. Мақолада операциядан олдинги баҳолаш, индивидуал анестезия режасини ишлаб чиқиш, интраоперацион мониторинг, инфузион терапияси ва операциядан кейинги кузатувнинг аҳамияти таҳлил қилинган. Самарали анестезиологик ёндашув боланинг хавфсизлигини таъминлаш, асоратларни камайтириш ва жарроҳлик даволаш натижаларини яхшилашга хизмат қилади.

Калит сўзлар: болалар, юз-жағ жарроҳлиги, анестезиология, анестезиологик таъминот, умумий анестезия, нафас йўллари, интубация, мониторинг, оғриқсизлантириш, операциядан кейинги давр.

INTRODUCTION

In pediatric surgery, the surgical treatment of diseases and congenital defects affecting the maxillofacial region is a field that requires a specialized medical approach. Operations in this area aim not only to restore the child's physical appearance but also to preserve or restore vital functions such as chewing, swallowing, breathing, and speech. Consequently, the success of maxillofacial surgery depends not merely on surgical technique but also directly on proper patient preparation during the perioperative period, effective pain management, and the stable monitoring of vital functions [1].

The pediatric body differs significantly from the adult body in terms of anatomical and physiological characteristics. In young children, factors such as relatively narrow airways, high oxygen demand, limited respiratory reserve, and unique individual responses to anesthetic agents can complicate anesthetic management. Low body weight necessitates precise calculation of drug dosages. Furthermore, the child's age, body weight, general somatic condition, and any co-existing medical conditions serve as critical criteria when selecting the appropriate anesthesia method. The specific nature of maxillofacial surgery is primarily defined by the anatomical proximity of the surgical site to the airways. In certain instances, surgical manipulations within the oral cavity and maxillofacial region can present additional challenges for the anesthesiologist regarding airway management. Ensuring airway safety is a priority, particularly in cases involving cleft lip and palate, developmental defects of the maxillofacial region, traumatic injuries, inflammatory processes, or extensive surgical procedures

Anesthetic management encompasses the preoperative, intraoperative, and postoperative stages as an integrated system. Preoperatively, it is essential to assess the child's clinical condition, determine anatomical airway characteristics, review the allergy history, and consider any prior anesthesia experiences and existing medical conditions. During the operation, continuous monitoring of respiration, cardiovascular function, oxygenation, and other vital signs is required[3.6.8].



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The postoperative period also constitutes a crucial component of anesthetic safety. Adequate pain control, monitoring of respiratory function, prevention of nausea and vomiting, and ensuring a safe emergence from anesthesia in children influence the subsequent recovery process. In particular, for patients undergoing maxillofacial surgery, factors such as swelling, bleeding, or increased secretions can negatively affect airway patency[3.5.9]..

In this context, the individualized planning of anesthetic management, the use of modern monitoring techniques, and the preoperative assessment of risks are critical issues in pediatric maxillofacial surgery. This article highlights key aspects, including the age-related physiological characteristics of children, airway management in maxillofacial surgery, anesthesia safety, pain management, and postoperative monitoring.

MATERIALS AND METHODS

The article “Anesthesiological Concepts in Pediatric Oral and Maxillofacial Surgery” by Riemer J.-E. and Piegeler T., published in 2026, was reviewed. It analyzed the main principles of the anesthetic approach in pediatric oral and maxillofacial surgery, airway management, and perioperative safety issues [1].

Also, a study by Tran L. et al. on the characteristics of anesthetic support in children with craniofacial anomalies was used as material [2]. A review article on airway management in maxillofacial surgery by Merola R. et al. from 2025 was also included in the analysis [3].

In addition, the anatomical and physiological characteristics of the pediatric airway and the principles of their perioperative management were used in the article “Pediatric airway management” by Hsu G., von Ungern-Sternberg B.S., and Engelhardt T. [2].

The study was conducted in the Department of Maxillofacial Surgery, as well as the Department of Anesthesiology and Resuscitation of the State Medical University of Medical Sciences during 2021-2024. The age of the patients was 2-16 years. The total number of patients studied was 250 patients. They were divided into the following age groups: 2-4 years (n=26), 5-8 years (n=74), 9-12 years (n=100), 13-16 years (n=50).

After simple premedication, general combined anesthesia was performed in all children using propofol and remifentanyl, muscle relaxants, and local anesthesia, and artificial ventilation of the lungs was performed. Regional anesthesia methods were used depending on the area and volume of the operation: supraorbital nerve blockade, infraorbital nerve blockade, mandibular nerve blockade.

All patients underwent intraoperative cardiomonitoring. During monitoring, the following parameters were taken into account: heart rate (HR), arterial blood pressure (ABP), pulse sphygmography (SpO₂), and body temperature. All parameters were recorded simultaneously.

RESULTS

Individual planning of anesthesia care in the practice of maxillofacial surgery in children has been shown to be of great importance in ensuring patient safety. Taking into account the age, body weight, general clinical condition and nature of the surgical intervention of the child allows for the effective organization of the anesthesia process.

It was found that assessing the patient's respiratory status, studying the anamnesis and identifying possible anesthetic risks before surgery helps to reduce complications at later stages. Reliable control of the respiratory tract and careful planning of the intubation process in maxillofacial surgeries are of particular importance.

Regular monitoring of vital signs during the operation made it possible to timely detect changes in the general condition of the child. Also, calculating the dose of anesthetic drugs in accordance with the child's body weight and monitoring the fluid balance helped to maintain perioperative stability.

The effectiveness of anesthesia in maxillofacial surgeries was high in all study participants. Propofol dosage was 2.5-3 mg/kg for 2-4-year-old children, and 1.5-2 mg/kg for other groups of patients (13-16 years old).



Table 1

Depending on the age of the patient, the anesthetic dose changes and hemodynamic parameters change

Watching the tears fall	n	Propofol dose (mg/kg)	Rate of fire (rounds/min)	SpO ₂ (%)
2-4 years	26	2.5±0.3	95±8	98±1
5-8 years	74	2.2±0.3	88±7	98±1
9-12 years	100	1.8±0.3	82±6	99±0.5
13-16 years	50	1.5±0.3	76±5	99±0.5

The use of regional anesthesia methods in maxillofacial surgery procedures resulted in a saving in the total amount of anesthetic drug. Endotracheal intubations were performed accurately in all children. The size of the intubation tube was selected based on the formula: Tube size = (age + 16)/4. The most difficult aspects of the airway intubation process were observed in children aged 2-4 years, as this was associated with congenital malformations in children.

The airway intubation process in children aged 9-16 years passed without difficulties. Adequate pain control after surgery, monitoring of breathing, and safe awakening of the patient were identified as important factors in the recovery process. Overall, the results obtained showed that a comprehensive and individual anesthetic approach increases the safety of maxillofacial surgery procedures in children.

DISCUSSION

Surgical operations in the maxillofacial area in children require high professional skills and a unique approach from anesthesiologists-resuscitators. This is primarily due to the anatomical and physiological characteristics of the child's body and pathologies of the maxillofacial area (congenital cleft lip and palate, micrognathia, various deformations).

The results of our study showed that the most important stage of anesthesia management in maxillofacial surgery in children is safe airway control. Deformities in the maxillofacial system often cause the problem of "difficult airways". In this situation, the use of fiberoptic equipment for videolaryngoscopy and intubation, as well as airway management using laryngeal masks, significantly reduces the risk. The scientific works of a number of domestic and foreign scientists also emphasize the complexity of the intubation process in children with maxillofacial pathology and the need for prior preparation for it.

The combination of modern anesthetics and short-acting intravenous agents used in our study ensured stable hemodynamic parameters. Since the maxillofacial region of children is very vascular, the risk of bleeding during surgery is high. The use of the method of controlled arterial hypotension during anesthesia allowed to reduce blood flow in the surgical field and improve visibility, which in turn reduced the duration of the surgical procedure.

CONCLUSION

Correct organization of anesthesia supply in maxillofacial surgery in children is one of the important factors ensuring the safety and effectiveness of surgical treatment. Age-related anatomical and physiological features of the children's body, sensitivity to drugs, and the specificity of reactions to external influences require that anesthesiological tactics be determined individually for each patient. From this point of view, organizing maxillofacial surgery practice in children based on standard approaches in adult patients may not always give optimal results.

Anesthesiological maintenance is not a process that begins a few minutes before the operation, but a complex process that continues from the initial examination of the patient to his complete awakening and observation in the postoperative period. At the stage of preoperative preparation, taking into account the child's age, body weight, general somatic condition, allergic anamnesis, previous anesthetics, anatomical features of the respiratory tract, and existing co-morbidities allows for preliminary assessment of the risk of anesthesia.



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Airway management is of particular importance in maxillofacial surgery. The close proximity of the surgical site to the oral cavity and airways places high demands on intubation, ventilation, and control of airway patency during surgery. Therefore, the presence of an algorithm of actions agreed in advance between the anesthesiologist and the surgeon is important in the management of possible complex situations. An individual approach is necessary, especially in cases of cleft lip and palate, craniofacial malformations, trauma, and extensive oral surgery.

Continuous monitoring of vital parameters during surgery is one of the main conditions of anesthesiological safety. Monitoring of respiratory rate, oxygen saturation level, heart rate, arterial blood pressure and other clinical indicators allows timely detection of changes in the patient's condition. It is also important to determine the doses of anesthetic drugs and other drugs according to the child's body weight and individual characteristics.

In the postoperative period, adequate pain control, monitoring of breathing, prevention of nausea and vomiting, assessment of the patient's state of consciousness and hemodynamic indicators are important tasks. Due to the fact that swelling, bleeding and increased secretion that can occur after operations in the maxillofacial area can affect the permeability of the respiratory tract, special attention should be paid to monitoring the patient.

Thus, it is appropriate to follow the principle of individual clinical evaluation along with standard approaches to improve anesthesia care in maxillofacial surgery in children. Adapting the anesthetic plan to the type and complexity of the operation, reliable management of the airways, use of modern monitoring methods, rational organization of anesthesia, and strengthening postoperative control are important directions for ensuring children's safety.

The use of a comprehensive approach can serve to reduce the risks associated with surgical intervention, early recovery of the child and increase the overall quality of the treatment process.

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