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PREVENTION OF OCULOCARDIAC REFLEXES DURING ANESTHESIA IN PEDIATRIC OPHTHALMIC SURGERY

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Abstract: The use of general anesthesia is unquestionable in the surgical correction of congenital ophthalmic pathologies occurring in children. Anesthetic approaches employed in these cases are typically aimed at enhancing the quality of surgical interventions. Unlike other branches of ophthalmic surgery, the impact of the anesthetics used on the functional state of the visual organs is of significant importance. Certain anesthetics (ketamine) and agents (muscle relaxants) can increase intraocular pressure during surgery, potentially inducing unexpected adverse effects. Therefore, a tailored approach is essential in selecting anesthetic agents and techniques for surgeries for congenital ophthalmic pathologies in children, aiming to prevent potential complications that may arise during and after surgery.

Components of General Anesthesia in Pediatric Ophthalmic Surgery

The active development of ophthalmic microsurgery in the last decade has introduced new demands for improving anesthetic management in these procedures. Anesthesia in pediatric ophthalmic surgery necessitates a specialized approach, encompassing the provision of adequate sedation, effective preoperative and postoperative analgesia, prevention of undesirable reflex reactions (oculocardiac, swallowing), reduction of postoperative nausea and vomiting, and prevention of post-anesthetic agitation [1, 2, 3]. Numerous researchers suggest that low-dose ketamine improves the surgical process and reduces the risk of oculocardiac reflex during surgery, while also eliminating the need for atropine administration for OCR prophylaxis. The oculocardiac reflex was first described by Aschner and Dagnini in 1908. It is considered a peripheral type of the trigeminal cardiac reflex (TCR), similar

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to the maxillomandibular cardiac reflex (MMCR). According to Shevchenko Y.L., stimulation of any branch of the trigeminal nerve causes the afferent signal flow to pass from the Gasserian ganglion to the sensory nucleus of the trigeminal nerve, while efferent pathways from the motor nucleus of the vagus nerve are interrupted [3, 4].

Some researchers believe that not only traction of the extraocular muscles or pressure on the eyeball, but also stimulation of the periosteum can lead to cardiac rhythm disturbances, such as bradycardia, AV block, ventricular ectopy, or asystole [9, 10]. The authors also report the risk of temporary cardiac arrest during strabismus surgery as 1 in 2200 cases. It has been shown that even prophylactic atropine administration does not reduce the risk of developing complications [11]. In the field of pediatric ophthalmic anesthesia, it was long considered necessary to premedicate with atropine and seduxen when performing anesthesia with ketamine [1, 2]. However, this option did not fully meet all the requirements set by surgeons, as they aimed to prevent postoperative agitation, excitement, nausea, and vomiting, as these conditions can increase intraocular pressure and, consequently, reduce the effectiveness of the surgical intervention [5]. This combination also creates vagotonic and bronchodilator effects [8, 10], reduces the risk of hypoventilation when used in precise doses [9], and initiates a rapid awakening process with single administration. Joniev S.Sh. and colleagues (2015) discuss propofol, describing it as a drug that fully meets all the requirements for anesthetic management in eye surgery. The authors emphasize that propofol does not increase intraocular pressure, general anesthesia begins at a predictable rate, is stable, and then quickly and smoothly restores consciousness and somatic functions, while strain or vomiting are not observed. Anesthesia combined with propofol creates the most suitable conditions for surgical correction, minimizes the negative effects of its individual components, and maximally ensures the specific tasks of anesthetic management for ophthalmic operations [4]. While ketamine has the most pronounced psychotropic adverse effects, according to, anesthesia combined with propofol affects the psyche through a sedation mechanism, making the ketamine-propofol combination more favorable [5]. In his study on ophthalmic surgery using

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ketamine, sevoflurane, propofol, midazolam, and halothane, found that hemodynamic changes were minimal with ketamine, and the risk of developing oculocardiac reflex was minimal [11]. Autors (2021) recommends conducting anesthesia induction using ketamine and midazolam, and also notes that propofol and remifentanil increase the risk of oculocardiac reflex development [10]. However, in a study by of a combination of propofol, sufentanil, and remifentanil, no adverse complications such as oculocardiac, oculopulmonary, and oculogastric reflexes were observed during and after surgery [3]. The authors emphasize the negative aspects of using fentanyl, which are manifested in respiratory depression and prolongation of postoperative recovery time. Faster recovery of consciousness and spontaneous breathing has also been noted in patients where regional anesthesia was used [2,3]. The author explains his conclusions as follows: the use of general anesthesia and retrobulbar blockade in strabismus surgery eliminates oculogastric and oculocardiac reflexes, provides effective pain relief during and after surgery, which creates a positive psychological environment for children and their parents [3].

Use of Inhalation Anesthesia in Pediatric Ophthalmic Surgery

Inhalation anesthetics are among the most common anesthetic agents used in ophthalmic surgical interventions and are actively employed in pediatric practice. These drugs are characterized by their ability to depress respiration in a dose-dependent manner, with minimal impact on the cardiovascular system, enabling highly controllable inhalation anesthesia. They reduce cerebral metabolism, adapting it to ischemic conditions [3], although a characteristic is a dose-dependent increase in intracranial pressure and a slight increase in cerebral blood flow under normal capnia conditions [5]. One of the positive qualities of inhalation anesthesia, particularly with sevoflurane, includes the possibility of conducting anesthesia using low and minimal flow techniques. This provides more comfortable conditions in the breathing circuit and offers economic benefits [4]. Emergence from anesthesia is often accompanied by motor hyperactivity (crying, negativism towards parents and medical staff). The author

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indicates that premedication with midazolam and the use of conduction anesthesia before surgery can ensure a smoother emergence from anesthesia, reducing the incidence of emergence agitation syndrome to 5% of cases [5]. Scientists emphasize that using propofol after sevoflurane inhalation effectively prevents the development of post-anesthetic agitation syndrome in 82.8% of cases; however, this prolongs the drug-induced sedation phase. As a prophylactic measure, they recommend using intranasal dexmedetomidine 30 minutes before the start of anesthesia, which reduces the risk of agitation development by 90% [9]. Joniev S.Sh. (2022) in their work, note that sevoflurane provides the best preservation of mental functions, similar to droperidol and propofol [10]. Currently, in pediatric ophthalmic anesthesia, preference is given to inhalation anesthetics that ensure rapid anesthesia induction and rapid recovery, do not exhibit significant negative hemodynamic effects, and have minimal impact on intracranial and intraocular pressure.

Pain Management Components in Pediatric Ophthalmic Surgery Anesthesia

Numerous works dedicated to anesthesia in ophthalmic interventions raise the issue of the combined use of non-opioid analgesics. Paracetamol is the most commonly used in pediatric practice. It possesses a significant analgesic effect, prevents the development of central sensitization, which provides grounds to consider it a central analgesic, and is applicable in all age groups [11]. The analgesic effect of the drug begins within 5-10 minutes after the start of infusion and reaches its maximum within 1 hour, with the peak analgesic effect lasting for 4-6 hours. Paracetamol is actively used as a non-opioid analgesic for postoperative pain management [11]. Intravenous administration of paracetamol (15 mg/kg) during surgery does not cause postoperative nausea and vomiting for 24 hours, and its effectiveness increases if the drug is used prophylactically before or during surgical intervention compared to its administration when pain occurs [7]. Undoubtedly, the positive role of paracetamol as an effective analgesic in intravenous anesthesia and postoperative pain relief in ophthalmic interventions can be emphasized [8]. Furthermore, the drug is often used as a co-

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anesthetic under general anesthesia conditions, often by reducing the doses of opioid analgesics.

Use of Combined Anesthesia in Pediatric Ophthalmic Surgery

To ensure the necessary conditions for performing ophthalmic surgeries, success is often achieved through regional blocks, which include: retrobulbar, parabulbar, perilimbal, epibulbar, sub-Tenon's, epibulbar-intracameral anesthesia, pterygopalatine fossa block (PPFB), and topical (instillation) anesthesia [6,7]. For example, sub-Tenon's anesthesia, when used in combination with NSAIDs (non-steroidal anti-inflammatory drugs) and serotonin receptor antagonists, significantly reduces pain, and also prevents postoperative joint pain and vomiting in the surgical treatment of eyelid diseases in children, as it contributes to a more complete interruption of afferent impulses associated with the ophthalmic intervention zone [7]. Although the use of retrobulbar anesthesia has decreased, abroad this block is still used in at least 5% of cases [8]. Researchers, based on this data, have concluded that retrobulbar hematoma is not a fatal complication leading to loss of function. They also cited foreign publications indicating the incidence of retrobulbar hematomas is 0.14–1.7% [10]. Stretching of extraocular muscles, injury to epibulbar structures, and traction on the eyeball during surgical procedures can lead to an increase in intraocular pressure (IOP). Therefore, the authors recommend using a combined anesthesia technique via pterygopalatine fossa (PPF) access [7]. Given that vegetative innervation of the eye is carried out from the ciliary and pterygopalatine ganglia, simultaneous targeting of both ganglia is advisable [10]. Through this block, simultaneous influence on the ciliary and pterygopalatine autonomic ganglia can be achieved. In such a block, a depot of the drug substance is created, its action begins more gently, and the effect lasts longer. They also indicate that this technique (access to the pterygopalatine ganglion via zygomatic approach) is beneficial in a number of operations, including vitreous surgeries and dacryocystorhinostomy, as well as in relieving glaucoma attacks [9].

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Experimentally, they determined the accuracy of the canal's location in the sagittal plane, determined the percentage of successful procedures, and defined the optimal angle for needle insertion. The angle size varies greatly from 20 to 70 degrees, averaging 45.88 degrees and is considered optimal in 75% of cases.

Performing regional blocks during ophthalmic operations always requires determining the amount of local anesthetic (LA), as there is a constant risk that LA may enter the orbit through the inferior orbital fissure, leading to the development of transient diplopia (double vision) [9,10]. Factors of significant importance in ensuring effectiveness and safety when performing regional blocks are related to the properties of the local anesthetics used, among which are: analgesic potential, duration of the latent period, duration of action, and toxicity [9]. The authors also note that this drug induces deep and long-lasting anesthesia and analgesia. They emphasize that the effectiveness of anesthesia is ensured by rapid sensory blockade due to the effect of lidocaine and long-lasting postoperative pain relief due to the effect of ropivacaine [13].

Conclusion: The prevalence and structure of eye diseases are of significant importance in providing ophthalmic care to the population. Unilateral blindness, enucleation, and loss of the eye are major complications of eye damage. Among eye diseases, congenital pathologies, particularly congenital strabismus, are frequently observed and are mostly surgically corrected at an early age. However, the anatomical and physiological condition of children, and the age-related stages of organism development, influence the pathogenesis and clinical presentation of diseases they experience. Therefore, all treatment methods, including anesthetic management, must take these factors into account.

bibliography

1. Joniev, S.Sh. (2020). Hemodynamic aspects in multicomponent general anesthesia in endocrine surgery [Text]. *MEDICUS International Medical Scientific Journal (MEDICUS Mezhdunarodnyy Meditsinskiy Nauchnyy Zhurnal)*, *№ 5 (35)*, 8-13. [In Russian]

2. Joniev, S.Sh., Pardayev, Sh.K., Goyibov, S.S., & Akramov, B.R. (2019). The use of a modified method of preoperative preparation and anesthesia in thyroid surgery [Text]. In *Collection of Scientific Articles XIV International Correspondence Scientific Specialized Conference*. Boston: PROBLEMS OF SCIENCE, pp. 175-186. [In Russian]

3. Joniev, S.Sh., & Khushvaktov, U.O. (2020). Rational hemodynamic monitoring in anesthetic management in endocrine surgery. In *Actual Issues of Diagnosis and Treatment of New Coronavirus Infection*, pp. 6-11. [In Russian]

4. Joniev, S.Sh. (2013). Influence of complex preoperative preparation on biochemical parameters of blood in patients with nodular goiter [Text]. *Doctor's News (Doktor Axborotnomasi)*, *№ 1(3)*, 71-73. [In Russian]

5. Joniev, S.Sh., Rakhimov, A.U., & Babajanov, A.S. (2013). Significance of biochemical parameters in preoperative preparation of patients with nodular goiter [Text]. *Science and World*, *№ 9(136)*, 136-138. [In Russian]

6. Joniev, S.Sh., Babajanov, A.S., Khushnayev, S., & Sultanova, S. (2018). Improving methods of preoperative preparation and anesthesia in the perioperative period of thyroid diseases [Text]. *European Research*, *№ 5*, 135-138. [In Russian]

7. Joniev, S.Sh., Babajanov, A.S., & Rakhimov, A.U. (2017). Analysis of the effectiveness of preoperative preparation and anesthesia options in the treatment of thyroid diseases [Text]. *Problems of Biology and Medicine (Problemы Biologii i Meditsinы)*, *№ 1*, 93-95. [In Russian]

8. Joniev, S.Sh. (2014). Determination of the effectiveness of preoperative preparation of patients with nodular goiter based on biochemical parameters [Text]. *Problems of Biology and Medicine (Problemы Biologii i Meditsinы)*, *№ 1 (77)*, 14-18. [In Russian]

9. Joniev, S.Sh. (2019). Modified method of preoperative preparation and anesthesia in the surgical treatment of thyroid pathology. In *Materials of the*

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Interregional Scientific-Practical Forum with International Participation "Healthy Family - Future of Russia" (Materialы mezhregionalnogo nauchno-prakticheskogo foruma s mezhdunarodnыm uchastiyem «Zdorovye semi — buduщyeye Rossii»). Izhevsk: MedExpoForum LLC, pp. 37-40. [In Russian]

10. Joniev, S.Sh. (2015). Preoperative preparation and anesthesia in thyroid surgery. In *Collection of Lecture Cycles "Anesthesia in Patients with Comorbidities and in Various Types of Surgical Interventions" (Sbornik sikla leksii "Anesteziya u pasiyentov s soputstvuyuщimi zabolevaniyami i pri razlichnыx tipax xirurgicheskix vmeshatelstv»)*. Samarkand: SamGMI, pp. 72-81. [In Russian]