

Overcoming Challenges: A Case Report of Dexmedetomidine-Ketamine Sedation and Peribulbar Block for Pediatric Ocular Surgery with Difficult Airway Predictors

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ABSTRACT

Children usually require general anesthesia when undergoing ophthalmic surgery since they are unable to cooperate and remain motionless during the procedure. Although most cases are straightforward, a subset of patients may have genetic syndromes or metabolic diseases associated with difficult intubation. A 10-year-old boy with an undiagnosed neurological condition and multiple predictors of difficult airway was scheduled for a cataract surgery. The preoperative evaluation showed a history of unsuccessful intubation attempts. Therefore, we decided not to induce general anesthesia and provide a sedation with dexmedetomidine and ketamine combined with a peribulbar block. Our positive experience demonstrates that there may be safe alternatives to general anesthesia for pediatric ophthalmic surgery, particularly when securing a definitive airway poses significant challenges.

Keywords

Anesthesia, Dexmedetomidine, Ketamine, Ophthalmology, Pediatric cataract surgery, Peribulbar, Sedation.

Introduction

Children make up a sizable number of patients seeking ocular care for cataract, strabismus, glaucoma and blocked lacrimal ducts. Most of them are healthy, ASA I or II, and can be treated as outpatients. However, ophthalmic conditions can occasionally be associated with specific syndromes, including many affecting the airway. Some examples are: mucopolysaccharidoses, the disorders of craniosynostosis (Crouzon, Apert and Pfeiffer syndromes), the craniofacial syndromes (Goldenhar, Treacher-Collins and Smith-Lemli-Opitz) and chromosomal anomalies (Trisomy 21 and Edward's syndrome) [1].

In all these conditions, it is advisable to adopt proper precautions and techniques to be prepared for difficult intubation. Alternatives to direct laryngoscopy for children are similar to those that may be used in adults (eg, flexible scope intubation, videolaryngoscopy, supraglottic airway). However, awake intubation is rarely performed in young children due to the lack of cooperation. The choice of advanced airway technique can be influenced by patient characteristics (age, size, neck mobility, mouth opening, physiologic reserve), available resources and the anesthesiologist preference. Nonetheless, it is crucial to have additional equipment available for other endeavors in order to avoid repeated attempts of the same technique [2].

Although general anesthesia provides a good operative condition, the possibility of a difficult airway leads us to search for an alternative anesthetic technique that allows the surgery to be

performed and reduces postoperative pain. When managing young children who will have ophthalmic surgery, the optimal anesthetic treatment should be secure, simple to use, and offer sufficient sedation, amnesia, immobility, cardiovascular stability, and quick recovery. Albeit rarely used, ophthalmic pediatric regional anesthesia has been widely described. As in the majority of pediatric regional techniques, eye blocks are placed in children while under general anesthesia or heavy sedation, for the purpose of diminishing complications. Differences in globe-to-orbit ratio and intraocular pressure between young children and adults impact its execution. But it is important to notice that regional techniques confer several advantages, such as reduced opioid consumption, attenuation of the oculocardiac reflex, prevention of postoperative nausea and vomiting, and refined analgesia [3].

The purpose of this study was to assess the safety and efficacy of peribulbar anesthesia instead of general anesthesia in children with multiple anomalies including a difficult airway.

Case Report

A 10-year-old male child weighing 12 Kg, having congenital bilateral cataract was posted to cataract extraction. He presented an unknown neurological condition, which curses with hypotonia, neuropsychomotor and growth delay. There was no history of pneumopathy or heart disease. The preoperative evaluation reported unsuccessful intubation attempts for an elective surgery at the age of two. Other predictors of difficult airway included micrognathia, high palate and microstomia. To avert airway complications, we sidestepped intubation, instead employing dexmedetomidine and ketamine for sedation, supplemented by a peribulbar block. The patient was monitored with electrocardiography, oximetry and non-invasive blood pressure. All the available difficult airway material was placed in the operating room: guide, bougie and video laryngoscope. Inhalational anesthetic (sevoflurane 7%) was provided through a facial mask to obtain peripheral access. Dexmedetomidine and ketamine boluses were initiated (1 mcg/Kg and 1 mg/Kg in 10 minutes) and, after ensuring that the patient was easily ventilated, we performed a laryngoscopy with curved blade. Two different physicians visualized only the epiglottis (Cormack 3) and we decided to proceed with the plan to avoid general anesthesia. The infusion rates were reduced to 0,5 mcg/Kg/h and 0,5 mg/Kg/h respectively. A peribulbar block was performed bilaterally using a short and small bore needle (13 x 0,38 mm). We injected a mixture of 3,5 mL containing 16 mg of bupivacaine and 26 mg of lidocaine in both extraconal spaces. The patient remained hemodynamically stable and with a normal breathing pattern receiving oxygen through a nasal cannula during the entire procedure.

Discussion

A retrospective study of 11,219 pediatric patients submitted to general anesthesia with endotracheal intubation found an overall rate of difficult direct laryngoscopy of 1,35% [4]. Although this

patient exhibited clear indicators of challenging intubation, the procedure was elective and effective ventilation was achieved without complications. Consequently, in accordance with ASA guidelines, we followed the non-emergency pathway. Employing a laryngeal mask was not viable due to restricted mouth opening and a pediatric flexible bronchoscope was not available. Thus, for non-invasive airway management, there were two options left: direct laryngoscopy and videolaryngoscope.

Our choice of not intubating may be hazardous in the setting of ophthalmic surgery since there is no access to the patient's airway during the procedure. Nevertheless, at least two series demonstrated the safety of ketamine anesthesia in pediatric eye surgery. Pun et al. reported a consecutive series of 679 children who underwent intraocular and extraocular procedures at Tilganga Eye Hospital in Nepal receiving a ketamine-based anesthesia, which sometimes was associated with diazepam and retrobulbar block. None of the operated children required resuscitation or intubation [5]. More recently, Rajput et al. conducted a prospective study in a tertiary eye care center in India, which included 55 children operated under intravenous ketamine administration and local anesthesia during COVID-19 pandemic. Again, no intubation or resuscitation was needed [6].

In order to achieve sedation, there must be preserved cardiovascular stability, no respiratory depression, good operating circumstances, and a quick restoration to the preoperative physical and mental state without negative consequences. Combination regimens are better because they can exhibit synergy, which allows for the administration of lower doses of each drug to get the desired effect. Ketamine is a phencyclidine derivative and is considered for sedation because of its analgesic properties, minimal suppressive effects on respiration and stable hemodynamics. The combination with dexmedetomidine is known to reduce tachycardia, hypertension, salivation and emergence phenomena associated with ketamine, without compromising respiratory drive [7,8].

This strategy has become popular in children's sedation and demonstrated its benefits in the presented case. Numerous studies have revealed that dexmedetomidine's pharmacokinetics in children is predictable and stable, producing outcomes comparable to those seen in adults. When dexmedetomidine is not available, it is possible to use midazolam as premedication and associate ondansetron and atropine in order to prevent the mentioned side effects. Finally, regional anesthesia, the preferred anesthetic technique in adults (with or without sedation), may also play an important role in pediatric eye surgeries. Usually employed under general anesthesia or heavy sedation, ophthalmic blocks contribute to smooth and uneventful perioperative transitions, since they improve analgesia, facilitate surgical dissection, attenuate oculocardiac reflex and reduce postoperative nausea and vomiting. Sight or life-threatening complications are rare, but the possibility of eye perforation, anesthesia-induced strabismus,

ocular hypertension and local anesthetic toxicity must be kept in mind [3].

Conclusion

Our case underscores the feasibility of employing ketamine and dexmedetomidine sedation alongside a peribulbar block as a secure alternative to general anesthesia in pediatric ocular surgeries, reinforcing the possibility of diversifying the anesthetic techniques used in this population, especially in adverse situations such as difficult intubation.

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