



Anesthesia management for children with eye injuries

MARTINA MATOLIĆ¹
VIŠNJA NESEK ADAM¹
MLADEN BUŠIĆ²

¹University Department of Anesthesiology
Resuscitation and Intensive Care, Clinical
Hospital Sveti Duh
Sveti Duh 64, Zagreb

²University Department of Ophthalmology
Clinical Hospital Sveti Duh, Sveti Duh 64,
Zagreb

Correspondence:

Martina Matolić
Specialist of Anesthesiology
University Department of Anesthesiology
Resuscitation and Intensive Care, Clinical
Hospital Sveti Duh
Sveti Duh 64, Zagreb
E-mail: martina.matolic@zg.t-com.hr

Abstract

Eye injuries in childhood are very common and an important cause of ocular morbidity. They are a leading cause of non-congenital unilateral blindness in children.

The anesthesia management of children with eye injuries requires particular skills and is a challenge for all anesthesiologists. The anesthesia management must prove safety for the child, but also must not endanger eye injury any further.

In the polytraumatized child, trauma principles must always be applied. Life-threatening problems should be managed before sight-threatening problems. General anesthesia is a choice for majority of children with an eye injury. Maintenance of anesthesia will depend on patient factors, local facilities and surgeon preferences. Extubation is better to be performed in deep anesthesia, breathing spontaneously, lying on the side to avoid coughing and straining as this increase the risk of ocular hemorrhage.

Multimodal approach and combination therapy (e.g. dexamethason and ondasteron) will minimize PONV in children. Satisfactory postoperative analgesia is important to have a non-crying and calm child to avoid rise in IOP and postoperative hemorrhage.

INTRODUCTION

Eye injuries in childhood are very common and an important cause of ocular morbidity. They are a leading cause of non-congenital unilateral blindness in children (1). Contusions and foreign bodies in the eye account for the majority of this injuries.

The types of injuries are categorized in four groups (2):

1. extraocular
2. ocular – those account for majority of eye injuries in children
3. intraorbital
4. orbital fracture

Most of these injuries will not require hospitalization, but traumatic injuries that can be blunt or penetrating ('an open eye') requires hospitalization and urgent surgery (3).

ANESTHESIA MANAGEMENT

The anesthesia management of children with eye injuries requires particular skills and is a challenge for all anesthesiologists. The anesthesia management must prove safety for the child, but also must not endanger eye injury any further. Some factors have to be considered when dealing with a child who has an eye injury:

1. Associated injuries
2. The effect of anesthetic agent on intraocular pressure (IOP)
3. The balance between protection of the airway from a full stomach and protection of the eye from further injuries

In the polytraumatized child, trauma principles must always be applied. Life-threatening problems should be managed before sight-threatening problems.

Ideally for general anesthesia is that all patients should be fasted before surgery to minimize the risk of aspiration and associated lung injury. It is essential to discuss this matter with the surgeon to establish the urgency of injured eye. Penetrating injuries need urgent surgery because of the risk of infection and endophthalmitis. A child with an open eye injury is at risk of vitreous loss and retinal detachment (4).

Most injuries, sometimes including blunt trauma, can be delayed to allow patient fasting. A fasting for six hours is suggested. Drinking clear fluids is possible up to two hours before surgery. In polytraumatized child (with head trauma) it can take up to 24 hours for gastric emptying, so most important time interval is between the last meal and the time of injury (5).

Because of fasting time all children can be premedicated with a sedative agent (usually with midazolam). Premedication calms the child down, stops crying and rubbing the injured eye so the risk of the rise of intraocular pressure is diminished.

General anesthesia is a choice for majority of children with an eye injury. A frightened, crying and uncooperative child cannot be performed under local or regional anesthesia. In open eye injury, local or regional anesthesia is usually avoided because injection of a local anesthetic by peribulbar or retrobulbar technique is associated with an increase in the intraocular pressure which may lead to vitreous loss (6).

Penetrating eye injury requires removal of any foreign bodies and early closure and sometimes cannot be delayed to ensure an empty stomach. This is a continuous problem for anesthesia because of two problems. One problem is that the full stomach demands the rapid induction-intubation sequence using succinylcholine. The other problem is a need to protect the injured eye from acute rise in intraocular pressure (IOP), since that may cause extrusion of ocular contents through even a very small wounds leading to total loss of vision in that eye.

As aforementioned succinylcholine causes transient but definite rise in IOP (7, 8), so it is recommended to avoid succinylcholine and to perform intubation with a large dose of non-depolarizing relaxant while cricoid pressure is maintained (9). If there are any concerns about airway protection and the risk of regurgitation, succinylcholine should be used as a part of rapid sequence induction. Especially because there have been no well documented reports about vitreous extrusion following the administration of succinylcholine (10).

Maintenance of anesthesia will depend on patient factors, local facilities and surgeon preferences. Maintenance of anesthesia with inhalational agents or intravenous agents (except ketamine) is safe because all these agents reduce IOP (11).

For all intraocular procedures the surgeon needs a still "quiet" eye that is achieved with using non-depolarizing relaxant and controlled ventilation. Intubation and controlled ventilation secure airway and facilitate to achieve mild hypocarbia because it lowers IOP.

At the end of the surgery, for patients who are not at risk for aspiration it is recommended to perform extubation in deep anesthesia, breathing spontaneously, lying on the side, so coughing and straining, that can rise intraocular pressure, can be avoided.

Children have a higher incidence of PONV than adults. Vomiting rises IOP so it should be avoided and kept to a minimum in postoperative period. Many different strategies to reduce PONV have been proposed with varying success, including anticholinergic agents, dexamethasone, clonidine, anti-emetic agents (metoclopramide, ondasteron) (12). Multimodal approach and combination therapy (e.g. dexamethasone and ondasteron) will minimize PONV in children.

Satisfactory postoperative analgesia is important to have a non-crying and calm child to avoid rise in IOP and postoperative hemorrhage. Pain relief can be enhanced significantly if surgeon performs a sub-Tenon block before waking up the patient. Adequate analgesia is achieved with using paracetamol and non-steroidal anti-inflammatory analgesic (diclofenac, ibuprofen).

CONCLUSION

1. Delaying emergency eye surgery for some hours is possible for most cases of eye injury in children, without worsening the visual outcome
2. Sedative premedication calms the children down, so crying and rubbing of the injured eye can be avoided and rise in IOP is diminished
3. Succinylcholine rises IOP so it is the best practice to avoid it during induction of anesthesia
4. Maintenance of anesthesia depends on local availability but as aforementioned all inhalational and intravenous anesthetic agents reduce intraocular pressure
5. Control ventilation requires the use of non-depolarizing relaxant and mild hypocarbia is preferable because it lowers IOP
6. Extubation is better to be performed in deep anesthesia, breathing spontaneously, lying on the side to avoid coughing and straining as this increase the risk of ocular hemorrhage

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