

CASE REPORTS

Anesthesia Management for a Pediatric Trauma Patient with Coloboma Following a Dog Bite

Silvana Leka*, Elona Reci, Agron Dogjani

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Abstract

Introduction: The anesthetic care of this pediatric patient with coloboma and the indication for surgical intervention due to a dog bite injury are discussed in this case report. Coloboma can be part of several syndromes, and thus, the perioperative risk for complications is increased, particularly elevated intraocular pressure during airway manipulation.

Case Presentation: We selected Total Intravenous Anesthesia using a propofol-based general anesthetic without inhalational agents. We did this to maintain hemodynamic stability and circumvent the specific risks associated with coloboma. We selected Total Intravenous Anesthesia because it has been demonstrated to be capable of providing controlled anesthesia without increasing intraocular pressure, a vital consideration in this case.

Discussion: The successful management of this complex case demonstrates the central role of personalized anesthetic planning in obtaining better outcomes for pediatric trauma patients with specific congenital anomalies. Total Intravenous Anesthesia proved effective in maintaining controlled anesthesia while minimizing the risk of raised intraocular pressure.

This case serves as a reminder of the necessity of having an overall understanding of unusual congenital disorders like coloboma in the context of trauma. It also underscores the critical role that the anesthesiologist plays in ensuring perioperative safety and the success of surgery. The contribution of the anesthesiologist is not only necessary but integral to the medical team, and this case serves as a reminder of that fact.

Keywords: Pediatric anesthesia, Trauma, Coloboma, Total Intravenous Anesthesia, Dog bite, Intraocular pressure

Introduction

Coloboma is a congenital ocular malformation that results from the failure of the embryonic fissure to close, affecting structures such as the iris, retina, choroid, or optic nerve. [1]

Coloboma can be isolated or associated with systemic syndromes such as Treacher-Collins Syndrome, which confers added airway challenges as well as heightened

risks for postoperative complications such as augmented secretion and desaturation. [2]

In trauma, anesthetic management must carefully consider intraocular pressure (IOP) dynamics. Inhalational anesthetics alter IOP. [3]

Total Intravenous Anesthesia (TIVA) with a propofol-based regimen favors stable hemodynamics and less pronounced changes in IOP—a very valuable advantage if an ocular abnormality is present. [4]

Case Presentation

A 3-year-old male patient presented to the emergency department with a traumatic dog bite to the neck and face (see Fig. 1). The profuse bleeding from multiple lacerations did not permit a proper physical examination, and the patient was found to be shocked. A history of medical conditions was taken from his mother, who reported a

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* **Corresponding author:**
Silvana Leka, MD
✉ silva_leka@yahoo.co.uk

University Hospital of Trauma, Tirana, ALBANIA

unilateral iris coloboma (see Fig. 2), though she did not report any characteristics of an underlying syndromic condition. No genetic workup had been performed, and an ophthalmological assessment to delineate the size and depth of the coloboma was postponed due to concern regarding complications from anesthesia.



Figure 1. Dog bites to the face and neck.

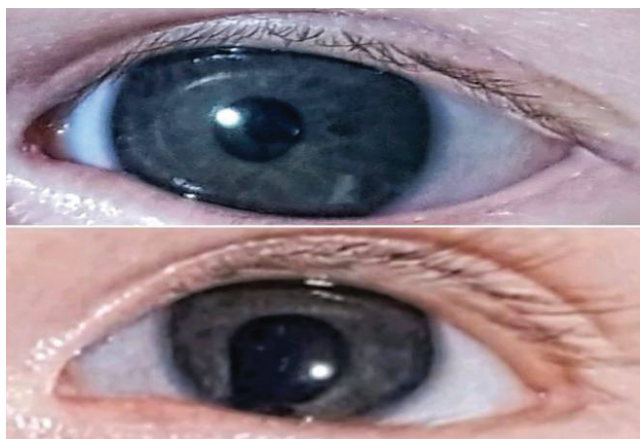


Figure 2. Presence of a unilateral coloboma of the iris.

Materials and Methods

A dedicated anesthetic protocol was devised to address four key objectives: secure airway management, aspiration prophylaxis, hemodynamic stability, intraocular pressure (IOP) stability, and smooth emergence.

The preoperative assessment was conducted with meticulous attention to detail. **Airway** evaluation showed Mallampati II with no external facial deformities or restricted neck mobility. The cardiopulmonary examination was unremarkable. Neurologic assessment was limited by agitation. Fasting status reflected ingestion of solids less than two hours prior, classifying the patient as high aspiration risk according to ASA guidelines.

Aspiration Prophylaxis and Premedication: Intravenous metoclopramide (0.1 mg/kg) was administered 15 minutes pre-induction to accelerate gastric emptying and increase

lower esophageal sphincter tone. • Midazolam (0.05 mg/kg IV) was carefully titrated to provide anxiolysis and amnesia without significant respiratory depression in toddlers.

Induction and Neuromuscular Blockade: A modified rapid-sequence induction (RSI) was performed to balance speed with pediatric hemodynamic tolerance. Propofol (2 mg/kg IV) and fentanyl (2 µg/kg IV) achieved hypnosis and analgesia while minimizing sympathetic surges and IOP elevation. Vecuronium (0.1 mg/kg IV) provided neuromuscular relaxation. Succinylcholine, with its documented transient IOP spikes and potential for hyperkalemia in traumatized children, was deliberately avoided.

Maintenance of Anesthesia: TIVA was maintained with a propofol infusion (100–200 µg/kg/min) supplemented by intermittent fentanyl boluses (0.5–1 µg/kg) to ensure analgesia and hemodynamic steadiness. This regimen attenuates IOP fluctuations compared with volatile agents.

• Mechanical ventilation was set to pressure-controlled mode, targeting end-tidal CO₂ of 35–40 mm Hg to prevent both hypocapnia-induced vasoconstriction and hypercapnia-related IOP rise.

Emergence and Extubation: At the surgical conclusion, neuromuscular blockade was reversed with neostigmine (0.05 mg/kg) and atropine (0.02 mg/kg) once a train-of-four ratio ≥ 0.9 was confirmed. A deep extubation technique was employed during a light plane of anesthesia to minimize coughing, bucking, and resultant IOP or hemodynamic surges. Gentle oropharyngeal suctioning preceded airway device removal to reduce secretions and aspiration risk.

All anesthetic interventions were guided by continuous monitoring of ECG, noninvasive blood pressure, pulse oximetry, capnography, and, when feasible, noninvasive IOP measurements.

Discussion

Managing pediatric trauma patients with coloboma presents unique challenges that require meticulous planning. These challenges include the increased risk of aspiration after recent oral intake, the need to maintain stable intraocular pressure (IOP), and the requirement for optimal hemodynamic control.

The challenges include aspiration risk after recent oral intake, maintaining stable intraocular pressure (IOP), and achieving optimal hemodynamic control. In this patient, the increased aspiration risk necessitated a rapid sequence induction modification, as recommended by the American Society of Anesthesiologists (ASA) pediatric anesthesia guidelines [4, 5].

In ocular trauma cases, maintaining stable IOP is vital, as a significant increase could worsen the injury and impair visual outcomes [1, 3, 4, 5, 6].

To maintain stable IOP and prevent worsening of the injury, volatile anesthetic agents that may unpredictably alter IOP were deliberately avoided. Instead, total intravenous anesthesia (TIVA) using a propofol regimen was chosen

for its proven benefits: better control of IOP, more stable hemodynamics, and a reduced incidence of postoperative nausea and vomiting (PONV).

Administering propofol and fentanyl together facilitated smooth induction and maintenance, prevented sympathetic peaks and IOP increases, and created a favorable perioperative environment for ocular and overall stabilization.

Furthermore, deep extubation was performed to minimize coughing or straining, which can suddenly elevate IOP and worsen ocular trauma. Vigilant monitoring and strict perioperative care were essential to ensure an uneventful and safe outcome and to uphold the high standards of anesthetic management for pediatric trauma cases with ocular defects [4–10].

In summary, this case highlights the benefits of a tailored anesthetic approach for complex pediatric trauma with ocular pathology. By focusing on airway safety, IOP control, and hemodynamic stability, the clinical team optimized both ocular and systemic outcomes. This experience supports the broader use of propofol-facilitated TIVA and modified rapid sequence induction in similar situations, consistent with current literature that advocates techniques with minimal IOP fluctuations and respiratory side effects [4–10].

Conclusion

This comprehensive case suggests that an anesthetic management strategy with TIVA is safe and effective for children who have ocular anomalies and require emergency trauma surgery. The judicious use of rapid sequence induction, along with the elimination of inhalational agents, reduces the risk of aspiration. Additionally, it prevents fluctuations in intraocular pressure, and all hemodynamic parameters remain within normal limits throughout the surgical period. In this case, the customized anesthetic regimen resulted in a seamless and uneventful recovery, thus supporting existing recommendations in support of TIVA in comparable clinical situations.

COI Statement: This paper has yet to be submitted in parallel, presented fully or partially at a meeting, podium, or congress, published, or submitted for consideration beforehand.

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Abbreviations

TIVA - Total Intravenous Anesthesia; IOP - Intraocular Pressure; ETCO₂ - End-Tidal CO₂; RSI - Rapid Sequence Intubation; ASA - American Society of Anesthesiologists; PONV - Postoperative Nausea and Vomiting;

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