Pediatric Anesthetic Management Associated With Various Ophthalmic Diseases

Essay

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Abstract

Anesthesia for ophthalmologic procedures in children is mostly performed under general anesthesia. The anesthesiologist caring for the ophthalmologic patient should be familiar with the disorders and syndromes frequently associated with ocular pathology, the effects of ophthalmic medications used preoperatively and intraoperatively, and the ocular effects of the anesthetic agents to be used during the perioperative period.

In this essay, we review the current practice and recent development of the different ophthalmic anesthetic approaches with special emphasis on benefit, risk factors, safe performance and prevention of complications.

Key words: Pediatric Anesthesia in Ophthalmic Diseases

Prcoperative Psychological Management of Pediatrics

Anesthetic Medication in Pediatrics

Local Ophthalmic Anesthesia in Pediatrics

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List of Abbreviations

ACH: Acetylcholine

ANS: Autonomic Nervous System

CHD: Congenital Heart Disease

CNS: Central Nervous System

CO_2: Carbon dioxide

DCR: Dacryocystorhinostomy

ECF: Extracellular Fluid

ECG: Electrocardiogram

ET: Endotracheal Tube

FRC: Functional Residual Capacity

FG: Fat Group

GI: Gastrointestinal

GFR: Glomerular Filtration Rate

ICP: Intracranial Pressure

ICU: Intensive Care Unit

IM: Intramuscular

IOP: Intraocular pressure

IV: Intravenous

LMA: Laryngeal Mask Airway

MAC: Minimal Alveolar Concentration

MG: Muscle Group

MH: Malignant Hyperthermia

NICU: Neonatal Intensive Care Unit

NSAID: Non Steroidal Anti-inflammatory Drug

OTFC: Oral transmucosal fentanyl citrate

O_2: Oxygen

OCR: Oculocardiac Reflex

PONV: Postoperative Nausea and Vomiting

ROP: Retinopathy of Prematurity

STOP-ROP: Supplemental Therapeutic Oxygen for Prethreshold Retinopathy

VPG: Vessel Poor Group

VRG: Vessel Rich Group

Yrs: Years

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Introduction

Introduction

Ophthalmic pathology in infants and children undergoing eye surgery ranges from the atypical to the commonplace. These pathologies include nasolacrimal duct obstruction, strabismus, congenital or traumatically induced cataracts, penetrating eye injuries, glaucoma, retinopathy of prematurity, intraorbital tumors and more.

Nasolacrimal duct stenosis, cataracts, and traumatic eye injuries often occur in otherwise healthy pediatric patients, however, many ophthalmopathies can be associated with other congenital disorders that may have important anesthetic implications.

As an outpatient anesthetic, quick onset and offset of anesthesia, rapid recovery and early discharge are all important. The anesthetist needs to be aware of potential interactions between ophthalmic drugs and anesthetic agents.
Unlike adults most pediatric eye surgeries require general anesthesia, however peribulbar block appears to be a safe analgesic technique for pediatric ophthalmic surgeries with no complications related to it. Also the combination of general anesthesia with peribulbar block proved to be very beneficial for relief of postoperative pain and for aborting the oculocardiac reflex.
In this essay we will try to review anesthesia issues within context of various ophthalmic diseases.

Anatomical and Physiological Consideration for Pediatrics

Anatomical Considerations in Pediatric

A detailed knowledge of the anatomy of the respiratory tract is of great importance to the anesthetist as instrumentation of the airway is part of anesthetic daily routine requiring great familiarity with the structures involved. Many clinical problems that confront the anesthetist arise from compromised airway patency. The respiratory tract begins at the anterior nares and the lips and ends in the alveoli of the lung. It is divided into upper and lower airway at the level of the vocal cords **(1).**

The Mouth and Oropharynx

The mouth is small in children and infants, relative to the head. It is divided into the vestibule and the oral cavity. The oral cavity proper is separated from the vestibule by the teeth and gums. Maxillary teeth, especially if prominent, bucked or capped, can interfere with laryngoscopy and intubation **(2).**
The mouth cavity is bounded by the alveolar arch and teeth in front, the hard and soft palate above, the anterior two thirds of the tongue and the reflection of its mucosa forward into the mandible below, and oropharyngeal isthmus behind **(3).**

The tongue is composed of intrinsic and extrinsic groups of muscles. The extrinsic muscles are paired and innervated by the 12^{th} cranial nerve except the palatoglossus, which is innervated by the pharyngeal plexus. The genioglossi alone are capable of protruding the tongue, so in general anesthesia or neurological

lesion the tongue falling against posterior wall leads to risk of increasing the upper airway obstruction and suffocation **(4).**

The oropharynx opens to the oral cavity at the palatoglossal folds, marking the anterior two thirds of the tongue. The palatoglossal folds and the more posterior palatopharyngeal folds form the bilateral triangles, called the fauces that contain the tonsils. Hypertrophy of the tonsils can challenge the anesthesiologist attempting mask ventilation or intubation **(5).**

The Nose

The nose is anatomically divided into external nose and nasal cavity. The external nose projects from the face; its skeleton is largely cartilaginous. The nasal cavity extends from nostrils (anterior nares) to the posterior end of the nasal septum where it opens into the nasopharynx through the posterior nasal apertures **(6).**

The nasal cavity is divided into the right and left halves by the midline nasal septum, each half of the cavity has a roof, floor, medial wall and lateral wall .The roof is the cribriform palate of ethmoid separating it from the cranial cavity. The floor is the hard palate separating it from the oral cavity. The medial wall is the nasal septum formed by septal cartilage anteriorly, vomer and perpendicular palate of ethmoid posteriorly. The lateral wall is irregular having three conchae (superior ,middle, inferior) arching over three channels called superior ,middle inferior respectively. The inferior turbinate usually limits the size of the nasotracheal tube that can be passed through the nose. The vascular mucous membrane overlying the turbinate can be damaged easily, leading to profuse hemorrhage **(7).**

The fragility of the nasal turbinates assures that intubation attempts will cause epistaxis unless the tube is guided parallel to the hard palate and perpendicular to the face through channel beneath the inferior turbinate **(5).**

The adenoids are present on the roof and posterior wall of the nasopharynx. When attempting to pass nasotracheal tube the adenoids may prevent passage, become dislodged, obstruct the lumen of the tube, and be displaced into the larynx or cause severe bleeding. If adenoids are present in children and not atrophied around puberty, the relative consideration to nasal intubation is recommended **(7).**

The Pharynx

The pharynx extends from the base of skull down to the sixth cervical vertebra. The wall is formed mainly by the constrictor muscles (superior, middle and inferior) and fibrous tissue. Anatomically, the pharynx is divided into three parts, the nasopharynx, which lies behind the nasal cavity, the oropharynx, which lies behind the oral cavity, and the laryngopahrynx, which lies behind the larynx and contains the inlet of the larynx and pyriform fossa on each side **(6).**

The Larynx

The larynx consists of three single cartilages (epiglottis, thyroid and cricoid) and six smaller paired cartilages (arytenoids, corniculate and cuneiform) and their mucosal coverings shape the larynx **(8).**

The larynx serves three important functions: it acts as an airway; it serves as an instrument of phonation, and protects the lower airway. It is the narrowest portion of the entire airway system and liable to obstruction **(9).**