Pediatric Laryngospasm in a Difficult Airway with the Concern for Negative Pressure Pulmonary Edema

Jenna Klenz, SAA – Advisor: Kris Tindol, CAA

South University Anesthesiologist Assistant Program, Savannah, Georgia

Abstract

A 6-year-old male presented for a left lateral rectus resection and left medial rectus resection to treat exotropia of the left eye. History of OSA s/p T&A at age 4 and BMT at age 2, as well as a BMI in the 95%. Anesthesia records show the patient was intubated easily with a Miller 1.5 and 4.0 oral rae ETT. No other pertinent medical history. During induction of anesthesia, the patient experienced a laryngospasm that was unable to be broken with positive pressure and propofol, as well as being a difficult intubation. Upon extubation, the patient began to produce pink froth in the endotracheal tube as well as his mouth. Following a chest x-ray, the patient was cleared of a negative pressure pulmonary edema.

Learning Objectives

- ❖ **Outline the pediatric difficult airway algorithm**
- ❖ **Discuss the relationship of laryngospasm to negative pressure pulmonary edema**
- ❖ **Describe anesthetic management of laryngospasm**

Background

❖A laryngospasm is a protective mechanism, causing sudden, involuntary closure of the vocal cords that can be life threatening under anesthesia.

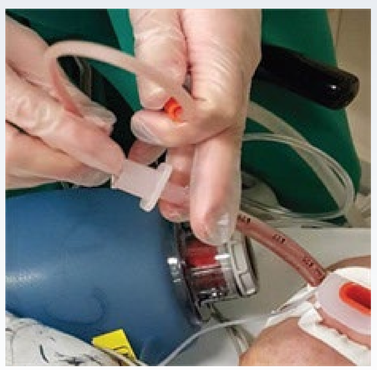
❖Negative pressure pulmonary edema is a buildup of fluid in the lungs secondary to upper airway obstruction and increased negative intrapleural pressure from inspiration against the obstruction, most commonly following a laryngospasm.

❖ Eventually the large negative pressure buildup during attempts at inhalation causes fluid from the blood vessels into the lungs.

Stimulation of vocal cords → **Laryngospasm** → **Inspiration against obstruction** → **Negative pressure pulmonary edema**

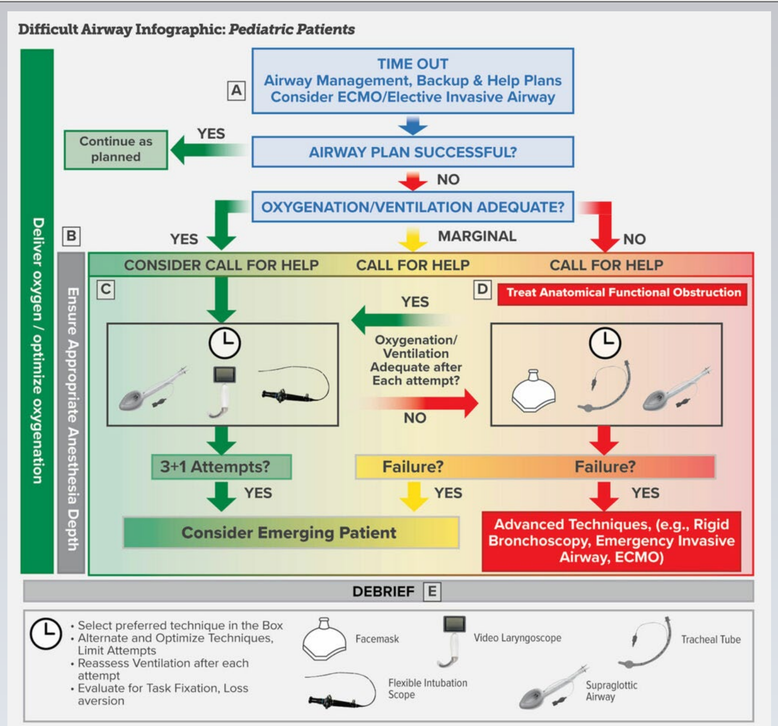
Case Description and Management

The patient was brought to the OR and induced with 8% sevoflurane and 70% nitrous oxide but sustained a laryngospasm briefly before the successful placement of an IV. While the IV was connected, positive pressure and a jaw lift were initiated but failed, 100 mg of propofol was pushed as efforts to ventilate the patient were continued to be made. The spasm persisted and an initial attempt to intubate with a Miller 1.5 were made while rocuronium was drawn up as succinylcholine is not stocked in the children's hospital. The initial attempt was unsuccessful, the saturation began to fall below 80%, and as another attempt to ventilate with an oral airway was made, 30 mg of rocuronium was pushed. Ventilation was still unsuccessful, and a second attempt to intubate with the miller 1.5 was made as help is called overhead. The second attempt is also unsuccessful, and the saturation has fallen to the 60's. 100 mg of propofol and an additional 20 mg of rocuronium are pushed while still making unsuccessful efforts to ventilate. A third attempt at intubation is made with a MAC 2 while the glidescope is being brought to the room and a grade III view is achieved, but tube placement is unsuccessful. The saturation has fallen into the 20's when efforts to ventilate are finally successful but are weak and insufficient in raising the saturation. The glidescope arrives and a 4th attempt to intubate is made but intubation is unsuccessful without a stylet. A pediatric stylet was added as the patient was ventilated, but the saturation remained in the 20's until the 5th attempt at intubation with the glidescope and stylet was successful. The patient's saturation began to rise slowly and remained stable for the remainder of the case. At the end of the procedure, following a reversal with 400 mg of sugammadex, the patient began to produce a pink froth in the ETT. The decision was made to extubate the patient after thorough suctioning, and a CXR confirmed there was no pulmonary edema.



Park, H., Nam, S., Yang, Y. J., & Ku, S. (2021, January 8). *Negative pressure pulmonary edema in a patient undergoing... : Medicine*. LWW. https://journals.lww.com/md-journal/fulltext/2021/01080/negative_pressure_pulmonary_edema_in_a_patient.103.aspx

Discussion



- ❖ Negative pressure pulmonary edema occurs in 0.05-0.1% of cases, with over half being related to laryngospasm
- ❖ Pediatric difficult airway algorithm focuses on the use of 3 airway resources: SGA, flexible intubation, video laryngoscope
- ❖ Difficult airways in children present a unique challenge as awake intubation is usually not possible due to size and lack of cooperation

References

Park, H., Nam, S., Yang, Y. J., & Ku, S. (2021, January 8). *Negative pressure pulmonary edema in a patient undergoing... : Medicine*. LWW. https://journals.lww.com/md-journal/fulltext/2021/01080/negative_pressure_pulmonary_edema_in_a_patient.103.aspx

Fiadjoe, J. E., & Mercier, D. (2024, February 17). *Anesthesia Patient Safety Foundation update: 2022 American Society of Anesthesiologists Practice Guidelines for management of the difficult airway*. Anesthesia Patient Safety Foundation. https://www.apsf.org/article/anesthesia-patient-safety-foundation-update-2022-american-society-of-anesthesiologists-practice-guidelines-for-management-of-the-difficult-airway/

Miller, R., & Pardo, M. (2017). *Basics of Anesthesia* (7th ed.). Elsevier Health Sciences (US). https://digitalbookshelf.southuniversity.edu/books/9780323401159

Laryngospasm: Treatment, definition, symptoms & causes. Cleveland Clinic. (2024b, May 1). https://my.clevelandclinic.org/health/diseases/22406-laryngospasm

Omuro, P. K., Sander, D., & Hart, D. (2024, November 1). *Severe postoperative negative pressure pulmonary edema: A case report - bmc anesthesiology*. BioMed Central. https://bmcanesthesiol.biomedcentral.com/articles/10.1186/s12871-024-02785-2