Abstract

Negative-pressure pulmonary edema or Post Obstructive Pulmonary Edema (POPE) is an infrequent but life-threatening complication of upper airway obstruction. While well-described in the adult population, there is a paucity of literature about POPE in pediatrics. This is a low-frequency high-impact event and awareness of this condition is crucial in the perioperative setting. We present a case of a healthy seven year old male who, after severe laryngospasm on induction, developed signs, symptoms, and radiographic findings consistent with POPE. In our institution, 7,388 pediatric general anesthetics were administered in the last two years. This is the only documented case of POPE.

Complications of unrecognized POPE include ARDS, pneumonia, prolonged intubation, and death. A high index of suspicion for POPE in children can assist with early identification and initiation of appropriate treatment.

Case Report

A 7 y/o male, ASA class 1E, weighing 21 kg, was scheduled for urgent Incision and Drainage of a traumatic nasal septal hematoma and abscess. The pre-anesthesia assessment and exam were unrevealing and NPO status confirmed.

The patient was induced with 70% N2O, 30% oxygen and Sevoflurane 8%. He quickly went into severe laryngospasm unresponsive to airway maneuvers, with oxygen saturations dropping below 70%. Intramuscular succinylcholine 10 mg and atropine 0.2 mg were given with subsequent rapid recovery of airway. Intravascular access was obtained, Propofol 30mg and Remifentanil 20mcg were both administered, and the patient was intubated with size 5.5 cuffed endotracheal tube. Anesthesia was maintained with Sevoflurane 2%, 50% mix of N2O and oxygen. The case proceeded without further incident or desaturation. Intra-operatively, the patient received Fentanyl 20mcg, dexamethasone 8mg, and Clindamycin 200mg. Five hundred milliliters of lactated rinses were administered and blood loss was estimated at 15ml.

While emerging from anesthesia, the patient began coughing and the endotracheal tube filled with copious amounts of pink frothy sputum, with concomitant desaturation which improved with repeated suctioning. Exam revealed bilateral rales and coarse breath sounds. Based on the above signs and symptoms, negative pressure pulmonary edema was diagnosed and the decision was made to remain intubated in the PICU post-operatively.

Chest Xray in PICU showed fine perihilar granular opacities predominantly in the upper lung zone, consistent with pulmonary edema. The patient was extubated in the early afternoon on POD 1. The subsequent day CXR confirmed rapid resolution of edema. That evening, dexamethasone 12mg were administered, and blood loss was estimated at 15ml.

Discussion

POPE is a low-frequency high-impact event that has been well described in the adult literature but bears review since the practitioner is able to make a rapid diagnosis and treat appropriately. The presentation of POPE can be immediate or delayed and is triggered when a large negative intrathoracic pressure is generated against an obstructed upper airway, causing fluid to shift into the lung interstitium.

Patients often present with an immediate onset of respiratory distress, however a delayed presentation of up to 24 hours has been reported (7). Clinical signs include decreased oxygen saturations and the hallmark finding of pink frothy sputum, tachypnea, tachycardia, and ronchi (8). A chest radiograph typically shows diffuse interstitial and alveolar infiltrates (9).

Young, healthy, athletic male patients appear to be at highest risk for POPE (10,11). Incidence has been reported to be 0.05%-0.1% in all anesthesia practice (7,12) but may be as high as 11% of all cases of acute airway obstruction requiring active intervention (13,14). In our institution, 7,388 pediatric general anesthetics were administered in the last two years. This is the only documented case of POPE, an occurrence of 0.0001%.

Management: Priority should be given to rapid relief of airway obstruction and return of oxygen saturations to normal. Once stable, supportive care is usually sufficient until pulmonary edema resolves. This may include oxygen, PEEP, diuretics if the patient is not volume depleted or hypoperfused, intubation and mechanical ventilation. Death attributed to POPE from ARDS, multiple organ or system failure have been reported (7,15).

Summary

POPE is an infrequent event requiring urgent diagnosis and treatment. Mortality rates ranging from 11% to 40% have been reported (16). Anyone involved in the perioperative care of both adult and pediatric patients should have a high index of suspicion for POPE after an acute airway obstruction when a patient develops respiratory distress and hypoxia.

References