

# Unexpected Pulmonary Events during Endotracheal Intubation in a Pediatric Patient

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Nearly 21% of pediatric surgical operations are accompanied by adverse events, 12.8% of which are respiratory complications including bronchospasm (1.2%)<sup>[1]</sup> and pulmonary edema (11%).<sup>[2]</sup> Among them, aspiration pneumonia<sup>[3]</sup> and negative-pressure pulmonary edema are rare pulmonary complications in pediatrics. However, they are difficult to predict and can be fatal if not appropriately treated; careful monitoring is required. We present a case of pulmonary complication secondary to aggravation of bronchial spasm during intubation of a pediatric patient.

A 9-year-old female child (height, 132.7 cm; weight, 29.3 kg; American Society of Anesthesiologists Physical Status Score, 1) had undergone an emergency laparoscopic appendectomy due to acute appendicitis. There were no abnormal medical history, vital signs, and laboratory findings, except for slight raised white blood cell count. The patient had fasted for >10 h until operation.

Anesthesia was induced with propofol (40 mg), rocuronium (15 mg), and fentanyl (15 mcg). When mask ventilation was done with O<sub>2</sub> without high inspiratory flow rates and excessive tidal volume, we did not detect any stiffness or resistance of bag. When endotracheal (ET) tube with an internal diameter (I.D.) to 5.5 mm was inserted, there were no lung sounds and no signs of end-tidal CO<sub>2</sub> (EtCO<sub>2</sub>). Considering wrong insertion, we retried I.D. to 5.0 mm immediately after extubation. After reintubation, the patient's oral cavity was filled with a secretion of unknown type. On auscultation, severe wheezing and coarse rales were noted in whole lung fields. A Levin tube was inserted to drain gastric contents for preventing aspiration due to preoperative computed tomography images which showed gastric and intestinal distension and clotted brown fluid rained intermittently from this tube. We suctioned repeatedly

whenever pinkish, frothy to watery secretions were appeared. Despite these measures, oxygen saturation (SpO<sub>2</sub>) increased under 92% in FiO<sub>2</sub> 1. However, with concerns about increasing peak airway pressure during laparoscopy, the operation proceeded without delay because it became apparent that the patient had a perforated appendix with small amounts of ascites and over 38°C body temperature. At the end of the 90-min operation, lung sounds improved.

As an emergent diagnosis of respiratory event, a portable chest X-ray was taken in the operating room and revealed that infiltrates were present in both lungs, particularly severe in the right middle and lower fields. She was transferred to the postanesthesia care unit in intubated state. She was transferred to the surgical intensive care unit due to intubated state. Intensive management such as albuterol by nebulizer, ipratropium by inhaler, and antibiotics (ampicillin/sulbactam and metronidazole) intravenously was done as considering pneumonia. Differential diagnoses among pulmonary edema, preexisting pneumonia, and aspiration pneumonia were needed. However, there was no further evaluation including computed tomography because she could maintain spontaneous ventilation with SpO<sub>2</sub> up to 96% in FiO<sub>2</sub> 1 by T-tube ventilation, and applied treatments had effect on recovery. A chest radiograph was taken immediately after the operation [Figure 1a] and through postoperative day 3

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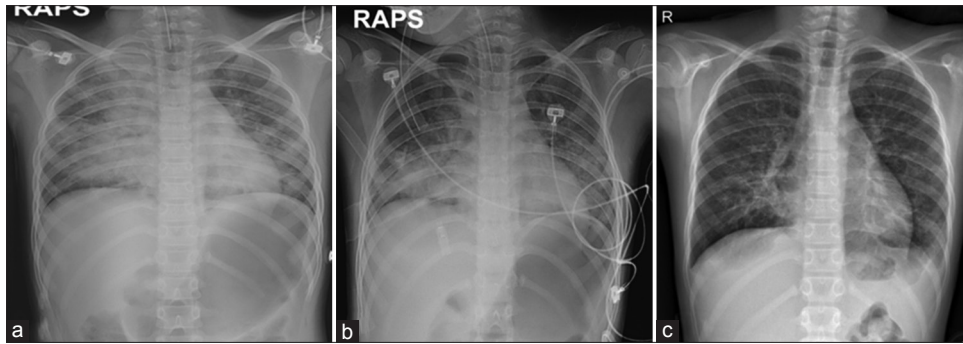
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**Figure 1:** Chest X-ray. (a) Immediately after the operation. (b) After transfer to the intensive care unit. (c) Three days postoperative.

[Figure 1b and 1c]. She was extubated and transferred to the general ward without further complications after improving all condition.

Bronchospasm may be caused by airway irritation (35%), ET tube problems (23%), and aspiration of gastric contents (14%), among other problems.<sup>[4]</sup> Pediatric anesthesia involves many risk factors, the most common of which are airway problems.<sup>[5]</sup> Because our patient had no specific signs of respiratory infection, we had no doubt about unexpected respiratory complication.

From this event, three expected causes were drawn. First, aspiration pneumonia may have occurred. The patient sufficiently fasted, so we did not perform the rapid-sequence intubation. However, preexisting abdominal distension and mask ventilation might contribute to an increase in stomach distension; this may have increased the risk of aspiration. Second, pulmonary edema may have occurred after bronchospasm caused by acute upper airway obstruction, which followed by incomplete airway muscle relaxation and increased abdominal pressure. The last, a preexisting upper respiratory infection may have resulted in sudden aggravation of respiratory symptoms. Although the likelihood of this seems low, we must consider the possibility that pneumonia occurred because an unknown history of respiratory infection can increase the risk of respiratory complications.<sup>[5]</sup>

Regardless of the result and differential management of them, treatment for this complication as pneumonia without discriminating its type was a successful outcome. If this was pulmonary edema, the treatment should include diuretics such as furosemide (Lasix<sup>®</sup>), and if aspiration pneumonia, antibiotics should be changed.

From this result, our case should take into consideration some mistaken points. First, preoperative evaluation should be fully assessed including lung condition. We missed some aspects of patient history such as cold and examinations that showed the findings of slight infiltrates in the right lower lung field in the abdominal computed tomography. These factors might contribute to rapid aggravation of respiratory complications during anesthesia.

Second, the ET tube size should be carefully considered. Our patient's height and weight were within the reference ranges,

so our first ET tube should have been the appropriate size for the patient. However, we felt resistance upon insertion without resistance during passage and no sound of leakage; therefore, we did not inflate the cuff. In this case, the usual procedure with pediatric patients is to use a smaller ET tube if resistance is felt and changed to one-half smaller size. We could not predict the possibility of upper airway spasm immediately before changing ET tube, and it resulted in the absence of breath sounds, ventilation, and EtCO<sub>2</sub> in spite of correct intubation.

The last, fasting duration may not indicate an empty stomach in patients with abdominal distension. Mask ventilation during general anesthesia can lead to the reflux of gastric contents regardless of fasting time. Because of the risk of adverse events such as aspiration, rapid-sequence intubation must always be considered.

Respiratory risk including airway problems must be taken into account in children regardless of preexisting respiratory disease. Even in minor surgical procedures, careful observation is necessary for preventing adverse events at any time. Medical personnel who manage pediatric patients must consider all adverse events and should apply timely appropriate management.

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### Conflicts of interest

There are no conflicts of interest.

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