

CASE REPORTS

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Lung Collapse after Induction of Anesthesia in a Healthy Outpatient

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MUCOUS impaction of small bronchioles is commonly associated with asthma and chronic obstructive pulmonary diseases. Although segmental or subsegmental atelectasis may occur during anesthesia, mucous plugging of a major bronchus has not been previously reported in an anesthetized patient without a history of pulmonary disease. We report a case in which an allegedly healthy outpatient developed a right mainstem obstruction, resulting in a total collapse of her right lung after induction of general anesthesia.

Case Report

A 35-yr-old, 86-kg, 165-cm woman with a history of mild hypertension, chronic sinusitis, and cigarette smoking (< 1 pack/day for 15 yr) was scheduled for elective laparoscopic tubal ligation during general anesthesia. Her only current medication was birth control pills. There was no history of asthma, drug allergies, or pulmonary disease. She denied any acute bronchitic or upper respiratory symptoms (e.g., coughing or mucous production). Laboratory data (including complete blood count, SMA 6, and U/A) were within normal limits. Physical examination, including heart and lung auscultation, revealed no evidence of any acute or chronic disease processes. Preoperative blood pressure was 146/101 mmHg, heart rate 80 beats/min, respiratory rate 14 breaths/min, and oral temperature 36.8°C. The patient received no preanesthetic medication.

After insertion of an intravenous (iv) cannula and placement of routine intraoperative monitoring devices (including an electrocardiogram, noninvasive automatic blood pressure monitor, and pulse oximeter), the patient received midazolam 2 mg and fentanyl 150

µg iv. Anesthesia was induced with thiopental 375 mg iv. Within 60 s after the injection of mivacurium to facilitate tracheal intubation (by which time only 10 mg had been administered), the patient's heart rate increased from 80 to 150 beats/min and her blood pressure from 140/100 to 160/120 mmHg. The patient's lungs were extremely difficult to ventilate using a face mask and oral airway (with peak inspiratory pressures of 50–60 mmHg). Lung auscultation revealed bilateral expiratory wheezes (greater on the left than on the right side). Although the patient was receiving 100% oxygen, her hemoglobin oxygen saturation decreased from 100% to 82%.

Isflurane 2% in oxygen, vecuronium 9 mg iv, and fentanyl 50 µg iv were administered. Within 2–3 min, the trachea was easily intubated with a 7.0-mm tracheal tube. After tracheal intubation, the blood pressure was 142/95 mmHg and heart rate 125 beats/min, and the hemoglobin oxygen saturation increased to 94–96%. We easily passed a suction catheter through the tracheal tube but were unable to suction out any secretions. The patient was then administered 1% isoflurane and 60% nitrous oxide in oxygen while the lungs were ventilated at a rate of 8 breaths/min and a tidal volume of 800 ml/min. However, the peak inspiratory pressure increased to 80 mmHg and the end-tidal carbon dioxide tension increased to 46 mmHg within 5 min of the initiation of mechanical ventilation.

The nitrous oxide was discontinued, and the isoflurane concentration was increased to 1.5%. Albuterol aerosol (Proventil) 360 µg (four doses) was administered into the inspiratory limb of the circuit to treat the persistent wheezing. Although the wheezing remained unchanged, heart rate increased further, and frequent premature ventricular contractions were noted on the electrocardiogram. The patient was then administered 1% lidocaine 100 mg and verapamil 1.5 mg iv to treat the ectopic activity.

Subsequent auscultation of the patient's chest, approximately 15–20 min after induction of anesthesia, revealed persistent expiratory wheezes on the left side and the absence of breath sounds on the right side. A portable chest radiograph was ordered in the operating room and revealed a virtual "white-out" of the right lung field (fig 1). The tip of the tracheal tube was 3.4 cm above the carina. A decision was made to cancel the operation, and the residual neuromuscular block was reversed with neostigmine 5 mg and glycopyrrolate 1 mg iv. The patient was able to maintain a satisfactory hemoglobin oxygen saturation (96–98%) while spontaneously breathing 100% oxygen. Upon awakening from anesthesia, she removed the tracheal tube and immediately coughed up a 3 × 2 × 1-cm³ greenish-yellow mucous mass. The patient was transported to the recovery room, and a second chest x-ray was reported to be within normal limits. Chest auscultation revealed no evidence of wheezing, and the lung sounds were equal bilaterally.

The patient was discharged from the hospital's outpatient facility approximately 2 h after the end of anesthesia without any further

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Fig. 1. Chest radiograph taken in operating room after tracheal intubation.

problems. A follow-up telephone interview revealed that the patient had experienced a recent exacerbation of her chronic sinusitis. Subsequently, a chest radiograph and pulmonary function tests were performed on an outpatient basis and were reported to be within normal limits. The patient remains physically active and in good health.

Discussion

Acute airway obstruction is a potentially life-threatening complication. As a result of the airway obstruction, lung volume decreases and pulmonary vascular resistance increases secondary to hypoxic pulmonary vasoconstriction.¹⁻³ In contrast to that of a previous report describing acute mainstem bronchus obstruction by a mucous plug,⁴ this case occurred in an apparently healthy outpatient who had no history of pulmonary disease and did not involve a nasotracheal intubation technique. In our patient, the obstruction developed coincident with the administration of mivacurium (10 mg iv). Although the temporal sequence of events initially suggested that mivacurium-induced bronchospasm may have played an important role in the etiology of the patient's intraoperative respiratory difficulties, it would appear that impaction of a large mucous plug aspirated from the patient's nasal sinus cavity during

the induction sequence was the cause of the persistent ventilatory problems. The absence of a hypotensive episode at the onset of the wheezing argues against mivacurium-induced histamine release as the primary inciting event.

Acute localized obstruction of a major airway is distinct from generalized obstructive disease of the small airways. Complete obstruction of a mainstem (or segmental) bronchus usually leads to ipsilateral atelectasis due to absorption of the trapped gas and can lead to wheezing in the contralateral lung.⁵ Although the presence of the tracheal tube and inadequate anesthesia may have contributed to the wheezing, the loss of lung volume on the right side secondary to the mucous plug is a more likely explanation for the persistent wheezing. The chest radiograph taken in the operating room demonstrated that the tracheal tube was correctly placed. Although a presumptive diagnosis of right mainstem bronchus obstruction was made, fiberoptic bronchoscopy was not performed because of concerns regarding the possibility of exacerbating the acute bronchospastic reaction.

In summary, acute airway obstruction of the right mainstem bronchus from mucous plugging in a healthy outpatient is an unusual but potentially life-threatening complication in the ambulatory setting. Mainstem bronchus obstruction secondary to mucous plugging during the induction period has not been reported previously.

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