Anesthetic Management Using a Laryngeal Mask Airway in a Child With Congenital Bronchial Atresia

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Congenital bronchial atresia is a relatively rare malformation that causes a segmental obstruction of the bronchus during the fetal period. The peripheral lung distal from the obstructed bronchus becomes hyperinflated because of the unidirectional flow through collateral check-valve entry. Positive pressure ventilation during general anesthesia may cause a rupture of the bulla, resulting in pneumothorax. An 8-year-old girl, who had to undergo oral surgery, was diagnosed as having congenital bronchial atresia and one-fifth of her lung was poorly ventilated. We planned to perform general anesthesia under spontaneous respiration using a laryngeal mask, which was well tolerated.

Key Words: Congenital bronchial atresia.

Congenital bronchial atresia (CBA) is a relatively rare disorder that accompanies obstruction of the bronchus. The lung lobe distal from the obstructed bronchus is prone to overinflation. Positive pressure ventilation during general anesthesia is risky for such patients because pneumothorax may develop. Herewith, we report a case in which spontaneous respiration was maintained to avoid hyperinflation during general anesthesia in this patient.

An 8-year-old female was scheduled for the surgical removal of supernumerary tooth and a maxillary cyst, later diagnosed as a bronchogenic cyst. The patient was diagnosed with congenital bronchial atresia, on the superior segmental bronchus of the left lung, at the age of 1 year old after experiencing frequent bouts of pneumonia. She had been doing well, although one-fifth of her lung was insufficiently aerated. Pulmonary function testing was within normal limits (% vital capacity [VC] 92.7%, % forced expiratory volume [FEV] 1.0 92.13%). Chest radiograph (Figure 1) revealed an extrahilar mass in the upper lobe of the left lung. Chest computed tomography images (Figure 2)

confirmed obstruction at the central end of the superior segmental bronchus branching from the main bronchus. The left upper lobe displayed hyperlucency and hyperinflation. In addition, mucoid impaction was seen distal to the obstructed bronchus. Bullae were found dispersed in the pulmonary apex region.

General anesthesia was induced with propofol. Respiration was gently assisted, followed by laryngeal mask insertion. Anesthesia was maintained with 2~3% of sevoflurane. Spontaneous respiration was preserved with SpO₂ 99%, respiration rate (RR) 25 to 28 rpm, and end-tidal CO₂ (EtCO₂) 45 to 54 mmHg. The laryngeal mask was removed before complete arousal, following gentle assist of respiration. A postoperative chest radiograph confirmed the absence of abnormal change in the region of interest. The patient was discharged the following day without any adverse event.

In 1953, Ramsay¹ classified CBA as a congenital pulmonary cystic disease. The disease is characterized by localized obstruction of the segmental bronchus while the bronchus distal to the region of the obstruction maintains normal structure. Radiographic images indicate mostly mass shadows or hyperinflation.² Clinical symptoms include (1) bronchial dilation distal to the obstruction, (2) mucous retention and

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Figure 1. Preoperative chest radiograph. A mass shadow (a) in the upper left lung field is surrounded by hyperlucent lung field.

inflammation, and (3) emphysema caused by collateral ventilation.

In this case, recurrent pulmonary infection during infancy destroyed the alveolar wall and caused the formation of scar tissue and bullae in the pulmonary apex region. Emphysematous lung is also known to exclude the normal healthy lung.³ Some cases of CBA develop into tension pneumothorax.⁴ Measures should be taken to avoid lung barotrauma such as high frequency oscillation ventilation for respiratory management,⁵ one-lung ventilation, or artificial pneumothorax. Since dental treatment for this patient did not need neuromuscular blockade, we chose spontaneous respiration during anesthesia. As positive pressure ventilation facilitates air trapping in the hyperinflated lung lobe, potentially leading to pneumothorax, we chose spontaneous respiration during general anesthesia. This was well tolerated by this patient.

Figure 2. Chest computed tomography. A hyperinflated lobe distal from an occluded bronchus was confirmed, suggesting a mucoid impaction (b) in the occluded bronchus.

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