CORRESPONDENCE

Using lung ultrasound in an infant to detect bronchial intubation not previously identified by auscultation

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To the Editor,

Bronchial intubation is more likely to occur in children because of a relatively short trachea. Auscultation, one of several methods used to confirm correct endotracheal tube (ETT) placement, has been reported to miss bronchial intubation in approximately 3% of cases.¹ In recent years, lung ultrasound has been reported as being useful in detecting bronchial intubation in adults,² and it may also be effective for use in children.³ Herein, we report successful detection of bronchial intubation – not previously identified by auscultation – using lung ultrasound in an infant (aged 14 months; height, 67 cm; weight, 6.9 kg) undergoing pyeloplasty for left ureteropelvic junction obstruction. The infant's medical history included radical surgery for total anomalous pulmonary venous return and home oxygen therapy for tracheomalacia. Consent for publication of this report was provided by the parents.

Following the induction of general anesthesia with nitrous oxide and sevoflurane, a peripheral intravenous catheter was inserted, and atropine 0.1 mg, fentanyl 20 µg, and rocuronium 10 mg were administered. The infant's trachea was subsequently intubated with a 4-mm Portex® Blue Line® oral/nasal uncuffed ETT (Smiths Medical Japan Ltd., Tokyo, Japan). Using auscultation, we determined a bronchial intubation length of 14 cm as the distance from the maxillary incisors. Accordingly, we fixed the ETT 13 cm from the maxillary incisors as the breath sounds were similar on both sides of the chest at this point. In addition, the infant's oxygen saturation was 99% (F_iO₂ 0.4), his heart rate was 153 beats·min⁻¹, and the end-tidal

CO₂ pressure was 47 mmHg with a square capnographic tracing. Nevertheless, the airway pressure required to obtain a tidal volume of 70 mL was 18 cm H₂O, which we regarded as being slightly high, and thus, we suspected a bronchial intubation. Although the auscultation findings were normal, we were concerned about its potential for inaccuracy, and therefore, we performed a lung ultrasound. We observed lung movements on the M-Turbo® ultrasound system (Fujifilm SonoSite Inc., Tokyo, Japan) by placing a linear array transducer in the fourth intercostal space (Figure). Although right lung sliding was observed, the absence of left lung sliding indicated that the infant's left lung was not being ventilated. Furthermore, lung pulse and comet-tail artifacts were observed, which are absent in patients with pneumothorax. On the basis of these findings,

Figure Ultrasound image. If the lung is ventilated, ultrasound shows shimmering or sliding at the pleural interface during respiration. If the lung is not ventilated, this phenomenon is not observed. A comet-tail artifact is observed at the boundary between the visceral pleura and pulmonary alveoli with air. This finding is often observed in normal patients and can help rule out pneumothorax

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we made a diagnosis of right bronchial intubation. When we retracted the ETT to 12 cm from the maxillary incisors, we subsequently observed left lung sliding and a decreased airway pressure. Interestingly, the auscultation appeared unchanged.

In addition to observing lung sliding as an indication of ventilation, lung ultrasound is effective for discriminating pneumothorax and interstitial lung disease, including pulmonary edema.⁴ In patients with bronchial intubation, lung sliding is not observed as in the contralateral intubated lung. Since auscultation may not always reliably detect bronchial intubation because of mixed breath sounds from the contralateral side, lung ultrasound may offer a significant advantage. Because desaturation occurs rapidly in children,⁵ physicians have limited time to search for the cause. Consequently, in addition to using ultrasound for detecting tracheal intubation³ and other select lung pathologies,⁴ we suggest that it be used to evaluate suspected bronchial intubation.

Conflicts of interest None declared.

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