Diaphragmatic Ultrasound Is Not Accurate for Identifying Mainstem Intubation

The risk for a false finding of mainstem intubation makes this technique dangerous.

End-tidal carbon dioxide (ET-CO$_2$) detection is the standard for confirming that an endotracheal tube is in the airway, not in the esophagus, but a chest x-ray is required to determine where the tube is located in the airway. These authors evaluated whether detection of diaphragm movement by ultrasound could distinguish tracheal intubation from mainstem bronchus or esophageal intubation in children.

Investigators enrolled a convenience sample of 127 children (mean age, 6 years) who were emergently intubated in a pediatric emergency department in Cincinnati during a 16-month period. After confirmation of tracheal intubation by ET-CO$_2$ testing, patients underwent chest radiography, followed by diaphragmatic ultrasonography. Sonographers received minimal training in the technique and were blinded to chest x-ray results but not to ET-CO$_2$ results. No esophageal intubations were detected by any test. Of 24 mainstem bronchus intubations detected by chest x-ray, 12 were detected by ultrasound, yielding a false-negative rate of 50%. In addition, ultrasound falsely identified 9 of 103 tracheal intubations as mainstem bronchus intubations, yielding a false-positive rate of 9%.

Comment: This is a good example of a small single-center study that provides a definitive answer. A 9% false-positive rate translates to a 1 in 11 chance of erroneous endotracheal tube repositioning, and, when combined with a 50% false-negative rate, the results indicate that ultrasound observation of diaphragmatic movement for determination of endotracheal tube position is unsafe and cannot be recommended.

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