Efficacy of Endotracheal Tube Cuff Palpation and Humidity in Distinguishing Endotracheal from Esophageal Intubation

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Introduction. Many methods have been proposed to discriminate between tracheal and esophageal intubation. Ideally, there should be direct visualization of the endotracheal tube as it passes between the vocal cords. Two highly reliable methods for confirmation of tube placement are visualization of the trachea with a fiber optic laryngoscope or the detection of carbon dioxide in exhaled gas (ETCO₂). Both approaches require specialized equipment that may not be available particularly outside of the operating room.

An ideal test would be easily learned, rapidly performed, sensitive, and specific. Palpation of the endotracheal cuff at the supra sternal notch has been reported as a reliable means of positioning the tube tip at mid trachea. While there has been no study confirming the validity of this approach in differentiating between esophageal and endotracheal tube placement, it has become a common clinical practice. Another commonly mentioned technique is to check the endotracheal tube for condensation after a single breath. The present study was designed to evaluate these two techniques in a prospective blinded fashion.

Methods. After obtaining appropriate institutional approval and informed consent, fifteen ASA I and II adults scheduled for elective surgery were randomly assigned to one of two groups. Routine monitoring was used on all patients including mass spectrometry and pulse oximeter. Group one patients were endotracheally intubated following preoxygenation, curare 3 mg, succinylcholine 1.5 mg/kg and pentothal 4 mg/kg. The endotracheal tube was inserted to 2 cm in females and 22 cm in males, measured at the teeth. Group two patients were similarly anesthetized. After being evaluated with direct laryngoscopy as having an easily visualized airway, they had endotracheal tubes placed to the same depths in the esophagus. In both groups the pilot balloon was inflated to a pressure of 20 mmHg. A blinded fellow or staff anesthesiologist had ten seconds to evaluate tube placement. Position was evaluated initially by pressing above the supra sternal notch while palpating the pilot balloon. Next a single breath was given and the endotracheal tube observed for condensation during exhalation. Group two patients were then appropriately intubated. At no time did any patient nor would any patient have been allowed to have an arterial saturation value of less than 95% trachea. The data were analyzed utilizing Fisher's exact test.

Results. Eight patients were randomized and placed in group one. The endotracheal tube cuff was palpated eight of eight times. Group two consisted of seven patients. The endotracheal tube cuff was palpated six of seven times.

Presence of humidity in the tracheal placed endotracheal tubes occurred eight of eight times versus two of seven times in the endotracheal tubes placed in the esophagus. P ≤ 0.007.

Discussion. The present study underscores the potential for catastrophe whenever cuff palpation or the presence of water condensation are used to discriminate between esophageal and tracheal tube placement. Esophageal tube cuffs were commonly palpated as endotracheal by blinded, trained observers. The presence of condensation, although statistically less likely, can and does occur. That it did occur 28% of the time in the present study should strongly discourage its presence from being interpreted as a "reliable" indication of a successful outcome. The results in this evaluation should reemphasize the need for careful assessment of multiple signs and symptoms as well as the use of advanced technology whenever feasible.

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