Inflating Cuffed Endotracheal Tubes in Pediatric Patients: Are We Doing it Right?

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Introduction
Until recently, the standard practice was to avoid cuffed endotracheal tubes in pediatric patients. However, over the past 5 years, there has been an increase in the use of cuffed endotracheal tubes in infants and children. When cuffed endotracheal tubes are used, the literature suggests that an intra-cuff pressure ≥ 30 cmH₂O may result in tracheal damage. There is a recommendation that the cuff pressure be regularly monitored using a manometer, thereby avoiding excessive pressure by the cuff on the cricoid area. However in clinical practice, a manometer is rarely used. Instead, anesthesiologists routinely inflate the cuff to a point where there is no audible air-leak during positive pressure ventilation or CPAP (CPAP air-leak technique) with the assumption that this technique prevents hyperinflation of the cuff. The purpose of the current study is to assess the safety of this technique.

Methods
The study was approved by the Institutional Review Board of Nationwide Children's Hospital. Pediatric patients undergoing general anesthesia and endotracheal intubation with a cuffed ETT were eligible for inclusion. After endotracheal intubation, the cuff was inflated using the CPAP air-leak technique. A stethoscope was placed in the suprasternal notch and CPAP of 20-25 cmH₂O held. The cuff was slowly inflated until there was a loss of audible air leak around the cuff. The intracuff pressure was then measured using a manometer.

Results
The study cohort included 200 patients ranging in age from 0.5 to 18 years. The size of the cuffed endotracheal tube ranged from 3.0 to 7.0 mm. The intracuff pressure ranged from 8 to 40 cmH₂O with a mean of 21 ± 4 cmH₂O. The intracuff pressure was ≤ 30 cmH₂O in 199 of 200 patients.

Discussion
The literature has demonstrated several advantages related to the use of cuffed endotracheal tubes including reduced pollution and cost due to decreased wastage of medical gases. There is also a reduction in the number of repeat intubation attempts due to inappropriate size. Although recent redesign of cuffed endotracheal tubes may have made them safer for use in children, over-inflation of the cuff is still a concern. Although using a manometer to measure the cuff pressure is probably more accurate, the devices cost approximately $300 and also must be cleaned between patients further increasing manpower needs. Anesthesiologists routinely use the disappearance of air-leak around the cuff while holding CPAP as an endpoint, with the presumption that this technique will avoid excessive cuff pressures. Our study demonstrated that the simple CPAP air-leak technique, which currently is used by many anesthesiologists, is a safe way to ensure that the intracuff pressure is ≤ 30 cmH₂O.

References