

LETTER TO THE EDITOR

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Changes in endotracheal tube cuff pressure in mechanically ventilated adult patients

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Abstract

During mechanical ventilation, endotracheal tube cuff pressure should be maintained within proper range. We investigated the effect of frequent adjustment on cuff pressure in 27 mechanically ventilated patients. Cuff pressure was recorded every 2 h and was adjusted to 24 cmH₂O each time. We found that cuff pressure was decreased by 4.9 ± 2.9 cmH₂O from the target value. Cuff pressure decreased to less than 20 cmH₂O in 45% of measurement occasions 2 h after adjusting it to 24 cmH₂O.

Keywords: Cuff pressure, Endotracheal tube, Critically ill patients, Mechanical ventilation

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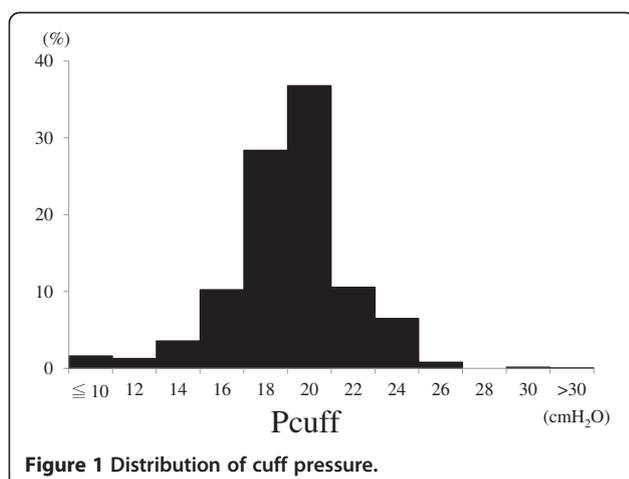
To prevent gas leakage and aspiration, an endotracheal tube (ETT) with a cuff is generally used for mechanically ventilated patients. Because excessive cuff pressure decreases tracheal capillary perfusion, and insufficient cuff pressure leads to aspiration of oropharyngeal contents, [1-3] cuff pressure should be maintained within the proper range. Cuff pressure measurements are routinely taken every 8 to 24 h, and during the interval, air inside the cuff may escape from the ETT cuff surface or through the pilot balloon valve. It remains unknown whether, through frequent adjustment, cuff pressure can be maintained within the target range. We prospectively collected 1,846 data points of cuff pressure from 27 adult patients receiving mechanical ventilation for longer than 48 h with cuffed ETTs, standard high-volume low-pressure cuff (Hi-Lo Mallinckrodt Medical, Dublin, Ireland). Nurses measured the cuff pressure every 2 h using a cuff inflator (Cuff Pressure Gauge, VBM Medizintechnik GmbH, Baden-Württemberg, Germany) each time readjusting the pressure to 24 cmH₂O. Ventilatory settings and body position remained unchanged during the 2-h interval. The study was approved by the hospital research board, which waived the requirement for informed consent for this observational study that was part of routine care.

Cuff pressure deviation from the target value (24 cmH₂O) was -4.9 ± 2.9 cmH₂O. Cuff pressure was below 20 cmH₂O in 45% of the measurements, below 24 cmH₂O in 93%, and over 30 cmH₂O in 0.05% (Figure 1). Loss of cuff pressure is known to increase the risk of complications cuff pressure below 20 cmH₂O is associated with the development of ventilator-associated pneumonia [1,2,4,5]. Nseir et al. [3], measuring cuff pressure every 8 h, found that cuff pressure was maintained within recommended range (20 to 30 cmH₂O) in only 18% of patients, that it was lower than 20 cmH₂O at least once for 54% of patients, and that it was over 30 cmH₂O at least once for 73% of patients. In our study, the cuff tended to deflate, probably owing to different patient characteristics than in Nseir's study.

Because frequent readjustment did not prevent cuff pressure loss, we suspected that the measurement procedure itself might contribute to changes in cuff pressure. The air compressed in the cuff might escape to the measurement system during the connection procedure. Further study is needed to clarify the effect of measurement procedures in a broader variety of situations. Our study has several limitations: small population, varied observation time, and lack of evaluation of clinically significant outcomes. In conclusion, cuff pressure decreased to less than 20 cmH₂O in 45% of measurement occasions taken from critically ill patients 2 h after adjusting it to 24 cmH₂O.

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Abbreviation

ETT: endotracheal tube.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

AM, SA, HK, and YM established the design of the study, collected the data, and drafted the manuscript. TM participated in the design of the study and revised the manuscript. HI performed the statistical analysis and revised the manuscript. MN revised the manuscript. All authors read and approved the final manuscript.

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Received: 8 August 2013 Accepted: 16 January 2014

Published: 31 January 2014

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doi:10.1186/2052-0492-2-7

Cite this article as: Motoyama *et al.*: Changes in endotracheal tube cuff pressure in mechanically ventilated adult patients. *Journal of Intensive Care* 2014 **27**.

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