

ORAL PRESENTATION

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Lung deposition of a radiolabeled aerosol with two ventilation modalities during invasive mechanical ventilation: a randomized comparative study

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Introduction

Volume-controlled ventilation has been suggested during nebulization to optimize lung deposition although promoting spontaneous ventilation is targeted for ventilated patient management. Comparing topographic lung aerosol deposition during volume-controlled and spontaneous ventilation in pressure support has never been performed.

Objectives

The aim of this study was to compare lung deposition of a radiolabeled aerosol generated with a vibrating-mesh nebulizer during invasive mechanical ventilation, using two ventilation modes: pressure support ventilation (PS) and volume-controlled ventilation (VC).

Methods

Seventeen postoperative neurosurgical patients without pulmonary disease volunteered to participate in the study and were randomly ventilated in PS ($n = 8$) or VC ($n = 9$) with constant inspiratory flow. Diethylenetriaminepentaacetic acid labelled with technetium-99 m (2 mCi/3 mL) was administered using a vibrating-mesh nebulizer (Aerogen Solo[®], Aerogen Ltd., Galway, Ireland) connected to the endotracheal tube. Pulmonary and extrapulmonary particles deposition was analyzed by planar scintigraphy.

Results

Mean lung deposition expressed as a percent of nominal dose was $10.5 \pm 3.0\%$ and $15.1 \pm 5.0\%$ during PS and VC,

respectively ($p < 0.05$). Higher endotracheal tube and tracheal deposition was observed during PS ($27.4 \pm 6.6\%$ versus $20.7 \pm 6.0\%$, $p < 0.05$). A similar aerosol penetration from the inner to the outer region of the right lung ($p = 0.347$) and the left lung ($p = 0.239$) was observed.

Conclusions

Volume-controlled ventilation improved lung deposition of aerosolized particles as compared to pressure support ventilation. The clinical benefit of this effect warrants further studies.

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