

Title: The effect of endotracheal tube diameter on tidal volume delivery during high frequency oscillatory ventilation (HFOV)

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Rationale: Endotracheal tube (ETT) size will affect delivered tidal volume during HFOV, but this has not been examined systematically. We studied the relationship between delivered Vt and ETT internal diameter during HFOV of a lung model.

Method: A previously validated Acutronics hot-wire anemometer (Florian) with an adult flow sensor was placed in series with a Sensor Medics 3100B HFOV ventilator, one of three ETTs, and a Model 4600 Michigan test lung. At fixed mean airway pressure (30 cmH₂O), compliance (30 ml/cmH₂O), airway resistance (5 cmH₂O/L/sec), bias flow (20 L/min), and inspiratory:expiratory ratio (1:2), Vts were determined by integration of measured flow. Measurements were taken under each combination of frequency (*f*: 3, 6, 12 Hz), pressure amplitude (ΔP : 50, 70, 90 cmH₂O), and endotracheal tube internal diameter (ID: 6, 7, 8 mm). Measurements were obtained once from each of two 3100B oscillators.

Results: Delivered Vt decreased with decreasing ETT diameter. Across all settings of *f* and ΔP , Vt fell 5.5 +/- 4.1% (mean +/- SD) when ETT diameter was reduced from 8.0 to 7.0 mm, and 26.2 +/- 2.3% when reduced from 8.0 to 6.0 mm (Figure 1).

Conclusions: Endotracheal tubes of smaller internal diameter decrease delivered Vt by a predictable proportion during HFOV with a Sensor Medics 3100B ventilator between 3-12 Hz and ΔP of 50 – 90 cmH₂O.

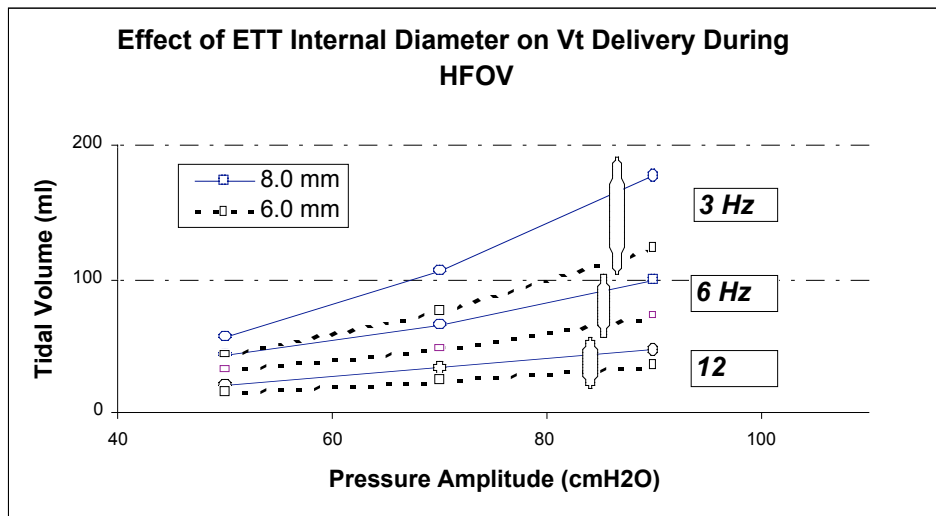


Figure 1

