



Albuterol Delivery via Intrapulmonary Percussive Ventilator and Jet Nebulizer in a Pediatric Ventilator Model.

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BACKGROUND: In-line administration of bronchodilators is widely used in pediatric patients receiving mechanical ventilation. We compared the amount of albuterol captured at the end of the endotracheal tube (ETT) with an intrapulmonary percussive ventilator (IPV) versus a Salter 8900 jet nebulizer placed in-line in a pediatric ventilator model, under various operating conditions. We hypothesized that the type of aerosol generator, tidal volume (V_T), and position in the ventilator circuit would influence the albuterol delivery.

METHODS: We connected a ventilator to a heated-wire ventilator circuit (heated to 37°C), to a cuffed 5.5-mm inner-diameter ETT, to a lung model, and ran the ventilator at pediatric ventilation settings: pressure-regulated volume-control mode, respiratory rate 20 breaths/min, PEEP 5 cmH_2O , FiO_2 0.4, inspiratory time 0.75 s, inspiratory rise time 0.15 s, and flow-triggering at 3 L/min. We collected aerosol with a filter at the distal end of the ETT (ie, between the ETT and the lung model). We tested 3 IPV units run on central O_2 at 50-PSI, with a drive pressure of 25 cmH_2O , and 3 Salter 8900 units run on central O_2 at 6 L/min. We diluted 5 mg of albuterol in saline, and nebulized 3 mL with the jet nebulizer and 10 mL with the IPV. We studied V_T (100 mL vs 200 mL), position in the circuit (at the humidifier vs at the Y-piece), and the IPV's "easy" and "hard" percussion settings.

RESULTS: When positioned at the humidifier, the IPV delivered significantly less albuterol than the jet nebulizer (3.1-3.9-fold difference, $P = .002$). When the IPV was moved to the Y-piece, the albuterol delivery was similar to that of the jet nebulizer at either position. Neither increasing the V_T nor increasing the IPV settings increased the albuterol delivery.

CONCLUSIONS: The IPV delivered less albuterol than the jet nebulizer when placed at the humidifier. IPV was equivalent to jet nebulizer when placed at the Y-piece. Doubling the V_T did not increase aerosol delivery.

PMID: 21122179 [PubMed - in process]

[Respir Care](#) - 2010 Dec; 55(12):1699-704.



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