

Effect of a Nebulizer Holding Chamber on Aerosol Delivery

A new holding chamber was designed to be used with the Aerogen Solo nebulizer to increase the aerosol emitted that reach the patient. The aim of this study was to evaluate the efficacy of this holding chamber with Solo nebulizer and determine its usability with other nebulizers. The study was divided into 2 parts. In the first part, aerosol emitted of 1 mL respirable solution (nominal dose of 5000 μ g salbutamol), delivered by using the Solo nebulizer, Pronebulizer, and jet nebulizer, connected to a T-piece or a holding chamber, was determined by using a breathing simulator set to provide a tidal volume of 500 mL, frequency of 15 breaths/min, and the inspiratory-expiratory ratio of 1:1 for adults as the quiet breathing pattern. Aerodynamic particle size characterizations were determined by using a cooled cascade impactor at an inhalation flow of 15 L/min. In the second part of the study, 12 healthy nonsmoking subjects (6 females) >18 y, with an FEV₁ > 90% were enrolled. Inhaled aerosol of 1 mL respirable solution (5,000 μ g salbutamol) was delivered through the Solo nebulizer– holding chamber and an Solo nebulizer–T-piece using normal tidal breathing. The subjects provided urine samples 30 min after dosing and cumulatively collected their urine for 24 h. The samples were analyzed for salbutamol content. RESULTS: The holding chamber significantly increased aerosol emitted by the 3 nebulizers compared with the T-piece ($P < .01$) and relatively decreased the mass median aerodynamic diameter but with no significant difference. The Solo nebulizer– holding chamber resulted in significantly higher aerosol emitted compared with any other delivery method tested ($P < .01$). Also, Solo nebulizer– holding chamber resulted in higher urine samples 30 min after dosing (as an index of lung deposition) and cumulatively collected urine for 24 h (as an index of systemic absorption) compared with the Solo nebulizer–T-piece ($P < .05$). The use of the holding chamber with a jet nebulizer, Pro nebulizer, and the Solo

nebulizer significantly increased the aerosol delivery. The Solo nebulizer–holding chamber had the highest aerosol emitted compared with all nebulizer-adapter combinations and higher urine samples 30 min after dosing and cumulatively collected urine for 24 h compared with the Solo nebulizer–T-piece.