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Title: Study of the performances of a new spacer in adult mechanical ventilation

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Body: Rationale: The aim of this study was to evaluate the performances of a new spacer called Combihaler (Protec'som, France) to improve drugs delivery either from nebulizer or pMDI. Methods: To assess the Combihaler chamber in clinical conditions, assembly includes a respirator (Volume controlled, Vc = 450mL, f = 15/min, PEEP = 6, P max = 19, Ti / Ttot = 40/60) and a model of adult lung Dual TTL 5600i (Michigan Instruments). Ventilation parameters were measured with and without the new spacer. A filter was placed after the endotracheal tube to measure aerosol delivery. Amikacin (1g/8ml) was nebulized with an Aeroneb Solo (Aerogen, Ireland) and a T-piece or a Combihaler. Beclomethasone was delivered with a pMDI (250µg, Becotide, GlaxoSmithKline, France) and a T-piece (Allegiance Healthcare Corporation) or a Combihaler. Drug deposited on filter were assayed. Amikacin was measured with an electrochemical tracer and beclomethasone was measured by spectrophotometry. Results: The use of the Combihaler didn't change the ventilation parameters (p=0.82). The mass of amikacin deposited on the filter was higher with the Combihaler chamber compared with the Aerogen T-adapter (491.1±12.4 mg vs 142.8±4.1 mg, p<0,05) corresponding of an increasing of a factor 2.5 in term of output rate with Combihaler (8.3 mg/min ± 0.6 vs 3.3 mg/min ± 0.3, p < 0,05). The mass of beclomethasone deposited on the filter was increased with Combihaler chamber in comparison with T-piece (81.1±0.9 µg vs 26.5±0.4 µg / puff, p<0,05). Conclusions: The Combihaler chamber doesn't modified ventilator parameters and increases drug delivery by mesh nebulizer and pMDI.