

Summary

Inhalation is a very old method for delivery of drugs, and it became the backbone of respiratory care in the 20th century, known as aerosol therapy. Either being the end organ for local diseases treatment or the route of administration for systemic therapies, the lung is considered a very attractive non-invasive target for drug delivery. To get a physiological effect of inhaled particles, they must first deposit within the respiratory system past the oropharyngeal region to achieve therapeutic effectiveness.

Obstructive lung diseased patients often require ventilatory support either via invasive or non-invasive mechanical ventilation according to the severity of the exacerbation.

The devices used for comparison in our study were: Sidestream Jet Nebulizer, Aerochamber MV Spacer and AERONEB Pro Nebulizer.

To compare the three devices, In vitro study using Andersen Cascade Impactor, in vivo study included twelve randomly selected patients and ex vivo study were done. The inclusion criteria of in vivo study was mechanically ventilated patients suffering bronchospasm under supervision of critical care unit physician. Exclusion criteria included patients taking beta blockers, other sympathomimetics or non potassium sparing diuretics, pregnant females, pediatrics, known hypersensitivity, acute pulmonary edema and moderate or severe renal impairment defined as creatinine clearance or GFR of < 20 ml /min.

The in-vitro results showed significantly different aerodynamic characterization of aerosol delivered by the three tested methods. Depending on the FPD and FPF results, 18 MDI doses actuated in the inspiration phase, containing $100\mu\text{g}$ salbutamol each (1.8 mg salbutamol) could result in pulmonary lung deposition similar to about 8.6 mg delivered by VMNs and 10 mg salbutamol by jet nebulizer in invasive ventilation circuit.

The in-vivo and ex vivo studies both proved the greater efficacy in pulmonary drug delivery proved by attachment of AERO spacer to pMDI and PRO vibrating mesh nebulizer than the traditionally used Sidestream jet nebulizer. Also AERO spacer attachment to pMDI has proved the greatest efficacy. From our in vivo results, the suggested equivalent doses from the tested aerosol delivery methods for invasive mechanically ventilated patients would be nearly 1.2 mg salbutamol from MDIs with spacers (12 MDI doses actuated in the inspiration phase, containing $100\mu\text{g}$ salbutamol) equivalent to 4.5 mg from PRO and 10 mg salbutamol by JET.