Dose–Response Data For Albuterol Delivered Using a High-Flow Nasal Cannula with In-line Aerogen® Solo in Patients with Obstructive Airways Diseases


Background

Although delivery of aerosolized bronchodilator therapy via HFNC in patients with obstructive airways diseases is of interest to clinicians, there is a lack of dose–response data in this setting.

Objective

This study examined dose–response results for aerosolized albuterol delivered using a HFNC with in-line Aerogen Solo®, as compared with an MDI with valved holding chamber, in adult patients with stable mild-to-moderate COPD and asthma.

Materials and Methods

Design: Doubling dose-escalation study

Patients with a positive bronchodilator response* to 400μg of albuterol via MDI plus valved holding chamber → N=42

Inhalation of albuterol administered via HFNC with in-line Aerogen Solo

Aerosol delivery and outcome assessment

- Spirometry
  - Escalating doses of albuterol (total volume 2mL)
  - Delivered at 37°C at a flow rate of 15–20L/minute
  - Aerogen Solo positioned at the dry side of the humidifier
  - Escalating doses were administered for ~5 minutes at 15- to 20-minute intervals
  - The dose was escalated until an improvement of <5% in FEV₁ versus the previous dose or the occurrence of adverse effects (eg tachycardia, arrhythmia, tremor)

*Defined as an absolute change of ≥200 mL and a ≥12% increase from baseline in FEV₁ per 2005 American Thoracic Society/European Respiratory Society criteria; †Spirometry was performed before the initial dose and 5–6 minutes after the HFNC was disconnected. COPD, chronic obstructive pulmonary disease; FEV₁, forced expiratory volume in 1 second; HFNC, high-flow nasal cannula; MDI, metered-dose inhaler.
**Achievement of a positive bronchodilator response***

<table>
<thead>
<tr>
<th>Accumulative dose of albuterol</th>
<th>0.5mg</th>
<th>1.5mg</th>
<th>3.5mg</th>
<th>7.5mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients (%)</td>
<td>33%</td>
<td>69%</td>
<td>79%</td>
<td>13%</td>
</tr>
<tr>
<td>n</td>
<td>14/42</td>
<td>29/42</td>
<td>27/34</td>
<td>1/8</td>
</tr>
</tbody>
</table>

**FEV₁ increment from baseline (mean ± standard deviation)**

- **Albuterol 400µg via MDI with valved holding chamber**
  - 0.34L (±0.12)

- **Albuterol 1.5mg via HFNC with Aerogen Solo**
  - 0.34L (±0.18)

*Aerosolized albuterol via HFNC with in-line Aerogen Solo resulted in a positive bronchodilator response in COPD and asthma patients***

*Defined as an absolute change of ≥200 mL and a ≥12% increase from baseline in FEV₁ per 2005 American Thoracic Society/European Respiratory Society criteria.

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