Supplementary Online Content


eFigure 1. Details on treatment failures for patients treated with bi-level positive airway pressure or high-flow nasal oxygen therapy

eFigure 2. Course of partial pressure of arterial O2 (PaO2)/fraction of inspired O2 (FiO2) ratio, and partial pressure of CO2 (PaCO2) during the first three days in patients treated with bi-level positive airway pressure or high-flow nasal oxygen therapy

eFigure 3. Course of respiratory rate during the first three days in patients treated with bi-level positive airway pressure or high-flow nasal oxygen therapy

eFigure 4. Timing of collection of arterial blood gas and respiratory measurements during treatment; and respiratory and extra pulmonary complications during the ICU stay

eTable 1. Reasons for reintubation

eTable 2. Causes of death in ICU

This supplementary material has been provided by the authors to give readers additional information about their work.
Details on treatment failures for patients treated with bi-level positive airway pressure or high-flow nasal oxygen therapy

178 treatment failures

- BiPAP group n=91
  - Switch n=33
  - Orotracheal intubation n=43
  - Premature discontinuation n=15
    - Reoperation n=3
    - Abdominal distension n=1†
    - Confusion n=2*
    - Pneumothorax n=1†
  - Patient refusal n=8
    - Orotracheal intubation n=11
    - Success n=22
  - HFNO n=3
    - Standard O₂ n=5

- High Flow Nasal oxygen group n=87
  - Switch n=45
  - Orotracheal intubation n=36
  - Premature discontinuation n=6
    - Patient refusal n=5
    - Reoperation n=1
  - Orotracheal intubation n=21
  - Success n=24
  - BiPAP n=1
    - Standard O₂

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Reasons for failure were premature discontinuation in 15 (16.5%) patients with bi-level positive airway pressure and 6 (6.9%) patients with high-flow nasal oxygen therapy (P=0.047); and a switch to the treatment used in the other arm in 33 (36.3%) patients with bi-level positive airway pressure and 45 (51.7%) patients with high-flow nasal oxygen therapy (P=0.037). Patients who underwent reoperation were systematically intubated and considered as a failure.

Success = success was defined as absence of ventilatory support for the next 72 hours.

Standard O₂ = Standard oxygen therapy: patients received O₂ via a standard nasal cannula, simple facemask, or nonrebreathing mask

*Patients received standard oxygen therapy.

†This patient received high-flow nasal oxygen therapy.

BiPAP: bi-level positive airway pressure

HFNO: high-flow nasal oxygen therapy
eFigure 2. Course of partial pressure of arterial O₂ (PaO₂)/fraction of inspired O₂ (FiO₂) ratio, and partial pressure of CO₂ (PaCO₂) during the first three days in patients treated with bi-level positive airway pressure or high-flow nasal O₂ therapy. Data are the worst value for each variable recorded on each of the 3 days. Data are reported as mean [95% CI]
- PaO$_2$/FIO$_2$ ratio increased over time in both groups (P<0.0001) with no interaction between groups. The ratio was higher in the bi-level positive airway pressure group (P<0.0001).
- PaCO$_2$ showed no differences over time or between groups (P=0.20)
- BiPAP: bi-level positive airway pressure
- HFNO: high-flow nasal oxygen therapy
eFigure 3. Course of respiratory rate during the first three days in patients treated with bi-level positive airway pressure or high-flow nasal oxygen therapy. Data are the worst value recorded on each of the 3 days. Data are reported as mean [95% CI]

- Respiratory rate was higher in patients with bi-level positive airway pressure ($P<0.0001$) and changed over time ($P=0.03$) with no interaction between groups.
- BiPAP: bi-level positive airway pressure
- HFNO: high-flow nasal oxygen therapy
ABG: arterial blood gas

BiPAP: bi-level positive airway pressure

HFNO: high-flow nasal oxygen therapy

PSV: pressure support ventilation

PEEP: positive end-expiratory pressure

* 287 patients (69%) were under BiPAP and 129 (31%) under standard O₂ therapy
eTable 1: Reasons for reintubation

<table>
<thead>
<tr>
<th>Reasons for reintubation, n (%)</th>
<th>BiPAP group (n=58)</th>
<th>HFNO group (n=57)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute respiratory failure</td>
<td>35 (60%)</td>
<td>27 (47%)</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>5 (9%)</td>
<td>10 (17%)</td>
</tr>
<tr>
<td>Upper airway obstruction</td>
<td>0</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Encephalopathy</td>
<td>6 (10%)</td>
<td>3 (5%)</td>
</tr>
<tr>
<td>Septic shock</td>
<td>4 (7%)</td>
<td>8 (14%)</td>
</tr>
<tr>
<td>Hypercapnic coma</td>
<td>7 (12%)</td>
<td>5 (9%)</td>
</tr>
<tr>
<td>Reoperation</td>
<td>1 (2%)</td>
<td>3 (5%)</td>
</tr>
</tbody>
</table>

No significant difference was found between groups (p=0.29)

- BiPAP: bi-level positive airway pressure
- HFNO: high-flow nasal oxygen therapy
eTable 2. Causes of death in ICU

<table>
<thead>
<tr>
<th>Cause (n, %)</th>
<th>BiPAP group (n=23)</th>
<th>HFNO group (n=28)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septic shock</td>
<td>9 (39%)</td>
<td>13 (46%)</td>
</tr>
<tr>
<td>Mesenteric ischemia</td>
<td>5 (22%)</td>
<td>3 (10%)</td>
</tr>
<tr>
<td>Acute heart failure</td>
<td>4 (17%)</td>
<td>3 (10%)</td>
</tr>
<tr>
<td>Hemorrhagic shock</td>
<td>4 (17%)</td>
<td>2 (7%)</td>
</tr>
<tr>
<td>Acute respiratory distress syndrome</td>
<td>0</td>
<td>4 (14%)</td>
</tr>
<tr>
<td>Cerebral hemorrhage</td>
<td>0</td>
<td>2 (7%)</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>1 (5%)</td>
<td>2 (7%)</td>
</tr>
</tbody>
</table>