Noninvasive ventilation decreased mortality and the need for endotracheal intubation for COPD exacerbation


Objective
To compare noninvasive ventilation, administered through a face mask, with standard treatment in patients with chronic obstructive pulmonary disease (COPD) in the intensive care unit.

Design
Randomized controlled trial.

Setting
5 intensive care units in Europe.

Patients
85 patients (mean age 70 y) who had COPD and exacerbation of dyspnea lasting < 2 weeks and at least 2 of respiratory rate > 30 breaths/min, partial pressure of oxygen < 45 mm Hg, or an arterial pH < 7.35 after breathing room air for ≥ 10 minutes. Exclusion criteria included respiratory rate < 12 breaths/min or need for immediate intubation, receipt of sedative drugs within the previous 12 hours, central nervous system disorder, kyphoscoliosis, upper airway obstruction or asthma, or clear cause of decompensation requiring specific treatment. Follow-up was complete.

Intervention
Patients were allocated to standard treatment (oxygen, maximal flow rate 5 L/min plus subcutaneous heparin, antibiotics, and bronchodilators) (n = 42) or to standard treatment plus periods of noninvasive pressure-support ventilation with a face mask ≥ 6 hours/d (n = 43). Any patient who met 1 of 5 objective criteria (respiratory arrest, respiratory pauses with loss of consciousness or gasping for air, psychomotor agitation, heart rate < 50 beats/min, or hemodynamic instability) received endotracheal intubation.

Main Outcome Measures
Need for endotracheal intubation and mechanical ventilation. Secondary outcomes were length of hospital stay, duration of ventilatory assistance, and mortality.

Main Results
Noninvasive ventilation led to fewer requirements for endotracheal intubation than did standard treatment (26% vs 74%, P < 0.001). (This absolute risk reduction (ARR) of 48% means that 2 patients would need to be treated (NNT) to prevent 1 intubation, 95% CI 2 to 4; the relative risk reduction (RRR) was 65%, CI 43% to 80%.)

Patients who received noninvasive ventilation had a shorter time in the hospital (23 [SD 17] vs 35 d [SD 33]) (CI for the 12-day difference 0.17 to 23.3, P = 0.02). Noninvasive ventilation led to fewer deaths than did standard treatment (9% vs 29%, P = 0.02) (ARR 20%, NNT 5, CI 3 to 36; RRR 67%, CI 13% to 88%).

Conclusion
The addition of noninvasive pressure-support ventilation, administered through a face mask, to standard treatment was more effective than standard treatment alone for patients with chronic obstructive pulmonary disease in the intensive care unit.

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*Numbers calculated from data in article.


Commentary
Mechanical support of ventilation is usually achieved through the use of translaryngeal intubation. To reduce the complications and expense of this method, the potential utility of "noninvasive" mechanical ventilation delivered by nasal or face mask is being evaluated in a wide variety of disorders, including neuromuscular disease, thoracic cage abnormalities, and COPD (1). The study by Brochard and colleagues is only the second controlled study to evaluate the efficacy of noninvasive ventilation in patients with acute exacerbations of COPD. Combined with the earlier results of Bott and colleagues (2), the current study provides compelling evidence for the use of this technique in selected patients.

Noninvasive ventilation is rapidly becoming a conventional therapy that should be available for selective application in settings where patients with acute respiratory failure are evaluated and managed. Although some initial training of physicians, nurses, and respiratory therapists is necessary and warranted, the technique is feasible in most patients, and the resources necessary for its application are readily available. Although Brochard and colleagues used a specially developed face mask, appropriate devices are now commercially available (e.g., Respironics and Healthdyne).

Maximum benefit from noninvasive ventilation requires targeted and timely application. It is important to point out that Brochard and colleagues did not attempt noninvasive ventilation in patients with severe physiologic perturbations who fulfilled conventional criteria for immediate endotracheal intubation, but evaluated its use in patients with an impending likelihood of requiring endotracheal intubation. Further studies are necessary to help clarify indications for noninvasive ventilatory techniques in patients with decompensated COPD and for patients with "stable" hypercapnic COPD (3) and other disorders.

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References