

Nasal highflow improves ventilation in patients with COPD.

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Int J Chron Obstruct Pulmon Dis. 2016;(11):1077-1085.

Abstract

Background: Nasal highflow (NHF) provides a warmed and humidified air stream up to 60 L/min. Recent data demonstrated a positive effect in patients with acute hypoxemic respiratory failure, especially when caused by pneumonia. Preliminary data show a decrease in hypercapnia in patients with COPD. Therefore, NHF should be evaluated as a new ventilatory support device. This study was conducted to assess the impact of different flow rates on ventilatory parameters in patients with COPD.

Materials and methods: This interventional clinical study was performed with patients suffering from severe COPD. The aim was to characterize flow-dependent changes in mean airway pressure, breathing volumes, breathing frequency, and decrease in partial pressure of CO₂ (pCO₂). Mean airway pressure was measured in the nasopharyngeal space (19 patients). To evaluate breathing volumes, we used a polysomnographic device (18 patients). All patients received 20 L/min, 30 L/min, 40 L/min, and 50 L/min and - to illustrate the effects - nasal continuous positive airway pressure and nasal bilevel positive airway pressure. Capillary blood gas analyses were performed in 54 patients with hypercapnic COPD before and two hours after the use of NHF. We compared the extent of decrease in pCO₂ when using 20 L/min and 30 L/min. Additionally, comfort and dyspnea during the use of NHF were surveyed.

Results: NHF resulted in a minor flow dependent increase in mean airway pressure. Tidal volume increased, and breathing rate decreased. The calculated minute volume decreased under NHF breathing. In spite of this fact, hypercapnia decreased with increasing flow (20 L/min vs 30 L/min). Additionally, an improvement in dyspnea was observed. The rapid shallow breathing index shows a decrease when using NHF.

Conclusion: NHF leads to a flow-dependent reduction in pCO₂. This is most likely achieved by a washout of the respiratory tract and a functional reduction in dead space. In summary, NHF enhances effectiveness of breathing in patients with COPD, reduces pCO₂, the work of breathing, and rapid shallow breathing index as an indicator of respiratory work load.