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Editorial

Sorting Out the Mechanisms of Benefit of High Flow Nasal Cannula in Stable COPD

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Abbreviations: chronic obstructive pulmonary disease, **COPD**; high flow nasal cannula; **HFNC**
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Introduction

Progressive dyspnea and exercise intolerance are common reasons why patients with severe chronic obstructive pulmonary disease (COPD) seek medical help.[1] Patients with COPD have expiratory flow limitation that causes air trapping.[2] Respiratory infections or environmental factors (seasonal change, poor air quality, etc.) can lead to increases in airway resistance and mucous production and complicate expiratory flow limitation, thus leading to worsened air trapping. Hyperinflation from air trapping has multiple negative physiologic consequences such as increased dyspnea, decreased exercise tolerance and worsened quality of life.[3] Therapies that can reduce hyperinflation may improve respiratory symptoms as well as outcomes in patients with COPD.

High flow nasal cannula (HFNC) has been shown to be an effective modality in treating critically ill patients with acute hypoxemic respiratory failure.[4] Multiple reasons have been suggested to account for the benefits associated with HFNC and include improved oxygenation, reduced work of breathing, an increase in end expiratory lung volume, washout of nasopharyngeal dead space, altered breathing pattern and improved mucociliary clearance.[5-7] Most of these mechanistic studies have been conducted using bench or animal models or healthy volunteers.[8] Data regarding its use in patients with COPD, however, are limited and the mechanisms of potential benefit in this patient population are uncertain.

In this issue, Atwood and colleagues provide important insight into the possible benefits associated with HFNC in patients with moderate to severe, stable COPD.[9] They sequentially studied 32 patients with stable COPD treated with 1-2 L minute home oxygen, on no therapy and then subsequently randomly assigned them to HFNC and their prescribed level of low flow oxygen. HFNC reduced respiratory rates compared to the no therapy and low flow oxygen conditions without any increase in tidal volume or change in levels of arterial carbon dioxide. Oxygenation with HFNC was lower when compared to low flow oxygen but similar to the control. The reduction in ventilatory effort with HFNC with no change in carbon dioxide or oxygenation parameters suggests that HFNC purges the anatomic dead space of carbon dioxide and thereby improves ventilatory efficiency.

These data support prior studies showing that HFNC reduces respiratory rate in COPD patients during hospitalization or performing exercise. However, these studies were limited because supplemental oxygen was also administered to treat concurrent moderate to severe hypoxemia.[10,11] In this study, the use of HFNC independent of oxygen administration in stable COPD provides important information that washout of nasopharyngeal dead space results in a reduction in respiratory rate and stable oxygenation and carbon dioxide levels thus indicating an improved respiratory efficiency.

Limitations of the study includes its short-term assessment period, lack of assessment of the add on effects of supplemental oxygen on gas exchange changes and no information on the benefits, if any, of enhanced humidification. Its strengths are that the population represented stable COPD and the opportunity to assess patients without supplemental oxygenation allowed the investigators to detail the impact of purging the conducting airway of carbon dioxide on improving ventilatory efficiency.

HFNC may have important benefits for patients with COPD by improving gas exchange, decreasing breathlessness and improving exercise tolerance. To understand the clinical benefits that can be achieved due to these mechanistic effects, additional studies that explore the impact of long term use of HFNC on important clinical parameters such as exacerbation frequency, hospitalization, sleep quality and quality of life are needed.

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