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Chronic Obstructive Pulmonary Disease (COPD) is a major cause of disability and is expected to be the third leading cause of death worldwide by the year 2030.¹

Breathlessness is the most frequent symptom to limit exercise capacity and reduce quality of life for patients with COPD. Exercise limitation associated with extreme shortness of breath occurs well before the ventilatory limits are attained.²

Pathophysiological factors that can contribute to dyspnea in COPD include intrinsic mechanical loading of the inspiratory muscles or what is known as intrinsic positive end expiratory pressure (PEEPi). Other factors include an increased mechanical restriction of the thorax, inspiratory muscle weakness, increased ventilatory demand relative to capacity, gas exchange abnormalities, or any combination of the above.³

Since ventilatory limitation is the key factor that leads to inactivity in COPD, measures aimed at reducing the ventilatory limitation allow the patient to participate in activities of daily living (ADL). Noninvasive positive pressure ventilation (NPPV) as a ventilatory supplement is one such measure that has been shown to reduce breathlessness during acute ventilatory failure resulting from COPD, as the therapy reduces the increased load on the respiratory muscles, particularly during exercise.⁴

Discussion

As far back as 1993, Keilty et al. recognized that the application of inspiratory pressure support during exercise significantly reduced the sensation of breathlessness in patients with severe stable COPD, with several doubling the distance they walked.²

Collective results of randomized control trials show that noninvasive ventilatory support reduces breathlessness and improves exercise performance in patients with moderate to severe COPD. Summaries of several of these studies are as follows:

Randomized controlled trial of domiciliary noninvasive positive pressure ventilation and physical training in severe chronic obstructive pulmonary disease.

Summary: This study evaluated the effects of NPPV on an exercise training program in 45 COPD patients. Over eight weeks, exercise capacity and health status were assessed at baseline and after the eight-week training program. The study demonstrated significant improvement in the shuttle walk test as well as ratings on the Chronic Respiratory Disease Questionnaire (CRDQ). This study suggests that NPPV can be used successfully in exercise training with COPD patients.⁶

Effects of training with heliox and noninvasive positive pressure ventilation on exercise ability in patients with severe COPD.

Summary: This study evaluated the application of nasal noninvasive positive pressure ventilation (NPPV) and the effect on exercise capacity in patients with COPD. A total of 32 patients completed the study, which evaluated the use of NPPV in incremental treatment tests and training over a six-week course of pulmonary rehabilitation. The study demonstrated that the use of NPPV produces an immediate improvement in both exercise time and maximum workload attained which may result in a training advantage.⁴

The roles of bronchodilators, supplemental oxygen, and ventilatory assistance in the pulmonary rehabilitation of patients with chronic obstructive pulmonary disease.

Summary: In patients with COPD, pulmonary rehabilitation significantly improves dyspnea, exercise capacity, quality of life and health –resource utilization. This article summarizes the evidence to support that short-term administration of non-invasive ventilation (NIV) to COPD patients decreases hyperinflation, which may allow for higher exercise intensity. A systematic review found that NIV significantly improves dyspnea and exercise endurance. There have been several trials that have evaluated the effect of NIV during supervised exercise training and the majority of those studies show advantage of NIV in some exercise outcomes. A recent evidence-based guidelines statement on pulmonary rehabilitation concluded that NIV may enhance outcomes in the immediate post-rehabilitation period in patients with more advanced COPD.⁷

Training with inspiratory pressure support in patients with severe COPD.

Summary: Twenty-nine patients were enrolled in the study. In COPD patients suffering from a ventilatory limited exercise capacity, exercise training with inspiratory support of 10cm H₂O resulted in statistically significant improvements in exercise performance and dyspnea relief than training with inspiratory pressure support of 5 cm H₂O. Inspiratory pressure support of 10 cm H₂O may be considered as adjunct during high-intensity exercise training.⁸

Summary

The acute effects of noninvasive ventilatory support during exercise on exercise endurance and dyspnea in patients with chronic obstructive pulmonary disease: a systematic review.

Summary: The objective of this study was to review studies systematically, in which the acute effects of noninvasive ventilatory support (NIVS) during exercise were evaluated in patients with COPD. Fifteen studies were identified. The systematic review suggests that NIVS during exercise may acutely reduce exertional dyspnea and improve exercise endurance, in patients with COPD.⁹

New strategies to improve exercise tolerance in chronic obstructive pulmonary disease.

Summary: Continuous positive airway pressure and different modalities of noninvasive positive pressure ventilation (NPPV) may reduce breathlessness and increase exercise tolerance in these patients.³

Noninvasive ventilation during walking in patients with severe COPD: a randomized cross-over trial.

Summary: NPPV in a pulmonary rehabilitation setting has been shown to reduce dyspnea on exertion and improve exercise tolerance. This study tested the feasibility of NPPV application during walking in patients with COPD. Twenty patients demonstrated that noninvasive ventilation used during walking can improve oxygenation, decrease dyspnea and increase walking distance.⁵

The Philips Respironics handheld recovery device, VitaBreath, is a portable device providing supplemental non-invasive ventilatory support for the short-term relief of shortness of breath in chronic obstructive pulmonary disease during physical exertion.

The bi-level therapy delivered from VitaBreath decreases post-exercise recovery from dyspnea.

For more information, visit:
www.philips.co.uk/vitabreath

Not available for sale in the USA

References:

1. World Health Organization, Burden of COPD; <http://www.who.int/respiratory/copd/burden/en>
2. Keilty et al. Effect of inspiratory pressure support on exercise tolerance and breathlessness in patients with severe stable chronic obstructive pulmonary disease, Thorax 1994;49:990-994
3. Ambrosino and Strambi, New Strategies to Improve Exercise Tolerance in Chronic Obstructive Pulmonary Disease, European Respiratory Journal 2004; 24:313-322
4. Johnson et al. Effects of Training with Heliox and Noninvasive Positive Pressure Ventilation on Exercise Ability in Patients with Severe COPD, Chest 2002; 122:464-472
5. Dreher et al. Noninvasive Ventilation During Walking in Patients with Severe COPD: a randomized cross-over trial, European Respiratory Journal 2007; 29: 930 – 936
6. Garrod et al. Randomized Controlled Trial of Domiciliary Noninvasive Positive Pressure Ventilation and Physical Training in Severe Chronic Obstructive Pulmonary Disease, Am J Respir Crit Care Med 2000; 162: 1335-1341
7. ZuWallack, R. The Roles of Bronchodilators, Supplemental Oxygen and Ventilatory Assistance in the Pulmonary Rehabilitation of Patients with Chronic Obstructive Pulmonary Disease, Resp Care 2008; 53(9): 1190-1195
8. Van't Hul A. et al. Training with inspiratory pressure support in patients with severe COPD, Eur Respir J 2006; 27:65-72
9. Van't Hul A et al. The acute effects of noninvasive ventilatory support during exercise on exercise endurance and dyspnea in patients with chronic obstructive pulmonary disease: a systematic review, J Cardiopulm Rehabil 2002; 22(4): 290-7

