Non-PAP Treatment Modalities in Obesity-Hypoventilation Syndrome

Role of Exercise, Nonsurgical and Surgical Weight Reduction, Tracheostomy, Respiratory Stimulants, and Oxygen

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KEYWORDS

• Obesity-hypoventilation syndrome • Exercise • Bariatric surgery • Weight reduction • Tracheostomy • Respiratory stimulants • Oxygen

KEY POINTS

- Although NIV is an efficient symptomatic treatment of OHS, a multidisciplinary management of OHS is important to maximize the impact of treatment as much as possible on the cause of OHS (ie, obesity).
- Rehabilitation programs offer the possibility of adapted exercise programs, increasing exercise capacity and decreasing dyspnea.
- Medical and supportive management of weight loss often has limited results, but bariatric surgery can induce significant weight loss in selected individuals, contributing to an improvement in AHI and hypoventilation.
- A few drugs have been shown to have a modest effect on respiratory drive in OHS, but their impact is marginal and no medication is presently recommended for the treatment of OHS.
- Long-term oxygen therapy must not be considered as an alternative to positive pressure therapy (CPAP or NIV), and may have deleterious effects.
- Oxygen supplementation may be indicated after optimal titration of NIV.

INTRODUCTION

Obesity hypoventilation syndrome (OHS) is preferably treated by noninvasive positive pressure ventilation (NIV). NIV improves obstructive sleep apnea hypopnea syndrome (OSAHS), which is frequently associated with OHS, and associated symptoms, and improves symptoms of hypercapnia, quality of sleep, daytime arterial blood gases (ABG), and probably survival. NIV does not, however, treat the underlying cause of OHS (ie, obesity). Furthermore, NIV may be poorly tolerated in a subset of patients, may fail because of poor adherence, and more importantly may not reduce

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significantly the comorbidities associated with obesity.[1] Therefore exploring alternative (or complementary) options to NIV is important. Among these options, the contribution of exercise, surgical or nonsurgical weight reduction, tracheostomy, respiratory stimulants, and oxygen are discussed in this article (**Box 1**).

ROLE OF EXERCISE AND REHABILITATION PROGRAMS IN THE MANAGEMENT OF OHS

Although patients with OHS have a relatively preserved functional capacity (ie, performance during a 6-minute walk test) compared with patients with other causes of chronic respiratory failure treated with long-term NIV, their exercise tolerance is lower than that of obese eucapnic patients with OSAHS.[2,3] Little is known about daytime activity of patients with OHS. Murphy and colleagues[4] assessed daytime activity during the week following initiation of NIV in patients with OHS. Daytime activity improved significantly after 3 months of nocturnal NIV, but in a significant percentage of patients, NIV was initiated in acute conditions and the improvement in activity can also be interpreted as a return to baseline level of performance. The authors of the Murphy study hypothesized that there was a relationship between enhanced nocturnal ventilation and improvement in daytime symptoms, which in turn had a direct relationship with the observed increase in daytime physical activity. Conversely, in the only randomized controlled trial available, West and colleagues,[5] found no increase in activity after 3 months of treatment with nocturnal continuous positive airway pressure (CPAP) in patients with OSAHS, despite improvements in daytime sleepiness. The hypothesis of a relationship between improved daytime symptoms and an increase in daytime physical activity is, however, supported by two earlier studies: in patients with hypercapnic chronic obstructive pulmonary disease (COPD), nocturnal NIV combined with pulmonary rehabilitation enhanced the benefits of pulmonary rehabilitation, reduced fatigue, and increased daily activity compared with rehabilitation alone.[6,7] Improvement in the perception of dyspnea and fatigue may be a key factor for improving daily activity: fatigue and dyspnea could be, for instance, a determinant of the reduction in time spent outdoors.[8]

Patients with OHS often have a very limited social activity; they also lack motivation regarding rehabilitation programs.[9,10] As mentioned, fatigue could contribute to this lack of motivation. Thus, although rehabilitation programs are likely to benefit patients with OHS, optimal modalities and timing for starting such programs must be determined to reinforce motivation, adherence, and long-term benefits. The onset of nocturnal NIV could be the appropriate time to start a rehabilitation program because nocturnal NIV itself may increase exercise tolerance.[11] Regarding modalities of exercise training, few data are available.[12,13] Exercise training in patients with OHS often requires expensive devices adapted to the increased weight load. Beyond these practical aspects, specific strategies may improve exercise training in OHS. For example, despite correction of diurnal $Paco_2$ after 3 months of nocturnal NIV, patients with OHS may continue to hypoventilate during exercise.[12] In this situation, NIV during exercise training may increase performance and efficacy of training.[14] Also, combining respiratory muscle training with a low-calorie diet and a physical activity program has been shown to induce a greater improvement in dyspnea and exercise capacity than physical activity and diet alone.[15] Finally, home-based neuromuscular electrical stimulation previously used in severely disabled patients with COPD might be of interest to allow morbidly obese patients to return to at least a minimal level of physical activity.

In summary, (1) rehabilitation programs are likely to benefit patients with OHS but this must be confirmed by well-designed randomized controlled trials; (2) the onset of nocturnal NIV could be the appropriate time to start a rehabilitation program; and (3) programs have to be

Box 1
Treatments for obesity-hypoventilation other than noninvasive positive pressure ventilation

- Rehabilitation programs are recommended for increasing exercise tolerance and daily activity
- The onset of nocturnal NIV could be the appropriate time to start a rehabilitation program
- Contrasting with medical and supportive management of weight loss, bariatric surgery induces more effective weight loss, improves sleep apnea indices and hypoventilation in subjects with OHS and OSAHS
- Respiratory stimulant drugs have a marginal impact in OHS and cannot be recommended
- Long-term oxygen therapy must not be considered as an alternative to positive pressure therapy but may be indicated after optimal titration of NIV for "resistant hypoxemia," although its long-term benefit has yet to be established through randomized trials.