Use of Expiratory Positive Airway Pressure Delivered by a Spring Load Resistor During Exercise: A New Tool to Optimize Exercise Training in Patients With COPD?

In this issue of the RESPIRATORY CARE, Monteiro and colleagues[1] contribute to the scientific literature of COPD by applying in these patients a modality of noninvasive ventilation that has not yet been studied in depth during exercise: expiratory positive airway pressure (EPAP). The authors evaluated the effects of EPAP delivered by a spring load resistor face mask on dynamic hyperinflation during exercise. The study was conducted with COPD patients who developed dynamic hyperinflation during a previous submaximal time-limited exercise test. Those patients repeated the exercise test 48 hours later, using the face mask coupled with a spring load resistor which delivered an EPAP of around 5–10 cm H_2O. When comparing the lung volumes measured before and immediately after exercise in both conditions (without and with EPAP), the authors found that inspiratory capacity and functional residual capacity changed significantly less when EPAP was applied (inspiratory capacity -0.57 ± 0.45 L vs -0.18 ± 0.35 L, $P = .021$, functional residual capacity 0.69 ± 1.10 L vs 0.22 ± 0.68 L, $P = .02$). The authors hypothesize that this attenuation in dynamic hyperinflation with the use of EPAP during exercise is probably linked to reduced expiratory dynamic airway compression and collapse, in addition to a reduction in the inspiratory threshold load on hyperinflated lungs of patients with COPD, enhancing neuromuscular coupling.

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Possibly the most relevant novel finding derived from this study is that EPAP applied through a simple and affordable device was able to reduce dynamic hyperinflation after exercise in patients with COPD. This was observed specifically in those patients who were characterized by developing hyperinflation during exercise. Unfortunately, the authors did not assess dyspnea and/or fatigue perception of the studied patients during exercise when it was performed with and without EPAP. The comparison of those variables would be useful to evaluate the clinical benefits of EPAP from the patient's perspective. It is reasonable to hypothesize that the use of EPAP may reduce symptoms during exercise, since decrease of the dynamic hyperinflation occurred. Although EPAP does not assist the ventilatory muscles, as observed in other modalities such as continuous positive airway pressure or bi-level positive airway pressure, it generates a reduction of the inspiratory load imposed by intrinsic PEEP. In addition, another methodological aspect of the study is that, in case patients were submitted to a non-time-limited exercise test, it would be possible to evaluate the effect of EPAP on increasing exercise capacity.

Despite its noncontrolled design, the study by Monteiro and colleagues[1] was undoubtedly able to demonstrate that the spring load resistor face mask is suitable and safe to deliver EPAP to patients with COPD during exercise. Another recent study has shown that a similar EPAP device increased inspiratory capacity and marginally prolonged exercise duration.[2] Furthermore, evidence has emerged that noninvasive ventilation is a new tool in pulmonary rehabilitation, since it reduces symptoms during exercise in those patients with more severe disease and, consequently, improves exercise tolerance.[3] Considering the high cost of using other noninvasive ventilation modalities in addition to pulmonary rehabilitation, it is relevant to investigate the applicability of cost-effective devices such as EPAP delivered by a spring load resistor, in order to increase the availability of this strategy in the highest possible number of clinical settings when treating patients with COPD.

Taking into consideration the finding that high-intensity exercise training is indicated to reach greater physiologic benefits in pulmonary rehabilitation,[4] and that patients with more severe disease often do not tolerate it, all efforts to add information about new strategies to treat patients with chronic respiratory disease are worthwhile. Although further clinical benefits of EPAP delivered by a spring load resistor during exercise in COPD remain to be determined, the study of Monteiro and colleagues represents an important first step and should certainly instigate future research in this field.

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The authors have disclosed no conflicts of interest.

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DOI: 10.4187/respcare.02067