Do CHF Patients Align with COPD Patients during Exercise?

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‘Flow limitation’ is an expression classically used to indicate that there is a reduction in the maximal expiratory flows that may be attained during the forced vital capacity (FVC) maneuver. It is measured from the ratio FEV_1/VC , which dates back to Tiffeneau, where FEV_1 is the forced expiratory volume in the first second and VC is the slow expiratory vital capacity. As such it is proposed in the ERS consensus statement [1] as a relatively sensitive index of chronic obstructive respiratory disease (COPD).

As a matter of fact, measurement of expiratory flow limitation should be based on the isovolume relationships between flow and transpulmonary pressure, but this procedure is time-consuming and invasive [2]. To overcome these drawbacks, Hyatt [3] proposed that expiratory flow limitation should be evaluated by comparing tidal volume with FVC curves. Since this approach may lead to erroneous conclusions [4], a new definition of airflow limitation has been recently proposed to better assess changes in the mechanical properties of airways and lung parenchyma [4, 5]. This new definition is based on a simple and noninvasive approach, namely, the negative expiratory pressure (NEP) technique, which does not require performance of FVC maneuvers on the part of the subject. It entails applying a negative pressure at the mouth during tidal expiration and comparing the ensuing flow-volume curve

with that of the previous control expiration. It can be applied in different body positions, both at rest and during muscular exercise [6]. It has been observed that the NEP technique provides a rapid and reliable method to detect expiratory flow limitation at rest and during exercise in COPD patients [6].

Schroeder et al. [7, this issue of *Respiration*] have chosen to assess flow limitation and breathing reserve at rest and during exercise in patients with congestive heart failure (CHF) by comparing FVC loops (MFVL) with subsequently obtained tidal flow-volume loops (FVL). Similarly to Koulouris et al. [6] in COPD patients, they report a significant increase of flow limitation during exercise in CHF patients, whereas the increase in expiratory flow volume reserve (EFVR) and in end inspiratory lung volume (EILV) is not significant. They conclude that, unlike normal subjects, CHF patients cannot utilize their full respiratory capacity during exercise secondary to expiratory flow limitation and an inability to increase EILV and EFVR. It remains to be ascertained whether these interesting conclusions on expiratory flow limitation and breathing strategy are affected by the mentioned shortcomings inherent in comparisons between tidal volume and FVC curves obtained from measurements of expired gas volume. In particular, the reported results on expiratory airflow limitation (i.e., inability to further increase flow

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at a given lung volume) might be affected by thoracic gas volume compression artifacts [8, by incorrect alignment of tidal and maximal expiratory flow-volume curves [9], the effect of previous volume and time history [10], and the effect of muscular exercise on lung mechanics [11].

One way to test the effect of these potential errors on the results of Schroeder et al. [7] may be to repeat their protocol in patients with CHF making use of the NEP

technique instead of comparing tidal and maximal flow-volume loops. If the study, duplicated in this way, yielded results on airflow limitation at rest and during exercise in patients with CHF that align with those observed, under the same conditions, in patients with COPD, even the conclusions on the breathing strategy of the CHF patients during exercise might be indirectly reinforced.

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