Lung Volumes in COPD

Not Only the Total Lung Capacity

To the Editor:

We read with extreme interest the recently published work by O'Donnell and colleagues (May 2010). Comparing lung volumes obtained using different techniques in a sample of patients with severe airflow limitation, the authors conclude that plethysmography systematically overestimates lung volumes with regard to gas dilution and thoracic imaging techniques. We believe it is meritorious to assess how the available diagnostic methods differ in determining lung volumes in the context of severe bronchial obstruction. However, we think the authors might have derived more from their data and results.

We are afraid the implementation of the present study results in the clinical setting might be limited. In fact, the main reason for measuring lung volumes in subjects with COPD is to determine the presence and degree of lung hyperinflation. To the radiologist, hyperinflation of the lungs implies an increase in total lung capacity (TLC) because this is the lung volume at which chest radiographs are normally obtained. In a clinical context, however, hyperinflation implies an abnormal increase in the volume of gas in the lungs at the end of tidal (functional residual capacity [FRC]) or maximal (residual volume [RV]) expiration. Moreover, hyperinflation is sometime inferred from an increase in the RV/TLC (Motley index) and the FRC/TLC ratios, commonly used as a surrogate of air trapping. Unfortunately, the authors do not mention any of these other parameters in their study. This is, in our opinion, a major concern because TLC in COPD patients varies as a function of the prevalent phenotype (increased in emphysema, often normal in chronic bronchitis); therefore, it cannot be used routinely to address pulmonary hyperinflation in COPD. Conversely, RV and FRC are strongly related to the severity of airflow obstruction.

On the one hand, Dykstra and colleagues did not find a significant association between TLC and the degree of airway obstruction. On the other hand, such a relationship is well established between RV/TLC or FRC/TLC, proper indexes of hyperinflation, and the severity of bronchial obstruction. Moreover, to further complicate the clinical interpretation of lung volume changes in COPD, it can be observed that RV increase usually antedates that of FRC and then TLC.

In conclusion, the article by O'Donnell and colleagues has merit but we consider it of this article is prohibited without written permission from the American College of Chest Physicians (www.chestpubs.org/site/misc/reprints.xhtml).

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Response

To the Editor:

We wish to thank Scarlata et al for their thoughtful correspondence regarding our article in CHEST. We agree that the functional consequences of lung hyperinflation in the setting of airflow obstruction are more directly related to elevated operating volume (the range of volume excursion over which ventilatory work is performed and gas exchange takes place) than to the total lung capacity (TLC). Because the differences between TLC and functional residual capacity (FRC) or residual volume (RV) are assessed spirometrically by volume displacement at the airway opening (as inspiratory capacity [IC] or vital capacity [VC], respectively), measurements of FRC and RV are subject to the same sources of error as TLC, and any absolute error in the estimation of TLC would be added to the FRC and RV with the

Correspondence to: Simone Scarlata, MD, Unit of Respiratory Pathophysiology, Health Centre for Elderly People (CeSA), Università Campus Biomedico, Via Alvaro del Portillo, 5, 00128 Rome, Italy; e-mail: s.scarlata@unicampus.it

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