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EDITORIAL

Pulmonary Function Studies, Still A Priority in COPD

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Chronic obstructive pulmonary disease (COPD) is a generic term encompassing different conditions characterized by non-completely reversible airflow obstruction. The morphological basis for airflow obstruction has been long recognized to be the result of intrinsic airway narrowing, or loss of lung elastic recoil, or both. In 1959, a consensus was reached at the Ciba Foundation Guest Symposium (1) to include emphysema and related conditions under the term of chronic non-specific lung disease (CNSLD), which was widely used for about a decade until it was realized that any lung disease other than tuberculosis could have been classified as CLSLD. For this reason, the term chronic obstructive lung disease was first coined and subsequently replaced by COPD, to emphasize the functional mechanism leading to respiratory symptoms and disability. Therefore, it became apparent that the airflow obstruction is central to the definition of COPD (2), thus making its demonstration necessary for diagnosis.

Ever since the seminal work of Tiffeneau dated 1957 (3), an obstructive abnormality was defined by a reduction of 1-s forced expiratory volume (FEV_1) to vital capacity or forced vital capacity (FVC). However, basic knowledge of lung mechanics suggested that simple spirometry does not allow to distinguish between mechanisms of airflow limitation, i.e., intrinsic airway narrowing vs. loss of lung elastic recoil (4). Moreover, early studies clearly showed that tests of overall lung function such as spirometry remain unaltered before considerable abnormalities of small airways have developed (5, 6). Over the last decades of the 20th century, pulmonary physiologists developed methods to recognize abnormalities of lung function in smokers with still normal spirometry and to assess for the presence of emphysema (7). At the beginning of the current century, a Global initiative for chronic Obstructive Lung Disease (GOLD) was started, which for the sake of simplicity recommended COPD be diagnosed by spirometry only (8). With this reductionist approach, COPD was regarded as a unique entity to be treated by severity, irrespective of the mechanisms underlying airflow obstruction. In the following years, changes in the definition of COPD were made in which airflow obstruction was no longer considered the hallmark but just a component of an inflammatory disorder (9) and some authors, without considering the clear association between smoking and pathological lung abnormalities and the airflow obstruction already seen in young smokers, believe that COPD is possibly a component of a multi-system disease (10). In this context, the role of lung function studies was further minimized (11) and the only area of debate was the choice of FEV_1/FVC cutoffs for diagnosis of COPD, though it has been recognized that the widely used GOLD fixed ratio is not specific for COPD (12, 13).

More recently, with the introduction of new therapeutic options, attention has been paid again to the heterogeneity of COPD. Although several clinical phenotypes were proposed (14), the major reason for heterogeneity appears to be the relative prevalence of airway or parenchymal disease. The growing

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availability of high resolution computed tomography (HRCT) prompted studies looking at the relationships between morphological abnormalities of airways and lung parenchyma and lung function, but in most of them lung function was assessed by simple spirometry only. This approach has serious limitations due to the effects of volume history (15) and thoracic gas compression (16) and the insensitivity of forced expiratory flows to heterogeneity (4). Therefore, for a better understanding of the impact of structural changes on lung function and patient-centered outcomes, new studies are needed using measurements other than simple spirometry. Among these are absolute lung volumes, which may be altered before the FEV_1/FVC is reduced (17), respiratory impedance by forced oscillation technique, which allows non-invasive assessment of airway distensibility (18) and ventilation heterogeneity (19), analysis of multi-breath nitrogen washout, which allows to separate heterogeneity at different levels of bronchial tree (20), and diffusing capacity for both NO and CO (21).

Hopefully, in the near future pulmonary function testing for COPD shall remain a priority, not limited to confirm a clinical diagnosis but aimed at defining the mechanisms of airflow obstruction in a quantitative manner, thus being integrated in the identification of patient's phenotype and ultimately contributing to the decision making process. New technologies that are relatively simple, non-invasive and radiation-risk free have been developed and some old ones have been refined to become ready to be considered for both clinical practice and therapeutic trials.

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