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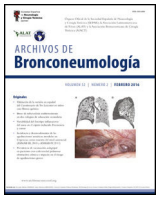

Editorial

Lung Function Testing in Idiopathic Pulmonary Fibrosis: More Than Just Spirometry?☆

Pruebas de función pulmonar en la fibrosis pulmonar idiopática: ¿más allá de la espirometría?

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Since 1846, when John Hutchinson performed the first spirometry in London, the measurement of the air that can be mobilized during a maximum respiration has become the gold standard for the study of lung function.[1] Dr. Hutchinson gave the name "vital capacity" to the volume of air that is mobilized in one deep expiration made after a maximum inspiration, and observed that individuals with lower values died prematurely. In 1947 Tiffeneau and Pinelli introduced the concept of velocity of the expired air,[2] and since then both values, vital capacity (VC) and maximum expired volume in 1 s (MEVS or FEV_1) have been integral parameters in the determination of respiratory function.

Lung function tests in patients with a diagnosis of idiopathic pulmonary fibrosis (IPF) show the disease as a restrictive-type change impacting moderately on CO transfer (DLCO) with moderate hypoxemia and hypocapnia at rest, which, in the more advanced stages, develops into frank respiratory failure.[3,4] International recommendations on the diagnosis and follow-up of IPF underline the importance of lung function testing in the control of this disease.[5] The most recent clinical trials for the introduction of new drugs for treating this entity have adopted forced vital capacity (FVC) and DLCO as primary variables for confirming clinical efficacy.[6,7]

Nevertheless, the follow-up and control of IPF is an area where various authors are introducing new concepts and variables that better relate patient symptoms to prognosis, an essential step in a disease that carries such a heavy mortality burden. This has gradually led to the introduction of more complex determinations, including "total lung capacity", "functional residual capacity", "maximal exercise tolerance", "pulmonary artery pressure", etc., or the quantification of radiological images from new multidetector high-resolution computed tomography (HRCT) equipment. It is not surprising, then, that efforts are being made to introduce multidimensional indices that provide clinical, radiological and functional data, to give a more integrated picture of this highly complex disease that has such a grim prognosis.[8]

The notion of using spirometry, and more specifically FVC, as the most important variable in the follow-up of IPF is based more on its simplicity and low variability than on its physiological significance. While not wanting to undermine the prognostic value of a determination that is even called "vital", as IPF is a disease which substantially modifies pulmonary distensibility, reducing the area for gas exchange, the variables that best quantify these changes would be compliance, or at least, determination of total lung capacity and DLCO. In any case, to evaluate prognosis, it makes more sense to quantify the functional reserve of the lungs (6-min walk test or maximum exercise tolerance) than any static determination. Indeed, some authors indicate that DLCO, 6-min walk test results, or nighttime desaturations can be independent predictors of survival. All of these considerations suggest the utility of a multidimensional approach to the problem, in the form of clinical, radiological and functional scales that would provide an overall evaluation of the patient. We should remember that FVC and FEV_1 have a very low coefficient of variation (no greater than 2%–3%), and therefore often stand out in multivariate regressions, with a very high predictive capacity for mortality.[9] If we also take into account the simplicity of performing FVC and its universal availability and acceptance, it is not surprising that this parameter has become the main variable in the majority of clinical trials conducted for the introduction of new drugs.

But it is maybe time to cast a more critical eye on these ideas. The simplest approach is not always the most useful, and with regard to IPF, what seemed obvious years ago, when this disease was not in the spotlight, should not be accepted as such now that we are experiencing a surge in the development of new treatments. If our aim is to better understand the functional implications of certain complex histopathological changes in the alveolocapillary territory and the interstitial space, we must use more comprehensive tests, and these must be taken into account when designing future studies. While we are reluctant to lose the simplicity of spirometry, we suggest studying the following parameters to determine

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the diagnosis and follow-up of IPF: static lung volumes (functional residual capacity and total lung capacity), CO transfer (DLCO and KCO), evaluation of functional residual capacity (6-min walking test and maximal symptom-limited exercise test), and blood gases with determination of intrapulmonary shunt (PO_2 alveolar-arterial gradient on 100% oxygen). Naturally, clinical data and information from specific health-related quality of life questionnaires and the quantification of HRCT images must also be taken into account.

In a not too distant future, the functional quantification of radiological images obtained from HRCT signals will offer another new perspective. What could be called "pulmonary functional imaging" is already a reality. In a recent editorial, Hall and Irvin[10] drew our attention to the need to place greater emphasis on lung function studies in the professional training of respiratory medicine specialists. Not only do we support this proposal, we also believe that we now have a new opportunity to better understand and quantify lung function, thanks to signals captured by the highly powerful software integrated in the computers already installed in the radiology departments of our hospitals.

The basis of respiratory mechanics and gas interchange are affected in IPF, and hopefully the new treatments that modify the biological mechanisms of the disease will lead to clinical improvements, which are always difficult to put in objective terms, as well as to functional improvements. Current understanding goes beyond spirometry, and new procedures and determinations will give greater insight into the evolution of an entity that represents a true intellectual and scientific challenge for respiratory medicine physicians.

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