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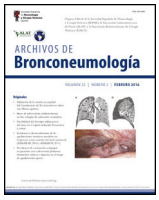

Editorial

Single-Breath Diffusion Testing: Longevity is the Reward for Virtue☆

Prueba de difusión por respiración única. La longevidad es la recompensa de la virtud

Luis Puente-Maestú,* Javier de Miguel Díez, Daniel López Padilla

Servicio de Neumología, Hospital General Gregorio Marañón, Facultad de Medicina, Universidad Complutense-IISGM, Madrid, Spain

The measurement of CO transfer (DLco/TLco) was first described in 1915 and developed for clinical use some decades later.[1] DLco is not equivalent to DLo_2, since the latter is dominated primarily by the reaction with hemoglobin[2] (this reaction accounts for 50% of DLco, the rest being membrane-dependent), and is differently affected by *V*/*Q* mismatch, due to different solubilities in blood.[3] CO conductivity (1/DLco) is the sum of two components: membrane conductibilities (1/DMco) and the reaction with hemoglobin ($1/\theta$Vc), in which θ is the affinity of hemoglobin and Vc is the capillary volume. The conventional determination of DMco and Vc requires several measurements of DLco while breathing different fractions of oxygen, a technical complexity that has relegated this technique to the field of research.[4]

DLco has many clinical indications: identification of the cause of disproportionate dyspnea or hypoxemia higher than what would be expected from spirometry, monitoring of the progress of interstitial lung diseases, screening for the development of interstitial or pulmonary vascular involvement in patients exposed to chemotherapy, inhaled agents, transplants, or collagen diseases, and preoperative evaluations in lung resection. In smokers and patients with obstructive disease, DLco correlates extremely well with the degree of emphysema[5] and one of its consequences, namely, the risk of developing lung cancer.[6] However, interest in the clinical use of the CO diffusion coefficient (Kco) as an indicator of microvascular involvement, as opposed to a reduction in alveolar volume (V_A) as causes of a low DLco,[7] has declined due to difficulties in interpretation, and the development of lung and heart imaging as primary diagnostic criteria of parenchymal and vascular involvement.

Some significant innovations have emerged in recent years, including rapid analyzers that can measure gas concentrations in real time. These devices measure V_A in a different, more precise manner than the previous generation,[8] which could produce DLco discrepancies in patients with *V*/*Q* mismatch of up to 15%. They can also determine if the washout of tracer gas from the previous maneuver has been sufficient, and if not, they can compensate for the presence of residual concentrations of that gas in the diffusion calculations and select the time and volume of collection of the alveolar gas sample, a useful technique in patients with low volumes.[8] Some of these devices use ultrasound measurement, an entirely new technology that makes them more compact.

Another novelty is the publication of the "Global Lung Initiative" reference values, based on 19 studies including 9710 subjects, valid for populations of European origin aged 4–91 years. Their predicted values are somewhat lower than the traditionally used equations, and their variance is homoscedastic. Therefore, like spirometric variables, fixed percentages are arbitrary cutoff points, and confidence intervals or the *z*-score value should be calculated. They propose that a physiologically significant difference be defined as changes of 0.5 *z*-scores or 10%, a variation that is slightly lower in many subjects than the 1.3 mmol s^{-1} kPa^{-1} that has been used until now.[9]

Finally, advances have been made in the measurement of lung diffusion of nitric oxide (DL_{NO}).[10] The advantage of this approach is its reproducibility, irrespective of the hemoglobin concentration. When combined with DLco, it can be used to easily measure DMco and Vc, which may have implications in the management of lung and heart diseases. However, chemiluminescence analyzers are accurate and rapid, but expensive, whereas electrochemical devices are not fast enough to be included real-time expiratory gas analyzers. Another problem is that the sensitivity of the current analyzers requires an apnea of less than 6 s, which if measured simultaneously would affect DLco results.

Diffusion testing is a highly useful technique that has improved greatly in reliability in recent years, thanks to better standardization and more precise machines. Its usefulness depends on the quality of the measurement. We reiterate that it is important that we pulmonologists regard our physiology laboratories as providers of essential pivotal services, in which the implementation of rigorous quality standards is a top priority.

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* Corresponding author.
E-mail addresses: lpuente@separ.es, luis.puente@salud.madrid.org (L. Puente-Maestú).

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