



## EDITORIAL

## A pulmonary index able to predict peripheral muscle function in COPD



Chronic obstructive pulmonary disease (COPD) has as its main characteristic the persistent obstruction of airflow, which is usually progressive.<sup>1</sup> The severity of the disease can be influenced by extrapulmonary manifestations, also described as common features of the disease.<sup>1</sup> Peripheral muscle dysfunction can be cited as one of the main extrapulmonary manifestations of COPD, and the decline in muscle strength of the lower limbs, especially in the quadriceps femoris muscle, is known to be two to four times faster in these patients in comparison to healthy individuals.<sup>2</sup> This reduction in peripheral muscle strength contributes to exercise intolerance and is associated with poor quality of life and increased risk of mortality in this population.<sup>3,4</sup> Considering the close association of peripheral muscle strength with these important clinical and functional outcomes in COPD, as well as the eventual difficulty of accurately assessing muscle strength, there is growing interest in identifying effective pulmonary indices to predict peripheral muscle (dys)function in these patients.

Although the expiratory forced volume in one second ( $FEV_1$ ) is the main severity parameter of COPD, studies have shown only weak relation between  $FEV_1$  and mortality.<sup>5,6</sup> Furthermore, a study by Marín and colleagues investigated the relationship between lung function and peripheral muscle strength assessed by the one repetition maximum test (1RM) in patients with COPD. The study concluded that there are only weak correlations between  $FEV_1$  and muscle strength of upper and lower limbs.<sup>7</sup>

Indices which concern the evaluation of lung volumes and capacities, such as the inspiratory capacity-to-total lung capacity (IC/TLC) ratio, have been recently identified as predictors of mortality in patients with COPD.<sup>8</sup> Additionally, the IC/TLC ratio is also associated with exercise capacity in this population.<sup>9,10</sup> However, to date only one study investigated the relationship between the IC/TLC ratio (i.e., >25%) with muscle strength, and that was with maximal handgrip strength.<sup>11</sup>

Cebollero and colleagues contributed to the literature of this field with an article published in the present issue of *Portuguese Journal of Pulmonology* (Revista Portuguesa

de Pneumologia).<sup>12</sup> The study investigated the IC/TLC ratio as a predictor of peripheral muscle strength. The authors evaluated individuals with moderate to severe COPD divided into two groups:  $IC/TLC \leq 25\%$  and  $IC/TLC > 25\%$ . Patients were assessed regarding their muscle mass of the thigh ( $MM_T$ ), muscle strength of upper and lower limbs, and muscle power of lower limbs. The main results of this study showed that  $MM_T$ , muscle strength of upper and lower limbs and muscle power are significantly lower in subjects with COPD who present  $IC/TLC \leq 25\%$ . Furthermore, a positive and moderate association was found between the IC/TLC ratio with  $MM_T$  and peripheral muscle strength.

According to the authors, the mechanisms that explain the reduction in muscle mass and muscle strength in individuals with  $IC/TLC \leq 25\%$  are still not clear. However, it is suggested that the reduction of lower limb muscle mass and reduction in peripheral muscle strength and muscle power may occur due to inflammatory responses and physical inactivity associated with systemic inflammation. This hypothesis is supported by the association observed between the IC/TLC ratio with inflammatory markers and the level of physical activity in this sample.

Although the study of Cebollero and colleagues is certainly able to demonstrate that IC/TLC ratio is correlated with peripheral muscle strength in patients with COPD, there are a few points to be discussed. Unfortunately, this study evaluated only male subjects with moderate to severe COPD, which could limit the external validity of the findings. A sample including women and patients in GOLD stage I would allow wider generalization of the results. Finally, the authors cite as a methodological limitation the lack of measurement of dynamic hyperinflation. Garcia-Rio and colleagues<sup>13</sup> showed that the increase in end-expiratory volume during exercise is associated with dyspnea sensation assessed by the *Medical Research Council* scale, and breathlessness may worsen physical inactivity, contributing to muscle atrophy, leading to a vicious circle, and generating even more physical inactivity, atrophy and muscle dysfunction.

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Possibly, the main message of this study is that an IC/TLC  $\leq$  25% reflects peripheral muscle dysfunction in patients with COPD. Considering the scientific quality and the important findings of the study by Cebollero and colleagues, it certainly deserves the attention of professionals involved in managing patients with COPD.

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L. Martinez, F. Pitta\*

*Laboratory of Research in Respiratory Physiotherapy,  
State University of Londrina, Paraná, Brazil*

\*Corresponding author.

*E-mail address: [fabiopitta@uol.com.br](mailto:fabiopitta@uol.com.br) (F. Pitta).*