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RESEARCH LETTERS

Peak cough flow measurement with a pneumotacograph and a portable peak flow meter in patients with neuromuscular diseases

To the Editor:

Patients with neuromuscular diseases (NMD) have weak respiratory muscles that may affect their ability to cough and the effectiveness of mucus clearance.[1] Peak cough flow (PCF) values can be measured, through a peak flow meter (PCFm) or through a pneumotachograph (PCFp), and have been proposed to assess cough capacity,[1] estimate glottic function[2,3] and predict the risk for respiratory complications in patients with neuromuscular diseases.[4] Flows of 160 L/min have been reported to be the minimum needed to cough effectively and are associated with successful extubation or tracheostomy tube decannulation rates.[5] Low values of PCF are used as indication criteria for Mechanical Insufflation–Exsufflation (MI-E). It has been shown that MI-E can be useful when PCFs are below 270 L/min in patients with Duchenne muscular dystrophy with a high risk of pulmonary complications during respiratory tract infections.[6,7]

Despite the absence of precise threshold values, the measurements of PCF are very important in clinical practice. As NMD patients usually perform pulmonary function evaluation in a laboratory on a regular basis, it seems useful to take advantage of the very sensitive flow sensor of the spirometer (pneumotachograph). Therefore, the authors aimed to compare non-assisted PCF values obtained with both methods (PCFp and PCFm) in a group of patients with NMD followed and accessed in an outpatient clinic between 2009 and 2013.

Measurements through PCFp and PCFm were performed in the same order on the same day, after a resting period of three to five minutes without fatigue between them. All patients that presented swallowing and speech impairment and therefore severe bulbar muscle dysfunction were excluded. The cough evaluation was performed in 25 patients with several types of muscular dystrophies (MD), 21 patients with Amyotrophic lateral sclerosis (ALS), 6 patients with spinal muscular atrophy (SMA) type II, 3 patients with metabolic myopathies and one patient with multiple sclerosis.

Mean values of non-assisted PCFm and PCFp were 160.91 ± 94.84 L/min and 248.49 ± 113.63 L/min ($p < 0.0001$), respectively. Bland–Altman analysis was used to compare peak flow measurements obtained from the pneumotachograph and a peak flow meter. Fixed bias was analyzed by describing mean bias across the range and calculating 95% limits of agreement from the standard deviation (SD) of differences. Bland–Altman analysis of our neuromuscular patients' PCF measurements indicated that the PCFm measurements were markedly lower than the pneumotachograph system (mean 95% limits of agreement) bias 87.11 L/min (−82.29 to 256.50 L/min) (Fig. 1).

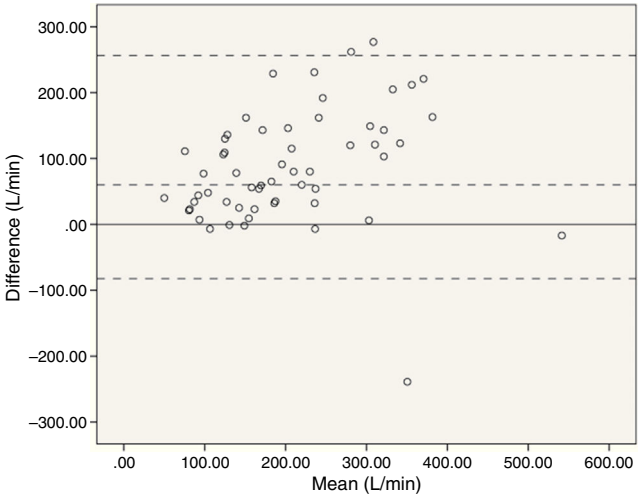

Figure 1 Coughs by patient: Bland–Altman plot of the agreement in measuring peak cough flow (L/min) between the pneumotochograph measurement system and the peak flow meter. The difference between two measurements (pneumotachograph-peak flow meter) is plotted against the mean of two measurements. Solid line indicates the line of equality (no difference between measurements). Three dashed lines indicate the difference between measurements (bias) and the upper and lower 95% limits of agreement (bias ± 1.96SD). The bias (95% limits of agreement) was 87.11 L/min (−82.29 to 256.50 L/min).

The results obtained in this study were different from the findings by Sancho et al.[2] which compared both measures in a population of healthy subjects and patients with neuromuscular disease. The mean of the differences between the values obtained using both instruments ± limits of agreement (+2 SD) was 0.20 ± 109.78 l/min (not significant). When the agreement was tested over three ranges of flows (<270 l/min, 270–480 l/min, and >480 l/min) no statistically significant differences were obtained for the population as

a whole in any range; although, in the lower flow range, 14 patients had PCFm significantly greater than PCFp.

Kulnik et al.,[8] performed a similar comparison of non-assisted PCF measurements in healthy subjects and Bland–Altman analyses of volunteers' PCF measurements indicated that all portable devices under test returned lower readings than the pneumotachograph system, regardless of whether measurements were taken when connected in series or in isolation. The differences in measured peak flow between the pneumotachograph and alternative devices were smaller when the instruments were connected in series; and larger when the instruments were used in isolation.

We conclude that it is relevant to obtain a correct and accurate measurement of PCFs, since these values of cough efficacy have important clinical implications on the risk of respiratory infections and on the criteria for manual and mechanical assisted coughing techniques.[9,10] Our results suggest that the PCF measured through a pneumotachograph is more sensitive and accurate in patients with predicted cough impairment. Although the values through PCFm can be useful, until further studies, it seems reasonable to use the measurement of PCF-p in the cough evaluation of NMD patients.

Conflicts of interest

The authors have no conflicts of interest to declare.

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Comparison of predictive equations of resting energy expenditure in older adults with chronic obstructive pulmonary disease

Dear Editor,

Chronic obstructive pulmonary disease (COPD) increases resting energy expenditure (REE)[1] due to chronic inflammation and greater effort for breathing.[2] REE is the major component of total energy expenditure and the correct measurement of REE is essential to offer a proper nutritional management and consequently prevent or treat malnutrition. Up till now, there has been no consensus about which REE equation is the best to use in clinical practice to match the energy intake of older adults with COPD. Therefore, we aimed to compare predictive equations of REE with indirect calorimetry (IC) in older adults with COPD.

We evaluated 20 older adults with COPD (16 men and 4 women) and all subjects were selected from a pulmonary rehabilitation program of a private health service. The details of sample selection and recruitment have been previously described.[1]

Demographic and anthropometric data were used to calculate the REE using gender-specific predictive equations[3]: Mifflin St. Jeor equation, Harris & Benedict, World Health Organization (WHO)1, WHO2, Owen et al., and de Oliveira et al.

Indirect calorimetry (Metalyzer 3B – R2 (Cortex), breath by breath) was used for determining REE after calibration of barometric pressure (960 mbar) and room air (O_2: 20.93/CO_2: 0.03 vol%) using a known gas mixture (White Martins, O_2: 15.94/CO_2: 5.01 vol%) and volume (3-L Hans