

Respiratory muscle training in patients with stroke

Ana Lista-Paz PhD¹; Rodrigo Torres-Castro MSc²; Guilherme Fregonezi PhD³;
Luz González Doniz PhD¹

¹ Faculty of Physiotherapy University of A Coruña A Coruña, Spain. ² Department of Physical Therapy Faculty of Medicine University of Chile Santiago, Chile. ³ PneumoCardioVascular Lab Hospital Universitário Onofre Lopes Empresa Brasileira de Serviços Hospitalares (EBSERH) & Departamento de Fisioterapia Universidade Federal do Rio Grande do Norte Natal, Brazil.

To the Editor:

We have read with great interest the article written by Yoo and Pyun¹ entitled “Efficacy of Bedside Respiratory Muscle Training in Patients With Stroke.”¹ The authors conducted a randomized clinical trial in 40 patients with stroke within less than 3 months of evolution (20 in the intervention group and 20 in the control group) with those who performed a protocol of 3 weeks of muscular respiratory training based on exercises of respiratory control, flow-oriented incentive spirometry, and Acapella vibratory positive expiratory pressure device.

It is known that patients with stroke have respiratory muscle weakness.² This weakness that appears in the acute stage of the disease and remains in the chronic period decreases the efficiency of the respiratory system by which it produces a decrease in lung volumes and alteration of the mechanism of cough, increasing morbidity and mortality due to respiratory diseases.^{3,4} In addition, respiratory muscle weakness in the chronic phase of stroke leads to important functional and cardiorespiratory limitations.⁵ The sum of this weakness, together with alterations in respiratory mechanics, the spasticity and contractures of trunk muscles, and a reduced mobility of the affected diaphragmatic dome, could lead to a restrictive ventilatory pattern.^{4,6} Therefore, it is necessary to continue investigating the effects of stroke on respiratory muscles and the use of training of respiratory muscles as a rehabilitation technique.

The authors describe a training protocol for inspiratory and expiratory muscles. However, it is important to highlight that respiratory muscle training, as well as the training of any other muscle, must comply with certain principles: overload, specificity, and reversibility. Although the duration and frequency of training continue to be the subject of discussion, the key to the training prescription is the correct dosage of its intensity or load, as well as the total time or volume of training.⁷

The most commonly used test in the clinical field for the evaluation of the respiratory muscle strength is the measurement of the maximum respiratory pressures in the mouth: the maximum inspiratory pressure and the maximum expiratory pressure. From these values, reference values have been established for a healthy population and countless publications provide values for different diseases.⁸

The authors did not report the value of maximum inspiratory pressure and maximum expiratory pressure, so the degree of muscle weakness or the training load cannot be determined. With the data provided, only the peak expiratory flow is available as an indirect measure of the state of the expiratory muscles and whose value is approximately 200 l/min, very close to the threshold of an ineffective cough.⁹

Having the maximum respiratory pressure value is essential, not only to dose the intensity of initial training but also to adjust the workload during the duration of the muscle training program and, once completed, to set the measures of maintenance of strength through the continuity of home-based training, considering that the devices used to train the muscles are portable.

Another important point is the protocol used. The authors cite in methods a recent systematic review in which training protocols are described, emphasizing devices that have shown clinical and statistically significant improvement.² This review shows five clinical trials in which threshold devices were used, which do not depend on flow and in which a training load can be objectively established. That is, from the maximum inspiratory pressure, you can train a percentage of it, which is usually established in a range between 30% and 80%. The literature has consistently demonstrated, in different types of pathologies, that threshold devices with loads greater than 30% produce improvements in the strength and resistance of respiratory muscles.¹⁰⁻¹² However, Yoo and Pyun,¹ for inspiratory muscle training, used a flow-oriented incentive spirometer, whose main indication is the prevention of postsurgical complications, such as atelectasis, as well as in the prehabilitation of surgical patients, by contributing to increasing the volume and expansion of the pulmonary parenchyma. This device lacks a regulation system by pressure, which does not allow to establish the objective load of training. There are even investigations that report that the maximum pressure generated by this type of device does not exceed 10 cmH₂O.¹³ Regarding the training of the expiratory muscles, the authors used the Acapella device that generates positive expiratory pressure with endogenous vibration with the fundamental objective of improving the rheology of the secretions and favoring their drainage.¹⁴ This device has been shown to generate very low pressures that depend on expiratory flow ranging from 4 to 21 cmH₂O.¹⁵

We believe that the work of Yoo and Pyung¹ is a very important step that shows significant results in the variables of pulmonary function before and after intervention with the use of two instruments whose main objectives are the increase of lung volumes (flow-oriented incentive spirometer) and secretion drainage (Acapella). However, it cannot be asserted that the result is due to the training of the respiratory muscles as the authors conclude. It has already been reported that patients with stroke have a significant volume decrease in the hemiplegic side that can reach up to 25% and that this decrease is normalized with the use of volume incentives as used by the authors.⁶

We are deeply convinced that the evaluation of the respiratory system after a stroke is fundamental in this population and that the incorporation of respiratory therapeutic interventions associated with neurorehabilitation programs should be part of the process of integral recovery of people who have experienced a stroke, to improve their quality of life and survival. It is important to continue research into the role played by the respiratory muscles in the cardiorespiratory conditioning process in stroke, but to draw reliable conclusions, precise evaluation procedures, key parameters, appropriate protocols, and the indicated training instruments should be selected.

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