

## Letters to the Editor

**Appropriate Use Criteria for Cardiopulmonary Exercise Testing in Patients With Cardiac Resynchronization Devices*****Criterios de uso apropiado para la ergoespirometría en el paciente portador de dispositivos de resincronización cardíaca*****To the Editor,**

We have read with great interest the publication in your journal on the utility of treadmill exercise testing in patients with cardiac resynchronization therapy (CRT) devices.<sup>1</sup> According to the authors' conclusions, treadmill exercise testing is a simple tool for clinical decision-making on drug therapy in patients with CRT devices. In our opinion, it may be of interest to discuss a series of points related to treadmill exercise testing compared with cardiopulmonary exercise testing in patients receiving CRT.

In patients with heart failure refractory to medication in New York Heart Association classes I through IV, with a prolonged QRS duration and a marked decrease in the left ventricular ejection fraction, CRT is a nondrug therapeutic alternative.<sup>2</sup> A number of studies have demonstrated that CRT reduces hospital admissions for heart failure and the mortality rate and improves quality of life.<sup>3</sup> During the follow-up of patients with CRT, it is necessary to carry out a complete evaluation of the electrocardiographic and echocardiographic findings at baseline and following CRT device implantation, as well as to interrogate the device, assess the position of the electrode, and carefully optimize medical treatment.<sup>4,5</sup>

Cardiopulmonary exercise testing is a functional test that noninvasively assesses the pathophysiology of the respiratory and cardiovascular systems under conditions of physical stress, objectively evaluating the degree of functional limitation and its mechanism.<sup>6</sup> The current literature lends convincing support to the use of several combined variables of the cardiopulmonary exercise test to determine the prognosis of patients with heart failure and CRT devices. Most of these variables are rated on a continuous scale, which enables their interpretation for prognosis.<sup>7</sup> Major variables in the prognosis of patients with CRT devices are maximal oxygen consumption ( $\text{VO}_{2\text{max}}$ ) and markers of respiratory efficiency (the minute ventilation/carbon dioxide production slope  $[\text{MV}/\text{VCO}_2]$  and exercise oscillatory ventilation  $[\text{EOV}]$ ).<sup>7</sup>

A large body of information has been gathered over the last 2 decades on the importance of cardiopulmonary exercise testing in the functional assessment of patients receiving CRT, which has begun to gain recognition in the clinical context, and it is considered an indispensable tool in these patients.<sup>8</sup> In the study carried out by Riva-Silva et al,<sup>1</sup> all the patients with dilated cardiomyopathy and indications for CRT underwent treadmill exercise testing. This type of test does not enable the determination of any of the variables mentioned above. Thus, and in accordance with current clinical guidelines, the performance of treadmill exercise testing is not indicated in these patients.

It is very important to reduce health care costs in health systems and improve the quality of care by applying appropriate use criteria for functional tests in accordance with the major scientific societies.<sup>8</sup> The performance of a cardiopulmonary exercise test is complex and its interpretation requires experience; its clinical applicability in patients with dilated cardiomyopathy who are receiving CRT has clearly been demonstrated. Even so, greater support is needed to facilitate a more widespread use of cardiopulmonary exercise testing in the health system.

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