The role of cardiopulmonary exercise testing in a contemporary heart failure population

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Introduction: Cardiopulmonary exercise testing (CPET) is used for risk stratification in patients with chronic heart failure (CHF). However, there is a lack of information regarding CPET prognostic power in patients under new HF therapies such as sacubitril/valsartan, Mitraclip, IV iron or SGLT2 inhibitors. The aim of this study was to evaluate the prognostic value of CPET parameters in a contemporary subset of patients with optimal medical and device therapy for CHF.

Methods: Retrospective evaluation of patients with CHF submitted to CPET in a tertiary center. Patients were followed up for 24 months for the composite endpoint of cardiac death, urgent heart transplantation or left ventricular assist device.

CPET parameters, including peak oxygen consumption (pVO2) and VE/VCO2 slope, were analysed and their predictive power was measured.

HF events were stratified according to cut-off values defined by the International Society for Heart and Lung Transplantation (ISHLT) guidelines: pVO2 of ≤12 mL/Kg/min and VE/VCO2 slope of >35.

Results: CPET was performed in 204 patients, from 2014 to 2018. Mean age was 59 ± 13 years, 83% male, with a mean left ventricular ejection fraction of 33 ± 8%, and a mean Heart Failure Survival Score of 8.6 ± 1.3.

The discriminative power of CPET parameters is displayed in the Table.

In patients with pVO2 ≤12 mL/Kg/min, the composite endpoint occurred in 18% of patients. A pVO2 value of ≤12 mL/Kg/min had a positive predictive power of 18% while pVO2 >12 had a negative predictive power of 93%.

Regarding VE/VCO2 slope >35, the composite endpoint occurred in 13% of patients.

A VE/VCO2 slope value of >35 had a positive predictive power of 13% while VE/VCO2 slope <35 had a negative predictive power or 94%.

Conclusion: Using ISHLT guideline cut-off values for advanced HF therapies patient selection, there was a reduced number of HF events (<20%) at 24 months in patients under optimal CHF therapy. While pVO2 and VE/VCO2 slope are still valuable parameters in risk stratification, redefining cut-off values may be necessary in a modern HF population.

Discriminative power of CPET parameters

Parameters	HR; 95% CI	AUC	p-value
Peak VO2	0.824 (0.728-0.934)	0.781	0.001
Percent of predicted pVO2	0.942 (0.907-0.978)	0.774	0.002
VE/VCO2 slope	1.068 (1.031-1.106)	0.756	0.008
Cardiorespiratory optimal point	1.118 (1.053-1.188)	0.746	0.004
PETCO2 maximum exercise	0.854 (0.768-0.950)	0.775	0.003
Ventilatory Power	0.358 (0.176-0.728)	0.796	0.002

HR: Hazard ratio, AUC: Area under the curve, PETCO2: end-tidal CO2 pressure