Cardiopulmonary exercise testing outcomes of 3-week intensified cardiac rehabilitation in patients with heart failure and coronary artery disease: a single centre pilot study

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Introduction: Cardiopulmonary exercise testing (CPET) is the gold standard for evaluating cardiovascular functional capacity. It provides assessment of the integrative exercise responses involving pulmonary, cardiovascular and skeletal muscle systems. CPET integrates different variables that support the understanding of physiological and pathophysiological mechanisms. Moreover, it provides a remarkable tool for monitoring the cardiac rehabilitation program (CR) and the effect of therapy. Clinical decision-making and recommendations for its application are continuously evolving every year. In patients with chronic heart failure (HF), physical activity is one of the main components of CR[1], although the training structure is not clearly defined. Many parameters are used to classify the intensity of physical activity (RPE, MET, %HRpeak, %Wpeak)[2]. Still, "threshold-based" classification, determined regarding the first and second ventilatory thresholds (VT), VT1 and VT2, is considered as the optimal for improving individual's functional capacity[3].

Patients and Methods: A pilot project of 8 patients with HF (HFrEF, HFimpEF) with underlying coronary artery disease (CAD) (age 65 ± 6 yrs; VO_2peak 15.4 ± 2.7 ml min-1 kg-1, EF 42±9%) underwent CR for 3 weeks. Functional capacity (VO_2peak) and all corresponding cardiopulmonary parameters were assessed using CPET at the program's beginning and end. The training zones were prescribed and adjusted according to the parameters obtained in the CPET. Aerobic continuous training (ACT) of moderate-intensity was carried out for all patients.

Results: Peak VO_2 significantly increased by 9% (15.4 ± 2.7 vs. 16.9 ± 2.6 ml min-1 kg-1, p=.001, d=1.93) after 3 weeks of training. At the same time point, VT1 and VT2 significantly improved by 12% (9.6 ± 2.6 vs. 10.8 ± 3.0 ml min-1 kg-1, p=.005, d=1.43) and 12% (13.5 ± 3.3 vs. 15.0 ± 2.4 ml min-1 kg-1, p=.011, d=1.21).

Conclusion: A 3-week ACT program is sufficient to induce significant functional adaptations visible in VO_2peak and VO_2 improvements at VT1 and VT2 in patients with HF, provided that patients are trained at the same volume but at an individually defined intensity. Further research is needed to define if volume or intensity (ACT vs HIIT, High-Intensity Interval Training) is the key parameter that induces significant functional improvements in CAD patients with HFrEF in 3-week CR.

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LITERATURE

1. Dibben GO, Hannay JR, Taylor RS. Exercise training in heart failure. Heart. 2024 Feb 12;110(5):373-381. https://doi.org/10.1136/heartjnl-2022-321132
2. Visseren FLJ, Mach F, Smulders YM, Carballo D, Koskinas KC, Bäck M, et al; ESC National Cardiac Societies; ESC Scientific Document Group. 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice. Eur Heart J. 2021 Sep 7;42(34):3227-3337. https://doi.org/10.1093/eurheartj/ehab484
3. Hansen D, Abreu A, Ambrosetti M, Cornelissen V, Gevaert A, Kemps H, et al. Exercise intensity assessment and prescription in cardiovascular rehabilitation and beyond: why and how: a position statement from the Secondary Prevention and Rehabilitation Section of the European Association of Preventive Cardiology. Eur J Prev Cardiol. 2022 Feb 19;29(1):230-245. https://doi.org/10.1093/eurjpc/zwab007