

can generate impairments on cardiac function, leading to functional decline and quality of life, with a negative impact on morbidity and mortality. The benefits of exercise training (ET) under these conditions have been demonstrated by numerous studies. However, there are still a few studies on the benefits of ET in AFp associated with HF.

Purpose: The aim of this study was to verify the effect of ET on echocardiographic parameters, respiratory efficiency and quality of life in patients with HF and AFp.

Methods: 32 men, age 53±6 years, with HF and AFp were randomly allocated to cardiac exercise training group (n=16) or control group (n=16). The left atrial dimension (LAD), left atrial volume (LAV), left ventricular mass (LVM), left ventricular end-systolic volume (LVSV), left ventricular end-diastolic volume (LVDV) and left ventricular ejection fraction (LVEF) were evaluated by two-dimensional doppler echocardiography. The maximal oxygen consumption (VO₂max) and minute ventilation of the production of carbon dioxide (VE/VCO₂ slope) was evaluated by cardiopulmonary exercise testing on cycloergometer. The quality of life was evaluated by Minnesota questionnaire. Exercise training was performed in 60-minute sessions three times a week for 12 weeks. The exercise protocol consisted of 5 minutes of warm-up, 40 minutes of aerobic exercise on a cycloergometer, 15 minutes of resistance exercises and 5 minutes of calm back. The control group was advised to maintain as usual activities.

Results: Baseline characteristics were not different between groups. After 12 weeks, the exercise training group significantly modified the echocardiographic parameters: decreasing the LAD (from 53.4±3.2 to 46.8±3.8 mm, P<0.001), LAV (from 152.2±17.1 to 138.1±13.0 ml, P<0.001), LVM (from 266.4±29.1 to 211.3±31.2 g, P<0.001), LVSV (from 135.6±4.4 to 124.4±5.6 ml, P<0.001) and LVDV (from 194.2±9.1 to 177.2±8.1 ml, P<0.001), and increasing LVEF (from 33.1±3.6% to 39.1±3.2%, P<0.001). Exercise training also increased VO₂max (from 15.3±2.8 to 19.0±2.5 ml kg⁻¹ min⁻¹, P<0.001), decreased VE/VCO₂ slope (from 38.9±4.9 to 32.1±3.0, P<0.001), and decreased the overall quality of life score (from 40.4±5.0 to 26.2±15.9, P<0.002). There were no changes in the control group during the protocol, except the increasing on VE/VCO₂ slope (from 39.2±6.4 to 41.1±5.9, P<0.003). Six patients, three in each group, did not complete the study period due to two withdrawals and one death in each group.

Conclusion: Exercise training after 12 weeks was safe strategy that improves cardiac structure and function, respiratory efficiency and quality of life of patients with AFp associated with HF. Despite the need for future studies, such findings support the importance of intervention with exercise in treatment of the arrhythmia.

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Cardiac rehabilitation referral in lombardy region: a population study on incident cases from 2005 to 2012

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Background: The European Guidelines in 2016 suggested integrating Cardiac Rehabilitation (CR), as a multifactorial management approach, in the care of patients with Heart Failure (HF).

Purpose: The aim of this study was to analyze, as primary outcome, the impact of the in-hospital cardiac rehabilitation program (InH-CRP) on all-causes mortality in patients with HF, and the readmissions for all causes, as secondary outcome.

Methods: We analyzed, from the Lombardy regional healthcare system administrative database, the discharge forms of patients with HF-related diagnosis, recorded from 2000 to 2012. This included, among all data, the number of all in-hospital admissions, CR facility admissions, post-discharge deaths, outpatient drug prescriptions and outpatient visits. A 5-years period of freedom from hospitalizations was considered adequate for our study. We considered as "new" or "incident" HF cases, the patients at their first HF hospitalization, limiting the analysed period from 2005 to 2012. We divided patients in two groups. GROUP A: patients admitted only in hospitals for HF acute care, GROUP B: patients admitted at least once to a CR facility for an InH-CRP.

Results: The sample study was represented by 140,552 "incident" HF cases. Of these patients 100,843 (71%) were in Group A, and 39,709 (29%) in Group B. In the Group B, the patients had a mean of 3.26±1.78 HF acute admissions before they referred to CR facility for an InH-CRP. Male gender, females' age and burden of comorbidities (>2) were significantly higher among patients referred to a CR facility (p<0.0001). Patients in Group B had performed a significantly higher number of interventional procedures (p<0.0001) and had a significantly higher drug prescriptions and outpatient visits (p<0.0001). Total mortality was 30% for group A and 29% for group B, but adjusting for different covariates, the risk of dying (Cox Model) was decreased by 43% for patients admitted to an InH-CRP. The number of readmissions after the first event were 176,072 (64% of the total with a mean of 2.59±2.21) in group A and 98,449 (44% of the total with a mean of 3.43±3.03) in Group B (p<0.001). The risk of readmission was decreased by 31% for those patients who underwent to an InH-CRP.

Conclusions: This population study provide evidence of a beneficial relationship between the use of Cardiac Rehabilitation program and the improved patient survival.

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Changes in exercise capacity of frailest patients with heart failure treated with standard exercise recommendations versus stroke volume response to exercise: a pilot study

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Background: Peak exercise oxygen uptake (V·O₂peak) and exercise capacity are strong factors for predicting mortality in heart failure patients (HF). Although considerable heterogeneity in the nature of exercise intolerance was found in HF patients, one third of them presented a central hemodynamic exercise limitation induced by the impairment to augment stroke volume (SV) during a cardiopulmonary exercise testing (CPET). Among the frailest HF subjects (V·O₂peak <18.0 mL min⁻¹ kg⁻¹), SV moreover reached its peak levels at a submaximal exercise intensity (pSVmax) in 86% of patients. To improve exercise capacity of the frailest HF patients, the international guidelines recommended to prescribe moderate continuous intensity exercise (MICE) based on the heart rate value (HR) associated with the anaerobic threshold (VT1). However, the b-blockers interactions on ventilatory adaptations and the attenuated HR response to exercise generally observed in HF patients would induce a dissociation between VT1 and pSVmax. This might be taken into consideration for the exercise intensity prescription.

Purpose: The aims of the study were, in HF patients: 1) to examine whether VT1 is concomitant with pSVmax, 2) to compare the effects of 4 weeks of exercise cardiac rehabilitation based on VT1 or pSVmax on cardiorespiratory responses.

Methods: Twelve HF patients (V·O₂peak: 15.1±3.6 mL min⁻¹ kg⁻¹) performed a CPET with respiratory gas analysis and simultaneous assessment of SV, using a thoracic impedance method, before and after an exercise-based cardiac rehabilitation. Maximal tolerated power (MTP), V·O₂peak and VT1 were determined in accordance with the international standards. Peak SV values and pSVmax were estimated by a third-order curvilinear regression method. During 4 weeks, all subjects performed, 5 times per week, 20–50-min cycling exercise at the power associated to VT1 (GVT1, n=6) or pSVmax (GpSVmax, n=6). Exercise session duration was regulated to maintain similar training load between both groups using session rating of perceived exertion.

Results: Baseline medication, anthropometric and exercise characteristics did not differ between groups. For all HF patients, pSVmax was lower than VT1 before (60.3±12.6 vs. 63.6±14.5 w, p=0.004) and after (73.3±18.9 vs. 76.0±19.6 w, p=0.02) training. MICE significantly improved MTP (p=0.01) without any difference between GVT1 and GpSVmax (p=0.12). MICE based on VT1 did not improve V·O₂peak, but 2 dropouts were found among GVT1 patients. In contrast, a significant V·O₂peak increase occurred after MICE based on pSVmax. Changes in V·O₂peak were related to SV change to training (r=0.77, p=0.05) in GpSVmax. **Conclusion:** Changes in V·O₂peak with training suggested a greater effect of MICE based on pSVmax compared to MICE based on VT1. Further investigation is required to confirm our results and the interest of SV monitoring in order to prescribe exercise intensity in heart failure.

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A single session of exercise training stimulates the mobilization of endothelial progenitor cells in patients with chronic heart failure

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Introduction: Heart failure (HF) deteriorates the vascular endothelium. Exercise has been shown to stimulate the mobilization of endothelial progenitor cells (EPCs) which are used as an index of vascular endothelial function. EPCs contribute to the regeneration of the inflammatory endothelium and promote neovascularization.

Purpose: The purpose of the present study was to evaluate the effect of a single session of exercise training on the vascular endothelial function in patients with chronic HF.

Methods: Thirty six patients (30 males, 6 females) with stable chronic HF [mean ± SD, Age (years): 55±10, EF (%): 31±9, VO₂peak (ml/kg/min): 17.7±4] underwent a symptom limited maximal cardiopulmonary exercise testing (CPET) on a cycle ergometer. Venous blood was sampled twice, once before CPET and at the end of CPET. Four different cellular populations (2 subgroups of EPCs and 2 subgroups of circulating endothelial cells, CECs) were quantified by flow