Exercise training in Patients with Chronic Obstructive Pulmonary Disease. Effectiveness ten years after participation.

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Background

Chronic Obstructive Pulmonary Disease (COPD) is a preventable and treatable disease caused by exposure to tobacco smoke and poisonous gases. It is characterized by progressive obstruction of the air-flow, irreversible once lesions occur in the parenchyma. (1). Patients with COPD may respond to exercise training in different ways compared to healthy subjects, since the determinants of exercise limitation appear to be widely multi-factorial (2). Such factors may include gas exchange abnormalities, dynamic lung hyperinflation, insufficient energy supply to the peripheral and respiratory muscles, morphological alterations in leg and diaphragm muscle fibers and reduced functional metabolic capacities (3). The strength exercise can improve the respiratory muscle performance with potential positive effects on blood oxygenation, and consequently, muscular performance of patients with COPD (4). This improvements may affect positively this individuals health and quality of life at short and long term, leading to a lower health service recurrence (HSR) (5).

Purpose

To assess the effectiveness of attending to an exercise program, combined (aerobic and strength exercise) or aerobic training alone in patients with COPD compared with subjects not submitted to exercise programs.

Methods

Thirty men with moderate COPD, were randomly assigned for 2 groups: 15 patients (age, 66.5±6.2 years; FEV1, 55.8±9.9%) to a combined exercise training program (CG), and 15 (age, 65.4±3.6 years; FEV1, 59.1±9.1%) to an aerobic training program (AG), for 10 weeks, three times a week. Outcome variables included cardiopulmonary function (cardiopulmonary exercise test (CPET) and 6-min walk distance (6MWD), muscular strength (1-RM); and quality of life (HRQL) with SF-36 and QRSG. Ten years after the programs, both groups were compared with ten patients who weren't submitted to exercise programs, by evaluating health service recurrence and mortality for respiratory cause. The study was approved by the Ethics Committee of the Garcia de Orta Hospital and all participants gave their written informed consent prior to inclusion in the investigation.

Results

Means and standard deviations values of the modification rate, before and after training for both groups are displayed in Table 1.

Baseline data: No significant differences were observed, between groups, for cardiorespiratory variables, except for $SatO_{2peak}$ (%) and 6-min walk test distance (m). For HRQL we just observed significant differences in vitality dimension in the MOS-SF 36 questionnaire.

After training: Both exercise groups increased (p<.05) functional capacity, O2pulse peak, CPET time and power and 6MWD.

HRQL improved immediately after exercise, with greater benefits for the CG group (p<.05) in all variables in St. George Respiratory Questionnaire.

With the generic instrument, MOS SF-36, significant differences were observed in modification rates for physical function, role physical and role emotional (Graph 1).

Results

Ten years later, there were no differences between the exercise groups on mortality and HSR.

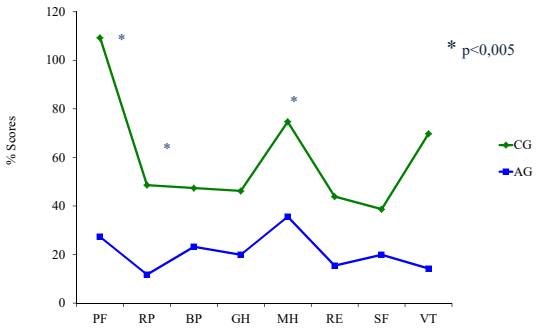
Between exercise groups and subjects who didn't integrate the program, there weren't differences on mortality, but there were significant differences on HSR (p<.05).

Table 1 Mean and standard deviation values for modification rate of functional cardiorespiratory parameters, maximal oxygen uptake (VO_{2peak}), carbon dioxide production (VCO_{2peak}) minute ventilation (VE_{peak}), oxygen pulse (Pulse O_{2peak}), ventilatory equivalents for oxygen uptake (VE/VO_{2peak}), oxygen saturation peak (SatO2), heart rate at basal and peak stages, exercise duration and 6-min walk distance , in combined exercise training group (CG) and in aerobic training group (AG).

	%Δ		
	CG	AG	p*
VO_{2peack} (mL·kg^{-1}·min^{-1})	24±16	26±25	0.002
VCO_{2peack} (L·min^{-1})	10±5.3	14±6.4	0.121
VE_{peack}(L·min^{-1})	2.8±18.1	26.9±27.7	0.072
O_2 $pulso_{peack}$	24±0.1	21±0.2	0.000
VE/VO_{2peack}	(-)17.3±10.5	6.1±14.3	0.006
$SatO_{2peack}$ (%)	2.0±0.3	(-)1.0±3.1	0.053
HR_{peack} b.min^{-1}	(-)3.8±4.9	3.7±13.8	0.048
HR_{reste} b.min^{-1}	(-)4.9±2.1	(-)4.2±2.4	0.108
Exercise duration (min.)	28.6±8	3.0±17	0.000
6-min Walk (m)	12.7±4	6.8±3	0.003

* Differences between groups p<0,05

Graph 1: Modification rate in Medical Outcomes Study SF-36



Conclusions

Combined exercise training was more effective than aerobic exercise alone with greater improvement in muscular strength, functional capacity and HRQL after program, reducing morbidity by improving functional capacity through exercise. It is still unknown if improvements in functional capacity are maintained in the long-term and if this leads to increased physical activity levels as measured by a free-living activity monitor. Nevertheless participation in exercise programs seems to reduce HSR at long-term follow-up

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