

## **Effect of Exercise Training on Left Ventricle Systolic Function, Exercise Tolerance and Prognostic Predictors in Idiopathic Pulmonary Fibrosis Patients**

**Baruch Vainshelboim**<sup>1,2</sup>, Jose Oliveira<sup>2</sup>, Alexander Sagie<sup>3</sup>, Gila Roth<sup>3</sup>, Mali Mantzur<sup>3</sup>,  
Liora Yohoshua<sup>1</sup>, Israela Wais<sup>1</sup>, Mordechai Kramer<sup>1</sup>

<sup>1</sup>*Pulmonary Institute, Rabin Medical Center, Beilinson Campus, Israel*

<sup>2</sup>*Research Center in Physical Activity and Health, Faculty of Sport, University of Porto,  
Portugal*

<sup>3</sup>*Echocardiography Unit, Department of Cardiology, Rabin Medical Center, Beilinson  
Campus, Israel*

### **Rationale:**

Idiopathic pulmonary fibrosis (IPF) is manifested in restrictive pathophysiology, dyspnea, exertional hypoxemia and exercise intolerance. Moreover, pulmonary hypertension (PH) and left ventricle impairments, also prevalent in IPF patients, are associated with disease severity, poor function and worse prognosis. The aim of the present study was to examine the effect of exercise training on left ventricle systolic function exercise tolerance and prognostic predictors in IPF patients.

### **Methods:**

Thirty-one IPF patients male and female aged 50-80 years ( $67.4 \pm 7.1$  yr) were recruited and randomly allocated to either exercise training (ET) group (n=15) or control group (n=16). ET group participated in a 12-week outpatient pulmonary rehabilitation program, consisting of twice-weekly 60-minute supervised group exercise training, while control group continued with regular medical treatment. Pulmonary function test (PFT), resting Doppler-Echocardiography, cardiopulmonary exercise test (CPET), 6 min walk test (6MWT), blood measurements and health related questionnaires were assessed at baseline and 12 weeks after the intervention.

### **Results:**

Peak oxygen consumption ( $VO_2$  peak), peak work rate, 6MWT and distance saturation product (DSP) increased significantly (2.1 ml/kg/min, 15 watts, 71 m and 52 m\% respectively) only in ET group.  $O_2$  pulse increased by 1 ml/beat in ET group and without alteration in the control. Forced vital capacity % predicted increased by 3% in ET group and decreased by 4% in control group after the intervention. Exercise training had no effect on resting systolic pulmonary arterial pressure (sPAP), fractional shortening, stroke volume, cardiac output and N-terminal pro-brain natriuretic peptide (NT-proBNP) following the program (table 1).

### **Conclusion:**

Exercise training in patients with IPF improves exercise tolerance, functional capacity, dyspnea and quality of life with improvement of several prognostic predictors. Resting left ventricle systolic function, sPAP and NT-proBNP did not significant changed after exercise training intervention.

**Table 1. Resting and exercise parameters in exercise training and control groups after 12 weeks intervention in patients with IPF.**

	Control (n=16)		Exercise Training (n=15)		p Value
	Baseline	After 12 weeks	Baseline	After 12 weeks	
FVC %pred.	70±18	66±19	66±15	69±18	.030
HR (beat/min)	71±15	75±12	75±12	72±15	.069
SV (ml/beat)	78±17	74±14	68±14	64±15	.799
C.O (L/min)	5.1±0.9	5.1±1.1	4.8±0.8	4.4±0.7	.095
FS%	36±6	37±7	38±7	39±6	.966
sPAP (mmHg)	33±9	33±8	33±7	32±7	.790
NT-proBNP (pg/ml)	175±100	352±579	166±134	181±169	.284
Peak WR (watts)	81±31	74±33	72±28	87±27	.000
VO <sub>2</sub> Peak (ml/kg/min)	14.2±3.1	13.7±3.9	13.6±3.4	15.7±4	.002
O <sub>2</sub> pulse(ml/beat)	10.5±3.4	10.3±3.5	9.1±2.8	10.1±2.5	.032
6MWT (m)	509±110	496±111	471±108	542±154	.001
DSP (m/%)	412±131	397±151	396±105	449±149	.002
mMRC dyspnea score (0-4)	1.8±1	2.1±1	1.9±0.9	1.1±1	.000
SGRQ-total score	19±4.3	22±6	21±7	14±8	.000

FVC; forced vital capacity, HR; heart rate, SV; stroke volume, C.O; cardiac output, FS%; fractional shortening, sPAP; systolic pulmonary arterial pressure, NT-proBNP; N-terminal pro-brain natriuretic peptide, Peak WR; peak work rate, VO<sub>2</sub> Peak: peak oxygen consumption, 6MWT; 6 minute walk test, DSP; distance saturation product, mMRC; modified medical research council, SGRQ; St. George respiratory questionnaire.