

Online supplement

Safety precautions

These included infection prevention and control measures, exclusion of active infection and control of disease related complications. In brief, necessary protection measures were taken into consideration to avoid the spread of the virus in the facilities where the evaluation of patients and delivery of rehabilitation services took place. These measures are described in detail by the Hellenic National Public Health Organization (HNPHO).[1] Patients upon arrival at the rehabilitation centre were screened for active disease according to the guidance issued by the HNPHO for discontinuation of precautionary measures in a patient with (life-threatening) COVID-19 infection following hospital discharge.[1] Evaluation and rehabilitation of patients took place in properly ventilated facilities with each patient individually and a time separation of 1 h between assessments and rehabilitation sessions was implemented. According to BTS guidance a series of possible complications of COVID-19 infection were taken into account during the initial evaluation including thromboembolic disease, complications from the heart, mainly myocarditis, and the detection of hypoxemia during exertion.[2] The safety precautions that were followed have been described in detail by the Hellenic Thoracic Society.[3],[4]

Lower body muscle strength

This was assessed by a handheld dynamometer (K-Force Muscle Controller, Kinvent Company, France). Participants were seated with hip and knee at 90° flexion in an elevated chair with support back and straps for stabilization of the patient. The dynamometer was placed on the anterior surface of proximal to ankle.[5],[6] The test was carried out 3 times bilaterally and the mean score of 3 repetitions was calculated to minimise measurement errors.[7],[8] Outcomes are presented in table 1.

Cycle ergometer peak work capacity

Patients assigned to the rehabilitation group performed a maximum incremental test on an electromagnetically braked cycle ergometer (Ironman M3; Garland, Texas) to determine the peak work rate (WR_{peak}). The procedure included 3-min of rest measurements, 3-min of unloaded pedaling, followed by an increase in work rate every min by 5 to 20 W to the limit of tolerance, while patients maintained a pedaling frequency of 60 revolutions per minute. Heart rate (HR) and percentage of arterial oxygen saturation (%SpO₂) were determined using a pulse oximeter (Onyx, NONIN) as well as symptoms of dyspnea and leg discomfort using the 0-10 Borg scale.[9]

Rehabilitation programme

The programme was multidisciplinary and included supervised exercise training, education, breathing control, relaxation techniques, dietary advice, and psychological support. The programme consisted of two sessions per week over an 8-week period.

Exercise prescription

Patients assigned to the rehabilitation group performed intermittent exercise on an electromagnetically braked cycle ergometer (Ironman M3; Garland, Texas). Intensity at the beginning of the program was equivalent to 50% of WR_{peak} (measured at baseline), with 30 sec of work alternated by 30 sec of rest periods for 30 min/session.[10],[11] The workload was increased weekly by 10% of baseline work rate, based on patients' Borg Scale symptoms of breathlessness and leg discomfort. The workload was increased when Borg dyspnoea and/or leg discomfort were reduced by 1 unit for a given workload. During training, heart rate was recorded by a pulse oximeter and the Borg (0-10) scale was used for the evaluation of breathlessness and leg discomfort. The rehabilitation programme also included resistance training for the upper and lower limbs using fitness equipment. In particular, patients performed 4 resistance exercises, namely knee extension, seated chest press, peck deck and lateral pull-down, at an intensity equivalent to 60 to 70% of one repetition maximum (1RM, performed at baseline) with 3 sets of 10 repetitions per exercise.[12]

	Group	Baseline	8-weeks	Pre-post difference	Pre-post significance	Between groups significance at 8 weeks
DLco (%pred)	Rehab	59.2 ± 18.4	68.2 ± 16.5	9.0 ± 11.9	<i>p</i> =0.023*	<i>p</i> =0.481
	UC	67.2 ± 12.9	76.1 ± 14.0	8.9 ± 10.5	<i>p</i> =0.005*	
FEV ₁ (%pred)	Rehab	89.6 ± 15.5	98.4 ± 13.3	8.76 ± 9.16	<i>p</i> =0.005*	<i>p</i> =0.951
	UC	90.9 ± 12.7	99.3 ± 8.7	8.4 ± 9.9	<i>p</i> =0.003*	
FVC (%pred)	Rehab	89.2 ± 18.91	98.0 ± 15.5	8.7 ± 8.6	<i>p</i> =0.004*	<i>p</i> =0.972
	UC	90.1 ± 14.9	98.4 ± 10.1	8.34 ± 9.5	<i>p</i> =0.002*	
Q. Muscle strength right (Kg)	Rehab	19.80 ± 3.68	21.98 ± 3.56	2.18 ± 3.81	<i>p</i> =0.088	<i>p</i> =0.004*
	UC	18.02 ± 4.69	17.19 ± 3.54	-0.83 ± 2.52	<i>p</i> =0.278	
Q. Muscle strength left (kg)	Rehab	20.86 ± 5.36	22.98 ± 3.83	2.13 ± 3.81	<i>p</i> =0.094	<i>p</i> <0.001*
	UC	18.01 ± 5.04	16.76 ± 3.30	-1.25 ± 2.61	<i>p</i> =0.124	

Table1: Initial evaluation and outcome measurements of lung function and muscle strength. Data are presented as mean±SD. Baseline evaluation was within 6-8 weeks post hospital discharge. Pre-post significance within groups was assessed with paired t-tests. Outcome comparisons at 8 weeks between groups were performed with univariate analysis of variance (ANCOVA) using baseline values as covariates. Rehab: Rehabilitation group, UC: Usual Care group. FEV₁: Forced Expiratory Volume in 1 second; FVC: Forced Vital Capacity; DLco Diffusing capacity for carbon monoxide; Q. Muscle strength: Quadriceps muscle strength test. Asterisks (*) denote statistical significance between groups (*p*<0.05).

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