Novel rehabilitation program after left ventricular assist device (LVAD) implantation improves functional tests and reduces levels of prognostic heart failure biomarkers

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Background: Rehabilitation after LVAD implantation is increasingly used. We developed the novel method of comprehensive rehabilitation starting directly after LVAD implantation.
Study group: 21 recent LVAD (15 Heart Mate III, 6 HeartWare) recipients (56.2±11.7 yrs, 100% men) were included to 5-week rehabilitation program, which included supervised endurance training on cycloergometer (5 times per week), resistance training, general fitness exercises with elements of equivalent and coordination exercises (every day). 6-minute walking test (6MWT), cardiopulmonary exercise test (CPET) and prognostic biomarkers: NT-proBNP, Galectin-3 and ST2 were investigated at the beginning and at the end of rehabilitation program.
Results: See Table 1.
At the end of rehabilitation program, significant increase in 6MWT distance, maximum workload, peak VO2 and upward shift of anaerobic threshold in CPET were observed in all patients. Significant reductions of NTproBNP, ST2 and galectin-3 levels were observed. There were no major adverse events during rehabilitaton.
Conclusions: Comprehensive novel rehabilitation in LVAD recipients is safe and results in significant improvement of 6-minutes walking test distance and cardiopulmonary exercise test results. Moreover, this novel rehabilitation program reduces levels of prognostic biomarkers of heart failure: NT-proBNP, Galectin-3 and ST2.

Results before and after rehabilitation

Parameter	Before (x ± SD)	After (x ± SD)	Delta [95% CI]	P
6MWT distance (m)	313.5±103.2	433.1±94.4	119.6 [83.1; 156.1]	<0.0001
Max workload (Watts)	42.6±12.4	61.6±16.0	19.0 [14.4; 23.6]	<0.0001
pVO2 (ml/kg/min)	11.2±2.1	13.2±2.4	2.0 [1.1; 2.9]	0.0002
pVO2% predicted	39.4±11.3	46.4±11.5	7.0 [3.5; 10.6]	0.0006
AT (ml/kg/min)	9.0±1.8	10.8±2.1	1.8 [1.0; 2.6]	0.0002
Galectin-3	9.87±2.25	8.48±1.81	–1.39 [–2.22; –0.56]	0.0029
ST2	27.86±11.4	22.64±7.8	–5.22 [–9.5; –0.92]	0.0205
NTproBNP (pg/ml) median [Q1 –Q3]	4350 [2620–8476]	1201 [1048–2329]	–2621 [–4961; –1211]	<0.0001

6MWT, 6-minutes walking test; Max workload, maximum achieved workload on cycle ergometer; pVO2, peak oxygen uptake; pVO2% predicted, % of predicted peak oxygen uptake; AT, anaerobic threshold; NTproBNP, N-Terminal Pro-B-Type Natriuretic Peptide – medians and quartiles; Delta [95% CI], difference between the results before and after rehabilitation, 95% confidence interval is given in square brackets.

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