The Cardiovascular Effects of Upper-Limb Aerobic Exercise in Hypertensive Patients

Timm H. Westhoff, Sven Schmidt, Viola Gross, Marian Joppke, Walter Zidek, Markus van der Gielt, Fernando Dimeo
The Cardiovascular Effects of Upper-Limb Aerobic Exercise in Hypertensive Patients

Background: Aerobic exercise is broadly recommended as a helpful adjunct to obtain blood pressure control in hypertension. Several hypertensive patients, however, are limited by musculoskeletal complaints or vascular occlusive disease from lower-limb exercise such as jogging or cycling. In the present randomized-controlled study, we evaluate whether an aerobic arm-cycling program provides a measurable cardiovascular benefit.

Methods: Twenty-four probands were randomly assigned to sedentary activity or a heart rate controlled 12 week exercise program, consisting of arm-cycling at target lactate concentrations of 2.0 ± 0.5 mmol/l. Endothelial function was assessed by flow-mediated dilation of the brachial artery. Augmentation index and large/small artery compliance (C1 and C2) were measured by computerized pulse-wave analysis of the radial artery.

Results: The exercise program led to a significant reduction in systolic (134.0 ± 20.0 to 127.0 ± 16.4 mmHg; P = 0.03) and diastolic blood pressure (73.0 ± 21.6 to 67.1 ± 8.2 mmHg; P < 0.02) accompanied by a significant improvement in C2 (3.5 ± 1.6 to 4.8 ± 2.0 ml/mmHg T 100; P = 0.004). Flow-mediated dilation, augmentation index, and C2 were not significantly affected (P > 0.05). Physical performance as derived from lactate and heart rate curves of lower-limb stress tests was unchanged, whereas maximal workload in an upper-limb ergometry significantly increased (P = 0.005). Blood pressure and vascular parameters remained unchanged in the control group.

Conclusion: Regular arm aerobic exercise leads to a marked reduction in systolic and diastolic blood pressures and an improvement in small artery compliance. Arm-cycling is a reasonable option for hypertensive patients who want to support blood pressure control by sports despite having coxarthrosis, gonarthrosis, or intermittent claudication.


Keywords: arm, arterial compliance, endothelial function, exercise, hypertension.

Abbreviations: AI, Augmentation index; BP, Blood pressure; C1, Large artery compliance; C2, Small artery compliance; FMD, Flow-mediated dilation

aDepartment of Nephrology and bSection of Sports Medicine, Charite – Campus Benjamin Franklin, Hindenburgdamm, Berlin, Germany
Correspondence to Dr. med. Timm H. Westhoff, Charite – Campus Benjamin Franklin, Department of Nephrology, Hindenburgdamm 30, 12200 Berlin, Germany
phone: +49 30 8445 641420; fax: +49 30 8445 4235; e-mail: timm.westhoff@charite.de
Received 15 December 2007 Revised 19 February 2008 Accepted 26 February 2008

If you would like to receive the complete study please contact the RECK Company at info@motomed.com; The upper body training program was performed with the motor-assisted movement therapy device MOTOMed viva2 (Reck-Technik, Betzenweiler, GERMANY).