Evaluation of the effects of interval hypoxic-hyperoxic training in patients with metabolic syndrome

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Introduction: Metabolic syndrome (MS) as a “cluster” of interrelated disorders, including insulin resistance, visceral obesity, dyslipidemia, and hypertension, is a serious clinical problem that is a high risk factor for the development of type 2 diabetes, acceleration of the development and progression of cardiovascular diseases, and such increasingly common liver damage like non-alcoholic fatty liver disease. According to a number of authors, metabolic syndrome is a reversible condition, and with early diagnosis and treatment, a reduction in the severity of manifestations of this syndrome can be achieved. A significant role in the treatment of MS and obesity is played by non-drug methods – dosed physical activity, diet, various physiotherapeutic procedures, as well as interval hypoxic-hyperoxic training (IHHT).

Objective: Evaluation of the effect of interval hypoxic-hyperoxic training (IHHT) on the components of metabolic syndrome, and the possibility of their reversal recovery.

Materials and methods: The study included 65 patients (33 men) with metabolic syndrome, aged 29–66 years. The patients were divided into 2 groups: study and control (the groups were matched by sex, age, presence of MS components and number of comorbidities). Initially, anthropometric, laboratory and instrumental studies were carried out. The patients of the main group underwent a course of IHHT for 3 weeks, 5 days a week (15 workouts). Patients in the control group underwent a course of training simulating IHHT (placebo), which also consisted of 15 trainings. The duration of one procedure was 40 minutes. Next day after the end of the training course, the changes in all initial parameters were assessed.

Results: The statistical significance of changes after the IGGT course was assessed using the Wilcoxon test as \( p < 0.05 \) and was detected in the main group according to the following parameters: reduction in arterial stiffness, measured using CAVI (Cardio-Ankle Vascular Index, on the Fukuda Denshi ap.), a decrease in the stage of liver fibrosis and stiffness of liver tissue (was realized by a non-invasive method, a liver elastometry, on the FibroScan ap. Echosense), a decrease in high-sensitivity C-reactive protein, heat shot protein-70, a decrease in total cholesterol, low density lipoproteins, triglycerides levels. According to nitric oxide, transforming growth factor beta-1, heart-type fatty acid binding protein, there was no significant dynamics after the IHHT course in both groups. There was also a tendency towards a decrease in the indices of the abdominal/hip circumference, weight, and in blood pressure, but this results was not statistically significant, due to the insufficient power of the study (a small number of patients).

Conclusions: IHHT is a safe, well-tolerated procedure and is recommended in the therapeutic and prophylactic plan for patients with metabolic syndrome, and is effective in correcting and minimizing the components of this syndrome.