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FUNCTION OF ENDOTHELIUM AT ADOLESCENTS WITH CONSTITUTIONAL EXOGENOUS OBESITY BEFORE AND AFTER REHABILITATION

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Function of endothelium at 43 adolescents with constitutional exogenous obesity before rehabilitation and at 33 healthy adolescents has been studied. Disorder of endothelial function has been established in 32 (74.4%) adolescents with constitutional exogenous obesity and in 7 (21.2%) healthy adolescents. We showed the efficiency of the rehabilitation program on restoration of endothelial function at adolescents with constitutional exogenous obesity.

Keywords: constitutional and exogenous obesity, adolescents, endothelial function

Изучена функция эндотелия у 43 подростков с конституционально-экзогенным ожирением до и после реабилитации и у 33 здоровых подростков. Установлено нарушение функции эндотелия до реабилитации у 32 (74,4%) подростков с конституционально-экзогенным ожирением и у 7 (21,2%) здоровых подростков. Показана эффективность воздействия реабилитационной программы на восстановление функции эндотелия у подростков с конституционально-экзогенным ожирением.

Ключевые слова: конституционально-экзогенное ожирение, подростки, эндотелиальная функция

Cardiovascular disease begins to develop in people with obesity usually from young age. Probability of development and severity of cardiovascular disease increases with body mass index [1]. It is now established that insulin resistance and endothelial dysfunction are closely associated states leading to metabolic and cardiovascular diseases [2]. Diagnosis of early stages of pathological states is currently being considered as priority of clinical medicine. Influencing on the functional factor of vascular remodeling which is endothelial dysfunction we can prevent or slow down the progression of structural remodeling of the vascular wall and hence affect the development of hypertension in patients with obesity [3]. The problem of structural-functional state of vessels in obesity in childhood and adolescence [4] remains poorly explored.

Objective: to study the state of vasodilating endothelial function in adolescents with constitutional exogenous obesity before and after rehabilitation and in healthy adolescents.

Materials and methods

The study included 76 adolescents in age from 11 to 17 years. The basic group comprised 43 adolescent with constitutional exogenous obesity (CEO) of I-III degree, 21 boys and 22 girls passed rehabilitation program «School for overweight children» in a sanatorium. The control group included 33 healthy adolescents with normal body weight.

Diagnosis of CEO has been verified on the basis of comprehensive examination, including clinical, laboratory and instrumental, psychological research methods. Clinical examination of children with CEO before admission to sanatorium and in the dynamics of surveillance has been conducted on the basis of the Regional Children's Hospital in Velikiy Novgorod. Rehabilitation of children with CEO has been carried out in sanatorium «Sosnovka» — SHCI «Mother and Child» in the Novgorod region for 21 days on the program «School for overweight children»; it included the modification of eating behavior, physical activity, psycho-correction, rehabilitation of chronic infection and treatment of disease-satellites.

Dynamic observation of the basic group of children has been held at the end of the sanatorium session with the continuation of the rehabilitation program in 3, 6 and 12 months.

Endothelial function was assessed by the degree of change in local blood flow. Endothelial function in all groups has been studied in the probe with the flow (endothelium) dependent vasodilation of brachial artery. To measure the diameter of the brachial artery we used 7.5 MHz linear transducer. The image was evaluated in two-dimensional mode. The transducer has been disposed in the longitudinal direction on fixed area of the upper extremity (at 2-15 cm above the cubital fossa — for the assessment of brachial artery). Measurements have been made at rest, after factor stimulating production of endothelial vasodilating substances (cuff test). Vessel diameter was defined as the distance between the proximal and distal to the transducer ultrasound images of intima-media complex of the vessel (intraluminal diameter). Investigations began after a 10-15 minutes of the patient's stay in a horizontal position. Stimulus that causes endothelial-dependent dilation of peripheral arteries is a temporary cessation of blood flow to the extremities. The cuff was placed proximal to the studied area, pressure exceeding systolic blood pressure on 30 mmHg has been produced for 4 minutes, and then rapid decompression has been performed, in response to which there was increase of blood filling and blood velocity (reactive hyperemia) in studied segment of the

artery. Positive reaction was when the brachial artery increased its diameter on 10% or more from baseline; smaller increase or its lack that corresponded vasoconstriction testified about the negative or paradoxical reaction. Statistical analysis was performed using software package STATISTICA 6.0.

Results and discussion

At the end of sanatorium session immediate positive trend was observed in all 43 adolescents passed rehabilitation. Average weight was 80.10 ± 3.20 kg initially and 75.37 ± 2.94 kg after 21 days of the sanatorium treatment; and 74.70 ± 3.29 kg after 3 months after rehabilitation.

Similar data are presented in the studies of Zhu Luyun (2006), which shows that adults with obesity during 2 years treated (diet, exercise, drugs that reduce body weight), body weight loss led to the restoration of impaired endothelial function [5].

Initially in adolescents with CEO we revealed endothelial dysfunction; increase in brachial artery diameter after cuff test was +1.64% on the average. During rehabilitation performing the cuff test we observed a significant increase in BA diameter after 3, 6 and 12 months that comprised 13.8%, 11.56%, 14.16% on the average correspondingly. In healthy adolescents increase of the diameter of the BA during the cuff test averaged 17.69% (Fig.2).

Endothelial function in adolescents with CEO in the dynamics of sanatorium treatment

	Adolescents with initial endothelial dysfunction, % (n = 43)	Growth of lumen diameter of brachial artery (%)	Adolescents with normal endothelial function in 3 months, %, (n = 33)	Growth of lumen diameter of brachial artery (%)
Adolescents with CEO	74,4%	+1,64%	63,7%	+13,80%
Healthy adolescents (n=33)	21,2%	+17,69%	78,8%	+17,69%
Reliability	7,920 P = 0,005	11,988 P = 0,000	—	0,133 P = 0,715

According to our data initial endothelial dysfunction was detected in 32 (74.4%) adolescents with CEO and the normal characteristic of endothelial function was revealed only in 11 (25.6%) adolescents. In healthy adolescents endothelial dysfunction occurred in 7 (21.2%) ($p \leq 0.005$), which may have been caused by children smoking (Table).

After 3 months of rehabilitation and weight loss endothelium dependent vasodilation has come to normal in more than half surveyed — 21 (63.7%) adolescents, after 6 months — in 20 (76.9%), after 12 months — in 26 (63.4%) patients (Fig.1).

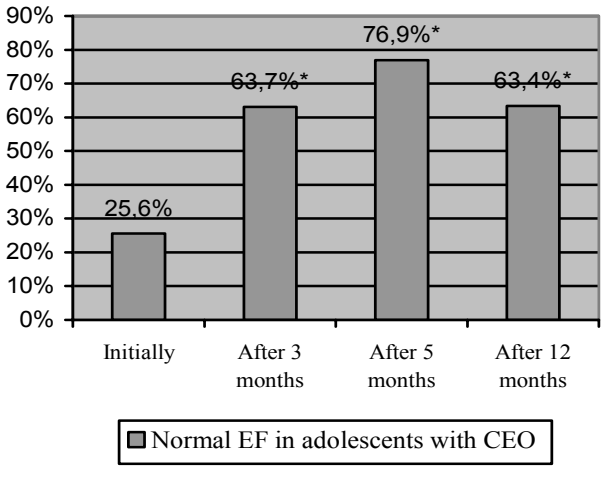

Fig.1 Adolescents with CEO with normal endothelial function in the dynamics of sanatorium treatment, %

Apparently regression of vascular remodeling in some adolescents with CEO occurred after the rehabilitation program and weight loss.

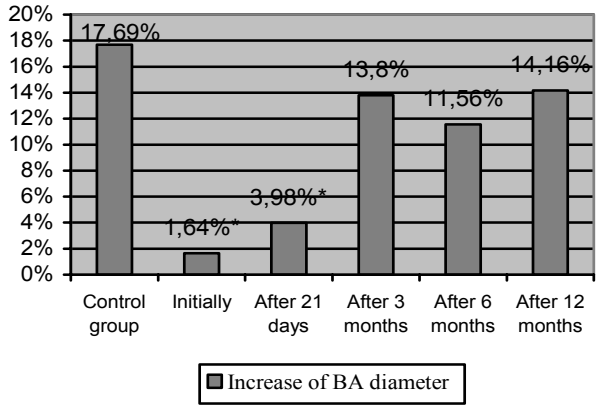

Fig. 2 Dynamics of endothelium dependent vasodilatation in adolescents with CEO in the period of rehabilitation and healthy adolescents

Thus in adolescents with CEO the restoration of endothelial function occurred with the best result after 6 months of rehabilitation.

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