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SOME HORMONAL, LIPID AND HAEMODYNAMIC MAINTENANCES OF ALTERNATIVE VEGETOTROPIC EFFECTS OF BALNEOTHERAPY ON SPA TRUSKAVETS'

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Abstracts

Background. The data on the influence of balneotherapy in the spa Truskavets' on the autonomic nervous system are ambiguous, so research in this direction remains relevant. The purpose of this study is accompanying changes in some hormonal, lipid and hemodynamic parameters in women with alternative variants of the vegetotropic effect of balneotherapy. **Materials and Methods.** The object of the study were 30 women aged 30-50 years old, patients with chronic cholecystitis in the remission phase, combined with polycystic ovaries and hyperplasia of the thyroid gland. Before and after balneotherapy, HRV was recorded and hormonal, lipid as well as veloergometric parameters were determined. **Results**. We confirmed the ambivalent nature of the vegetotropic effect of balneotherapy: sympathicotonic in 57% women and vagotonic in 43%. It is revealed the tendency to decrease testosterone level with sympathicotonic effect and the opposite tendency with vagotonic effect. There were no significant differences with respect to thyroid hormones, FSH, estradiol, prolactin and cortisol. Vagotonic but not sympathicotonic effect is accompanied by a tendency to decrease the coefficient of atherogenicity and the response of systolic blood pressure to standard physical load. **Conclusion.** Alternative vegetotropic effects of balneotherapy on spa Truskavets' are accompanied by alternative changes in the level of testosterone alone, but no other registered hormones as well as lipid and hemodynamic parameters.
Keywords: spa Truskavets', balneotherapy, women, HRV, hormones, lipids, hemodynamics.

INTRODUCTION

Previously it was shown that the course use of bioactive water Naftussya influences the autonomic nervous system of healthy rats of both sexes [18,19,24], children of both sexes

with dysadaptosis [17,19] and women with chronic endocrine-gynecological pathology [21,24-27] is ambiguous: it carries both vagotonic and sympathetic tonic effects, or does not significantly alter the vagal-sympathetic balance. Concomitant changes in some hormonal, metabolic and hemodynamic parameters are also ambiguous. On the other hand, the same variety has been found for thyrotropic effects of bioactive water Naftussya [2,4,5,9-16] as well as for changes in stress-index [23], hemodynamics, cholekinetics, gastric and pancreatic secretion [3]. So research in this direction remains relevant. The purpose of this study is accompanying changes in some hormonal, lipid and hemodynamic parameters in women with alternative variants of the vegetotropic effect of balneotherapy.

MATERIAL AND METHODS

The object of the study were 30 women aged 30-50 years old, patients with chronic cholecystitis in the remission phase, combined with polycystic ovaries who underwent rehabilitation course at the spa Truskavets'. At the arrival and after the completion of the three-week course of drinking bioactive water Naftusya (3,5 ml/kg for 1 hour before meals thrice a day), carried out vegetative, biochemical and veloergometric tests. The state of vegetative regulation is estimated by the HRV [1], using the hardware-software complex "CardioLab+HRV" (in the "KhAI-MEDICA", Kharkiv, Ukraine).

Biochemical tests included, firstly, the determination of the content of hormones in blood plasma: TSH, thyroxine, triiodothyronine, prolactin, FSH, estradiol, testosterone and cortisol (using the ELISA, the analyzer "Tecan", Oesterreich and the corresponding sets of reagents of Alkor Bio Co., Russian Federation [7]). Another set of tests related to the parameters of the lipid plasma spectrum: triglycerides and cholesterol of the lipoproteins of very low (VLD), low (LD) and high (HD) densities. The determination was carried out by means of reflectometry, using the apparatus "Reflotron" (BRD). Norms borrowed from literature [1,2,6,7,19,23,24,26].

Physical performance was estimated by the method of two-stage (load 0,5 and 1,5 W/kg) veloergometry. Veloergometer „Tunturi" (Finland) used.

The digital material is processed on a personal computer by the method of variation analysis using the program „Statistica 5.5".

RESULTS AND DISCUSSION

By orientation of the dynamics of the sympathic-vagal balance index (LF/HF), two groups of women subordinate to the vagotonic or sympathotonic vegetotropic effect of balneotherapy were retrospectively formed (Table 1).

Table 1. Features of hormonal status and its dynamics in alternative variants of vegetotropic effect of balneotherapy

Parameters	Term	Vegetotropic effect of balneotherapy		Norm
		Vagotonic (n=13)	Sympathotonic (n=17)	
LF/HF	Before After	6,5±0,9* 3,1±0,6*#	2,2±0,4v 5,0±0,7*#	1,5±0,1
TSH, mIU/L	Before After	4,36±0,67* 4,81±0,74*	6,21±0,77* 5,14±0,93*	1,90±0,15
Thyroxine, nM/L	Before After	96±10 107±12	93±10 96±9	110±4
Triiodothyronine, нМ/л	Before After	1,79±0,26 2,13±0,33	1,63±0,30 1,80±0,23	2,10±0,09
Prolactin, μg/L	Before After	15,9±2,9* 18,5±3,3*	14,9±2,6* 16,3±2,8*	8,4±0,5
FSH, IU/L	Before After	5,7±0,5 6,6±0,3	5,5±0,4 6,0±0,4	6,1±0,4
Estradiol, ng/L	Before After	94±8 96±12	97±9 93±10	115±8
Testosterone, μg/L	Before After	0,80±0,14* 1,00±0,14*	0,95±0,12* 0,80±0,16*	0,28±0,02
Cortisol, μg/L	Before After	198±10* 199±12*	196±11* 194±11*	165±8

Notes: 1. Parameters that are significantly different from normal are marked*.

2. Significant differences between the initial parameters of the groups are marked^{v}.

3. Significant differences between the endpoints and the starting points in each group are marked$^{\#}$.

First, we will analyze the features of the initial neuro-endocrine status and the dynamics of its parameters. In the first place, it was found that the examined contingent is characterized by hypothyroidism as a whole, as evidenced by the lower levels of triiodothyronine combined with elevated levels of TSH. Hypothyroidism in women with normal or slightly elevated sympatho-vagal index is slightly more pronounced than in women with significant sympathicotonia: T_3 level are 78% of the mean norm (MN) versus 85% of MN, while TSH level, on the contrary, is 327% of MN against 229% of MN.

Hypothyroidism is associated with an equally moderate increase in cortisol levels (up to 119% and 120% of MN) and equally pronounced hyperprolactinemia (177% and 189% of MN), while the initial levels of follicle stimulating hormone and estradiol are almost normal. The listed hormones are not subject to essential influence of balneotherapy, though it should be noted the positive dynamics of thyroid hormones and FSH in the direction of normalization, in conjunction with the subsequent increase in hyperprolactinemia. However, these trends are not related to the nature of the vegetotropic effect.

Instead, the level of testosterone, which is significantly elevated, is somewhat higher in normotonics (339% of MN) than in sympathotonics (286% of MN), the opposite changes with respect to the dynamics of the sympatho-vagal index. In particular, for the sympathetic effect, it decreases (by 16%), whereas for vagotonic it increases (by 23%).

The lipid plasma spectrum (Table 2) as a whole in the contingent is characterized by severe hypertriglyceridemia: 148% of MN in the euthonics and 167% of MN in the sympatotonics, and an increase in cholesterol in the composition of very low density lipoproteins (149% and 168% of MN) and its decrease in composition lipoproteins low (up to 85% and 92% of MN) and high (up to 82% and 84% of MN, respectively) density. As a

result, it gives an equally pronounced increase in the Klimov's atherogenicity coefficient - up to 138% of MN.

The sympathetic effect of balneotherapy is associated with the absence of the dynamics of lipid profile parameters; instead, for vagotonic effect the tendency toward growth of very low density lipoproteins cholesterol is 17% in combination with the opposite trend of low density lipoproteins cholesterol (-21%), which, even in the absence of the dynamics of the antiatherogenic fraction, leads to small (by 13%) reduction of the atherogenicity.

Table 2. Features of lipid plasma spectrum and its dynamics in alternative variants of vegetotropic effect of balneotherapy

Parameters	Term	Vegetotropic effect of balneotherapy		Norm
		Vagotonic (n=13)	Sympathotonic (n=17)	
Triglycerides, мM/L	Before After	2,10±0,16* 2,48±0,17*	1,86±0,14* 1,90±0,15*	1,26±0,04
Total cholesterol, мM/л	Before After	5,00±0,14 4,49±0,11*#	4,68±0,11* 4,64±0,11*	5,26±0,09
VLDL cholesterol, мM/L	Before After	0,69±0,05* 0,81±0,06*	0,61±0,05* 0,61±0,05*	0,41±0,01
LDL cholesterol, мM/L	Before After	3,04±0,14 2,39±0,12*#	2,81±0,11* 2,74±0,12*	3,32±0,07
HDL cholesterol, мM/L	Before After	1,28±0,04* 1,30±0,05*	1,26±0,05* 1,29±0,05*	1,53±0,02
Klimov's atherogenicity coefficient	Before After	3,07±0,15* 2,66±0,13*#	3,06±0,16* 2,86±0,14*	2,21±0,03

The analysis of hemodynamic parameters (Table 3) shows that women subordinate to the vagotonic effect of balneotherapy are characterized by slightly higher initial levels of systolic and diastolic pressure at rest and after bicycle ergometric loading of 1,5 W/kg compared to women subordinate to sympathetic effect.

Table 3. Changes in hemodynamics in alternative variants of vegetotropic effect of balneotherapy

Parameters	Term	Vegetotropic effect of balneotherapy	
		Vagotonic (n=13)	Sympathotonic (n=17)
Systolic blood pressure at rest, mmHg	Before After	125±4 123±2	119±4 119±3
Diastolic blood pressure at rest, mmHg	Before After	81±2 79±1	76±2 V 76±1
Systolic blood pressure after loading, mmHg	Before After	147±4 135±3#	142±4 140±4
Diastolic blood pressure after loading, mmHg	Before After	88±2 81±2#	79±2 V 82±3
Heart rate after at rest, beats/min	Before After	85,7±2,9 76,8±3,1#	65,0±2,9v 75,6±4,1#
Heart rate after loading, beats/min	Before After	129±3 138±4	135±4 133±3
Tachycardic-hypertensive reaction index, μW/kg•beat•mmHg	Before After	77,7±4,2 80,6±4,2	78,4±4,1 80,1±4,4

The difference in heart rate is especially noticeable at rest, but tachycardic responses to load are not significantly different. The sympathetic effect of balneotherapy is expected to be

accompanied by an increase in heart rate at rest at 16%, but the tachycardia response to exercise remains unchanged, as well as parameters of arterial pressure at rest and after loading. Instead, the vagotonic effect is associated with a 10% reduction in heart rate at rest, in combination with an increase of 7% after exercise, with a systolic pressure decrease of 8% and a diastolic decrease of 8% as well. The index of tachycardic-hypertensive response to a load of 1,5 W/kg, proposed by IL Popovych for the assessment of physical ability [3,4], remains unchanged in both groups.

CONCLUSION

Alternative vegetotropic effects of balneotherapy on spa Truskavets' are accompanied by alternative changes in the level of testosterone alone, but no other registered hormones as well as lipid and hemodynamic parameters.

ACCORDANCE TO ETHICS STANDARDS

This study was approved by the local ethical committee of Truskavets' Scientists Assotiation. Tests in patients are conducted in accordance with positions of Helsinki Declaration 1975, revised and complemented in 2002, and directive of National Committee on ethics of scientific researches. During realization of tests from all participants the informed consent is got and used all measures for providing of anonymity of participants. For all authors any conflict of interests is absent.

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