The Comparative Analysis of the Effectiveness of Traditional and Optimized Complex of Drug-Free Treatment of Patients with Isolated and Combined Pathology of the Cardiovascular System and Metabolism

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Received January 14, 2014; Revised February 18, 2014; Accepted February 27, 2014

Abstract In the Sochi sanatoriums, 609 patients with coronary heart disease, hypertensive disease, diabetes, metabolic syndrome and various combinations of these diseases were examined. The traditional and optimized medical complexes were used. The optimization implied the joining balneotherapy and climate therapy, therapeutic physical training and diet therapy, bioresonance therapy, “Magnerot” medicinal product, hypoxytherapy, hypercapnotherapy, “Arfazetin” herbal tea and “Chvizhepse” mineral water. The studies have shown that the use of optimized treatment program is more efficient, than the traditional one for patients of all groups.

Keywords: optimized drug-free treatment, combined pathology, cardiovascular diseases, metabolic diseases


1. Timeliness

Currently, Russia is high on the world list concerning the cardiovascular mortality rate, first of all, coronary heart disease and cerebral stroke [8]. Only the registered cases of cardiovascular diseases in Russia include now 16.2 million people. In 2006, 56.9% in our country are included in the structure of total mortality from circulatory diseases, among them coronary heart disease - 49.3%, cerebrovascular disease - 35.3% [3].

Arterial hypertension is the most important factor that initiates the cascade of cardiovascular continuum. According to the survey data conducted within the framework of the target Federal program – “Prevention and Treatment of Arterial Hypertension in the Russian Federation,” the prevalence of arterial hypertension among the population in 2009 was 40.8 % (men - 36.6%, women - 42.9%). The hypertensive patients’ awareness of disease presence makes 83.9-87.1%. 69.5% of hypertensive patients take antihypertensives, among them 27.3% are effectively treated and only 23.2 % of patients control the arterial tension at the target level [5].

Lipid storage diseases are one of the most important risk factors for atherosclerosis. Relatively recently, hypercholesterolemia played the main role in the development of atherosclerosis, but then, as a result of clinical and epidemiological researches, convincing proofs of the fact that any hyperlipidemia can contribute to the emergence and further development of atherosclerosis of arteries were provided. Thus, for example, hypoalphacholesterolemia is an independent risk factor of coronary atherosclerosis and myocardial infarction or sudden death. Hypertriglyceridemia in combination with the low level of high-density lipoprotein cholesterol is a form of dyslipidemia, which is often found in patients with metabolic syndrome and type 2 diabetes [2].

Prevalence progression of diabetes worldwide has grown into an “infectious epidemic”. According to the World Health Organization experts’ forecasts, the number of patients with diabetes should increase - from 1997 to 2025 - from 143 to 380 million people. Cardiovascular mortality is 3 times higher among individuals with diabetes, than among the general population [7].

The interest in the metabolic syndrome problem has been steadily increasing recently. First, this is due to the wide spread of this syndrome (up to 30 % of the population). Secondly, the clinical significance of metabolic disorders, combined within the syndrome, is that their combination is associated with a high risk of developing cardiovascular diseases and non-insulin dependent diabetes mellitus [7].

According to modern concepts, insulin resistance and hyperinsulinemia, which is associated to it, form the basis of all metabolic syndrome manifestations. Abdominal obesity can be the cause of metabolic syndrome development, and insulin resistance in this case will be the
result of competition of free fatty acids and glucose for entering the cell. On the other hand, insulin resistance by means of hyperinsulinemia promotes development and progression of abdominal obesity.

Thus, the undeniable strong correlation between changes of lipid, carbohydrate metabolism and arterial hypertension with the occurrence and progression of atherosclerosis of arteries is the main cause of myocardial infarctions and cerebral strokes, the main culprits of population mortality. The prevalence of these pathological states and their common compatibility in intra-patients lead to comorbidity and potentiation of pathological action of these diseases.

However, the impact on cardiometabolic pathology only by medicinal means is not highly effective. A comprehensive and systematic approach to the prevention and treatment of these pathological states at all stages of cardiometabolic continuum is required. Search for new, more effective complexes of drug-free treatment of coronary heart disease, hypertensive disease, non-insulin dependent diabetes mellitus, metabolic syndrome and their combinations still proceeds.

The research aim was to study the effectiveness of traditional and optimized sanatorium-and-spa treatment complexes in patients with coronary heart disease, hypertensive disease, non-insulin dependent diabetes mellitus, metabolic syndrome in the presence of monopathy and various combinations of these diseases.

2. Research Methodology

The study involved 609 patients of the Sochi sanatoriums aged from 49 to 68 years (middle age - 59.6 years), among them 466 men and 143 women with coronary heart disease, hypertensive disease, non-insulin dependent diabetes mellitus and metabolic syndrome, or combinations of these diseases. 83.8 % of patients with coronary heart disease had changes of lipid metabolism, 92% of patients with diabetes were overweight or obese.

Patients were divided into the following randomized groups by nosological states and age:

- groups of patients with monopathy (n = 148) - coronary heart disease (group 1) (n = 43); arterial hypertension (group 2) (n = 52); metabolic syndrome (group 3) (n = 34); non-insulin dependent diabetes mellitus (group 4) (n = 19);
- groups of patients with combined pathology (n = 461) - coronary heart disease and arterial hypertension (group 5) (n = 143); coronary heart disease and metabolic syndrome (group 6) (n = 137); coronary heart disease and diabetes (group 7) (n = 92); arterial hypertension and diabetes (group 8) (n = 89).

The existence of a stable effort angina and/or painless myocardial ischemia, verified by means of imaging or functional techniques, forms the criteria for inclusion in group 1. The functional class of angina I made 82%, the functional class of angina II – 15%, painless myocardial ischemia without angina – 3%.

The figures of clinical arterial blood pressure > 140/90 mm Hg, recorded at numerous measurements, and/or the figures of average daily arterial blood pressure during 24-hour blood pressure monitoring > 130/80 mm Hg form the criteria for inclusion in group 2. The study included 12 % of patients with arterial hypertension degree I and 88% – degree II.

The indicators of fasting venous blood glucose > 6.1 mmol/L, identified at repeated determination, form the criteria for inclusion in group 3.

The main feature presence of visceral obesity (waist circumference > 80 cm for women and > 94 cm for men) and the minimum of 2 additional features (arterial blood pressure > 140/90 mm Hg; triglycerides > 1.7 mmol/L; high-density lipoproteins <1.0 mmol/L for men and 1.2 for women; low-density lipoproteins > 3.0 mmol/L; fasting plasma glucose > 6.1 mmol/L; plasma glucose 2 hours after a 75-g oral glucose load between > 7.8 and < 11.1 mmol/L) form the criteria for inclusion in group 4.

The stable effort angina of functional class III-IV, unstable angina, myocardial infarction, arterial hypertension degree III, crisis course of arterial hypertension, cerebral stroke, diabetes decompensation, revascularization heart surgery, traumas and oncological diseases are considered the criteria for exclusion in groups, since they are contraindications for directing patients to balneo-climatic sanatoriums (within the first year after the surgery or disease occurrence).

According to treatment methods, all 609 surveyed were divided into three equal groups of 203 persons.

Patients of (control) group I: coronary heart disease (n = 15); arterial hypertension (n = 17); metabolic syndrome (n = 12); diabetes (n = 6); coronary heart disease and arterial hypertension (n = 46); coronary heart disease and metabolic syndrome (n = 43); coronary heart disease and diabetes (n = 33); arterial hypertension and diabetes (n = 31).

Patients of the control group received the background therapy, including Pevsner’s diet (No. 8 for patients with metabolic syndrome, No. 9 - diabetes, No.10 - coronary heart disease and arterial hypertension; the diet therapy was administered according to the underlying disease for patients with combined pathology), climate therapy and exercise therapy (according to training, sparing-training or dose-sparing regimen depending on age, exercise tolerance and severity of clinical manifestations), rational psychotherapy. According to indicators, balneotherapy was prescribed to 67.5% of the surveyed patients – sulfated hydrogen, radon, ozone or iodine-bromine baths.

Patients of group II: coronary heart disease (n = 20); arterial hypertension (n = 15); metabolic syndrome (n = 10); diabetes (n = 7); coronary heart disease and arterial hypertension (n = 46); coronary heart disease and metabolic syndrome (n = 38); coronary heart disease and diabetes (n = 35); arterial hypertension and diabetes (n = 32). They received the modified treatment, which is a combination of background therapy, bioresonance therapy and usage of “Magnerot” medicinal product. Magnerot (magnesium and orotic acid preparation, 1 tablet - 500 mg) was administered as 2 tablets 3 times a day during the first week and then - 1 tablet 3 times a day.

Patients of group III: coronary heart disease (n = 8); arterial hypertension (n = 20); metabolic syndrome (n = 12); diabetes (n = 6); coronary heart disease and arterial hypertension (n = 51); coronary heart disease and metabolic syndrome (n = 56); coronary heart disease and diabetes (n = 24); arterial hypertension and diabetes (n = 26). These patients received the enhanced modified treatment. That is, except for the modified treatment,
patients with coronary heart disease, which prevailed in the clinic, were treated with normobaric interval hypoxotherapy (“Mountain Air”); patients with the prevalence of arterial hypertension – hypercapnotherapy (dry carbon dioxide baths), patients with diabetes – “Arfazetin” herbal tea, patients with metabolic syndrome – “Chvizhepse” Sochi mineral water.

Bioresonance therapy was carried out by means of the “MORA Super Bipolar” device. The essence of MORA-therapy method consists in the differentiation of physiological and pathological oscillations of biological media and redemption of pathological electromagnetic waves, which are present in the patient’s body.

Magnesium in a body has a lot of clinical effects: anti-ischemic, antiarrhythmic, antispasmodic, antianginal. Magnesium as a natural physiological calcium antagonist is of particular interest. Anti-ischemic and antiarrhythmic effects, associated primarily with magnesium and calcium antagonism, are the basis of preventive action of magnesium preparations concerning the development of reperfusion syndrome, during the treatment of various forms of coronary heart disease. The combination of magnesium and orotic acid summarizes and mutually potentiates their positive qualities as orotic acid is an active metabolic agent, which ensures the stability of colloidal state of cholesterol, contributes to intracellular magnesium fixation, and provides the synthesis control of pyrimidine bases and through them – of nucleic acids [6].

According to V.V. Ivanov and G.A. Nevraev’s classification, the “Chvizhepse” mineral water refers to carbonic arsenical waters of low salinity (1.6-2.3 g/l) of hydrocarbonate and sodium-calcium type, slightly acidic, cold. Carbon dioxide and arsenic have a major therapeutic effect when dealing with metabolic syndrome. The action of the arsenic active element, which is involved in metabolism and affects the rate of fermentation processes of tissue respiration, is added to the vasodilating effect of carbon dioxide.

“Arfazetin” is a packaged herbal tea, which has a regulating effect on carbohydrate metabolism (hypoglycemic effect). It consists of bilberry shoots, bean fruit shells, Eleutherococcus rhizomes and roots, rosehips, field horsetail herbs, St. John’s wort herbs and chamomile flowers. One should use 1 cup of brewed drink 2-3 times a day before meals, in warm or cold form.

Hypercapnotherapy method by means of dry carbon dioxide baths is based on carbon dioxide penetration through the skin. Dry carbon dioxide baths increase the content of carbon dioxide in the alveolar air and blood, affect the sympathetic and parasympathetic nervous system, significantly reduce the level of adrenaline and noradrenaline in the myocardium, promote the formation of biologically active agents, stimulate the central nervous system, and significantly change the hemodynamics. The expansion of peripheral blood vessels occurs due to the influence of dry carbon dioxide baths, thus involving the redistribution of blood in tissues and organs [1]. The carbon dioxide is also a powerful natural antioxidant.

The method of intermittent normobaric hypoxotherapy consists in breathing gas mixture with the reduced oxygen content (10-18 %) at a pressure equal to the atmospheric one within 50-60 minutes in a fractional and cyclic mode (5 minutes of breathing the mixture, 5 minutes of breathing the atmospheric air). The time of one cycle and the oxygen concentration are chosen by the doctor, usually in ascending (training) mode. 15-30 daily procedures per course of treatment. In this case, a large number of self-regulation mechanisms are initiated in the body. The indicators of tissue respiration and metabolic processes are improved, and the nonspecific immunity is increased [4].

All patients with the verified diagnosis received the drug therapy, which was selected at the pre-sanatory stage: angiotensin-converting enzyme inhibitors or sartans, statins or fenofibrate, aspirin, metformin, beta-blockers and calcium antagonists. The adequately selected drug therapy wasn’t changed throughout the course of sanatorium-and-spa treatment.

For results’ objectification at the beginning and at the end of sanatorium-and-spa treatment, all patients were subject to the following examination: filling in the specially designed questionnaire concerning the anamnestic data and complaints, the WAM test card (wellbeing, activity, mood), the definition of adaptation possibilities according to Garkavi - Kvakina - Ukolova technique (comparative assessment of the number of lymphocytes and segmented neutrophils), electrocardiography, Doppler echocardiography, ultrasound investigation of arteria carotises, treadmill test, 24-hour blood pressure monitoring, 24-hour electrocardiographic Holter monitoring, anthropometric measures (body weight, waist circumference, body-weight index), clinical blood and urine analysis, lipid panel (total cholesterol, triglycerides, low-density lipoproteins, very low-density lipoproteins, high-density lipoproteins, the Atherogenic Index), blood glucose, glycated hemoglobin and oral glucose tolerance test, fibrinogen, uric acid, creatinine.

The content of total cholesterol and triglycerides were determined with the help of the fermentation method; the high-density lipoproteins – with the help of the flotation method by means of the Cormay Plus device. The level of very low-density lipoprotein was determined as triglycerides / 2.2. The level of low-density lipoprotein was calculated by the Friedewald formula: HDL cholesterol = total cholesterol - (HDL cholesterol + triglycerides / 2.2); the fasting blood glucose concentration; the oral glucose tolerance test – by means of the “Biosen 5030” analyzer; glycated hemoglobin – by means of the “DCA 2000 tm” analyzer; fibrinogen – by means of the “Cormay KG-1” double-channel optical coagulometer; creatinine and uric acid – by means of the biochemical analyzer.

Using the electrocardiography (“BIOSET-8000” – Switzerland and “Fukuda Denshi” – Japan) and 24-hour electrocardiographic monitoring (JNDHEM-AD-24 – Japan), we identified the episodes of myocardial ischemia, heart rhythm and conduction disorders. The myocardium visualization, identification of its systolic and diastolic functions, left ventricular hypertrophy and intima-media complex thickness (or the presence of atherosclerotic plaques) were performed using the ALOKA SSD 1400 (Japan) Doppler echocardiography according to the common method in the M-modal and B operating modes by means of the ultrasonic transducer with a frequency of 3.5 MHz. In addition, the echocardiography was performed by means of the “SONOS-4500” (USA) ultrasound system. Myocardial ischemia during stress and exercise tolerance were detected using the treadmill test and cycle ergometry (Kettler “Ex-1” (Germany) with the electrocardiography registration on cardioanalyzer of the “Medicom Ltd” (Taganrog) firm, or with the use of load
testing system of the “SHILLER” AT-104 firm with the “treadmill”). The clinical, outpatient and 24-hour blood pressure were determined.

The statistical analysis of the research results was performed using the “Statistica” computer program; the standard statistical characteristics were determined to assess the quantitative indicators: the mean value (M) and the standard error (m). The comparison of samples was performed using the Student’s t-test. The critical level of significance of differences between samples (p) was assumed to be equal or less than 0.05.

3. Research Results

At the beginning of the research, the average body weight of all groups of patients ranged from 86 to 92 kg. The following dynamics took place during the observation and treatment period: group I – increase in body weight from 86.1 to 97.2 kg; group II – decrease from 87.3 to 86.3 kg; group III – decrease from 91.1 to 89.3. Similar results were observed when assessing other anthropometric data. More significant positive changes have occurred in the groups with metabolic syndrome and non-insulin dependent diabetes mellitus.

According to the blood pressure data analysis, which was obtained by 24-hour blood pressure monitoring and clinical blood pressure measurement during the observation period, we have found out the reduction of this indicator in groups II and III and insignificant dynamics in group I. The average arterial pressure in group II at the beginning of the research – 114.3 mm Hg, at the end of the research – 109.7; in group III – 110.7-99.8; in group I – 111.3-110.0. More significant positive changes have occurred in the groups with the metabolic syndrome and diabetes, and the arterial hypertension and metabolic syndrome.

The electrocardiography and electrocardiographic Holter monitoring were used to study the myocardial ischemia. The determination of load power and amount of work completed was carried out by means of the treadmill test or cycle ergometry. The obtained data show the increase of load power in patients groups II and III, respectively, from 82 to 86 W and from 83 to 91 W, and less significant improvement of this indicator in group I – from 84 to 85 W.

Fixation of myocardial ischemia episodes during the 24-hour electrocardiographic monitoring produced the following results at the beginning and at the end of the research: group III – 0.4-0 (the average number of ischemia episodes per person); group II – 0.5-0.2; and group I – 0.2-0.1. The decrease in myocardial ischemia in all groups, mainly due to the drug therapy, was traced. The anti-ischemic effect increased in the groups, where the physical therapy (especially enhanced modified therapy) was optimized.

The dynamics of glycated hemoglobin percentage in all groups during the observation period wasn’t changed significantly, since it is a prolonged indicator: group I – 6.68-6.49; group II – 6.53-6.15; group III – 6.92-6.51.

The creatinine level increase is a marker of renal dysfunction, a predictor of target organ lesions and, therefore, a valuable diagnostic criterion. We recorded the following dynamics of this indicator in patients of all groups (mmol/L): group I – 90.1-88.2; group II – 86.5-83.5; group III – 101.8-95.3 that indicates a greater efficiency of the proposed modified complexes of drug-free therapy.

The integral indicator of plasma lipoprotein atherogenicity – the Atherogenic Index has changed as follows: group I – 4.78-4.82; group II – 4.71-3.82; group III – 4.43-2.86. Our observations have shown that the proposed programs of optimized treatment affect the blood lipids better, than the traditional ones.

Thus, the use of bioresonance therapy, magnesium preparation, hypercapnotherapy, hypoxytherapy, herbal medicine and internal use of mineral water increases the efficiency of traditional sanatorium-and-spa treatment of patients with cardiovascular and metabolic disorders.

In our opinion, it is advisable to recommend the effective modified techniques to widespread use in health resorts.

4. Conclusions

1. According to subjective and objective data, in sanatorium conditions the course of combined therapeutic pathology is more severe and is worse treated, than the isolated one.

2. The greatest effect from application of the modified and enhanced modified treatment complexes was observed in groups of patients with metabolic syndrome, arterial hypertension and non-insulin dependent diabetes mellitus and with a combination of arterial hypertension and diabetes (P<0.01).

3. The modified technique of sanatorium-and-spa treatment is more effective, than the background therapy in all groups (P<0.05).

4. Bioresonance therapy, magnesium preparation and orotic acid are effective in patients of all groups, i.e. have nonspecific positive effect on patients with cardiovascular and metabolic disorders.

5. The enhanced modified technique of sanatorium-and-spa treatment is more effective, than the technique of modified therapy in all groups (P<0.01).

References