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BASICS OF MEDICAL REHABILITATION IN CARDIOLOGY

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МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
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КАФЕДРА МЕДИЦИНСКОЙ РЕАБИЛИТАЦИИ И ФИЗИОТЕРАПИИ

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ОСНОВЫ МЕДИЦИНСКОЙ РЕАБИЛИТАЦИИ В КАРДИОЛОГИИ

BASICS OF MEDICAL REHABILITATION IN CARDIOLOGY

Учебно-методическое пособие

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Освещены общие положения оценки функционального состояния пациентов с сердечно-сосудистыми заболеваниями по критериям, рекомендуемым ВОЗ, обоснование использования средств медицинской реабилитации в кардиологии с позиций доказательной медицины.

Предназначено для студентов 6-го курса медицинского факультета иностранных учащихся, обучающихся на английском языке по учебной дисциплине «Физиотерапия и медицинская реабилитация».

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LIST OF ABBREVIATIONS

AH — arterial hypertension

CHD — coronary heart disease (IHD — ischemic heart disease)

BMI — body mass index

VO2 max — maximum oxygen consumption (MPC)

CO-Cardiac Output — minute volume of blood flow (IOC)

SVR — total peripheral vascular resistance

HI — heart index (ratio of CO to body surface area)

CVD — cardiovascular diseases

CHF — chronic heart failure

ET — exercise tolerance

FC — functional class

SO — systolic output

EF — Ejection Fraction

HR — Number of Heartbeats

ICF — International Classification of Functioning. Disability and Health

ICIDH — International Classification of Impairment Disability and Handicap

MET — the number of metabolic units (the multiplicity of increase in O_2 consumption at the height of the load compared to the rest level)

MI — Myocardial Infarction

MU — metabolic unit (oxygen consumption while sitting per unit of time per unit of mass — 3.5 ml O_2 / min / kg)

PWC — physical performance

INTRODUCTION

Cardiovascular disease (CVD) is a leading contributor to global mortality and morbidity. Internationally, it is responsible for approximately one-third of all annual deaths, with mortality rates ranging from 20 % to 50 % in high-income countries. Every year 4 million people die from cardiovascular diseases in Europe. More women die (2.2 million — 55 %) than men (1.8 million — 45 %), although before the age of 65, mortality from cardiovascular diseases is higher

among men (490,000 vs. 193,000). Secondary prevention and rehabilitation can improve the quality of life of patients after the first CVD event, despite the high risk of relapse.

Rehabilitation of patients with cardiovascular diseases is an active process of realizing their capabilities (physical, psychological, professional, educational, and recreational) within the framework of disorders caused by the disease, environmental restrictions and desires.

MOTIVATIONAL CHARACTERISTIC OF THE THEME

The total time of the lesson is 7 hours.

The teaching aid provides material on the medical rehabilitation of patients with cardiovascular diseases.

The topic is intended for study by 6th year students of the Medical Faculty for International Students within the discipline “Physiotherapy and Medical Rehabilitation”.

The need to publish this educational and methodological manual is determined by the fact that the medical rehabilitation of patients with cardiovascular disease is an essential part of the protocol for the management and observation of persons in this category. Although doctors know the means and methods of medical rehabilitation, their appointment is not always justified due to a lack of understanding of the points of application of the action of these means from the standpoint of the fundamental concept of rehabilitation — the concept of the consequences of diseases.

The publication of this educational and methodological manual is also necessary due to the lack of textbooks on medical rehabilitation with a section on assessing the functional state of cardiac patients.

The purpose of the lesson: assessment of the functional state of patients with cardiovascular diseases and choosing medical rehabilitation program for people in this category.

Lesson objectives:

– be able to learn to determine the most informative methods for assessing the functional capabilities of patients with cardiovascular pathology;

– master the specifics of assessing the functional state of patients with cardiovascular diseases;

– be able to evaluate the data of stress tests, interpret the test of individual ET (PWCmax), the results of the 6-minute walk test;

– be able to estimate the readiness of patients to actively participate in the rehabilitation process;

– be able to describe the main means of medical rehabilitation for this category of people and their application;

– be able to explain the mechanism of action of the main means of rehabilitation used in cardiology.

Requirements for the initial level of knowledge. To fully master the topic, the student should repeat:

– from the course of normal physiology: physiology of the cardiovascular system and muscle activity;

– from the course of biochemistry: lipid metabolism;

– from the internal diseases: main diseases of the cardiovascular system, their clinical classifications, pathogenesis and treatment.

Control questions from related disciplines:

1. What is physical performance?
2. Systems that limit physical performance.
3. Factors determining venous return of blood to the heart.
4. Reserves of oxygen supply to organs and tissues.
5. Modes of muscle contraction.
6. Classification of physical exercises depending on the modes of muscle contraction, the mechanisms of energy supply of muscle activity and the intensity of physical activity.
7. Lipid metabolism.
8. Functions of the heart and blood vessels.
9. Classifications of CHF, CHD, AH.
10. Classification of CHF according to NYHA, taking into account the distance of a 6-minute walk.
11. Pathogenesis of atherosclerosis.
12. Hemodynamic changes in hypertension.
13. Treatment of coronary heart disease, hypertension and CHF (groups of drugs used, their mechanism of action in terms of rehabilitation).

Control questions on the topic of the lesson:

1. According to the ICIDH model, what type of disorders are functional disorders in cardiovascular diseases?
2. What methods of functional diagnostics are used in cardiology?
3. What stress tests are used in cardiology to assess the function of the cardiovascular system?
4. Describe the main indicators of the PWCmax test protocol.
5. What are the criteria for assessing the functional state of patients with cardiovascular diseases?
6. What aspects (categories) of vital activity are affected in patients with cardiovascular diseases?
7. Describe 1 FC of the consequences of cardiovascular diseases according to the ICIDH model.
8. Describe the 2 FC of the consequences of cardiovascular diseases according to the ICIDH model.
9. Describe the 3 FC of the consequences of cardiovascular diseases according to the ICIDH model.

10. Describe the 4 FC of the consequences of cardiovascular diseases according to the ICIDH model.

11. Clinical rationale for the use of medical rehabilitation in cardiovascular diseases.

12. Means of medical rehabilitation in cardiology.

13. Effect of aerobic dynamic load on the body.

14. Rationale for the use of psychotherapy in cardiology

15. The mechanism of action of diet therapy in cardiology.

16. The mechanism of action of training on hypoxia in cardiology.

CONTENT

Basic provisions of cardiac rehabilitation:

– rehabilitation should start as early as possible, be continuous and last until the end of life;

– the patient must actively participate in the rehabilitation process and be aware of his role in achieving the optimal result;

– rehabilitation should be aimed at preventing complications and exacerbations of the disease;

– for each patient, the rehabilitation program must be individual.

Goals of cardiac rehabilitation:

– improvement or complete restoration of function of the cardiovascular system;

– improvement o of the patient's life activity, reduction of his unjustified disability; providing an opportunity to return to fulfilling a useful and personally satisfying role in society;

– improving the quality of life of each patient.

EVALUATION OF THE FUNCTIONAL STATE OF CARDIAC PATIENTS

In contrast to the etiopathogenetic orientation of the treatment of patients of any profile, rehabilitation (including medical) is an active process of reducing the consequences of diseases and injuries. When assessing them, the ICIDH-I and ICF(ICIDH-II) models are used (disease-functional disorders-limitations of life activity-social insufficiency) (WHO, 1980, 2001). Medical rehabilitation is the restoration of the function of an organ or system after past or congenital diseases and injuries.

All patients with cardiovascular diseases have the same consequences. In relation to them, the same methods of assessing the functional state and methods of rehabilitation are used. There are special criteria for assessing the functional state only for the patient with myocardial infarction in the acute phase of rehabilitation.

According to the ICF model, the following dysfunctions of the cardiovascular system are provided.

Functions of the cardiovascular, blood, immune and respiratory systems

Functions of the cardiovascular system (b410 – b429):

b410 Functions of the heart

b415 Functions of blood vessels

b420 Blood pressure functions

b429 Functions of the cardiovascular system, other specified and unspecified

Additional functions and sensations from the cardiovascular system:

b455 Exercise tolerance functions

The integral function of the heart is pumping, that is, the heart as a pump must provide exchange requests at rest and during exercise. The pumping function of the heart is ensured by the correct successive contractions of the atria and ventricles due to the functions of automatism, excitability, conduction and contractility. The pumping function of the heart is characterized by several indicators. One of the most important indicators of the work of the heart is the minute volume of blood circulation.

CO — is the volume of blood being pumped by the heart ventricles in a minute. The CO of the left and right ventricles is the same. CO is an integral indicator of the work of the heart, depending on the value of systolic volume (it, in turn, is determined by the contractility of the heart muscle — the amount of blood ejected by the heart in one contraction), heart rate, preload and after load (SVR). The ratio of the two main indicators of hemodynamic determines its type. So, the hyperkinetic type is characterized by the highest CO and low SVR, the eukinetic type is characterized by moderately increased CO and SVR, the hypokinetic type is characterized by low CO and increased SVR. Loss or decrease in the pumping function of the heart (i.e., providing a certain cardiac output of smaller exchange requests) — heart failure (acute or chronic). Consequently, the assessment of the pumping function of the heart is carried out according to physical performance, i.e. according to the power of the load, at which signs of its (load) intolerance appear. Physical performance depends on many factors, but in healthy individuals and patients with cardiovascular diseases, it is limited by the functional state of the cardiovascular system. To assess physical performance (=pumping function of the heart), exercise tests are used: PWCmax test, VO2max test, 6-minute walk test. In this case, the following methods of functional diagnostics are used: ECG (ECG exercise tolerance test), Echo-CG (stress echocardiography), and myocardial scintigraphy (with exercise). The New York classification of chronic heart failure is based on the same principle.

The severity of the consequences of diseases of the cardiovascular system can be different: from small to very significant, which is determined by the functional class.

When assessing the severity of functional disorders, five functional classes were identified:

– FC 0 — no violations;
– FC 1 — 25 % loss of function;
– FC 2 — 26–50 % loss of function;
– FC 3 — 51–75 % loss of function;
– FC 4 — more than 75 % loss of function or its complete absence.

In medical and social expertise and rehabilitation, for many categories of patients, special criteria have been developed for assessing dysfunctions of various organs and systems.

According to the ICIDH model, functional disorders can lead to disorders at the level of the whole organism (disability). The degree of disability is also ranked according to the five functional classes. In persons with diseases of the cardiovascular system, the following aspects of life are more likely to suffer: mobility, self-care (physical independence), ability to work, in children — the ability to learn.

Mobility is the ability to move efficiently in one's environment. It is assessed by the distance that a person can move, the pace of movement and the nature of the gait, the need for outside assistance when moving, the possibility of using transport and medical and technical means. FC 0 — no mobility impairments. FC 1 — slight mobility restriction. It remains possible to move long distances with a slight slowdown in the pace of walking, a slight change in gait, the need to use simple medical and technical means (cane, orthopedic shoes) or medicines that completely restore motor skills. The use of transport is not limited. FC 2 — moderate mobility disorders — restriction of movement by the area of residence (1.5–2 km.), slow pace of walking, a clear change in gait, the use of more complex assistive devices (functional types of prostheses, orthoses), incomplete medical correction of impaired functions. The use of transport is difficult, but possible without assistance. FC 3 — significant limitation of mobility — movement within 0.5 km, a sharp change in gait and pace of walking, the need to use complex mobility aids (crutches, walkers, lower limb prostheses) or wheelchairs. The use of public transport without outsiders is impossible; the use of personal transport is difficult. FC 4 — a sharp restriction or complete loss of mobility — restriction of movement outside housing, chair or bed. Mobility outside the home is possible only with the use of the main means of transportation (wheelchair) or with assistance.

Physical independence is the ability of a person to take care of himself, to effectively exist independently in the environment without the help of outsiders. It is assessed by the need for outside assistance in meeting regulated and unregulated needs, the intervals at which such need arises, the possibility of correction by adapting the premises, aids. Regulated needs are daily household needs: shopping in the store, cooking, washing, cleaning, and using household appliances, locks, taps, switches, phone. Unregulated needs are personal hygiene (shaving, washing, brushing teeth, and makeup), eating, dressing, and physiological func-

tions. FC 0 — complete independence in daily activities. FC 1 — mild physical dependence — this is the need for a small outside assistance in the implementation of regulated needs (minor repairs, general cleaning, large hand washing) or full compensation with the help of small technical means. FC 2 — moderate physical dependence this is the need for episodic (1–2 times a week) assistance from other persons in the implementation of one or more regulated needs (for example, the use of individual household appliances) or the use of technical means and devices that greatly facilitate self-care (for example, adaptive devices for the regulation of excretory functions) or housing adaptation. FC 3 — a significant limitation of physical independence — this is the need for systematic assistance from other people once a day and less often in meeting several or many regulated needs (purchasing food, cleaning, heating, using some household appliances) or partial compensation for physical dependence with the help of technical means and devices. FC 4 — pronounced or complete physical dependence — this is the need for the help of outsiders in meeting unregulated needs at short (every few hours) or critical (less than a few hours) intervals or constantly. In addition, this is a partial compensation for the ability to self-service with the help of technical means, if a person cannot use them without external assistance (for example, the inability to move independently into a wheelchair).

The ability to learn is the ability to perceive, assimilate and save up the transferred knowledge, to generate experience and skills. This is one of the most important integrative forms of life. It has the greatest social significance in childhood, equivalent to a violation of the ability to work in adults. Assessed by the possibility of studying in a general education (special) school or at home, the volume of training in the program of a general education or special school, the duration of training, the need to use special teaching aids. FC 0 — no restrictions in obtaining education. FC 1 — a slight limitation of the ability to learn — this is the possibility of studying in a regular educational institution if it is necessary to temporarily exempt from certain subjects (according to the conclusion of the MCC), periodic non-attendance of classes due to exacerbations or the need for a course of treatment, the use of simple technical means. FC 2 — moderate limitation of the ability to learn — this is studying in a regular educational institution with the regular use of complex technical means or studying in a special class of a general education school with the usual term of study or its slight extension (by 1 year). FC 3 — a significant violation of the ability to learn — this is the possibility of studying only in special boarding schools using special techniques, methods and teaching aids and a significant lengthening of the training period, reducing the program, as well as homeschooling (regardless of the volume of the program). FC 4 — the impossibility of learning.

METHODS OF MEDICAL REHABILITATION OF PATIENTS WITH CARDIOVASCULAR DISEASES

There are 4 components of rehabilitation programs: physiological, psychosocial, professional, educational.

The physiological component includes treatment (medical and surgical), physical activity, nutrition. Physical activity and any other activity are as important for patients with cardiovascular diseases as treatment. As a result of testing, an individual limit of exercise tolerance, opportunities for physical therapy, professional activities, and leisure is established. A diet is needed to regulate body weight, the lipid spectrum of blood serum, normalize blood pressure, and improve glucose tolerance.

The psychosocial component includes the study of personality traits, the "internal picture of the disease", the nature and severity of stressful effects on a person, the degree of anxiety, depression and hostility (psycho-emotional state), financial situation, family problems. The most common emotional disturbances in patients are anxiety and depression. To identify them, various scales are used (the Hamilton scale, the Sheehan self-assessment anxiety scale, and others). Various questionnaires are used to assess the "internal picture of the disease" (LOBI questionnaire, Sickness Impact Profile, and others). "Internal picture of the disease" — a set of psychological attitudes that characterize a person's attitude to the disease and treatment, a mental reflection of the real situation associated with the disease. Depending on this, the results of rehabilitation can be very different even in people with the same disease, symptoms. In the anosognosia of the "internal picture of the disease" of cardiac patients, anxiety is less, hospital mortality is less, and the likelihood of returning to work is more likely. However, they are more prone to stress in the future and the results of rehabilitation may be unsatisfactory.

The professional component involves the training of professionally significant functions, employment, retraining of patients.

The need for education of patients and relatives (educational component, school of the patient) is determined by the fact that they are required to change their lifestyle for the rest of their lives. Patients need to know why and how lifestyle changes are needed and should understand their responsibility for the best outcome of rehabilitation. As a rule, they are informed about the function of the cardiovascular system in healthy and sick people, about the causes of diseases, proper nutrition, physical activity, methods of controlling blood pressure and heart rate, how to manage oneself in stressful situations, about the dangers of smoking, alcohol, overweight, about life-threatening symptoms of diseases, the necessary medication, side effects of medicines.

Phases of rehabilitation of cardiac patients:

– phase 1 — sick leave (for patients with any cardiovascular diseases, it starts from 1–3 days of stay in the hospital);

– phase 2 — recovery phase;

– phase 3 — maintenance (phase after recovery).

PHYSICAL ACTIVITY

The main means of rehabilitation of patients with cardiovascular diseases are physical activity — dynamic aerobic exercise. 1 MU increase in exercise capacity reduces all-cause mortality by 12 %. Each 1 MU increase in exercise capacity improves survival by 10–25 %. In CHF with an ejection fraction < 35 %, exercise reduces all-cause mortality by 15 % and reduces hospital admissions. It has been proven that regular aerobic exercise therapy in cardiac rehabilitation programs reduces cardiovascular mortality (by 30 %), all-cause mortality (by 20 %), the need for hospitalization (by 60 %), and the risk of recurrent MI (by 17 % per year).

The preference for aerobic dynamic exercise is given for the following reasons:

1. All organs of the human body have two sources of oxygen supply: the volumetric blood flow rate (determined by cardiac output) and the venous oxygen reserve (arteriovenous oxygen difference). Aerobic dynamic loads increase the arteriovenous oxygen difference due to its better utilization, which reduces the need for organ blood flow over time. This reduces cardiac output and, consequently, the work of the heart at rest and at a certain level of physical activity of the body. Consequently, the minute volume of blood flow, at which signs of exercise intolerance appear, will provide greater physical performance, i.e. the pumping function of the heart will improve.

2. Peripheral resistance decreases, and, consequently, the work of the heart and blood pressure reduce.

3. As a result of such training, the maximum oxygen consumption increases.

4. Resting heart rate and resting blood pressure decrease (the work of heart decreases, that is, myocardial oxygen demand at rest decreases).

5. The Robinson index decreases at rest and increases with submaximal exercise.

6. The speed of blood flow decreases, which contributes to better tissue oxygen utilization.

7. The extensibility of arteries increases, their elastic resistance decreases and the capacity of the vascular bed increases. A decrease in vascular tone facilitates blood circulation and helps to reduce the energy costs of the heart.

8. The metabolic effect of aerobic dynamic loads is manifested in a decrease in the level of triglycerides in the blood serum, a decrease in the level of cholesterol, an increase in the level of high-density lipoproteins, and an increase in glucose tolerance.

9. Under the influence of exercise of moderate intensity, the content of fibrinogen, activity of coagulation factor VII and platelet aggregation decrease against the background of increased fibrinolytic activity of the blood, which reduces the risk of thrombosis.

10. Only aerobic dynamic loads help to reduce body weight, depression, trained people cope better with stress.

11. Endurance loads is a way of preventing the formation of venous blood clots.

It should be emphasized that as a result of physical training using aerobic dynamic loads, there is no increase in ejection fraction or improvement in myocardial perfusion, their main result is a decrease in heart work.

Under static loads, there is no economization of the activity of the blood circulatory system, there are no necessary hemodynamic and metabolic adaptive changes.

The intensity of dynamic loads is 70–85 % of the maximum possible. The frequency of physical training using aerobic dynamic loads is every other day; the duration of one lesson is up to 1 hour. Mandatory is the control of blood pressure and heart rate before, during and after exercise. During the lesson, symptoms such as weakness, severe shortness of breath, pain in the heart, dizziness, nausea, "interruptions" in the heart area should not appear. If this symptoms appear, the patient needs to be re-examined and tested. Fortunately for patients and physicians, this situation is rare and the recommended training loads are expertly selected. There is one fatal case per 49565 man-hours of training in patients with CVD.

TRAINING FOR HYPOXIA

Training for hypoxia is a process of human adaptation to a reduced supply of oxygen to the body. There are the following training options for hypoxia:

1. Adaptation to high-altitude hypoxia. This is only possible in countries with the corresponding geographic location.
2. Barotherapy (method of hypobaric hypoxia).
3. Normobaric hypoxia (inhalation of mixtures with low oxygen content). This method is available for most patients.
4. Special breathing exercises a) Buteyko gymnastics b) breathe holding exercises. The method is available for all patients.
5. Special simulators (Frolov's apparatus).

General contraindications for all types of such training are pregnancy, severe organ failure (cardiac, respiratory, renal, and hepatic), and pain in the heart of any nature at the time of training.

The effect of training on hypoxia on the human body is similar in many respects to the effect of aerobic dynamic loads (3):

– decrease in heart rate at rest and a smaller increase in heart rate during exercise;

– decrease in basic sympathetic activity, which increases the sensitivity of baroreceptors and contributes to the stabilization of blood pressure;

– lowering the level of cholesterol, triglycerides and low density lipoproteins in the blood;

– decrease in insulin resistance and decrease in blood glucose levels;

– increase in physical performance in cardiac patients and in healthy individuals;

– reduction in the number of ventricular extrasystoles during Holter ECG monitoring after training, as well as sleep improvement in patients with coronary artery disease;

– decrease in the number and volume of ischemic and reperfusion injuries of the heart under conditions of acute hypoxic injury (the effect of preconditioning is a phenomenon of metabolic adaptation of the myocardium to transient ischemia);

– increase in the activity of the main antioxidant enzymes and the associated decrease in the severity of systemic oxidative stress;

– decrease in the level of primary and secondary products of lipid peroxidation;

– normalization of endothelial function;

– weight loss.

It should be noted that the effectiveness of hypoxic training in the rehabilitation of patients with cardiovascular diseases from the standpoint of evidence-based medicine has not yet been studied enough.

DIET THERAPY

Dietary principles for patients with cardiovascular diseases are: reduce fat intake by 10 %, reduce consumption of foods containing saturated fatty acids, reduce consumption of foods high in cholesterol, increase consumption of foods containing polyunsaturated fatty acids, increase consumption of foods containing fiber, limit the intake of table salt, replacing solid fats with liquid fats in cooking. For patients with overweight, it is necessary to control energy consumption and energy expenditure.

The total energy consumption per day consists of the following components:

– basal metabolic rate;

– strengthening of thermogenesis after food intake (postalimentary thermogenesis, specific dynamic effect of food);

– arbitrary motor activity.

Total energy expenditure is calculated as follows: total daily energy expenditure = basal metabolic rate x by a correction factor for voluntary physical activity.

Correction factor values:

– 1.0 — low voluntary motor activity;

– 1.3 — moderate voluntary motor activity;

– 1.5 — high voluntary motor activity.

Motor activity is determined by the nature of professional activity and physical education. The following is a characteristic of professional physical activity:

for men:

– light work: 75 % of the time sitting or standing, 25 % of the time standing or moving — 1.99 kcal / min;

– medium-heavy work: 40 % of the time sitting or standing, 60 % of the time specific production activities — 3.16 kcal / min;

– hard work: 25 % of the time sitting or standing, 75 % of the time specific production activities — 4.45 kcal / min.

for women:

– light work: 75 % of the time sitting or standing, 25 % of the time standing or moving — 1.56 kcal / min;

– medium-heavy work: 40 % of the time sitting or standing, 60 % of the time specific production activities — 2.03 kcal / min;

– hard work: 25 % of the time sitting or standing, 75 % of the time specific production activities — 2.54 kcal / min.

For example, moderate voluntary motor activity is moderate work and walking for 30 minutes every other day (when calculating energy consumption, you must use a coefficient of 1.3).

The basal metabolic rate is determined by the formulas:

for women:

– 18–30 years old — 0.0621 (body weight (kg) +2.0357;

– 31–60 years — 0.0342 (body weight (kg) + 3.5377;

– over 60 years old — 0.0377 (body weight (kg) +2.7545.

for men:

– 18–30 years old — 0.0630 (body weight (kg) + 2.8957;

– 31–60 years old — 0.0484 (body weight (kg) +3.6534;

– over 60 years old — 0.0491 (body weight (kg) +2.4587.

Results are measured in megajoules (1 megajoule = 240 kcal). This is the required daily calorie content of food for individuals with a normal body mass index. For overweight patients (BMI greater than 30), the daily calorie content of food should be less than the daily theoretical energy expenditure. First, it is necessary to limit fats and alcohol. A realistic weight loss goal is losing 5 to 10 percent of current body weight. The main thing is not to achieve ideal body weight, but to reduce and maintain reduced weight for a long time.

The World Health Organization recommends following these guidelines for weight loss:

– exclusion of courses of hypocaloric diets and starvation;

– lifelong low-calorie diet;

– optional normalization of body mass index;

– mandatory stable retention of reduced body weight;

– mandatory reduction of fats (animal and vegetable) in the diet;

– optional, with rare exceptions, restriction of carbohydrates, including simple ones, in the diet;

– sharp restriction of alcohol consumption;

– high motor activity.

Fats should make up 25 % of daily calories, carbohydrates — 55–60 %, proteins — 15 %.

The normal value of the body mass index for adults is 18.5–24.99 kg / m². Only for women in the postmenopausal period, a BMI value of 29 kg / m² is acceptable.

PSYCHOTHERAPY

Each patient has his own subjective psychological reaction to the disease, its consequences, pain and well-being — an internal picture of the disease. It depends on social and constitutional factors (Correction of the attitude towards one's disease by psychological means leads to improvement of the condition, prevention of relapses, reduction of the severity of the course of the disease, and anxiety. Correction of an internal picture of the disease motivates patients to use the main means of rehabilitation in cardiology — physical activity and diet therapy (which is important in rehabilitation). Therefore, the assessment of the psychological state, the internal picture of the disease of cardiac patients and the use of psychotherapy can improve the results of medical rehabilitation of people in this category. Methods of behavior modification, the formation of a healthy lifestyle and thinking (control of emotions by understanding and managing those mental operations that automatically generate the corresponding emotion), rational psychotherapy use in cardiology.

SELF-CONTROL OF MASTERING THE TOPICS

For self-control of mastering the topic of the lesson, students are recommended to answer test questions and solve situational problems. The independent work on drawing up cards of an individual medical rehabilitation program for inpatients and outpatients with cardiovascular diseases will help to consolidate the knowledge gained.

SITUATIONAL TASKS

Task 1

Patient P., a 61-year-old man, does not work.

Diagnosis: ischemic heart disease: cardiosclerosis. Atherosclerosis of the coronary arteries.

Arterial hypertension 2, risk 3. CHF 2 FC. Obesity 1 st. (BMI 32). Chronic gouty arthritis.

Survey data:

Weight: 95 kg, height 172 cm.

ECG: sinus rhythm. Axis — horizontal. Deceleration of intraatrial conduction. Signs of left ventricular hypertrophy, right ventricular overload. Perhaps focal-cicatricial changes in the myocardium of the posterior diaphragmatic region.

Exercise testing protocol: maximum load 50 watts, double product 217, reasons for interrupting the test — achievement of the expected heart rate, restoration of blood pressure and heart rate — by 4 minutes, ECG of the recovery period without features, the test is negative, the type of hemodynamic reaction is hypertonic, exercise tolerance is low.

Distance 6-minute walk: 370 m.

Tasks:

– assess the functional state of the patient (type of disorders according to ICF and FC);

– choose means of rehabilitation.

Task 2

Patient Ya., male, 56 years old, installer.

Diagnosis: CHD: cardiosclerosis. Atherosclerosis of the coronary arteries.

Arterial hypertension 2, risk 4.

Supraventricular extrasystole. CHF 2FC.

Survey data:

Weight: 92 kg, height 182 cm.

ECG: sinus rhythm. EOS deviation to the left.

Ultrasound of the heart: the aorta is sealed, expanded in the ascending section up to 40 mm. AV: dense annulus and leaflets, minimal regurgitation. MV: dense annulus and cusps, mild regurgitation. TV: leaflets are not changed, mild regurgitation. LA — the cavity is expanded. Left ventricle: the cavity is not expanded, there are no zones of violations of local contractility. Contractile function of the myocardium — 59 % according to Simpson. RA — the cavity is expanded, RV: the cavity is not expanded. PAP average — 16 mm Hg, systolic — 23 mm Hg. Poorly located interatrial septum.

Load test protocol: 50 watts maximum load. Double product 102. Reasons for sample interruption — frequent extrasystoles. The recovery time for blood pressure and heart rate is 10 minutes. The test is not informative. The type of hemodynamic reaction is normotonic. Exercise tolerance is low.

Distance 6-minute walk: 550 m.

Tasks:

– assess the functional state of the patient (type of disorders according to the ICF, FC);

– choose means of rehabilitation.

Task 3

Patient Z., female, 69 years old, retired person.

Diagnosis: coronary heart disease: angina pectoris FC 1 (clinically). Cardiosclerosis. Atherosclerosis of the coronary arteries. Aortic valve insufficiency with stage 1 regurgitation, mitral valve insufficiency with stage 2 regurgitation.

Arterial hypertension 2, risk 4.

Persistent form of atrial fibrillation. Atrial extrasystole with short episodes of non-paroxysmal atrial tachycardia. CHF 2FC.

Concomitant: chronic thyroiditis, euthyrosis. Isidentaloma of the left adrenal gland without clinical signs of hormonal activity. Esophageal varices in the lower third Survey data:

Weight 80 kg, height 164 cm.

ECG: sinus rhythm. Axis — normal. Deceleration of intraatrial conduction. Frequent monotopic atrial extrasystoles. Changes in the myocardium of the anterolateral region.

Holter monitoring: sinus rhythm was observed with heart rate variations from 45 to 90. The average heart rate per day was 60 beats. in min. Average daily heart rate — 64, night — 53 beats. in min. Circadian index 1.22. (rigid rhythm). Ectopic activity is represented by single polytopic atrial extrasystoles (26 beats), including early ones, which form short episodes of non-paroxysmal atrial tachycardia with a heart rate of 74 to 81 beats. in min. (max. 6 cuts). There were no diagnostically significant changes in the ST segment. The duration of the QT interval is within the normal range.

Heart ultrasound: the aorta is compacted, not dilated. AoK — compaction of the valves and the fibrous ring, mild regurgitation. MK — compaction of the valves and the fibrous ring, mild regurgitation. LP — the cavity is expanded (42/55 mm). LV — the cavity is not expanded, there are no zones of impaired local contractility. Diastolic dysfunction of the left ventricle, type 1. Contractile function of the myocardium — 59 % according to Simpson. TC — leaflets are not changed, mild regurgitation. PP and PZh — cavities are not expand The "Eustachian" valve is located in the RA cavity. PLA average — 16 mm Hg, systolic — 23 mm Hg. WFP is poorly located throughout.

Load testing protocol: max. load 50 watts. Double product 122. Reasons for interrupting the test are dizziness, shortness of breath, weakness. Restoration of blood pressure by 2 minutes, heart rate — by 5 minutes. The test is not informative. The type of hemodynamic reaction is normotonic. Exercise tolerance is low.

Distance 6 — minute walk 360 m.

Tasks:

– assess the functional state of the patient (type of impairment according to the ICF, FC);

– choose means of rehabilitation.

Answers to tasks.

Task 1. Type of disorders according to the ICF: functions of the cardiovascular system b410 — b429, exercise tolerance functions b455, FC III. Means of medical rehabilitation: aerobic dynamic exercise, barotherapy (hypobaric hypoxia), normobaric hypoxia, training for hypoxia (exercises with holding the breath after exhalation, Buteyko gymnastics), diet therapy (basic diet), medications, school of the patient.

Task 2. Type of disorders according to the ICF: functions of the cardiovascular system b410 — b429, exercise tolerance functions b455, FC III. Means of medical rehabilitation: aerobic dynamic exercise, barotherapy (hypobaric hypoxia), normobaric hypoxia, training for hypoxia (exercises with holding the breath after exhalation Buteyko gymnastics), diet therapy (basic diet), medicines, patient school.

Task 3. Type of disorders according to the ICF: functions of the cardiovascular system b410 — b429, exercise tolerance functions b455, FC III. Means of medical rehabilitation: aerobic dynamic exercise, barotherapy (hypobaric hypoxia), normobaric hypoxia, training for hypoxia (exercises with holding the breath after exhalation, Buteyko gymnastics), diet therapy (basic diet), medications, patient school.

TESTS

(Some quizzes may have more than one answer.)

1. Of the listed risk factors for coronary artery disease, the most significant is: a) arterial hypertension with diastolic blood pressure of 95 mm Hg; b) right bundle branch block; c) hypercholesterolemia; d) impaired tolerance to carbohydrates; e) BMI over 30.

2. The main atherogenic class of lipoproteins is: a) high density lipoproteins; b) low density lipoproteins; c) very low density lipoproteins; d) intermediate density lipoproteins; e) chylomicrons.

3. Criteria for normal body weight: a) body mass index (the ratio of weight to body area — kg / m^2) — 25.0–28.0; b) waist circumference for men — less than 94 cm, for women — less than 80 cm; c) meals should be regular (3 main meals and 2 intermediate ones); d) with an initial daily caloric intake of 3000–5000 kcal, its reduction is carried out gradually (at the beginning by no more than 20 %); e) Reducing the calorie content of the daily diet by 1.5–2 times.

4. The highest sensitivity in the diagnosis of exertional angina has: a) dipyridamole test; b) test with hyperventilation; c) a test with a load on a bicycle ergometer; d) test with static physical load; e) cold test.

5. The discrepancy between myocardial oxygen demand and its delivery through the coronary bed is the cause of myocardial ischemia in: a) first-time angina pectoris; b) any variants of angina pectoris; c) progressive angina pectoris; d) spontaneous angina; e) stable angina pectoris.

6. The test with physical activity is regarded as positive in case of: a) right bundle branch block; b) the appearance of frequent extrasystoles of high gradations; c) development of depression of the ST segment of the ischemic type; d) development of T wave inversion.

7. Indications for conducting tests with physical activity in patients with cardiovascular diseases in rehabilitation are: a) assessment of the prognosis and effectiveness of treatment b) differential diagnosis of coronary heart disease and

its forms; c) determination of tolerance to physical activity; d) work capacity examination; e) all of the above is true.

8. Specify the main factor in the development of coronary heart disease: a) arterial hypertension; b) hyperlipidemia; c) hyperuricemia; d) hypokinesia; e) obesity.

9. Ways of using cholesterol in the body: a) energy supply of muscle activity; b) synthesis of apoproteins; c) synthesis of bile acids; d) synthesis of cell membranes; e) synthesis of steroid hormones.

10. The development of atherosclerosis is prevented by: a) adequate physical activity; b) viral infections; c) high hemodynamic loads; d) high content of polyunsaturated fatty acids in food; e) increased content of high-density lipoproteins in the blood.

11. An increase in myocardial oxygen demand may be due to: a) activation of the parasympathetic nervous system; b) increased blood pressure; c) increased tension of the ventricular wall; d) an increase in the strength of heart contractions; e) increased heart rate.

12. To characterize the contractile function of the heart, use: a) minute volume of the heart; b) ejection fraction index; c) myocardial distensibility; d) cardiac index; e) systolic output.

13. Select the main hemodynamic factor affecting the level of arterial pressure: a) the value of cardiac output; b) corticosteroids; c) atrial natriuretic peptides; d) OPSS; e) endothelin.

14. The most objective indicator for assessing the pumping function of the left ventricle: a) pressure in the aorta; b) expelled blood fraction (ejection fraction); c) systolic output; d) heart rate.

15. The value of cardiac output is affected by: a) after load; b) heart rate; c) myocardial contractility; d) preload; e) everything is correct.

16. What recommendations on physical activity should be given to a patient with functional class III heart failure in a state of relief during therapy? a) slow walking for 20–30 minutes at least 4 times a week; b) slow walking several times a day for 5–10 minutes; c) normal walking speed for short distances.

17. What recommendations on physical activity should be given to a patient with functional class IV heart failure in a state of relief during therapy? a) slow walking for 20–30 minutes at least 4 times a week; b) slow walking several times a day for 5–10 minutes; c) normal walking speed for short distances.

18. Aerobic dynamic loads: a) increase SVR; b) increase the CO of rest; c) reduce the rate of blood flow; d) reduce the CO of rest and SVR.

19. Static loads: a) increase resting blood pressure; b) do not affect the CO of rest; c) reduce cholesterol levels; d) reduce the rate of blood flow.

20. Aerobic dynamic loads: a) reduce resting blood pressure; b) lower cholesterol levels; c) increase the level of high density lipoproteins; d) everything is correct; d) everything is wrong.

21. Static loads: a) reduce body weight; b) increase the speed of blood flow; c) increase the level of high density lipoproteins; d) everything is correct; d) everything is wrong.

22. Aerobic dynamic loads: a) reduce body weight; b) increase glucose tolerance; c) are not a means of preventing the formation of venous blood clots; d) increase the capacity of the vascular bed.

23. For patients with arterial hypertension, physical training is indicated: a) competitive sports — volleyball, football, tennis; b) isometric loads (weight lifting); c) exercises with torso bends; d) aerobic dynamic loads.

24. Patients with CHD are shown: a) competitive sports — volleyball, football, tennis; b) isometric loads (weight lifting); c) training for hypoxia; d) aerobic dynamic loads.

25. The daily calorie content of the diet for cardiac patients is assumed: a) due to fats — 25 %, carbohydrates 60 %, proteins 15 %; b) due to fats — 35 %, carbohydrates 40 %, proteins 25 %; c) due to fats — 15 %, carbohydrates 60 %, proteins 25 %; d) due to fats — 25 %, carbohydrates 55 %, proteins 20 %.

26. Training for hypoxia is: a) adaptation to high-altitude hypoxia; b) hypobaric oxygenation; c) normobaric hypoxia; c) breathing exercises with an extended exhalation.

27. Training for hypoxia: a) increases resting heart rate; b) reduces resting heart rate; c) reduces the sensitivity of baroreceptors to stimuli; d) increases blood pressure; d) everything is correct.

28. Training for hypoxia: a) lowers cholesterol levels; b) increases the level of high density lipoproteins; c) reduces the level of glucose; d) raises the level of triglycerides.

29. Training for hypoxia: a) increases physical performance; b) reduces insulin resistance; c) reduces body weight, d) normalizes endothelial function.

Answers to tests: 1 — c; **2** — b; **3** — b; **4** — c; **5** — b; **6** — c; **7** — c; **8** — a, b, c; **9** — c, d, e; **10** — a, d, e; **11** — b, c, d, e; **12** — a, b, d, e; **13** — a, d; **14** — b; **15** — a; **16** — a; **17** — b; **18** — d; **19** — a, b; **20** — d; **21** — d; **22** — a, b, d; **23** — d; **24** — c, d; **25** — a; **26** — a, c; **27** — b; **28** — a, c; **29** — a, b, c, d.

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