

Strengthening the General Functional Capabilities of the Body in the Conditions of a Feasible Increase in Muscle Activity after Intervention on the Heart

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Severe occlusion of the coronary vessels forms an urgent need for coronary artery bypass grafting. This high-tech surgical method for the treatment of coronary heart disease provides in almost all cases a pronounced increase in coronary blood flow. Performing this operation always creates the need for physical rehabilitation, which is a key component of the recovery program for such patients. It contributes to a significant improvement in prognosis, increases exercise tolerance and improves the quality of life. First of all, well-conducted physical rehabilitation in such patients is based on dosed physical activity in the form of therapeutic physical culture. In addition, the physical rehabilitation of patients undergoing coronary artery bypass grafting should include a number of wellness approaches. Their selection is always carried out individually based on the functional state of the internal organs of a particular patient.

Keywords: Coronary Artery Bypass Grafting; Myocardium; Physiology; Recovery; Rehabilitation.

The study of the possibilities of surgical revascularization in acute myocardial ischemia was begun more than 30 years ago and is actively ongoing to the present. Currently, coronary artery bypass grafting is a difficult surgical intervention that allows you to restore blood flow in the arteries of the heart bypassing the site of narrowing of the coronary vessel using shunts¹.

The beginning of its use in the clinic was a real revolution in the treatment of coronary heart disease. Thanks to it, the quality improves and the

life expectancy of patients increases, the risk of complications decreases. The prognosis of patients who underwent coronary artery bypass grafting is associated with a number of circumstances. The first is the “technical” features of the surgical intervention (autoarterial shunting compared with autovenous is characterized by better patency of shunts and a lower risk of recurrence of coronary heart disease)². The second is the presence of concomitant diseases before surgery (myocardial infarction, diabetes mellitus, heart



failure). Thirdly, there is a direct dependence on the efforts of the patient and the doctor aimed at preventing and preventing early complications after undergoing aortocoronary bypass surgery (atrial fibrillation, heart failure, venous thrombosis and thromboembolism), preventing further progression of atherosclerosis. For this purpose, adequate physical rehabilitation of these patients should be carried out^{3,4}.

Purpose: to consider the main processes developing in the patient's body after coronary artery bypass grafting on the background of their physical rehabilitation.

The main indications for coronary artery bypass grafting are obstruction of the left coronary artery of more than 50%, narrowing of all coronary vessels by more than 70%, significant stenosis of the anterior interventricular artery in the proximal section.

Coronary artery bypass grafting is an abdominal operation, performed by the "open" method using a cardiopulmonary bypass or without it. After the operation, the patient has a risk of thromboembolism, atrial fibrillation, heart failure, secondary infection. To prevent these complications, patients undergo thorough preparation for surgery, as well as comprehensive rehabilitation^{5,6}.

Physical rehabilitation after coronary artery bypass grafting is a key component of the entire rehabilitation program. It helps to improve

prognosis, increase exercise tolerance and improve the quality of life. Physical rehabilitation after coronary artery bypass grafting includes physical therapy, breathing exercises, physiotherapy, balneotherapy, hydrotherapy and massage^{7,8}.

Physiotherapy in combination with respiratory gymnastics and the use of medicines occupies a leading place in the physical rehabilitation of patients⁹. After coronary artery bypass grafting, the patient undergoes regular dosed physical training throughout his life to maintain and develop the functional state of the cardiovascular system, respiratory system, and the overall performance of the body¹⁰. Therapeutic gymnastics includes breathing exercises, muscle development, corrective exercises, coordination and relaxation exercises in combination with exercises with gymnastic apparatus (gymnastic sticks, balls)^{11,12} (Figure 1).

Physical training on exercise bikes increases physical performance by increasing the coronary reserve, positively affects the metabolic processes in the myocardium, reducing its oxygen demand, enhances the function of the blood anticoagulation system and increases its fibrinolytic activity, which plays a role in the prevention of thrombosis^{13,14}.

Of great importance, especially at the stationary stage of rehabilitation, is the use of walking. It is the primary method of aerobic physical activation of patients. By the time of



Fig. 1. Conducting physical therapy with gymnastic apparatus (<https://sharm.click/wp-content/uploads/2018/12/uprazhneniya-s-gimnasticheskoy-palkoy-28.jpg>)

discharge from the surgical department, the patient passes along the corridor 200-400 m for 10 minutes at a speed of 70-80 steps per minute, or 2-3 km/h.

Methods of dosed walking include several rules - before walking, you need to rest for 5-7 minutes, count the pulse, and when walking, pay attention to posture. Walking pace can be slow 60-70 steps per minute (speed 3-3.5 km / h), medium - 70-80 steps per minute (speed 3.5-4 km/h), fast - 80-90 steps per minute (speed 4.5-5 km/h), very fast - 100-110 steps per minute (speed - 5-6 km/h). When dosed walking, it is necessary to keep a diary of self-control, in which the pulse should be recorded at rest and after exercise, as well as comments on well-being^{15,16}(Figure 2).

Static work without shortening the muscle fiber is an isometric muscle tension. At the same time, muscular work is not performed, however, energy is consumed and a pronounced effect on the cardiovascular system occurs^{17,18}.

The state after sternotomy carries a potential risk of sternal diastasis with inadequate physical activity, including static ones. Therefore, there is a cautious attitude to static and even to static-dynamic loads after coronary artery bypass grafting. This is expressed in recommendations on limiting weight lifting, "stretching" of the chest and sternum^{19,20}.

Resistive training refers to the category of static-dynamic loads. It's easier to call them resistance exercises or strength exercises. When they are performed, the muscles strain very significantly and continuously, but dynamic work is performed within a very short time. A classic example is lifting the bar^{21,22}.

The recommendations of the American Heart Association indicate that "resistance training is a success and recommended for healthy people. Their use in cardiovascular diseases (arterial hypertension, coronary heart disease, in the presence of arrhythmias, severe myocardial ischemia) is undesirable; the positive effects of such training on the cardiovascular system of patients with coronary heart disease are less pronounced than during training with dynamic loads"^{23,24}.

One of the advantages of resistive training over aerobic training is that in severe chronic heart failure, when mitochondrial activity is significantly suppressed, local resistive loads can to some extent affect muscle hypotrophy and activate its mitochondria. At the same time, resistive and combined training affect only the muscle being trained. Their effect does not apply to other muscle groups that are not involved in training^{25,26}.



Fig. 2. Therapeutic dosed walking (<https://avatars.mds.yandex.net/get-pdb/49816/e7e5703a-1197-479c-8dff-f1b6f117b436/s1200?webp=false>)

The use of physiotherapy after coronary artery bypass grafting is aimed at improving the functional state of the cardiovascular and nervous systems. The main thing here is low-intensity laser radiation, which is recommended for such patients in the early stages after surgical myocardial revascularization, in the absence of serious postoperative complications, in the presence of severe pain in postoperative sutures, radicular pain, pain manifestations of plexitis, inflammation of postoperative scars, while preserving coronary and myocardial reserves²⁷.

Sinusoidal modulated currents also favorably affect the cardiovascular system of such patients. Under their action, in these patients there is an improvement in tissue metabolism and a decrease in the effect of sympathetic innervation. Under the influence of these currents, chest pain due to tissue trauma during surgery is reduced. They are shown 14-18 days after coronary artery bypass grafting²⁸.

A low-frequency magnetic field is the method of choice for debilitated patients in whom rehabilitation by the methods of physiotherapy, balneotherapy and physiotherapy is not yet possible²⁹. Their inclusion in the rehabilitation complex of these patients prepares them for participation in physical rehabilitation programs. A low-frequency magnetic field helps to eliminate postoperative complications that impede the beginning of active rehabilitation measures³⁰.

Therapeutic massage after coronary artery bypass grafting is used to reduce pain as a consequence of sternotomy, relieve tension in the muscles of the back, chest, as well as to resolve the infiltrates and stimulate regenerative processes, activate capillary circulation, increase gas exchange in organs^{31,32}. A differentiated technique is used to massage the entire chest in patients after coronary artery bypass grafting, with a duration of 12-15 minutes³³. Use all the techniques of classical massage (stroking, rubbing, continuous labile vibration). Contraindications are unstable angina, angina pectoris of functional class IV, heart failure higher than functional class II, acute phlebitis and thrombophlebitis, mediastinitis, and febrile state. On the same day, massage is combined with therapeutic exercises, the interval between procedures should be at least 1 hour. With

the phased use of physical factors and massage, it is prescribed daily³⁴.

CONCLUSION

Coronary artery bypass grafting is a high-tech surgical method for the treatment of coronary heart disease, which provides a direct increase in coronary blood flow. Physical rehabilitation after coronary artery bypass grafting is a key component of rehabilitation programs for such patients, as it helps to improve prognosis, increases exercise tolerance and improves quality of life. First of all, the physical rehabilitation of such patients is based on dosed physical activity, which is represented in most cases by physical therapy. Physical rehabilitation of patients undergoing coronary artery bypass grafting traditionally includes a number of effective approaches. The selection of means and methods of physical rehabilitation is always carried out individually, based on the physical characteristics of a particular patient.

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