Outpatient stage of cardiorehabilitation in patients with acute coronary syndrome: prevalence of insulin-dependent diabetes and its risk factors

Abstract

Acute coronary syndrome is one of the most dangerous conditions in the world of modern cardiology, after which patients are at high risk of the appearance and development of chronic pathologies, in particular the development of type 2 diabetes mellitus. According to the latest data, there was a statistically significant increase in the number of new cases of diabetes mellitus after an episode of acute coronary syndrome. Doctors should provide high-quality assistance in the rehabilitation of patients after acute coronary syndrome, especially at the last stage of cardiorehabilitation, which is carried out in outpatient settings.

Comment [u1]: Try to include methodology and result

Keywords: *diabetes mellitus, acute coronary syndrome, cardiorehabilitation*

Comment [u2]: Better to write alphabetical order

Introduction

According to Russian clinical guidelines, there are three main stages of cardiac rehabilitation associated with the periodization of the disease. the first is the stationary stage, which takes place in an ordinary ward of the cardiology department of a hospital or vascular center. The second early inpatient rehabilitation stage, conducted in the inpatient cardio rehabilitation department of cardiological or multidisciplinary hospitals, or rehabilitation centers (the first two stages correspond to the periods of developing and scarring acute heart muscle infarction). And the third is the outpatient rehabilitation stage. At this stage, the patient is defined as a subject with post-infarction cardiosclerosis who needs to perform a complex of rehabilitation measures and prolonged secondary prevention.

In the first months after discharge from the hospital, these activities are carried out under medical supervision, and then under self-control at home [1]. Cardiological rehabilitation can be carried out at any time of the disease, with a stable clinical condition of the patient, the presence of rehabilitation potential, the absence of contraindications to certain rehabilitation methods and on the basis of a clearly defined rehabilitation goal.

An important task for therapists and cardiologists at the third stage is to provide maximum support in correcting the factors of the development of chronic pathologies. Especially, as mentioned above, this applies to diabetes mellitus.

Insulin-dependent diabetes, or type 2 diabetes mellitus, is an extremely common pathology all over the planet, which is an unpleasant burden for the global health system. Although the mechanisms of the onset and development of the disease are well studied, diabetes is difficult to manage and correct. According to the statistics of the International Diabetes Federation, the number of people with diabetes is projected to increase to almost 630 million by the middle of the XXI century [2]. Even despite the active struggle with it. Unsatisfactory management of chronic hyperglycemia, insufficient effectiveness of population and individual prevention are the result of a large number of factors, including social reasons that go beyond medical science. However, it is impossible to say about new facts in the pathophysiology of diabetes [3]. Modern studies of genomic associations confirm that its development as any "complex disease" is influenced by a wide range of biochemical, genetic, behavioral and environmental determinants, each of which individually determines only part of the risk of developing the disease [4]. Numerous observational studies have revealed a large number of risk factors for the development of insulin-dependent diabetes, some of which are associated with pharmacological interventions [5,6]. In particular, the relationship between low and very low density lipoproteins and the risk of developing type 2 diabetes is of particular interest. Moreover, numerous studies have shown that statin therapy increases the risk of insulin-dependent diabetes in humans [7,8]. A special case of

the use of high-intensity statin therapy is lipid-lowering therapy after acute coronary syndrome.

Comment [u3]: Better to include objectives, statement of the problem, hypothesis (research questions)...

Materials and Methods

According to a study conducted in Russia a few years ago, more than a thousand patients (1004 people) who underwent acute coronary syndrome and coronary artery stenting were admitted for dispensary observation in the first three days after discharge from vascular departments of hospitals. During 31.3±5.2 days, an individual cardiorehabilitation program was formed for 773 (77.0%) patients based on the results of a consultation with a cardiologist - specialist in medical rehabilitation and determination of the rehabilitation potential for these patients. This program was carried out on an outpatient basis for 1 year and included adequate drug therapy (including high-intensity therapy with atorvastatin in the form of monotherapy or, according to indications, in combination with ezetimibe, dual antiplatelet therapy, antagonists of the renin-angiotensin-aldosterone system, beta-blockers), physical rehabilitation, psychological rehabilitation, therapeutic nutrition, preventive group counseling.

In accordance with the inclusion/exclusion criteria for such programs, 200 patients were included in the current analysis, 151 of them (75.5%) men [9]. The average age of patients was 61.74±9.57 years. The studied parameters were quantitative (fasting blood glucose, body weight, body mass index (BMI), waist circumference, hip circumference, body shape index) and qualitative (overweight, obesity, diabetes mellitus, prediabetes.

Scientists found that of the 200 people included in the study, 190 (95%) were over 45 years old. A third of the patients had signs of multifocal atherosclerosis, 46 (23%) had a history of acute coronary syndrome, myocardial infarction or cerebral stroke (2 of them had myocardial infarction and cerebral stroke), and the majority had hypertension. Chronic heart failure dominated, with a preserved left ventricular ejection fraction. In 133 (67%) patients, chronic heart failure corresponded to functional class II, in 52 (26%) — functional class I and in

5 (2.5%) - functional class III. 40 (20%) patients had a history of type 2 diabetes mellitus (Table 1).

Table 1. Clinical characteristics of patients

№	***Characteristic***	***Meaning***
1	Age at the time of inclusion in the program	61,74±9,57
2	Repeated myocardial infarction	39 (19,5%)
3	Medical history of cerebral stroke	11 (5,5%)
4	The presence of coronary atherosclerosis	199 (99,5%)
5	The presence of peripheral atherosclerosis	9 (4,5%)
6	The presence of cerebral atherosclerosis	48 (24%)
7	Multifactorial atherosclerosis	64 (32%)
8	Revascularization procedures - coronary artery bypass grafting - stenting	200 (100%) 8 (4%) 192 (96%)
9	Arterial hypertension	191 (95,5%)
10	Atrial fibrillation	21 (10,5%)
11	Chronic heart failure	190 (95%)

Comment [u4]: Better to write the socio demographic characteristics with sound manner

In accordance with the individual treatment plan and clinical status, patients received complex drug therapy, which was adjusted depending on the clinical goals. In particular, more than 50% of patients needed combined lipid-lowering therapy (statin group drug + ezetimibe).

It was also revealed that abdominal obesity is one of the main modifiable risk factors for diabetes. It was found out that 75 (37.5%) people had normal body weight only in 34 (17%) observations. The following dynamics of metabolic parameters was noted: in the absence of statistically significant dynamics of body weight and body mass index, waist circumference and body shape index significantly increased (Table 2).

Table 2. Dynamics of some metabolic parameters over the period of therapy

№	*Indicator*	*Initially*	*After 12 months*
1	Body weight, kg	84,90±15,49	84,00±15,66
2	Body Mass Index	29,22±4,95	28,74±25,92
3	Waist size	93,11±13,01	94,55±13,49

4	Body Shape Index	0,075±0,01	0,076±0,01
5	Waist size/height	0,547±0,08	0,556±0,08
6	Obesity/overweight	165 (82,5%)	161 (80,5%)
7	Type 2 diabetes mellitus	40 (20%)	48 (24%)
8	Prediabetes	47 (23,5%)	34 (17%)
9	Type 2 diabetes mellitus and prediabetes	87 (43,5%)	82 (41%)
10	High-normal glucose levels	37 (18,5%)	46 (23%)

There was a significant decrease in the proportion of patients with grade II–III obesity with a statistically significant increase in the number of patients with grade I obesity. During the follow – up, a statistically significant increase in the number of cases of type 2 diabetes mellitus was registered - 8 cases de novo, as well as a significant increase in the frequency of detection of high-normal blood glucose levels (Table 2).

Taking into account the fact that the fasting glycemia threshold ≥5.6 mmol/l is classified by some foreign expert groups as a pre-diabetic condition, as well as domestic data on the clinical significance of a high-normal glycemic level (5.6-6.0 mmol/L) [10-12], the change in the frequency of its registration was analyzed. A statistically significant increase in the frequency of this trait was revealed during follow-up: a high-normal glucose level at the time of completion of follow-up was recorded in approximately one in four patients of the general group (Table 2).

Results and discussion

Most often, disorders of carbohydrate metabolism were recorded among patients with initially high-normal blood glucose levels. There were no statistically significant differences in the incidence of diabetes among the groups of patients under consideration, which may be due to the small number of groups. For comparison: among 47 patients with prediabetes, the development of diabetes was detected in 3 (6.38%) observations. At the same time, among patients without previously established type 2 diabetes mellitus/prediabetes and with an initial blood glucose level <5.6 mmol/l (n=77), in a third of cases (n=24, 31.17%), fasting glycemia levels in the range of 5.6–6.0 mmol/l were registered [13-16].

Numerous observational studies and the experience of foreign colleagues have revealed a large number of factors for the development of insulin-dependent diabetes, but due to the fact that observational studies cannot offer reliable evidence of causal relationships between the observed risk factors and one or another outcome of the disease, the study of risk factors for type 2 diabetes continues at the present time. The Mendelian randomization method has opened up new possibilities for independent evaluation of cause-effect relationships in the "endogenous risk factor - disease" system. In relation to some of the traditional factors, causal relationships have indeed been confirmed in Mendelian randomized trials. First of all, this concerns such markers of increased risk of diabetes as body mass index, obesity, waist circumference [17].

Conclusion

It is necessary to continue the search for risk factors, the above-mentioned adverse metabolic changes and ways to optimize the management of patients in this group.

In particular, it is necessary to competently assess the role of drug interventions, based on an assessment of their metabolic advantages and disadvantages, so that in the future it will be possible to provide effective correction and therapy for such patients.

Comment [u5]: Try to include recommendations

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Comment [u6]: Try to use appropriate referencing styles