



Metabolic features of elderly patients with multivessel coronary lesions

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DOI: <https://doi.org/10.33545/26634104.2020.v2.i2a.25>

Abstract

Peculiarities of the course of coronary heart disease in elderly patients with multivessel lesions of the coronary bed and uncorrected metabolic disorders, in particular lipid profile, are analyzed in the article. The study included 74 patients older than 65 years of both sexes with lesions of the left main coronary artery (LMCA) in combination with a lesion of two or more coronary arteries according to coronary arteriography. The authors found that the negative dynamics of carbohydrate metabolism is a predictor of the deterioration of the course of coronary heart disease (CHD) in elderly patients. An adherence to therapy and glycemic control significantly increase the chances of a favorable course of the disease in elderly patients with multivessel coronary lesions. An elevated level of triglycerides, very low-density lipoproteins cholesterol, and an overall atherogenic coefficient, are a predictor of re-hospitalization associated with coronary insufficiency in elderly patients with multivessel coronary lesions.

Keywords: multivessel coronary artery lesion, carbohydrate metabolism, elderly patients

Introduction

Multivessel lesion of the coronary arteries is a powerful factor in the poor prognosis in patients with CHD and the development of heart failure (HF) due to ischemia ^[1], while it has been shown that cardiovascular disease (CVD) is much more severe in people over 65 and leads to disability and death. An increase in age for every 5 years leads to an increase in mortality by 2-2.5 times per 100,000 population ^[2].

Currently, the range of indications for percutaneous coronary interventions is expanding, and therefore, many patients previously referred to coronary artery bypass grafting (CABG), choose PCI, although CABG shows good intermediate survival ^[1, 3, 5], while the choice of PCI in elderly patients is attractive with a minimally invasive character and lower postoperative mortality ^[6]. However, the best approach to the revascularization of older patients is still unknown.

There is also no definite answer: is there a correlation between uncorrected lipid and carbohydrate metabolism disorders, anemia, inflammation and a one-year prognosis after PCI in older patients with multivessel coronary disease?

In this regard, the aim of our research was to study the characteristics of some laboratory parameters and the course of CHD in elderly patients with the multivessel coronary lesions after PCI.

Materials and methods

A study was performed in 74 patients older than 65 years with a lesion of the LMCA in combination with a lesion of two or more coronary arteries. A stenting was performed in symptom-related coronary artery, if necessary, in other coronary arteries (from 1 to 4 stents), in all observed patients. All patients received basic t

herapy: acetylsalicylic acid (ASA), clopidogrel, beta-blocker bisoprolol 2.5-5 mg/day, ACE inhibitor, rosuvastatin 20 mg/day. The patients were monitored for a year. In particular, such endpoints were recorded as: fatal outcome, myocardial infarction (non-fatal), progression of CHD, development and progression of HF (according to the objective clinical condition scale modified by V. Mareev), re-hospitalizations associated with an increase in coronary insufficiency and the need for surgical intervention (CABG). The patients were divided into 2 groups according to the results of a year-long follow-up: the first group included patients who did not have a single endpoint (n=41), and the second group included patients who reached at least one endpoint (n=23).

We studied the parameters of the lipid spectrum (the level of total cholesterol (TC), triglycerides (TG), high-, low- and very low-density lipoprotein cholesterol (HDL-C, LDL-C, VLDL-C), atherogenicity coefficient) and other indicators of blood chemistry (alanine and aspartate aminotransferase (ALT and AST), bilirubin, urea, creatinine). Glomerular filtration rate was calculated using the CKD-EPI formula. The following indicators were also considered: the level of hemoglobin, hematocrit, platelets, leukocytes, erythrocyte sedimentation rate, fasting blood sugar and postprandial blood sugar after 2 hours, glycated hemoglobin, prothrombin index (PTI), international normalized ratio (INR) and fibrinogen.

Statistical data processing was carried out using the specialized program Statistica 12.0 and also MS Excel 2016. Due to the fact that the obtained data were non-parametric the four-field table and Fisher's criterion were used to calculate the reliability of the results.

Results

There were no significant differences between the groups initially in relation to the underlying and concomitant diseases. As for laboratory data, the initial values between the two groups did not significantly differ, with the exception of elevated ALT and AST levels in the group of patients who were reaching the end points (ALT, U/l: 43.4 ± 24.7 to 24.9 ± 8 , $p=0.004$; AST, U/l: 37.4 ± 21.1 to 22.1 ± 6.1 , $p=0.014$). However, during dynamic observation, there was a significant and reliable decrease in the lipid spectrum (from elevated values to the target level) in this group: TG from 194.9 ± 82.3 to 110.4 ± 22.0 mg/dl ($p=0.0002$), VLDL-C from 39 ± 16.5 to 21.9 ± 4.7 mg/dl ($p=0.0003$), the atherogenic coefficient from 4.8 ± 1.4 to 2.8 ± 0.5 ($p=0.00001$), and the level of HDL-C increased from 33.8 ± 7.0 to 44.0 ± 7.4 mg/dl ($p=0.032$) respectively.

In addition, there is a significant decrease in ALT levels from 37.4 ± 21.0 to 20.6 ± 5.1 U/l ($p=0.007$).

Unlike the first group, there is no significant and reliable decrease in the lipid spectrum in the group of patients who have reached at least one endpoint. Some dynamics can be noted a decrease in the level of total bilirubin due to its indirect fraction which initially corresponded to reference values: from 10.3 ± 4.0 to 5.7 ± 1.5 $\mu\text{mol/l}$, $p=0.011$.

In the dynamics, the expected significant differences in the lipid spectrum between the groups were observed, in particular, it is necessary to note a twofold decrease in the level of TG (235.0 ± 94.8 to 110.4 ± 22.6 mg/dl, $p = 0.017$) and VLDL-C (46.9 ± 18.9 to 21.9 ± 4.7 mg/dl, $p=0.016$) in the group of patients

who have reached at least one endpoint.

According to our data, the differences in routine laboratory parameters in both groups are quite predictable in general and confirm the previously known data on the cardioprotective function of HDL-C [2], and the negative effect of an increase in the atherogenic coefficient on the course of CHD. At the same time, it remains obvious that an elevated fasting triglyceride level is one of the indicators of carbohydrate metabolism disorders. However, a sensitive difference, although unreliable, was observed in relation to fasting glucose among patients of both groups: 8.2 ± 2.2 mmol/l in the group of patients who did not reach the endpoints, versus 11.2 ± 3.8 mmol/l in the group of patients who reached at least one endpoint, $p=0.17$. This combination is a significant predictor of the deterioration of the course of CHD.

When studying the distribution pattern of the reached endpoints, it was found that the highest frequency of re-hospitalizations and the deterioration of the clinical status of patients in our cohort were associated with an increase in coronary insufficiency. The above conditions are adjusted on an outpatient basis. It should be noted that hyperfermentemia and myalgia associated with taking statins were not observed in both groups.

An assessment of adherence to therapy was carried out using the Moriski-Green scale. According to this scale, patients who scored 4 points are considered compliant (committed). Patients who score 2 points or less are considered unassailable. Patients who scored 3 points are considered insufficiently committed and are at risk for developing non-adherence.

Table 1: Comparative the assessment of adherence to therapy between groups by the Moriski-Green scale

Score	Patients who have not reached the endpoints	P	Patients who have reached at least one endpoint
1	1 (2,4%)	0,26	2 (8,7%)
2	4 (9,8%)	0,002	10 (43,5%)
3	26 (63,4%)	0,00002	2 (8,7%)
4	10 (24,4%)	0,37	8 (34,5%)

* The differences are statistically significant at $p>0.05$.

Despite the relatively high percentage of compliant patients who reached at least one endpoint (34.5%), the majority of patients was not committed to therapy in this group: 52.2% versus 12.2% in the group of patients who did not reach the endpoints, $p=0.0005$. Unfortunately, the vast majority of patients in the group with favorable outcomes were not sufficiently compliant for the following main reasons: forgetfulness (58.5%) and inattention (63.4%).

Discussion

In healthy people, the liquid state of the blood is maintained due to the dynamic balance of platelet and plasma links of hemostasis and atrombogenicity of the vascular wall. An violation of at least one of these components leads to the activation of thrombosis. It is assumed that in the pathology of carbohydrate metabolism, the inner layer of the vascular wall, the endothelium, is primarily damaged [7]. Normally, the endothelium provides trophic and protective function in relation to other layers of the vascular wall. The fact that the endothelium is located on the border with the blood stream makes it vulnerable to various risk factors, including hyperglycemia, which contribute to the development of vascular complications [7]. A number of studies have established

a relationship between endothelial dysfunction and the pathology of carbohydrate metabolism [8].

The processes of atherogenesis in patients with the pathology carbohydrate metabolism are peculiar and more aggressive than with the physiological carbohydrate metabolism. CHD in patients with the type 2 diabetes, in comparison with patients without last one, develops at an earlier age and is characterized by more severe coronary lesions with involvement of the vessels of the distal bed [Betteridge DJ, 2001; Solfrizzi V, 2002].

A hypertriglyceridemia and/or low concentration of HDL-C are found in half of patients with the type 2 diabetes. The disorders of lipid metabolism appear several years before type 2 diabetes mellitus and are common in the patients with central obesity, metabolic syndrome and also type 2 diabetes [9].

Recent data on dyslipidemia in patients with diabetes mellitus obtained in the FIELD study showed that traditional lipid ratios (non-HDL-C/HDL-C, TC/HDL-C) are as powerful predictors of cardiovascular risk as the apoB/apoA1 ratio, and take into account the impact on the risk of CVD and atherogenic and antiatherogenic particles.

Despite the fact that the clinical effects achieved by treating atherogenic dyslipidemia (high TG and low HDL-C) are still

under discussion, the FIELD study was able to significantly reduce the frequency of cardiovascular events (by 11%), but not the primary endpoint of coronary events (coronary death or nonfatal MI). However, according to a post-hoc analysis of the FIELD study, fenofibrate reduced the incidence of cardiovascular events by 27% in patients with elevated TG (> 2.3 mmol/l or > 204 mg/dl) and decreased HDL-C (number needed to treat = 23)^[10].

Our data also clearly demonstrated a significant decrease in triglycerides in the group of patients who did not reach the endpoints (from 194.9 ± 82.3 to 110.4 ± 22.6 mg/dl, $p=0.0002$) and vice versa, the increase in the level of triglycerides in the group of patients who have reached at least one endpoint: from 209.6 ± 73.0 to 235.0 ± 94.8 mg/dl, $p = 0.23$. During dynamic observation, it was found that the level of triglycerides differs by more than 2 times between groups: 110.4 ± 22.6 to 235.0 ± 94.8 mg/dl, $p=0.017$.

Conclusions

1. The negative dynamics of carbohydrate metabolism is a predictor of the deterioration of the course of the CHD in elderly patients;
2. The adherence to therapy and glycemic control significantly increase the chances of a favorable course of the disease in elderly patients with multivessel coronary lesions;
3. An elevated level of triglycerides, VLDL-C and an overall atherogenic coefficient are a predictor of re-hospitalization associated with coronary insufficiency in elderly patients with multivessel coronary lesions.

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