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DETECTION OF SMALL MYOCARDIAL INJURIES AFTER PERCUTANEOUS CORONARY INTERVENTIONS

Summary: Cardiovascular diseases are currently the main cause of disability and premature mortality in economically developed countries. Coronary heart disease (CHD) remains the most common disease today, despite the high level of development of world medicine.

Today, according to the ACC/ANA classification, complications after PCI have been studied in sufficient detail and described: death, myocardial infarction, stroke, transient ischemic attack, complications at the puncture site, renal failure, allergic reaction to contrast agent; specific complications - coronary artery thrombosis, its perforation, tamponade and arrhythmias.

Key words: Cardiovascular diseases, angioplasty, myocardial revascularization, coronary artery thrombosis, cardiospecific markers, echocardiography, selective coronary angiography.

Introduction. Cardiovascular diseases are currently the main cause of disability and premature mortality in economically developed countries.
Coronary heart disease (CHD) remains the most common disease today, despite the high level of development of world medicine[1, 4].

Treatment of CHD in patients is an urgent problem at the present time. More than 3.0 million myocardial revascularization procedures are performed annually in the world. In recent years, the ratio of percutaneous coronary interventions (PCI) (angioplasty and stenting of the coronary arteries) and coronary bypass surgery is 2:1 in Europe, and 6:1 in the USA and Japan.

Observational studies involving a large number of patients confirm that PCI is a highly effective procedure with a low complication rate compared to other methods of myocardial revascularization. However, there are still many open questions in the problem of PCI[2, 3, 6].

Today, according to the ACC/ANA classification, complications after PCI have been studied in sufficient detail and described: death, myocardial infarction, stroke, transient ischemic attack, complications at the puncture site, renal failure, allergic reaction to contrast agent; specific complications - coronary artery thrombosis, its perforation, tamponade and arrhythmias.

The term "small myocardial injuries" (MPM) has appeared in the literature relatively recently. MPM occurs in 8-15% of cases after planned PCI and is manifested only by an increase in the level of cardiospecific markers, without clinical and electrocardiographic signs of myocardial damage[2, 3, 5].

**Purpose of research.** Optimize diagnostics, identify risk factors for small myocardial injuries and evaluate their impact on the long-term results of planned percutaneous coronary intervention in patients with coronary heart disease: angina.

**Materials and methods of research.** The study included 45 patients with CHD: FC III-IV angina who were admitted to the Namangan cardiology center for routine PCI and coronary artery stenting, selected according to the inclusion and exclusion criteria.

The patients included in the study were divided into groups according to the level of cardiospecific markers in blood serum: the study group - 25 patients (men 13, women 12) with coronary artery disease (CHD), functional classes III-IV after PCI, complicated by small myocardial injuries; the comparison group - 20 patients (men 12, women 8) with CHD: stress angina III-IV functional classes after PCI, not complicated by MPM.

All patients with coronary artery disease (groups compare and research) received the same drug therapy, which included: bisoprolol, trombas, perindopril, atorvastatin, clopidogrel. Patients also continued to receive the recommended therapy at the outpatient stage of treatment.

During PCI and coronary artery stenting, metal stents and drug-coated antiproliferative stents were used.

During the study, General clinical research methods were used (General blood and urine analysis), biochemical blood analysis (blood analysis for blood electrolytes, lactate dehydrogenase, aspartate dehydrogenase, creatinine, urea, prothrombin index, international normalized ratio, total cholesterol, triglycerides, glucose) and special research methods-immunochemical blood analysis (troponin T, creatine phosphokinase-MV, myoglobin). Instrumental research methods were also used:
electrocardiography (ECG), daily Holter monitoring of ECG, echocardiography and selective coronary angiography.

Statistical analysis of data was performed using descriptive statistics, clustering, sample comparison, regression, frequency, and correlation analysis (Pearson correlation coefficient). Data processing was performed using application programs, version 6.0.

**Research result.** During the examination of patients with IHD: functional class III-IV angina pectoris subjected to PCI and coronary artery stenting, on day 1, the presence of complaints in the study group for minor discomfort behind the sternum was revealed in 3.2% of patients, while patients in the comparison group did not complain (p<0.05).

In patients with IHD of the study and comparison group after performing PCI and coronary artery stenting, there were no differences in the indicators of biochemical blood analysis, such as: hemoglobin, creatinine, cholesterol. However, there is an increase in the General blood test of the level of white blood cells above normal - 10,23*10^9/l, in patients of the study group, which is not observed in patients of the comparison group (p<0.05).

**Table 1**

<table>
<thead>
<tr>
<th>Parameters under study</th>
<th>Research group (n-25)</th>
<th>Comparison group (n=20)</th>
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<tbody>
<tr>
<td>1 Complaints of minor discomfort behind the sternum after PCI</td>
<td>3.2%</td>
<td>was not observed</td>
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<tr>
<td>2 The level of white blood cells in the blood</td>
<td>10,23*10^9/l</td>
<td>6,5*10^9/l</td>
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<tr>
<td>3 Early repolarization of the left ventricle of the heart on an ECG</td>
<td>17,1%</td>
<td>was not observed</td>
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<tr>
<td>4 Dynamics of the ST segment on the ECG</td>
<td>was not observed</td>
<td>was not observed</td>
</tr>
<tr>
<td>5 Dynamics of ejection fraction on ECHOCARDIOGRAPHY</td>
<td>was not observed</td>
<td>was not observed</td>
</tr>
<tr>
<td>6 Violation of global and local contractility in ECHOCARDIOGRAPHY</td>
<td>was not observed</td>
<td>was not observed</td>
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Instrumental data for the detection of MPM are insignificant - they include ECG signs in the form of early ventricular repolarization, which are recorded only in the study group (17.1%) after planned PCI (p<0.05) (table 1). There were no differences between the groups of patients in terms of ECHO-KG (table 1).

**Table 2**

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<th>Cardiospecific markers in the studied groups (ng / ml)</th>
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Parameters under study | Research group (n=20) | Comparison group (n=25)
--- | --- | ---
1. Troponin T | 0.030±0.004 | 0.074±0.005
2. Myoglobin | 70.0±2.7 | 95.1, 38.5, 59 ng/ml
3. KFK-MV | 4.94±0.1 | 5.58±0.24 ng/ml

When analyzing data, the study group reported higher content of myoglobin in serum compared with the study group in 2.5 times (p<0.05).

1 day after PCI and stenting of the coronary arteries, an increase in levels of CPK-MB in the serum of patients of the study group that exceeds the comparison group in 1.7 times (p<0.05).

We obtained data on the excess of the troponin T level in the study group over the comparison group by 74 times (p<0.05).

When considering the statistical Association of the studied cardiospecific markers of myocardial damage in the study group, it was possible to identify an average positive correlation between the levels of myoglobin and CPK-MV (R=0.7693, p=0.0001), as well as between the indicators of myoglobin and troponin T (R =0.6021, p=0.001). The data obtained indicate the presence of MPM in patients of the study group. Step-by-step regression analysis performed for cardiospecific markers of myocardial damage revealed a stable linear relationship between the studied markers and the clinical manifestations of MPM. Since myoglobin directly affects the formation of troponin T values, CPK-MV has an indirect effect on the formation of troponin T values.

Using the indicators of the troponin T level determined in the blood serum of patients with CHD after PCI and coronary artery stenting, by immunochemical examination, it is possible to determine the value of myoglobin using a linear regression equation, with further detection of the development of MPM individually in each patient.

Also, using the linear equation obtained during regression analysis, it is possible to calculate the second cardiospecific marker of myocardial damage, troponin T, based on the values of the CPK-MV indicator determined using an immunochemical examination of the blood serum of patients with CHD.

The correlation coefficient is: g = 0.53366.

The obtained linear regression equations show a more important role of the relationship between the increase in cardiospecific markers, such as myoglobin, troponin T, and CPK-MV in response to the occurrence of small myocardial injuries after percutaneous coronary interventions and coronary artery stenting, which can serve as an algorithm for detecting this complication.

On the 1st day after percutaneous coronary interventions and coronary artery stenting in patients with coronary heart disease at the level of troponin TO-0.030 ng/ml, CPK - MV 0.10-4.94 ng/ml, myoglobin 25.0 -72.0 ng/ml, a favorable clinical course of the postoperative period is predicted without the development of small myocardial damage; and at the level of troponin T 0.030 - 0.072 ng/ml, CPK - MV
4.94-5.58 ng/ml, myoglobin 72.0 -93.6 ng/ml is predicted as an unfavorable course of the postoperative period with the development of small myocardial injuries [6].

**Conclusions:** Clinical peculiarities of the early postoperative period in patients with ischemic heart disease, 1 day after elective percutaneous coronary intervention in patients with the development of small myocardial damage, in contrast to the comparison group, is the presence of a slight discomfort behind the breastbone (17.1 percent), increasing levels of white blood cells (10.23 * 109/l), the syndrome of early repolarization of the left ventricle on ECG (3,2%) (p<0.05). Increased levels of cardiospecific markers in the blood serum: myoglobin (95.1±0.55 ng / ml), troponinate (0.074±0.002 ng / ml), creatine phosphokinase-MV (5.58±0.089 ng / ml) in patients with IHD: functional class III-IV stress angina after percutaneous coronary interventions, with a high probability indicate the development of small myocardial damage. Risk factors that allow predicting the development of small myocardial injuries after percutaneous coronary intervention and coronary artery stenting in patients with IHD are: diffuse coronary artery damage, stenosis length greater than 24.07±1.3 mm, recanalization with coronary artery stenting, lateral branch occlusion, metal stent implantation, implantation of two or more stents, systemic atherosclerosis, type 2 diabetes, arterial hypertegaemia (p<0.05). Increasing the level of cardiospecific markers, due to the development of small myocardial injuries, it adversely affects the long-term (1-year follow-up) results of percutaneous coronary intervention, leading to the return of angina (2.86%) and the need for repeated hospitalizations (5.71%).

**References**