

THE cTnTG4 PLASMA LEVELS IN RELATION TO ELECTROCARDIOGRAPHIC AND ECHOCARDIOGRAPHIC ABNORMALITIES IN PATIENTS WITH ACUTE CORONARY SYNDROMES WITHOUT ST SEGMENT ELEVATION – STUDY ON 123 CASES

A. BISOC^{1,2} A.M. PASCU¹ M. RĂDOI^{1,2}

Abstract: “The universal definition of the myocardial infarction” developed by Joint ESC/ACCF/AHA/WHF Task Force in 2007 provides precise criteria for the NSTEMI but the early diagnosis of the non ST elevation acute myocardial infarction (NSTEMI) is a challenge in the patients presenting soon after the onset of chest pain. Diagnostic difficulties are caused by the atypical clinical and imaging ischemic changes and by asynchronous occurrence of these changes. We studied 123 patients with acute coronary syndromes admitted in the hospital in the first 6 hours after the onset of chest pain and asses the diagnostic contribution of cardiovascular risk factors, ischemic changes on resting electrocardiogram and on bedside 2D echocardiography in the early diagnosis of NSTEMI. The association of old myocardial infarction or stroke with the wall-motion abnormalities on the bedside transthoracic 2D echocardiography seems to be predictors for early diagnosis of NSTEMI in patients with acute coronary syndromes.

Key words: Non-ST-elevation myocardial infarction (NSTEMI), troponin T, electrocardiographic abnormalities in acute coronary syndromes, echocardiographic abnormalities in acute coronary syndromes.

1. Introduction

The diagnosis of non-ST elevation myocardial infarction (NSTEMI) is a real “battle with time” because early

interventional or surgical coronary revascularization is associated with survival benefits [2]. The atypical clinical picture, sometimes late appearance of the ischemic changes on the resting

¹ Faculty of Medicine, “Transilvania” University Braşov.

² Emergency County Clinical Hospital Braşov.

electrocardiogram and analytical imprecision for the plasma level of the 99th percentile URL of cardiac troponins measured by a 4th generation technique (cTnTG4) are the main factors involved in the late diagnosis of the non-ST segment elevation acute myocardial infarction (NSTEMI). In patients with acute coronary syndromes the relationship between the plasma level of cTnTG4 defining NSTEMI or unstable angina and ischemic changes on resting electrocardiogram and echocardiography is a challenge in clinical practice.

2. Aims

Estimation of the diagnostic value of ischemic signs on the resting electrocardiogram and transthoracic 2D echocardiography in patients with non-ST segment elevation diagnosed with NSTEMI and unstable angina using the cTnT plasma levels determined by ELYSA, a 4th generation technique for measurement of cTnT plasma concentration (cTnTG4).

3. Material and methods

The diagnostic value of the electrocardiographic and echocardiographic ischemic changes in relation to cTnTG4 plasma levels was assessed in patients admitted to the Coronary Care Unit with acute coronary syndromes and diagnosed 6 hours later with non ST elevation myocardial infarction (NSTEMI) or unstable angina (UA) according with the criteria of the universal definition of the myocardial infarction in 2007 by ESC/AHA/ACC/WHO Taskforce [2].

The study group included 123 patients with non-ST-elevation acute coronary

syndromes admitted to the Coronary Intensive Care Unit of the Emergency County Clinical Hospital Braşov, at less than 6 hours after the onset of chest pain.

At the time of admission, the patients were clinically evaluated for heart failure, cardiovascular risk factors, personal history of coronary or cerebral or atherosclerotic disease. At the admission a resting ECG and bedside transthoracic 2D echocardiography were performed. cTnTG4 plasma level were determined at the admission time, 3 and 6 hours later. The 12 lead ECG registrations were made with a NIHON KOHDEN Cardiofax GEM electrocardiograph and the transthoracic 2D echocardiography with an ALOKA Prosound SSD-4000SV echocardiograph. The plasma level of cardiac troponin T (cTnT) was determined by ELYSA method (cTnTG4) on a COBAS 6000 device.

On the resting electrocardiogram there were considered: ST-segment depression ≥ 1 mm in at least two derivations regarding the same territory, T wave inversion and the absence of the suggestive myocardial ischemia signs. Segmental wall-motion abnormalities were taken into account as ischemic signs on the 2D echocardiography if these were in another area than old myocardial infarction.

The cTnTG4 plasma levels were measured when the patients arrived at the emergency room, 3 and 6 hours later. It is widely accepted that the initial and dynamic plasma levels of cardiac troponins are crucial to differentiate NSTEMI from unstable angina in patients presenting with clinical features of an acute coronary syndrome. According to the Universal definition of myocardial infarction from 2007 the patients were diagnosed with NSTEMI when cTnG4 plasma levels, were for at least one measurement above the value of 99th percentile URL and was

achieved a coefficient of variation (CV) $\leq 10\%$ [2]. The International Federation for Clinical Chemistry website estimates these values of cTnTG4 plasma levels to be equal or more than 0,03ng/mL and recommend these values of cTnTG4 for the diagnosis of myocardial infarction [http://www.ifcc.org/index.php?option=com_remository&Itemid=120&func=fileinfo&id=87]. Increases of cTnTG4 plasma level of at least 20% was used also as a diagnostic criteria of NSTEMI in our study.

The statistical analysis was performed with the SPSS program and χ^2 test was used to compare the data between the two subgroups of patients.

4. Results

The average time from the onset of the ischemic pain and admission in the Coronary Care Unit was 3 hours and 20 minutes. At 6 hours after admission 35 patients (28.4%) were diagnosed with NSTEMI (Group I) and 88 patients (72.6%) with unstable angina (Group II). The demographic characteristics, history of myocardial infarction and stroke and ischemic changes on resting ECG and transthoracic 2D echocardiography were studied comparatively for the patients with NSTEMI and for those with unstable angina.

The mean age of the patients was 51,1 years, 73 patients (59,3%) were males (19 of group I and 54 of group II, $p=0,543$). The evaluation of the of cardiovascular risk factors showed that 35 patients: 12 patients (34.3%) in group I and 23 patients (26.1%) in group II were diagnosed with diabetes mellitus ($p=0,382$), 83 patients: 20 patients in group I (57.1%) and 63 patients (71.6%) in group II ($p=0,139$) were known with arterial hypertension, 74

patients: 23 patients (65.7%) in group I and 51 patients (58%) in group II were diagnosed with dyslipidemia ($p=0,541$) and that 35 patients: 12 patients (34.3%) in group I and 23 patients (26.1%) in group II were smokers ($p=0,382$). There were no statistically significant differences between the two subgroups of patients regarding the presence of diabetes mellitus, arterial hypertension and dyslipidemia. The previously documented myocardial infarction or stroke was present in 13 patients: 7 patients (20%) in group I and 6 patients (6.8%) in group II ($p=0,048$).

Statistically significant evolution with NSTEMI was observed in patients with history of myocardial infarction or stroke.

The resting electrocardiogram performed on admission showed ST-segment depression ≥ 1 mm in at least two derivations regarding the same territory for 63 patients: 20 patients in group I (57.1%) and 43 patients in group II (48.9%) ($p=0,431$), T wave inversion in 21 patients: 3 patients (8.6%) in group I and 18 patients (20.5%) in group II ($p=0,073$). Left bundle branch block (LBBB) was previously documented in 16 patients: 4 patients (11.4%) in group I and 12 patients (13.6%) in group II ($p=1,000$). Significant or suggestive ECG signs of myocardial ischemia were absent in 20 patients: 5 patients (14.3%) in group I and 15 patients (17%) in group II ($p=0,792$). There were no statistically significant differences between resting ECG ischemic changes into two subgroups of patients.

The transthoracic 2D echocardiography performed on admission showed the presence of the segmental wall-motion abnormalities at the level of the left ventricle in 49 patients: 21 patients (60%) in group I and 28 patients (31.8%) in group II ($p=0,007$). The diastolic dysfunction estimated by evaluating the transmitral

flow was present in 71 patients: 22 patients (62.9%) in group I and 49 patients (55.7%) in group II ($p=0,546$). The comparative analysis of the echocardiographic parameters suggesting myocardial ischemia at the time of presentation to the emergency room showed that only the segmental wall-motion abnormalities of left ventricle were statistically significant more common in the group of patients who were diagnosed with NSTEMI in the next 6 hours. The regional wall-motion abnormalities in another area than old myocardial infarction seems to be a good predictor for NSTEMI in patients with acute coronary syndromes.

5. Discussions

Diagnostic difficulties of acute coronary syndromes arise initially from atypical chest pain and are amplified in absence of cardiovascular risk factors. Atypical chest pain was already reported in 22 % of the patients with acute myocardial infarction [4] and the absence of major cardiovascular risk factors was seen in 60 % of patients with coronary heart disease [6].

In patients with acute coronary syndromes, the resting ECG and bedside 2D echocardiography, the most readily available diagnostic procedures, provides sometimes inconclusive data for myocardial ischemia. When resting ECG was performed during the first hours after the onset of ischemic pain in patients with acute coronary syndromes, a normal ECG was observed in 1,1-10% patients and less specific myocardial ischemia signs like the T wave abnormalities (T wave inverted or flattened) in 2,6-8% patients [5,8]. In our study, comparing the early resting ECG ischemic changes in patients diagnosed with NSTEMI with those of patients

diagnosed with unstable angina there were no statistically significant differences. The absence of relevant ischemic changes on resting ECG in the first 6 hours after clinical onset of ischemic pain in 14.3% patients with NSTEMI underline a low sensibility of resting ECG in early differentiation of NSTEMI.

It is well known that the transthoracic 2D echocardiography can reveal regional wall motion abnormalities at the level of the left ventricle walls in relation to the myocardial ischemia or necrosis. The hypokinesia determined by ischemia can sometimes precede the ischemic changes on the resting ECG and in these cases it can be useful in the early diagnosis of the non-ST segment elevation acute coronary syndromes. The transthoracic 2D echocardiography, indicated in the clinical practice by bedside examination for the imaging evaluation of the myocardial ischemia, has a limited diagnostic specificity due to the fact that the abnormalities of the LV contraction are present during the ischemic episode and can be undervalued if the examination is performed in the asymptomatic period. On the other hand we must take into account that the segmental contraction abnormalities can be also determined by the chronic ischemia, old myocardial infarction [3]. For this reason we considered in relation with this recent acute coronary event only hypokinesia occurred in other area than the old myocardial infarction. In our study the wall-motion abnormalities on the bedside transthoracic 2D echocardiography and the history of cardiovascular events were statistically significant associated with the diagnosis of NSTEMI established through diagnostic increase of the G4TnT plasma levels.

6. Conclusions

In the patients diagnosed with NSTEMI in the first 6 hours after the onset of the chest pain the ischemic changes on the initial resting ECG and bedside echocardiography were frequently absent. The association of old myocardial infarction or stroke with the wall-motion abnormalities on the bedside transthoracic 2D echocardiography seems to be predictors for early diagnosis of NSTEMI in patients with acute coronary syndromes.

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