

CONFIRMATION OF DIAGNOSIS AND EXCLUSION OF MYOCARDIAL INFARCTION BY TROPONIN T AND CK-MB

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Keywords: myocardial infarction, troponin T, creatine-kinase MB isoenzyme

Abstract: The study showed that among patients admitted with suspected acute coronary syndrome, whose symptoms resolved following 24 hours, the diagnosis of myocardial infarction can be eliminated if the TnT remains ≤ 0.10 ng / l for 12-24 hours and CK-MB ≤ 5.0 ng / l up to 10-12 hours of onset of symptoms. If the TnT and CK-MB remains in the normal range for 12 hours after admission, the diagnosis of myocardial infarction can be eliminated if the 99% and 96% of patients. Moreover, for patients whose diagnosis of myocardial infarction was excluded, the persistent risk that over a period of one year to manifest coronary disease was correlated with positive history of the disease.

Cuvinte cheie: infarct miocardic, troponina T, CK-MB

Rezumat: Studiul a demonstrat că printre pacienții admiși cu suspiciune de sindrom coronarian acut și ale căror simptome au cedat după 24 de ore, diagnosticul de infarct miocardic poate fi eliminat dacă nivelul TnT rămâne ≤ 0.10 ng/l timp de 12-24 de ore și al CK-MB ≤ 5.0 ng/l până la 10-12 ore de la instalarea simptomelor. În cazul în care nivelul TnT și al CK-MB rămâne în limite normale timp de 12 ore de la internare, diagnosticul de infarct miocardic poate fi eliminat în cazul a 99% și respectiv 96% dintre pacienți. Mai mult, pentru pacienții al căror diagnostic de infarct miocardic a fost exclus, riscul persistent pe o perioadă de un an de a manifesta afecțiuni coronariene a fost corelat cu antecedente pozitive ale acestei afecțiuni.

INTRODUCTION

Modern biochemical indicators also help in establishing the diagnosis of myocardial infarction or rejection in patients with atypical symptoms or those with undiagnosed electrocardiograms. However, although cardiac troponins are precise and specific indicators of myocardial damage, their growth is not only due to ischemic lesions caused by coronary artery obstruction. Therefore, high levels of troponin interpretation are not always certain. Moreover, the clinical appearance and electrocardiograms are important in diagnosing acute coronary syndrome and clinical decision. The presence or absence at the time of admission revealed ST segment elevations of electrocardiogram decisive influence on treatment decisions.

Accordingly, repetitive episodes of chest pain and ST segment recovery isoelectric line in patients hospitalized with the diagnosis of acute coronary syndrome are adverse prognostic sign and indicate the urgent need to perform a coronary angiography.(1)

After biochemical indicators when placing an interest to put their time needed to rule out the diagnosis of myocardial infarction.(2,3,4) According to the results obtained in present work, myocardial infarction can be refuted in 99% of patients TnT and CK-MB in 96%, within the 12 hours after admission to the emergency department. Therefore, myocardial infarction could not be diagnosed or ruled by troponin or CK-MB much faster than conventional enzymes. The results are also influenced by the upper limit used. In this study, we used a relatively low limit (5.0 ng / l) for CK-MB to exclude the diagnosis of myocardial damage. Period of blood sampling relative to the time of installation is also problematic symptoms and clear the installation just moments symptoms can not be

established with certainty. In clinical practice the measurement timing biochemical indices in relation to the admission to the hospital, it is sufficient, as shown in the study.

Prognostic value of cardiac TnT and TnI is clearly established for acute coronary syndromes. However, the prognostic value of CK-MB is more controversial. High levels of cardiac troponins were regarded as indicators of risk so acute thrombotic risk in acute coronary syndromes. However, high levels of injury indicators may also reflect major myocardial injury resulting in left ventricular dysfunction and worsening prognosis.

PURPOSE

The aim of this study was to investigate the role of biochemical indicators of myocardial damage in diagnostic and prognostic evaluation of ACS (acute coronary syndrome).

The objectives were:

Setting the time required to exclude myocardial infarction with troponin T and creatine kinase MB isoenzyme, and the prognosis of patients with myocardial infarction. The study included patients whose symptoms suggestive of acute coronary syndrome were assigned within 24 hours of admission (n = 268). This study sought to assessing the time needed to confirm or refute the diagnosis of acute myocardial infarction according to the dynamics of troponin and CK-MB.

METHODS

The study population at baseline

This study is a follow-up of a random series of consecutive patients admitted through the emergency department clinics Oradea County Hospital-Cardiology Clinic

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Article received on 02.06.2014 and accepted for publication on 22.08.2014
ACTA MEDICA TRANSILVANICA September 2014;2(3):199-202

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with presumed acute coronary syndrome. During the study period between 2010-2012, were identified 341 such patients. 22 patients (6.36%) were excluded from the study on any of the following exclusion criteria: inability venipuncture, collecting a single blood sample, transfer to another department of the hospital, the lack of measurements of biochemical indicators. However, the patients who died during hospitalization were included in the study. The study involved a total of 319 patients.

RESULTS

In the study, there were included only patients whose symptoms suggestive of acute coronary syndromes has improved after 24 hours.

Of the 319 patients, only 300 had chest pain or other symptoms but equivalent record elapsed time from onset of symptoms to diagnosis could be said only 270 of the patients. Two patients who died from acute myocardial infarction in emergency department shortly after the first blood sample was collected in less than two hours from the onset of symptoms were excluded. Both had troponin T concentrations of 0.08 ng / L.

The subject of the study population included 268 patients: 161 (60.07%) men and 107 (39.93%) women aged 30-86 years (mean age 61 years).

The diagnosis of myocardial infarction was confirmed with elevated troponin T (> 0.10 ng / l) in 89 of 268 patients (33.21%). They were hospitalized with acute coronary syndrome but with improvement of symptoms within 24 hours.

Of the 89 patients with confirmed myocardial infarction, CK-MB was ≤ 5.0 ng / l in 13 patients (13.48%) and ≤ 10.0 ng / l in 22 patients (24.72%) (table no. 1).

On the other hand, in 179 patients with myocardial infarction has been excluded on the basis of troponin T ≤ 0.10 ng / l CK-MB was increased to > 5.0 ng / L 18 (10.06%) patients, to > 10.0 ng / m 3 (1.68%) patients (table no. 2).

Table no. 1. Frequency of patients with confirmed AMI denied and CK-MB values ≤ 5.0 ng / l and ≤ 10.0 ng / l

	AMI confirmed (n=89)		AMI infirmed (n=179)		Value p
CK-MB ≤ 5.0 ng/l	13	13,48%	161	89,94%	P < 0,0001
CK-MB $\leq 10,0$ ng/l	22	24,72%	176	98,32%	<0,0001

Table no. 2. Frequency of patients with confirmed AMI denied and CK-MB > 5.0 ng / l and > 10.0 ng / l

	AMI confirmed (n=89)		AMI infirmed (n=179)		Value p
CK-MB $>5,0$ ng/l	76	86,52%	18	10,06%	0,5734
CK-MB $>10,0$ ng/l	67	75,28%	3	1,68%	<0,0001

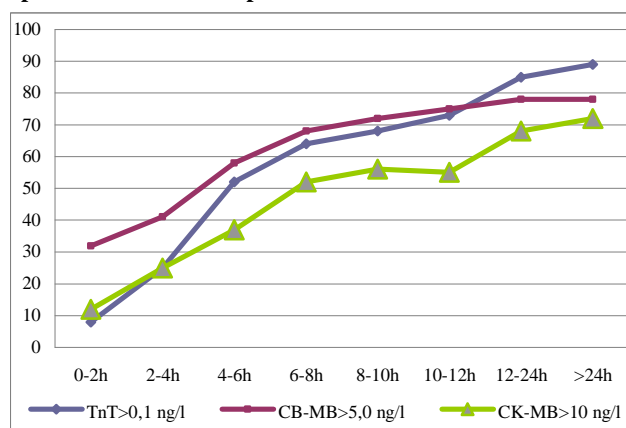
The duration of symptom onset to raise troponin T and CK-MB in the 108 patients with myocardial infarction is illustrated in figure no. 1.

Where of troponin T, the diagnosis of myocardial infarction was confirmed for 95.51% of patients (n = 85) from 12 to 24 hours after onset of symptoms and when CK-MB (using the limit of 5.0 ng / l) in 87.64% of the cases at the same time (n = 78). When the limit of 10.0 ng / l was used for CK-MB, the diagnosis of myocardial infarction was confirmed in 80.9% of all patients (n = 72) within 24 hours of symptom onset (table no. 3).

Of the 78 patients (87.64%) in the CK-MB was elevated to > 5.0 ng / L, the diagnosis of myocardial infarction was confirmed 10-12 hours from onset of symptoms to 96.15%

(n = 75) and as a result, myocardial infarction has been excluded with a high probability if the concentration of the troponin T remained in the normal range up to 12-24 hours or CK-MB by 10 to 12 hours after onset of symptoms (figure no.1).

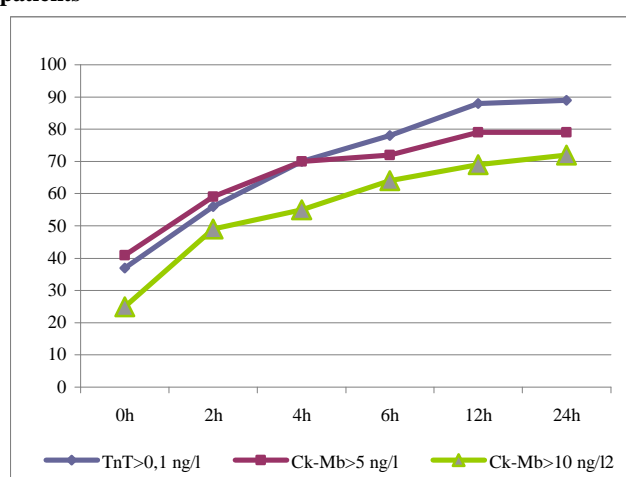
Figure no. 1. Dynamics of troponin T and CK-MB depending on the time elapsed since the onset of symptoms, reported the number of patients



The diagnosis of myocardial infarction was confirmed by troponin T for 98.88% (n = 88) of patients within 12 hours and 100% within 24 hours of hospitalization. In patients with elevated CK-MB > 5.0 ng / L, the diagnosis of myocardial infarction was confirmed to 88.76% (n = 79) of patients within 12 hours of hospitalization.

However, CK-MB was elevated to > 5.0 ng / l to 6 hours of hospitalization in 91.14% (n = 72) of the 79 patients in whom CK-MB increased within 72 hours, ie the 80.9% of all patients with confirmed myocardial infarction. When the limit of 10.0 ng / l was used for CK-MB, the diagnosis of myocardial infarction was confirmed for 77.53% of (n = 69) patients within 12 hours and in 80.9% (n = 72) of patients within 24 hours of hospitalization (table no. 4, figure no. 2).

Figure no. 2. Dynamics of troponin T and CK-MB depending on the time of admission, related to the number of patients



Myocardial infarction was removed to 99% of patients where the concentration of troponin T remained ≤ 0.10 ng / l for 12 hours and 95% in the concentration of CK-MB remains ≤ 5.0 ng / l to 6 hours of hospitalization. If CK-MB remained ≤ 5.0 ng / l up to 12 hours of hospitalization, myocardial infarction was excluded for 96% of patients.

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Table no. 3. Dynamics of troponin T and CK-MB depending on the time elapsed since the onset of symptoms, related to the number of patients

Time from onset of symptoms	TnT>0,1 ng/l		CB-MB>5,0 ng/l		CK-MB>10 ng/l	
	Number of patients n	Frequency %	Number of patients n	Frequency %	Number of patients n	Frequency %
0-2h	8	8,99%	32	8,99%	12	8,99%
2-4h	25	28,09%	41	46,07%	25	28,09%
4-6h	52	58,43%	58	65,17%	37	41,57%
6-8h	64	71,91%	68	76,40%	52	58,43%
8-10h	68	76,40%	72	80,90%	56	62,92%
10-12h	73	82,02%	75	84,27%	55	61,80%
12-24h	85	95,51%	78	87,64%	68	76,40%
>24h	89	100,00%	78	87,64%	72	80,90%

Table no. 4. Dynamics of troponin T and CK-MB depending on the time of admission, related to the number of patients

Time from onset of symptoms	TnT>0,1 ng/l		CB-MB>5,0 ng/l		CK-MB>10 ng/l	
	Number of patients n	Frequency %	Number of patients n	Frequency %	Number of patients n	Frequency %
0h	37	41,57%	41	46,07%	25	28,09%
2h	56	62,92%	59	66,29%	49	55,06%
4h	70	78,65%	70	78,65%	55	61,80%
6h	78	87,64%	72	80,90%	64	71,91%
12h	88	98,88%	79	88,76%	69	77,53%
24h	89	100,00%	79	88,76%	72	80,90%

Table no. 5 shows the incidence of major coronary heart disease and all over the next 1, 3, 6 months and 1 year for the 179 patients in whom myocardial infarction was excluded (including patients with unstable AP).

Table no. 5. Incidence of all major coronary heart disease events during the following periods of 1, 3, 6 months and 1 year for patients with myocardial infarction * statistically significant p

	History of coronary artery disease (n=110)	No history of coronary artery disease (n=69)	Z _p	Total patients (n=179)
Major coronary events				
1 month	2 (1,82%)	1(1,45%)	-0,423; 0,620	3
3 monday	4(3,64%)	1(1,47%)	0,385; 0,700	5
6 monday	9(8,18%)	1(1,47%)	1,554;0,120	10
1 year	11(10%)	2(2,9%)	1,463;0,143	13
Any coronary events				
1 month	14(12,73%)	2(2,9%)	1,974;0,04*	16
3 monday	17(15,45%)	3(4,35%)	2,051;0,04*	20
6 monday	27(24,55%)	4(5,8%)	3,024; 0,002*	31
1 year	33(30%)	5(7,25%)	3,435; 0,006*	38

Of these 65% had a history of coronary heart disease, and these patients within 1 year had more major coronary events and all coronary heart disease events than patients with or without a history of coronary heart disease unknown. Within 3 to 6 months, patients with a positive history of coronary heart disease had more coronary endpoints using any case, as a criterion for coronary heart disease. Only one (0.5%) patients with positive history of coronary artery disease coronary heart disease died within a month. Monday, May 3, (2.6%) patients and within 6 months 9 (4.8%) patients with coronary heart disease died of coronary heart disease, but no deaths occurred among patients with no history of disease CHD. Within 1 year, 11 (5.8%) patients and one (1.0%) patient with no history of coronary artery disease died from coronary heart disease (p = NS). In conclusion, the diagnosis of myocardial infarction can be removed with TnT and CK-MB at 12 hours after admission

to the emergency services at 99% and 96% of patients. An important prognostic factor in patients diagnosed with myocardial infarction has been excluded is the positive history of coronary heart disease.

DISCUSSIONS

The study showed that among pacineții admitted with suspected acute coronary syndrome, whose symptoms resolved following 24 hours, the diagnosis of myocardial infarction can be removed if the TnT remains ≤ 0.10 ng / l for 12-24 hours and CK-MB ≤ 5.0 ng / l up to 10-12 hours of onset of symptoms. If the TnT and CK-MB remains in the normal range for 12 hours of admission, the diagnosis of myocardial infarction can be removed if the 99% and 96% of patients. Moreover, for patients whose diagnosis of myocardial infarction was excluded, the risk of persistent over a period of one year was manifest coronary disease correlate with positive history of the disease.

The study results are consistent with those of the study by Winter et al (2) the diagnosis of myocardial infarction was based on symptoms, electrocardiogram abnormalities indicated, or increase or decrease in activity typical of CK-MB. They found that the diagnosis of myocardial infarction can be removed by CK-MB with accuracy of 95% to 7 hours, or 99% to 16 hours of onset of symptoms. By TnT, the diagnosis can be accurately elimiat 92% at 12 hours and 97% at 16 hours of the onset of symptoms. However, it was found that CK-MB and TnT increase later in patients with minor myocardial infarction than in patients with large infarcts.(2) The infarct size may influence the accuracy of these indicators within 8 hours of onset of symptoms. In a study of Winter et al (2) showed that the normal level of CK-MB at admission and 7 hours of admission eliminates the diagnosis of myocardial infarction in 99% of patients hospitalized with symptoms persist for more than 5 hours. However, all patients were kept under observation for at least 12 hours after symptoms instalation. Herren et al studied a series of 292 patients admitted in the emergency with chest pain lasting more than 12 hours.(3) According to their results, the diagnosis of myocardial infarction can be removed based on a 6-hour surveillance, serial measurement of CK-MB and continuous ST segment monitoring in the emergency department. The diagnosis was confirmed or denied by the measurement of TnT in 48 hours. However, patients had low or moderate risk of heart attack and eventually only 36 (12%) were

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diagnosed with myocardial infarction. In a study by Bakker et al over 290 consecutive patients (5), myocardial infarction could not be definitely confirmed or refuted based on biochemical indicators (CK, CK-MB, TnT and myoglobin) than the 10 - 12 hours after onset of symptoms. Noble (4) recommended that patients with a history of myocardial infarction but normal ST segment abnormalities in the electrocardiogram should undergo serial electrocardiograms and TNT monitored for 12 hours of admission. Low risk patients based on history or electrocardiogram should be monitored for a shorter period. Most of the previous studies did not include data on the prognosis of patients for the diagnosis of myocardial infarction was eliminated in the CK-MB or TnT. Some studies have indicated a favorable prognosis hospital or short-term in these patients.(2) In a series of 128 patients with myocardial infarction according to the criteria of the World Health Organization, Winter et al reported that although TnT was the only biochemical indicator predicted coronary events within 6 months, the best element of prediction were positive history of coronary artery disease.(6) Results of the study, according to which the risk of cardiovascular events in a year is influenced largely positive history of coronary disease patients for the diagnosis of myocardial infarction was ruled out, is consistent with the results obtained by them.

CONCLUSIONS

1. By direct comparison of cardiac TnT and CK-MB, the present study showed that the use of TnT and CK-MB in the diagnosis of myocardial infarction does not bring additional benefits to diagnose based on symptoms, ECG or conventional enzymatic activity. However.
2. Modern biochemical indicators are useful in the detection of minor myocardial damage can not be detected using conventional enzymes. Moreover, the diagnosis of myocardial infarction can be removed by using TnT or CK-MB in almost all patients within 12 hours after admission to the emergency department if symptoms have disappeared.
3. In clinical practice, the schedule by which measurements are reported at the time of admission biometrics seems to be more meaningful and less susceptible to misinterpretation than the timing of blood sampling in relation to symptoms.
4. Adoption TnT use in clinical practice as a central element to diagnose myocardial CK and LDH place on the recommendation of the ESC / ACC (15), leads to a substantial increase in the number of patients diagnosed with myocardial infarction from 23 to 33%.
5. Using modern indicators reduce the number of false-positive diagnosis of myocardial infarction. The risk of coronary heart disease-related events in patients with TnT > 0.10 ng / l was not significantly higher than in those with TnT ≤ 0.10ng / L among patients with a diagnosis of myocardial infarction or electrocardiographic criteria clinch though Store a trend for worse prognosis. So the prognosis of patients with isolated growth TnT requires further investigation on a larger group of patients.
6. In patients without electrocardiographic diagnosis of myocardial infarction, the prognostic value of TnT and CK-MB was higher than that of CK activity. These findings suggest that the use of cardiac TnT and CK-MB can lead to more accurate diagnosis and evaluation of acute coronary syndrome than using conventional enzymes.

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