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Role of early assessment of NT-proBNP in patients with acute coronary syndrome

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Abstract

Aim of present study was to evaluate the short-term prognostic value of the early measurement of NT-proBNP in a wide cohort of patients encompassing the whole spectrum of ACS - especially patients with STEMI and NSTEMI. **Methods:** We enrolled n=50 patients admitted to our coronary care units with the diagnose ofacute coronary syndrome- ACS. We used diagnostic methods, such as: Resting ECG, determination of cardiacTroponin I level (cTnI), measurements of NT-proBNP, we also measured CK-MB and performed echocardiography, NT-proBNP measurement, echocardiography we performed also during follow up: 1-3 months later after the hospital discharge. **Results:** According our results totally NT-proBNP was elevated in 36% (n=18) of hispitalized patients who had not symptoms of heart failure and were hospitalized because of ACS (STEMI and NSTEMI). All these patients were investigated after 1-3 months from hospital discharge. In our study group we had not no one case of patient death. seven patients (38,8%) had recurrent ischemic events (2 subsequent MI, 5 recurrent angina), and 11 (61%) had ymptoms of heart failure (NYHA II-III). We found correlation between NT-proBNP elevated level and decreased EF (ejection fraction) p<0.005 in STEMI group. Such kind of correlation wasn't found in NSTEMI group p<0.007, but during follow up we revealed direct correlation between recurrent episode of ischemia, heart failure symptoms, elevetated NT-Pro BNP level and decreased EF. **Conclusions:** Our data suggest that NT-proBNP levels, measured at admission can have predictive value for complications and short-term mortality in patients with ACS in both subgroups-STEMI and NSTEMI. Our results have practical implications, because the laboratory measurement of NT-proBNP we used has become commercially available and cost-effective it gives us ability to predict future complications and avoid them.

Keywords: NT-proBNP, Acute coronary syndrome, STEMI, NSTEMI.

INTRODUCTION

Optimal risk stratification of patients with acute coronary syndromes (ACS) is of paramount importance to deliver appropriate care according to risk categories in patients both with and without persistent ST-segment elevation. Risk prediction based on clinical, ECG, and biochemical, ie, cardiac troponin, markers, however, is relatively inaccurate. B-type natriuretic peptide (BNP) is a circulating cardiac hormone released mainly from the ventricles in response to increased wall stretch [1,2]. The BNP is produced as a prohormone, proBNP, which on secretion is split into BNP and N-terminal BNP (NT-proBNP). In patients, the proportional and absolute increases of NT-proBNP exceed those of BNP, suggesting that NT-proBNP may be a more sensitive marker of left ventricular (LV) dysfunction [3,4]. The measurement of both BNP and NT-proBNP has been shown to be useful in detecting LV dysfunction, particularly after acute myocardial infarction (AMI), and to be related to poor outcome [5,6]. It was recently shown that BNP and NT-proBNP also provide important prognostic information in patients with non–ST-segment elevation AMI or unstable angina pectoris [7,8].

Aim of present study was to evaluate the short-term prognostic value of the early measurement of NT-proBNP in a wide cohort of patients encompassing the whole spectrum of ACS - especially patients with STEMI and NSTEMI

METHODOLOGY

We enrolled patients admitted to our coronary care units with rest anginal pain lasting more than 10 minutes and occurring within 24-48 hours before admission, and associated with ischemic ECG changes. We used diagnostic methods, such as: Resting ECG, determination of cardiacTroponin I level (cTnI),

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measurements of NT-proBNP, we also measured CK-MB and performed echocardiography, assessment of systolic and diastolic function, measurement of Ejection Fraction (EF).

Resting ECG

We included patients in our study group with different ECG findings at presentation: isolated T-wave inversions of more than 0.1 mV; samplingnt depression 0.05 mV; transient (less than 30 minutes) ST-segment elevation of at least 0.05 mV in at least 2 contiguous leads; and persistent (more than 30 minutes) ST-segment elevation. Patients with left bundle-branch block were included in the group with persistent ST-segment elevation. Myocardial infarction (MI) as the index event was defined as creatine kinase (CK)-MB level was twice much elevated in at least 2 blood samples collected within 16 hours after arrival and according cTnI level. Recurrent ischemic events were the combination of subsequent MI and recurrent angina. Severe heart failure was defined as the occurrence of acute pulmonary edema or cardiogenic shock.

Laboratory Analysis: Blood samples were collected in tubes without anticoagulant. CK-MB and cTnI and NT-pro BNP measurements were performed by local laboratories, using commercial assays, at baseline and at 8, 16, and 24 hours after admission.

Doppler echocardiography

All echocardiograms were performed with the same echocardiographic instrument (HP-2500, Hewlett-Packard) and were interpreted by a single echocardiologist blind to NT-proBNP values. Two-dimensional and color Doppler imaging were performed to screen for valvular stenosis and regurgitation. In each subject, ejection fraction was measured and diastolic function categorized. Left ventricular mass was calculated according to the Devereux formula and indexed to body surface area [9-11]. Presence of left ventricular hypertrophy was defined on the basis of left ventricular mass index 130 g/m^2 for men and 100 g/m2 for women [12]. Presence of left atrial enlargement was defined as left atrial volume index 33 ml/m^2 in men and 30 ml/m^2 in women.

NT-proBNP measurement, echocardiographically assessment we performed also during follow up: 1-3 months later after the hospital discharge.

Statistical analysis

Study End Points and Follow-Up: The study end point was the occurrence of death at 30 days. Secondary end points were recurrent ischemic events and severe heart failure. Follow-up was performed by outpatient visit in 80% of surviving patients and by telephone interview in the remaining 20%. Events were adjudicated by a clinical event committee unaware of results of the biochemical markers under study. Statistical Data analysis was performed using the Statistical Package for Social Sciences (SPSS 10.1) software (SPSS Inc).

RESULTS

Fifty patients were enrolled in our study. Serum samples for determination of NT-proBNP were available in all of them. 30 patients (60%) had ST-segment elevation MI (STEMI), and 20 patients (40%) had no ST-segment elevation ACS (NSTE-ACS).

The NT-proBNP ranged from 5 to 35 000 ng/L, with a median of 354 ng/L (107 to 1358 ng/L); the median time from symptom onset to blood sampling was 3.0 hours (1.8 to 6.0 hours). In patients with STEMI, the median NT-proBNP was 250 ng/L (80 to 741 ng/L); the median time from symptom onset to blood sampling was 2.5 hours (1.5 to 4.0 hours). In patients with NSTE-ACS, the median NT-proBNP was 200ng/L (144 to 1801 ng/L); the median time from symptom onset to blood sampling was 3.5 hours (2.0 to 7.5 hours).

Totally NT-proBNP was elevated in 36% (n=18) of hispitalized patients who had not symptoms of heart failure and were hospitalized because of ACS (STEMI and NSTEMI). All these patients were investigated after 1-3 months from hospital discharge.

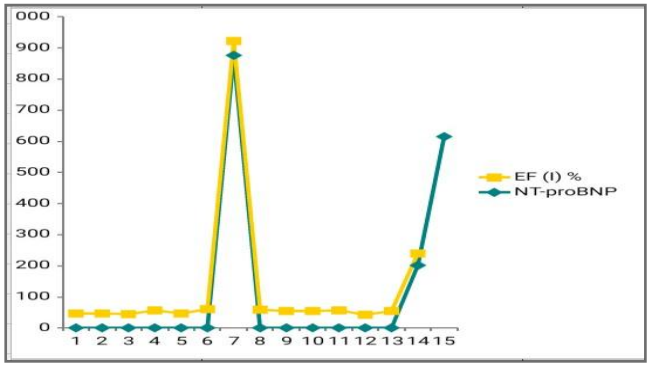

Figure 1: Percenage distribution of NTproBNP, EF, cTnI, coronary occlusion

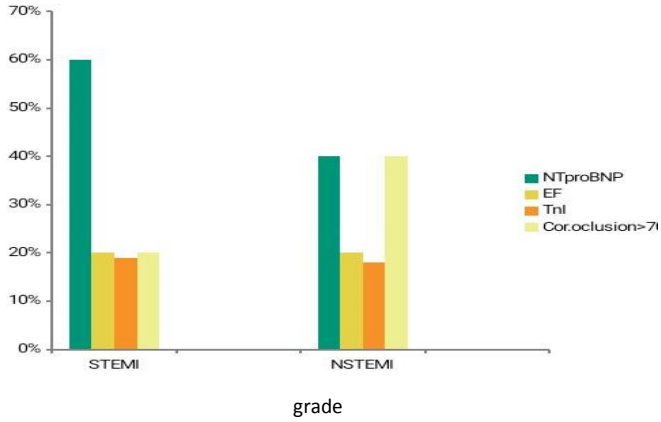

Figure 2: Distribution of NT-proBNP and EF in both groups

In our study group we had not no one case of patient death. seven patients (38.8%) had recurrent ischemic events (2 subsequent MI, 5 recurrent angina), and 11 (61%) had ymptoms of heart failure (NYHA II-III).

We found correlation between NT-proBNP elevated level and decreased EF (ejection fraction) p<0.005 in STEMI group. Such kind of correlation wasn't found in NSTEMI group p<0.007, but during follow up we revealed direct correlation between recurrent episode of ischemia, heart failure symptoms, elevetated NT-Pro BNP level and decreased EF.

Also we noticed correlation between NT-proBNP and cTnI level in both groups.

Strong correlation was found between elevated NT-proBNP level and reccurent symptom onset (reccurent ischaemic symptoms or symptoms of heart failure).

We couldn't find correlation between echocardiographically assessed systolic and diastolic dysfunction during hospitalisation in NSTEMI group and future complications: recurrent episodes of ischemia or early development of heart failure symptoms. But as we mentioned above, such correlation revealed during follow up.

Table 1: Correlation between NT-proBNP level and cTnI, coronary occlusion grade, EF, ACS complications.

	cTnI p value	For occlusion grade	EF	ACS Complications After 1-3 months
NT-proBNP STEMI n=30(60%)	p<0.0012	p<0.003	p<0.005	p<0.002
NTproBNP NSTEMI n=20(40%)	p<0.001	p<0.001	p<0.007	p<0.001

DISCUSSION

Our results showed that NT-proBNP was an independent predictor of the short-term occurrence of severe heart failure and recurrent episodes of unstable angina pectoris and that it had independent prognostic value in patients with STEMI, with a prognostic accuracy similar to that observed in NSTE-ACS. The mechanisms potentially responsible for the strong association between NT-proBNP elevations and short-term mortality cannot be ascertained by the present study. However, BNP and NT-proBNP release may be triggered by transient or permanent ventricular dysfunction induced by myocardial ischemia. Partially in contrast to cardiac troponin, NT-proBNP and BNP elevation is associated with several other risk factors for adverse outcome, including age, renal impairmeant, hypertension, and previous heart failure. As suggested by others, BNP and NT-proBNP may therefore also be considered a general marker for cardiac dysfunction. It should be acknowledged that the prognostic value of NT-proBNP may be limited by the occurrence of elevations in clinical contexts different from myocardial ischemia, particularly in renal insufficiency.

CONCLUSION

Our data suggest that NT-proBNP levels, measured at admission can have predictive value for complications and short-term mortality in patients with ACS in both subgroups-STEMI and NSTEMI. Our results have practical implications, because the laboratory measurement of NT-proBNP we used has become commercially available and cost-effective it gives us ability to predict future complications and avoid them.

Conflicts of interests

All authors have no conflict of interests.

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