Multimarker Approach by Troponin T, C-Reactive Protein, and CK-MB to Assessment in AMI in the Emergency Department

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Introduction

Investigation of several biochemical markers for risk stratification of patients who present with acute coronary syndromes (ACS) has been an active area of research (1). Increased concentration of one of the acute-phase proteins, C–reactive protein (CRP) appear to be predictive of higher risk for long-term cardiovascular morbidity or mortality in patients with ACS, as well as in asymptomatic patients at risk for coronary artery disease (CAD) (2). This potential predictive capacity of CRP warrants further evaluation alone and in conjunction with other established serum biochemical cardiac markers like cardiac specific troponin T (cTnT), creatine kinase-MB (CK-MB) and B-type natriuretic peptide (BNP) (3).

cTnT is a subunit of the regulatory troponin complex in cardiac myocytes and now well recognized as a sensitive and specific marker of myocardial necrosis. Elevation of serum cTnT has been shown to identify patients with ACS at increased risk for adverse clinical outcomes (2,4).

Creatine phosphokinase is well known cardiac biomarker, already been used in patients with acute ischemic chest pain, which especially elevated its fraction of MB isoenzyme. Recently, CK–MB became to be calculated quantitatively in the clinical laboratory (4,5).

So, several new cardiac markers have emerged as strong indicators or predictors among patients with ACS and are now routinely used in the emergency department (ED). We hypothesized that simultaneous assessment of all 3 biomarkers could provide complementary information and enable emergency physicians to assess the patient more effectively among the patients with acute myocardial infarction (AMI).
Materials and Methods

All consecutive patients with acute ischemic chest pain, whom were admitted in the ED at Yeungnam University Hospital between January 2002 and December 2002, were included in this study. All patients had ischemic chest pain, prolonged for at least 30 minutes and/or electrocardiographic (ECG) changes compatible to AMI like ST segment elevation/depression of more than 1 mV in two or more consecutive leads, abnormal Q wave, and T wave inversion and/or elevated cardiac enzymes. And also AMI was diagnosed by these results in the emergency department and lately confirmed by coronary angiogram in admission.

We measured the 3 biomarkers, i.e. troponin T, CRP, and CK-MB, initially at the same time in AMI in the emergency department and also analyzed the baseline characteristics, ECG findings, complications, locations and number of involved vessels, treatments, and outcome results, retrospectively. ECG findings compatible to AMI include ST segment elevation or depression, T inversion, and abnormal Q wave. Coronary angiogram was performed for the confirmatory diagnosis in AMI and then it defines that AMI has the infarct-related coronary artery including above 50% stenotic lesions.

Outcome results were reviewed after at least six months and included anyone of major adverse events like re-admission, revascularization, nonfatal myocardial infarction and cardiac death, and follow up cardiac events like anginal pain, heart failure, shock, atrioventricular block and ventricular tachycardia or fibrillation.

After then, total enrolled patients were classified by 2 study groups, i.e., group I was the patients elevated below any 1 enzyme, group II was the patients elevated 2 or 3 of all 3 enzymes and the patients whom had the left main coronary artery involved. Elevation of each 3 enzymes was designated as troponin T > 0.2 ng/mL, CRP > 0.06 mg/dL, and CK-MB > 4 ng/mL.

For the statistical analysis, the student’s t-test, Chi-square test were performed to compare between the two groups using the programs of Microsoft Excel 2000 and SPSS 10.0 for Windows, and the results were designated as mean value and numbers included and percentage of each groups. A value of p less than 0.05 was considered as statistically significant in this study.

Results

1. Baseline clinical characteristics(Table 1)

Total 130 patients were enrolled in this periods and divided into 2 groups; group I, the patients elevated below any one enzyme of all 3 enzymes, was fourty (mean age 60.4), group II, the patients elevated two or three enzymes of all 3 enzymes, was ninety (mean age 62.7). The ratio of male sex was