THE ROLE OF CREATININ KINASE-MB AND TROPONIN I IN NOVEL CARDIAC ENZYMES MARKER ERA

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Abstract

Backgrounds: Creatinin Kinase-MB (CKMB) and Troponin I were long established cardiac bioenzymes marker. Nevertheless the clinical performance of both enzymes is still taken into account in the diagnosis of myocardial infarction. Later appeared various other cardiac markers are quite sophisticated and expensive. The aim of this study is to see how CKMB and Troponin I used in diagnosing myocardial infarct by clinician.

Method: We used cross sectional observational design study. Data were collected from medical records in a private hospital in Yogyakarta throughout year 2017. All medical records of patients who comes in emergency department with chest pain complaint were collected. Incomplete data was exclusion criteria in this study. We used value 25 U/L as cut off for increasing CKMB and 0,01 U/L for Troponin I. All data were collected in nominal and tested with chi square statistical analysis using Medcalc software.

Result: There are 36 subject eligible for this study with men predominantly (91,67 % vs 8,33 %). The mean age was 59 years old. Chi square analysis showed closed relation between CKMB and clinical diagnose, so as Troponin I (p=0,0047 vs p=0,0014 respectively).

Conclusion: This study showed statistically significant correlation between both CKMB and Troponin I with clinical diagnose. This study showed that both cardiac bioenzymes marker still counted to diagnosing myocardium infarct by clinician.

Keywords: Cardiac enzymes, CKMB, Troponin I, Chest pain, Myocardium infarct

BACKGROUND:

Acute coronary syndrome (ACS) was principle causes of mortality on cardiovascular [1]. Earlier study in 2013 showed that mortality rate caused by ACS was 8,1 million [2]. This number increase especially in developing countries. Some causes for this phenomenon were limited access to health services, low health information, unhealthy lifestyle, and health service cost [2–4]. Economical burden of this disease in America was 39,017 US dollar every years [5].

Acute coronary syndrome was diagnose with triple event: chest pain complain, the increase of heart enzymes, and ST segment changes in electrocardiography examination [6,7]. ST elevation found in ACS was expected only in 5% cases. Therefore enzymes examination was needed. The increase of heart enzymes was examined using CKMB and Troponin I [8,9]. Both assay was still used although some studies showed false positive result [10–12].

Creatinin Kinase-MB was bioenzyme marker that found in heart. This enzyme increase in 2 hours after attack and reside until 72 hours. Peak concentration was achieved 24 hours after attack. CKMB was found increase in chronic heart failure (CHF) cases. The limitation for CKMB assay was many false positive result and couldn't rule out for ACS cases. CKMB was reported increase in blood after cardiomyocytes damages [13–15].

Troponin I assay was found caused by CKMB limitation. Troponin I was regulator protein complex reside in thin filament of heart muscles, part of troponin-tropomiosin cardiac contractile element [16,17]. The concentration was increased in 4-8 hours, peaked in 12-24 hours, and reside untul 7-10 days after attack with half life 90 minutes. Toponin I back to normal in 5-7 days because serum degradation faster that Toponin T [17–21].

Today many novel marker were found. For developing country both CKMB and Troponin I were prefer used. The aim of this study is to to see how CKMB and Troponin I used in diagnosing myocardial infarct by clinician.

METHOD :

This study using observative cross sectional design. Data were collected from medical records in a private hospital in Yogyakarta throughout year 2017. All medical records of patients who comes in emergency department with chest pain complaint were collected. Incomplete data was exclusion criteria in this study. Troponin I assay to diagnose using qualitative method. Then sample was examine used quantitative method using Enzyme-Linked

Flourescent Assay (ELFA) examination with brand name Vidas Troponin I Ultra. Troponin I quantitatively measured and reported in µg/L. CKMB assay to diagnose using qualitative method. Then sample was examine used quantitative method using Enzyme-Linked Flourescent Assay (ELFA) examination with brand name Vidas CK-MB. Troponin I quantitatively measured and reported in ng/L. We used value 25 U/L as cut off for increasing CKMB and 0,01 U/L for Troponin I. All data were collected in nominal and tested with chi square statistical analysis using Medcalc software.

RESULT :

There are 36 subject eligible for this study with men predominantly (91,67 % vs 8,33 %). The mean age was 59 years old. Table 1 showed that all baseline characteristic was indifferently between groups.

Table 1. Baseline characteristics of Subjects

	non ACS (9)	STEMI (19)	NSTEMI (8)	P
Age	57.875 ± 12.1589	59.368 ± 10.6990	59.625 ± 8.7495	0.934
Sex Male Female	 8 1	 17 2	 8 0	0.6257
Onset (hours)	3 (1-48)	5.500 ± 3.9022	6 (1-9)	0.797709
Systolic pressure	135.667 ± 35.2704	139.316 ± 26.9424	147.000 ± 42.6347	0.770
Diastolic pressure	90.778 ± 22.9988	84.842 ± 13.4671	75.500 ± 27.1662	0.284
Respiratory Rate	22 (20-24)	23.133 ± 4.1553	20 (20-32)	0.639659
Heart Rate	93.750 ± 17.1860	87.895 ± 10.9995	87.125 ± 7.9181	0.462
Temperature	36.537 ± 0.6070	36.4 (36-38)	36.55 (36-37.4)	0.950354
Previous History	0	3	1	0.4580
Diabetes Mellitus History	0	1	2	0.1380
Hypertension History	4	5	4	0.4211
Smoking	2	8	3	0.5901
Unhealthy Lifestyle	3	2	0	0.1156

CKMB and Troponin assays showed there was difference between groups (p=0,002 vs p=0,017 respectively) (Figure 1). Chi square analysis showed closed relation between CKMB and clinical diagnose, so as Troponin I (p=0,0047 vs p=0,0014 respectively).

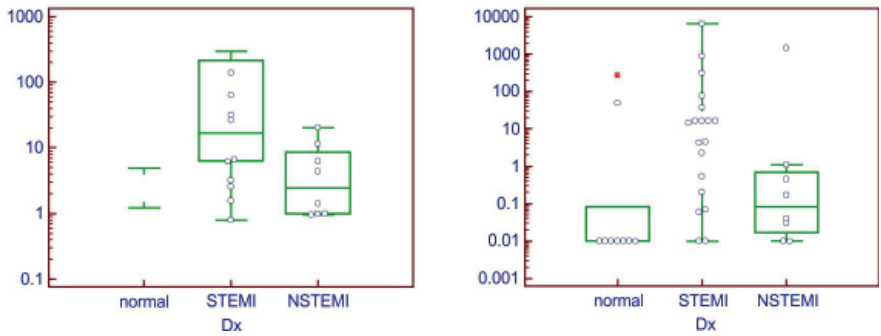

Figure 1. Box plot for CKMB and Troponin I examination

DISCUSSION:

Analysis showed that in this study there is no significant difference in baseline data between groups. Same result was found by Liu and Huang in 2011 in Taiwan, that showed there is no baseline characteristic difference between STEMI and NSTEMI patients except sex and comorbidities such as PCI history, End stage renal diseases, and cardiovascular diseases [22]. Other study showed similar result except hypertension as risk factor [23]. Difference result was found in other study that there was significant difference in baseline data between groups [24].

Both CKMB and Troponin I were standard to diagnose ACS, proved by both clinical study and statistical analyses [25]. Some study showed the role of both marker in prognostic value in clinical deteriorities and adverse event, with highest sensitivity in myoglobin with troponin I combination on 9 hours after admission [26]. This result caused Troponin I was sensitive to detect micro damage of heart muscles. Troponin I was good predictor for bad outcome [27]. Some study showed that Troponin I positively independent to predict mortality in year 12,5%, hence combination with CK- MB could predict mortality in year 11,7%. This result showed that Troponin I was superior than CKMB in predict bad outcome prognosis in ACS cases [28].

This study showed statisctically difference between CKMB and Troponin I in three groups. This is showed higher diagnostic value. Some study showed

that Troponin I more sensitive and specific than CKMB to predict ACS [29]. Other study showed that the increase of Troponin I more than 0,4 ng/mL increase mortality rate in 42 days significantly [27]. Although other marker was found with higher accuracy, but in low socioeconomic setting CKMB and Troponin I assay were recommended.

CONCLUSION :

CKMB and Troponin I were measured in almost all patients with chest pain complaint. There was almost perfect agreement between CKMB and troponin I assay result in patients with chest pain complaints.

CONFLICT OF INTEREST:

Authors declare there is no conflict of interest in this study

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