

32

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original article

EVALUATION OF CARDIAC SPECIFIC MARKER CARDIAC TROPONIN I AFTER CORONARY BYPASS SURGERY.

Dr NANDA JAGRIT*, Dr USHA PATEL**

* Associate Professor, Pathology, AMC MET Medical College, Ahmedabad.

** Assistant Professor, Biochemistry, AMC MET Medical College, Ahmedabad.

Corresponding author:

Dr Usha Patel, Assistant Professor, Biochemistry, AMC MET Medical College, Ahmedabad.

Abstract

Background: Cardiac troponin I (cTnI) is reported to be very specific for myocardial cell damage without cross reactivity with skeletal muscle isoform. Evaluation of cTnI after CABG will be useful as an early marker of excessive post operative myocardial damage when a specific therapeutic intervention can still be efficient and improve outcome.

Methodology: The study comprised of 50 patients who undergo Coronary artery bypass surgery at V.S group of Hospital. Blood sample were taken after 12 hour (T12) and 24 hour (T24) of post CABG. The sample were analysed for cTnI.

Results: Our results show that Troponin I levels after 2 hours, 12 hours and 24 hours in patients who had better outcome after CABG was 9.2 ng/ml, 13.9 ng/ml and 10.9 ng/ml respectively. Whereas, Troponin I levels after 2 hours, 12 hours and 24 hours in patients who had adverse outcome like death of patients after CABG was 10.6 ng/ml, 38.7 ng/ml and 28.9 ng/ml respectively.

Conclusion: Routine measurement of cardiac troponin levels after cardiac troponin can identify group of patients at increased risk of complications or death.

Key words: Cardiac Troponin I (cTnI), Coronary artery bypass grafting (CABG), Post operative myocardial infarction (PMI).

Introduction

There are mainly three different forms of troponin associated with contractile myofibril proteins :TnC (calcium binding molecular mass 18 kDa),TnI (inhibitory components molecular mass 22.5 kDa),TnT (tropomyosin-binding component molecular mass 37 kDa) which are mainly in muscle and minor fraction in cytosol.¹

However cardiac specific isoforms (cTnI,cTnT) are identified from multiple troponin isoforms in muscle and measured . cTnI and cTnT are released in response to myocardial injury due to any cause. In acute myocardial ischemia cTn measured in peripheral blood with in 4 hours ; with new high sensitive cTn(hsTn) we can detect earlier than 4 hours. Concentration of cTn depends on size of infarct within 24 -48 hours and remain high for period of days. Cardiac troponin I (cTnI) is reported to be very specific for myocardial cell damage without cross reactivity with skeletal muscle isoform (1). The specificity cardiac troponin I has been confirmed in various situations like myocardial infarction, contusion, myocarditis and renal failure. In general for conformation of diagnosis of myocardial infarction by measuring cardiac troponin in patient having symptoms and clinical sign suggestive of myocardial ischemia. ²

Hence measurement of cardiac troponin in patients helpful for early diagnosis and decrease recurrence of myocardial infarction and adverse outcome like death etc.. in patients having suspected myocardial infarction. (3,4)

There are many methods exist for to identify risk early like EUROSCORE, Biomarkers measurement (natriuretic peptides, creatine kinase (CK), or the cardiac troponins (cTn) ,myoglobin) for complication after cardiac surgical procedures. so we can easily predicts prognosis for adverse outcome may helpful in early therapeutic interventions following surgery like coronary artery bypass graft CABG. However all biomarkers have been shown to predicts risks but have limited use due to exact mechanism of release not well explain during and after operations. cardiac troponin measurement is superior than CK MB isoenzyme for risk prediction in post operative cardiac surgery due to more specificity.(5,6,7,8)

As cardiac troponin I measurement is objective ,superior than subjective for assessment of underlying pathology of patients in myocardial necrosis

commonly used “ gold standard “ for diagnosis and predictions of risk in cardiovascular disease.²

cTn may increased after cardiac surgery due to multiple reasons like cardiac manipulation, hemodynamic instability, injury, intra operative defibrillation, acute loss of grafts .⁹

Evaluation of cTnI after CABG will be useful as an early marker of excessive post operative myocardial damage when a specific therapeutic intervention can still be efficient and improve outcome.

Ischemic heart disease is highly prevalent in residents of the Ahmedabad. Many patients undergo coronary artery bypass surgery (CABG) in the city as a routine. No systemic database study of the cardiac specific marker Cardiac Troponin I after CABG has been done in Ahmedabad population considering ethnic diversity of the city.

Methodology

The study comprised of retrospective analysis 50 patients registry who undergone Coronary artery bypass surgery (CABG) at V.S group of Hospital between 2014 Dec to Dec 2016.

Inclusion criteria were reports of patients undergone CABG.

Blood sample were taken after 2 hours, 12 hour (T12) and 24 hour (T24) of post CABG. The sample were analysed for cTnI. The out come measured with major adverse cardiac events like death ,myocardial infarction, thrombosis etc...

The blood samples were collected in vials containing no anticoagulant or preservative. The samples were collected using a disposable needle and syringe and care was taken to get non hemolysed samples. The serum samples were analyzed for cTnI with well standardized method. The serum cTnI concentration was measured using the reagent kit manufactured by Abott c8000 architect system using CMIA (Chemiluminescent micro particle immunoassay).

Results:

Out of 50 patients post CABG, Group 1 comprised of 35 patients who had better outcomes, while 15 patients had adverse outcome in the form of adverse cardiac events like death of patient.

Normal reference value of Troponin I in healthy people is <0.04 ng/dl. For troponin concentrations 0.40 ng/mL and higher, maybe suggestive of the underlying cardiac injury. Our results show that Troponin I levels after 2 hours, 12 hours and 24 hours in patients who had better outcome after CABG was 9.2 ng/ml, 13.9 ng/ml and 10.9 ng/ml respectively (Table 1).

Whereas, Troponin I levels after 2 hours, 12 hours and 24 hours in patients who had adverse outcome like death of patients after CABG was 10.6 ng/ml, 38.7 ng/ml and 28.9 ng/ml respectively (Table 1).

Table 1: Troponin I levels post CABG.

	Troponin I (ng/ml) After 2 hours (Interquarantile range)	Troponin I (ng/ml) After 12 hours (Interquarantile range)	Troponin I (ng/ml) After 24 hours (Interquarantile range)
Group 1 (n=35)	9.2 (1.4-17.5)	13.9 (8.5-15.5)	10.9 (5.7-15.1)
Group 2 (n=15)	10.6 (10.6-25.7)	38.7 (28.8-63.8)	28.9 (22.8-61)

Discussion:

Our study comprised of measurement of cTn1 in patients undergone coronary artery bypass study after 12 hour (T12) and 24 hour (T24) of post CABG.

Troponin I is a regulatory subunit of the troponin complex associated with the actin filament within muscle cell. Clinical studies have demonstrated the release of troponin I into the blood stream within hours following AMI or ischemic damage.

The measurements of serum enzymes as a reflection of damage to myocardial muscle cells still play an important role in the diagnosis of AMI. Our results show that troponin I level was elevated at 2 hours, 12 hours and 24 hours after coronary bypass surgery. However, it was seen that 15 patients out of 50 developed post operative complications. Troponin I level in these 15 patients remained high even after 24 hours of surgery compared to group 1 patients who did not develop complications.

Cardiac surgery may be associated with significant perioperative and postoperative morbidity and mortality. Intraoperative injury maybe due to cardiac manipulation, defibrillation, acute post bypass hemodynamic instability. These can cause elevation of cardiac markers.

Cardiac troponins have shown to be specific markers of myocardial injury. cTnI is more cardiospecific than other cardiac markers like CK-MB and can be used as a tool for diagnosis of myocardial infarction after cardiac surgery. cTnI could be a marker of myocardial ischemia after open heart surgery .¹⁰

The National Academy of Clinical Biochemistry issued a guideline in 2007 that stated that “in the presence of a clinical history suggestive of Acute cardiac syndrome, the following is considered indicative of myocardial necrosis consistent with myocardial infarction: maximal concentration of cTn exceeding the 99th percentile of values.¹¹

In our study, cardiac Troponin I was found to be low in patients who had undergone CABG surgery, having no adverse effects post CABG. Study by¹² had similar findings, serum levels of cardiac troponin remained low after uncomplicated CABG. Low levels of cTnI within 24 to 48 hours after cardiac surgery is suggestive of absence of perioperative myocardial necrosis. ¹³

In our study, cardiac Troponin I was found to be high in patients who had undergone CABG surgery, having adverse cardiac complications / effects post CABG. In this group of patients, cTnI was not elevated 2 hours after CABG, but after 12 hours, the increase was more pronounced. Changes in cTnI levels immediately after surgery may not be very useful in predicting outcomes as the changes maybe due to surgery itself. cTnI levels 24 hours after surgery are more powerful short as well as long term predictors of mortality rather than after 2 hours .¹⁴ cTnI levels at 24 hours can be used to predict short-, medium- and long-term outcome in cardiac surgery patients.

Conclusion:

Troponin I levels post cardiac surgery can be used to identify patients at risk of developing complications or adverse cardiac reactions. Identification of such patients, in early stage, can help in improving the outcome as well as reducing morbidity and mortality.

Cardiac troponin I levels are frequently elevated after cardiac surgery. However, cardiac troponin levels measured 24 hours after surgery were

independently predictive of complications post operatively after CABG. These data suggest that routine measurement of cardiac troponin levels after cardiac troponin can identify group of patients at increased risk of complications or death.

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