PROGNOSTIC SIGNIFICANCE OF ELEVATED TROPONIN I AFTER PCI

Thesis
Submitted for partial fulfillment of M. Sc. Degree in Cardiology
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2006

الـدلالات المستقبليـة المؤثـرة لارتفاع إنزيم التروبونين (I) بعد التوسيع بالقسطرة العلاجيـة

رسالة مقدمة من

الطبيب/ شادى صبحى محمد سالم

توطئة للحصول على درجة الماجستير

فى أمراض القلب والأوعية الدموية

تحت إشـراف

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INTRODUCTION

Elevated creatine kinase-MB is prognostically important after PCI, but prognostic significance of elevated cTn-I after PCI is uncertain (Califf et al., 1998).

After percutaneous coronary intervention (PCI) about 20 % of patients develop elevated creatine Kinase (CK-MB) (Califf et al., 1998). Such elevations have been associated with increase risks for death, myocardial infarction and repeated revascularization (Califf et al., 1998).

A study by Stone et al. (2001) of 7.147 patients with systematically collected CK-MB after PCI suggested that the relationship with in-hospital death may be manifest only at higher CK-MB levels (Stone et al., 2001).

Compared with CK or CK-MB, the cardiac troponins are more specific biomarkers of myocardial necrosis and may be more sensitive in detecting myonecrosis after PCI.

However, the prognostic significance of elevated troponin levels after PCI has not been prospectively evaluated (Holmes et al., 2001).

AIM OF THE WORK:

To assess the incidence and clinical significance of elevated cardiac troponin I (cTn-I) after PCI.

Acknowledgment

**"First and Foremost, Thanks to GOD,
The Beneficent and Merciful of All"**

I would like to express my deepest gratitude and sincere thanks to **Prof. Dr. Wagdi Galal,** Professor of Cardiology, Faculty of Medicine, Ain Shams University for suggesting and planning this work, his instructive supervision, continuous guidance, unlimited help and unfailing support, valuable instructions throughout the work and final revision of the manuscript.

I owe much to **Dr. Ahmed Tamara,** Lecturer of Cardiology of Medicine, Ain Shams University for his continuous guidance, encouragement during the progress of this work and direct supervision.

Contents

LIST OF ABBREVIATIONS

ACE	Angiotensin converting enzymes
ACS	Acute coronary syndromes
AMI	Acute myocardial infraction
ATP	Adenosine triphosphate
CK	Creatine kinase
CK-MB	Creatine Kinase-MB
cTn-I	Cardiac roponin I
cTn-T	Cardiac troponin T
IVUS	Intravascular ultrasound
LD	Lactate dehydrogenase
NHLBI	National Heart Lung and Blood Institute
PCI	Percutaneous coronary intervention
PTCA	Perctaneous transluminal coronary angioplasty registry
ED	Emergency department

INTRODUCTION & AIM OF THE WORK

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However, the prognostic significance of elevated troponin levels after PCI has not been prospectively evaluated. (Ref 3)

Aim of the work :

To assess the incidence & clinical significance of elevated cardiac troponinI (cTn-I) after PCI.

Patients & Methods:

50 patients with IHD undergoing PCI will be studied in the period from April 2004 to April 2005 & all patients undergo:

- Full history taking

- General & Local cardiac examination
- 12 surface ECG
- CPK-MB & cTn-I 1 Hour Before PCI
- CK-MB &cTn-I immediately after PCI
- CK-MB &cTn-I 8 Hours after PCI
- CK-MB &cTn-I 16 Hours after PCI
- Echocardiography
- PCI to the target vessel

Inclusion Criteria :

-Patients undergoing PCI:

- Seven days after unstable angina or MI.
- Receiving either oral clopiodogrel or tirofiban.
- PCI and stent implantation.

Exclusive Criteria:

- Less than 7 days from MI
- Elevated levels of troponin or CK-MB.
- Patients with positive or missing pre-procedural CK-MB or cTn-I values

Follow up:

- 6 months composite incidence of death (all causes).
- MI (Re-infaction) or recurrent severe ischemia requiring urgent revascularization

References:

1- Califf RM, Bdelmeguid AE, Kuntz RE, et al. Myonecrosis after revascularization procedure. J AM Coll Cardiol 1998; 241-51.

2- Stone GW , Mehran R, Dangas G, Lansky AJ ,Kornowski R, Leon MB.

Differential impact on survival of electrocardiographic Q-Wave Versus enzymatic myocardial infarction after percutaneous intervention: a device-specific analusis of 7147 patients. Circulation 2001; 104:642-7.

3- Holmes DR, Jr.,Berger PB. Troponins, necrosettes , enzyme leaks, creatinine phosphokinase bumps, and infarctlets: what behind this new lexcon and what does it add? Circulation2001; 104:627-9.

CONCLUSION

- Cardiac Troponins are regarded as the most sensitive biochemical marker for diagnosis of myocardial injury .

- The use of Creatine Kinase (CK) –MB is still considered as an acceptable alternative if cardiac Troponin assay is not available.

- Among patients with acute coronary syndrome not diagnosed as AMI , cTn-I elevation is a strong predictor of serious cardiac event . The risk of such event correlates with the degree of elevation.

- The effective management of ACS patients is the early recognition of the cardiac ischaemic event and the proper placement of the patient in the risk spectrum of ACS .

- Results of our study showed that procedural complications didn't affect the risk of later cardiac events .

- Most of the complications had been reported in the group that includes patients with cTn-I > 0.45 ng/ml. So, although cTn-I is often elevated after PCI it is an important predictor of later cardiac event .

DISCUSSION

Proper evaluation of the patient with acute chest pain is a resource-intensive and expensive process (Kahn, 2000). Critical to the effective management of these patients is the early recognition of a cardiac ischemic event and the proper placement of the patient in the risk spectrum of acute coronary syndrome (Lee and Goldman, 2000). With increasing economic pressures on health care, physicians, health plans, and medical centers are interested in improving the efficiency of care for patients with acute chest pain. This interest recently reinforced the need for a better diagnostic approach to patients with suspected acute coronary syndrome and, consequently, the need for a new standard definition of acute myocardial infarction (AMI) and of risk determination (Mathew et al., 1999).

For much of the past 3 decades, acute ischemic heart disease has been regarded as a binary phenomenon, AMI or non-AMI, using World Health Organization recommendations that included fulfillment of at least two of the three well-known diagnostic criteria: a history of acute, severe, and prolonged chest pain; presence of significant changes in ECG; and unequivocal abnormal elevation of traditional enzyme activities in serum (Nomenclature and Criteria for Diagnosis of Ischemic Heart Disease, 1979). Chest pain is, however, an unreliable indicator: up to 33% of patients with AMI may have no chest pain and are clinically silent on presentation to the hospital (Canto et al., 2000). The ECG remains the cornerstone for the early diagnosis of acute ischemia, showing ST-segment change within seconds of the

ischemic insult in approximately 60% of patients. However, the ECG can be inconclusive in the remaining 40% of cases, therefore showing a globally low sensitivity (Rouan et al., 1989). Also well known are the imperfect sensitivity and specificity of the traditional enzymatic markers for the detection of myocardial injury (Panteghini, 1999).

In this historical context, the risk of misdiagnosis was therefore relatively high. Several studies estimated that 2 to 8% of patients with AMI were inadvertently sent home from emergency departments because of the diagnostic limitations of the ECG and of measurements of classic enzymes (Kontos and Jesse, 2000). Inappropriate early discharge also resulted in significantly higher morbidity and mortality (Lee et al., 1987; Kontos and Jesse, 2000; Pope and Aufderheide, 2000).

Considering these pitfalls in the traditional criteria for diagnosis of AMI and the excellent findings of several clinical trials using highly sensitive and specific markers of heart muscle damage that are not themselves enzymes, such as cardiac troponins, the Committee on Standardization of Markers of Cardiac Damage (C-SMCD) of the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC) made in 1999 a recommendation to expand on the enzyme diagnostic criteria for AMI to include cardiac-specific proteins (Panteghini et al., 1999). However, the C-SMCD considered that it was the responsibility of cardiology groups, and not laboratorians, to officially redefine the biochemical criterion for diagnosis of AMI. The consensus document (Alpert and Thygesen, 2000) published by the European Society of Cardiology and the American College

of Cardiology , therefore the appropriate next step, making specific new recommendations on the use of biomarkers for the detection of myocardial necrosis. In particular, the document considers as the best biochemical indicator for detecting myocardial necrosis "a concentration of cardiac troponin exceeding the decision limit on at least one occasion during the first 24 hours after the onset of clinical event" (Alpert and Thygesen, 2000). The use of creatine kinase (CK)-MB, measured by mass assays, is still considered as an acceptable alternative if cardiac troponin assays are not available (Alpert and Thygesen, 2000). The redefined criterion used to classify acute coronary syndrome patients presenting with ischemic symptoms as AMI patients is therefore heavily predicated on an increased cardiac troponin concentration in blood.

Cardiac troponins are correctly regarded as the most cardiac-specific of currently available biochemical markers for the diagnosis of myocardial injury (Jaffe et al., 2000). In particular, cardiac troponin I (cTnI) and cardiac troponin T (cTnT) have been identified. These proteins are associated with specific amino acid sequences encoded by genes different from those encoding skeletal muscle isoforms. While cTnI has been shown to have complete specificity for cardiac muscle, cTnT is present in small amounts in skeletal muscle during human fetal development and is reexpressed during diseases that involve skeletal muscle regeneration (eg, Duchenne muscular dystrophy) (Bodor et al., 1997).

This study was conducted on 62 patients suffered from acute coronary syndrome and had post PCI. They were divided

into three groups according to the level of troponin I in their venous blood post PCI . Group I: Included 18 patients in which their serum troponin I level was less 0.15 ng/ml. Group II: Included 22 patients in which their serum troponin I level was ranged from 0.15 ng/ml to 0.45 ng/ml. Group III: Included 22 patients in which their serum troponin I level was more than 0.45 ng/ml. Blood samples of the three groups were collected 1 hour before PCI, immediately after PCI, 8 and 16 hours after PCI for subsequent measurement of troponin I and CK-MB.

Our results showed that all PCI treated groups showed a gradual significant increase in cTnI level with a percentage starting from 22.2% and reaching to 36.4%. This gradual increase was started 8 hours after PCI ($p< 0.001$) and 16 hours after PCI ($p< 0.001$) when compared to both the baseline (before PCI) and immediately after PCI.

These results were in consistent with those of Shmuel et al. (2000) who measured cTn-I level after 6 and 18 to 24 hours after PCI and reported that patients with any cTn-I level more than 0.15 ng/ml showed elevation in cTn-I level in 30.6% of patients while those with cTn-I levels more than 3 times the upper limit of normal (0.15-0.45 ng/ml) were elevated in 15.4% of patients.

Many authors reported that elevation of cardiac troponins was detected in 30% to 44% of patients undergoing catherter-based coronary interventions (Karim et al., 1995; La Vecchia et al., 1996; Shyu et al., 1998).

However, many authers reported that the prognostic value of troponins after PCI has not been well established, but prior