LENGTH OF CORONARY STENOSIS IN PATIENTS WITH UNSTABLE ANGINA WITH ELEVATED VERSUS NON-ELEVATED TROPONIN T-LEVELS

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ABSTRACT

Background: Cardiac troponin T elevation had a strong association with the presence of severe and complex coronary artery disease. **Objective:** To determine the length of coronary stenosis on angiogram in patients with unstable angina having elevated versus non-elevated troponin T-levels. **Methods:** Two hundred ten consecutive patients admitted at Punjab Institute of Cardiology, Lahore with clinical diagnosis of unstable angina were enrolled. Serum samples for troponin T were obtained 6 to 12 hours after onset of chest pain. Patients were grouped into positive and negative depending on troponin T levels (cut off value was 0.10ng/ml). All patients underwent Coronary angiography before discharge. Angiographic films were reviewed to determine the length of lesions. 200 patients had positive angiogram and 10 patients had no significant coronary artery disease. Length of coronary stenosis was described as discrete, tubular and diffuse according to ACC/AHA criteria. **Results:** Total number of patients were 210 with mean age of 53.3, ± SD 10.49. Male were 79% (165) and female were 21% (45). 71% were troponin positive and 29% were negative. Length of coronary stenosis in positive versus negative troponin T were discrete lesions 6.0% vs 33.3%, tubular 59.3% vs 48.3% and diffuse was 30.7% vs 11.7% (P< 0.01). **Conclusion:** Our study has demonstrated that unstable angina patients with raised troponin T had severe angiographic coronary artery stenosis, tubular and diffuse lesions comparing patients with negative troponin T levels. Therefore, troponin T positive patients should be evaluated by coronary angiography to determine the extent and severity of coronary lesions.

Keywords: Unstable angina,Troponin T, Coronary angiography.

INTRODUCTION

Ischemic heart disease is now a leading cause of death, not only in the western countries but also in Asian countries like Pakistan. In Pakistan, ischemic heart disease involves relatively younger population and about 30% of all patients having coronary artery disease are below the age of 40 years. [1]

Unstable angina or non-ST elevation myocardial infarctions are very common manifestations of ischemic heart disease. Unstable angina / non-ST elevation myocardial infarction constitutes a clinical syndrome that is caused by atherosclerotic coronary artery disease and associated with an increased risk of myocardial infarction and cardiac death. [2]

The troponin blood assays to define various syndromes of acute ischemic heart disease has gained worldwide use. Currently, in an appropriate clinical setting, an elevated blood troponin value represents the "gold standard" for identifying acute ischemic myocardial necrosis. Troponin is the most sensitive and specific biomarker for myocardial cell death.[3] Elevation in cardiac troponins identifies a high- risk subgroup of patients who present with unstable angina or MI without ST elevation. These patients have more extensive coronary artery disease, more complex and severe coronary lesions, and a greater burden of intracoronary thrombus on coronary angiography.[4,5,6] Percutaneous revascularization of small vessel and diffuse disease is associated with decreased rates of procedural success and a greater incidence of acute complications and restenosis. Patients with diffuse coronary disease may not be suitable candidates for conventional bypass grafting because the disease involves the distal vascular territories.[7] Therefore, the purpose of the present study was to know the length of coronary stenosis in patients with unstable angina with elevated versus non- elevated troponin T levels.

PATIENTS AND METHODS

The study population comprised of consecutive 210 patients (165 male and 45 females) with diagnosis of unstable angina / non ST elevation myocardial infarction admitted at Punjab Institute of Cardiology Lahore between Aug. 2005 to Jan. 2007.

Inclusion criteria

Patients who fulfilled one of the following criteria

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were selected in the study; (a) Chest pain occurs at rest (or with minimal exertion) usually lasting more than 20 minutes. (b) Chest pain was severe and described as frank pain and of new onset (i.e., within one month). (c) Chest pain occurred with the crescendo pattern (i.e., more severe, prolonged, or frequent).

Exclusion criteria

The patients with following characteristics were excluded from study; (a) Patients with ST elevation myocardial infarction. (b) Patients who did not give "Written Consent". (c) Any known contraindication to angiography, such as; coagulopathy (INR > 1.8), renal failure (cut off point of serum creatinine < 1.5 mg/ dl), dye allergy, active infection, Laboratory abnormalities; anemia, electrolyte imbalances, decompensated heart failure, severe peripheral vascular disease, abdominal aortic aneurysm, uncontrolled severe hypertension.

Troponin T measurement

Cardiac troponin T was measured on the Elecsys 1010 and 2010 (Roche Diagnostics) immunoassay analyzers in the Central Pathological Laboratory at Punjab Institute of Cardiology, Lahore. Serum samples for Troponin T were obtained 6-12 hours after onset of chest pain. The sensitivity of Cardiac troponin T (cTnT) measurement was 98% at 6 hours and 100% sensitivity was at 12 hours.[8] The manufacturer had reported the minimal detectable concentration as 0.01 ng/ml. A diagnostic threshold value of 0.10 ng/ml was used to classify patients as Troponin T positive. Patients were grouped into positive (0.10 ng/ml) and negative (< 0.10 ng/ml) according to the level of Troponin T measured.

Baseline Characteristics and electrocardiogram

The presence of history of hypertension, diabetes mellitus, hypercholesterolemia, smoking, and a pertinent family history were noted. Routine standard 12- lead electrocardiograms were obtained at admission and in association with episodes of chest pain. All electrocardiograms were evaluated for the presence of ST segment depression and or elevation and inverted T waves. Patients who had ST elevation 0.1mv in at least 2 contiguous leads at admission diagnosed as ST segment elevation myocardial infarction were ruled out from the study.

Coronary angiography

All patients underwent coronary angiography before discharge in the cardiac catheterization laboratory of Punjab Institute of Cardiology Lahore using the Bicore mode and Hicore mode (Siemens's Germany) and INTEGRUS (Philips Netherlands) angiographic machines. Left sided cardiac catheterization, coronary angiography and ventriculography were performed using the Judkins Technique. All angiographic films were reviewed to determine the length of coronary stenosis blinded to the result of the serum troponin T analysis. The lesions were classified according to American College of Cardiolog/American Heart Association (ACC/AHA) criteria as; <10mm (Discrete), 10-20mm (Tubular) and >20mm (Diffuse).

Statistical Methods

The collected data was entered and analyzed in SPSS version 12.0 software. Nominal variables were reported as frequency and or percentages. Numerical variables were expressed as mean ± SD. Chi-square test was used for comparison of troponin T levels with length of coronary stenosis. P values below 0.05 were considered to indicate statistical significance.

Ethics

Informed written consent was obtained from all patients for coronary angiography.

RESULTS

Total 210 patients were enrolled in this study. The mean age was 53.3, ± SD 10.49. The majority of patients were between 40 to 70 years of age. 73% (165) were male and 21% (45) female. All the patients had chest pain but in addition, 6.7% had breathlessness and 4.3% had palpitation. 52.9% patients were hypertensive, 35.7% patients were diabetic, 37.1% patients were smoker, 4.8% patients had hypercholesterolemia, 35.2% patients had family history of CHD and 7.1% patients had no risk factor. (Table I)

Troponin T Status

Total (n=210) patients were separated into 2 subgroups, based on their troponin T values. The cut off value used for cardiac troponin T was 0.10ng/ml. 160 patients had troponin T levels 0.10ng/ml and

Table I:
Gender wise distribution of patients according to the presence of risk factors

Risk Factors	Male (n=165)		Female (n=45)		Total (n=210)	
	Freq.	Percent.	Freq.	Percent.	Freq.	Percent.
Hypertension	78	47.3%	33	73.3%	111	52.9%
Diabetes Mellitus	52	31.5%	23	51.1%	75	35.7%
Smoker	75	45.5%	3	6.7%	78	37.1%
Hypercholesterolemia	9	5.5%	1	2.2%	10	4.8%
Family history of CHD	59	35.8%	15	33.3%	74	35.2%
No Risk Factor	13	7.9%	2	4.4%	15	7.1%

they were considered as troponin T positive and 50 patients had troponin T levels < 0.10ng/ml and they were considered as troponin T negative.

Coronary angiographic findings

All patients (n=210) underwent coronary angiography before discharge. All coronary angiograms were evaluated without knowledge of clinical or troponin T status.

In 150 patients with elevated troponin T levels, 70 (46.7%) patients had 3 vessels disease, 9 (6.0%) patients had discrete lesion (<10 mm), 89 (59.3%) patients had tubular lesion (10-20 mm) and 46 (30.7%) patients had diffuse lesion (>20mm); while in 60 non- elevated troponin T level patients, 20 (33.3%) patients had discrete lesion (<10mm),

DISCUSSION

The present analysis of this study demonstrates that patients with unstable angina who have positive serum troponin T levels, have more chance of having extensive lesions such as, tubular and diffuse lesions (P value <0.01) and 3 vessels coronary artery disease, comparing patients with negative troponin T levels.

In the present study, there was a low incidence of thrombus and ulcerated lesion, even in troponin T positive patients. Coronary angiography was not performed acutely but an average of 3-4 days, and therefore, the presence of a thrombus or an ulcerated lesion was not judged during the acute phase.

Cardiac troponin T elevation had a strong association with the presence of severe and complex coronary artery disease. Elevation of cardiac troponin T was

Table II: L ength of lesions according to Troponin T levels

Length of lesion	Troponin T levels				Sig.
	< 0.10 ng/ml (n= 60)		>0.10 ng/ml (n= 150)		Chi-sq. = 30.58 df= 2 P value < 0.01
	Freq.	Percent	Freq.	Percent	
<10mm (Discrete)	20	33.3%	9	6.0%	
10-20mm (Tubular)	29	48.3%	89	59.3%	
>20mm (Diffuse)	7	11.7%	46	30.7%	

29 (48.3%) patients had tubular lesion (10-20mm) and only 7 (11.7%) patients had diffuse lesion (>20mm), as shown in Table II. P value remained significant (P<0.01).Visible thrombus was seen in only 6.7 % patients with elevated troponin T levels. In our study, 10 (4.8%) patients had no significant coronary artery disease.

correlated with angiographic evidence of significant coronary artery disease in 90% patients, intermediate coronary artery disease in an additional 6%. Cardiac troponin T positive patients had predominantly multi-vessel disease, greater coronary narrowing and frequently complex lesion morphology. So, positive cardiac troponin T results predict the presence of

complex and severely obstructive plaques.[5]
Estimation of procedural risk (lesion morphology) may be more usefully based on the presence of **one** or more specific adverse morphological features rather than use of a composite scoring system. The ACC/AHA criteria categorize lesions as Discrete (<10mm), Tubular (10-20mm), and Diffuse (>20mm). Diffuse lesions are associated with reduced procedural success. Lesion length is also an important predictor of restenosis after PCI, potentially related to more extensive plaque burden in long lesions.[9] The SIRIUS Trial enrolled patients with longer coronary lesions of 15 to 30mm and allowed long sirolimus-eluting stent placement. The trial found a 9.2% restenosis rate.[10] The Rapamycin-eluting Stent Evaluated at Rotterdam Cardiology Hospital (RESEARCH) registry evaluated the efficacy of SES (Sirolimus-Eluting Stent) in 96 consecutive patients with lesion lengths of more than 36 mm. The binary restenosis rate was 11.9% and in-stent late loss was 0.13 ±0.47mm. At long term follow-up (mean, 320 days), there were two deaths (2.1%), and the overall incidence of major cardiac events was 8.3%.[11] The New Approaches in Coronary Interventions(NACI) investigators have suggested that stenting of long coronary lesions more than 20mm has significantly higher rates for required repeat target lesion revascularization than stenting of more discrete lesions.[12] Recent analysis have suggested that implantation of Drug eluting stent (DES) is associated with a higher rate of very late (>1 year) stent thrombosis compared with Bare Metal Stents (BMS) implantation.[13,14,15]
Patients with Unstable angina/ Non ST elevation Myocardial infarction (UA/NSTEMI) enrolled (n=310) in the invasive arm of TACTICS-TIMI-18 systematically underwent coronary angiography. 34% patients had critical obstruction (>50% luminal diameter stenosis) of three vessels. Length of lesion was not determined in this study. In our study, 46.7% patients had three vessels disease. In our study, troponin T positive patients had 59.3% tubular lesion and 30.7% patients had diffuse lesions.
Jurlander et al. (2000) sought to identify differences in coronary anatomic pathology in patients with unstable angina and elevated versus non-elevated serum troponin T values. All patients (n=117) underwent coronary angiography. One-third (37) of the patients with unstable angina had increase in serum troponin T values. They had a higher incidence of three vessels disease (46% vs 26%), and less severe stenosis of the culprit artery (84% vs 65%) than patients with non-elevated serum troponin T values. Comparing with current study, the number of patients in this study is limited. I did not enroll any patient with history of previous myocardial infarction, previous coronary angiograms, previous coronary angioplasty or previous coronary bypass. Two thirds (150) of the total patients (n=210) with unstable angina had increase in serum troponin T values in our study. However, incidence of three vessel disease was comparable with our results.i-e;46% versus 46.7%. Length of lesion was not determined in their study. Additionally, in our study, troponin T positive patients had 59.3% tubular lesion and 30.7% patients had diffuse lesions.

CONCLUSION

Unstable angina patients with raised troponin T had severe angiographic coronary artery stenosis, tubular and diffuse lesions comparing patients with negative troponin T levels. Therefore, troponin T positive patients should be evaluated by coronary angiography to determine the extent and severity of coronary lesions.

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Prophet Mohammed (ﷺ) says:

It is better to sit alone then in company with the bad, and it is better still to sit with the good than alone. It is better to speak to a seeker of knowledge than to remain silent, but silence is better than idle words.

Bukhari sharif