

A Study of Cardiac Troponin I in ST Segment Elevation Myocardial Infarction and its Complications

Dr. Nidhish Nisty¹, Dr. Shivaling Nisty², Dr. Niranjana Nisty³, Dr. Suresh Harsoor⁴

¹Consultant Physician, Nisty Heart Center, Kalaburagi, India

²Resident, Department of General Medicine, Mahadevappuram Medical College, Kalaburagi, India

³Interventional Cardiologist, Nisty Heart Center, Kalaburagi, India

⁴Professor, Department of General Medicine, Mahadevappuram Medical College, Kalaburagi, India

Abstract: *Background and Objective: A flawless and prompt approach is required to manage patients with STEMI and its course especially its complications. Many studies earlier have suggested cardiac troponins like troponin I levels are elevated in STEMI and are directly proportional to prognosis of course of the disease. Present study was performed to study the prognostic and diagnostic significance of cardiac troponin I in ST elevation MI and its complications. It was also to study the quantitative correlation of cardiac troponin I with ST elevation MI and its complications. Methodology: Fifty cases were studied from November 2018 to May 2020. Cases diagnosed to have of ST elevation MI as per AHA/ESC/ACC guidelines within 6 hours onset of symptoms. All the patients were examined and investigated according the proforma. They received treatment as per AHA/ESC/ACC guidelines. During hospital stay, they were observed for predefined complications. Results: Among the fifty cases, mean age \pm SD in the study group was 53.76 ± 11.03 years and ranged from 22 to 70 years. Male patients 36 (72%) outnumbered the female patients 14 (28%) and Male: Female ratio is 2.51: 1. Most common symptom was chest pain (100%) followed by sweating (34%) and pain radiating to arm (34%). Major risk factors were cigarette smoking (62%), Diabetes Mellitus (42%), hypertension (32%). AAMI was more common with 70% of patients and 30% were IWMI. Tenecteplase 30mg was most used as thrombolytic agent administered to 70% of patients. In these patients 92% of them had elevated Cardiac Troponin-I levels and 8% had normal Troponin -I levels. Among these with elevated Troponin-I levels 44% of the patients experienced complications. Most common complications being arrhythmias 45.46% and next being the heart failure 40.9%. Mortality in the study is 6%. Interpretation and Conclusion: Cardiac Troponin-I is a reliable diagnostic as well as prognostic indicator in patients with STEMI. The magnitude of Cardiac Troponin-I levels is directly proportional to myocardial damage and adverse course of STEMI including its complications and mortality.*

Keywords: Cardiac Troponin I, Myocardial Infarction

1. Introduction

As per World Health Organization (WHO) data, the Coronary Artery Disease (CAD) prevalence continues to rise in India. It has already surpassed communicable diseases as the major cause of mortality in India. Incidence of CAD in young population in Western countries is 2–5%, whereas it is 11–16% in Asian Indians. In a study of ethnic differences in patients with Myocardial Infarction (MI), it was observed that young Indians had ten times more risk of developing MI as compared to the white population. About 10% of all deaths occurring due to CAD in India. INTERHEART-South Asia study identified eight coronary risk factors—abnormal lipids, smoking, hypertension, diabetes, abdominal obesity, psychosocial factors, low fruit and vegetable consumption, and lack of physical activity. These eight factors accounted for 89% of the cases of all acute MI in Indians. European scenario assumes that every sixth man and every seventh woman will die from MI. Nearly 3 million STEMI are estimated to occur in India per year. First attempt towards development of STEMI management protocols in India was done in the year 2011. India have a higher proportion of STEMI as compared to developed countries. A study done in Karnataka supported the well – established fact that the mean age of occurrence of STEMI in Indians is 5–10 years lower than Western population. In-hospital mortality rate for

STEMI up to 8%. STEMIs occur about twice as often in men as women. USA has about 500,000 STEMI events per year¹. The 1-year mortality rate after M. I is about 15%².

By seeing the burden of the disease, the type of study is important a unique in our region. Study of a co relation between the cTnI and STEMI and its complications, which is considered as prognostic as well as diagnostic marker is essential.

Objective

- 1) To study the prognostic and diagnostic significance of cardiac troponin I in ST elevation myocardial infarction and its complications.
- 2) To study the quantitative correlation of cardiac troponin I with ST elevation myocardial infarction and its complications.

2. Methodology

Source of data

The study of 50 cases diagnosed with STEMI admitted at Nisty Heart Centre, Kalaburagi and Basaveshwar Teaching and General Hospital, Kalaburagi affiliated to Mahadevappuram Medical College, Kalaburagi.

Fifty cases were studied from November 2018 to May 2020. Cases diagnosed to have of ST elevation MI as per AHA/ESC/ACC guidelines within 6 hours onset of symptoms.

Methods of Collection of Data

Inclusion Criteria:

- 1) Cases diagnosed to have of ST elevation MI as per AHA/ESC/ACC guidelines within 6 hours onset of symptoms
- 2) All age groups and gender
- 3) Isolated cases of ST elevation MI and its complications

Exclusion Criteria:

- 1) Pulmonary and cardiac conditions which are not complicated by ST elevation MI.
- 2) End stage renal disease or acute kidney injury
- 3) Aortic dissection
- 4) Sepsis
- 5) Rhabdomyolysis.

The following investigations are performed

- 1) Complete hemogram
- 2) Urine routine and microscopic examination,
- 3) RBS
- 4) RFT
- 5) Serum lipid profile
- 6) ECG admission and serially
- 7) cTnI levels
- 8) 2D echo
- 9) Chest X-ray PA view

All the patients received treatment as per AHA/ESC/ACC guidelines. During hospital stay, they were observed for predefined complications.

Statistical Methods

Descriptive & inferential statistics were performed using IBM SPSS Statistics, Version 23 (IBM Corporation, Armonk, NY, USA). Categorical data were presented as Frequency (%) and continuous as Mean±SD. Inferential statistics like Chi-square/Fischer exact test were used. P value <0.05 was considered statistically significant.

3. Results

Age distribution

In this study, the mean age is 53.76±11.03 years and ranged from 22 to 70 years. Maximum incidence was seen in 51 to 60 years where 17 (34%) patients and followed by > 60 years which were 14 (28%) patients. Next being 41 to 50 years constituted 12 (24%) patients and 31 to 40 years were 6 (12%) patients. The least being <30 years where 1 (2%) patient being in the age group.

Gender Distribution

In this study, male patients were 36 in number which accounted to 72% of total patients and female patients were

14 in number which accounted to 28% of total patients. Male: Female ratio is 2.51: 1.

Age and Gender correlation Distribution

In this study, Maximum incidence was seen in 51 to 60 years where 17 patients are present and accounts to 34% of total patients. Out of which 10 patients are male and 7 patients are female. Both Gender maximum incidence are in age group 51 to 60 years in study followed by >60 years age group.

Symptoms

Among 50 patients, Chest pain was most symptom found in all patients (100%), radiating to arm are 17 patients (34%) and sweating in 17 patients (34%). Other symptoms were vomiting-13 patients (26%), breathlessness-8 patients (16%), dizziness and loose stools are-2 patients (4%), nausea and epigastric discomfort-1 patients (2%).

Comorbid Conditions

In this study, most common comorbid conditions was Diabetes mellitus which were 21 patients (42%) and of which 7 patients (14%) were newly detected Diabetes mellitus. Patients who were hypertensive were 16 (32%). Other comorbid conditions were Bronchial asthma, Hyperthyroidism and Hypothyroidism which constituted each patient of them and accounted 2% each.

Cigarette Smokers

In this study, 31 patients (62%) were cigarette smokers and all were men. And rest 19 (38%) patients were not associated to cigarette smoking.

Dyslipidemia

In this study, patients with dyslipidaemia were just 3 in number (6%) and rest 47 (94%) patient's lipid profile was within normal limits.

Territory of STEMI

In this study, Patients with anterior wall myocardial infarction were 35 (70%). And patients with inferior myocardial infarction wall were 15 (30%).

Lysis Drug Used

In this study, the most common drug used for thrombolysis was Elaxim (Tenecteplase) 30mg in 35 (70%) patients. Reteplast (Reteplase) 36mg was used in 11 (22%) patients. Streptonase (streptokinase) 15 lac units were given in only 4 (8%) patients.

Troponin-I levels normal Vs elevated

In this study, at admission the Troponin-I levels were normal in 04 (08%) patients and due to early presentation of patient to facility. Elevated Troponin-I levels in 46 (92%) patients at admission.

Troponin-I levels quantitative

In this study, the quantitative troponin levels are been divided into four groups where,

- <0.01 ng/ml (normal) were 4 (8%) patients
- 0.02 to 5 ng/ml were 30 (60%) patients which constituted the most.

- 5.1 to 10 ng/ml were 2 (4%) patients which constituted the least.
- >10 ng/ml were 14 (28%) patients.

Patients Complicated vs Not complicated

In this study, the number of patients landed in complications were 22 (44%). Number of patients did not land in complications were 28 (%).

Complications types

In this study, the number of patients landed in complications were 22 (44%) out of which the following are the kind of complications.

Arrhythmias were most common which constituted 10 patients

Heart failure constituted 9 patients.

Mechanical complication like Ventricular septal rupture constituted 2 patients.

Cardiogenic shock constituted 1 patient.

Arrhythmia types

Troponin Levels in ng/ml	Heart failure n (%)	Cardiogenic shock n (%)	VSR n (%)	Arrhythmia n (%)	Total
<0.01	01 (4.54)	0	0	01 (4.54)	02 (9.09)
0.02 – 5.0	04 (18.18)	0	01 (4.54)	09 (40.90)	14 (63.63)
5.1-10	0	0	0	0	0
>10	04 (18.18)	01 (4.54)	01 (4.54)	0	06 (27.28)
Total	09 (40.90)	01 (4.54)	02 (9.09)	10 (45.44)	22 (100)

The above table shows the correlation of Troponin I levels with complications of STEMI in the study.

4. Discussion

Comparison of age distribution

Comparing the age, Present study shows 53.76±11.03 years (mean age). Ahmad et al being nearer 49.15 ± 8.28 years (mean age) and Cediel et al⁶² years (median age). Present study was comparable to Ahmad et al study.

Comparison of gender distribution

Comparing the gender distribution, present study shows 72% are male patients and 28% are female patients. Ahmad et al⁵ shows 92.5% as male patients and 7.5% as female patients. Cediel et al³ shows 79% as male patients and 21% as female patients. All the studies suggestive of incidence was much higher in males than females.

Comparison of risk factors

Smoking was a major risk factor in all studies, Ahmad et al⁵ had 47% patients, Cediel et al³ has 75% patients and present study had 62% patients as smokers in the study. Highest numbers were seen in Cediel et al³ study. Diabetes mellitus, Ahmad et al⁵ had 2.5% of patients, Cediel et al³ 24% patients and present study 42% patients were diabetic. Highest incidence was seen in present study. Astonishingly low incidence in Ahmad et al⁵ study. Dyslipidaemia, Ahmad et al⁵ had 52% of patients, Cediel et al³ 59% patients and present study shows only 6% patients. Highest incidence was seen in Cediel et al³ study. Surprisingly low incidence in present study. Hypertension, Ahmad et al⁵ had 24% of patients, Cediel et al³ 54% patients and present study shows

In this study, 10 patients who landed in complications of STEMI constituted of arrhythmias of which following were sub types.

- 3 patients developed AF (atrial fibrillation).
- 3 patients developed VPC (ventricular premature contraction)
- 2 patients developed SB (sinus bradycardia)
- 1 Patient developed AIVR (accelerated idioventricular rhythm)
- 1 Patient developed VT (ventricular tachycardia)

Mortality

In this study, 3 (6%) patients were accounted to mortality. The causes were 2 patients died due mechanical complication that is due to Ventricular septal rupture, one was male and another was female. Another patient died due to cardiogenic shock.

Troponin-I levels quantitative and Complications Correlation

32% patients as hypertensive. Highest incidence was seen in Cediel et al³ study.

Comparison of AWMI involvement

Comparing the anterior wall involvement in STEMI, Ahmad et al⁵ had 72% of patients, Cediel et al³ 42% patients and present study shows 70% patients. Highest incidence was seen in Ahmad et al⁴ study and comparable to present study.

Comparison of mortality

Comparing the mortality percentage, Cediel et al³ 4% of patients and present study shows 4% of patients. Both studies were comparable.

Comparison of mean of troponin I levels

Comparing the mean of troponin I levels, Cediel et al³ showed sc-TnI-20.82 ng/land in Ahmad et al⁵ showed cTnI-24.16 ng/ml. Ahmad et al⁴ study suggested that Serum troponin I concentration has a strong negative correlation with left ventricular ejection fraction after first acute myocardial infarction, and hence can be used to assess the LVEF in patients with first myocardial infarction. An observation was made that a cut off level of cTnI ≤ 8 ng/ml was associated with normal left ventricular systolic function. Cediel et al³ study suggested should reconsider the value of serial troponin measurements for risk stratification in STEMI.

5. Summary

Fifty cases of STEMI were randomly selected for this prospective study. At admission Cardiac Troponin-I level was measured. Patients were closely monitored during

hospital study and subsequently on OPD basis following discharge. Patients were evaluated as per the proforma and were looked for the development of predefined complications.

Among the fifty cases, mean age \pm SD in the study group was 53.76 ± 11.03 years and ranged from 22 to 70 years. Male patients 36 (72%) outnumbered the female patients 14 (28%) and Male: Female ratio is 2.51: 1.

Most common symptom was chest pain (100%) followed by sweating (34%) and pain radiating to arm (34%). Major risk factors were cigarette smoking (62%), Diabetes Mellitus (42%), hypertension (32%). AAMI was more common with 70% of patients and 30% were IWMI. Tenecteplase 30mg was most used as thrombolytic agent administered to 70% of patients. In these patients 92% of them had elevated Cardiac Troponin-I levels and 8% had normal Troponin-I levels. Among these with elevated Troponin-I levels 44% of the patients experienced complications. Most common complications being arrhythmia 45.46% and next being the heart failure 40.9%. Mortality in the study is 6%. Cardiac Troponin-I is a reliable diagnostic as well as prognostic indicator in patients with STEMI

The magnitude of Cardiac Troponin-I levels is directly proportional to myocardial damage and adverse course of STEMI including its complications and mortality.

References

- [1] Santanu Guha, Rishi Sethi, Saumitra Ray, Vinay K. Bahl, S. Shanmugasundaram, Prafula Kerkaret al. . Cardiological Society of India: Position statement for the management of ST elevation myocardial infarction in India. Indian Heart Journal 69 (2017).
- [2] Elliot M. Antman, Joseph Loscalzo. Harrison's Principles of Internal Medicine. Ed Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson J Let al 20th ed. McGrawHill; Volume 2; 1872
- [3] Germán Cediel, et al, Prognostic Value of New-Generation Troponins in ST-Segment-Elevation Myocardial Infarction in the Modern Era: The RUTI-STEMI Study, J Am Heart Assoc. 2017 Dec; 6 (12): e007252
- [4] M. Imteyaz Ahmad, Brijesh Kumar Yadaw, Neera Sharma, A. K Varshney, Lokesh Sharma, Rajnish Singh et al. Cardiac Troponin I Level in STEMI and Clinical Correlation with Left Ventricular Dysfunction in Indian Population. J Cardiovasc Dis Diagn 1: 116.