

Frequency Of Myocardial Infarction And Mortality In Septic Shock With Elevated Cardiac Troponin

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Background

- Cardiac Troponin (I or T) is the most specific biomarker for the diagnosis of myocardial infarction.
- Not specific for acute thrombotic occlusion of coronary artery.
- Elevated in Myocardial Injury secondary to variety of causes including sepsis or septic shock.

Operational Definition

Myocardial Infarction:

Detection and/or fall of cardiac troponin value above the 99th percentile of the upper limit, with evidence of myocardial ischemia, with at least one of the following:

- Symptoms of ischaemia (eg. chest pain)
- ECG evidence of ischaemia
- Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.
- Intracoronary thrombus Identified by angiography or autopsy

Third Universal Definition , ESC/ACCF/AHA/WHF Expert Consensus

Operational Definition

Sepsis:

Life-threatening organ dysfunction caused by a dysregulated host response to infection.

Septic shock:

A subset of sepsis in which profound circulatory, cellular and metabolic abnormalities are associated with a greater risk of mortality than with sepsis alone.

2016, The task force by the Society of Critical Care Medicine
and the European Society of Intensive Care

Troponin Elevation

Myocardial Ischemia

**Acute Coronary
thrombotic
Occlusion**

**Supply demand
mismatch**

**Non-coronary
Ischemia**

Myocardial Injury without Ischemia

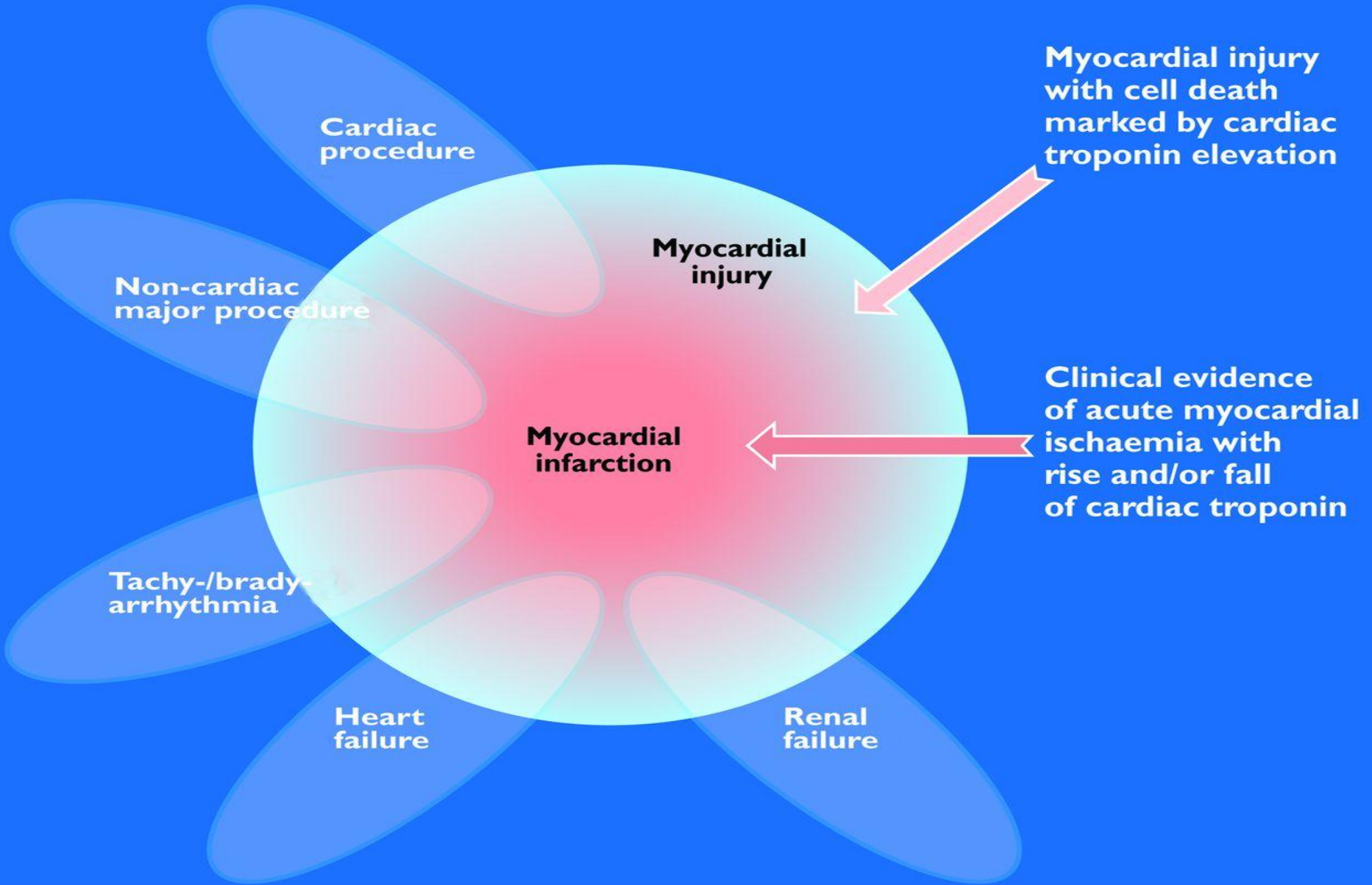
Co morbidities

**Specific
precipitants**

Miscellaneous

Important Causes Elevated Troponin

- Acute coronary syndrome
- Acute heart failure
- Pulmonary embolism
- Stroke
- Acute aortic dissection
- Tachyarrhythmias
- Hypotension / Shock
- Sepsis
- ARDS
- Renal Failure
- Peri-myocarditis
- Endocarditis
- Tako-tsubo cardiomyopathy
- Radiofrequency catheter ablation
- Cardiac contusion
- Strenuous exercise
- Sympathomimetic drugs
- Chemotherapy



Myocardial injury with cell death marked by cardiac troponin elevation

Myocardial injury

Clinical evidence of acute myocardial ischaemia with rise and/or fall of cardiac troponin

Myocardial infarction

Cardiac procedure

Non-cardiac major procedure

Tachy-/brady-arrhythmia

Heart failure

Renal failure

Serum Troponin in Critically ill

- ❑ In critically ill patients with septic shock, troponin is frequently measured to exclude any non ST elevation MI.
- ❑ Troponin rise is very common (up to 85%) in critically ill but may not have myocardial Ischemia.
- ❑ Associated with worse prognosis.

Table: Association between elevated cardiac Troponin and CAD

(Diagnosed by stress echo, coronary angiography or post-mortem)

Authors	Study design	Number of patients, Type	Elevated Troponin	CAD in patients with positive Troponin
Ammann et al. 2001	Prospective case control MICU	20 , SIRS/Severe sepsis /septic shock	85%	5.9
Ammann et al. 2003	Retrospective MICU	51 , SIRS/Severe sepsis /septic shock	63%	6
Altman et al. 2010	Prospective MICU	38 , SIRS/Severeseptis /septic shock	58%	4.5

Troponin rise in Sepsis or Septic shock

Demand –supply mismatch	Tachycardia, Hypoxemia ,Hypotension, Decreased perfusion pressure.
Direct Myocarditis	Bacteremia → Cytokine & endotoxin release → Microvascular dysfunction, myocardial depression, Increased Myocardial cell permeability.
Free and superoxide Radicals	Myocardial cell damage & Apoptosis.
Elevated filling pressure and ventricular wall stress	Intracellular signalling cascade Cardiac myocytes apoptosis, micronecrosis, reduced coronary perfusion pressure.
LV Diastolic & RV Systolic dysfunction	

Aim Of Our Study

1. Detect the frequency of myocardial infarction in-

- Critically ill patients with septic shock
- Troponin i was measured and elevated
- Symptoms and electrocardiography (ECG) were non diagnostic.

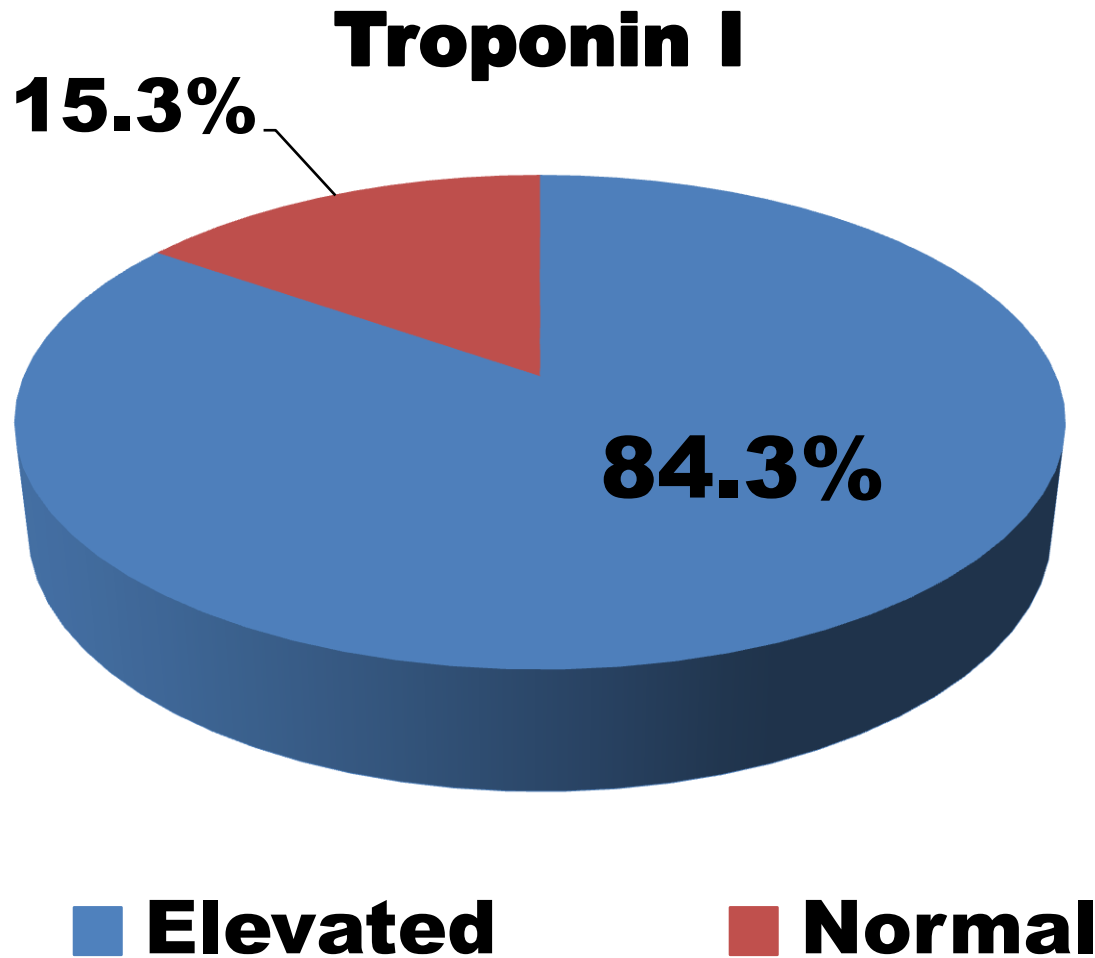
2. Any association with in hospital mortality.

Methods

- A prospective observational study,
- 85 adult patients with septic shock,
- Intensive care unit (ICU) of a tertiary private hospital in Bangladesh,
- From March, 2017 to September, 2017
- Serum Troponin I was measured (cut of value used was <0.034 ng/ml)
- Bedside echocardiography was performed.
- Data analysis done by SPSS IBM 22.

RESULTS

Frequency of Troponin Rise in Septic Shock



Cardiac Dysfunction by Echo in Elevated Troponin I

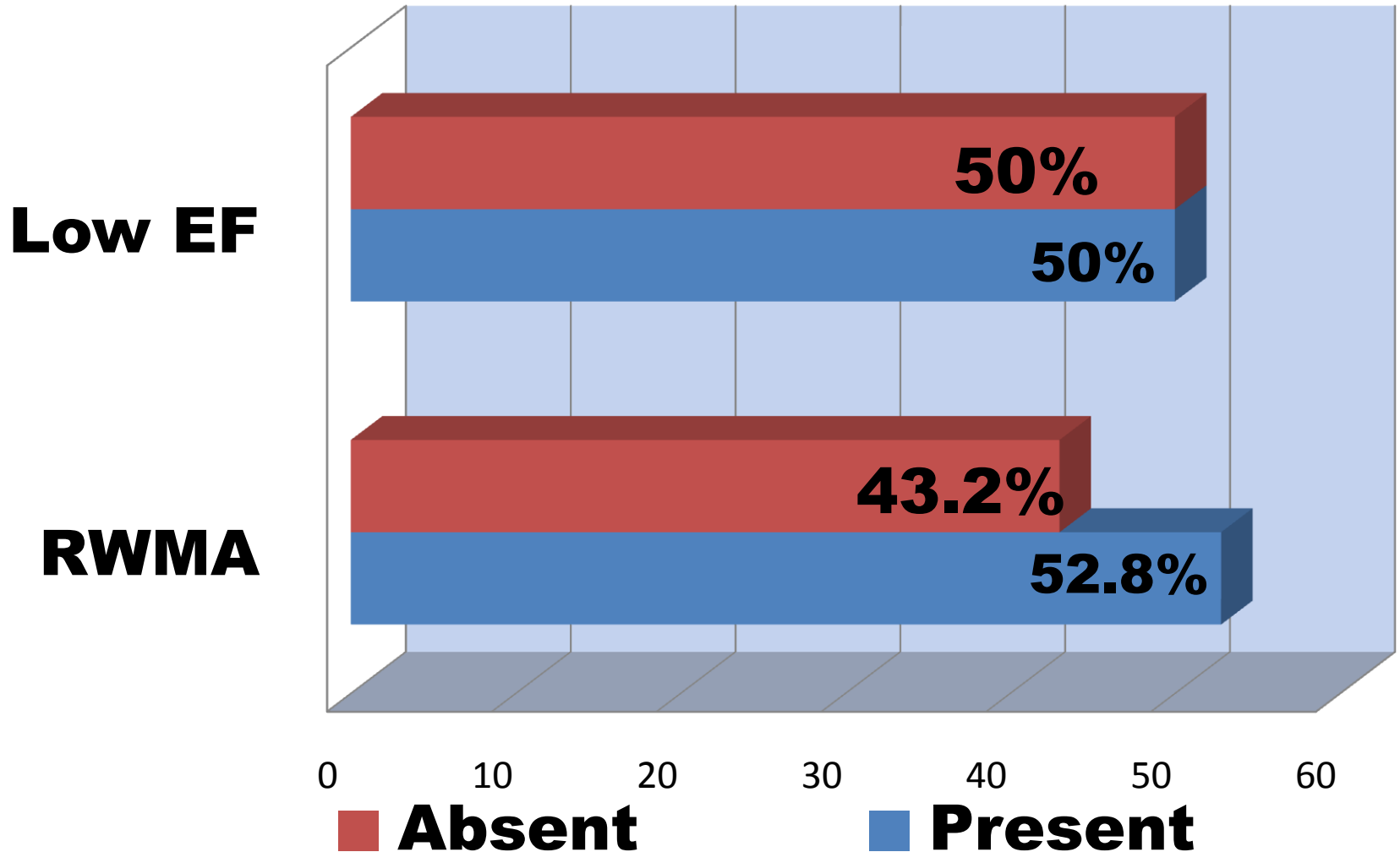


Table: Association between Troponin I and Echocardiography findings

Troponin I	Regional wall motion abnormality		Chi-Square	p-value (2 sided)
	Absent	Present		
Normal (<0.03)	11	2	6.180	0.013
Elevated	34	38		p-value <0.05 considered significant.

Table: Association between Troponin I and Echocardiography findings

Troponin I	Left ventricular Ejection fraction %		Chi square	P-value (2 sided)
	EF <50%	EF 50% or more		
Normal (<0.03%)	0	13	11.276	0.001
Elevated	36	36		p-value <0.05 considered significant.

Comparing means of variables between survivor and non-survivor (Independent t test)

Variables	Survivor (n= 45)		Non-survivor (n= 40)		p value
	Mean	SD	Mean	SD	
Age	59.84	17.70	64.15	16.39	0.250
Troponin I	2.62	6.85	4.45	9.05	0.293
EF%	49	7.80	45.13	9.50	0.042

Association with Mortality

Variables		Survivor	Non-survivor	p-value
Elevated Troponin I (>0.03)	Yes	38	34	0.94
	No	7	6	
Low EF% (<50%)	Yes	14	22	0.026
	No	31	18	
RWMA (Focal or Global hypokinesia or akinesia)	Yes	20	20	0.609
	No	25	20	
Elderly (>60 yrs)	Yes	25	27	0.259
	No	20	13	
MODS	Yes	5	25	.000
	No	40	15	

Discussion

- Around half of the patients with elevated Troponin I had echocardiography evidence of RWMA (regional wall motion abnormality) & left ventricular systolic dysfunction (Low EF%) suggestive of myocardial ischemia.
- Rest half can be considered as Troponin Leak.
- No patient with normal troponin I had systolic dysfunction evidenced by Echo.
- Elevation of Troponin I weakly correlates with the presence of low LV EF%

Outcome

- Raised troponin I along with low LV EF% rather than elevated troponin alone, is associated with adverse outcome and mortality.
- Elevated troponin in sepsis/septic shock with MODS (Multi organ dysfunction syndrome) is associated with mortality.

Key Points

- Troponin elevation indicate myocardial injury but do not define the cause of injury.
- Prompt to arrange Echocardiography.
- Non ischemic causes kept in mind like, Sepsis/septic shock ,renal failure, heart failure, arrhythmia etc.

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THANK YOU