Original Article

Significance of cardiac troponin estimation in acute ischemic stroke

Veena Purandare[1], Shruti Paramshetti[2*], Pankaj Palange[3]

[1]Assistant Professor, [2]PG Student, [3]Professor, Department of Medicine, Bharati Vidhyapeeth Medical college and Hospital Sangli, Maharashtra, INDIA.
Email: shrutivp@gmail.com

Abstract

Introduction: Cardiac troponin levels are measured routinely in patients presenting with symptoms suggestive of acute coronary syndrome. However, association between elevated cardiac troponin and acute ischemic stroke in absence of acute myocardial infarction is not very well established. **Methods:** We did a retrospective study of 120 patients of acute ischemic stroke proven by imaging studies admitted in our tertiary care hospital over a period of one year. We selected patients having stroke in whom Troponin I test was done and those who met inclusion criteria. We categorized them into Troponin I positive and troponin I negative group and observed the correlation between troponin I test results and clinical outcome. **Results:** Out of 120 patients, 11 were Troponin I positive. Maximum number of patients were between age group of 51 to 70years (106/120). Association between positive history of tobacco chewing and smoking and Troponin I positivity was strong (p=0.004) and also patients with history of ischemic heart disease were more likely to have positive (troponin I) (p=0.005). Non fatal myocardial infarction was seen to occur more commonly in patients who were Troponin I positive (p=0.000). **Conclusion:** Raised cardiac Troponin I in acute ischemic stroke without clinical or ECG changes of myocardial infarction predicts adverse cardiac outcome in the form of non fatal myocardial infaction.
Keywords: Troponin I, Ischemic stroke, acute Myocardial Infaction.

[*]**Address for Correspondence:**
Dr. Shruti Paramshetti, PG Student, Department of Medicine, Bharati Vidhyapeeth Medical college and Hospital Sangli, Maharashtra,
Email: shrutivp@gmail.com
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INTRODUCTION

Stroke is the second leading cause of death worldwide and one of the leading causes of disability in both developed and developing countries[1]. Stroke are of three types ischemic stroke, intracerebral hemorrhage, subarachnoid hemorrhage depending upon underlying vascular pathology[2]. Ischemic heart disease and acute ischemic stroke share a similar etiology in the form of atherosclerotic arterial occlusion. Troponin is a sensitive indicator of myocardial necrosis and therefore its estimation is widely used for accurate diagnosis of acute coronary syndrome[3,4]. Troponin levels are documented to increase in some condition other than myocardial infarction, one such condition is acute ischemic stroke[5]. Several mechanism are postulated for troponin increase in acute stroke. Central activation of sympathoadrenal system is thought to be responsible for cardiac damage secondary to acute cerebral ischemia, especially insular cortical damage[6]. Other mechanism proposed to cause elevation in concentration of serum troponin I is initial myocardial involvement with consequent cardioembolic cerebral ischemia or primary cerebral ischemia with secondary myocardial injury[6]. Aim of the study was to find out relationship between acute ischemic stroke without acute myocardial infarction and cardiac troponin elevation.

MATERIALS AND METHODS

All the patients of acute ischemic stroke who met inclusion criteria and in whom Troponin I test was done and admitted over one year duration (1-5-2015 to 30-4-2016) were included in the study. We studied clinical profile, ECG, 2D ECHO, Cardiac Troponin I as well as CT/ MRI brain imaging of these patients.

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Inclusion Criteria

- Acute cerebral infarction confirmed by magnetic resonance imaging or CT Brain.
- Ischemic stroke in whom Troponin I was done.
- All patients above age of 18years.

Exclusion Criteria

- Recent ischemic heart disease(2weeks prior to and 3 days after stroke onset).
- Symptoms and signs suggestive of AMI or Unstable angina at admission.
- Previous coronary angioplasty or coronary bypass surgery.
- Other heart disease like congestive heart failure, valvular heart disease, end stage renal disease in whom there is possibility of Troponin I positivity.

In our study serum Troponin I was done within 24hours of admission. This study included 120 patients, and they were catogerized into cardiac troponin positive and cardiac troponin negative group. Troponin I was done using immunocheck Troponin I test device which is a rapid immunochromatographic assay for qualitative detection of human cardiac Troponin I in whole blood, serum or plasma. Risk factors for stroke were identified in these patients. We studied indoor clinical outcome in these individuals. We correlated all the available data to conduct a statistical analysis. Statistical analysis was done using chi square test. P=<0.05 was considered statistically significant.

RESULTS

90.83%(109/120) patients were Troponin I positive while 9.17% (11/120)patients were troponin negative. There were more male patients (80/120) in the study. Amongst troponin I positive patients 8/11(72.72%) were males.

Table 1: Age distrubution

Age	Trop I Positive	Trop I Negative	Total
40-50	3(75%)	1(25%)	4(100%)
51-60	26(92.86%)	2(7.14%)	28(100%)
61-70	73(93.59%)	5(6.41%)	78(100%)
71-80	7(70%)	3(30%)	10(100%)

The chi square test statistic is 7.2665, P=0.063872

Table 2: Sex Distribution

	Troponin I Negative	Troponin I Positive	Total
Male	72(90%)	8(10%)	80(100%)
Female	37(92.50%)	3(7.5%)	40(100%)
Total	**109(90.83%)**	**11(9.17%)**	**120(100%)**

The Chi Square Statistic Is 0.2002, The P Value Is 0.654586

There have been many studies in the past that tried to correlate between raised cardiac troponin and ischemic stroke. They differ from eachother in terms of different parameter taken into consideration, duration of observation, type of troponin testing and inclusion and exclusion criteria of the study. Kerr *et al* identified 15 studies totaling 2901 patients. Overall percentage of positive Troponin testing was 18.1% in them[7]. In contrast in our study troponin I positivity was only 9.17%. Overall mortality in hospital was 6.67%in our study. Wira *et al* in his study reported 8% as mortality[8]. Sheitz *et al* in a retrospective study reported troponin elevation in 14% of patients[9]. A prospective study by Di Angelantonio revealed that cardiac troponin levels was an independent predictor of mortality and a higher risk for in hospital death or non fatal myocardial infarction[10]. Smokers and tobacco chewers who developed acute ischemic stroke showed high incidence of raised cardiac troponins(72.73%. z=0.848,p= 0.004) Association between hypertensives developing ischemic stroke and tropinin elevation was not found to be significant (p>0.005). Similarly diabetes with stroke didn't show any significant increase incidence of troponin elevation. Past history of ischemic heart disease in patients of ischemic stroke was of great value. These patients though didn't have history of coronary angioplasty or coronary bypass graft in past were more likely to have raised cardiac troponin (54.55%,p=0.005). Troponin elevation in these patients predicted unfavourable outcome in the form of adverse cardiac events.

Table 3: Association with comorbid condition

	TROP I Negative	TROP I positive	Z	P
Tobacco	65(59.63%)	8(72.73%)	0.848	0.004
Hypertension	70(64.22%)	9(81.82%)	1.173	0.242
Diabetes mellitus	40(36.70%)	6(54.55%)	1.16	0.246
Ischemic heart disease	20(18.35%)	6(54.55%)	2.777	0.005

Association with tobacco and troponin I is highly significant with p 0.004, Also association of troponin I positivity and ischemic heart disease is 0.005.

Primary myocardial damage with secondary cardioembolic cerebral ischemia or primary cerebral ischemia with secondary myocardial injury is related to central activation of the sympathoadrenal system[11,12]. Diffuse myocardial damage characterized by necrosis and subendocardial hemorrhage occur after stroke[14,15]. This type of injury leads to activation of sympathetic nervous system. This type of injury is due to autonomic and limbic connection[16]. Clinical outcome was also seen to be dependent on location of cerebral infarct. It was observed in various studies that lesion in insular cortex has been associated with raised levels of troponin which is thought to be due to acute catecholamine release and stress related cardiac changes. Insula is an important site for sensory,

autonomic and limbic function. Thus troponin I positivity associated with insular damage has poor outcome and increased mortality which is also thought to be due to catecholamine overload[17,18].

Table 4: location of infarct and troponin i result

Site Of Infarct	Troponin I Positive	Troponin I Negative	P Value
MCA Territory	2	80	S
Insular	9	5	NS
ACA	0	5	-
PCA	0	2	-
Cerebellar	0	2	-
Brainstem	0	10	-
Multiple infarcts	0	5	-

S: Significant; NS: Not Significant

In our study it was observed that there is a relationship between elevated serum troponin and stroke with insular cortex involvement. Our study had 11 troponin I positive patients of which 9 patients with troponin I positivity had involvement of insular area,while 2 had MCA territory infarct. Adverse clinical outcome in troponin I positive patients was in form of increased incidence of non fatal myocardial infarction. Outcome of patients during their hospital stay were studied. Recurrent stroke was seen in 9% of Troponin I negative and 9.17% troponin I positive patients ($z=0.009, p>0.05$). Death related to cardiovascular event occurred in 2/109(1.84%)of Troponin I negative stroke and 1/11(9.09%)of troponin I positive stroke ($p=0.142$).

Table 5: In hospital outcome

	TROP I NEGATIVE	TROP I POSITIVE	Z	P
Non fatal MI	4(3.67%)	5(45.45%)	5.015	0.000
Recurrent stroke	10(9.17%)	1(9.09%)	0.009	0.092
Death from CV Event	2(1.84%)	1(9.09%)	1.469	0.142
Death from neurological event	4(3.67%)	1(9.09%)	0.858	0.389

The P value for non fatal MI is 0.000. which is highly significant

In clinical study by Scheitz *et al* it was seen that there was significant rise in level of troponin in patients with insular involvement and it was also associated with increased mortality[9]. In our study Troponin I positive stroke were more likely to get nonfatal myocardial infarction.(5/11: 45.45%; p=0.000). Clearly troponin I positive stroke patients merit more attention as they develop cardiac complication more frequently during their hospital stay. Farhan Raza *et al* in his retrospective study also demonstrated that elevated troponin in the absence of acute coronary syndrome in acute ischemic stroke identifies high risk patients with increased risk of major adverse cardiac events especially non fatal myocardial infarction and that this group can benefit from aggressive monitoring in the long term follow up[19]. Also results of many studies indicated that these troponin I positive stroke individuals are likely to have unfavourable outcome in the long run[20].

STUDY LIMITATIONS

This study was a retrospective study of patients admitted in one year period hence sample size was small. Also long term outcome couldn't be ascertained because of retrospective nature of the study. There were no repeated troponin I testing. Rising levels of cardiac troponin can have more predictive value. There are many types of cardiac troponin tests which have different cut off for positivity. This makes it difficult for a comparison between different studies. Large prospective studies are required with long follow up period to substantiate these findings.

CONCLUSION

Positive troponin I test in acute ischemic stroke in absence of acute myocardial infarction predicts unfavourable short term prognosis. These stroke patients are more likely to suffer a cardiac complication like non fatal myocardial infarction irrespective of prior ischemic heart disease.

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