SERUM TROPONIN T LEVEL AND ECG CHANGES IN ACUTE ISCHAEMIC STROKE

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ABSTRACT

BACKGROUND

Serum troponin elevation, characteristic of ischaemic myocardial injury, has been observed in some Acute Ischaemic Stroke (AIS) patients.^[1] Its cause and significance are still controversial.^[2,3] The purpose of this study is to find determinants of troponin elevation and its relationship with stroke severity and location and to assess the prevalence of ECG changes in acute ischaemic stroke.

METHODS

Subjects with a diagnosis of Acute Ischaemic Stroke (AIS) presenting to Government Vellore Medical College and Hospital, Adukkamparai, from August 2015 to December 2015 were enrolled. Serum troponin T level was measured on admission. Patients were divided into two groups, Group 1 (Elevated cTnT) and Group 2 (Normal cTnT). Twelve lead standard electrocardiogram (ECG) was performed and stroke severity was assessed based on National Institutes of Health Stroke Scale (NIHSS).

RESULTS

Serum cTnT level was elevated in 19.56% (18/92) of patients. In Group 1 (Elevated cTnT) there were 18 patients and in Group 2 (Normal cTnT) there were 74 patients. It was observed that insular lobe involvement was more frequent in elevated cTnT group (6/18) (31%) than in Group 2 (10/74) (14%) ($p < 0.05$). ECG ischaemic changes were seen in 17 patients, 18% of patients. Stroke severity was greater in elevated cTnT group.

CONCLUSION

Troponin T elevation was associated with severity of stroke, higher age of the patients, ECG changes and Insular lobe involvement. Troponin T in acute ischaemic stroke is a marker of severity of stroke.

KEYWORDS

Troponin, Stroke, Location, Electrocardiography, National Institutes of Health Stroke Scale.

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INTRODUCTION

Stroke is defined as the primary pathology of brain vascular system that temporarily or permanently affects brain functions as a result of ischaemia and haemorrhage. Due to increase in trend of mortality and morbidity rates, stroke has become the major community problem for whole world.^[4] In the last decade, much interest has been drawn to the importance of serum troponin in acute stroke. Previous studies have shown that Troponin T is elevated in 10-30% of acute stroke patients.^[5-7] Some researchers have found association between troponin level and location and size of infarction, severity of stroke [Measured by National Institutes of Health Stroke Scale (NIHSS)], ischaemic electrocardiogram (ECG) changes and increased mortality.^[8-11] The purpose of this study is to investigate the relationship between cardiac troponin T and ECG changes in acute ischaemic stroke, its severity and location.

During the last decade, it has become evident that acute stroke in many cases is accompanied by a rise in the concentration of troponins in serum indicating concomitant coronary disease.^[12,4]

The Aims of the present study were

- (i) To assess the prevalence of ECG and troponin T (TnT) abnormalities in acute ischaemic stroke.
- (ii) Investigate the relationship between cardiac troponin T and severity and location of a stroke.

MATERIALS AND METHODS

Subjects with a diagnosis of Acute Ischaemic Stroke (AIS) presenting to Government Vellore Medical College and Hospital, Adukkamparai, from August 2015 to December 2015 were enrolled. Stroke patients were diagnosed according to World Health Organization definition (Sudden neurological deficit that has a presumable vascular aetiology). Ischaemic stroke was confirmed by showing diffusion restriction on diffusion-weighted imaging Magnetic Resonance Imaging (MRI). Stroke severity was assessed based on NIHSS.

Ninety two patients who met the WHO criteria for stroke with MRI brain showing AIS were enrolled. Informed consent was obtained from patients or responsible family members as applicable. On recruitment to the study demographic data were collected. Serum troponin T was measured as part of routine laboratory testing on admission.

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Troponin levels were measured by Roche Cobas E411-CLIA-Chemiluminescent immune assay and was considered abnormal if it was ≥ 14 ng/L. The patients were divided into two groups: an elevated cTnT (Group 1) and a normal cTnT (Group 2). Twelve lead standard ECG was performed.

Statistical analysis was performed: categorical and continuous variables were compared by Chi-square test and Student's t-test respectively. Invariable and multivariate logistic regression was used for further analysis; p value < 0.05 was considered statistically significant.

RESULTS

Serum cTnT level was elevated in 19.56% (18/92) of patients. In Group 1 (Elevated cTnT) there were 18 patients and in Group 2 (Normal cTnT) there were 74 patients (Fig. 1).

It was observed that insular lobe involvement was more frequent in elevated cTnT group (6/18) (31%) than in group 2 (10/74) (14%) ($p < 0.05$) (Fig. 2). ECG ischaemic changes were seen in 17 patients, 18% of patients. Stroke severity was greater in elevated cTnT group.

Table 1. Basic characteristics of enrolled Acute Ischaemic Stroke (AIS) patients.

Basic Characteristic Value

Age (Mean $\pm$ SD) 67.58 $\pm$ 14.98

Male sex [n (%)] 52 (57%)

NIHSS [n (%)]

0-9 60 (65.1)

10-19 23 (25.2)

20-42 9 (9.7)

Abnormal serum creatinine [n(%)] 9 (7.9)

Serum troponin (ng/l).

Abnormal [n (%)] 18 (19.56).

NIHSS: National Institutes of Health Stroke Scale.

Table 2. Electrocardiogram (ECG) changes of enrolled Acute Ischaemic Stroke (AIS) patients.

ECG changes n (%)

ST depression 1 (5.9%)

T inversion 7 (41.1%)

ST-T changes 4 (23.5%)

Atrial fibrillation 2 (11.8%)

LBBB 2 (11.8%)

RBBB 1 (5.9%)

ECG: Electrocardiogram; LBBB: Left bundle branch block; RBBB: Right bundle branch block.

DISCUSSION

ECG abnormalities in the acute stage of ischaemic stroke were found in this study. The most frequent changes were T-wave inversion, ST-T wave changes. However, ischaemic ECG changes are known to be prevalent in elderly patients.^[13,14] and accordingly as pre-stroke ECG records were not evaluated, pre-existing ECG changes cannot be differentiated from changes that occurred after onset of stroke symptoms.

Cardiac sequelae including myocytolysis, serum enzyme elevations and arrhythmias are known to develop in a portion of stroke patients. There is a great deal of clinical and experimental evidence that cardiac changes in stroke result from excessive sympathetic nervous activity secondary to insular cortical damage. It has been hypothesized that damage to centers regulating autonomic function can cause autonomic dysregulation resulting in sympathetic overflow and neurogenic myocardial injury.^[15] Therefore, insula and brainstem were center of attention of many researchers.^[16]

Some studies have shown that troponin level is higher in the right insular, brainstem or middle cerebral artery territory infarction.^[17]

Insular lobe was predominantly involved in patients with elevated cTnT with possibility of neuro-myocardial injury. Stroke severity was found to be high in patients with elevated cTnT.

CONCLUSION

Troponin T elevations was associated with severity of stroke, higher age of the patients, ECG changes and Insula involvement. Troponin T in acute ischaemic stroke is a marker of severity of stroke.

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