



Association of cardiovascular risk factors and troponin elevation after generalized tonic-clonic seizures



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ABSTRACT

Purpose: Troponins are very sensitive biomarkers of myocardial injury. Conflicting data regarding elevation of troponin levels following a generalized tonic-clonic (GTC) seizure have been reported. In this study we hypothesized that troponin elevation after a GTC seizure occurs more frequently in patients with cardiovascular risk factors.

Methods: Patients who presented to the ER after a single GTC seizure with troponin levels assessed by cardiac troponin T (cTnT) and drawn within 12 h of the GTC seizure were included. Patients with cardiac symptoms, elevated CPK levels or renal insufficiency were excluded. The frequency and risk factors for elevated cTnT levels were analyzed.

Results: Fourteen patients with a mean age of 54 years (range: 19–87 years) were included. Four patients (28.6%) had elevated cTnT levels (mean = 0.06 µg/L; range: 0.035–0.076 µg/L). Patients with elevated cTnT levels were significantly older than those with normal levels (77.5 years vs. 45.5 years; $P = 0.03$). Of the eight patients 60 years of age and older, four (50%) had elevated cTnT levels. The coronary heart disease (CHD) score was significantly higher in patients with elevated cTnT levels compared to those with normal levels (13.5 vs. 9.75, $P = 0.012$).

Conclusions: Elevated troponin levels can occur after a GTC seizure. Patients at risk are the elderly and those with cardiovascular risk factors. Our results suggest that elevation of troponin levels after a GTC seizure reflects a minor ischemic cardiac injury related to the demand ischemia during the sympathetic overactivity that accompanies a GTC seizure.

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1. Introduction

Cardiac troponins are specific biochemical markers that are highly sensitive and specific for the diagnosis of acute myocardial infarction.^{1–3} However patients with acute neurological illnesses, including rare patients who experienced generalized tonic-clonic (GTC) seizures, were found to have elevations in troponin levels.^{4–6} Some have speculated that the troponin elevation following a GTC seizure was secondary to the release of unbound cytosolic troponin due to increased permeability of myocardial cell membranes,^{7,8} a centrally mediated damage to myocytes⁵ or a false positive assay,^{4,8} whereas others have considered this finding as possibly indicative of a transient myocardial injury.⁵ Accordingly, the current study was designed to evaluate the significance of elevated

troponin as assessed by cardiac troponin T (cTnT) levels following a GTC seizure by comparing the frequency of this finding in young versus elderly patients. Furthermore, we hypothesized that troponin elevation following a GTC seizure would be more frequent in patients with cardiovascular risk factors.

2. Materials and methods

We reviewed all emergency room admissions to the American University of Beirut Medical Center over a period of 6 months and identified patients who presented with a GTC seizure. The diagnosis of a GTC was made based on the description of the spell and clear documentation in the chart of post-ictal confusion. Patients were not included when the description of the spell was unclear, when convulsive syncope was a possibility and when there was no documented evidence of postictal confusion. The medical records of patients who had a cTnT level drawn within 12 h of their seizure (at the discretion of the attending physician staffing the emergency room) were reviewed. Patients with cardiac symptoms, renal insufficiency (creatinine >1.5 mg/dL) or elevated CPK levels

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Table 1
Clinical characteristics of the patients.

Patients	Age (years)	Gender	Hx epilepsy	Cause of sz	Elevated troponin	CHD score
1	19	M	Yes	MTS	No	
2	21	F	Yes	cryptogenic	No	
3	23	F	Yes	Cortical dysplasia	No	
4	25	M	Yes	Cryptogenic	No	
5	28	M	Yes	MTS	No	
6	38	F	Yes	Cortical dysplasia	No	
7	62	M	Yes	Cerebrovascular disease	Yes	11
8	64	F	No	Tumoral	No	8
9	73	M	Yes	Cerebrovascular disease	No	11
10	76	M	No	Cerebrovascular disease	No	10
11	77	F	No	Cerebrovascular disease	Yes	14
12	83	F	No	Alzheimer	No	10
13	84	M	No	Cerebrovascular disease	Yes	14
14	87	M	No	Cerebrovascular disease	Yes	15

Hx: history, sz: seizure, MTS: mesial temporal sclerosis.

(>300 IU/L) were excluded. This study was approved by the Institutional Review Board of the American University of Beirut Medical Center. cTnT was measured on the Elecsys analyzer (Roche, Indianapolis, IN) which allows detection of cTnT concentrations as low as 0.003 $\mu\text{g/L}$. Based on recent guidelines,⁹ cTnT levels of 0.035 $\mu\text{g/L}$ and above were considered abnormal. For patients with cTnT levels of <0.003, a value of 0.003 was assigned for statistical calculations.

We compared the age of patients with normal and elevated cTnT levels via a double tailed t test. We tabulated the cardiovascular risk factors for all patients and calculated the coronary heart disease (CHD) score for patients aged 60 years and older based on a previously described model.¹⁰ This model is a coronary artery disease prediction algorithm, developed using categorical variables including age, cholesterol values, blood pressure, diabetes, and smoking. Based on those categorical variables, a total score stratified by gender can be calculated and was found to be highly predictive for coronary heart disease risk.¹⁰

Categorical variables for cardiovascular risk factors were compared between patients with normal and elevated cTnT using the exact Fisher's test. The CHD scores for patients 60 years and older with normal or elevated cTnT levels were compared via a two tailed t test. All significant results were set at a *P* value <0.05.

3. Results

Fourteen patients (M/F = 8/6) with a mean age of 54.3 years (range: 19–87 years) were included in this study (Table 1). Eight of the patients were already diagnosed with epilepsy whereas six presented with their first unprovoked GTC seizure. In patients younger than 60 years, the most common etiologies were mesial temporal sclerosis and cortical dysplasia whereas cerebrovascular disease (remote symptomatic cause) was the cause of seizure/epilepsy in those older than 60 years (Table 1). The mean initial cTnT level, drawn on average 2.8 h (range: 0.7–12 h) after the GTC seizure was 0.021 $\mu\text{g/L}$ (range: 0.003–0.076 $\mu\text{g/L}$). The mean

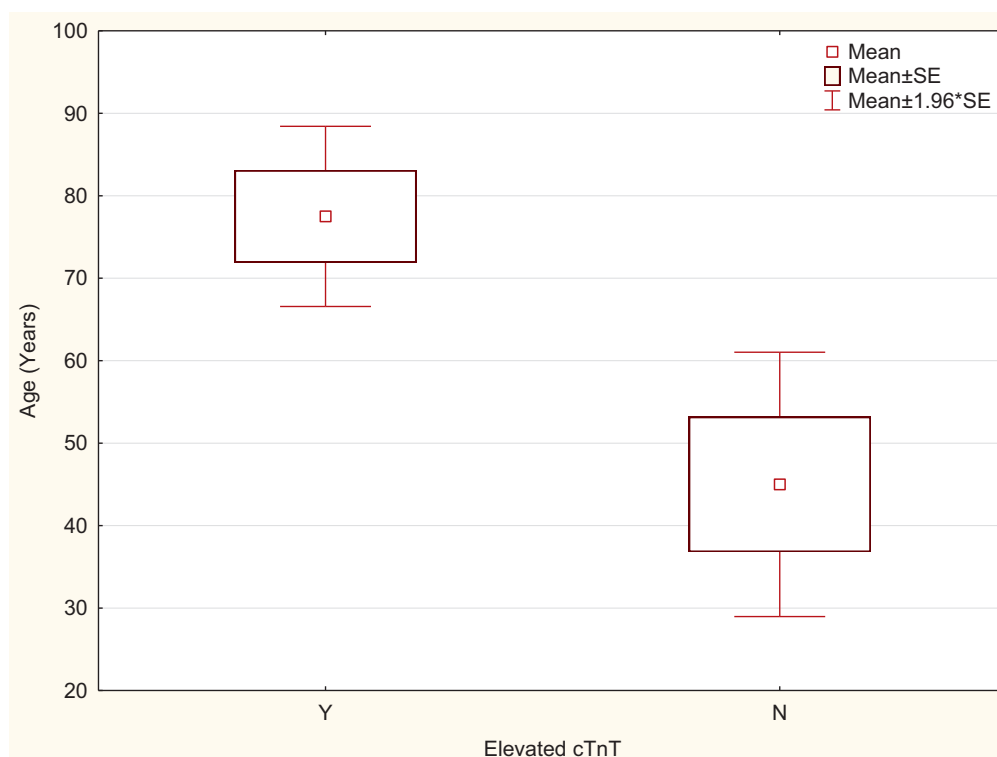


Fig. 1. Box and Whisker plot comparing the mean age (± 1.96 standard error) in patients with elevated cTnT to those with normal levels. SE = standard error.

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