

Cardiac Affection After Subarachnoid Hemorrhage

Thesis

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Master Degree in Critical Care Medicine**

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Abstract

Introduction: Cardiac injury and dysfunction after subarachnoid hemorrhage (SAH) is a well-recognized phenomenon, ECG changes, arrhythmias, serum elevations of cardiac enzymes and left ventricular (LV) systolic dysfunction have been described in SAH patients. In recent years, considerable investigative interest has been directed at evaluation of frequency of this cardiac injury, clinical implications, predictors and outcome. Despite the large body of evidence testifying the development of myocardial injury in SAH, the true incidence in this population remains unknown.

Methodology: Thirty patients with acute subarachnoid hemorrhage were included in the study, of whom twenty patients had aneurysmal SAH (12 women, 8 men, with mean age 47.55 ± 12.356 years) and ten patients had traumatic SAH (4 women, 6 men, with mean age 42.10 ± 14.753 years), patients with evidence of epidural, subdural or intracerebral hemorrhage, history of cardiac disease, renal impairment and systemic sepsis were excluded from the study, all patients were subjected to detailed medical history taken from the patient or a family member, daily clinical assessment of neurological status (graded according to Hess and Hunt score) and cardiac status, daily ECG, biochemical measurement of Cardiac troponin I every other day for 7 days using IMMULITE test (reference range for upper limit of normal 1 ng/ml) and transthoracic echocardiographic examination on admission (day 1) of the patient and follow up after one week (day 7) for assessment of both global and regional systolic functions of the left ventricle and it was reported as abnormal if there was evidence of regional wall motion abnormality RWMA or $\text{EF} < 45\%$, cardiac abnormality was considered to be present based upon the presence of at least one of the following criteria: ECG abnormalities, Positive cardiac troponin I or abnormal echocardiogram.

Results: Out of twenty patients with aneurysmal SAH, fifteen patients (75%) had cardiac abnormalities, all of them had ECG changes, distributed as follows: **ST-T wave changes** were detected in thirteen patients since day 1, by day 7, these ST-T wave changes were completely reversed in four patients and showed partial reversibility in six patients, **long QTc** was detected in three patients, that normalized in two of them by day 7, **arrhythmias** detected in six patients, of whom, four patients had sinus tachycardia, one patient had sinus bradycardia and three patients had atrial premature beats (two of them had sinus tachycardia), by day 5, three patients out of the four patients with sinus tachycardia showed complete disappearance of this tachycardia and it was persistent in the fourth patient till day 7, all the patients with atrial extrasystoles, showed complete recovery by day 7 and the patient with sinus bradycardia showed persistence of this rhythm till day 7, six patients were detected to have **elevated cardiac troponin (cTnI)**, of whom, three patients had cTnI normalized on day 7, two patients were detected to have a **low ejection fraction** ($\text{EF} = 42\% \& 44\%$) on day 1, that improved on day 7 ($\text{EF} = 63\% \& 54\%$ respectively) and three patients were detected to have **regional wall motion abnormalities** on day 1, then these changes completely disappeared in two patients and partially disappeared in one patient on day 7.

ECG abnormalities, elevated cardiac troponin I and left ventricular dysfunction were associated with more severe neurological injury in patients with aneurysmal SAH [P value = 0.035 & 0.001 & 0.021 respectively]

Out of ten patients with traumatic SAH, only three patients had cardiac abnormalities represented by ST-T wave changes associated with sinus tachycardia, by day 7, two patients showed partial reversibility of these changes and it was persistent in the third patient, there was no evidence of elevated cTnI or echocardiographic abnormalities in any of the patients with traumatic SAH.

Correlation between neurological status and cardiac function in traumatic SAH patients lack any statistical significance [P value = 0.5]

Comparison between aneurysmal and traumatic SAH groups revealed a statistically significant higher incidence of ECG abnormalities and positive cardiac troponin I in the aneurysmal SAH group when compared to the traumatic SAH group [P value = 0.045 & 0.05 respectively].

Conclusions Different types and frequencies of ECG changes were found in patients with SAH, most frequent were repolarization abnormalities, independent of previous history of ischemic heart disease

Elevated cardiac troponin I and Left ventricular systolic dysfunction both global and regional was frequently observed after SAH.

ECG abnormalities, elevated cardiac troponin I and left ventricular dysfunction were associated with more severe neurological injury.

Key Words: ECG, Echocardiography, Cardiac troponin I & Subarachnoid hemorrhage.