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Prognostic significance of electrocardiographic changes after subarachnoid hemorrhage

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Background and purpose: Many reports have examined electrocardiographic (ECG) changes after subarachnoid hemorrhage from long ago; however, there are few reports on the prognosis of patients who have an ECG abnormality. Therefore, in this study, the prognoses of patients with subarachnoid hemorrhage showing abnormal ECG findings were retrospectively analyzed.

Methods: Over 30 months from January 2014 to June 2016, 199 patients (mean age, 61.1±17.0 years; 46.7% male) admitted with a subarachnoid hemorrhage (SAH) were enrolled. To assess the mechanism underlying abnormal ECG in the SAH, predictor variables, such as demographics (age, sex, and body surface area), hemodynamics (heart rate and systolic blood pressure), blood biochemical results, neurological assessments (Glasgow Coma Scale), and computed tomography (CT) severity classification (World Federation of Neurosurgical Societies classification) were recorded. The subarachnoid hemorrhage was classified into either the cerebral aneurysm rupture group (N=132) or traumatic subarachnoid hemorrhage group (N=67) and analyzed.

Results: In the cerebral aneurysm rupture group, the QT prolongation was significantly increased compared with the traumatic subarachnoid hemorrhage group (424.8±87.7 ms vs. 400.5±95.8 ms, $P<0.05$). There was a correlation between consciousness level (Glasgow Coma Scale) on admission and QT prolongation, and significant QT prolongation was observed in critical patients (Pearson's correlation coefficient test P=0.04). ST changes correlated with CT classification severity (WFNS classification), and the most severe group (WFNS Grade 5) showed significant ST changes. On admission, the cerebral aneurysm rupture group and 97.0% in the traumatic subarachnoid hemorrhage group.

Conclusions: Significantly prolonged QT and ST changes are noted in patients with severe aneurysmal subarachnoid hemorrhage. The cause of the ECG abnormality in subarachnoid hemorrhage patients is not yet understood. A small number of experimental animal models have shown that electrocardiogram abnormalities associated with subarachnoid hemorrhage develop in the brain stem, and an autonomic nerve abnormality may also be involved.

A D-dimer is positively correlated with both aneurysm trauma and traumatic subarachnoid hemorrhage and may be used for auxiliary diagnosis of a subarachnoid hemorrhage.