

Original Paper

Relationship between consciousness and electrical activity of brain neurons in patients undergoing aortic valve replacement surgery

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Abstract

Background & Objective: Monitoring the depth of anesthesia is very important to prevent undesirable events during surgery, such as intra operative awareness and overdosing. It is shown that anesthetic agents have direct effects on synaptic activity of brain neurons. So there is a great interest on electroencephalogram analysis as a depth of anesthesia estimator. Due to difficulties in visual explanation of EEG, automatic and computer based signal processing methods have been used to assess the depth of anesthesia. Investigating the relationship between conscious level of patients and electrical activity of brain neurons was the main aim of this study.

Materials & Methods: In this study, EEG signals of six patients undergoing aortic valve replacement surgery have been acquired and recorded in a computer. After applying signal processing methods to these data, 3 different measures included temporal, spectral and bispectral parameters have been extracted. Mean values of mentioned parameters in different anesthetic regimens and levels have been analyzed by ANOVA in SPSS software.

Results: Extracted temporal parameter is correlated with depth of anesthesia in deep anesthetic levels and spectral one is correlated with depth of anesthesia in moderate and light levels ($P < 0.05$). Bispectral parameter is correlated with the depth of anesthesia only in ICU ($P < 0.05$).

Conclusion: Findings of this study confirm the relationship between consciousness and electrical activity of brain neurons and recommend the use of EEG processing techniques to monitor, control and estimate the depth of anesthesia in operating room and ICU ward.

Keywords: Depth of anesthesia, Brain waves, Signal processing

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Received 3 Nov 2007

Revised 26 May 2008

Accepted 29 Jun 2008