High-frequency components of auditory evoked potentials are detected in responsive but not in unconscious patients.

Abstract:

BACKGROUND: The dose-dependent suppression of midlatency auditory evoked potentials by general anesthetics has been proposed to measure depth of anesthesia. In this study, perioperatively recorded midlatency auditory evoked potentials were analyzed in a time-frequency space to identify significant changes induced by general anesthesia.

METHODS: Perioperatively recorded auditory evoked potentials of 19 patients, recorded at varying levels of anesthesia, were submitted to a multiscale analysis using the wavelet analysis. Energy contents of the signal were calculated in frequency bands 0-57.1 Hz, 57.1-114.3 Hz, 114.3-228.6 Hz, and 228.6-457.1 Hz. A Friedman test and a Dunn multiple comparisons test were performed to identify significant differences.

RESULTS: Statistical evaluation showed a highly significant decrease of the wavelet energies for the frequency bands 57.1-114.3 Hz (P< 0.0001), 114.3-228.6 Hz (P< 0.0001), and 228.6-457.1 Hz (P< 0.0001) for the measuring points representing deep general anesthesia. This decrease is accompanied by a decrease in the wavelet energy of the frequency band 0-57.1 Hz of no statistical significance (P = 0.021) (level of significance set to P = 0.01). The changes are most prominent in the poststimulus interval between 10 and 30 ms.

CONCLUSIONS: This study describes the presence of high-frequency components of the auditory evoked
potential. The amount of these components is higher during responsiveness when compared to unconsciousness. Temporal localization of the high-frequency components within the auditory evoked potential shows that they represent a response to the auditory stimulus. Further studies are required to identify the source of these high-frequency components.