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COMPARISON OF THE ELECTROENCEPHALOGRAPHIC MONITORS OF ENTROPY AND NARCOTREND INDEX DURING PROPOFOL ANESTHESIA

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Introduction: Entropy and Narcotrend are two new electroencephalographic monitors designed to measure depth of anesthesia, but little information about the difference of consciousness prediction between these two monitors is available, therefore, we designed this study to compare their efficiencies of consciousness assessment during the induction of propofol and the period of tracheal intubation.
Methods: Eighteen patients of ASA I-II were inducted by target-controlled infusion (TCI) of propofol, target was set according to the effect compartment concentration (Ce), and stepwise increasing ($0.5\mu g \cdot mL^{-1}$) method was used, after the arrival of final Ce ($6\mu g \cdot mL^{-1}$), orotracheal intubation was performed. The changes of consciousness were evaluated by Observer's assessment of alertness/sedation (OAA/S) scale. Response entropy (RE), state entropy (SE), stages and values of narcotrend (NT), MAP and HR were recorded at each step of Ce, and the time-point of before, immediately, and 1 to 10min after tracheal intubation.
Results: Increases of Ce of TCI resulted in the decreases of OAA/S scale scores, while, Ce according to OAA/S score of 2 and 0 were $2.0\pm0.6\mu g \cdot mL^{-1}$ and $2.2\pm0.6\mu g \cdot mL^{-1}$, respectively. Values of RE, SE, and NT decreased gradually with the increases of Ce, especially the NT values. The Spearman rank correlation coefficients between Ce and RE, SE, NT values were -0.83,-0.80, -0.86 ($P<0.01$), respectively. Increase to $2.0\mu g \cdot mL^{-1}$ of Ce resulted in statistically significant decreases in RE, SE, and NT values, while, MAP decreased significantly at $3.0\mu g \cdot mL^{-1}$ of Ce ($P<0.01$). The changes of RE and SE had a well correlation with NT during the period of propofol induction. Compared to the values of before intubation, RE and SE of immediately after intubation increased significantly ($P<0.05$), while, MAP and HR at the time-point of 1min and 2min after intubation increased also ($P<0.05$), however, values and stages of NT had no obvious changes during the period of tracheal intubation.
Discussion: Both Entropy and Narcotrend indexes can reflect promptly the changes of consciousness during the induction of propofol, and they have a close correlation with the effect compartment concentration of propofol, especially the NT values, meanwhile, entropy index (RE and SE) and hemodynamic parameters (MAP and HR), but Narcotrend values, can reflect the stimulation of tracheal intubation.
Reference:
1. Time-frequency balanced spectral entropy as a measure of anesthetic drug effect in central nervous system during sevoflurane, propofol, and thiopental anesthesia. Acta Anaesthesiol Scand. 2004, 48: 145-53.
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S-162.

VALIDATION OF THE CAS ADULT CEREBRAL OXIMETER DURING HYPOXIA IN HEALTHY VOLUNTEERS

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Introduction: Cerebral near-infrared spectroscopy (NIRS) is a non-invasive, optically-based technique to monitor brain oxygenation continuously by determining the cerebral tissue oxygen saturation ($S_{ct}O_2$). Light from the NIRS forehead sensor passes through extracerebral tissue and brain tissue, latter containing oxy- and deoxyhemoglobin within cerebral arterioles, capillaries and venules. $S_{ct}O_2$ is a mixed-vascular oxygen saturation parameter. The purpose of this study was to validate the non-invasive NIRS $S_{ct}O_2$ with a reference $S_{ct}O_2$ derived from simultaneous radial artery and jugular bulb venous samples.
Methods: With written informed consent, 18 adult ASA 1 volunteers were enrolled. Right internal jugular bulb catheter and left radial arterial line were inserted. Two prototype CAS NIRS sensors (CAS Medical Sysytems, Inc, Branford, CT, USA) were placed on the right and left forehead. A Sequential Gas Delivery system was used to deliver gas mixtures in stepwise decrements (21% to minimum 8% inspired oxygen) whilst maintaining normocarbia (end-tidal CO_2 tension of 40 mmHg). Upon completion the inspired concentration was increased to 100%. The protocol was stopped if the finger S_pO_2 value reached < 70%. Each step was maintained for 5 minutes. Blood samples were drawn simultaneously from the jugular bulb ($S_{jb}O_2$) and radial arterial (S_aO_2) catheters and analyzed for oxygen tension using a co-oximeter (IL-682). The reference $S_{ct}O_2$ was calculated from the following equation: reference $S_{ct}O_2 = 0.3xS_aO_2 + 0.7xS_{jb}O_2$ (ref) and was compared with the NIRS $S_{ct}O_2$ value displayed on the right and left forehead NIRS oximeters using linear regression.
Results: All 18 subjects completed the study protocol. 253 samples were analyzed. The results are shown in figure 1. The NIRS $S_{ct}O_2$ showed a strong correlation with the reference $S_{ct}O_2$ over the spectrum of S_pO_2 values between 70 and 100%. Normative NIRS $S_{ct}O_2$ values recorded from subjects breathing room air averaged 73.6% (range: 66.6 - 79.7).
Discussion: This study supports the feasibility of non-invasive NIRS $S_{ct}O_2$ as an estimate of cerebral tissue oxygenation during episodes of oxygen desaturation. There was a strong correlation with the global indices of tissue oxygen supply and demand, arterial and jugular bulb oxygen saturations respectively. Small differences between the reference $S_{ct}O_2$ and NIRS $S_{ct}O_2$ may reflect inter-individual variability and/or differences in the regional blood flow of the cerebral tissue.
Reference: Adv Exp Med Biol. 2005;566: in press.