

Detection of Awareness in Surgical Patients with EEG-Based Indices--Bispectral Index and Patient State Index.

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Background

Patient state index (PSI) and bispectral index (BIS) are values derived from the EEG, which can measure the hypnotic component of anaesthesia. We measured the ability of PSI and BIS to distinguish consciousness from unconsciousness during induction and emergence from anaesthesia and a period of awareness in surgical patients.

Methods

Forty unpremedicated patients were randomized to receive: (1) sevoflurane/remifentanyl (< or =0.1 microg kg(-1) min(-1)), (2) sevoflurane/remifentanyl (> or = 0.2 microg kg(-1) min(-1)), (3) propofol/remifentanyl (< or =0.1 microg kg(-1) min(-1)), (4) propofol/remifentanyl (> or = 0.2 microg kg(-1) min(-1)). Every 30 s after the start of the remifentanyl, patients were asked to squeeze the investigator's hand. Sevoflurane or propofol were given until loss of consciousness (LOC1). Tunstall's isolated forearm technique was used during neuromuscular block with succinylcholine. After tracheal intubation, propofol or sevoflurane were stopped until return of consciousness (ROC1). Propofol or sevoflurane were re-started to induce LOC2. After surgery, drugs were discontinued and recovery (ROC2) was observed. PSI and BIS at LOC (LOC1 and LOC2) were compared with those at ROC (ROC1 and ROC2) (t-test). Prediction probability (P(k)) was calculated from values at the last command before and at LOC and ROC. Values are mean (SD).

Results

At non-responsiveness, BIS (66 (17)) and PSI (55 (23)) were significantly less than at responsiveness (BIS, 79 (14); PSI, 77 (18); P<0.05). The wide variation with both BIS and PSI measurements of the 80 'awareness' values led to an erroneous classification as unconscious in some cases (BIS, six patients; PSI, nine patients). P(k) was 0.68 (0.03) (BIS) and 0.69 (0.03) (PSI).

Conclusions

Despite significant differences between mean values at responsiveness and non-responsiveness for BIS and PSI, neither measure may be sufficient to detect awareness in an individual patient, reflected by a P(k) less than below 70%.