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Title: Use of the bispectral index to document burst suppression during pentobarbital coma

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Introduction: Pentobarbital coma remains a viable option in patients with elevated intracranial pressure (ICP). To demonstrate effective end-organ concentrations, continuous electroencephalographic (EEG) monitoring is used to document a burst suppression pattern (3 to 5 episodes or bursts of electrical activity per minute). The obtainment of the burst suppression pattern ensures that the cerebral metabolic rate for oxygen is adequately depressed to achieve the optimal effect from the pentobarbital. However, the use of a continuous EEG can be cumbersome, requires placement by trained personnel as well as training of bedside nurses and clinicians to ensure accurate interpretation. Placement issues become particularly cumbersome when the EEG leads must be removed and then replaced after radiologic imaging procedures such as computed tomography scans. To overcome such issues, we have started using the Bispectral Index (BIS) simultaneously with standard continuous EEG monitoring and have noted that the presence of a burst suppression pattern on the EEG can be ensured by using either the BIS number or the suppression ratio (SR) from the Bispectral Index Monitor. We present data regarding the correlation of the BIS number and SR with burst suppression pattern in patients receiving pentobarbital for control of ICP.

Methods: This study was approved by the institutional IRB. We retrospectively reviewed the records of patients who received pentobarbital for treatment of elevated ICP and who were simultaneously monitored with both a continuous EEG and the BIS monitor. Demographic data included age, weight, and gender. When the EEG demonstrated a burst suppression pattern, we recorded the BIS number and the SR. The data are presented as the mean ± SD with 95% confidence intervals.

Results: BIS and SR data were recorded for seven pediatric patients (six males, one female) who ranged in age from 2.9 to 14 years (8.7 ± 3.8 years) and in weight from 14.8 to 52.0 kilograms (37.1 ± 12.3 kilogramsg). The 7 patients were receiving pentobarbital for control of elevated ICP and all had a burst suppression pattern (3-5 bursts of electrical activity per minute) documented by continuous EEG monitoring. The mean BIS number was 14 ± 3 (95% confidence interval 13 to 15). The mean SR was 75 ± 6% (95% confidence interval 74-76). The BIS and SR values were highly correlated ($R= -0.90$, $p <0.0001$).

Discussion: The BIS monitor proved to be a reliable predictor of burst suppression in pediatric patients during pentobarbital treatment of elevated ICP. The above data suggest that a BIS number less than 15 or an SR greater than 76% are highly predictive of the presence of a burst suppression pattern (3-5 bursts/min) on continuous EEG monitoring. BIS monitoring is easier to perform, requires less technical expertise to interpret, and appears to be highly predictive of continuous EEG data. The probe for the BIS monitor can be easily removed and a new probe replaced when radiologic interventions (CT or MR imaging) are required. For these reasons we suggest that BIS monitoring may be a valid alternative to continuous EEG monitoring during pentobarbital treatment of elevated ICP in pediatric patients.