

**Bispectral Index Monitoring During Sedation With Sevoflurane, Midazolam, and Propofol.**

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**Received during:** RPCP case rounds

**Abstract:**

**Background:** Bispectral Index (BIS) has been used to measure sedation depth. Ideally, to guide anesthetic management, range of BIS scores at different sedation levels should not overlap, and BIS should be independent of drug used. This study assessed ability of BIS to predict sedation depth between sevoflurane, propofol, and midazolam. Quality of recovery was also compared.

**Methods:** Patients undergoing surgery with local or regional anesthesia and sedation were randomized to sevoflurane (N = 23), midazolam (n = 21), or propofol (n = 22). Sedation was titrated to Observers's Assessment of Alertness-Sedation score of 3 (responds slowly to voice). BIS and Observers's Assessment of Alertness-Sedation were measured every 5 min. BIS prediction probability (Pk) was compared between drugs. Recovery was assessed by BIS and Digit Symbol Substitution and memory tests.

**Results:** Bispectral Index of responders to voice vs significantly different from nonresponders ( $86 \pm 10$  vs.  $74 \pm 14$ , mean  $\pm$  SD;  $P < 0.001$ ). However, wide variability and overlap in BIS were observed (25th-75th percentile, responders vs. non-responders: 79-96 vs. 65-83). BIS of responders was different for sevoflurane versus propofol and midazolam. BIS was a better predictor of propofol sedation than sevoflurane or midazolam ( $P_k = 0.87 \pm 0.11$ ,  $0.76 \pm 0.01$ , and  $0.69 \pm 0.02$ , respectively;  $P < 0.05$ ). At 10 min. after the procedure, 76, 48 and 14% of sevoflurane, propofol, midazolam patients, respectively, returned to baseline Digit Symbol Substitution scores ( $P < 0.05$ ). Excitement-disinhibition occurred in 70, 36, and 5% of sevoflurane, propofol and midazolam patients, respective ( $P < 0.05$ ).

**Conclusion:** Individual BIS scores demonstrate significant variability, making it difficult to predict sedation depth. The relation between BIS and sedation depth may not be independent of anesthetic agent. Quality of recovery was similar between drugs, but excitement occurred frequently with sevoflurane.

**Comments:**

**Strengths/uniqueness:** Well-designed, clear, and thorough evaluation of the reliability and accuracy of Bispectral Index Monitoring (BIS) as a measure of sedation level in a population of surgical patients not receiving general anesthesia. Good presentation of the strengths and weaknesses of BIS when compared to accepted clinical assessments of sedation level in surgical patients. Includes evaluation of recovery assessment by BIS as well as two clinical assessment tools. Good description of side effects encountered in this study in relation to specific study drugs. Conclusion that BIS is not a reliable measure of sedation level seems well founded.

**Weaknesses:** Limited sample size. Excludes patients on opioids (except for those requiring Fentanyl during surgery). Clinical assessor of sedation level not blinded to study drug. No thorough description of BIS as a technique.

**Relevance to Palliative Care:** Describes the complexity of sedation level assessment. Presents some simple, practical, clinical tools to assist in assessment of sedation level (e.g. Observer's Assessment of Alertness-Sedation score). Evaluates action and side effects of agents used in palliative care (i.e. midazolam and propofol). Since BIS is used in

some critical care and operative settings palliative care professionals may be asked about it by patients, families, or health care professionals from other specialties.