

The Impact of Addition of N₂O on BIS™ and PSI during a Stable Sevoflurane Anesthetic
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Background

N₂O is a commonly used anesthetic agent that has significant amnestic and analgesic properties. Studies in volunteers breathing up to 70% N₂O have shown no change in Bispectral Index™ (BIS™) from normal awake values (95-100), despite loss of responsiveness to commands and apparent sedation. Furthermore, in a previous study we have shown that addition of N₂O to a stable sevoflurane anesthetic did not change BIS™ despite near doubling of MAC. Patient State Index (PSI) is a new index of unconsciousness using a different EEG derived algorithm than BIS™. The purpose of this study was to compare the BIS™ and PSI responses to N₂O during a sevoflurane anesthetic.

Methods

General anesthesia was induced and titrated to maintain normal blood pressure and pulse during laparoscopic surgical procedures. Laparoscopic operations were selected due to a relatively stable level of surgical stimulation. After 10 min with no change of more than $\pm 10\%$ in heart rate, mean blood pressure, end-tidal anesthetic concentration, and BIS™ or PSI, baseline data were recorded. N₂O was then added to the inspired gas mixture to achieve an end tidal concentration of $>65\%$. When end-tidal N₂O was $>65\%$ and after 10min of blood pressure and pulse stability, data were again collected. N₂O was discontinued, and after end-tidal N₂O was $<5\%$ and following 10min of physiologic stability, data were re-collected. Sample size (n=20) was designed to detect a 10 unit change in BIS™ or PSI with $\alpha = .05$ and statistical power = .80. Data are summarized as mean \pm SD and were compared with an analysis of variance for repeated measures.

Results

There were no differences in variables reflecting cardiovascular function throughout the study in either the PSI or BIS™ groups. Supplementing sevoflurane with $>65\%$ N₂O increased MAC from 1.3 ± 0.05 to 2.2 ± 0.10 , but did not alter BIS™ or PSI (p-value for differential MAC is <0.001). (Figure 1)

Conclusion

Supplementing sevoflurane with $>65\%$ N₂O affected neither BIS™ nor PSI despite nearly doubling MAC. Since N₂O often is used in combination with volatile anesthetics to increase depth of anesthesia, it is important to know that N₂O has variable effects on these derived measures of "unconsciousness" while deepening the patients' level of hypnosis. This evidence suggests that neither BIS™ nor PSI are useful measures of depth of anesthesia when using N₂O in addition to sevoflurane anesthesia.

Figure 1

Differential Measures of Unconsciousness

