Is Patient State Index of EEG Better Than Bispectral Index of EEG in Assessing Different Levels of Sedation as Judged by Ramsey Sedation Score in ICU Patients?

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Introduction

Patient State Index (PSI) (Physiometrix, Inc., N. Billerica, MA) has been shown to perform better than Bispectral Index (BIS) (Aspect Medical Systems, Newton, MA) during induction of and emergence from general anesthesia.1 For assessment of sedation levels in ICU patients, Ramsey Sedation Score (RSS) still remains the gold standard. However, RSS is subjective and observer dependent. BIS and PSI have been shown to be helpful for assessing levels of sedation in ICU patients.2,3 We undertook the following study to compare the performance of BIS and PSI simultaneously versus modified RSS (mRSS) for assessing sedation levels in ICU patients.

Methods

Following approval by the Institutional Review Board and after obtaining written informed consent, 9 adult male patients in the Surgical ICU were studied. Patients' foreheads were cleaned with alcohol before the application of the PSI and BIS sensors. PSI sensors were applied closer to the eyebrows while BIS sensors were applied above PSI sensors. Once the monitors checked the impedance of the sensors and passed them baseline measurements were performed. The Ramsey Sedation Score was modified as: 1=anxious, 2=cooperative/tranquil, 3=sedated but responds to commands, 4=asleep/brisk response to spoken name, 5=asleep/sluggish response to spoken name, 6=asleep/no response to painful stimulus. Other parameters monitored were the heart rate, blood pressure, oxygen saturation, and respiratory rate. All values including mRSS were recorded every 15 minutes for four hours. EEG data were continuously recorded online for offline analysis. Sedative drugs were administered as per the physicians taking care of the patients and were not controlled in the study.

The PSI and BIS values were averaged over a period of 60 seconds around the time when each mRSS was assessed. PSI and BIS values were grouped separately by each mRSS. The group data was analyzed employing a standard ANOVA test. These results were used to evaluate the significance of the differences between the group means for each mRSS level, using four sets of criteria: 'tukey-kramer', dunn-sidak', 'bonferroni', and 'scheffe'. Values of PSI & BIS for each mRSS were compared to values of all other mRSS. A p-value of <0.05 was considered statistically significant.

Results

Significance was determined for mean values of PSI and BIS for each mRSS level versus the values for the rest of mRSS levels. Total of 30 comparisons were performed for PSI and 30 for BIS. Tables show comparison of group means of PSI (Table 1) and BIS (Table 2) for mRSS of 1 through 6

Conclusion

PSI reached statistical significance 22 times while BIS was statistically significant for only 10 times out of 30. It appears from this study that PSI may be able to differentiate different levels of mRSS more often than BIS.

References: 1. Anesth Analg 2002:(95):1669-74 2. Anesthesiology 2002:97(3A):A554. 3. ASCCA Annual Meeting, 2003.

Table 1 Group Mean of PSI

	mRSS 1	mRSS 2	mRSS 3	mRSS 4	mRSS 5	mRSS 6
mRSS 1		NS	S	S	S	S
mRSS 2	NS		S	S	S	S
mRSS 3	S	S		NS	NS	S
mRSS 4	S	S	NS		NS	S
mRSS 5	S	S	NS	NS		S
mRSS 6	S	S	S	S	S	

S = Significant, NS = Non-Significant

Table 2 Group Mean of BIS

	mRSS 1	mRSS 2	mRSS 3	mRSS 4	mRSS 5	mRSS 6
mRSS 1		NS	NS	S	NS	S
mRSS 2	NS		NS	S	NS	S
mRSS 3	NS	NS		S	NS	NS
mRSS 4	S	S	S		NS	NS
mRSS 5	NS	NS	NS	NS		NS
mRSS 6	S	S	NS	NS	NS	

S = Significant, NS = Non-Significant