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## Noxious Stimulation Response Index (NSRI): Validation of a Novel Anesthetic Depth Index

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**Background :** Several parameters have been proposed to measure nociceptive responsiveness in anesthetized patients but none has been shown to predict the probability of patients response to clinical stimuli. We have recently presented an index based on the sequential hypnotic-opioid interaction model [1,2] reflecting the total anesthetic potency of the two components as a number between 100 and 0. We validated the NSRI on a data set from a previous study [3] for non-noxious and noxious stimuli.

**Methods:** 45 females, ASA class 1 had been randomly allocated to 3 groups receiving remifentanyl infusions at 0, 2 and 4 ng ml<sup>-1</sup> respectively [3]. In each group propofol infusions had been given at stepwise increasing effect site target concentrations, starting at 1.5 (no remifentanyl) and 1.0 mcg ml<sup>-1</sup> respectively. At each propofol concentration the observer assessment of alertness and sedation score (OAAS/S), the presence or absence of eyelash reflex and of a movement response to a 2 sec. tetanic stimulation of the volar forearm had been recorded [3]. Bispectral index and acoustic evoked potential index (ARX) had also been recorded. From the predicted propofol and remifentanyl effect site concentrations recorded immediately before stimulation, we computed the NSRI values and calculated the prediction probability [4] (Pk) of the NSRI and other independent variables related to the dependent variables OAAS/S value, probability of loss of eyelash reflex and loss of response to tetanic stimulation, and of the BIS and ARX values before stimulation.

**Results:** One patient was excluded from the analysis because of incomplete data. The prediction probability of NSRI, predicted propofol and remifentanyl effect site concentrations, BIS and AAI related to the clinical and EEG derived endpoints are presented in table 1.[table1] **Conclusion:** The NSRI best predicted loss of response to the noxious stimulus. As expected the prediction probability was intermediate for the non-noxious stimuli and low for the EEG measures for hypnosis. This reflects the contribution of hypnotics and opioids and their interaction. NSRI may be an promising anesthetic depth indicator supplementing EEG derived parameters.

**References:**

- 1) Bouillon T.W., Anesthesiology 2004;100:1353-72
- 2) Schumacher P.M., Anesthesiology 2007;107:A17
- 3) Struys MMRF., Anesthesiology 2003;99:802-12
- 4) Smith WD.;Anesthesiology 1996;84:38-51.

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Table 1

	OAAS/S	LOE	LORT	BIS	AAI
NSRI	0.77(0.02)*	0.82(0.03)*	0.88(0.02)*	0.67(0.02)*	0.63(0.02)*
Propofol Ce	0.89(0.01)	0.91(0.02)	0.65(0.03)	0.87(0.01)*	0.80(0.01)*
Remifentanyl Ce	0.42(0.02)*	0.42(0.03)*	0.67(0.03)	0.35(0.02)*	0.37(0.02)*
BIS	0.89(0.01)	0.93(0.02)	0.70(0.03)		
AAI	0.86(0.01)	0.92(0.02)	0.67(0.03)		

Legend: Numbers are Pk values (SE), LOE (loss of eyelash reflex), LORT (loss of response to tetanic stimulation), BIS (bispectral index), AAI (ARX index, A-Line Monitor, Danmeter Inc. Denmark). \* p<0.05 compared to all other Pk values in a column (one-way ANOVA with multiple pairwise comparison (Holm-Sidak)).