

Monitoring Depth of Anaesthesia with the Conox

Presenting Author: Erik W Jensen¹

Co-Authors: Isabel Serra¹, Umberto Melia¹, Pedro L Gambús²

¹Quantium Medical SL, Mataró, Spain

² SPEC-M Lab of the Anesthesiology Dept., Hospital Clínic, Univ. Barcelona, Barcelona, Spain

Introduction: The electroencephalogram (EEG) has been studied to develop a reliable measure of the effects of the anesthetic agents in surgical procedures; a proper evaluation of the EEG during surgery is known to be a good predictor of the real physiological state of the patient [1]. The qCON is an index implemented in the Conox (Fresenius Kabi, Bad Homburg, Germany), which gives a prediction of the hypnotic level directly from the frontal EEG of patients under general anesthesia. The objective of this study is to validate the qCON index performance during surgical procedures by comparing it with the bispectral index (BIS) (Covidien, Boulder, CO, USA), and with clinical signs.

Methods: The EEG signals, qCON, BIS, anaesthetic agent concentrations and hemodynamic parameters were recorded simultaneously from a total of 1000 patients scheduled for ambulatory major surgeries in Hospital Clínic (Barcelona) undergoing general anesthesia with propofol and remifentanyl, after approval of the local IRB. The target controlled infusion (TCI) system (Base Primea, Fresenius Vial, Brézins, France) administered the anaesthetic agents following the predictions of pharmacokinetic-pharmacodynamic models. Propofol (Ce prop) was infused following the Schnider model [2] and remifentanyl (Ce remi), following the Minto model [3].

Clinical signs of loss of consciousness (LOC), such as loss of response to verbal command and loss of eyelash reflex were recorded during surgery. Prediction probability (Pk) has been computed for both qCON and BIS indices to compare two different anaesthetic states: the mean value during three minutes before LOC against the mean value three minutes after LOC. Acquired data with low signal quality index (SQI<50) were rejected. The relation between qCON and BIS indices was analyzed with Pk and Bland-Altman plot. Only the periods with Ce values in steady state were included in the analysis. The Pk and its standard error (SE) were computed taking the pool of data of qCON and BIS of all the recorded patients. The BIS was used as the reference: BIS values were divided in 4 levels (100-80; 80-60; 60-40; 40-0) and the histogram was equalized taking 45000 random points of each level.

Results: The obtained Pk between qCON and BIS indices of the 1000 registers is 0.8898 ± 0.0001 . Figure 1 represents a boxplot of the qCON values against the BIS divided in 10 levels.

The distribution of the values of qCON and BIS of all the data pool is represented by the Bland-Altman analysis in figure 2. The mean values and standard deviation (SD) of the qCON and BIS indices three minutes before and after LOC are shown in the first and second column of table 1. The Pk's for qCON and BIS vs LOC are shown in the third column of table 1.

Conclusions: The qCON index shows a good agreement with the BIS index, as a predictor of the level of consciousness during general anesthesia. Clinical signs evaluated during surgery corroborate that qCON is a validated index for predicting the probability of the patient of being awake.

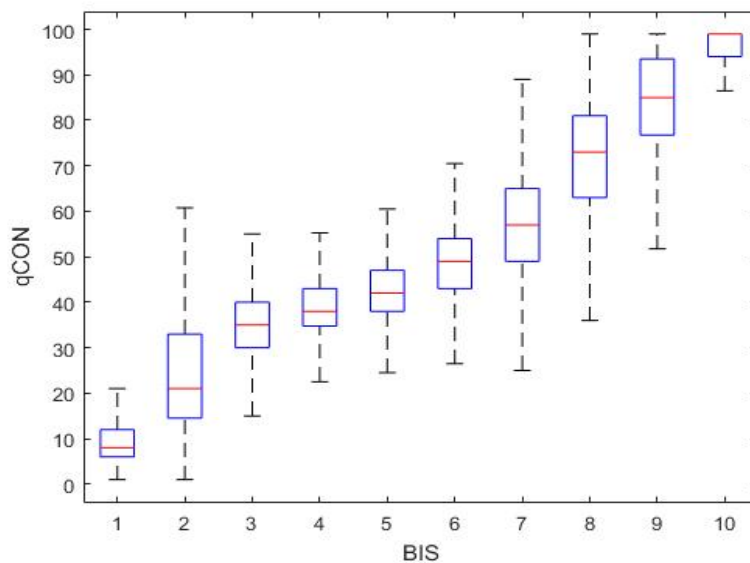


Figure 1: Boxplot of qCON index with respect to BIS (divided in ten levels)

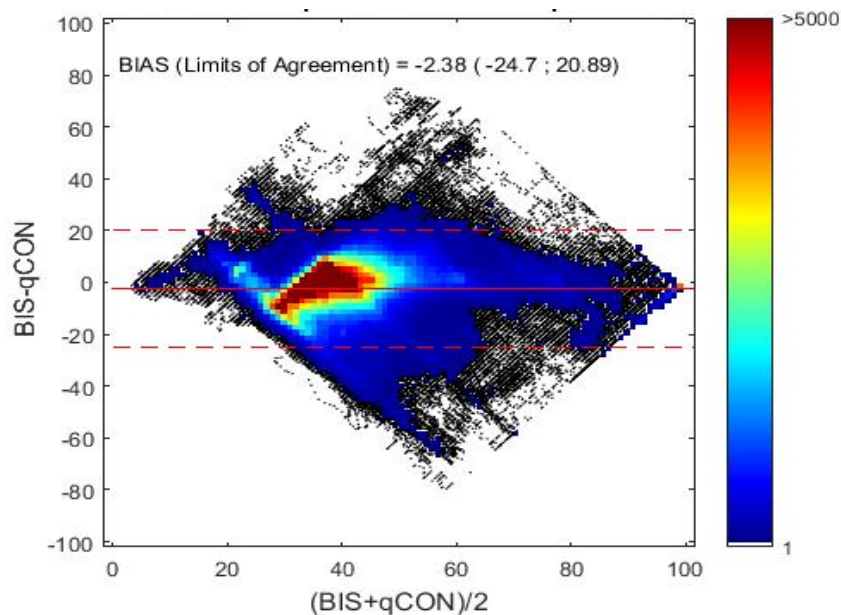


Figure 2: Bland Altman of BIS and qCON indices.

Table 1: values of qCON and BIS index before and after the LOC (state of patient):

	Before LOC Mean \pm SD	After LOC Mean \pm SD	Pk \pm SE
qCON	84.22 \pm 12.14	47.70 \pm 11.68	0.970 \pm 0.005.
BIS	84.16 \pm 10.04	46.52 \pm 12.17	0.982 \pm 0.004

References

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