TITLE PAGE

Comparison of the qCON-qNOX and Bispectral Index (BIS) responses to anesthesia and noxious stimuli during surgery

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ABSTRACT

BACKGROUND: Monitoring a patients' level of anti-nociception during surgery can minimize autonomic and muscular responses to intraoperative stimuli. Electroencephalogram (EEG)-based tools like Bispectral Index (BIS) (Covidien, Boulder CO. USA) and qCON (Quantium Medical, Spain) provide insights into depth of hypnosis, while qCON-qNOX is designed to assesses nociception during surgery. The purpose of this observational study was to evaluate the correlation between the qCON and BIS indices for evaluating the depth of hypnosis, and the qNOX as a monitor for assessing the responses to noxious surgical stimuli.

METHODS:
Prior to induction, 59 consenting adult patients undergoing general anesthesia with a laryngeal mask airway (LMA) were monitored using BIS and qCON-qNOX electrodes. Monitoring continued throughout surgery with the surgical and anesthetic teams both blinded to both the BIS and qCON-qNOX values. Responses to-LMA insertion and removal, as well as noxious events related to surgery: skin preparation, local infiltration, incision, and suturing were recorded.

RESULTS:
The prediction probabilities (Pk) in the Bland-Altman analysis show significant concordance among comparisons of qCON vs BIS (Pk=0.821, $p<0.01$), qCON vs qNOX (Pk=0.827, $p<0.01$), and qNOX vs BIS (Pk=0.743, $p<0.05$) during anesthesia. During LMA insertion, there were no significant differences in heart rate (HR), mean arterial pressure (MAP), BIS, or qCON values in patients who moved vs. those who did not move; however, qNOX and qNOX-qCON values were significantly higher ($p<0.05$) in “movers” compared to “non-movers”. During the aformentioned stimulating intraoperative events there was not a significant difference in qCON when comparing movers and non-movers, but HR, MAP, BIS, qNOX, and qNOX-qCON were significantly higher ($p<0.05$) in movers compared to non-movers. These findings suggest that qNOX can accurately serve as a surrogate for sympathetically mediated responses to noxious stimuli. Probability response analysis showed that qNOX-qCON, followed by qNOX, was the most accurate predictor of intraoperative movement and the remaining aforementioned parameters were less predictive.

CONCLUSION:
This observational study confirms a strong correlation between BIS and qCON in monitoring hypnotic levels and validates qNOX for anti-nociception monitoring. qNOX appears sensitive to anti-nociception levels independently from qCON, suggesting increased qNOX levels may signal

inadequate analgesia. These findings underscore the importance of separately monitoring hypnosis and nociception throughout surgeries, particularly during noxious stimuli. Anesthesia providers should integrate hypnotic and anti-nociceptive monitoring alongside hemodynamic measures to ensure optimal anesthetic depth.

Fig 5. Probability responses during maintenance. Hemodynamics and EEG indices.