

Fall and Rise Times of the qCON and qNOX Indices during Induction and Recovery of Anaesthesia

The objective of this study was to analyze the performance of qCON and the qNOX indices of hypnotic effect and pain/nociception after drug induction and during recovery of consciousness by measuring their fall and rise times.

Data was recorded from 140 patients scheduled for general anaesthesia with a combination of propofol and remifentanyl. The qCON 2000 monitor (Quantum Medical, Barcelona, Spain) was used to calculate the qCON and qNOX. Both indices are derived from the frontal electroencephalogram¹.

In order to analyze the responses of the two indices to the changes of hypnotic and analgesic concentrations, the qCON and qNOX fall and rise times were defined at the beginning and at the end of the surgery. The fall times (Figure 1a) was defined as the difference between the time instants when the effect site concentration of propofol or remifentanyl was above zero (T_0) and the time when qCON and qNOX reached a value under 85 ($T_{<85}$) and 65 ($T_{<65}$). The rise times (Figure 1b) were defined as the difference between the time of recovery of consciousness (eye opening) or response to noxious stimuli (T_{RC}) and the times when qCON and qNOX reached a value above 65 ($T_{>65}$) and 85 ($T_{>85}$).

The qCON had a faster decrease than qNOX (p-value<0.05): time to reach 85 and 65 were in median (25th; 75th percentile): 148.5 (67.0; 190.0) s and 198.0 (114.0; 245.0) s after anaesthesia induction. The qNOX fall times were significantly longer (p-value<0.05): 198.0 (114.0; 245.0) s and 249.0 (189.0; 322.0) s. At the end of the surgery, the qNOX started to increase before than qCON: the qNOX raised to 85 at 5.0 (-44.0; 46.0) s after recovery, while the qCON raised to 85 at 96.0 (26.0; 184.0) s after qNOX (p-value<0.05).

Both indices were able to detect differences between the times of actions of hypnotic and analgesic agents. The clinical interpretation is that according to the rate of change of qCON and qNOX loss of consciousness is achieved before adequate analgesia, after anaesthesia induction. During recovery, the probability of response to noxious stimuli (assessed by the qNOX) increases before the patient recovered consciousness as assessed by the qCON. Hence, the qNOX could be interpreted as an arousability index.

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REFERENCES

1 Jensen, E. W., Valencia, J. F., Lopez, A., Anglada, T., Agustí, M., Ramos, Y., Serra R., Jospin, M., Pineda, P., Gambus, P. (2014). Monitoring hypnotic effect and nociception with two EEG-derived indices, qCON and qNOX, during general anaesthesia. *Acta Anaesthesiologica Scandinavica*, 58(8), 933-941.

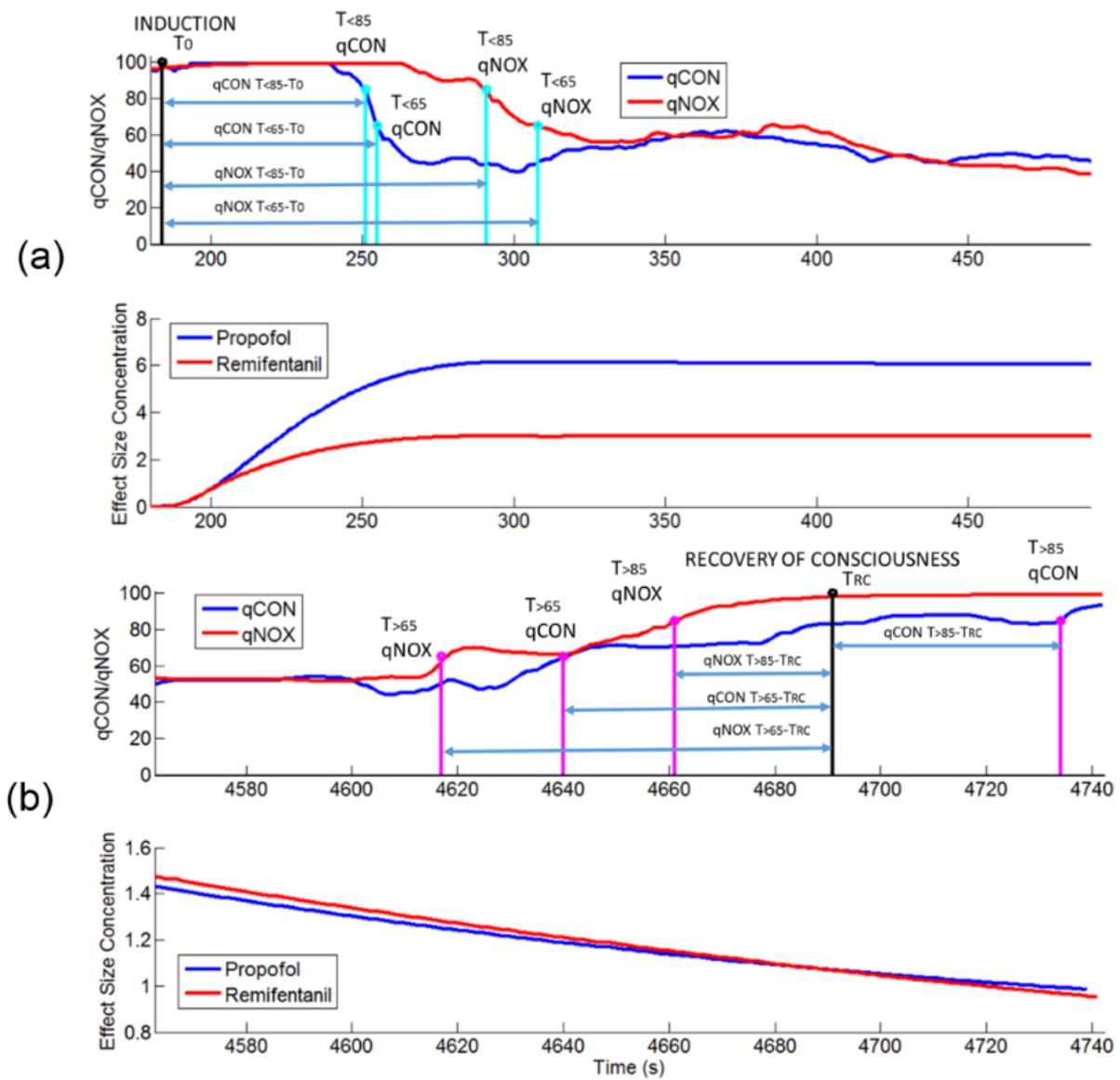


Figure 1 – Example of $qCON$ and $qNOX$ fall and rise times: (a) T_0 is the time instants when the effect site concentration of propofol or remifentanyl is above zero; $T_{<85}$ and $T_{<65}$ are the time when $qCON$ and $qNOX$ reached a value under 85 and 65, respectively; (b) T_{RC} is the time of recovery of consciousness (eye opening) or response to noxious stimuli; $T_{>65}$ and $T_{>85}$ are the times when $qCON$ and $qNOX$ reached a value above 65 and 85, respectively.