LETTER TO THE EDITOR

RESIDUAL NEUROMUSCULAR BLOCKADE (RNMB): ROCURONIUM'S DEFASCICULATING DOSE, NEOSTIGMINE-INDUCED WEAKNESS, AND AWARENESS DURING RECOVERY

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Residual neuromuscular blockade (RNMB) is always a potential concern for anesthesiologists. However, there is no uniformity and/or universal protocol (because it constantly keeps evolving) in regards to neuromuscular blocking drugs (NMBDs) administrations based on peri-operative neuromuscular monitoring as well as tracheal extubations guided by neuromuscular monitoring. Moreover, neuromuscular monitors are either qualitative that is subjective visual assessment by providers for presence of twitches for train-of-four (TOF) stimulations, or quantitative wherein numerical values for TOF ratios are ascertained by either acceleromyographic (AMG) monitoring or electromyographic (EMG) monitoring. To avoid the TOF ratios’ overestimation by AMG monitoring1 that can cause more false-positives in regards to preparedness for extubations and more false-negatives in regards to RNMB as gold standardized by EMG monitoring, recent intra-departmental implementation of quantitative EMG monitoring by Todd et al.2 appears as commendable tool against RNMB. However, as many as 37% patients had been reported to not receive neostigmine despite receiving intraoperative rocuronium (most commonly used non-depolarizing NMBDs) presumably secondary to assumed spontaneous reversal. It is interesting to note that post-extubation TOF ratios can give insight into assumed spontaneous reversal's etiologies and the patterns they follow such as time elapsed since rocuronium's last dose and rocuronium's total dose, or exclusive use of depolarizing NMBDs (succinylcholine). Moreover, in future research it remains to be seen if a pre-quantified duration since last dose of rocuronium matters in the currently followed definition for RNMB (TOF ratio<0.9 by EMG monitoring)3 for the patients who receive only one-time defasciculating doses or one-time intubating doses of rocuronium without any additional dose supplementations. These future investigations will give insight into variable frequencies of spontaneous reversals (without neostigmine administration) and potential for suboptimal recovery-room TOF ratios because (a) rocuronium's defasciculating doses (despite prevalent variable defasciculating doses3 and variable lag periods for succinylcholine administration after rocuronium affecting TOF ratios) may or may not require neostigmine, and (b) intubation-induced parasympathetic surge-related acetylcholine release (although primarily implicated in intubation-induced bronchospasm4) may or may not hasten spontaneous reversal by decreasing rocuronium's intubating doses' duration of action5-6. Moreover, as neostigmine-administration can (a) itself depress TOF ratio in upto 13% patients for variable time-periods after 40mcg/kg neostigmine dose7 or (b) be avoided for the potential risk of post-reversal weakness in spontaneously reversed patients with TOF ratio >0.98 or (c) cause weakness in patients who had not received prior non-depolarizing NMBDs8, an appropriate sequential-EMG monitoring should include pre-reversal (neostigmine/spontaneous) TOF ratio followed by pre-extubation TOF.

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ratio followed by post-extubation TOF ratio followed by recovery-room TOF ratio. An enhanced form of intra-departmental implementation should also ensure standardized protocol for sedation among patients with clinically-underdiagnosed but EMG-exposed RNMB because in-vivo muscle relaxants (although not specifically studied during residual paralysis stages) may increase the risk for awareness under anesthesia with subsequent long-term psychological sequelae when patient is recovering from intraoperative neuromuscular blockade through intermediary transient postoperative RNMB. The standardization of sedation protocol for RNMB primarily needs to address indications and timeline when to initiate sedation in "paralyzed" patients recovering from general anesthetics (whether end-expiratory inhalational gas concentrations vs. TOF ratios needs to be used as sedation-initiation triggers) and what medications needs to be administered for recovery-room intravenous sedation (amnestics vs. anesthetics). Finally, universal quantitative EMG monitoring needs to account for how to manage EMG-overdiagnosed "paralyzed" patients' awareness risks despite these patients (sometimes) undergoing otherwise uneventful post-anesthesia cardio-respiratory recoveries even when their recovery room TOF ratios are well below 0.9. In summary, skeptics can always question the universal use of EMG-monitoring based reversals, extubations and recoveries of patients receiving perioperative non-depolarizing NMBDs; however they can never deny the fact that in the face of risks for RNMB-complicated recovery room cardio-respiratory events and still-non-quantified incidence of RNMB-related awareness of “paralysis” and its sequelae, EMG-based TOF ratios as quantitative neuromuscular monitoring can never be found guilty for being overused by anesthesiologists.

References

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