

Should Neuromuscular Blocking Agents Always Be Reversed?

To the Editor:

We read with great interest the Bulka *et al.*¹ article associating intraoperative neuromuscular blockade administration with postoperative pneumonia. We found the conclusion that not “reversing” neuromuscular blockade was associated with an increased risk of postoperative pneumonia to be particularly important. However, we find the title of the accompanying editorial (“To Reverse or Not to Reverse?” The Answer Is Clear!²) to be misleading, and the second part of the text in the editorial’s figure (“reversal of neuromuscular blocking agents should be routine”) to differ from what we would consider safe and patient-centered practice.

We believe that reversal of neuromuscular blockade should only occur when guided by neuromuscular transmission monitoring, preferably quantitative. The authors also believe this, as it is written in their editorial: “Unless there is quantitative evidence that the TOF [train-of-four] ratio at the adductor pollicis has returned to a value of more than or equal to 0.9, an appropriate dose of an anticholinesterase agent or sugammadex should be administered at the end of surgery.”² However, we find this statement to be incongruent with their conclusion that “reversal of neuromuscular blocking agents should be routine.”

“Routine reversal” of neuromuscular blockade with neostigmine is not settled science. It has been shown to improve clinical outcomes,^{1,3} have little effect on clinical outcome,^{4,5} and even cause harm at high doses,⁶ all dependent upon clinical context. Neostigmine should not be used in a patient with deep neuromuscular blockade.⁷ Patients who have already recovered their strength (TOF greater than 0.9) may be weakened through the administration of neostigmine, as demonstrated in a healthy volunteer study.⁸ The only way to prevent these two dangerous situations is to monitor the patient depth of neuromuscular blockade and reverse appropriately.⁹

Furthermore, we would like to clarify an additional point from the editorial regarding our prospective, observational study of 3,000 postoperative patients who were intraoperatively administered intermediate-acting neuromuscular blocking agents.¹⁰ Quantitative neuromuscular transmission monitoring within 10 min of postanesthesia care unit arrival was included in the statistical model. In our study, neostigmine usage was associated with increased diagnoses of atelectasis, and, in *post hoc* analysis, unwarranted neostigmine usage was independently associated with pulmonary edema and reintubation.

We offer the strong suggestion that the administration of neuromuscular blocking agents and reversal agents be guided by frequent neuromuscular transmission monitoring,

preferably quantitatively. No reversal should be administered until there are at least two twitches, and no reversal should be administered if there is a TOF greater than 0.9.¹¹

Competing Interests

Dr. Eikermann received research funding from Merck & Co. (Kenilworth, New Jersey) and holds equity stakes in Calabash Bioscience, Inc. (College Park, Maryland). The other author declares no competing interests.

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(Accepted for publication April 13, 2017.)