

Correspondence

Rapid tracheal intubation – atracurium may not be the answer

To the Editor:

We read the recent article on rapid tracheal intubation using atracurium by Naguib *et al.*¹ with considerable interest and some concern.

The use of a nondepolarizing relaxant to facilitate rapid tracheal intubation during a rapid sequence induction for patients with a full stomach is indicated in certain conditions, for example, the patient with an open eye injury. Excellent intubating conditions are essential to minimize effects on intraocular pressure. Although the authors state that they were able to intubate the patients within one minute after administration of the full relaxant dose with optimal priming, excellent intubating conditions were obtained in *only five* of 22 patients. This suggests that even with priming, atracurium may not be an appropriate choice for rapid tracheal intubation, particularly in the patient with an open eye injury.

The apparent discrepancy between complete twitch suppression and failure to obtain excellent intubating conditions in this study may be attributed to three factors: (1) the use of a twitch frequency of 1 Hz may overestimate the degree of neuromuscular blockade (while Viby-Mogensen² does state that this frequency is useful in the *clinical* setting, fatigue of the neuromuscular junction may occur at frequencies greater than 0.15 Hz),^{3,4} (2) the diaphragm is less sensitive to neuromuscular blockade than the peripheral neuromuscular junctions,^{5,6} and (3) the use of surface electrodes may cause overestimation of the degree of blockade.⁷

Another concern relates to the priming principle itself. Although the priming principle has generated a flurry of enthusiasm, it may increase the risk at operation. Musich and Walts recently reported a case in which pulmonary aspiration occurred after a priming dose of vecuronium,⁸ suggesting that priming doses should be administered with discretion.

Naguib *et al.* concluded that "this [atracurium] may provide an alternative to succinylcholine for rapid endotracheal intubation." However, "rapid (endo)tracheal intubation" refers specifically to a rapid sequence induction in patients with full stomachs – most in emergency situations. Because of the arguments discussed above, we

cannot endorse atracurium as an alternative to succinylcholine for patients requiring rapid sequence inductions. We believe that pancuronium remains the nondepolarizing muscle relaxant of choice for patients with open eye injuries requiring a rapid sequence induction.⁹

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REPLY

Thank you for giving me the opportunity to reply to the letter of Drs. McLeod and Lerman.

In our paper¹ we did not suggest or recommend using the priming technique with atracurium in patients with open eye injury or in patients undergoing emergency surgical procedures. We also noted that even with priming,^{1,2} intubations

may not be quite as ideal as they usually are after succinylcholine. We clearly stated in another report² that "The use of priming doses in this study, as in the others reported¹, did not provide ideal intubating conditions." Conditions for intubation depend on both depth of anaesthesia and depth of paralysis. Although we were able to improve the intubating conditions following priming with atracurium by additional doses of thiopentone, administered before intubation,³ we believe that further studies are warranted in order to establish the safety and the efficacy of the priming principle in emergency situations.

Non-depolarizing muscle relaxants have different effects on different muscle groups. The diaphragm is more resistant to the effects of non-depolarizing muscle relaxants than other muscles.^{4,5} Using train-of-four stimulation, Donati et al.⁶ demonstrated in humans a more than two-fold difference between the diaphragm and the adductor pollicis with respect to their sensitivity to pancuronium. The implication is that measuring the onset of diaphragmatic paralysis can yield a better correlation with the intubating conditions. However, until diaphragmatic paralysis can be routinely monitored clinically, the use of the adductor pollicis will be the standard method of monitoring neuromuscular function. In addition, Capan et al.⁷ found no significant difference in twitch height suppression and peak current amplitude when a constant current stimulator was used with either surface or needle electrodes.

The priming manoeuvre is best viewed as a new application of an old practice – the pretreatment with small doses of non-depolarizing muscle relaxant prior to the administration of succinylcholine. The use of the priming technique has been widely evaluated in patient populations by different authors, with no risk to the patient. The case reported by Musich and Walts⁷ did not convince us that the pulmonary aspiration occurred because of the priming technique. Their patient weighed 102 kg and had consumed an unknown quantity of alcohol one hour before an automobile accident and was premedicated with meperidine 100 mg and hydroxyzine 50 mg IM one hour before surgery. This patient was at a higher risk for pulmonary aspiration because of the above-mentioned factors and we believe that it is unjustifiable to indicate that the aspiration occurred because of the priming dose of vecuronium, without mentioning the other contributing factors.

McLeod and Lerman in their letter stated that "Pancuronium ... remains the non-depolarizing muscle relaxant of choice for patients requiring a rapid sequence induction when a non-depolarizing relaxant is indicated." The studies^{9,10} quoted by them did not include either comparisons with other non-depolarizing muscle relaxants or observations in patients scheduled for emergency surgical procedures. Therefore, caution should be exercised when extrapolating these results to emergency situations. In addition, a relatively larger dose of pancuronium (0.15 mg·kg⁻¹) was recommended in these studies to facilitate rapid tracheal intubation. High-dose pancuronium 0.15 mg·kg⁻¹ (or other long-duration, non-depolarizing relaxants) produces a prolonged paralysis with accentuated autonomic side effects.¹⁰ This concern was addressed in our paper.¹ Using equipotent doses of atracurium (330 µg·kg⁻¹), vecuronium (66 µg·kg⁻¹) or pancuronium (75 µg·kg⁻¹), Gramstad et al.¹¹ reported that the mean times to 95 per cent twitch depression were: atracurium 2.7 min, vecuronium 2.8 min and pancuronium 3.6 min. Furthermore, Schiller and Feldman¹² demonstrated that atracurium (0.6 mg·kg⁻¹), resulted in a statistically significant earlier onset of satisfactory intubating conditions than with vecuronium (0.1 mg·kg⁻¹) or pancuronium (0.1 mg·kg⁻¹).

The onset of neuromuscular paralysis produced by any

non-depolarizing muscle relaxant can be accelerated by the administration of larger doses.^{13,14} Therefore, we do not agree with McLeod and Lerman that pancuronium is the muscle relaxant of choice for patients requiring a rapid sequence induction when succinylcholine is considered undesirable or contraindicated. We believe that because of its more rapid onset and shorter duration of action and fewer side effects, atracurium (or vecuronium) with or without priming is a better choice.

Since, as yet, the proposed ideal muscle relaxant is not available, studies on the priming principle might provide an alternative, and this may be the answer!

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