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Clinical Testing for Neuromuscular Blockade Correlates with Train-of-four

To the Editor:—Viby-Mogensen *et al.*[1] state that despite train-of-four ratios between 60 and 80 per cent many patients showed inadequate reversal of neuromuscular blockade on arrival in the recovery room. This conclusion is based entirely upon the test of head lift for 5 sec, since their clinical assessment of recovery from neuromuscular blockade did not include measurements of vital capacity, inspiratory force, or hand grip, and they did not report data for the patients' abilities to cough, protrude the tongue, or open the eyes. Furthermore, although the type of statistical analysis was mentioned, results of statistical analyses were not reported.

Forty-two patients (58 per cent) had train-of-four ratios of 70 per cent or more. Their figure 1 shows that the authors had no contact with four of these patients; 37 of the 38 patients with whom the authors had good contact could lift their heads; yet, the authors emphasize that "residual curarization in the recovery room remains a problem in patients not monitored with a nerve stimulator." That need be a problem in cooperative patients only when clinical signs of reversal of neuromuscular recovery are not elicited. Unfortunately, the authors present minimal data to describe results of assessment of neuromuscular reversal at the bedside. That three patients with train-of-four ratios less than 60 per cent were able to sustain head lift for 5 sec may well mean that adequate clinical evaluation of neuromuscular recovery was not performed, since other tests of neuromuscular function were not used and probably would have shown neuromuscular deficits.

Our studies of clinical neuromuscular testing using vital capacity, inspiratory force, hand grip, tongue protrusion, eye opening, and head lift demonstrate that clinical reversal of neuromuscular blockade correlates with a train-of-four ratio of 70 per cent or more.[2] Thus, in cooperative patients, neuromuscular monitoring is not necessary. Viby-Mogensen *et al.*, in fact, demonstrate that only one of 38 patients with whom they had good contact could not sustain head lift when the train-of-four ratio was 70 per cent or more.

The authors claim that their data do not support findings in studies by Katz[3] and Miller *et al.*,[4] who showed that neostigmine, 2.5 mg, is sufficient to antagonize a nondepolarizing block in most adult patients. However, the patients in both these studies had less than 100 per cent nondepolarizing block when reversal was attempted. Obviously, attempting to reverse a neuromuscular block of 100 per cent may fail even when much more than 2.5 mg neostigmine is used. Is it possible that many of the blocks antagonized in the series studied by Viby-Mogensen *et al.* studies were 100 per cent at the time reversal was used? I'm sure we can all agree that patients who are overdosed with nondepolarizing muscle relaxants are likely to have residual nondepolarizing blockade after neostigmine. Of crucial importance is the ability to identify such patients. Either the train-of-four or complete clinical testing will readily do so, as we demonstrated previously.[2] The conclusion of Viby-Mogensen *et al.* should be that unless patients are monitored with a nerve stimulator in the operating room or show even early signs of clinical reversal, residual nondepolarizing blockade may be a problem in the recovery room. If Viby-Mogensen *et al.* had made a complete clinical evaluation of neuromuscular recovery, I believe their data would further support our own conclusion that complete clinical testing of neuromuscular blockade correlates with the train-of-four ratio such that patients who demonstrate clinical reversal of neuromuscular blockade also have train-of-four ratios of 70 per cent or more. Such patients would, in fact, have adequate reversal of neuromuscular blockade.

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