CORRESPONDENCE

Calibration of the neuromuscular monitor: Is it necessary?

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To the Editor,

I read with interest the paper by Bhananker *et al.*¹ In their well-performed study, the authors showed a difference between subjective (i.e., tactile / visual) and objective neuromuscular monitoring. I present here an obvious but perhaps less known reason for their results.

When using objective monitoring, the monitor should be calibrated after induction but before administering the neuromuscular blocking agent.² The train-of-four (TOF)-Watch® SX has two calibration modes: CAL 1 sets only the gain (i.e., the amplification of the evoked response); CAL 2 sets the supramaximal stimulation and the gain. During the calibration process, the response to nerve stimulation is registered and the evoked response (the height of the twitch) is set to 100% (see Figure a). With weak twitch responses, the gain is set high; at strong responses, the gain is set low. Thus, if the gain is set too low, one or more responses to train-of-four (TOF) stimulation will not be in the measurement window and the displayed value will underestimate the recovery (see Figure b). Conversely, if the gain is too high, small disturbances and artefacts might be registered as responses even though there is actually no response to nerve stimulation. In the study by Bhananker *et al.*, calibration was not performed.¹ The standard (default) gain in some patients will be too low, and in others, it will be too high.

The bias between measured and subjective monitoring of twitch height is unpredictable.

Clinicians frequently use neuromuscular monitors without first calibrating them. Without calibration, the responses to TOF stimulation and post-tetanic potentiation/count displayed on the monitor cannot be trusted. Instead, the clinician must trust the subjectively observed value. It should be emphasized, however, that clinicians have difficulty discriminating twitch responses at a TOF ratio of 0.40 (40%).³ Estimates of residual blockade (i.e., TOF ratio < 90%) based on subjective or tactile

Figure a) Without neuromuscular blockade, the displayed TOF = $T4/T1 = 100\%$, with or without calibration. b) Without calibration, only three responses to the TOF stimulation are displayed during partial neuromuscular block (e.g., during early recovery). In contrast, with calibration all twitches are in the measurement window and $TOF = T4/T1 = 38/80 = 48\%$. TOF = train-of-four

This letter is accompanied by a reply. Please see Can J Anesth 2016; 63: this issue.

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evaluation of TOF are therefore inaccurate. Fortunately, the displayed TOF ratio (not count) can be trusted as the gain influences the four responses in the TOF equally.

Conflict of interest None declared.

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