Monitoring neuromuscular blockade in diabetic patients using electromyography: an opportunity missed

Editor—We read with interest the article by Saitoh and colleagues\(^1\) investigating onset and offset of neuromuscular block after administration of vecuronium in diabetic patients. Saitoh and colleagues concluded that, in comparison with non-diabetic patients, time to first return of T1 or T4 and recovery of T1/T0 are delayed in diabetic patients. However, the fact that they used a non-validated device for neuromuscular monitoring—the ElectroSensor (Datex-Ohmeda Inc., Helsinki, Finland)—based on a method (electromyography) that cannot be used interchangeably with mechanomyography as the gold standard of neuromuscular monitoring, diminishes the validity of their findings.

Several studies have shown that electromyography and mechanomyography cannot be used interchangeably.\(^2\)\(^-\)\(^4\) Mechanomyography measures a shorter onset, a more profound block, and slower recovery than electromyography. In some diseases states, such as neuromuscular disease, hypothermia, or musculoskeletal disease, these differences are more pronounced. Studies have shown that musculoskeletal problems occur with increased frequency in diabetic patients, including Dupuytren’s...
disease, carpal tunnel syndrome, palmar flexor tenosynovitis, or trigger finger.\textsuperscript{5,6} The authors do not comment on whether any of the patients had any kind of musculoskeletal problems that would have affected neuromuscular monitoring. It cannot therefore be presumed that in diabetic patients electromyography and mechanomyography can be used interchangeably. Onset, maximum effect and recovery of neuromuscular block measured using electromyography cannot be used as a valid estimate of the same values measured using mechanomyography.

In addition, the authors used a new monitoring device, the ElectroSensor of the Anaesthetic monitoring system A/S3 (Datex-Ohmeda Inc., Helsinki, Finland). As we have pointed out for the second monitoring device integrated in this monitoring system, the M-NMT Mechanosensor,\textsuperscript{7} neither device has been scientifically validated with standard monitoring systems. The ElectroSensor provides processed data that has not been compared with original electromyographic signals. What does it measure? The amplitude of an electromyographic signal or the area under the curve of the original signal? The fact that a neuromuscular monitoring device is handily integrated into an anaesthetic monitoring device does not justify its scientific value.

This leaves us with the question, why did the authors not measure neuromuscular block using mechanomyography? In the light of the known problems with electromyography and the unproven scientific accuracy of their monitoring device, we feel that an opportunity was missed to answer the interesting question of whether neuromuscular block in diabetic patients is different from non-diabetic patients.

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Editor—We showed that times to return of T1, T2, T3, or T4, and recovery of T1/T0 were delayed when measured electromyographically in diabetic patients.\textsuperscript{1} Dr Hemmerling stated that when assessing the degree of neuromuscular block, electromyography and mechanomyography could not be used interchangeably and the differences were more pronounced in patients with neuromuscular disease. He reported that in diabetic patients, when assessed electromyographically, the mean action potential duration and amplitude of the evoked response measured in skeletal muscle were decreased by at least 20 and 50\%, respectively, compared to controls. In our study, the amplitude of the train-of-four response was evaluated electromyographically, and was thought to be suppressed to a certain degree. It has been shown that in most diabetic patients, quadriceps femoris may have been denervated to such an extent that femoral motor responses recorded from it are unelicitable or of low amplitude.\textsuperscript{2,9}

I recently assessed the level of neuromuscular block electromyographically in a 54-year-old male with diabetes mellitus receiving vecuronium. Although his thumb only started to move in response to train-of-four stimuli more than 40 min after vecuronium 0.1 mg kg\textsuperscript{-1}, T1/T0 measured electromyographically was always zero. Moreover, even when powerful movements of his arms and spontaneous ventilation could be observed, T1/T0 measured electromyographically was zero. If the degree of neuromuscular block has been monitored mechanically or accelerographically, T1/T0 could have been as his thumb moved distinctly in response to ulnar nerve stimulation. To solve this problem, further work is needed.

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