Electromyography better than acceleromyography at detecting adequate recovery from neuromuscular block

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Video Abstract

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Abstract

Residual paralysis is a significant problem in anesthesia. Despite advanced methods for quantifying patients' recovery from neuromuscular blockade, devices that are both reliable and easy to use remain scarce. In a study recently published in the journal Anesthesiology, researchers compared neuromuscular monitors based on two different technologies to determine which might be better suited for quantifying recovery: acceleromyography or electromyography. Acceleromyography-based monitors measure recovery based on the force of muscle contraction, whereas devices that use electromyography, or EMG, measure muscle action potentials. Until recently, acceleromyography-based devices were the most frequently used type of neuromuscular monitor. Obtaining reliable measurements with these devices, however, often requires clinicians to take several precautions, such as fixing the arm in the supine position, calibrating the device, or normalizing the results. While they tend to improve results, these measures might also prevent clinicians from using acceleromyography-based devices. And they can't be used when patient arms are tucked at their side. In the study published in Anesthesiology, researchers fitted 50 patients with an acceleromyography-based TOF-Watch SX and the TetraGraph, a portable EMG-based monitor cleared for use by the FDA in 2019. Responses from patients' adductor pollicis muscle were recorded simultaneously, on the same side, and with the same nerve and muscle configuration, from neuromuscular block to extubation. Importantly, the responses recorded from the two devices were synchronized through a fiber optic cable. That enabled the researchers to examine the agreement between the devices during distinct phases of neuromuscular block. Acceleromyography showed a normalized train-of-four ratio greater than or equal to 80% earlier than EMG. That's the ratio of the fourth to the first neuromuscular responses from patients to electrical impulses delivered by each device. An analysis of normalized data revealed a bias of 1.3 when the acceleromyography train-of-four ratio was at least 80% and a bias of minus-0.5 when the EMG reading was at least 80%. Raw data showed an overall bias of 7.0, which is lower than values reported in previous studies, likely due to the synchronization of the devices through a fiber optic cable. Notably, the type and dose of neuromuscular blocking agent were not standardized across all patients. And analyses did not include cases when simultaneous measurements recorded distinct types of data—for example, a train-of-four ratio versus a train-of-four count—which could affect the interpretation of the results. Overall, the acceleromyography-based device was more sensitive in detecting early neuromuscular recovery but less sensitive at complete or near-complete recovery. The findings suggest that the EMG-device provides a better indication of when patients recover adequately from neuromuscular block and are ready for safe tracheal extubation.