

Title: POSTTETANIC RESPONSES IN THE EVALUATION OF PROFOUND NONDEPOLARIZING NEUROMUSCULAR BLOCK

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Introduction. Increasing use of large "intubating" doses of nondepolarizing neuromuscular blocking agents; need of profound neuromuscular block (NMB) at certain periods and type of surgery; occasional occurrence of unusual sensitivity to this type of agent; and deep NMB, as a result of potentiating agents, necessitate monitoring of deep nondepolarizing NMB. A recently described clinically useful method (posttetanic count, PTC) helps the quantitation of intense NMB (1). We demonstrated that posttetanic twin impulses (PTW) and posttetanic short tetanic stimuli evoke more pronounced muscle responses than the single posttetanic impulses (PT) during profound NMB (2). The purpose of this study was to further evaluate the PTW during different types of anesthesia and compare it with the PT response.

Methods. Thirty-three male surgical patients (30-80 yrs.) of ASA I and II categories were studied with informed consent and institutional approval. Anesthesia was induced with I.V. thiopental, intubation was accomplished with 0.7 mg/kg suxamethonium, and anesthesia was maintained with N₂O+O₂ (60/40%) supplemented with fentanyl (F) (n-11) halothane (H) (0.7-1.0% inhaled) (n-11) enflurane (E) (1.2-1.7%) (n-11). The ulnar nerve was stimulated at the wrist through s.c. placed needle electrodes. A Grass Laboratory nerve stimulator was set for continuous supramaximal impulses of 0.2 ms. duration, each 5 sec. Tetanic stimuli of 100 Hz were applied at five to ten minute intervals for 5 sec. each. In case of PTW, twin impulse delay was 4 ms. PTW's were applied 4-5 times with 5 sec. interval and followed the tetanic stimuli by 5 seconds. The transduced thumb adductor m. response was displayed on a chart recorder. Deep NMB was obtained with incremental doses of pancuronium (P) until both the single twitch (T) and the posttetanic responses disappeared. We determined: 1. The time interval until the first response of each type: (T), (PT), and (PTW) appeared. 2. The magnitude of post-tetanic responses after every tetanic stimulus during the first hour following (P). The size of each response was calculated in percent of the control twitch height (prior to NMB). Symbol $\sum_{i=1}^4$ PT = sum of four PT, and $\sum_{i=1}^4$ PTW = sum of four PTW responses. (See fig. 1) Comparisons were made: 1. between the time intervals until the first response with each stimulus-type appeared, 2. between the size of PT vs. PTW responses using the same anesthetic, and 3. between sizes of the same response (PT or PTW) using different anesthesia regimens. (Paired Student "t" Test)

Results. Time of return of the first response (in minutes + SD): T: >50 (all anesthetic groups), PT: 14 ± 14 (F), 28 ± 15 (H), 25 ± 15 (E), PTW: 8.3 ± 13 (F), 12.2 ± 11 (H), 15.6 ± 5.8 (E). Data on the magnitude of the PT and PTW responses are shown in the Figure. While there was no significant difference in the size of a given posttetanic response between different anesthesia groups, there was a significant difference between the recovery of PT vs. PTW responses with each anesthetic regimen. (P < .05 values were obtained for all corresponding pairs of data points between anesthetic agents except with those obtained at 5 minutes.)

Discussion. The PTW appears 6-16 minutes earlier than the PT and at least 34-42 minutes earlier than (T) (dependent on the type of anesthesia) during spontaneous recovery from profound (P) induced NMB. By measuring the magnitude of PTW responses sampled at 5-10 minute-intervals, the expected recovery pattern can be prognosticated from a deeper level of nondepolarizing NMB than with the use of the PTC.

References.

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