Title: DOUBLE BURST STIMULATION ASSESSMENT OF NONDEPOLARIZING NEUROMUSCULAR BLOCKADE
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Introduction. Double burst stimulation (DBS) is reported to be a more sensitive method of detecting atracurium blockade than the train-of-four (TOF) method(1). The present study was performed to determine the clinical utility of DBS in detecting neuromuscular blockade caused by intermediate-duration or long-duration nondepolarizing muscle relaxants.

Methods: After IRB approval and informed consent, 27 ASA 1 and 2 adult patients undergoing isoflurane anesthesia were studied. Twenty-one observers tactilely assessed the decrement in force of the second evoked thumb contraction to DBS (i.e. DBS fade) during spontaneous recovery from atracurium, vecuronium and pancuronium blockade (63 total observations). The TOF ratio and the elapsed time until the TOF ratio exceeded 0.75 was measured using a mechanomyograph when no DBS fade was perceived by the observers. The results are expressed as mean values ± SD. One-way analysis of variance, the Fisher exact test ($p < 0.05$ was considered significant), and unpaired t-tests with Bonferroni's correction for multiple comparisons ($p < 0.05 \div 3 = p < 0.016$ was considered significant) were used to compare values between the muscle relaxants.

Results: The measured TOF ratios did not differ significantly between atracurium (0.74 ± 0.07), vecuronium (0.74 ± 0.08) and pancuronium (0.69 ± 0.12) blockade. The measured TOF ratio was > 0.75 for 11/21 (52.4%), 12/21 (57.1%) and 8/21 (38.1%) observations made during recovery from atracurium, vecuronium and pancuronium blockade, respectively ($p = 0.28$). When the assessments were made during recovery from atracurium and vecuronium blockade, all of the observers were able to perceive DBS fade when the measured TOF ratio was < 0.60. However, when the assessments were made during recovery from pancuronium blockade, 2 observers were unable to perceive DBS fade when the measured TOF ratio was < 0.60 ($p = 0.12$). The time from when no DBS fade was perceived until the measured TOF ratio exceeded 0.75 was significantly greater for pancuronium blockade (17.7 ± 10.3 min) than for atracurium (5.5 ± 2.7 min) or vecuronium (7.0 ± 4.8 min) blockade ($p < 0.016$).

Discussion. TOF fade is not consistently perceptible when the measured TOF ratio is > 0.41(2). In contrast, the results of this study indicate that during spontaneous recovery from atracurium and vecuronium blockade, DBS fade is consistently percentible when the measured TOF ratio is < 0.60. These observations suggest that tactile assessment of the evoked thumb contractions to DBS combined with knowledge of the time elapsed from when no DBS fade is perceived until the measured TOF ratio exceeds 0.75 may improve clinical detection of nondepolarizing neuromuscular blockade.

References

1. Anesthesiology 70:578-581, 1989
2. Anesthesiology 63:440-443, 1985

Title: DOUBLE BURST STIMULATION ASSESSMENT OF NONDEPOLARIZING NEUROMUSCULAR BLOCKADE: COMPARISON WITH 50 HZ TETANY
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Introduction. Double burst stimulation (DBS) has been reported to be a more sensitive method of detecting nondepolarizing neuromuscular blockade than the train-of-four (TOF) method (1). During spontaneous recovery from atracurium blockade, a decrement in force of the second evoked thumb contraction to DBS (i.e. DBS fade) was consistently perceptible when the measured TOF ratio was < 0.60 (2). Anesthesiologists frequently interpret a sustained response to 50 Hz tetanus for 5 s as adequate recovery of neuromuscular function. The present study compares the preceived absence of DBS fade with the mechanical response to 50 Hz tetanus for 5 s.

Methods. After Institutional Review Board approval and informed consent, 21 observers tactilely assessed DBS fade in 17 ASA 1 and 2 adult patients undergoing isoflurane anesthesia during spontaneous recovery from atracurium (n = 10 observations), vecuronium (n = 10) or pancuronium (n = 10) blockade. The force of contraction of the thumb to 50 Hz tetany for 5 s was recorded with a mechanomyograph when no DBS fade was perceived by the observers. The observers were blinded to the type, dose and time of administration of the muscle relaxant, and to the measured level of neuromuscular blockade.

Results. Ten to 49% fade to 50 Hz tetany for 5 s was recorded when no DBS fade was perceived by the observers during spontaneous recovery from vecuronium blockade for 3 of 10 observations. However, the measured force of contraction to 50 Hz tetany for 5 s was always sustained when no DBS fade was perceived by the observers during spontaneous recovery from atracurium and pancuronium blockade (Fig.)

Discussion. The results of this study indicate that the perceived absence of DBS fade did not always preclude a fade response to 50 Hz tetanus for 5 s. Therefore, the clinical perception of a sustained response to double burst stimulation does not always ensure adequate neuromuscular recovery as defined by a sustained response to 50 Hz tetany.

References

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