Skeletal Muscle Relaxation in Patients Undergoing Electroconvulsive Therapy

To the Editor:—The use of general anesthesia and skeletal muscle relaxants has been standard technique in electroconvulsive therapy (ECT) since the 1950s. Hundreds of thousands of patients receiving ECT have been treated successfully with methohexital and succinylcholine. It has come to our attention that a common error in the practice of ECT may be premature delivery of the electrical stimulus, i.e., before the maximal effect of succinylcholine has occurred. This may result from the concern that the hypnoretic effect of the methohexital will wane.

The time to onset of maximal relaxation (TMR), i.e., neuromuscular block following succinylcholine 1 mg/kg recently has been determined to be longer than the traditional minire associated with rapid sequence induction, and intubation and to have significant age dependence.1 We recently gathered similar data on patients undergoing ECT and receiving 1 mg/kg of succinylcholine for neuromuscular block. In 35 consecutive patients who underwent ECT, we measured the time between the completion of the injection of succinylcholine and total abolition of the Babinski response. Additionally, the adductor pollicis muscle response to ulnar nerve stimulation was assessed. In all cases, the response to nerve stimulation was extinguished long before cessation of fasciculations and abolition of the Babinski response in the lower extremities. We found an average TMR of 101 s, with a range of 70–155 s. In no case was this interval less than 1 min.

In our sample, patients older than 60 yr of age (n = 18) had a mean TMR of 109 s, with a range of 75–155 s. Patients 40–60 yr of age (n = 8) had a mean TMR of 97 s, while patients younger than 40 yr of age (n = 7) had a mean TMR of 84 s. Using a regression model analysis, the variance in TMR with age was statistically significant (P = 0.0072). A Bonferroni multiple comparison analysis revealed that the TMR was significantly different in the greater than 60 and less than 40 age groups (P ≤ 0.05).

Based on our results and those of Koscielniak-Neilson et al., we recommend that in most clinical situations, one should wait at least 90 s or more between the injection of succinylcholine and the delivery of the electrical stimulus in patients undergoing ECT. Careful attention to waiting to deliver the electrical stimulus at the time of maximal effect of succinylcholine should allow for better attenuation of motor seizure activity without the physician having to resort to inordinately large doses of muscle relaxant.

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Laryngeal Mask Airway Cuff Pressure and Position: The Effect of Adding Nitrous Oxide to the Cuff

To the Editor:—The silicon rubber cuff of the laryngeal mask airway (LMA) is highly permeable to nitrous oxide, and both cuff volume and pressure increase during nitrous oxide anesthesia.1,2 Some investigators have advocated monitoring cuff pressure, particularly for prolonged anesthesia, because of the unknown risk of displacement and ischemic damage to the pharyngeal mucosa.1,4 A simple method
of controlling or predicting cuff pressure without requiring sophisticated monitoring would be clinically useful. The possible options include filling the cuff with fluid, filling pressure relief valves, avoiding the use of nitrous oxide, intermittently removing gas from the cuff, and filling the cuff with air. Variation in cuff pressure, a technique that has met with some success with the tracheal tube. We investigated the effects of varying initial cuff concentrations of nitrous oxide on subsequent changes in cuff pressure and LMA position during nitrous oxide: oxygen anesthesia.

With ethical committee approval and informed written consent from volunteers, we studied 32 male patients (ASA physical status 1 or 2, aged 37 yr (range 18–77), weight 72 kg (range, 50–99) who were undergoing minor peripheral surgery. Each LMA was tested for defects and then exhausted to −25 mmHg, and 30 ml air was injected to establish a baseline pressure. Anesthesia was induced with fentanyl (1 µg/kg -1) and propofol (2.5 µg/kg -1), and the necessary LMA was inserted using the standard technique, with the cuff fully deflated to −25 mmHg by an experienced LMA user. The cuff was inflated with 30 ml air or freshly prepared gas mixture, and the system was sealed. Patients were allocated randomly to one of four groups: In group 1, the cuff was inflated with 30 ml air; in group 2, 20 ml air and 10 ml N2O; in group 3, 15 ml air and 15 ml N2O; and in group 4, 10 ml air and 20 ml N2O. The patient’s head and neck were maintained in the neutral position, and spontaneous ventilation was maintained with 1–2% isoflurane in 66% N2O and O2. In addition to standard monitoring, anesthetic gases were analyzed continually using a Datex AS/3 monitor (Tewksbury, MA), and nasopharyngeal temperature was recorded. Cuff pressure was monitored continuously, and final cuff gas volume and composition were noted at the end of the procedure. Immediately after insertion of the LMA and toward the end of the procedure, a fiberoptic scope was passed to the level of the mask aperture bars, and the position of the LMA was scored.

Demographic data and fibroptic scoring were similar for all groups. The LMA was inserted successfully in all patients. All fiberoptic scores (median 3.1) were identical at the beginning and end of the procedure, and there was no displacement of a mark made on the tube at the teeth. The mean in vitro cuff pressure with 30 ml air was 94 mmHg, and the mean initial pressure after insertion was 143 mmHg. The mean nasopharyngeal temperature was 36.4°C and contributed to a 2 ml increase in cuff volume. Cuff pressures were found to vary by 1–5 mmHg during the respiratory cycle. The variation in mean cuff pressure with time, expressed as percentage change from the initial pressure, is given in figure 1. There were significant differences between all groups at all times. Cuff gas volume increased by 3–10 ml in the air group and 0–5 ml in the 50% N2O group, and decreased by 2–7 ml in the 50% N2O group and 3–6 ml in the 66% N2O group after 35 min. Data for gas analysis from 14 patients revealed that overall absolute nitrous oxide concentration increased in groups 1 by 13–18% (n = 3) and in group 2 by 4–7% (n = 2), and decreased in groups 3 and 4 by 8–16% (n = 6) and 21–32% (n = 3), respectively, after 35 min.

Achieving completely stable cuff pressures during nitrous oxide anesthesia is difficult without monitoring and manipulating cuff pressures, because there are too many unknown variables. This unpredictability suggests that there is little to be gained from adding nitrous oxide to the LMA cuff in terms of cuff pressure stability. Although nitrous oxide: air was used in this study, similar short-term results would be expected with nitrous oxide:oxygen mixtures, because nitrogen and oxygen have similar diffusion characteristics across the LMA cuff. We suggest that the most logical method of controlling cuff pressures during nitrous oxide:oxygen anesthesia with the LMA may be to take the “just seal” pressure as a control value and withdraw volume to maintain values close to this pressure.

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