

Prolonged Vecuronium Neuromuscular Blockade in a Patient Receiving Orally Administered Dantrolene

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Various controversies still exist in the prophylactic treatment of patients susceptible to malignant hyperthermia (MH) with dantrolene, particularly the dose, route of administration, and duration of prophylaxis.¹ The following is a report of an apparent effect of oral dantrolene on the electromyographic (EMG) response to vecuronium in a patient at risk of MH.

REPORT OF A CASE

A 60-year-old woman, 66.5 kg, was admitted for a breast biopsy. Her family history was positive for MH. Consequently, dantrolene was given orally during the 28 h prior to surgery. A total of 350 mg (5.3 mg/kg) of dantrolene was given to the patient over a 28 h period prior to the induction of anesthesia.

Preanesthetic medication consisted of 10 mg diazepam orally, 5 mg droperidol im, and 7 mg nicomorphine im. Anesthesia was induced with 0.15 mg fentanyl and 450 mg thiopental iv and maintained with 70% nitrous oxide and intermittent doses of iv fentanyl for a total dose of 0.4 mg.

A 45 µg/kg iv bolus injection of vecuronium was given to facilitate orotracheal intubation. Ventilation was controlled to maintain end-tidal CO₂ at 4–4.5 vol%, as measured by capnography.

The effect of vecuronium was monitored by recording the evoked compound electromyogram of the thenar and hypothenar muscles after stimulation of the ulnar nerve at the wrist with supramaximal stimuli of 0.1 Hz with 0.2 ms duration.² The depth of the neuromuscular block, expressed as the percentage depression of the original electromyographic twitch response, and the time needed for 90% recovery were calculated. The slope of the recovery curve was taken as a measure of the recovery rate. The obtained values were compared with values of a control group of eight patients (38 ± 19 yrs) not at risk of MH. This control group received the same dose of vecuronium and a similar anesthetic regimen, but without the dantrolene prophylaxis.

The recovery time was prolonged and recovery rate slower in the patient treated with dantrolene (table 1).

Figure 1 shows the prolonged electromyographically recorded response to 45 µg/kg vecuronium in the dantrolene-treated patient (fig. 1A) as compared with a typical response in a control patient (fig. 1B). After positive biopsy results, a mastectomy subsequently was performed. The course of anesthesia and the postoperative period were uneventful. An *in vitro* caffeine-halothane provocation test

according to the method of Kalow *et al.*³ on a peroperatively taken muscle biopsy of the patient had negative results.

DISCUSSION

We observed a prolonged recovery from vecuronium muscle paralysis measured with the evoked compound EMG in a patient pretreated with dantrolene. The iv administration of dantrolene in doses of 0.2 to 2 mg/kg to humans causes a dose-dependent depression of the mechanically recorded twitch tension of the adductor pollicis muscle and a prolonged decrease of grip strength.⁴ However, dantrolene does not depress the neural evoked compound electromyogram.^{5,6}

Dantrolene mainly acts directly on the muscle by interference with calcium uptake into or release from the sarcoplasmic reticulum.^{5,6} Dantrolene may have an additive effect on a *d*-tubocurarine-induced neuromuscular blockade measured with the mechanomyogram but not with the EMG.⁶ Our case report, however, suggests that dantrolene may well cause a prolongation of the EMG response to vecuronium. This could be related to a dantrolene-induced decrease of transmitter mobilization at the neuromuscular junction due to impaired release of calcium from storage sites within the cholinergic nerve terminal.⁷

Another possible explanation for the observed vecuronium potentiation is a pharmacokinetic interaction between vecuronium and dantrolene.

The kind of interaction should be studied further to investigate the possible risk of prolonged muscle paralysis from neuromuscular blocking agents in patients receiving dantrolene for prophylaxis of malignant hyperthermia.

TABLE 1. Electromyographic Parameters after Intravenous Administration of Vecuronium (45 µg/kg)

EMG Parameters	Nonpretreated Patients (n = 8)	Pretreated Patient (n = 1)
Depth of block (%)	79 ± 14	100
Ninety per cent recovery time (min)	22 ± 8	47
Recovery rate* (% · min ⁻¹)	6.2 ± 1.5	3.7

* Rate of recovery from a 25–75% recovery of twitch tension.

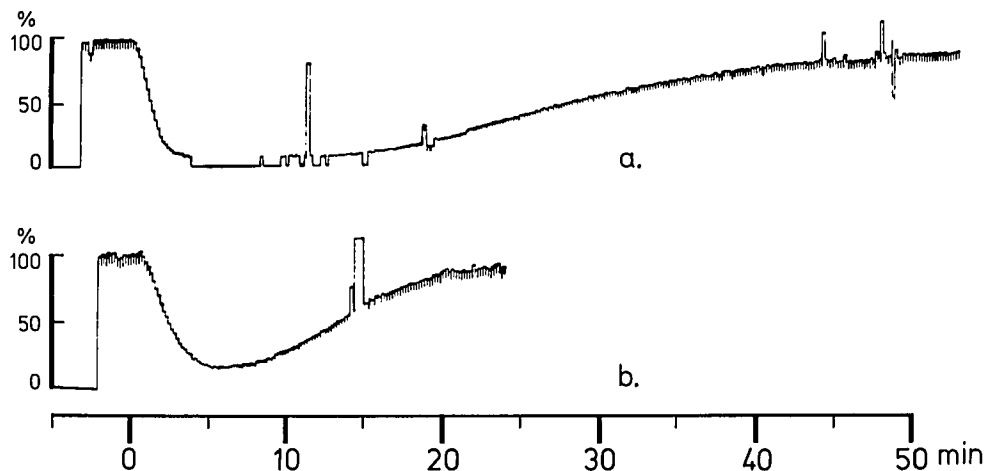
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FIG. 1. Electromyographic recording of the effect of vecuronium with (a) and without (b) oral dantrolene pretreatment. At $t = 0$, an iv bolus of $45 \mu\text{g}/\text{kg}$ vecuronium was given.



In summary, our case report suggests that pretreatment with oral dantrolene may prolong the duration of muscle paralysis caused by vecuronium.

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Diagnostic Application of an Axillary Block in an Infant

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Although anesthesia of the upper extremity by means of a brachial plexus regional block is well described in pediatrics,^{1,2} its use in infants and children for surgical procedures frequently is restricted. We report the use of the axillary approach to blocking the brachial plexus

to provide excellent conditions for electromyographic (EMG) study of the upper extremity in an infant who was suspected of having an infantile form of myasthenia gravis.

REPORT OF A CASE

The patient, an 18-month-old male infant (weight 12.2 kg), was hospitalized since birth for multiple problems following an apparent episode of perinatal asphyxia and meconium aspiration. He was a 3,015-g product of a 37-week gestation in a 20-year-old woman with no history or clinical signs of myasthenia gravis. Labor was complicated by variable and late decelerations. Immediately after delivery, his trachea was intubated, and meconium suctioned from below the vocal cords, with immediate extubation. Apgar scores were 3 at 1

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