

Repeat dosing of rocuronium after reversal of neuromuscular block by sugammadex

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To the Editor,

Sugammadex specifically antagonizes the steroidal neuromuscular blocking agent (NMBA), rocuronium,¹ and it also has affinity for other steroidal NMBAs. A period of 24 hr is currently recommended before re-administering rocuronium after sugammadex.^A If neuromuscular block (NMB) is needed before this time interval ends, a nonsteroidal NMBA should be given; however, nonsteroidal NMBAs are not available clinically in Japan. We present herein a 35-yr-old male patient (weight 73 kg, height 173 cm) in whom NMB was achieved using rocuronium 19 min after administering sugammadex. The authors have obtained agreement from the patient for submission of this case report to a medical journal.

The patient was scheduled for elective parotidectomy, and his preoperative blood chemistry was within normal limits. Anesthesia was induced with propofol, and endotracheal intubation was facilitated using rocuronium 40 mg. Maintenance of anesthesia was achieved with sevoflurane, remifentanyl, and fentanyl. Repetitive train-of-four (TOF) stimulation was applied at the ulnar nerve using a TOF Watch (Organon Ltd, Dublin, Ireland) monitor. Rocuronium 10 mg was added every 30–40 min, for a total dose of 100 mg over 204 min. At the end of surgery, 60 min after rocuronium, sugammadex 200 mg ($2.75 \text{ mg}\cdot\text{kg}^{-1}$) was administered, and the patient's trachea was extubated.

After that, bleeding from the drainage tube and progressive bulging of the surgical field were observed. The otolaryngologists requested immediate re-exploration for hemostasis. We prepared to monitor NMB at the adductor

pollicis muscle using a TOF-Watch® SX with preload (the Hand Adapter, Organon, Oss, the Netherlands), and we obtained digitized data. Anesthesia was induced with propofol, remifentanyl, and sevoflurane inhalation, and neuromuscular blockade was monitored throughout the second surgery. Peripheral skin temperature, measured at the thenar eminence of the palm, was maintained at $32.5\text{--}34.5^\circ\text{C}$, and body temperature was maintained at $36.2\text{--}37.2^\circ\text{C}$.

Rocuronium 70 mg was administered 19 min after sugammadex, but the first twitch to TOF stimulation (T1) did not disappear 195 sec after this dose so an additional 30 mg was added (Figure). The first twitch disappeared 105 sec after the second dose, for an onset time of 300 sec. Anesthesia was maintained using sevoflurane, remifentanyl, and fentanyl.

A single response following post-tetanic stimulation (post-tetanic count) was observed 50 min after rocuronium, and T1 appeared at 64 min. At the end of the second surgery, sugammadex 150 mg was again administered when the train-of-four ratio was 16%. The train-of-four ratio reached 102% within 150 sec, and the patient's trachea was extubated (Figure).

Cammu *et al.* examined the onset and duration of re-administration of $1.2 \text{ mg}\cdot\text{kg}^{-1}$ rocuronium after sugammadex $4.0 \text{ mg}\cdot\text{kg}^{-1}$ under propofol anesthesia in healthy volunteers.² They found that sugammadex prolongs the onset time of rocuronium when the time interval from sugammadex administration was <25 min. Our patient was given rocuronium $1.0 \text{ mg}\cdot\text{kg}^{-1}$, and T1 had not disappeared after 195 sec, indicating that this dose was insufficient under

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^A Summary of product characteristics. Available from URL: http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_-_Product_Information/human/000885/WC500052310.pdf (accessed May 2011).

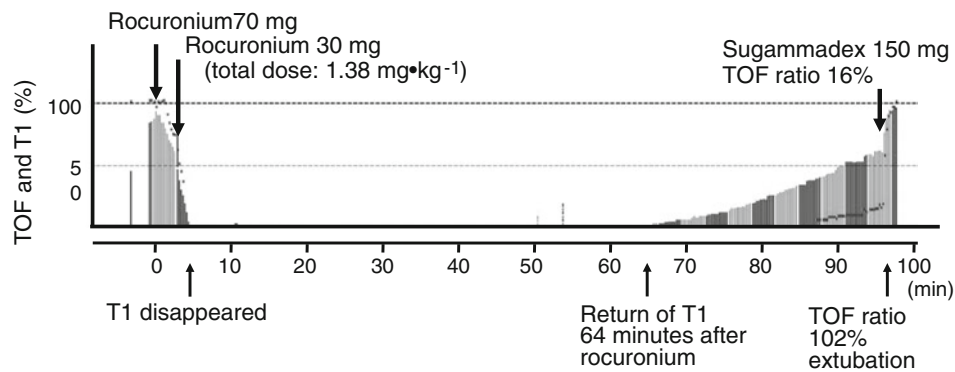


Figure Recording of the neuromuscular block induced by re-administration of rocuronium after sugammadex administration. Dotted lines represent the train-of-four (TOF) ratio expressed as a

percentage. Bars represent the first twitch in response to TOF (T1) expressed as a percentage of the baseline value. Calibration could not be performed

sevoflurane anesthesia to achieve complete NMB 19 min after sugammadex.

The clinical duration (recovery of T1 to 25%) of NMB action by rocuronium $1.2 \text{ mg}\cdot\text{kg}^{-1}$ under isoflurane anesthesia has been reported to be 73 min.³ Re-appearance of T1 in the present case was at 64 min, and the duration of action was not noticeably shortened. This outcome is not consistent with Cammu *et al.*'s results,² and the difference might be due to the anesthetics used. Sevoflurane has been reported to potentiate the effect of nondepolarizing NMBAs,⁴ and in the present case, it may have prolonged the duration of action of re-administered rocuronium and potentiated it even a short time after sugammadex. Re-administration of high-dose rocuronium after sugammadex would make the resultant duration of NMB unpredictable, especially when using sevoflurane, and monitoring NMB is mandatory in such a scenario.

Conflicts of interest None declared.

References

1. Epemolu O, Bom A, Hope F, Mason R. Reversal of neuromuscular blockade and simultaneous increase in plasma rocuronium concentration after the intravenous infusion of the novel reversal agent Org 25969. *Anesthesiology* 2003; 99: 632-7.
2. Cammu G, de Kam PJ, De Graeve K, et al. Repeat dosing of rocuronium 1.2 mg kg^{-1} after reversal of neuromuscular block by sugammadex 4.0 mg kg^{-1} in anesthetized healthy volunteers: a modelling-based pilot study. *Br J Anaesth* 2010; 105: 487-92.
3. Magorian T, Flannery KB, Miller RD. Comparison of rocuronium, succinylcholine, and vecuronium for rapid-sequence induction of anesthesia in adult patients. *Anesthesiology* 1993; 79: 913-8.
4. Naguib M, Lien CA. Pharmacology of muscle relaxants and their antagonists. In: Miller RD (Ed.). *Miller's Anesthesia*, 7th ed. Philadelphia: Churchill Livingstone Elsevier; 2010: 859-911.