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Neuromuscular block reversal with sugammadex in a morbidly obese patient with myasthenia gravis

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Abstract

Backgraound. Myasthenia gravis is a rare immunological illness that impairs neuromuscular transmission. Myasthenic patients are usually hypersensitive to non-depolarising muscle relaxants, and reversal with neostigmine is rarely effective. We report the successful reversal of rocuronium-induced neuromuscular block in a morbidly obese myasthenic patient.

Case report. A 38-year-old morbidly obese (body weight 160 kg, BMI 48.8 kg m^{-2}) woman was scheduled for elective laparoscopic gastric banding. She was anaesthetised with propofol-based TIVA; intubation was facilitated by 24 mg of rocuronium. After spontaneous recovery of T_1, she received 200 mg of sugammadex, which completely restored the NMT ratio (TOF=100%) within 2 min and 48 sec., and she was extubated. No postoperative complications were observed.

Conclusion. Sugammadex can be successfully used in myasthenic patients, allowing for the safe use of muscle relaxants in these patients.

Key words: neuromuscular relaxants, antagonists, sugammadex; neuromuscular diseases, myasthenia gravis; surgery, bariatric

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Myasthenia gravis is a rare autoimmune disease characterised by impaired neuromuscular transmission. Its pathogenesis is associated with the destructive effects of autoantibodies against the acetylcholine receptors. The antibodies reduce the number of acetylcholine receptors, which can lead to unpredictable reactions to muscle relaxants [1]. The key manifestation of myasthenia gravis is the weakness of skeletal muscles. Even a slight physical effort is likely to result in muscle paralysis persisting for several days or months. Until recently, the muscle weakness in myasthenia gravis has been believed to be caused exclusively by blocking the acetylcholine receptor in the postsynaptic membrane by a specific anti-acetylcholine receptor antibody (Anti-AchRB). On the other hand, some myasthenic patients have also been reported to have certain other antibodies involved in the impairment of neuromuscular transmission, which are directed against muscular kinase, myosin, actin or troponin I [2].

Autoimmune myasthenia gravis affects individuals at any age; its incidence is higher in young women between18-30 years of age.

At present the prevalence of myasthenia gravis is about 1/5000 individuals. The disease onset with poorly manifested symptoms may last for years. In some cases, the symptoms may develop suddenly, suggesting some other neurological disturbances, e.g. stroke. In about 60-70% of patients, the ocular muscles are initially affected [3]. The symptoms are of various severities and forms; to distinguish the disease types, the modified classification of myasthenia gravis according to Osserman is currently applied [4, 5].

We report a case of general anaesthesia in a patient with myasthenia gravis, in whom neuromuscular block was reversed with sugammadex.

CASE REPORT

A 38-year-old morbidly obese (body weight 160 kg, height 181 cm, BMI 48.78 kg m^{-2}) woman underwent laparoscopic adjustable gastric banding (LAGB). For the last eight years, the patient was treated for myasthenia gravis. Prior to the procedure, she received pyridostigmine bromide 60 mg twice a day plus autoreactive antibodies (ARAB) against acetylcholine receptors. The pre-treatment symptoms included weakness, faster fatigability of the lower limbs (falls caused by weakened muscle strength) and ptosis of the right upper eyelid. The respiratory muscle symptoms were not observed.

On the surgery day, the patient received pyridostigmine bromide in a single dose of 60 mg. During the procedure the function of the neuromuscular synapse junction was controlled accelerometrically using TOF stimulation whereas the depth of sleep was assessed using the BIS. The general anaesthesia was maintained with propofol infused with an automated syringe according to the Robert`s regimen [6] to obtain BIS 60-40. The striated muscles were relaxed with rocuronium 0.3 mg kg^{-1} of the ideal body weight. Once TOF=0 was achieved, the patient was intubated; the lungs were ventilated with a mixture of oxygen and air 1:1. After the 42-minute procedure, when the level of muscle relaxation for TOF stimulation was 1, the patient was administered a bolus of sugammadex 2 mg kg^{-1} of the corrected body mass weight. Two minutes and forty eight seconds later, TOF was found to be 100% and the supply of propofol was discontinued. After another three minutes, the patient opened her eyes, started to breathe spontaneously and the endotracheal tube was removed. There were no anaesthesia- or sugammadex-related complications. The patient did not report any complaints during the next 24 h and was discharged home after two days.

DISCUSSION

In the case described, the benzodiazepines were not used for induction and anaesthesia was not maintained with an inhalation anaesthetic. Both imidazobenzodiazepines and volatile anaesthetics are likely to inhibit the pre- and postsynaptic neuromuscular transmission, already impaired by myasthenia gravis. [7, 8]. In such cases, rocuronium, atracurium and vecuronium are recommended for relaxation [9]. Rocuronium in obese and non-obese patients provides similar intubation conditions and no differences in spontaneous and induced return of neuromuscular conduction were found [10]. In myasthenic patients, relaxants should be administered with great caution and the neuromuscular function during anaesthesia should be continuously monitored.

Sugammadex is a modified gamma-cyclodextrin, which selectively binds steroid muscle relaxants (vecuronium and rocuronium) [11]. Our case demonstrates that sugammadex quickly reverses relaxation, which in obese patients with myasthenia gravis is important due to possible residual effects of relaxants and resultant complications. However, in some myasthenic patients the effects of sugammadex might be difficult to anticipate due to the reduced number of acetylcholine receptors and ED95 exceeding its normal value by 2.6 times [12], which arouses some controversies concerning its dosing. The reports on the use of sugammadex in patients with myasthenia gravis suggest the doses recommended by manufacturers, i.e. 2 mg kg^{-1} of real weight [1, 9, 13, 14]. However, these recommendations regard patients with normal body weight or even underweight. Our report is the first description of the use of sugammadex in an obese patient with myasthenia gravis. According to the manufacture recommendations, obese patients should receive the dose of this agent based on their real weight. However, the most recent reports suggest, that the dose should be based on the corrected body weight, i.e. ideal weight + (real weight – ideal weight) x 0.4 [15]. Our observations confirm that such a dosing method is sufficient [16].

The administration of rocuronium followed by sugammadex in morbidly obese patients with myasthenia gratis exerts beneficial effects on the perioperative period and prevents potential complications related to prolonged neuromuscular block.

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