



# The Use of Rocuronium and Sugammadex on a Patient with Multiple Sclerosis

## Multipl Sklerozlu Bir Hastada Rokuronyum ve Sugammadeks Kullanımı

 Gamze TALİH,<sup>a</sup>  
 Çiğdem ÜNAL KANTEKİN,<sup>a</sup>  
 Tutkun TALİH<sup>b</sup>

Departments of

<sup>a</sup>Anesthesiology and Reanimation,

<sup>b</sup>General Surgery,

Bozok University Faculty of Medicine,  
Yozgat

Received: 08.03.2018

Received in revised form: 23.05.2018

Accepted: 11.06.2018

Available online: 26.09.2018

Correspondence:

Gamze TALİH

Bozok University Faculty of Medicine,

Department of Anesthesiology and

Reanimation, Yozgat,

TURKEY/TÜRKİYE

gamzetalih@gmail.com

**ABSTRACT** Multiple sclerosis (MS) is a chronic inflammatory, demyelinating autoimmune illness which affects the central nervous system. Stress, surgery, anesthesia, emotional distress, changes in body temperature may lead to an increase in MS symptoms or new attacks in patients in remission. One of the difficulties in the management of anesthesia seen in MS patients is the inability to reverse neuromuscular block early and completely. A 31-year-old female patient (74 kg, 169 cm) who consulted to the general surgery department with abdominal pain was admitted with the diagnosis of cholelithiasis and cholecystectomy was planned. This patient has been diagnosed as MS the age of 19, occasionally had attacks for 12 years and receives interferon-1a treatment. In this case report, a MS patient was presented who underwent laparoscopic cholecystectomy in which muscle relaxation was provided with rocuronium, and whose neuromuscular block was reversed with sugammadex.

**Keywords:** Multiple sclerosis; rocuronium; sugammadex

**ÖZET** Multipl skleroz (MS) santral sinir sistemini etkileyen kronik inflamatuvar, demiyelinizan otoimmün bir hastalıktır. Stres, cerrahi, anestezi, emosyonel sıkıntı, vücut ısısı değişiklikleri MS semptomlarında artmaya veya remisyonadaki hastada yeni ataklara yol açabilir. MS hastalarında karşılaşılan anestezi yönetim zorluklarından biri nöromusküler blokajın erken ve tam olarak geri çevrilememesidir. Karın ağrısı şikayeti ile genel cerrahi polikliniğine başvuran 31 yaşında (74 kg, 169 cm) kadın hasta kolelitiazis tanısıyla kabul edilmiş ve kolesistektomi planlanmıştır. Hasta MS tanısını 19 yaşında almış, 12 yıldır ara ara atak geçirmekte ve interferon -1a tedavisi almaktadır. Bu olgu raporunda rokuronyum ile kas gevşemesinin sağlandığı laparoskopik kolesistektomi yapılan ve sugammadeks ile nöromusküler bloğu geri çevrilen MS'li bir hasta sunulmuştur.

**Anahtar Kelimeler:** Multiple skleroz; rokuronyum; sugammadeks

**M**ultiple sclerosis (MS) is a chronic inflammatory, demyelinating autoimmune illness which affects the central nervous system. The illness emerges with sudden symptoms related to vision and other senses, or, partial or complete paralysis. Perioperative stress, emotional instability, anesthesia and increased body temperature may aggravate MS attacks.<sup>1,2</sup> One of the challenges in practice of anesthesia seen in MS patients is the neuromuscular block and the inability to completely reverse this effect. The lack of full recovery of muscular strength may cause a big problem in these patients.<sup>3</sup> Hence, the anesthesiologist must choose the most suitable and the most secure method for the patient. Sugammadex, with a gamma-cyclodextrin structure, is a selective agent which encapsulates relaxant mus-

cular agents with steroid structures. We present, a MS patient is presented who underwent laparoscopic cholecystectomy in which muscle relaxation was provided with rocuronium, and whose neuromuscular block was reversed with sugammadex.

## CASE REPORT

A 31-year-old female patient (74 kg, 169 cm) who was consulted to the general surgery department with abdominal pain was admitted with the diagnosis of cholelithiasis. In her past history, 12 years ago she was admitted to the neurology ward with the complaint of inability to walk, she was diagnosed as MS, and interferon-1a treatment was given 3 days a week. The patient stated that she had a final attack with a visual loss 4 months ago.

Preoperative neurological examination of the patient revealed sensory loss in the right lower and upper extremities. There were no motor deficits in the patient who specified floating specks occasionally. Deep tendon reflexes were recorded as normal. In the preoperative evaluation, the body temperature was 36.4°C, pulse rate was 76/min, blood pressure was 120/65 mmHg and the body weight was 74 kg. Total blood count, liver and kidney function tests, electrolytes, hemorrhage and coagulation time values were within normal limits in the patient. No abnormal pathology was found on electrocardiography (ECG), and no abnormal findings were seen on chest X-ray.

Before the surgery, information about the surgery, anesthesia, perioperative risks and management plans were given to the patient and written approval was taken. Diazepam 5 mg was given orally the night before the operation. One hour before the surgery, 2 mg of midazolam was administered intravenously. Non-invasive blood pressure, ECG, pulse oximetry (SpO<sub>2</sub>), and body temperature with esophageal temperature probe were monitored during the procedure. Neuromuscular activity via the TOF watch machine (TOF watch-Organon technical, Ireland) placed on the right arm. In addition, the depth of anesthesia was monitored with bispectral index (BIS) (NASAQ; MASI, Irvine CA).

Anesthesia induction was performed with propofol 200 mg, fentanyl 75 mcg and rocuronium 25 mg. After 2 minutes of ventilation with the mask, the patient was intubated when the TOF value was found to be 0. Maintenance of anesthesia was achieved with a mixture of 1-1,5% sevoflurane in O<sub>2</sub>/N<sub>2</sub>O (1: 1 ratio 3 l/min). An additional fentanyl 50 mcg was added before the surgical incision. Intraoperative BIS values and body temperature were kept stable at 32-50 and 35.8-36.2°C. No additional dose of rocuronium was needed during the surgery. TOF values did not exceed 0,4. For postoperative analgesia, tramadol 100 mg was given iv. while the surgical incision was closed. Ondansetron 5 mg was given again iv. to prevent vomiting and nausea. The operation lasted 95 minutes. One minute after the anesthetic gases were stopped, while the TOF value was 0,5, sugammadex 200 mg was administered iv. After 42 seconds, when the TOF value was observed to be 0,9, the patient was extubated. The patient who had relaxed spontaneous breathing was taken to the recovery room. The patient was observed for an hour in there. No complications were observed during the intraoperative or postoperative periods. No residual block was observed. The patient was hospitalized for two days and was discharged without any problems. In the one month follow-up, no additional pathology was observed in the patient related to MS.

## DISCUSSION

Stress, surgery, anesthesia, emotional distress, changes in body temperature may lead to an increase in MS symptoms or new attacks in a patient in remission. For that reason, a good premedication, deep anesthesia, and postoperative pain control are very important before the anesthesia.<sup>4</sup> The disease predominantly affects women between 10-60 years old and is most commonly seen between 20-40 years old.<sup>5</sup> This patient has been diagnosed with MS at the age of 19, occasionally has had attacks for 12 years and receives interferon-1a treatment. The literature on the most optimal general anesthesia method in MS is generally limited to the case reports. It is reported that general anesthesia

and surgical stress may cause exacerbation of MS as well as cases in which no attack is observed in post-operative follow-up.<sup>3,5,6</sup>

One of the points to be considered in MS patients is to maintain the body temperature in a stable manner. It is known that the increase in the body temperature causes transmission block in demyelinated axons.<sup>7,8</sup> In this case, the body temperature is closely monitored and ranged between 35.8-36.2°C.

While there are reports of safety of sevoflurane in maintenance of general anesthesia, no reports are found about desflurane use in the literature. For that reason, we also preferred to use sevoflurane as an inhalation agent on our patient.<sup>9</sup>

The use of neuromuscular blocker drugs requires attention in MS patients. The upregulation of nicotinic acetylcholine receptors of skeletal muscles in MS patients was recorded. In addition to that, the anatomical alteration of receptor subunits causes to the extension of the channeling time. The dose, that is given due to the unforeseen response to neuromuscular blocker drugs, must be carefully regulated. Therefore, muscle relaxation induced by rocuronium may be expected to be longer than the normal. Sevoflurane is also known to enhance rocuronium-induced neuromuscular blockade.<sup>1</sup> For that reason, we applied rocuronium in the patient under the normal adopted dose (0,5 mg/kg) and decided to use sugammadex which completely removes the effect by encapsulating rocuronium. Sugammadex does not cross the blood-brain barrier and does not affect the peripheral muscles through the central nervous system. In the case reported by Sinikoğlu et al. repeated use of sugammadex has been quick and successful at reversing the neuromuscular block each time.<sup>1</sup> The mean time needed to reach 1,0 TOF value after sugammadex injection in all surgeries was reported to vary between 85-140 sec. An increased number of postjunctional receptors explains the relative resistance to non-depolarizing NMBDs; muscular weakness and decreased muscle mass may be re-

sponsible for the cases of increased sensitivity. Because of the unpredictable response to these agents it is imperative to carefully titrate the dose administered.<sup>4</sup> Therefore, we have applied to our patient muscle relaxation with 25 mg of rocuronium. As well as that the use of lower dose of rocuronium might be the reason for quick reversal of a TOF value of 0.9 (42 vs 85-140 sec). It is reported that the postoperative residual block can be seen even if a single dose of nondepolarizing muscle relaxant is used in standard anesthesia and emphasized that the application of sugammadex provides the rapid return of block and prevents the residual block.<sup>10,11</sup> It is seen in our MS patient that the block returned successfully with sugammadex, who had muscle relaxation with rocuronium. No residual block was seen the postoperative period.

## CONCLUSION

The use of rocuronium - sugammadex may be a safe option for the multiple sclerosis patients who have been followed for neuromuscular block, body temperature and depth of anesthesia.

### Source of Finance

*During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.*

### Conflict of Interest

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

### Authorship Contributions

**Idea / Concept:** Gamze Talih, Çiğdem Ünal Kantekin; **Design:** Gamze Talih, Passion Talih; **Supervision/Consulting:** Gamze Talih; **Data Collection and/or Processing:** Gamze Talih, Çiğdem Ünal Kantekin; **Analysis and/or Interpretation:** Gamze Talih, Passion Talih; **Source Browsing:** Çiğdem Ünal Kantekin, Tutkun Talih; **Written by Makalenin:** Gamze Talih; **Critical Review:** Gamze Talih, Passion Talih.

## REFERENCES

1. Sinikoglu N, Totoz T, Gumus F, Karagulle O. Repeated sugammadex usage in a patient with multiple sclerosis: a case report . *Wien Klin Wochenschr* 2016;128(1-2):71-3.
2. Yamashita K, Yokoyama T, Tokai H, Imazu Y, Lee M, Manabe M. [Anesthetic management for a patient with multiple sclerosis at exacerbation stage under general anesthesia]. *Masui* 2003;52(5):521-3.
3. Staikou C, Rekatsina M. Use of rocuronium and sugammadex under neuromuscular transmission monitoring in a patient with multiple sclerosis. *Saudi J Anaesth* 2017;11(4):472-5.
4. Makris A, Piperopoulos A, Karmanioliou I. Multiple sclerosis: basic knowledge and new insights in perioperative management. *J Anesth* 2014;28(2):267-78.
5. Ohshita N, Gamoh S, Kanazumi M, Nakajima M, Momota Y, Tsutsumi YM. Anesthetic management of a patient with multiple sclerosis. *Anesth Prog* 2017;64(2):97-101.
6. Ceyhan A, Uyar ET, Gencay IY, Gunal SE. Anesthesia in multiple sclerosis and obstructive sleep apnea: case report and literature review. *J Res Med Sci* 2011;16(6):828-35.
7. Bajada S, Mastaglia FL, Black JL, Collins DW. Effects of induced hyperthermia on visual evoked potentials and saccade parameters in normal subjects and multiple sclerosis patients. *J Neurol Neurosurg Psychiatry* 1980;43(9):849-52.
8. Khan EI, Amjad N, Khan AA. Anaesthetic management for a patient with severe multiple sclerosis. *J Pak Med Assoc* 2001;51(6):231-3.
9. Lee KH, Park JS, Lee SI, Kim JY, Kim KT, Choi WJ, et al. Anesthetic management of the emergency laparotomy for a patient with multiple sclerosis-A case report. *Korean J Anesthesiol* 2010;59(5):359-62.
10. Debaene B, Plaud B, Dilly MP, Donati F. Residual paralysis in the PACU after a single intubating dose of nondepolarizing muscle relaxant with an intermediate duration of action. *Anesthesiology* 2003;98(5):1042-8.
11. Gaszynski T, Szewczyk T, Gaszynski W. Randomized comparison of sugammadex and neostigmine for reversal of rocuronium-induced muscle relaxation in morbidly obese undergoing general anaesthesia. *Br J Anaesth* 2012;108(2):236-9.