



Case Report

Sugammadex for Cesarean in a Patient with Multiple Sclerosis

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Abstract

The aim of the present study was to discuss the management of anesthesia in our case with multiple sclerosis (MS) and to present the effects of sugammadex administration. A 36-year-old pregnant patient with MS disease was followed up for 6 years. She was on steroid treatment. The patient had not suffered the entire pregnancy. In addition to performing routine monitoring, "train of four" (TOF) monitorization was used. General anesthesia was given using propofol and rocuronium. At the end of the operation, muscle relaxation was reversed using sugammadex in the patient with a low TOF score. The patient was discharged on postoperative day 3. The most reliable method should be preferred in patients with MS. In patients under general anesthesia, the muscle relaxant effect is prolonged, and sugammadex can be safely used.

Keywords: Cesarean section; general anesthesia; multiple sclerosis; sugammadex.

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Multiple sclerosis (MS) is a chronic disease of the central nervous system, which is thought to have an autoimmune background that courses with degeneration associated with neuroinflammation. Owing to the higher incidence of MS in women and the fact that 60%–70% of the cases are women of childbearing age, the relationship between pregnancy and MS has been frequently investigated and discussed. It was previously accepted that pregnancy in cases with MS would worsen the course of pregnancy so the pregnancy should be terminated. In 1948, in a study where case reports were reviewed, any harmful effects of MS on pregnancy and fetus were not reported, and termination of pregnancy was deemed to be unnecessary.^[1] Antenatal follow-up of pregnant women with MS should not differ from routine pregnancy follow-up. However, it should be noted that maternal anemia, constipation, and

urinary infections can easily trigger attacks.^[2]

Since the duration of action of rocuronium may be prolonged in pregnant women who receive general anesthesia and muscle relaxant, intensive neuromuscular block may continue when the operation ends. Especially in cases where surgery is completed in a short time, it is very difficult to achieve decurarization with acetylcholinesterase inhibitors.^[3] Although they are commonly used in combination with muscarinic antagonists, undesirable cardiovascular, respiratory, and cholinergic side effects are frequently seen when they are used to reverse deep neuromuscular blockade.^[4] Sugammadex, which is a drug with a γ -cyclodextrin structure, is a useful alternative in reversing the effect of steroid neuromuscular agents.^[5]

The passage of sugammadex into breast milk is not known exactly, but the absorption of cyclodextrin is low, so a sin-

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gle-dose administration does not cause any side effect in breastfeeding mothers.^[6]

In this case report, anesthesia management and sugammadex use in pregnant women with MS were investigated.

Case Report

A 36-year-old, multiparous 38-week pregnant woman was admitted to the operating room after 8 h of fasting. Surgery, anesthesia methods, and complications that may develop were explained to the patient. Written informed consent was obtained from the patient.

It was learned that the patient was diagnosed with MS 6 years previously and was followed up with steroid treatment, and after the pregnancy was confirmed, steroid treatment was discontinued. On physical examination, her breath sounds were normal with a Mallampati score of 2. She was conscious, oriented, cooperative with isochoric pupils, light reflex +/+, and Hoffman positivity on the left, whereas deep tendon reflexes were normoactive in the upper and hyperactive in the lower extremities. It was learned that she had not suffer an attack during pregnancy. The American Society of Anesthesiologists score was evaluated as 2. General anesthesia was planned because it was predicted that general anesthesia would be managed more successfully in this patient. Electrocardiogram, pulse oximetry, noninvasive blood pressure measurement, heat, and train of four (TOF, 40 mA and 0.2 s) monitoring (AISYS CS2, CARESCAPE B650, Helsinki, Finland) were applied.

Any anxiolytic agent was not used for this patient, masked respiration was applied with 100% oxygen for 3 min, then induction was achieved with 2 mg kg⁻¹ propofol, and 0.5 mg kg⁻¹ rocuronium was preferred as a neuromuscular blocker. TOF values were checked at 15-second intervals after giving rocuronium. Intubation was successful when the TOF value reached 0 (Table 1). Sevoflurane 1 MAC and 50% O₂-air mixture were used for the maintenance of anesthesia. Seven minutes after the induction, a baby boy was born. The APGAR scores of the baby who was first evalu-

ated by a team of pediatricists were recorded as 9 points at 1 min and 10 points at 5 min after delivery. After the baby was delivered, remifentanyl infusion was administered at a dose of 0.25 µg kg⁻¹ min⁻¹ until the end of the operation for analgesia, and dose adjustment was made according to her vital signs. Her hemodynamic parameters and et CO₂ values led a stable course during the operation, and her body temperature varied between 36.8 °C and 37.2 °C and did not increase.

TOF value did not increase during the operation, so rocuronium was not used again. Surgery lasted for a total of 50 min. The patient's TOF value was measured as 3 points, and at the onset of her recovery from anesthesia, 2 mg kg⁻¹ sugammadex was given intravenously. Her TOF level gradually increased to 91 after 45 s, and she was extubated without any complication (Table 2). The patient was kept in close observation for 24 h and discharged on postoperative day 3, and then neurological control was recommended after 15 days.

Discussion

Antenatal follow-up of pregnant women with MS should not differ from routine pregnancy follow-up. However, it should be noted that maternal anemia, constipation, and urinary infections may easily trigger attacks.^[2] Vukusic et al.^[7] reported a decrease of 70% in the number of attacks during the 3rd trimester of the pregnancies of female patients with MS followed up for 2 years when compared with the year before pregnancy, whereas an increase of 70% was indicated compared with the pre-pregnancy period.

Infection, mood changes, and high fever may cause exacerbation of symptoms and induction of attacks in patients with MS, whereas perioperative stress and anesthesia may contribute to this state.^[8] Since emotional state is an important factor increasing the frequency of attacks in MS, preoperative anxiolytic treatment should be evaluated in planning emergency operations in these cases.^[9] Preoperatively, cases should be informed with respect to the possible attacks. Postoperative changes in the frequency of attacks are more frequently associated with infections, emotional states, and high fever developed during the postoperative period rather than the technique of anesthesia.^[10]

The patient was informed in detail before the operation also taking her concerns into consideration, and surgery

Table 1. TOF values at intubation

After use of rocuronium	
15 s	75
30 s	67
45 s	56
1 min	51
1 min and 15 s	43
1 min and 30 s	18
1 min and 45 s	4
2 min	0

Table 2. TOF values at extubation

From the end of surgery (50 min)	3
After sugammadex	
15 s	38
30 s	66
45 s	91

was started without premedication in case the fetus could be affected.

The lesions in the medulla oblongata or the cervical and thoracic spinal cord where the respiratory centers are located may affect respiratory function. Diaphragmatic paralysis due to cervical spinal cord involvement and associated pulmonary problems have been reported. In these cases, the central control of respiration and the response given to increased CO₂ pressure were impaired.

Based on this information, pulmonary function tests and arterial blood gas analysis are recommended during preoperative preparation to demonstrate the degree of dysfunction. The autonomic system may be affected which may cause clinical hemodynamic instability during the perioperative period in high-level thoracic spinal cord involvement.^[10] In this case, cranial or spinal cord involvement was not detected, and any change in body temperature and etCO₂ values was not observed.

Preoperative drugs should be questioned, and steroid treatment should be planned during the perioperative period to prevent the development of adrenal insufficiency in steroid users. Complications of chronic steroid use should be noted, and care should be taken in particular when positioning the patient during the operation.^[10] After confirmation of the pregnancy was made, her steroid treatment was discontinued, and she had not experienced problems during pregnancy.

Baclofen may be also used for MS-related spasticity. In these cases, it may cause muscle weakness and increase sensitivity to neuromuscular blockers. It should be kept in mind that cyclophosphamide may be associated with pancytopenia, pulmonary fibrosis, and myocarditis.^[9] It was learned that our patient did not use these agents during her follow-up for 6 years.

In retrospective studies performed in patients with MS who underwent surgery, there was no difference between all the anesthesia methods used as for the exacerbation of MS symptoms or the occurrence of attacks in cases with remission. Therefore, there is no consensus in the literature regarding the preferred anesthesia method.^[11] As a result of the research conducted by the National Multiple Sclerosis Society, the frequency of attacks in women who underwent epidural and general anesthesia was examined, and no significant difference was observed.^[12] Regional anesthesia techniques are not contraindicated; however, they are not completely safe.^[13]

Lower prevalence of hypotension in epidural anesthesia may be preferred instead of spinal anesthesia.^[14] Kyatta et al.^[15] examined the association between the perioperative findings of 56 cases with MS and the anesthetic technique

used and reported that they have encountered hypotension refractory to intravenous vasopressor treatment in 4 patients who received regional anesthesia in the form of spinal (n=2) and epidural anesthesia (n=2). Owing to the lack of precise and clear data about the reliable and safe anesthesia method for MS cases in the literature, the use of general anesthesia was preferred in this case coursing with remission during pregnancy, thinking that we could deliver it more safely under our control.

There are advantages and disadvantages of general anesthesia in patients with MS. As an effect of MS, axonal demyelination causes slowing and blocking of neural conduction. Body temperature changes cannot be regulated, and close follow-up is recommended because of the blockage of transmission in demyelinated axons in MS cases.^[16] In our case, hypothermia was avoided by using heat monitoring and heating, in case necessary.

When studies and case reports are taken into consideration, it is seen that propofol, intravenous opioids, and inhalation anesthetics are successfully used in the induction and maintenance of anesthesia.^[10] Neuromuscular blocker agents should be used in a controlled manner. Succinylcholine may cause hyperkalemia by increasing potassium release. Hyperkalemia may result in muscle denervation and cardiac arrest. Patients with lesions involving the motor nuclei are at greater risk for hyperkalemia. Therefore, the use of succinylcholine in patients with MS is not recommended.

Non-depolarizing muscle relaxants are safer, but they should still be used with caution. Pharmacodynamic effects and interactions with drugs in the treatment of MS may complicate the application of general anesthesia.^[10] Colak et al.^[17] reported that the use of muscle relaxants is previously unplanned, but they had to provide neuromuscular relaxation using rocuronium because of the development of extensive and severe myoclonic contractions. Titration, monitoring, low dose drug use, and avoidance of unnecessary medications should be the main principles when using all drugs.^[10]

When the extubation procedure is started, the sustained effects of muscle relaxants may cause many problems involving postoperative respiration and circulation. It is very difficult to terminate the neuromuscular block by using acetylcholinesterase inhibitors, especially when the intensive block continues. In studies, the use of sugammadex has been shown to decrease cardiovascular and respiratory instability, thus reducing postoperative early complications.^[3] In a retrospective 1-year-long case analysis, Şinikoğlu et al.^[18] investigated 1681 cases of caesarean section where sugammadex was used and did not report any complications.

Tuzcu et al.^[19] reported that upon the development of agitation, hypertension, tachycardia, and tachypnea at the end of the operation performed in a patient who received a combination of atropine–neostigmine, sedation with propofol was applied. Since the patient could not remove the effects of neostigmine and rocuronium, sugammadex was administered, and the case became completely stable 90 s later. The patient was checked for the depth of neuromuscular block by using TOF monitoring. At the end of the operation, sugammadex was preferred because of the persistence of the deep neuromuscular block, and a smooth course of extubation was achieved.

Conclusion

In conclusion, the use of the most reliable and the best controllable anesthesia method is the most important factor in the control of perioperative attacks in patients with MS. We believe that monitoring the patient who will receive neuromuscular blockers and use of sugammadex to reverse the neuromuscular blockade at the end of the operation will be a major contribution to a safe and comfortable recovery.

Disclosures

Informed Consent: Written informed consent was obtained from the patient for the publication of the case report.

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