OLGU SUNUMU CASE REPORT

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Sudden Cardiac Collapse After Sugammadex Administration in a Patient with First Variant Angina Attack

Sugammadeks Uygulanan Hastada İlk Varyant Anjina Atağı ve Ani Kardiyak Kollaps

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ABSTRACT Sugammadex reverses neuromuscular blockade without the muscarinic side effects typically associated with the administration of acetylcholine esterase inhibitors. As the use of sugammadex continues to expand, new clinical situations and unexpected side effects may occur. The effects of sugammadex on cardiovascular system are not very well-known. The patient who underwent percutaneous nephrolithotomy under general anesthesia, ventricular fibrillation developed immediately after sugammadex administration to reverse the muscle relaxant effect. Sinus rhythm was achieved after cardiopulmonary resuscitation. Then, a coronary angiogram was performed and the patient was diagnosed with variant angina. In this case, we aimed to present an unexpected cardiac collapse developing after sugammadex administration in the patient with no cardiac complaints, along with the potential causes of this clinical picture.

Keywords: Sugammadex; angina pectoris; variant; ventricular fibrillation

ÖZET Sugammadeks, asetilkolin esteraz inhibitörlerinin uygulanmasına bağlı muskarinik yan etkiler olmaksızın nöromüsküler blokajı tersine çevirir. Sugammadeksin kullanımı arttıkça yeni klinik durumlar ve beklenmedik yan etkiler ortaya çıkabilecektir. Sugammadeksin kardiyovasküler sistem üzerindeki etkileri çok iyi bilinmemektedir. Genel anestezi altında perkütan nefrolitotomi yapılan bu olguda, sugammadeks uygulamasından hemen sonra ventriküler fibrilasyon gelişti. Kardiyopulmoner resüsitasyon sonrası hastada sinüs ritmi sağlandı. Ardından yapılan koroner anjiografide hastaya varyant anjina tanısı kondu. Bu olgu sunumunda; kardiyak şikayeti olmayan hastada sugammadeks uygulamasından sonra gelişen beklenmedik kardiyak kollapsı ve bu klinik tablonun olası nedenlerini tartışmayı amaçladık.

Anahtar Kelimeler: Sugammadeks; anjina pektoris; varyant; ventriküler fibrilasyon

Sugammadex reverses the neuromuscular block that arises upon the use of aminosteroid drugs such as rocuronium by encapsulating the drug molecule in the plasma. The resulting complex is very stable and is eliminated by the kidneys.[1] While there are many studies and meta-analyses demonstrating the efficiency, reliability, and superiority of sugammadex in the reversion of the neuromuscular blockade, there are only a few studies on its effect on cardiac patients and hemodynamic parameters.[2,3] In the current case, we aimed to present an unexpected cardiac collapse that developed immediately after the administration of sugammadex to a patient with no cardiac symptoms along with the potential causes of this clinical picture.

CASE REPORT

The male patient, who was 59 years old, scheduled to undergo percutaneous nephrolithotomy and given general anesthesia. In the preoperative evaluation, the patient's body mass index (BMI) was 32, and did not have any other known systemic diseases. Routine blood tests, electrocardiogram (ECG) and blood pressure measurement were normal. The informed consent was obtained from patient before operation. The patient was taken to the operating room without any premedication. Heart rate was 82/min, noninvasive blood pressure (NIBP) was 200/110 mmHg and saturation (SpO2) was 96%. Sedation was performed using 2 mg midazolam (Midolam®, Mefar, Istanbul, Turkey), and 100 mcg fentanyl (Talinat®, VEM, Istanbul, Turkey). NIBP was 160/90 mmHg, heart rate was 76/min and induction of general anesthesia was performed using 50 mg of lidocaine (Jetmonal®, Adeka, Samsun, Turkey), 120 mg propofol (Propofol 1%, Fresenius®, Kabi Fresenius AB, Uppsala, Sweden), 50 mg rocuronium (Myocron®, VEM, Ankara, Turkey). On the third minute following rocuronium administration, endotracheal intubation was performed without any problems. The patient was placed in the prone position for nephrolithotomy. Anesthesia was maintained via the infusion of 6% desflurane (Suprane®, Baxter Healthcare, Puerto Rico, USA), 0.1 mcg/kg/min remifentanyl (Rentanil®, VEM, Ankara, Turkey). The patient was hemodynamically stable and was administered with 2000 ml crystalloid and 500 ml colloid throughout the operation (Table 1). On the 90th minute of the operation, the patient was administered with 20 mg rocuronium due to the increased airway pressure. Surgery was terminated 30 minutes after the administration of the additional dose. The patient was placed in the supine position. Desflurane and remifentanyl infusions were terminated. To reverse the neuromuscular blockade, the patient was administered with available dose of 100 mg (1mg/kg) sugammadex (Bridion®, Patheon Manufacturing Services, North Carolina, USA). Immediately after the administration of sugammadex, the patient's heart rhythm was observed as ventricular fibrillation (VF). Chest compression was initiated immediately and the defibrillator was prepared. The patient was defibrillated with 200 joules, and chest compression was continued. As the rhythm was still VF, the patient was defibrillated once more with 200 joules, and compressions were continued. Cardiac rhythm became ventricular tachycardia (VT) with the pulse. Therefore, cardioversion was performed with biphasic 150 joules and intravenous push was performed simultaneously using 300 mg amiodarone (Cordalin®, Osel, Istanbul, Turkey), and then infusion was initiated. The rhythm became sinus rhythm. The patient had a heart rate of 120/min and was hypotensive, and noradrenalin (Seladrenalin®, Osel, İstanbul, Turkey) infusion was initiated at a

TABLE 1: Hemodynamic parameters during operation.

	Systolic Pressure (mmHg)	Diastolic Pressure (mmHg)	Heart Rate (/min)	Saturation (%)
Before Induction	160	90	72	98
After Induction	140	70	66	98
After Intubation	156	92	78	96
15th Min. of Operation	138	72	64	97
30th Min. of Operation	142	70	68	98
45th Min. of Operation	130	65	65	97
60th Min. of Operation	128	62	63	97
75th Min. of Operation	138	70	62	98
90th Min. of Operation	142	75	72	96
105th Min. of Operation	126	65	68	98
120th Min. of Operation	138	72	62	98

Min:Minute.

dose of 0.1 mcg/kg/min. Arterial blood analysis was performed and metabolic acidosis (pH: 7.17 and HCO3: 17) was detected, and the patient was administered with 6 ampoules of NaHCO3. Cardiology consultation was requested and transthoracic echocardiography (ECO) was performed in operation room. The patient's ejection fraction (EF) was 45% and heart wall movements were slightly decreased at the anterior wall and there was no intracardiac thrombus. Approximately 10 minutes after the sinus rhythm was attained, the rhythm became VF. The patient was defibrillated with 200 joules and the sinus rhythm was attained. Heart rate was 140/min. The patient, who was hemodynamically stable and did not have increased need of inotropes for 20 minutes, taken to coronary angiography unit while in sinus rhythm. In the left anterior descending coronary artery (LAD), 60-70% narrowing was detected, and distal plaques were observed (Figure 1). LAD lesion after intracoronary nitroglycerin was found to be 50-60%. Clinical presentation of the patient was attributed to variant angina. Following angiography, troponin was 0.374 ng/ml (slightly elevated), mass CK-MB was 1.73 ng/ml (normal). Post-angiographic results of arterial blood gas and all other routine tests were normal. The patient did not need inotrope on the tenth hour post-resuscitation, and his EF was 50%. The patient was extubated on the first postoperative day. The patient was mobilized on the second postoperative day and was transferred to the ward. Transthoracic ECO on the 5th postoperative day showed that EF was 60%, there were abnormal left ventricular relaxation, minimal tricuspid regurgitation, and pulmonary artery pressure was 23 mmHg. The patient was discharged on the fifth post-operative day with normal laboratory test results and without any complications.

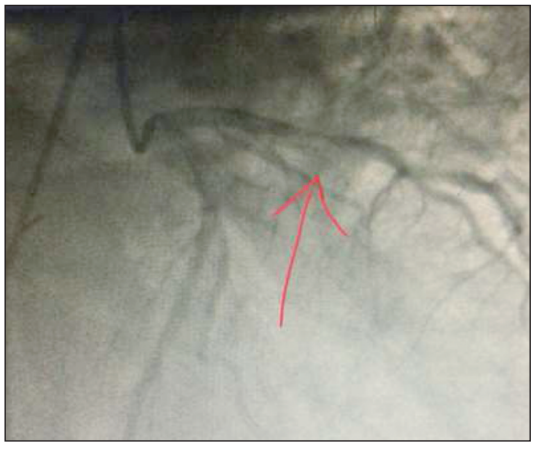

FIGURE 1: Angiography after cardiac arrest shows stenosis in left anterior descending coronary artery (LAD).

DISCUSSION

In the present case, VF was observed immediately after the administration of sugammadex to the patient. Defibrillation was performed twice and ventricular tachycardia with pulse was observed. The patient was back to normal sinus rhythm with cardioversion, and VF occurred once more and the patient was back to sinus rhythm with single defibrillation and hemodynamic stability was attained. The patient, who did not have any preoperative cardiac complaints, was diagnosed with variant angina after undergoing coronary angiography.

In the clinical manifestation of variant angina, vasospasm, which occurs as a result of a temporary increase in the tonus of the coronary arteries with atherosclerotic plaques of varying degrees, plays a role.[4] Episodes of variant angina can be provoked by many stimuli such as cold, drinking icy water, REM sleep, atrial pacing, mental stress, hypomagnesemia, insulin resistance and many drugs that are beta-blockers, ergo compounds, nicotine, sympathomimetics, serotonergics.[4-6] General anesthesia can also induce episodes of coronary spasm, but it is hard to clearly identify the triggering drug.[7]

In the present case, the patient did not have any history of drug use or smoking that can cause variant angina. Preoperative and postoperative laboratory tests did not detect any electrolyte abnormality. Intraoperative follow up of the capnography values, and arterial blood gas measurements had ruled out hyperventilation. We see that the majority of the sugammadex-related cardiac collapses reported in the literature are due to anaphylaxis.[8,9] As the patient did not have any symptoms that are similar to the cases in the

literature or that suggest anaphylaxis such as angioedema, skin rash, sudden hypotension, and as variant angina diagnosis was made after performing coronary angiography immediately after the VF, we do not attribute the clinical picture to anaphylaxis.

The patient's BMI was 32 and the postoperative insulin level was 13.6 μIU/mL, glucose was 95 mg/dL, HbA1C was 5.7%, and insulin resistance was detected. Insulin resistance and secondary hyperinsulinemia are risk factors for the development of atherosclerosis. In the literature, insulin resistance was also reported as a possible independent risk factor for vasospastic angina.[10] The presence of comorbidities like diabetes, hypertension, and insulin resistance considerably increases the risk of developing an ischemic heart disease, especially in obese patients. Classical symptoms of ischemic heart disease may be hardly present in these patients, and a subclinical coronary artery disease may become over following surgical stress.[11] Therefore, obese patients should be evaluated for the presence of medical conditions, which may increase the risk of perioperative mortality, before undergoing any type of elective surgery.[12] The clinical experience with this patient has demonstrated the requirement for pre-operative cardiology consultation in obese patients even though the patients do not suffer from cardiological complaints.

Serious complications that may be observed in patients with variant angina are acute myocardial infarction, high-level atrioventricular blockades, severe arryhthmias and sudden cardiac death. In variant angina, these complications are more frequent during the first episode and within 3 months following the first episode.[13] Clinical picture observed in our patient was the patient's first angina attack, presenting with recurring ventricular dysrhythmias.

The limited number of studies have reported that sugammadex does not have any clinically significant effect on blood pressure, heart rate, respiration, and thermoregulation.[14,15] There are only a few case presentations that show coronary vasospasm may be correlated with sugammadex.[16,17] The study, in which the hemodynamic effects of sugammadex and neostigmine on cardiac patients are compared, has found that sugammadex is more stable regarding cardiac function but causes a significant decrease in heart rate within the first minute after its administration.[3] So the effects of sugammadex on cardiovascular system are not very well-known. In this case, because of the development of ventricular fibrillation immediately after the administration of sugammadex, we think that this clinical picture can be a variant angina attack aggravated by sugammadex.

In conclusion, although the potential causes involved in the development of coronary spasm in this patient included insulin resistance, obesity, general anesthesia, and undergoing surgery in the prone position; it should not be overlooked that sugammadex administration could also be responsible for the development of this clinical picture. Therefore, sugammadex should be used with caution in patients in the risk group for variant angina, and more information is required on the cardiac adverse effects of the drug.

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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: *Gülçin Hacıbeyoğlu, Atilla Erol, Şule Arıcan;* ***Design:*** *Gülçin Hacıbeyoğlu, Atilla Erol, Şule Arıcan, Rabia Yaman, Muhammet Sait Yüce, Sema Tuncer Uzun;* ***Control/ Supervision:*** *Gülçin Hacıbeyoğlu, Atilla Erol, Şule Arıcan, Sema Tuncer Uzun;* ***Data Collection and/or Processing:*** *Gülçin*

Hacıbeyoğlu, Rabia Yaman, Muhammet Sait Yüce; ***Analysis and/or Interpretation:*** *Gülçin Hacıbeyoğlu, Atilla Erol, Şule Arıcan, Sema Tuncer Uzun, Rabia Yaman, Muhammet Sait Yüce;* ***Literature Review:*** *Gülçin Hacıbeyoğlu, Rabia Yaman, Muhammet Sait Yüce, Şule Arıcan;* ***Writing the Article:*** *Gülçin Hacıbeyoğlu, Atilla Erol, Şule Arıcan, Rabia Yaman, Muhammet Sait Yüce;* ***Critical Review:*** *Gülçin Hacıbeyoğlu, Atilla Erol, Sema Tuncer Uzun, Şule Arıcan;* ***References and Fundings:*** *Rabia Yaman, Muhammet Sait Yüce;* ***Materials:*** *Muhammet Sait Yüce, Rabia Yaman.*

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