

Anaesthesiology Experience in Bariatric Surgery of Adolescent Paediatric Morbid Obesity

Pediatric Adolesan Morbid Obezitenin Bariatrik Cerrahisinde Anesteziyoloji Deneyimi

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Abstract: Obesity frequency among children has been on the rise and since the success of its medical treatment is quite limited, surgical methods are applied on certain cases. Obesity causes various changes both in the airway and drug metabolism. In the literature, there is limited information on the anaesthesia method for obese patients and there is no consensus especially on the paediatric patient group. In this case, we emphasized the importance of multidisciplinary anaesthesia management approach in paediatric patients and the use of anaesthetic doses according to suitable with the body mass, and for the first time in paediatric bariatric surgery in Turkey we reported to describe the use of sugammadex in a morbid adolescent patient.

Keywords: morbid obesity, adolescent, bariatric surgery, anaesthesiology

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Özet: Çocuklarda obezite sıklığı giderek artmakta olup tedavisinde medikal tedavi başarısının sınırlı olması nedeniyle seçilmiş olgularda cerrahi yöntemlerde uygulanmaktadır. Obezite hem hava yolunda hem de ilaç metabolizmasında çok sayıda değişikliğe neden olmaktadır. Literatürde yeterli veri bulunmayan obez hastalarda anestezi yönetimi ile ilgili özellikle de çocuk hasta grubunda bir uzlaşma yoktur. Biz bu olguda, pediatrik hastada multidisipliner anestezi yönetimi yaklaşımımızı ve anestezi dozlarının vücut kütlesi ile uygunluğuna göre kullanımın önemini vurgularken. Türkiye'de pediatrik bariatrik cerrahide ilk kez morbid ergen hasta grubunda sugammadex kullanımını anlatmaya değer bulduk.

Anahtar Kelimeler: morbid obezite, adolesan, bariatrik cerrahi, anestezi

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1. Introduction

Obesity frequency has been on the rise among children as well as in adults. Since the success of its medical treatment is quite limited, surgical methods are applied on certain cases. Although surgical treatment is frequently applied on adults, it is applied on especially children with body mass index over $40 \text{ kg} \cdot \text{m}^{-2}$, who are included in the morbid obesity category (1,2). It is known that anaesthesia method on obese patients is controversial. In addition, the literature presents a limited number of cases in paediatric group (2,3). This study is noteworthy in that it underlines the importance of using anesthetic drug doses in accordance with the patient's body mass. Tracheal extubation was performed with awake, sitting position, addition of positive end-expiratory pressure (PEEP) and recruitment manoeuvres in morbid obese adolescent patient who has undergone bariatric surgery, and it's used sugammadex in the obese paediatric patient group for the first time in the literature.

2. Case Presentation

An 15-year-old male patient was hospitalized due to rapid weight gain for the last 5 years and was taken into laparoscopic sleeve gastrectomy operation with morbid obesity diagnosis resistant to medical treatment. In the airway examination, the patient had a short thick neck, thyromental distance 4 cm, and Mallampati score III. In the pre-anaesthesia examination, lung sounds were bilateral and rough. Preoperative respiratory function tests were as; FVC (Forced Vital Capacity): 1900 ml FEV₁ (Forced Expiratory Volume)₁: 1520 ml FEV₁ / FVC: 81 %, electrocardiogram (ECG), echocardiography (ECHO), chest graphy and preoperative tests liver function tests, renal function test, thyroid hormone tests, complete blood count were normal.

There was no other characteristics in patients history, and his height turned out to be 186 cm (>97 p), body weight 189 kg (>97 p), body mass index 54,6 (>97 p), and fat-free mass 110 kg in his physical examination, before the operation. The patient's lower limbs were put

on elastic compression socks for prophylactic treatment of venous thromboembolism. Written informed consent was obtained from patient's family after that the patient was taken to the operating. During the operation, ECG, peripheral oxygen saturation (SpO₂), capnography, invasive blood pressure, uriner output, CVP (Central Venous Pressure) and train-of-four (TOF) were monitored. Muscle contraction of the adductor pollicis in response to electrical stimulation of the ulnar nerve was monitored by acceleromyography (TOF-Watch®-S; Organon, Dublin, Ireland), and the acceleration transducer was placed in a hand adaptor. After loss of consciousness, calibration, and subsequent TOF stimulation every 15 s was started. No pre-medication was applied to the patient, systemic artery pressure was 130/80 mmHg, SpO₂ 94%, heart rate was 76 beat min⁻¹ and before anaesthesia administration, equipment was checked, including a LMA (Laryngeal Mask Airway) fastrach, gum elastic bougie, a videolaryngoscopy, a tracheostomy tray. Preoxygenation was performed on ramped position. We were able to mask ventilation the patient adequately after that anaesthesia induction was suitable with the body mass; intravenous (iv) propofol was applied as 1 mg kg⁻¹ (Propofol 1%, Fresenius Kabi, İstanbul) and remifentanil as 0.5 mcg kg⁻¹ iv (Ultiva®, Glaxo Smith Kline, İstanbul), afterwards rocuronium was administered as 0.6 mg kg⁻¹ iv (Esmeron®, Organon, İstanbul) as neuromuscular blocker. At the 6th minute after induction, TOF was balanced at 0 and then endotracheal intubation was applied. Tracheal intubation was performed on 3 Macintosh laryngoscope blade with 7.5 mm inner diameter endotracheal tube and confirmed by auscultation and capnography. Mechanical ventilation was maintained of ideal body weight (IBW) and using volume control mode to a tidal volume 5-7 ml kg⁻¹, inspiration/ expiration ratio of 1:2, respiratory rate of 10-12 min, PEEP, 5 cmH₂O, the pick inspiratory pressure < 30 cmH₂O, and end tidal CO₂ 35-40 mmHg with 4 L min⁻¹ of fresh gas flow. In the maintenance of anaesthesia, 50% oxygen, 50% air, sevoflurane (MAC (Minimum Alveolar Concentration) % 1.2) and remifentanil iv

infusion ($0.05-0.2 \text{ mcg kg}^{-1} \text{ min}^{-1}$) were started. After the patient was placed properly, operation started. Hemodynamic parameters and rocuronium additional dose were followed during perioperative period (Table1). Operative time was 5 hour 15 minutes. Duration of the anaesthesia was 5 hour 45 minutes. Postoperative analgesia was performed from dose of suitable with the body mass with paracetamol $10 \text{ mg kg}^{-1} \text{ iv}$ and tramadol 1 mg kg^{-1} . We were made the

recruitment manoeuvres. After neuromuscular blockade was reversed dose of suitable with the body mass with 2 mg kg^{-1} sugammadex, the patient was extubated awake, sitting position and $100\% \text{ O}_2$ was administered by means of a mask at a rate of 6 L min^{-1} . After that the patient was monitored with a 45° head up tilt in the postanesthesia care unit for 3 days. He was discharged from paediatric surgery ward on the postoperative ninth day.

Table 1.
Perioperative Parameters

	0 min	1 min	2 min	5 min	15 min	30 min	60 min	120 min	180 min	240 min	300 min	Extubation 360 min
SAP (mmHg)	95	96	95	92	96	95	110	121	105	100	99	125
DAP (mmHg)	49	47	50	36	46	45	64	52	51	49	46	50
MAP (mmHg)	63	62	62	61	62	62	85	67	67	63	61	71
spO₂ (%)	94	97	97	98	98	99	100	99	100	100	100	97
Et CO₂ (mmHg)	28	32	32	28	34	36	36	38	36	40	38	44
NMB-R Additional Dose(mg)							10		10	10		

SAP: Systolic arterial pressure

DAP: Diastolic arterial pressure

MAP: Mean arterial pressure

spO₂: peripheral oxygen saturation

EtCO₂: End-tidal carbondioxide

NMB-R: Neuromuscular blockade rocuronium

3. Discussion

This study shows that difficulties in the airway in paediatric patient group with morbid obesity can be overcome without any trouble by means of applying suitable anaesthetic agents such as remifentanyl, rocuronium and sugammadex after calculating the appropriate dosage according to fat-free mass.

Morbid obese patients always constitute a risky and difficult patient group in terms of anaesthesia due to frequent observation of

hypoxia, hypercarbia, pulmonary hypertension and right heart failure (1,2). In obese patients, with the increase in the fatty tissue of pharynx wall, anatomical changes are observed in the structure of the upper airway, causing difficulty in mask ventilation and intubation (1,3).

Obesity surgery is divided into three groups in terms of impact mechanism. These are volume restricting operations, absorptive disruptive operations and operations presenting both impacts. Sleeve gastrectomy

applied to our patient is one of the volume restricting operations. After this operation, organ injury, pulmonary complications, bleeding and emboli, which may present in all laparoscopic surgeries, may be observed (3). We did not observe any of these complications in our case.

There are different applications in the dosages of anaesthetic agents. The activity of volatile agents changes in obese patients based on their solubility in fat or lipid. It is important to adjust the dosage of these agents in children according to ideal body weight or fat-free weight (2). In the literature, it is suggested that possible overdoses and occurrence of adverse effects may be prevented through dosage adjustment (2). In our case, we adjusted the drug usage anaesthetics doses of suitable with the body mass in the way suggested in the literature

Despite a small number of adverse effects of neuromuscular blockade, it is commonly used around the world to accelerate endotracheal intubation and immobilize the patient during surgery. Sugammadex is the first and only selective agent that forms a complex by binding the steroidal neuromuscular blockers in the circulation and at the neuromuscular junction, and reverses the neuromuscular blockade. Although the effects and reliability of sugammadex on children have been revealed as on the adults, there is not enough study about its effects and reliability on children below 2 years old (4). On the otherhand obese patients are high risk of acute upper airway obstruction, difficult mask ventilation, perioperative hypoxemia, bronchospasm and perioperative desaturation (3,5). Rapid recovery is therefore desirable, to ensure early efficient coughing and to decrease the rate of postoperative respiratory complications. In our case we were used rocuronium and sugammadex for induction and recovery period without any complication.

Perioperative management is important for complication of peri and postoperative obesity patient. Obese patient of pharmacology, positioning, respiratory system, cardiovascular system are differed from non-obese patients and require specific perioperative management (6). We used the anaesthetics drugs as doses suitable with the body mass. Tracheal extubation was performed with awake, sitting position, addition of PEEP and recruitment manoeuvres. So that, intra and postoperative complications such as hypoxemia, atelectasis was reduced.

When used in appropriate dosage to neutralize the effects of rocuronium, sugammadex terminates the effects of rocuronium in a short time and provides a more secure extubation. Moreover, sugammadex, lately used to prevent residual neuromuscular blockade, reduces the post-surgery respiratory complications. The usage of sugammadex especially in paediatric patients to reverse the neuromuscular blockade is suitable in terms of easily getting over the present risky situation in this patient group (4). We did not observe any post-surgery problems in our case with the fast and reliable wake up.

4. Conclusion

In this study, we remind the importance of ideal dosage adjustments in the selection of anaesthetic agent according to fat-free body mass for a successful surgery and result, and present our rare case of anaesthesia application in adolescent morbid obesity perioperative management for the first time in Turkey. Also anaesthetic multidisciplinary management and methodological quality are decreased risk of peri and postoperative period for adolescent obesity surgery.

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Informed Consent: Written informed consent was obtained from patient's family who participated in this case.

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