



The Manage Strategy in a Morbid Obesity Patient with Bronchospasm during General Anesthesia

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During general anesthesia, anesthesiologists encounter problems including difficult airway intubation, high respiratory airway pressure, fluctuation of blood pressure, and poor oxygen saturation, especially in obese patients. In addition, obese patients with asthma or bronchospasm make these difficulties even more challenging. We present the case of a 37-year-old male with morbid obesity (height: 160 cm, weight: 120 kg, and body mass index: 47 kg/m²) with asthma attack and who was injured during a car accident that caused open fracture of the right patella which needed emergent open reduction and internal fixation surgery. He refused spinal anesthesia. By using rocuronium and its reversal agents sugammadex, lidocaine, β -2 agonist, epinephrine, sevoflurane, hydrocortisone, magnesium sulfate, and deep extubation, we were able to intubate smoothly and extubate successfully after the surgery without intensive care.

Key words: Sugammadex, morbid obesity, bronchospasm

INTRODUCTION

Anesthesiologists face many challenges of different patients during daily practice. Obese patients usually have multiple comorbidities such as diabetes, hypertensive cardiovascular disease, and obstructive sleep apnea (OSA). Anesthesiologists encounter problems including difficult airway intubation, high respiratory airway pressure, fluctuation of blood pressure, and poor oxygen saturation in obese patients. In addition, patients with asthma or bronchospasm make these difficulties even more challenging.

Sugammadex (trade name: Bridon®) had been demonstrated to improve both postoperative respiratory function and cost-effectiveness in morbidly obese patients during general anesthesia (GA).¹ In addition, lidocaine, β -2 agonist, steroid, sevoflurane, epinephrine, magnesium sulfate, and deep extubation had been demonstrated to successfully manage bronchospasm during GA. To the best of our knowledge, a combination of all these modalities in morbidly obese patients with asthma has been rarely reported. In this study, we successfully conducted a GA by using the manage strategy to a morbidly obese bronchospasm patient.

CASE REPORT

A 37-year-old male with morbid obesity (height: 160 cm, weight: 120 kg, and body mass index: 47 kg/m²) suffered from open fracture of the right patella during a car accident which needed emergent open reduction and internal fixation surgery. He had no previous surgical experience, but asthma was diagnosed since childhood and preoperative chest auscultation showed wheezing over the bilateral lower-lung field. Moreover, he denied any history of food or drug allergy. We explained the risks and suggested spinal anesthesia for his condition, but he strongly refused spinal anesthesia; instead, he desired GA despite the risk of bronchospasm and respiratory insufficiency during the surgery. The GA induction started with fentanyl (250 μ g, [I.V.]), midazolam (5 mg, I.V.), and lidocaine (120 mg, I.V.). Then, propofol was initiated by using a target-controlled infusion system programmed with the Marsh model (Fresenius Orchestra Primea, Fresenius Kabi AG, Bad Homburg, Germany) and setting effective target concentration (Ce) at 4 μ g/mL. Rocuronium (80 mg, I.V.) and dexamethasone (5 mg, I.V.) were administered after the patient lost consciousness. Tracheal

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intubation (Cormack and Lehane Grade II) was facilitated with the GlideScope® system (Verathon medical, Inc., Bothell, WA, USA). After tracheal intubation was finished, chest auscultation revealed severe wheezing over the bilateral lung field with a high end-tidal carbon dioxide (EtCO₂) 67 mmHg and a sharp slope of capnogram. Therefore, bronchospasm was considered. Although the oxygen supplement was 100% (FiO₂:100%), his pulse oximetry (SpO₂) was around 88%–95% and peak airway pressure was 30–35 mmHg. Under this circumstance, we administered fenoterol (six puffs from endotracheal tube) and combined propofol (Ce: 2.0 µg/ml) and sevoflurane 2% in an oxygen flow of 1 L/min to maintain the GA. We also prescribed rocuronium 20 mg and fentanyl 50 µg I.V. bolus every 25 min intraoperatively. Because the bronchospasm persisted, we added hydrocortisone (200 mg, I.V.) and epinephrine (0.3 mg, subcutaneously), and the wheezing breathing sound over the bilateral lung reduced. The surgical time took 180 min, and blood loss was 350 mL. Considering the care management of this patient after the surgery, our goal was to extubate safely and avoid worse bronchospasm. In addition, we administered magnesium sulfate (2.0 g, I.V. drip) for 30 min before extubation. At the end of the surgery, we stopped sevoflurane but kept propofol at a Ce of 2.0 µg/ml²² in deep anesthesia, including a deep neuromuscular block (NMB) and suctioned the endotracheal tube before extubation. The patient began to breathe spontaneously 2 min after the injection of sugammadex (500 mg, I.V.). Then, the patient was extubated smoothly without bronchospasm and other sequela, and the SpO₂ was kept between 93% and 97% under FiO₂ of 60%.

DISCUSSION

During GA, the management of overweight patients' respiratory system is difficult. Moreover, if these patients have a history of asthma, anesthesiologists might encounter high airway pressure, respiratory acidosis, tissue hypoxia, and even life-threatening cardiac arrest, especially in the period of induction or intubation.³ In general, surgeons or anesthesiologists should inquire their patients' history of asthma control and should appropriately direct them under a specialist's supervision for a period to minimize the risk of bronchospasm during the surgery. However, the emergent operation is not considered. Hence, we need a strategy for this difficult and life-threatening situation.

Preventing the direct stimulation to upper airway is the key. Our strategy was minimizing the airway stimulation caused by intubation and extubation to prevent bronchospasm attack. Administration of adequate opioid could minimize the pain during intubation. Intravenous lidocaine and propofol could reduce airway irritability.⁴ Steroids and β-2 agonists could prevent bronchospasm due to their bronchodilative effect.⁴ Intravenous or subcutaneous epinephrine is safe in patients with acute

life-threatening asthma.^{4,6} The maintenance stage of anesthesia is also important. Above all, inhaled anesthetic, sevoflurane, is the best agent, which processes minimal airway irritability and has direct bronchial smooth muscle relaxation effect.⁴ As mentioned before, propofol also reduces airway excitation. Therefore, during the maintenance stage, combined propofol and sevoflurane could reduce the incidence of bronchospasm minimally.

We choose rocuronium because it has a select reversal agent, sugammadex, which encapsulates steroidal NMB agents without muscarinic side effects and relies on the inhibition of acetylcholinesterase.⁷ In addition, reversal of NMB with acetylcholinesterase inhibitor such as neostigmine could be dangerous due to the muscarinic effect to bronchus which may induce bronchospasm and increase airway secretion.⁷ Therefore, it can be concluded that sugammadex provides better postoperative oxygenation after the antagonism of moderate NMB than neostigmine.^{8,9} Moreover, sugammadex decreases the incidence of postoperative respiratory complications and related costs in patients with OSA.¹ Maintaining intraoperative deep NMB and performing reversal with sugammadex can affect not only the intraoperative surgical conditions, but also the postoperative recovery profiles.¹⁰ Rocuronium plus sugammadex is the ideal combination for this purpose; it produces profound NMB during surgery plus a safe, rapid recovery from deep rocuronium-induced NMB after surgery.^{11–15} Administering magnesium sulfate can attenuate the cardiovascular response during airway management.^{13,15} Bronchial smooth muscle relaxation can be induced by magnesium by blocking calcium influx into the cytosol and its release from the endoplasmic reticulum and activating sodium–calcium pumps.⁴ Further, magnesium can block the interaction between calcium and myosin, leading to muscle cell relaxation. Increases in β-2 receptor agonist affinity and stimulation of both nitric oxide and modulation prostacyclin synthesis by magnesium may lead to bronchodilation.⁴ Morbidly obese patients usually combine with cardiovascular disease. Administering magnesium sulfate can attenuate the cardiovascular response during airway management and reduce the release of catecholamines from the adrenal medulla and adrenergic nerve terminals after sympathetic stimulation due to intubation.^{15,16} In addition, administration of magnesium sulfate provides a quick, safe, and effective reversal of rocuronium-induced NMB in morbidly obese patients.^{13–18}

CONCLUSION

We successfully conducted a GA to a morbidly obese bronchospasm patient. We suggested the use of rocuronium and its reversal medication sugammadex to prevent bronchospasm during intubation and extubation. Rocuronium plus sugammadex is the ideal combination for profound NMB

during surgery followed by a safe, rapid recovery from deep rocuronium-induced NMB after surgery, especially in morbidly obese patients with bronchospasm. Combined propofol and sevoflurane in the maintenance stage has direct bronchodilative effect during GA. Steroids, β -2 agonists, epinephrine, and magnesium sulfate could prevent and treat bronchospasm due to their bronchodilation effect. Innovative drug such as remifentanyl which can minimize the opioid accumulation induces respiratory suppression due to its characteristic rapid drug metabolism. Moreover, we may add precedex for our management strategy. Precedex has both sedation and analgesia effects due to its highly selective α^2 receptor agonist feature. By these multiple modalities, we could successfully treat bronchospasm during anesthesia in morbidly obese patients with asthma exacerbation undergoing emergency surgery.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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