

Case Report

Anesthesia management of morbid obesity and ankylosing spondylitis with a difficult airway: a case report

Ying Zhou*, Yu Zhang*, Tao Hu, Xuan Li, Qiang Fu

*Department of Anesthesiology, Third People's Hospital of Chengdu (Affiliated Hospital of Southwest Jiaotong University), Chengdu 610000, Sichuan, P. R. China. *Equal contributors.*

Received March 29, 2021; Accepted May 26, 2022; Epub July 15, 2022; Published July 30, 2022

Abstract: Background: The anesthesia management in morbidly obese patients is challenging, because there may also be a number of complications in addition to predictable difficulties associated with airway and ventilation management. Potential complications require careful preoperative evaluation and intraoperative management to ensure rapid recovery and minimize adverse effects from anesthesia. Case presentation: This study involved a 39-year-old male patient who had ankylosing spondylitis complicated with morbid obesity (body mass index =48.8). He had severely limited head and neck mobility, severe obstructive sleep apnea syndrome as well as a high STOP-BANG score and Mallampati class IV. After administering local airway anesthesia, awake tracheal intubation was conducted under the guidance of fiberoptic bronchoscopy. Total intravenous anesthesia was adopted intraoperatively, and awake extubation was performed 5 minutes after the completion of the operation. The patient experienced no nausea or vomiting, and the pain score assessed by the Visual Analogue Scale was only 1-2 points. He did not suffer from painful memories relating to anesthesia. Conclusions: We report a case of concurrent ankylosing spondylitis and morbid obesity associated with a difficult airway successfully treated with total intravenous anesthesia and awake intubation. This approach can be referred in patients with similar conditions.

Keywords: Morbid obesity, anesthesia, difficult airway, obstructive sleep apnea, ankylosing spondylitis, total intravenous anesthesia

Introduction

Anesthesia management in morbidly obese patients has always been challenging, because there may also be multiple complications in addition to predictable difficulties such as airway and ventilation management [1, 2].

Difficult airways in patients with morbid obesity are caused by airway and respiratory changes, such as upper respiratory obstruction, difficult intubation or mask ventilation, difficult extubation, and increased sensitivity to respiratory inhibitory responses to anesthetics. For patients with difficult airways, the criteria for awake tracheal intubation and extubation are extremely demanding regarding perioperative management. Some studies have evaluated the effect of awake intubating laryngeal mask airway placement in patients with morbid obe-

sity combined with ankylosing spondylitis (AS)-related head and neck immobility [3]. There is also evidence showing that total intravenous anesthesia (TIVA) in laparoscopic sleeve gastrectomy results in better postoperative recovery and reduced adverse effects and analgesic needs [1]. However, to best of our knowledge, there are no study on the application of awake tracheal intubation and intraoperative anesthesia management in patients with concurrent AS and morbid obesity. This study, as far as we are aware, is the first to report the perioperative management of a patient with morbid obesity complicated with AS.

Case presentation

A 39-year-old man (height: 176 cm, weight: 151.3 kg [body mass index =48.8]) was diagnosed with morbid obesity, AS, hypertension,

Morbid obesity and ankylosing spondylitis with airway difficulties



Figure 1. Orthotopic view (A) and lateral view (B) of the patient.

diabetes, and obstructive sleep apnea syndrome (OSAS). The medical history indicated a diagnosis of 25-year course of AS, 2-year course of heart failure, and 2-year course of right atrial hypertrophy. AS involved the cervical vertebrae but not the temporomandibular joint, and was associated with cervical stiffness, anteversion, and severe limited head and neck movement mobility. The patient had a neck circumference of 57.3 cm, a mouth opening degree of approximately two horizontal fingers, Mallampati class IV, a loud Snoring, Tiredness, Observed apnea and high blood Pressure (STOP), and a Body mass index, Age, Neck circumference, and Gender (BANG) score of 7 (**Figure 1**). Laboratory tests revealed renal insufficiency, elevated myoglobin and troponin, and slightly increased concentration of brain natriuretic peptide. Severe restrictive ventilatory impairment was suggested by pulmonary function tests. One week before surgery, the patient was treated with continuous positive airway pressure ventilation delivered via noninvasive approach ventilation for OSAS to improve ventilation, and diuresis was performed to improve cardiac function. The day before the operation, the patient was informed of the process of awake tracheal intubation to reduce his anxiety and improve patient compliance.

The patient underwent routine monitoring after entering the operating room. He was placed in a reverse Trendelenburg position [4] during which the head of the operating table is tilted upward, i.e. the head is high and the feet are

low. It is commonly used for upper abdominal surgery to facilitate access to the upper abdominal organs during laparoscopic or open surgery. Patient received pure oxygen at a rate of 8 L/min. He had a non-invasive blood pressure measurement of 160/85 mmHg, a heart rate of 63 beats/min and an oxygen saturation of 92%. Catheterization of the left radial artery was performed to monitor arterial blood pressure, and an intravenous injection of phencyclidine and methylprednisolone and oral gargling with 1% tetracaine gel were administered. After oro-

pharyngeal local anesthesia using the “spraying while entering” method and tracheal local anesthesia with 2% lidocaine for thyrocricocentesis, an oropharyngeal airway was placed. Dexmedetomidine was then injected intravenously within 10 min using a syringe pump. The dosage was selected according to the patient’s ideal body weight, with a loading dose of 0.5 µg/kg and a maintenance dose of 0.2 µg/kg/h. A No. 8 endotracheal tube was successful inserted on the first attempt under the guidance of a fiberoptic bronchoscope, and the patient experienced no choking or vomiting. According to the corrected body weight, the patient received TIVA using propofol and remifentanyl, and intravenous injections of 2 mg midazolam and 90 mg rocuronium bromide for anesthesia induction. The ventilator parameters were set as follows: tidal volume: 550 ml, respiratory rate: 16 breaths/min, fresh gas flow rate: 2 L/min, fraction of inspired oxygen: 60%, maintenance partial pressure of end-tidal carbon dioxide: 35-45 mmHg, and peak pressure: 22-28 mmHg. Then, bilateral rectus sheath block and transversus abdominis plane block were performed under ultrasound guidance. TIVA was performed with propofol and remifentanyl, and dexmedetomidine was used for anesthesia maintenance. Intraoperatively, the patient had a bispectral index value of 40-60, an average arterial pressure of 70-80 mmHg, a heart rate of 57-64 beats/min, and an oxygen saturation of 98%-100%. Intraoperatively, multimodal analgesia (oxycodone 10 mg and flurbiprofen axetil 50 mg) and dual antiemetic thera-

py with dexamethasone and tropisetron were administered. The operation lasted for 145 min. Five minutes after the completion of the operation, the patient opened his eyes and regained consciousness. Upon awakening, he had recovered normal muscle tension and satisfactory tidal volume. Flumazenil and neostigmine were administered as muscle relaxation antagonists. The endotracheal tube was removed after 10 min of observation without oxygen supplementation. The patient experienced no nausea or vomiting, and the pain score assessed by the Visual Analogue Scale was 1-2 points. After 40 minutes of observation in the postanesthesia care unit (PACU), the patient returned to the ward as he was observed to be doing well. Four hours after the operation, he was able to ambulate. The patient received continuous positive airway pressure ventilation during sleep and was discharged 2 days after the operation.

Discussion and conclusions

For predictable difficult airways, awake endotracheal intubation must be considered [5]. While fiberoptic endotracheal intubation is indicated in patients with AS [6]. The patient in this study had AS and limited head and neck mobility, with inability to turn, bend or stretch his neck. In addition, morbid obesity resulted in increased neck circumference, OSAS and restricted mouth opening. Mallampati class IV and a STOP-BANG score of 7 were also concerns [7]. Awake endotracheal intubation was performed on this patient by an experienced operator. This obese patient, extremely sensitive to sedatives, had poor lung functional reserve, OSAS and obesity apnea-hypopnea syndrome. Therefore, respiratory depression, airway loss, hypoxia, and respiratory and circulatory instability may occur during anesthesia induction. The patient was placed in the reverse Trendelenburg position to avoid adverse sequelae caused by hypoxemia. This result was consistent with a previous study by James, et al. [8], who found that in morbidly obese patients, the 30° reverse Trendelenburg position provided the longest safe apnea period when compared to the 30° back up fowler and horizontal-supine positions. Since mask ventilation and/or intubation may be difficult for morbidly obese patients with general anesthesia induction, this extra time may prevent adverse sequelae resulting from hypoxemia.

To maximize the success rate of awake endotracheal intubation under minimal amounts of sedating medications, the upper airway must be sufficiently anesthetized. Some researchers have reported using a custom-made atomizer to place an oropharyngeal airway, which provided effective local airway anesthesia and optimized patient comfort [9]. However, we did not have an access to a custom-made atomizer. Because of the patient's neck anatomy, we were unable to accurately identify the anatomical markers for glossopharyngeal and superior laryngeal nerve blocks, even under ultrasound guidance. Therefore, we performed tracheal surface anesthesia by percutaneous injection of 2% lidocaine from the midline of the cricothyroid membrane into the tracheal cavity. Additionally, surface anesthesia of the tongue root, oropharynx, hypopharynx and throat structures was achieved with 1% tetracaine gel using a "spraying while entering" approach. The tube was placed in the oropharyngeal airway after satisfactory superficial anesthesia. Dexmedetomidine was then administered by a syringe pump within 10 minutes with a loading dose of 0.5 µg to relieve the patient's anxiety. Awake endotracheal intubation was then performed using a fiberoptic bronchoscope. The patient was cooperative, and the intubation was successful on the first attempt with satisfactory clinical effects. In intraoperative management, we avoided volatile anesthetics because of the risk of malignant hyperthermia, which occurs in genetically susceptible individuals with a hypermetabolic reaction to potent inhalational anesthetics or succinylcholine [10]. Elbakry et al. found that TIVA with propofol and dexmedetomidine was more effective than desflurane inhalational anesthesia in patients undergoing laparoscopic sleeve gastrectomy for morbid obesity [1]. In another study, a patient with AS, morbid obesity and insufficient pulmonary reserve was extubated on postoperative day 2 [3]. Ulrike Berth, et al. [11] also reported a case of morbid obesity with cervical spine AS presenting with acute spinal shock and complex airway management. In this case, TIVA was used for anesthesia maintenance during surgery, and the anesthetic dosage was strictly calculated and actively adjusted according to anesthesia depth. The patient woke up 5 min after the operation and stayed in PACU for 40 min. Unfortunately, we had no access to sugammadex, so instead, we used

neostigmine for muscle relaxant reversal. Studies have shown that administering sugammadex according to a patient's ideal body weight leads to faster reversal and is independent of relapse. A previous study supports dosing sugammadex according to ideal body weight regardless of the depth of neuromuscular blockage or type of neuromuscular blocker [12]. We speculate that the use of sugammadex could reduce the PACU time.

In this paper, we discussed the successful use of TIVA and awake intubation in a patient with concurrent AS and morbid obesity associated with a difficult airway. This approach should be considered in patients with similar conditions.

Disclosure of conflict of interest

None.

Address correspondence to: Qiang Fu, Department of Anesthesiology, Third People's Hospital of Chengdu (Affiliated Hospital of Southwest Jiaotong University), Chengdu 610000, Sichuan, P. R. China. Tel: +86-028-61312288; E-mail: fqiang1878@126.com

References

- [1] Elbakry AE, Sultan WE and Ibrahim E. A comparison between inhalational (desflurane) and total intravenous anaesthesia (propofol and dexmedetomidine) in improving postoperative recovery for morbidly obese patients undergoing laparoscopic sleeve gastrectomy: a double-blinded randomised controlled trial. *J Clin Anesth* 2018; 45: 6-11.
- [2] Drenick EJ, Bale GS, Seltzer F and Johnson DG. Excessive mortality and causes of death in morbidly obese men. *JAMA* 1980; 243: 443-445.
- [3] Herman AG and Mahla ME. Awake intubating laryngeal mask airway placement in a morbidly obese patient with ankylosing spondylitis and unstable thoracic spine. *J Clin Anesth* 2016; 32: 62-64.
- [4] Hassan EA and Baraka AAE. The effect of reverse Trendelenburg position versus semi-recumbent position on respiratory parameters of obese critically ill patients: a randomised controlled trial. *J Clin Nurs* 2021; 30: 995-1002.
- [5] Ahmad I, El-Boghdady K, Bhagrath R, Hodzovic I, McNarry AF, Mir F, O'Sullivan EP, Patel A, Stacey M and Vaughan D. Difficult airway society guidelines for awake tracheal intubation (ATI) in adults. *Anaesthesia* 2020; 75: 509-528.
- [6] Epaud A, Levesque E and Clariot S. Dramatic cervical spine injury secondary to videolaryngoscopy in a patient suffering from ankylosing spondylitis. *Anesthesiology* 2021; 135: 495-496.
- [7] Mahmoud M, Hasanin AM, Mostafa M, Alhamade F, Abdelhamid B and Elsherbeenly M. Evaluation of super-obesity and super-super-obesity as risk factors for difficult intubation in patients undergoing bariatric surgery. *Surg Obes Relat Dis* 2021; 17: 1279-1285.
- [8] Boyce JR, Ness T, Castroman P and Gleysteen JJ. A preliminary study of the optimal anaesthesia positioning for the morbidly obese patient. *Obes Surg* 2003; 13: 4-9.
- [9] Leung Y and Vacanti FX. Awake without complaints: maximizing comfort during awake fiberoptic intubation. *J Clin Anesth* 2015; 27: 517-519.
- [10] Ruffert H, Bastian B, Bendixen D, Girard T, Heiderich S, Hellblom A, Hopkins PM, Johannsen S, Snoeck MM, Urwyler A and Glahn KPE; European Malignant Hyperthermia Group. Consensus guidelines on perioperative management of malignant hyperthermia suspected or susceptible patients from the European malignant hyperthermia group. *Br J Anaesth* 2021; 126: 120-130.
- [11] Berth U, Shaikh S, Cooper B and Heard SO. Case report on morbidly obese patient with cervical spine ankylosing spondylitis presenting with acute spinal shock and complex airway management. 2008.
- [12] Horrow JC, Li W, Blobner M, Lombard J, Speek M, DeAngelis M and Herring WJ. Actual versus ideal body weight dosing of sugammadex in morbidly obese patients offers faster reversal of rocuronium-or vecuronium-induced deep or moderate neuromuscular block: a randomized clinical trial. *BMC Anesthesiol* 2021; 21: 62.