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Anesthetic Challenges for Airway Management in Obese Patient - a Case Report

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Abstract: Anesthesia management in morbidly obese patients is challenging due to the potential for various complications related to ventilation and airway control. Obesity is associated with an increased risk of perioperative morbidity and mortality. This risk is increased significantly if the BMI Is above 40 kg/m².

This case report is about a 44-years-old morbidly obese patient with predominantly centrally distributed obesity and a Mallampati score of III, who was planned for elective surgical intervention, and it describes the perioperative anesthetic strategies for such patients undergoing general anesthesia and highlights the importance of a comprehensive approach to ensuring their safety.

Key Words: obesity, morbid obesity, airway management, ramp position, rapid sequence intubation, general anesthesia.

Introduction: According to the World Health Organization, overweight and obesity are defined as abnormal or excessive fat accumulation that poses a health risk. A normal BMI ranges from 18.5kg/m² to 24.9kg/m². A BMI over 25kg/m² is classified as overweight, and a BMI above 30kg/m² is considered obese (1).

Over the world, the prevalence of obesity has increased exponentially (2). Obese patients are a unique group of patients, and each anesthesiologist must know about pathophysiologic changes that occur in these patients, and how to respond if a complication occurs (3). Difficult airway management is a significant challenge in anesthetic practice, particularly in obese patients due to anatomical and physiological alterations. Besides the potential difficulties in securing an airway for these patients, anesthesia management in obese patients is also challenging due to associated comorbidities like sleep-disordered breathing, hypertension, dyslipidemia, ischemic heart disease, diabetes mellitus, osteoarthritis, liver disease, high risk of development of septic shock. Also, obese patients are more prone to gastrointestinal issues, such as gastroesophageal reflux and delayed stomach emptying, which can increase the risk of pulmonary aspiration. Obese patients have altered pharmacodynamics due to physiological changes which include increased cardiac output, fat and muscle mass, increased plasma volume, renal blood flow, and splanchnic blood flow. Therefore, doses of anesthetic medications should be carefully adjusted. Dosing recommendations for patients with normal BMI are usually based on their total body weight

(TBW), because it is similar to their ideal body weight (IBW), but dosing in obese patients is quite different and most of the medications require dosing based on ideal body weight (IBW) to avoid an overdose (3). Obesity is also a major risk factor for developing pulmonary and venous thrombosis. Anticoagulant therapy should be initiated in the preoperative and postoperative period with appropriate dosage to mitigate these risks.

Case Report: A 44-years-old man (weight=175 kg, height=180 cm, BMI=54.0 kg/m2) was scheduled for the repair of a ventral hernia, and removal of a suspected metastatic liver deposit. His medical history included hypertension, hyperthyroidism, type II diabetes mellitus, gastroesophageal reflux disease (GERD), and adenocarcinoma of the colon and he was an ex-smoker. The patient had no allergies to medication and food. He was on chronic therapy, including Metformin 1000mg, Lercanidipine 10mg, Levothyroxine 25mg, and Lisinopril/ Hydrochlorothiazide 10/12.5mg. Prior to the intervention, a general physical examination revealed that the patient had morbid obesity, a Mallampati score of III, a neck circumference of 43cm, and slightly limited neck extension. Auscultation showed clear breath sounds, and the chest X-ray indicated no significant changes. The blood glucose level before the intervention was 8mmol/L. Although the patient had not been formally diagnosed with obstructive sleep apnea (OSA), he exhibited symptoms such as daytime sleepiness and snoring. The patient was then monitored using EKG, pulse oximetry, and non-invasive blood pressure measurement. Two intravenous lines were inserted, and the following equipment was prepared: a laryngoscope with both straight and curved spatulas, a McCoy laryngoscope, a tube exchanger, an intubating stylet, a video-laryngoscope, and supraglottic airway devices. Before induction, the vital parameters were as follows: blood pressure 205/120mmHg, heart rate97/min, and SaO2 93%. An epidural block was performed at the Th10-Th11 level, and the epidural catheter was advanced 20cm into the epidural space. After that, the patient was positioned in a ramp-up position. Folded towels were placed under the head and back until the ear was in the same horizontal plane as the sternum, and the patient was positioned in a slightly reverse Trendelenburg position. For premedication, we used Midazolam 1mg. Metoclopramide 20mg also was given. Pre-oxygenation was initiated with 100% oxygen via face mask for about 5 minutes, and rapid sequence intubation with Propofol 200mg and Succinylcholine 120mg was performed. General anesthesia was induced through intravenous administration of Lidocaine 80mg, Fentanyl 100mcg, Ketamine 25mg. The patient was intubated using a video laryngoscope with a D-spatula at the first attempt. A non-depolarizing muscle relaxant Roccuronium Bromide 50mg was used during the procedure. Mechanical ventilation was set on pressure controlled volume guaranteed mode (PCV-VG), with TV of 650ml and RR of 16 per minute, fresh gas flow rate: 3L/min, positive end-expiratory pressure (PEEP) of 6cmH_2O, inspired oxygen fraction: 50%; partial pressure of end-tidal carbon dioxide: 37–40mmHg; and peak pressure: 28–30mmHg, I:E ratio of 1:2. Anesthesia was maintained with Sevoflurane 2% vol. Continuous analgesia was provided with the short-acting opioid Remifentanil administered via under target–controlled infusion, TCI

0,05mcg/kg/min. Bupivacaine 0.25% was used through the epidural catheter. During the procedure, Ceftriaxone 2g, MgSO4 1.5g, Famotidine 40mg, and Furosemide 10mg, were administered. The intervention lasted 3 hours and 30 minutes. During the operation, the patient was hemodynamically stable, with blood pressure around 130/80, heart rate around 90/min, and SaO2 around 95-99%. Arterial blood gas analyses were taken as well, and they were normal, Ph=7.38; pCo2=39.3mmHg; pO2=84.5mmHg; HCO3=23.2mmol/l; BE (ecf)=-1.8mmol/l. After the surgical procedure was done, the patient was positioned in a slightly reverse Trendelenburg position, and when he started breathing on his own, Neostigmine 3mg and Atropine 1mg were administered. Extubating was done when the patient was fully awake to reduce the possibility of obstruction of his airway. Following extubating, 100% oxygen was given for about 2 minutes. The patient was then taken to the recovery room for further observation. During the entire stay in the recovery room, the patient had stable vital parameters, he was put on an oxygen mask 4L/min, his blood pressure was around 150/90mmHg, and SaO2 was around 97%. After 1 hour and 30 minutes of stay in the recovery room, the patient was successfully transferred to the Clinic of Abdominal Surgery.

Discussion: Perioperative management of obese patients is challenging, and the management of the airway in these patients requires careful planning. Patients suffering from obesity develop anatomical changes due to redundant adipose tissue in the upper airway and the head and neck areas, shoulder and back. The increased adipose tissue deposition in the upper airway leads to airway narrowing (3). A larger tongue is more difficult to displace in the submental space during laryngoscopy. Excessive soft tissue around the cheeks and face leads to difficult bag and mask ventilation. Because of their poor respiratory mechanisms, difficulty with bag-mask ventilation, and difficulty with tracheal intubation, patients with morbid obesity are considered high-risk candidates for airway manipulation (3). These include early airway closure, micro-atelectasis, decreased chest wall compliance, decreased functional residual capacity (FRC), and increased requirements for oxygen. Because the supine position leads to accelerated desaturation in patients with morbid obesity by aggravating early airway closure and atelectasis and further lowering FRC, certain modifications are needed in these patients during intubation. To facilitate intubation in these patients, the “ramp” position is recommended. In this position, the external auditory meatus must be positioned in the same horizontal position as the sternum of the patient. This position will improve mask ventilation, lung capacity, pulmonary compliance, better visualization of vocal cords, and offer a longer safe apnea period. Pre-oxygenation of these patients is very important. Due to lower FRC, high-quality pre-oxygenation is essential. When compared to patients with a normal BMI, these patients have a shorter safe apnea time and a faster time to desaturation (3). At least 5 to 10 minutes of pre-oxygenation with 100% oxygen is recommended. The ODEPHI trial (2021), a multicenter randomized study, demonstrated that high-flow nasal oxygen (HFNO) during gastrointestinal endoscopy reduces the incidence of desaturation compared to traditional oxygen therapy (4). HFNO is an advanced oxygenation technique that provides a higher fraction of inspired oxygen (FiO2) than standard systems, with flow rates reaching up to 70L/minute (5). Since we don’t have HFNO in our department, we used

5 minutes of pre-oxygenation with 10L/min of oxygen via face mask and successfully increased the oxygen saturation in the patient from 93% to 99% before induction. Our initial plan for anesthesia was to perform awake intubation, but because our patient had GERD, we decided to use rapid sequence intubation versus awake intubation. We were fully aware of all the complications that can come with securing the airway in morbidly obese patients, we were prepared in advance, and we managed to avoid any complications during intubation. Our patient underwent the planned surgical procedure successfully without major complications.

Conclusion: Obesity is a condition that can have negative impacts on all organs and organic systems. Since the prevalence of obesity is increasing, anesthesiologists should adjust to the needs of these patients. With careful planning and preparation, obese patients can be successfully managed. Anesthetic management of these patients is challenging and requires a multidisciplinary approach to assure their safety. Before the intervention, the proper position of obese patients is very crucial. “Ramp position”, as previously discussed, is very beneficial. This posture allows gravity to assist in the downward displacement of the diaphragm, improving lung capacity and chest wall expansion (3). Additionally, since the period of apnea can lead to rapid desaturation, it is essential to maximize oxygen reserves through effective pre-oxygenation before induction. This case report emphasizes the critical importance of proper positioning of obese patients, and pre-oxygenation, and demonstrates that with proper planning and preoperative assessment, these patients can be managed safely.

References:

1. World Health Organisation. Obesity and overweight. 2021Last accessed on 2022 Jan 15 Available from: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight.
2. Liew, Wan Jane; Negar, Asadi; Singh, Prit Anand. Airway management in patients suffering from morbid obesity. *Saudi Journal of Anaesthesia* 16(3):p 314-321, Jul–Sep 2022. | *DOI:* 10.4103/sja.sja_90_22. https://journals.lww.com/sjan/fulltext/2022/16030/airway_management_in_patients_suffering_from.7.aspx.
3. Paul K.Sikka, Shwan T.Beaman, James A.Street. Basic Clinical Anesthesia-Obesity, Ricky Harika, Cynthia Wells, ISBN 978-1-4939-1736-5 ISBN 978-1-4939-1737-2. ISBN 978-1-4939-1736-5 ISBN 978-1-4939-1737-2 (eBook) DOI 10.1007/978-1-4939-1737-2.
4. Nay MA, Fromont L, Eugene A, et al. High-flow nasal oxygenation or standard oxygenation for gastrointestinal endoscopy with sedation in patients at risk of hypoxaemia: a multicentre randomized controlled trial (ODEPHI trial). Br J Anaesth 2021;127(1):133–142. DOI: 10.1016/j.bja.2021.03.020.
5. Shrividya Chellam, Kajal Dalal, Pratibha V Toal. Anesthesia Management of a Morbidly Obese Patient in a Nonbariatric Setup Using HFNO: A Case Report, Published on: 29 December 2023, https://www.riajournal.com/doi/pdf/10.5005/jp-journals-10049-2038.