Case Report

DOI: 10.7860/JCDR/2024/72598.19881

Anaesthesia Section

Anaesthesia for Laparoscopic Abdominal Surgery in a Morbidly Obese Female with Hypothyroidism and Hypertension: A Case Report

SANJYOT NINAVE[1], SAIESH RAUT DESSAI[2]

ABSTRACT

Obesity is characterised by a body weight that surpasses the expected or ideal weight by over 10%, considering factors such as height, age, body build, and sex. Another way to define obesity is based on body fat content: a male is considered obese if body fat exceeds 25% of his total weight, while a female is considered obese if body fat exceeds 30%. Abdominal obesity, prevalent in 40% of women in India, poses significant challenges in the realm of anaesthesia, particularly during laparoscopic abdominal surgeries. The co-existence of morbid obesity, hypothyroidism, and hypertension present intricate medical conditions that demand precise management. During the surgical procedure, issues related to large intraabdominal tumours and airway maintenance impact respiratory and circulatory dynamics. Notably, intraoperative challenges, including bronchospasm, hypotension, and respiratory acidosis, were addressed to ensure the patient's well-being and a successful surgical outcome. The present case report provides insights into the comprehensive management of high-risk patients undergoing laparoscopic abdominal surgery. It underscores the significance of tailored anaesthesia strategies to mitigate complications and ensure a favourable postoperative recovery. This report presents the case of a 59-year-old female with obesity (BMI: 39.6 kg/m^2), hypothyroidism, and hypertension who underwent laparoscopic abdominal surgery and discusses managing intraoperative challenges, such as bronchospasm, hypotension, and respiratory acidosis, and the postoperative care for successful patient recovery.

Keywords: Difficult airway, General anaesthesia, Obesity, Systemic diseases

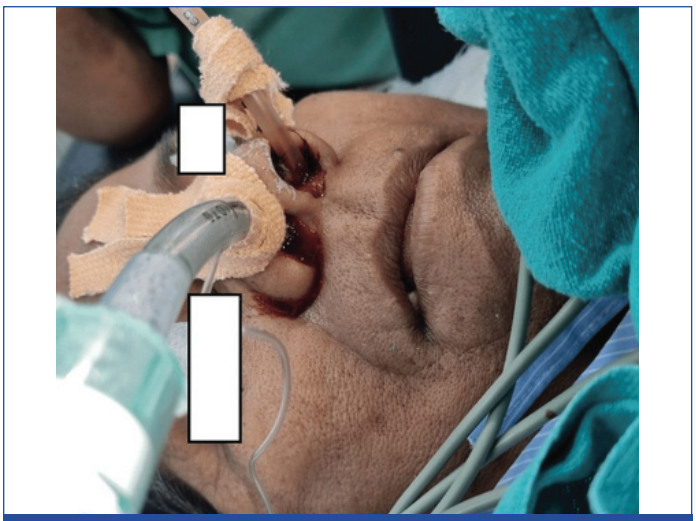
CASE REPORT

Preoperative assessment: A 59-year-old obese female para four, living 4, total body weight 109 kg, with a height of 166 cm (BMI= 39.6), presented with a history of bleeding per vagina for two months. She was diagnosed with papillary adenocarcinoma (endometrium carcinoma) and was posted for laparoscopic hysterectomy. She also added that she had a dry cough for two days. Her history revealed that she was diagnosed with hypothyroidism four years ago, for which she was on tab thyroxine 50 mcg, and hypertension for one year, for which she was on tab amlodipine 5 mg once a day. The patient's preoperative evaluation revealed missing upper and lower incisors, a large tongue and adequate mouth opening, and mallampatti grade 3 adequate neck mobility in full range. During the respiratory examination, the evaluation showed her respiratory rate was 25/minute, with decreased bilateral basal air entry. Examination of the lower back did not show a normal vertebral column and bony landmarks due to massive fatty tissues. The patient had a mild restriction on pulmonary function tests (FEV1/FVC:72%). Her complete blood profile, thyroid profile and echocardiography were within normal limits. Chest X-ray showed increased bronchovesicular markings. Blood pressure was well-controlled between 130/80 to 140/90 mmHg. It was monitored on a four-hourly basis; her random blood sugar was 95 gm/dL, and the patient was classified as an ASA class 3, indicating significant systemic disease. An 18 G intravenous cannulas were secured in the bilateral upper limb.

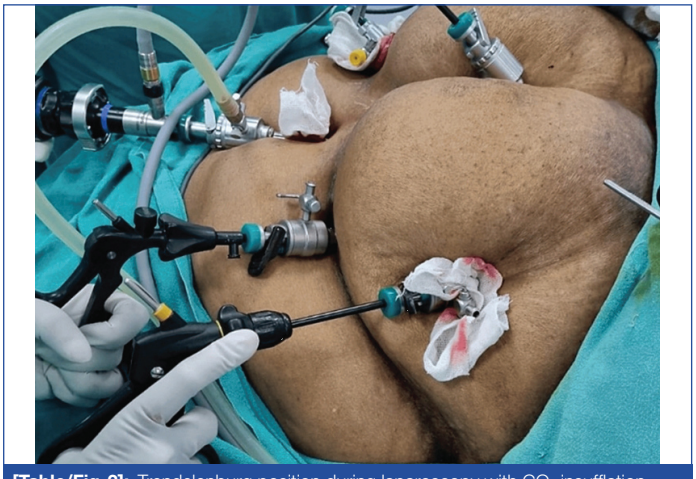
Anaesthesia plan: Oral and written consent from the patient was obtained. Considering the patient's condition preoperatively and anticipated risks, the anaesthesia plan included both epidural and general anaesthesia. The patient was nil per os for eight hours. Intraoperatively, an 18G Tuohy-epidural needle was placed in the L2-3 vertebral space for pain management after local anaesthetic application at the site of the prick. The epidural catheter was fixed at 9 cm at L2-3 space, following which a test dose was given with an injection of 2% lignocaine with adrenaline 3 mL. After general anaesthesia, 7fr central venous access was secured with the right Internal Jugular Vein (IJV) using the Seldinger technique. For invasive blood pressure monitoring, a 20 G arterial line was secured, as she was a known case of hypertension and blood loss was expected. Two packed cells and four platelet concentrates were reserved for the patient. A difficult airway cart was kept ready for difficult airway instrumentation and access. Blood pressure was 140/80 mmHg, pulse was 82/min, and SpO_2 was 94% on room air prior to the administration of anaesthesia. Intraoperatively, the left nostril was prepared for nasal intubation in view of prolonged ventilation with xylometazoline nasal drops and lignocaine jelly. The patient received an injection of pantoprazole 40 mg i.v. and nebulisation with lignocaine 4%. Injection of glycopyrrolate 0.004 mg/kg, injection of midazolam 0.05 mg/kg, and injection of fentanyl one mcg/kg were given before induction and sevoflurane was used as an inhalational agent. After confirming mask ventilation, the induction was achieved with an injection of propofol 2 mg/kg and a muscle relaxant injection of succinylcholine 2 mg/kg.

Nasal intubation with an armoured flexo-metallic tube (size 7.0) was performed using direct laryngoscopy using McCoy blade 4, and the tube position was confirmed with bilateral equal air entry and capnography [Table/Fig-1]. Ryles tube 14 fr was inserted. The patient was kept in Trendelenburg [Table/Fig-2]. A tidal volume of 450 mL with a respiratory rate of 25/minute was set with Positive End Expiratory Pressure (PEEP) 5 cm H_2O. Anaesthesia was maintained with inhalational sevoflurane and vecuronium top-up of 1 mg every 30 minutes. During surgery, there was sudden desaturation (SpO_2 70%) with decreased bilateral air entry. Prompt intervention with 100% oxygen, salbutamol puff via endotracheal tube, and 125 mg

aminophylline i.v. diluted in 10 mL normal saline slowly given over 10 minutes and 125 mg in 100 mL normal saline at a rate of 0.8 mg per minute helped alleviate the bronchospasm. The endotracheal tube was repositioned after encountering resistance while changing the patient's position. The patient experienced sudden hypotension (80/35 mmHg) intraoperatively, managed with phenylephrine 100 mcg bolus followed with 50 mcg after 10 minutes. A continuous phenylephrine infusion was initiated at 10-35 mcg/min to maintain the systolic blood pressure between 100-120 mmHg. Bolus 500 mL of ringer lactate was given once blood pressure was maintained. Tidal volume and respiratory rate were adjusted to maintain $EtCO_2$ between 30 to 40 mmHg. Blood loss was around 200 mL. The patient was put on mechanical ventilation with adjustments to the ventilator settings to correct respiratory acidosis caused by pneumoperitoneum. An Arterial Blood Gas examination (ABG) after CO_2 deflation revealed a pH of 7.336, pCO_2 of 40.1 mmHg, and pO_2 of 97.2 mmHg HCO_3 of 22 mmol/L. The total duration of surgery was four hours and 30 minutes, following which the patient was shifted to the surgical i9/u with an ET tube in situ. The patient was kept on midazolam infusion at 2 mg/hour. Postoperative epidural analgesia with bupivacaine 0.125% 10 mL over 10 minutes was initiated for pain management twice a day and the catheter was removed on 3rd postoperative day. Postoperatively, the patient was on Continuous Positive Airway Pressure (CPAP) with a FiO_2 of 65% and PEEP of 6. The ABG results were 7.358 pH, 42.31 mmHg CO_2, and 168 mmHg O_2, HCO_3 of 29 mmol/L. The patient was weaned off midazolam infusion and shifted to a T-piece in the morning (POD1). Nebulisation with budesonide 0.5 mg (2 mL) and intravenous injection of hydrocortisone 100 mg was administered for 48 hours. Hemodynamically stable, the patient was extubated on POD1 and post-extubating ABG was within normal range.



[Table/Fig-1]: Airway secured via nasal intubation using flexometalic endotracheal tube 7.0 mm.



[Table/Fig-2]: Trendelenburg position during laparoscopy with CO_2 insufflation.

DISCUSSION

The prevalence of abdominal obesity in India is 40% in women. The findings show that 5-6 out of 10 women aged 30-49 years are abdominally obese [1]. It is associated with various complications for general anaesthesia, including Obstructive Sleep Apnoea (OSA), hypoventilation, and difficulties in intubation [2]. Body Mass Index (BMI) serves as a measure of obesity. Overweight is defined as having a BMI of 25 to 29.9 kg/m^2, whilst obesity is defined as having a BMI of 30 or above. Asian and Black African-Caribbean ethnic groups and elderly persons are more at risk than other ethnic groups [3]. Risks of laparoscopic surgery include visceral and vascular damage, complications associated with extremes of positioning, venous gas embolism, and pulmonary atelectasis [4].

Operation Theatre (OT) tables have weight limits. When dealing with obese patients, it is crucial to consider both the weight-bearing capacity of the OT table and the risk of pressure-related injuries. The patient's high-risk status required a detailed anaesthesia plan, including a combination of epidural and general anaesthesia. Morbid obesity, hypothyroidism, and hypertension are common medical conditions that complicate anaesthesia management. Managing this obese female patient with multiple comorbidities requires a comprehensive and multidisciplinary approach. Obesity and OSA are prevalent high-risk disorders that affect management. Obese patients often have reduced lung volumes and increased airway resistance, which can make ventilator management more challenging. They may also be at higher risk for complications such as atelectasis [5].

OSA is characterised by recurrent episodes of upper airway obstruction during sleep, leading to hypoxaemia (low blood oxygen levels) and disrupted sleep patterns. Patients with OSA may have underlying respiratory compromise and may be at increased risk for postoperative complications, including respiratory failure and difficulty with extubation. A thorough assessment of the patient's medical history, airway, and cardiovascular status was conducted to identify potential risks and tailor the anaesthetic plan accordingly. The anaesthesia plan, which included both epidural and general anaesthesia, was well-suited for this case to achieve adequate pain management and haemodynamic stability. With significant risk factors present, aspiration prophylaxis should have been considered [6]. Absent upper and lower incisors and a large tongue necessitated careful airway management. Supraglottic airway devices, McCoy blades, video laryngoscopes, and fiberoptic endoscopes should all be accessible as standard airway adjuncts. The decision to use a nasal intubation technique with an armoured flexo metallic tube was appropriate as the patient might require prolonged ventilation. Epidural analgesia was employed to provide adequate postoperative pain relief and minimise the need for systemic opioids, which could potentially worsen respiratory function. Obese patients develop hypoxaemia within 2-4 minutes after apnea, even with adequate preoxygenation [7]. Difficulties encountered in the bag and mask ventilation can be overcome by the E-C clamp technique or the Two-hand Thenar Eminence technique [8].

Obesity affects drug pharmacokinetic and pharmacodynamic profiles. The volume of distribution of lipophilic drugs is more significant than in normal-weight patients, whereas the hydrophilic drugs do not vary as much. Recently, the guidelines for administering anaesthetic medications for obese individuals were reported in 'Pharmacokinetics of Anaesthetic Drugs at Extremes of Body Weight' by Hebbes CP and Thompson JP [9]. With a few exceptions, lean body weight is often the proper scalar to compute pharmacological dosages. Suxamethonium is dosed according to total body weight, while emergency drugs like noradrenaline and adrenaline are dosed according to optimal body weight. Desflurane and sevoflurane, which work quickly and have low blood gas partition coefficients, can limit absorption into adipose tissue, decreasing the possibility of sedation and poor respiratory performance [5].

The pneumoperitoneum causes an increase in intraabdominal pressure. As Intra-Abdominal Pressure (IAP) increases, SVR also increases due to the compression of the abdominal aorta [4]. Inferior vena cava compression reduces preload and may decrease cardiac output, thus causing blood pressure to fall. This and intrathoracic pressure further reduce cardiac output [4].

Bradycardia is one of the complications of laparoscopy. Peritoneal insufflation causes stretching of the peritoneum, which causes increased vagal tone. Rapid CO_2 inflation can cause rapid peritoneal stretching, which triggers a vagal response. Various precautions have been established to prevent this, such as limiting the peritoneal filling pressure to 15 mmHg. This can be managed by decreasing the insufflation flow rate [10]. Premedication with glycopyrrolate has been shown to reduce incidences of bradycardia due to peritoneal stretch. During surgery, vital signs, oxygen saturation (SpO_2), and end-tidal CO_2 ($EtCO_2$) levels were continuously monitored. Adequate SpO_2 was maintained between 96-97%. Sudden bronchospasm and desaturation required prompt intervention, with repositioning of the endotracheal tube and appropriate bronchodilator therapy. Respiratory changes occur due to increased IAP and Trendelenburg positioning. Diaphragmatic movement is restricted when the abdomen is distended with CO_2, leading to elevated intra-thoracic pressure, decreased pulmonary compliance, and a lower FRC. Thus, leading to pulmonary atelectasis and hypoxaemia. The pneumoperitoneum causes an increase in the IAP, which raises the diaphragm, resulting in the collapse of basal lung tissue and, thus, a decrease in FRC [11]. Intraoperative hypotension was managed with adequate fluid maintenance and continuous infusion of phenylephrine to maintain the blood pressure within the target range. Complete muscle relaxation should be provided for adequate pneumoperitoneum. Raised IAP can lead to hypercarbia. Therefore, vigilant $EtCO_2$ monitoring is required. If there is a rise in $EtCO_2$ above baseline, the abdomen should be desufflate and changed to reverse the Trendelenburg position [4].

Comprehensive intraoperative monitoring ensures timely detection and management of complications, such as hypotension, bronchospasm, or desaturation. For pneumoperitoneum, ventilation settings were adjusted to maintain adequate ventilation and to correct respiratory acidosis after CO_2 deflation. During invasive ventilation, obese patients require higher PEEP [12]. Postoperative pain management was achieved using epidural analgesia with bupivacaine.

CONCLUSION(S)

The anaesthetic management of laparoscopic abdominal surgery in a morbidly obese female patient with multiple comorbidities and abnormal airway characteristics presented numerous challenges and require a comprehensive approach. In obese patients points to be considered are drug dose calculation, perioperative diseases and its optimisation, difficult airway and postoperative chances of compromised airway. The combination of epidural and general anaesthesia, meticulous monitoring, and prompt intervention allowed successful surgery and postoperative recovery. However, complications such as bronchospasm and intraoperative hypotension highlight the importance of vigilant monitoring and preparedness to manage high-risk patients effectively- a multidisciplinary approach, with continuous communication between the anaesthesia team, surgeon, and ICU staff is essential for achieving favourable outcomes. Adaptations to management strategies for similar high-risk patients in the future could be considered to mitigate observed complications, which would include enhanced preoperative assessment, interdisciplinary collaboration, and specialised monitoring protocols.

REFERENCES

[1] Chaudhary M, Sharma P. Abdominal obesity in India: Analysis of the National Family Health Survey-5 (2019-2021) data. Lancet Reg Health Southeast Asia. 2023;14:100208. Doi: 10.1016/j.lansea.2023.100208.

[2] Juvin P, Lavaut E, Dupont H, Lefevre P, Demetriou M, Dumoulin JL, et al. Difficult tracheal intubation is more common in obese than in lean patients. Anesth Analg. 2003;97:595-600. Doi: 10.1213/01.ANE.0000072547.75928.B0.

[3] Stegenga H, Haines A, Jones K, Wilding J. Identification, assessment, and management of overweight and obesity: Summary of updated NICE guidance. BMJ. 2014;349:g6608. Doi: 10.1136/bmj.g6608.

[4] Hayden P, Cowman S. Anaesthesia for laparoscopic surgery. Contin Educ Anaesth Crit Care Pain. 2011;11(5):177-80.

[5] Wynn-Hebden A, Bouch DC. Anaesthesia for the obese patient. BJA Educ. 2020;20(11):388-95.

[6] Clark K, Lam LT, Gibson S, Currow D. The effect of ranitidine versus proton pump inhibitors on gastric secretions: A meta-analysis of randomised control trials. Anaesthesia. 2009;64:652-57. Doi: 10.1111/j.1365-2044.2008.05861.x.

[7] Ramachandran SK, Cosnowski A, Shanks A, Turner CR. Apneic oxygenation during prolonged laryngoscopy in obese patients: A randomised, controlled trial of nasal oxygen administration. J Clin Anesth. 2010;22:164-68. Doi: 10.1016/j.jclinane.2009.05.006.

[8] Soleimanpour H, Sarahrudi K, Hadju S, EJ Golzari S. How to overcome difficult-bag-mask-ventilation: Recents approaches. Emerg Med. 2012;2(4):01-03.

[9] Hebbes CP, Thompson JP. Pharmacokinetics of anaesthetic drugs at extremes of body weight. BJA Educ. 2018;18:364-70. Doi: 10.1016/j.bjae.2018.09.001.

[10] Heyba M, Khalil A, Elkenany Y. Severe intraoperative bradycardia during laparoscopic cholecystectomy due to rapid peritoneal insufflation. Case Rep Anesthesiol. 2020;2020:1-6.

[11] Srivastava A, Niranjan A. Secrets of safe laparoscopic surgery: Anaesthetic and surgical considerations. J Minimal Access Surg. 2010;6(4):91.

[12] De Jong A, Wrigge H, Hedenstierna G. How to ventilate obese patients in the ICU. Intensive Care Med. 2020;46:2423-35. Doi: 10.1007/s00134-020-06286-x.

PARTICULARS OF CONTRIBUTORS:

1. Professor, Department of Anaesthesia, Datta Meghe Institute of Higher Education and Research, Wardha, Maharashtra, India.
2. Junior Resident, Department of Anaesthesia, Datta Meghe Institute of Higher Education and Research, Wardha, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Saiesh Raut Dessai,
Ragpbaji Boys Hostel, DMIHER, Sawangi, Wardha-403714, Maharashtra, India.
E-mail: saieshrautdessai4321@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: May 31, 2024
- Manual Googling: Jun 22, 2024
- iThenticate Software: Jul 09, 2024 (9%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **May 30, 2024**
Date of Peer Review: **Jun 19, 2024**
Date of Acceptance: **Jul 10, 2024**
Date of Publishing: **Sep 01, 2024**