Anesthesia Management in Laparoscopic Cholecystectomy: A CASE REPORT

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ABSTRACT

Background : Laparoscopic cholecystectomy is a minimally invasive procedure for treating cholelithiasis, offering reduced pain and faster recovery. However, it presents challenges in anesthesia management due to the effects of CO2 insufflation and patient positioning on respiratory and cardiovascular functions.

Case Illustration : A 56-year-old female with cholelithiasis underwent laparoscopic cholecystectomy after presenting with right upper abdominal pain and nausea. Preoperative evaluation revealed no significant comorbidities. General anesthesia was induced with fentanyl, propofol, and atracurium, followed by intubation with an endotracheal tube. Intraoperative monitoring included ECG, pulse oximetry, blood pressure, and EtCO2. The procedure proceeded without complications, and the patient was extubated and transferred to recovery.

Conclusion : Anesthesia management for laparoscopic cholecystectomy requires careful monitoring of respiratory and cardiovascular changes caused by CO2 insufflation and positioning. In this case, a coordinated approach with multimodal analgesia and vital sign monitoring ensured stable hemodynamic and successful recovery, emphasizing the importance of tailored anesthesia strategies for laparoscopic procedures.

Keywords : Laparoscopic cholecystectomy, anesthesia management, CO2 insufflation

INTRODUCTION

Laparoscopic cholecystectomy has become the gold standard for the treatment of cholelithiasis due to its numerous advantages, including reduced postoperative pain, quicker recovery times, and smaller incisions.[1] However, the procedure presents specific challenges regarding anesthesia management, primarily due to the physiological effects of carbon dioxide (CO2) insufflation and the positions required during surgery, which can impact respiratory and cardiovascular function.[2,3] This case report details the anesthesia management of a 56-year-old female patient undergoing laparoscopic cholecystectomy for cholelithiasis, highlighting the approach to anesthesia induction, intraoperative monitoring, and postoperative management.

CASE ILLUSTRATION

The patient, a 56-year-old female, was diagnosed with cholelithiasis and presented with right upper abdominal pain and nausea, with no vomiting or fever for the past three months. Her medical history was unremarkable, with no hypertension, diabetes, asthma, or previous surgeries. On physical examination, her vital signs were stable, with normal cardiovascular and respiratory findings, and no signs of jaundice or other organ abnormalities.

DISCUSSION

A 56-year-old female, presented with complaints of right upper abdominal pain, nausea (no vomiting), and no fever, lasting for the past three months. The patient has no history of hypertension, diabetes, allergies, or asthma, and has not undergone any previous surgeries. The patient was diagnosed with cholelithiasis and is scheduled for laparoscopic cholecystectomy.

During the laparoscopic procedure, CO2 gas insufflation was performed to create the operative space. CO2 was selected because it has the advantages of being non-flammable, non-explosive, easily eliminated from the body via the lungs, and highly soluble in blood.[4] However, CO2 insufflation can cause physiological changes in the cardiopulmonary system; thus, preoperative evaluation focuses on patients with severe heart or lung disease that could contraindicate laparoscopic procedures.[5] In this case, no abnormalities in the heart or lungs were found, which would contraindicate laparoscopic surgery. The necessary preoperative tests included complete blood count, electrolytes, and kidney function tests due to the potential risk of oliguria during the procedure. A preoperative chest X-ray is crucial, not only to detect any pulmonary abnormalities but also to evaluate postoperative

complications such as subcutaneous emphysema or pneumomediastinum.[5] The patient's laboratory results and chest X-ray were within normal limits.

Induction was performed using 2 mg of midazolam, 100 mg of propofol, 100 mcg of fentanyl, and 3 mg of atracurium, followed by endotracheal tube (ETT) intubation for airway management. Various anesthetic techniques can be used in laparoscopic surgery, but in this case, general anesthesia with endotracheal intubation, standard monitoring, and capnography were employed. This is crucial for monitoring hemodynamic and respiratory effects due to pneumoperitoneum and positional changes. Additionally, endotracheal intubation helps protect the airway and prevent aspiration.[5]

The patient's peak inspiratory pressure (PIP) was measured at <35 cmH2O, indicating that intra-abdominal pressure from the insufflation of gas was within normal limits. Laparoscopic surgery can cause changes in the respiratory system. Insufflation of the abdomen causes upward displacement of the diaphragm. Pulmonary compliance can be observed as an increase in PIP during positive pressure ventilation. In this patient, no hypercapnia was observed, with EtCO2 monitoring maintaining values between 35-40 mmHg. Additionally, skin color and turgor were assessed to monitor for hypercapnia and subcutaneous emphysema due to CO2 insufflation. Hypercapnia routinely occurs in all patients undergoing laparoscopic surgery due to CO2 absorption into the systemic circulation from the intraperitoneal cavity. The CO2 is then exhaled via the respiratory system.[5] Ventilator adjustments were made to increase the respiratory rate and tidal volume to ensure adequate minute ventilation with tolerable airway pressures.

CO2 insufflation can also cause physiological changes in the cardiovascular and respiratory systems, where the intra-abdominal insufflation pressure should not exceed 12-15 mmHg. Muscle relaxation and paralysis were administered during the surgery to allow for lower insufflation pressures (not exceeding 15 mmHg) and improved visualization of the operative field.[4] A total of 750 mL of crystalloid fluid was administered, as the patient must remain euvolemic during the procedure. The insufflation of gas increases intra-abdominal pressure, compressing large vessels, particularly the inferior vena cava, which decreases venous return and preload, leading to a reduction in cardiac output and potentially causing hypotension.[4] Intraoperative monitoring showed stable systolic blood pressure (100-120 mmHg).

The patient was positioned in reverse Trendelenburg, a position used for upper abdominal surgeries such as cholecystectomy. This position can affect preload and systemic vascular resistance, potentially leading to a decrease in cardiac output due to reduced venous return.[4] In this patient, euvolemia was maintained, ensuring hemodynamic stability.

An NGT (nasogastric tube) and Foley catheter were placed for gastric decompression, as CO2 can diffuse into the stomach and cause distension. The Foley catheter was also used for urinary decompression to facilitate better visualization of the operative field.[5]

The surgery lasted 2 hours and 5 minutes, and the patient was extubated postoperatively and transferred to the recovery room with the head-up position at 15 degrees, receiving oxygen via nasal cannula at 3 liters per minute. The patient was given 1 gram of intravenous paracetamol for postoperative pain management. The patient's postoperative pain, measured by the Numeric Rating Scale (NRS), was scored at 3. Postoperative pain typically occurs within the first 2 hours after the procedure. Shoulder pain after laparoscopic surgery is common, as residual CO2 in the peritoneal cavity can cause referred pain to the shoulder. Adequate gas evacuation by the surgical team helps minimize this discomfort. All patients should receive supplemental oxygen during recovery to mitigate the respiratory effects of pneumoperitoneum.[5]

Additionally, dexamethasone was administered as part of the antiemetic management to prevent postoperative nausea and vomiting (PONV), which is common after laparoscopic procedures. The patient's recovery proceeded smoothly without significant complications, and she was transferred to a regular care room.

CONCLUSION

Laparoscopic cholecystectomy is a highly effective and minimally invasive procedure for treating cholelithiasis, offering numerous benefits such as reduced postoperative pain, faster recovery, and smaller incisions. However, it presents unique challenges in anesthesia management due to the physiological changes induced by CO2 insufflation and the positioning of the patient. In this case, comprehensive anesthesia management was crucial to maintaining stable hemodynamic, adequate ventilation, and effective pain control. Through careful monitoring of respiratory and cardiovascular parameters, appropriate fluid management, and the use of multimodal analgesia, the patient underwent a successful procedure with minimal complications. Postoperative care focused on managing residual CO2 effects and ensuring optimal oxygenation, contributing to a smooth recovery. This case highlights the importance of an integrated approach to anesthesia, emphasizing the need for close monitoring and tailored interventions to address the specific challenges of laparoscopic surgery.

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