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Case Report

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Double-Lumen Tube Intubation In Prone Position In the Intraoperative Period

Fatma Gulgun Kilicaslan¹, Ayca Tuba Dumanli Ozcan¹, Sertac Cetinkaya¹, Mehmet Uçar¹, Esra Ozayar¹, Handan Gulec² and Levent Ozturk²

¹University of Health Sciences Anesthesiology and Reanimation Department

²Yildirim Beyazit University Anesthesiology and Reanimation Department

***Corresponding author:** Ayca Dumanli Ozcan, University of Health Sciences Ankara City Hospital, Department of Anaesthesiology and Reanimation.

E-mail: draycaozcan@gmail.com

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Introduction

Double-lumen endotracheal tubes (DLET) are the most commonly used airway equipment for single-lung ventilation. Functional residual capacity and arterial partial oxygen pressure increase as long as abdominal movement is not inhibited in the prone position, but chest wall and lung compliance remain unchanged. This case series discusses anesthesia management of esophagectomy cases in the prone position with the double-lumen tube.

Introduction

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Single lung ventilation (SLV) is widely used in many areas, such as thoracic surgery, esophagus, minimally invasive cardiac surgery and hemoptysis treatment [1, 2]. In thoracic surgeries, a deflated lung and an immobile surgical field are often requested, achieved with one-lung ventilation (SLV). Double-lumen endotracheal tubes (DLET) are the most commonly used airway equipment for SLV [3].

Due to the large diameter, and curved and rigid nature of DLETs, it may be challenging to place them in the supine position, even in the standard procedure. More than 30% of DLETs applied with the blind technique result in malposition, and their location needs to be confirmed with a fiberoptic bronchoscope [4, 5].

As long as abdominal movement is not prevented in the prone position, functional residual capacity and arterial partial oxygen pressure increase, but chest wall and lung compliance remain unchanged [6, 7]. The decreased cardiac output seen when returning to the prone position is considered to be a result of decreased stroke volume. The reduction in arterial pressure is compensated to some extent by compensatory sympathetic tachycardia and increased peripheral vascular resistance [8]. The prone position decreases cerebral blood flow and increases intracranial pressure by partial occlusion of the carotid and vertebral arteries and spinal vessels and compression of venous drainage [9].

This case series aimed to present the patients who were followed in the prone position with DLET in the perioperative period.

Case 1

A 73-year-old 45-kg female patient diagnosed with esophageal SCC due to swallowing difficulty was taken to esophagectomy surgery on 03.01.2022 after preoperative preparations were made. The patient had ASA 4 hypothyroidism, CRF, COPD, was a carrier of HCV, had previous PTE diagnoses, received neoadjuvant chemotherapy (5 cycles, last 1.5 months ago), and RT (1 month). The patient's baseline apex beat rate was 113/min, noninvasive arterial pressure value was 166/98 mmHg, and peripheral oxygen saturation (Spo₂) value was 92%. After arrhythmal 50 mg, propofol 150 mg, fentanyl 50 mcg, midazolam 2mg, and rocuronium 50 mg

were administered, the patient was intubated with a size 35 left DLET. The tube's location was confirmed by observation of the surgical site and auscultation methods.

The operation started while the patient was in a prone position. The thoracic cavity was entered through an incision made in the inferior of the right scapula. After the lung was deflated, dissection was started over the esophageal reflex. When the right lung was ventilated and oxygenated, and deflated again, it was observed that the endotracheal tube cuff created a full-thickness tear in the trachea. It was decided to switch to open surgery. The left lateral decubitus position was placed, and the opening in the right main bronchus was repaired. During the esophagogastrostomy, a defect of approximately 2 cm was observed in the patient's trachea. Tracheostomy was applied. The cannula was advanced distal to the opening. Trachea was repaired. A bilateral chest tube was inserted. Based on the patient's hemodynamic status, necessary blood products, fluid and electrolyte replacement was applied. During the case, steradine infusion was started in the patient. The patient was taken to the intensive care unit as intubated. The patient died on 04.01.2022 at 05:25 in the ICU.

Case 2

A 69-year-old female patient underwent esophagectomy surgery on 17.02.23 after preoperative preparations due to esophageal CA. The patient had ASA 2 hypothyroidism. The patient's baseline apex beat rate was 72/min, noninvasive arterial pressure value was 108/63 mmHg, and peripheral oxygen saturation (Spo₂) value was 96%. After arrhythmal 80 mg, propofol 200 mg, fentanyl 100 mcg, and rocuronium 50 mg were administered, the patient was intubated with a size 37 left DLET. The tube's location was confirmed by observation of the surgical site and auscultation methods. Left radial artery cannulation was performed and monitored. A central venous catheter was placed in the right jugular vein.

Massimo monitoring was done. The operation was started while the patient was in a prone position. In the prone position, CO2 was insufflated by making an incision from the medial inferior of the right scapula. The right lung was deflated. The esophagus was released distally up to the hiatus and proximal to the suprasternal notch. Then a chest tube was inserted through the lowest trocar and closed. The patient was returned to the supine position. The sagittal incision opened from the superior umbilicus in the obese position was insufflated with cO2 in the abdomen, and trocars were inserted. The stomach was released, pulled from the neck, and stomach anastomosis was done. Based on arterial blood gas values and hemodynamic status, necessary blood products, fluid and electrolyte replacement were applied to the patient. The hemodynamically stable patient was extubated and taken to the intensive care unit.

Case 3

A 58-year-old, 80-kg female patient was taken to thoracoscopic laparoscopic total esophagectomy surgery on 24.02.2023 after preoperative preparations due to esophageal SCC. The patient had ASA 3 DM, HT, RCC, and esophageal SCC diagnoses. She had received RT for 25 days and CT 5 times (last one month ago). The patient's baseline apex beat rate was 119/min, noninvasive arterial pressure value was 190/102 mmHg, and peripheral oxygen saturation (Spo₂) value was 92%. The patient underwent a preoperative erector spinae block. BIS monitorization was performed. Left radial artery cannulation was performed, and invasive arterial pressure was measured in the patient. A central venous catheter was placed in the right internal jugular vein. After arrhythmal 80 mg, propofol 200 mg, fentanyl 100 mcg, midazolam 2 mg, and rocuronium 70 mg, the patient was intubated with a size 35 left DLET. The tube's location was confirmed by observation of the surgical site and auscultation methods. The operation was started while the patient was in a prone position. After the right lung was deflated, a trocar was inserted under the scapula. The esophagus was released distal to the crus of the diaphragm and proximal to the apex of the lung. After one chest tube was placed in the thorax, the patient was closed and turned supine. After a median incision above the umbilicus, pneumoperitoneum was achieved with a Veress needle. The stomach was released. The stomach was released. An esophagogastric anastomosis was performed on the neck. Based on the patient's hemodynamic status, necessary fluid and electrolyte replacement was applied. The patient was taken to the intensive care unit as extubated.

Case 4

A 56-year-old, 50-kg male patient diagnosed with gastric adenocarcinoma, who presented with abdominal pain, underwent total gastrectomy and esophagojejunostomy surgery on 14.03.2023 after preoperative preparations were made. The patient had ASA 3 pancreatic Ca and gastric Ca diagnoses. He had received four cycles of CT. The patient's baseline apex beat rate was 72/ min, noninvasive arterial pressure value was 109/67 mmHg, and peripheral oxygen saturation (Spo.) value was 96%. An epidural catheter was inserted for postoperative analgesia. Right radial artery cannulation was performed and monitored. A 16 g vascular access was opened from the right and left arm brachial region. After arrhythmal 60 mg, propofol 140 mg, fentanyl 150 mcg, midazolam 2 mg, and rocuronium 50 mg were administered, the patient was intubated with a size 39 left DLET. The tube's location was confirmed by observation of the surgical site and auscultation methods. The operation started while the patient was in the supine position. The mass extending to the distal esophagus in the cardia was excised, and a Roux-en-Y anastomosis was performed. After the drains were placed, the patient was closed and placed in the prone position. The right lung was deflated. The thorax was entered under the right scapula. An area of approximately 3 cm in the distal esophagus was excised. Esophagojejunostomy was performed. The thorax tube was placed. Based on the patient's hemodynamic status, necessary fluid and electrolyte replacement was applied. One hundred sixty minutes after switching to SLV, the patient was taken to the intensive care unit as extubated.

Discussion and Conclusion

SLV is used in most thoracic surgeries today. Safer surgical intervention, increased visibility in the surgical field, immobility of the surgical field, and protection of the healthy lung from infected material and bleeding are among the main reasons for choosing an SLV as surgery [10].

DLET and bronchial blockers (BB) are most commonly used for SLV. BB is less preferred because it must be applied with FOB. Among the advantages of DLETs in SLV applications are their usefulness, allowing independent ventilation and aspiration of both lungs, ease of transition to one-lung and both-lung ventilation, and application of different ventilation modes to both lungs [11].

A fiberoptic bronchoscope (FOB) is used in patients who underwent elective thoracoscopic and laparoscopic-assisted esophagectomy to maintain the correct placement of the double lumen tube and eliminate problems such as DLT dislocation while placing the patient in the prone position. However, the routine use of fiberoptic bronchoscopy in DLT placement is controversial. It is more costly and time-consuming but an important tool for reintubation of a displaced DLT, especially in the prone position. It has been stated that an experienced FOB operator with good airway anatomy knowledge is required to successfully place the DLT in the prone position [12].

A study in the literature comparing the oxygenation during single lung ventilation in the prone position during esophagectomy with the lateral decubitus position showed that the prone position provides better oxygenation than the lateral decubitus position [13].

Although better oxygenation is achieved with the prone position in patients with the double-lumen tube in the intraoperative period, it should be kept in mind that many complications may develop, from tube displacement to tracheobronchial damage during a position change.

Acknowledgement

None.

Conflict of Interest

No conflict of interest.

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