Letter to the Editor

Anesthetic consideration of a patient with acquired tracheoesophageal fistula undergoing radical left colectomy for sigmoid cancer

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Introduction

Tracheoesophageal fistula (TEF) is an unusual connection that forms between the trachea and the esophagus. In adults, most TEFs are acquired, with over half of all cases arising in cases of esophageal or lung cancer (1). Acquired nonmalignant TEFs result from extended tracheal intubation, stenting, infection, trauma, radiation therapy, corrosive substance ingestion, prior surgeries in the affected area, and inflammatory diseases (1,2).

TEFs present significant challenges for anesthesia providers. Their location and size determine the potential for aspiration, hypoxia, and difficulties with ventilation in the operating room. In this case, we describe the anesthesia management of a 66-year-old male patient with a TEF who was scheduled for a radical left colectomy for carcinoma.

Case presentation

A 66-year-old male patient, with a height of 170 cm, weight of 47 kg, and body mass index (BMI) of 16.3 kg/m^2, had a diagnosis of sigmoid colon carcinoma and was scheduled for a radical left colectomy. The patient had a history of pulmonary tuberculosis (TB) and an untreated TEF, which was discovered during TB treatment. Chest computed tomography (CT) reported chronic bronchitis and emphysema in both lungs, with the left lung partially consolidated, and bilateral pneumonia in both lungs. A lung function test indicated moderate to severe restrictive ventilation dysfunction, and forced expiratory volume in the first second (FEV1) was only 1.81 L. No abnormalities were found in the preoperative laboratory tests. An esophagram was performed by orally administering an iodine contrast agent, revealing the presence of a linear contrast agent entering the right bronchus at approximately the T6 level. The results of the esophagography can be seen in *Figure 1A*. After carefully assessing the patient's condition and in close cooperation with the patient and his family, both thoracic surgery and interventional therapy experts recommended a conservative approach to managing the TEF at this stage. Due to the TEF, the patient was advised to avoid solid food until there were no adverse reactions such as choking with oral diet after surgery, and a percutaneous gastrostomy was performed for this purpose. Considering the patient's TEF, the surgical plan was modified from laparoscopic surgery to open surgery after consulting with the surgeon. As the TEF could lead to the entry of gas from the stomach during controlled ventilation, causing inadequate ventilation, we opted for a combination of epidural anesthesia and general anesthesia using sevoflurane to maintain spontaneous respiration in this case. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was provided by the patient for publication of this article and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

The patient entered the operating room at 12:07 pm. A 1 microgram per kilogram dose of dexmedetomidine was

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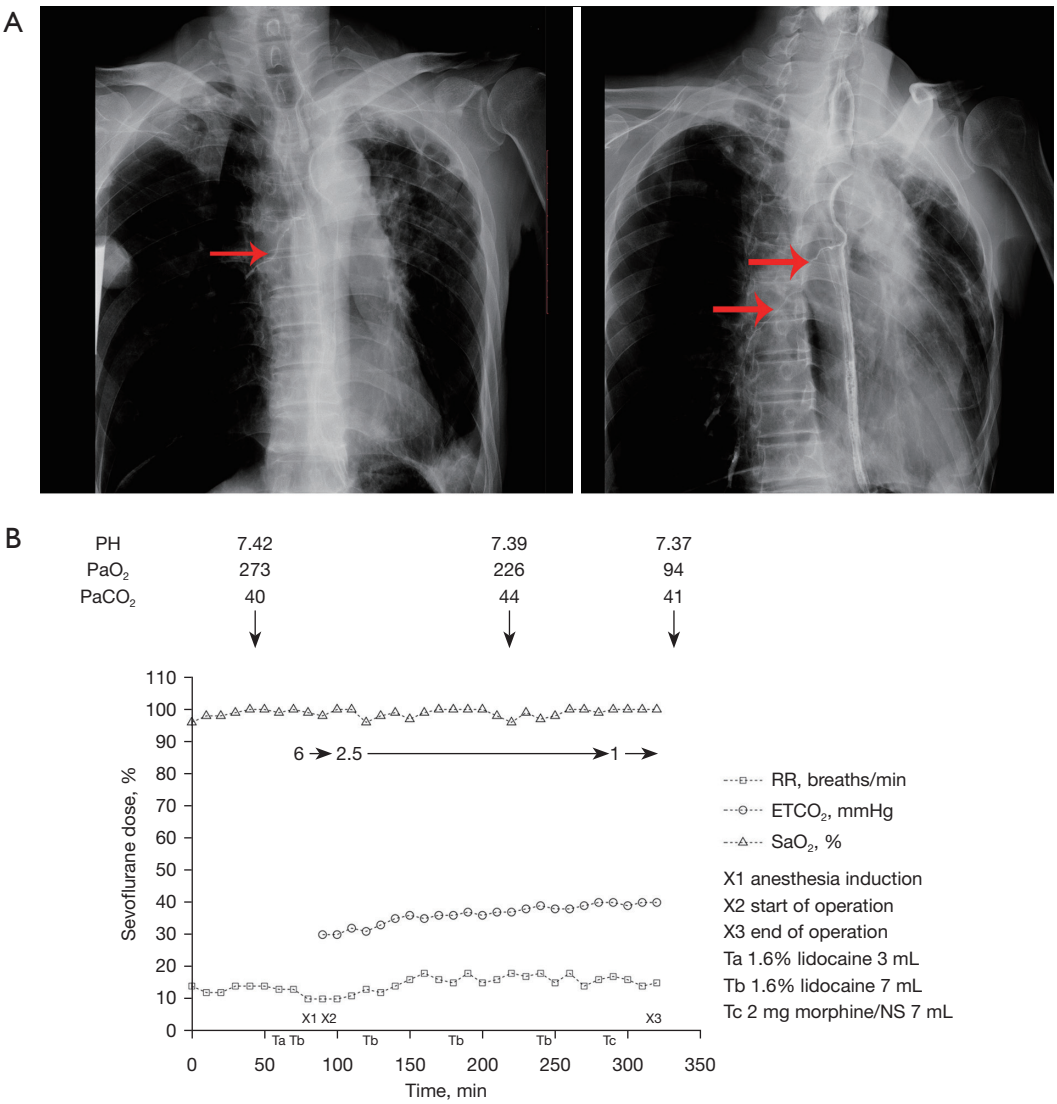

Figure 1 The esophagography and vital signs for the patient. (A) Result of esophagography. The red arrows indicate the iodine agent entering the right bronchus. (B) Vital signs throughout the surgical procedure. PH, pondus hydrogenii; PaO_2, partial pressure of dioxide; $PaCO_2$, partial pressure of carbon dioxide; RR, respiratory rate; $ETCO_2$, end-tidal carbon dioxide; SaO_2, arterial oxygen saturation; NS, normal saline.

intravenously administered over 15 minutes. While under local anesthesia, an arterial catheter [Arterial Cannula; Becton, Dickinson, and Co. (BD), Franklin Lakes, NJ, USA] was inserted, and an epidural catheter (Durasafe, BD) was placed into the epidural space at the T11–T12 level using a needle (Durasafe, BD). Following a 3 mL test dose of 1.6% lidocaine, 7 mL of 1.6% lidocaine was slowly injected into the epidural space. After 15 minutes, a sensory block was achieved at the T6–T12 level. Subsequently, general anesthesia was induced using 6% sevoflurane for 10 minutes. The entropy index displayed reaction entropy/state entropy (RE/SE) values of 54/48, with a respiratory rate of 10 breaths per minute. A Supreme laryngeal mask airway (SLMA) was then inserted, and the depth of anesthesia was maintained with 1–2.5% sevoflurane. During the operation, dexmedetomidine was intravenously administered at a rate of 3 mL per hour, and 7 mL of 1.6% lidocaine was injected into the epidural space every hour. Throughout the surgical procedure, the patient maintained spontaneous ventilation, as depicted in *Figure 1B*, which

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shows the vital signs. Approximately 30 minutes before the surgery's conclusion, 2 mg of morphine in a 7 mL saline solution was injected into the epidural space. The laryngeal mask was promptly removed after the surgery, and the patient was transferred to the intensive care unit (ICU) for intensive care. The patient was discharged from the ICU 2 days after the surgery and was released from the hospital after 15 days. The patient was under a poor nutritional status, anemia, and low albumin levels, resulting in slow recovery. He did not have an ileus, or an infectious complication. His feeding was restarted through the gastrostomy tube 6 days after the surgery, and he was allowed to eat orally after about a month.

Discussion

Acquired TEF is a challenging clinical situation that may pose significant challenges to anesthesia providers. Anesthesiologists need to develop corresponding airway management strategies based on the location and size of the fistula. Common problems include difficulty in oxygenation and/or ventilation caused by placing endotracheal tubes inside or not crossing the fistula, as well as atelectasis, bloating, and other issues (3).

If TEF is located above the tracheal carina, crossing the fistula at the end of an endotracheal tube can prevent stomach bloating. The first step is to pass the catheter over the protrusion and enter the right main bronchus. Once the catheter is confirmed to enter the right main bronchus, the next step is to pull the catheter outward to allow the tracheal catheter to enter the main airway. It should be ensured that the Murphy eye/oblique plane of the tracheal catheter is located in front, which will allow the catheter axis to block the fistula located on the posterior wall of the trachea (4). For very large TEFs, in order to prevent fistula ventilation, it is necessary to block the esophagotracheal fistula using a sleeved endotracheal tube under bronchoscopy or using a 2 or 3 Fr Fogarty catheter before placing an endotracheal tube. When the patient is supine, the catheter is more likely to pass through the fistula, which is located behind and in a dependent position. After placement, the balloon expands, the bronchoscope is removed, and the tracheal intubation is placed in a standard manner (5). If a gastrostomy has been placed, the Fogarty catheter can also be pushed into the fistula through the gastrostomy. However, in addition to being technically complex, the use of Fogarty catheters may also cause some problems including interrupted ventilation, central airway obstruction, and esophageal mucosal damage. Another option is to perform single lung ventilation on the right or left main bronchus until the fistula is ligated (4).

If the TEF is located near the carina, the correct positioning of the tracheal catheter may be difficult to achieve and maintain. Standard anesthesia management includes avoiding positive pressure ventilation and the use of muscle relaxants, as well as conscious tracheal intubation to prevent TEF ventilation (6). However, some studies have shown that for patients with small fistulas who do not have respiratory system damage, controlled ventilation is relatively safe (7).

Overall, the possible methods for airway management in TEF patients are as follows (6,8): induce general anesthesia by inhalation or intravenously (taking care to maintain spontaneous respiration); demonstrate adequate face mask ventilation with low inflation pressures, without causing gastric distention (optional—induce muscle relaxation and again demonstrate adequate mask ventilation); rigid bronchoscopy (if desired by the surgical team) to further characterize the airway, main fistula, presence of secondary fistulas, or other anomalies such as vascular rings. A Fogarty catheter can be placed during this step to occlude the fistula. Intubation either beside the Fogarty catheter, or below the fistula as described earlier.

General anesthesia with sevoflurane is often combined with regional anesthesia techniques, such as sacral canal blocks for lower abdominal surgeries, especially in preschool children (9). Inhalational agents are used in conjunction with a laryngeal mask airway (LMA) when spontaneous breathing is required (10). Epidural anesthesia often results in sympathetic blockade, leading to venous pooling, reduced venous return, decreased cardiac output, and hypotension (11). Although epidural anesthesia may meet surgical requirements, it can lead to hemodynamic instability, respiratory suppression due to a high level of anesthesia, incomplete muscle relaxation in the surgical area, and difficulty in effectively suppressing intraoperative reflexes. Patients frequently experience tension, anxiety, and adverse reactions such as visceral traction during epidural anesthesia, which can hinder the smooth progress of the surgery. The use of sevoflurane for general anesthesia allows for convenient control of the depth of anesthesia, suppression of various stress responses, and maintenance of hemodynamic stability during epidural anesthesia (9).

In this specific case, we employed a combination of epidural anesthesia and sevoflurane general anesthesia to maintain spontaneous respiration throughout the surgery. This case report underscores the potential

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benefits of maintaining spontaneous respiration through the combination of sevoflurane general anesthesia and epidural anesthesia in patients with TEF, especially when the fistula is located near or under the carina. Particular attention should be given to the anesthesia management of TEF patients during general anesthesia to prevent adverse outcomes.

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Footnote

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at https://qims.amegroups.com/article/view/10.21037/qims-24-179/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was provided by the patient for publication of this article and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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