CASE REPORT

Anesthetic Management of Supraglottic Tumors Undergoing Direct Laryngoscopy

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ABSTRACT

Background: Supraglottic tumors are a type of tumor in the larynx that often causes airway obstruction. Comorbidities such as pulmonary tuberculosis (TB) and malnutrition can threaten patient safety during surgery. Comprehensive special perioperative anesthetic management involving multidisciplinary procedures and good communication between anesthesiologists and surgeons is needed. The aim of this case report is to understand the anesthetic management of a patient with a supraglottic laryngeal tumor with comorbid pulmonary TB, atelectasis and malnutrition.

Case: A 44-year-old man came to the ear, nose and throat (ENT) clinic with complaints of shortness of breath since the previous month accompanied by pain while swallowing. The patient had a history of smoking and pulmonary TB. Computed tomography (CT) revealed a supraglottic tumor that was suspected to be malignant. The patient was programmed to undergo direct laryngoscopy for tissue biopsy.

Discussion: The patient was intubated with a size 5 nonkinking endotracheal tube (ET tube) on the inside, which was connected to a size 7 kinking ET tube on the outside because the glottis rima was narrowed because of a tumor in the supraglottis so that only a small ET tube could pass to secure the airway. In this patient, induction therapy was performed with propofol and opioids. Muscle relaxants are not given to maintain respiratory muscle tone, especially in patients with pulmonary TB and atelectasis, who require full function of the respiratory muscles due to impaired lung development.

Conclusion: Special perioperative management is needed in patients with supraglottic tumors with comorbid pulmonary TB, atelectasis and malnutrition. Airway management and the drugs and anesthesia induction techniques chosen must be agents that have minimal side effects on the respiratory tract and maintain respiratory muscle tone.

Keywords: airway management; direct laryngoscopy; malnutrition; pulmonary tuberculosis supraglottic; tumor

INTRODUCTION

Laryngeal tumors are the most common head and neck tumors and rank as the sixth most common tumor worldwide, with 177,400 new cases per year. The incidence of laryngeal tumors worldwide is approximately 3.6 new cases per 100,000 people each year, and the age-adjusted mortality rates are 1.9 and 0.3 per 100,000 people in men and women, respectively.[1]

Laryngeal tumors can be anatomically divided into glottic, supraglottic, and subglottic tumors. As many as 35% are supraglottic tumors, and 60–70% originate from the glottis. The main risk factors for supraglottic tumors are smoking and excessive alcohol consumption.[2] Supraglottic tumors have a worse prognosis than glottic tumors do. The worse prognosis is due to the abundant lymphatic drainage in the supraglottic area, which results in a higher rate of regional and distant metastases. Supraglottic tumors can interfere with basic daily life functions such as speaking, swallowing and breathing, so they require immediate action, one of which is surgery. Patients with supraglottic tumors often present with advanced conditions.[3] Handling this type of tumor requires special techniques and attention, especially in airway management. Supraglottic tumors cause narrowing of the larynx, so anesthesiologists tend to have difficulty intubating using an endotracheal tube (ET tube) to maintain airway patency during surgery. Often, an ET tube with an age-appropriate size has a diameter that is too large, so it cannot enter the trachea because of pressure from the tumor in the supraglottis, or the length of the ET tube is insufficient when an ET tube with a small diameter is used. Microlaryngeal tubes are needed for intubation procedures because they are small in diameter and suitable in length, so they can fit into the larynx and can be connected to a mechanical ventilator.[4] However, not all hospitals have this tool, so modifications are needed in the intubation procedure with a special approach.

Patients with supraglottic tumors sometimes present with comorbidities that can hinder surgery, such as pulmonary tuberculosis (TB). Pulmonary TB is a disease of the lungs caused by infection of the lungs caused by *Mycobacterium tuberculosis*, which can cause restrictive disorders in the lungs, making it difficult for the lungs to expand.[5] A multidisciplinary approach is essential to ensure a smooth process through the perioperative period, optimizing outcomes and minimizing discomfort without compromising safety at all times.[6] Patients with special conditions such as comorbid pulmonary TB, poor nutritional status and atelectasis require special anesthetic management to maximize patient outcomes.[7] This case report discusses anesthetic management and airway modification in a supraglottic tumor patient with comorbid pulmonary TB, atelectasis and malnutrition.

CASE

A 44-year-old man who had complained of shortness of breath for 1 month that worsened in the last 4 days came to the ear, nose and throat (ENT) outpatient clinic. The patient was diagnosed with a supraglottic tumor. Other complaints that were felt included a voice that became hoarse and began to disappear, pain when swallowing with a visual analog scale (VAS) score of 4 and swallowing problems. The patient had a history of smoking for approximately 20 years and a history of pulmonary TB.

On physical examination, the patient was found to be cooperatively conscious, with a blood pressure of 110/72 mmHg, pulse of 80x/minute, respiratory rate of 22x/minute, and SaO2 of 97% with a nasal cannula of 4 liters per minute. The patient's nutritional status was classified as malnourished, with a body weight of 39 kg, a height of 150 cm and a body mass index (BMI) of 17.3 kg/m2. Examination of the local status of the ENT on the tonsils was within normal limits. Flexible laryngoscopy revealed a 2x2 cm nonfriable mass in the supraglottis, the airway was difficult to evaluate, no mass was visible in the subglottis, the epiglottis was normal in size and shape, and no accumulation of sputum was detected.

The results of a computed tomography (CT) scan of the larynx with contrast agent revealed a non-enhanced, lobulated solid-cystic mass in the visceral space of the posterolateral aspect of the left false vocal fold measuring ±2.06 × 1.88 × 2.56 cm and multiple reactive lymphadenopathies in the regio colli bilateral region (Figure 1). The results of the preoperative blood laboratory examination and preoperative electrocardiography (EKG) examination were within normal limits. The results of a chest X-ray examination revealed active pulmonary TB, pleural effusion and atelectasis in the right lung (Figure 2).

Based on the results of flexible laryngoscopy performed by the previous operator, the mass did not appear fragile, and the patient had no previous history of coughing or vomiting blood; thus, we decided to continue with intubation. Before the procedure, the patient was premedicated with metoclopramide (10 mg IV), ranitidine (50 mg IV) 30 minutes before the procedure and atropine sulfate (0.25 mg IV).

Propofol (100 mg) was administered intermittently, and fentanyl (100 mcg) was given via an i.v. bolus. Sevoflurane inhalation, starting at 1, was gradually increased to 3 monitored anesthesia care (MAC). Intubation was performed via a modified ET tube with the help of an Insighter brand video laryngoscope and a size M blade to assist in visualization in anticipation of airway complications. ET tube modification involves connecting 2 ET tubes of different types and sizes. ET tube nonkinking no. 5 connected at the base with ET tube kinking no. 7 (Figure 3).

When sedation is deep enough, the ET tube is inserted nasally, and then the video laryngoscope is inserted slowly so that the tip of the blade does not touch the tumor. Magill forceps are used to help guide the tip of the ET tube to the rima glottis carefully. A suction catheter was also prepared.

The intubation process went quite smoothly, and the patient experienced only slight increases in heart rate and blood pressure from baseline. The operator was already in sterile condition when induction was performed so that when complications occurred that caused airway obstruction, a tracheostomy could be performed immediately. Next, the ET tube was connected to a mechanical ventilator machine in ventilator pressure control mode until a tidal volume (TV) of 6–8 cc/kg, RR of 14, FiO2 of 60%, and positive end expiratory pressure (PEEP) of 6 were reached when the patient started not breathing spontaneously.

Initially, the operator only performs a tumor biopsy, but after being viewed through direct laryngoscopy, the tumor was not fragile and was still operable, so tumor extirpation was performed. The location of the tumor did not reach the tracheal lumen, so intubation was not a problem.

Direct laryngoscopy was used to visualize the tumor mass in the supraglottis (Figure 4). The aim of direct laryngoscopy was initially only for biopsy, but in the end, it was followed by excision of the mass. Tumor excision was successful with minimal bleeding. Hemodynamics during surgery were quite stable, and no desaturation occurred. The operation took approximately 45 minutes. During the operation, the airway remains protected until the operation is completed without any obstruction or complications in the airway.

After the operation is completed, the patient is extubated consciously when the protective reflexes have returned to optimal, thereby reducing the risk of laryngospasm and aspiration. Awake extubation was performed without complications. The patient can breathe spontaneously quite adequately.

After being observed for some period, the patient was confirmed to have no obstruction from the airway because the tumor had been removed, breathing adequately, hemodynamics were stable, and the patient was then taken to the post-anesthesia care unit (PACU). Postoperative complaints included sore throat with a VAS pain scale score of 2–3.

The patient was given dexamethasone 10 mg iv to provide anti-inflammatory effects and reduce the risk of laryngeal edema and spasm. In addition, the patient was given analgesics in the form of paracetamol 1 g iv and dexketoprofen 50 mg iv. Opioids were not given because of the risk of respiratory depression.

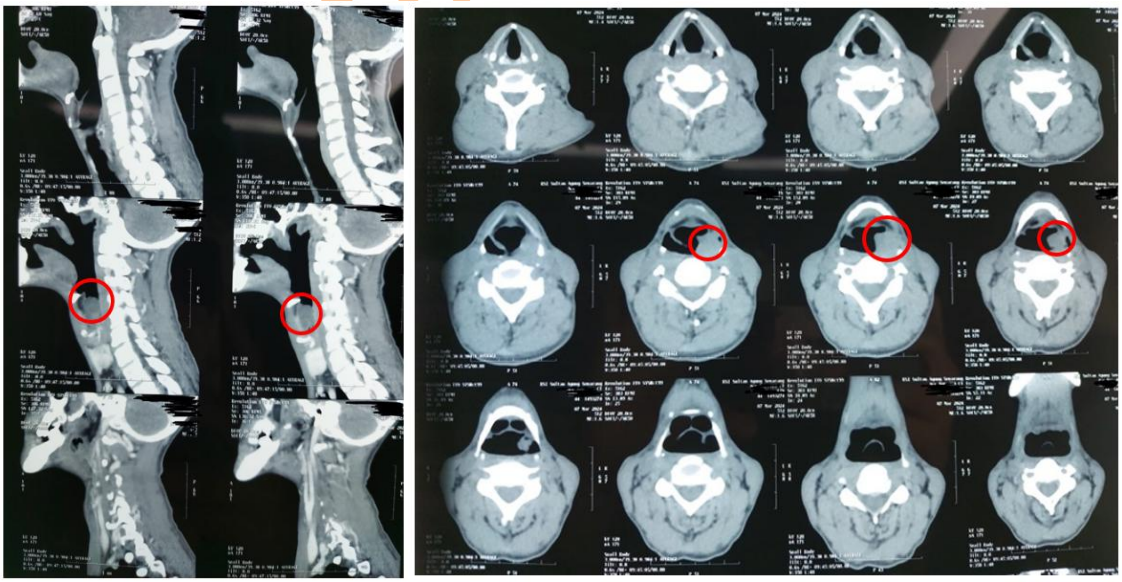

Figure 1. Sagittal and Axial Section CT Results for the Larynx. The CT results show a supraglottic tumor mass at the level of cervical vertebrae IV - VI, located on the left side of the epiglottis to the front of the left corniculate cartilage

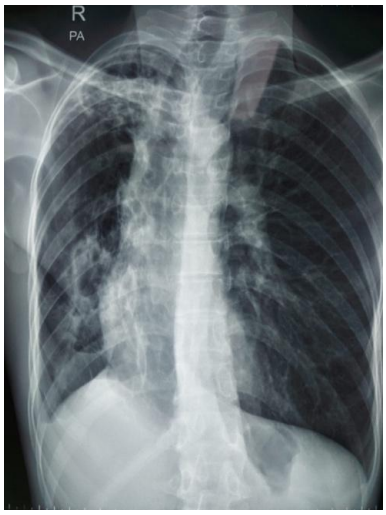

Figure 2. Posteroanterior projection thoracic X-ray examination results. There is a patchy infiltrate at the right pulmonary apex, tracheal deviation to the right, and a raised right diaphragm.

(A) (B)

Figure 3. (A) Visualization of Microlaryngeal Tube (red arrow) versus ET tube no. 5 (blue arrow); (B) Visualization of the 2 ET tubes Linked to this Report.

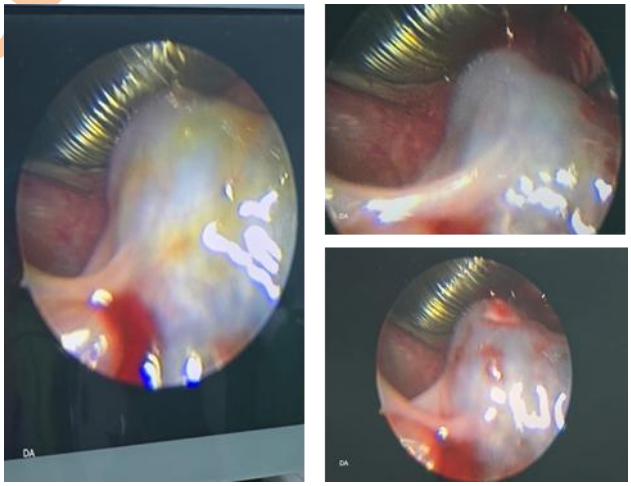

Figure 4. Visualization results of direct laryngoscopy

DISCUSSION

Based on this case, there are several challenges in performing anesthesia on this patient. Airway assessment is very important for determining the choice of anesthetic technique and airway management. Difficulty in airway management occurs due to a combination of anatomical disorders. The incidence of difficult intubation ranges from 0.5–2% in the general population to 8–10% in patients undergoing ENT surgery and increases to 28% in patients with airway tumors.[8,9] Supraglottic tumors are a type of tumor in the larynx that causes the airway to narrow, making it difficult for anesthesiologists to intubate. According to previous reports, in these cases, intubation can be performed via a microlaryngeal tube with an internal diameter of 5.0 mm and the use of a short-acting muscle relaxant agent to relax the respiratory tract muscles.[10] The challenge in this case is that there is no availability of microlaryngeal tubes or special ET tubes that have a small diameter but an appropriate length, so modifications are made with a special approach. In this case, an approach was taken by installing a small, nonkinking size 5 ET tube into the trachea so that it could enter the rima glottis, which had narrowed due to tumor pressure. Because the length of the 5.0 ET tube is too short for adult patients, the ET tube tube is connected to a size 7 ET tube on the outside, which is connected to the mechanical ventilator.

Muscle relaxant agents were not used in this patient because this patient had comorbidities, such as pulmonary TB and atelectasis in the right lung. The goal is to maintain the tone of the patient's respiratory muscles, thereby minimizing postoperative complications.[11] Previous research has shown that the use of muscle relaxant agents in general anesthesia is associated with an increased risk of postoperative pulmonary complications, such as respiratory failure, lung infection, atelectasis, bronchial spasm and other ventilation disorders.[12] In this case, propofol was induced in combination with a strong opioid, namely, fentanyl. Propofol was chosen because it has been proven to blunt airway reflexes, thereby reducing the risk of respiratory tract spasms. Fentanyl is a short-acting opioid that is suitable for use in direct laryngoscopy procedures because it has rapid and predictable elimination and has been shown to maintain cardiovascular stability and a rapid and smooth recovery during surgery.[13,14]

An inhalation agent with sevoflurane was used in this case for maintenance of anesthesia during surgery. The goal of using inhalation agents is to maintain spontaneous ventilation until a sufficient depth of anesthesia is obtained to allow direct laryngoscopy and visualization of the glottis. Sevoflurane is preferred because of its mild halothane-like odor, minimal airway irritation and low blood gas solubility.[15]

These patients also have poor nutritional status or malnutrition. Anesthesia in patients with malnutrition requires a special approach. Adequate rehydration before the induction of anesthesia is essential to avoid cardiovascular collapse. Malnourished patients are at risk of aspiration due to gastric distension and delayed gastric emptying, so placing a nasogastric tube before intubation and administering metoclopramide and ranitidine before induction are necessary.[16]

Moreover, malnourished patients are at high risk of experiencing intraoperative hypothermia, so efforts can be made to keep patients warm with warm IV fluids, patient warmers, heat and moisture exchange (HME) and careful monitoring of the perioperative core temperature. The position of the patient during surgery is very important for avoiding nerve compression because cushioning and loss of muscle mass often occur. Necrosis or stress-related fractures due to careless posture can occur in malnourished people.[17] In patients with malnutrition, there is also a risk of drug toxicity. Therefore, consideration should be given to drug dosage by calculating the reduced total body mass, albumin concentration, and volume of distribution. A smaller initial dose is necessary because electrolyte abnormalities can potentiate their action.[18]

In addition, the use of muscle relaxants should be avoided because of their effects on the patient's respiratory system. If forced to use muscle relaxants, it is better not to give them a reversal. This is because of the occurrence of arrhythmia, especially in patients with malnutrition. In addition, hyperventilation in malnourished patients should be avoided, as it can decrease potassium levels, thereby lowering the threshold for life-threatening arrhythmias. The use of halothane should be avoided because of its potential to cause arrhythmias. Given the potential for cardiovascular instability and decreased cardiac output, the anesthesiologist should have a low threshold for invasive cardiac monitoring.[19]

Extubation in malnourished patients requires special attention because they are at risk of experiencing difficulties during extubation due to impaired respiratory muscle function and impaired upper respiratory tract reflexes. Extubation is recommended if possible, when the patient is fully conscious and responds to commands. In addition, malnourished patients should be aware of the occurrence of hypoglycemia immediately after surgery. This is because the stress response to surgery can deplete glucagon stores. Glucose replacement is carried out carefully because of the risk of hyperinsulinemia after a glucose bolus, which can result in refractory hypoglycemia. Early enteral nutrition in malnourished patients is more advisable to prevent refractory hypoglycemia.[20]

The long-term effect of the anesthetic technique in this report is relatively minimal, with the main principle of maintaining optimal oxygenation, avoiding hypercarbia or hypercapnia, and avoiding prolonged desaturation to minimize side effects and complications such as respiratory disorders, delirium or postoperative cognitive dysfunction.[21]

CONCLUSION

Airway management is a challenge in cases of supraglottic tumors, so modifications are required by connecting two ET tubes of different sizes if a microlaryngeal tube is not available. In patients with comorbid pulmonary TB and atelectasis, the use of muscle relaxant agents is not recommended because it increases the risk of postoperative pulmonary complications.

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