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Case Report

# Challenges of Airway Management in Patients with a History af Total Laryngectomy: A Case Report

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**ABSTRACT**

A 45-year-old male patient was diagnosed with papillary thyroid cancer and was scheduled for total thyroidectomy. Three months before, he had undergone laryngeal surgery for squamous cell carcinoma of the larynx. Before the operation, an internal consultation was performed and no respiratory or cardiac complications were reported. Upon visiting Besat Hospital, the patient's vital signs were stable. Establishing a safe airway due to tracheostomy breathing was a challenge. But after consultation with the anesthesia team, the endotracheal tube was successfully inserted. This surgery lasted for 5.5 hours smoothly and without complications. The patient was transferred to the intensive care unit after the operation and was discharged in a stable condition after recovery.

## Introduction

Squamous cell carcinoma of the larynx is a type of cancer increasingly prevalent in today's modern lifestyle. This disease can become life-threatening based on various factors, including the tumor's location, the patient's age, gender, nutritional status, functional and psychological condition, and any comorbidities. One of the primary treatment options is laryngectomy surgery, with the extent of resection tailored to the patient's specific circumstances. In a total laryngectomy, the larynx, vocal cords, cricoid cartilage, three tracheal rings, and certain surrounding muscles are removed. Postoperatively, the patient is ventilated through a tracheostomy created in the neck [1-2].

## Case Report

The patient was a 45-year-old male who presented to the hospital with a diagnosis of papillary thyroid cancer and was scheduled for a total thyroidectomy. Three months prior, he had undergone a total laryngectomy due to laryngeal cancer. A preoperative internal medicine consultation was performed, revealing no cardiac or respiratory issues. Following the laryngectomy, the patient had been breathing through a tracheostomy and had not been taking any medications. Laboratory tests indicated normal thyroid hormone levels (T3 = 2.6, T4 = 89.6, TSH = 1.42). Upon admission for surgery, the patient's vital signs were as follows: HR = 86, RR = 13, BP = 128/64, $SpO_2$ = 94%, T = 36.6°C.

The primary challenge for the anesthesia team was establishing a secure airway. Given the patient's history of laryngectomy and the inability to ventilate with a mask due to the inaccessibility of the tracheostomy, the anesthesia specialists were concerned about how to proceed with anesthesia induction and intubation while minimizing the risk of hypoxia. After discussions between the anesthesia and surgical teams, it was decided to place a size 7.5 tracheostomy tube while the patient was awake, followed by intubation with an endotracheal tube after anesthesia induction.

Considering the patient's heightened sensitivity during the placement of the tracheostomy tube, the

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anesthesiologist opted to employ local anesthesia. Using ultrasound guidance, the recurrent laryngeal nerve was identified, and 20 mg of lidocaine was injected on each side of the patient's neck. Subsequently, an additional 20 mg of lidocaine was administered intratracheally via the tracheostomy.

Once the anesthesia team confirmed that adequate local anesthesia had been achieved in the tracheal area, a size 7.5 tracheostomy tube was successfully placed (Figure 1).

**Figure 1- Tracheostomy tube in the patient's airway**

After establishing a secure airway, the patient was administered propofol (120 mg) and sufentanil (30 mcg) to induce anesthesia. 100 seconds later, the tracheostomy tube was removed, and a size 7.5 Spiral Endotracheal tube was inserted into the trachea. After confirming the exact location of the tracheal tube by auscultating the lungs, the tracheal tube was fixed in place by the surgeon with sutures (Figure 2).

**Figure 2- Spiral Endotracheal tube in the patient's airway**

To maintain anesthesia, inhaled isoflurane was utilized alongside $N_2O$ at a rate of 1 liter per minute and $O_2$ at 5 liters per minute. Throughout the surgery, the patient was meticulously monitored by the anesthesia team. After 5.5 hours, the surgical procedure was completed, and the endotracheal tube was replaced with the tracheostomy tube. The anesthesia team then ensured that the patient's respiratory rate and tidal volume returned to normal ranges before transferring him to the intensive care unit. The patient was discharged from the ICU three days later.

## Discussion

This article aims to explore the Obstacles to airway control in laryngectomy patients are medical procedures. Awareness of these potential obstacles and associated risks is essential for establishing a secure airway. Such insights equip the anesthesia team to select the safest intubation technique and make informed decisions about the most effective airway management strategies.

Laryngeal cancer, a malignancy affecting the larynx, has shown increasing incidence over the past three decades. The prognosis and treatment outcomes for this disease largely depend on the timeliness of diagnosis and the choice of therapeutic approach [3].

For advanced and aggressive cases of laryngeal cancer, total laryngectomy is one of the primary treatment options. This surgical procedure involves the removal of the larynx, hyoid bone, cricoid cartilage, epiglottis, three tracheal rings, and portions of the surrounding musculature. Following surgery, a stoma is established at the front of the neck to facilitate patient ventilation [4].

In such cases, the anesthesia team's only option for airway access is through the stoma, which must be utilized in accordance with the specific procedural requirements

### Preoperative consideration

In the preoperative assessment of patients with a history of laryngectomy, evaluating the airway and respiratory system is among the anesthesia team's most critical responsibilities. Due to alterations in their respiratory anatomy, laryngectomy patients face a significantly higher risk of respiratory infections, which can present serious complications during anesthesia [5].

In the case presented, this evaluation was approached with utmost diligence. In consultation with internal medicine, the patient's respiratory system was thoroughly assessed, revealing no infections or abnormalities. The anesthesia team conducted a detailed examination of the patient's airway the day before surgery and ensured they were fully prepared to establish a secure airway.

### Perioperative consideration

Airway management in patients with a history of laryngectomy presents significant challenges and is a critical task. The improper use of techniques can facilitate the transmission of respiratory diseases from the patient to healthcare providers, potentially endangering the patient and leading to various complications after extubation [5-6]. Selecting an appropriate airway management technique requires a comprehensive assessment of the patient's airway, underlying health conditions, and the specific needs of the surgeon [7]. Given that surgical procedures in the neck region necessitate a secure airway, it is essential to minimize the risks of extubation failure and aspiration [8].

In the case presented, establishing an airway through mask ventilation during the induction phase was not feasible due to the patient's history of total laryngectomy. As a result, the anesthesiologist opted to secure ventilation by placing a tracheostomy tube. Since the patient was uncooperative during the placement of the tracheostomy tube, a nerve block and intratracheal technique were employed to maintain spontaneous breathing and facilitate the placement of the tracheostomy tube prior to the induction of general anesthesia.

Utilizing a nerve block during surgery proved advantageous for the patient, reducing the requirement for muscle relaxants to tolerate the endotracheal tube. This approach also allowed the surgeon to assess neural function throughout the procedure. Given that the surgical field was located in the neck, endotracheal intubation was chosen to mitigate the risk of aspiration and ensure a secure airway. Intubation was performed using a spiral tube, whose flexible design helps prevent obstruction during surgery [8]. This flexibility significantly reduces the risk of tissue damage in the trachea of patients with a history of laryngectomy.

For respiratory monitoring, pulse oximetry and capnography were utilized. Capnography is one of the most effective monitors for evaluating the quality of patient ventilation and is recognized as the gold standard for this purpose. It provides valuable insights into the amount of CO2 eliminated through respiration, indicating both ventilation adequacy and perfusion. Additionally, this device accurately reports the frequency and depth of ventilation [8].

**Postoperative consideration**

Postoperative care for laryngectomy patients varies based on the specific type of surgery performed. In this study, given that the patient underwent extensive surgery in the neck region, a tracheostomy tube was placed following anesthesia. To prevent the formation of pressure hematomas in the neck, the surgical team secured drains on both sides of the patient’s neck (Figure 3).

**Figure 3- Drain and tracheostomy tube to control the patient's airway after anesthesia**

## *Conclusion*

Total laryngectomy is a treatment option for patients with laryngeal cancer that can significantly extend their lifespan. However, airway management in patients following laryngectomy poses considerable challenges. These individuals may need extensive surgeries throughout their lives, making it essential to conduct a thorough assessment of their airway and respiratory system during the pre-anesthesia evaluation. Throughout the surgical procedure, continuous respiratory monitoring is critical. Postoperatively, many of these patients may require mechanical ventilation for several hours due to the risk of airway obstruction or reduced ventilation resulting from anesthetic drugs.

**Data availability**

Patient treatment information is available from history of cancer and total laryngectomy and total thyroidectomy surgery.

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