Anesthesia for a Patient with Base of Tongue Mass undergoing Transoral Robotic Surgery: A Case Report

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ABSTRACT

Transoral robotic surgery (TORS) is a minimally invasive surgical technique that has recently gained popularity. This involves the use of a robotic system to access and operate on hard-to-reach areas of the body, such as the base of tongue and pharynx. General anesthesia is the technique of choice in TORS as this procedure poses unique challenges due to the patient's airway anatomy, the need for precise surgical movements, and the potential for postoperative complications. Awake fiberoptic intubation (AFOI) is the gold standard for an anticipated difficult airway. This case report describes the anesthetic management for a patient undergoing TORS for a tongue base mass.

Keywords: transoral robotic surgery, anesthesia, awake fiberoptic intubation, base of tongue mass

INTRODUCTION

Pseudoepitheliomatous hyperplasia (PEH) is a reactive epithelial proliferation that can occur in response to various stimuli, such as chronic irritation, infection, or trauma.[1] In the oral airway, PEH is a rare condition that can manifest as a nodular or polypoid lesion characterized by the epithelium hyperplasia with variable degrees of scaling and crusting, which may be mistaken for a neoplastic or inflammatory process.[2,3] Treatment of PEH depends on the underlying cause and the extent of the lesion. In some cases, conservative management such as observation and removal of any offending agents may be sufficient. In other cases, surgical intervention may be necessary to rule out neoplastic or infectious processes.[1]

Transoral robotic surgery (TORS) is an emerging surgical technique that is being increasingly used in the management of oral mass lesions and it is gaining popularity as an alternative to traditional surgical approaches.[4] It is a safe and effective treatment option with a low complication rate and high success rate.[4-6] It offers several technological advancements such as better visualization of the surgical field, improved precision of surgical movements, and shorter recovery times.[4,7]

In the Philippines, documented cases of TORS are relatively few and only selected hospitals offer this procedure. General anesthesia is usually utilized in TORS as it entails shared access to the surgical site with the airway of the patient and requires complete immobility. Special considerations in the anesthetic management are vital to ensure patient safety and optimal surgical outcomes. To date, only a few case series describing the anesthetic management of robotic assisted excision of a base of tongue mass have been reported. Hence, this study describes the anesthetic management of a

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patient undergoing TORS for a base of tongue mass in the Philippine General Hospital.

CASE DESCRIPTION

A 39-year-old, ASA 1 female, presented with a tongue base mass that was biopsy-confirmed to be benign pseudo-epitheliomatous hyperplasia. She was scheduled for transoral robotic surgery due to a 5-month history of progressive dysphagia associated with globus sensation and change in voice. No dyspnea, wheezing, or episodes of decrease in sensorium were noted. On assessment, airway physical examination revealed Mallampati class 1, mouth opening of 4cm, a thyromental distance of 6.5cm, full neck range of motion, there was no visible mass upon mouth opening (Figure 1A). However, preoperative indirect laryngoscopy revealed a smooth mucosal vallecular mass, abutting the epiglottis (Figure 1B). Oral cavity CT scan with contrast enhancement showed isodense nodular focus seen at the posterior aspect of the tongue measuring 2.9 x 2.8 x 3.3 cm indenting the oropharynx (Figures 2A-C). Blood counts, coagulation study, and chemistries were unremarkable. A collaboration between the otolaryngology, anesthesiology, and general medicine was necessary to discuss the perioperative management of the patient and to ensure a safe and successful procedure. Given the potential risks to the patient for difficult airway management and perioperative bleeding, the focus of the discussion is on the prevention of adverse events.

Before surgery, the patient received paracetamol (15 mg/kg), dexamethasone (0.1 mg/kg), and antibiotic prophylaxis. The patient was placed in a 30-degree back up position upon transfer to the operating room bed. The following monitors were attached to the patient: a 5-lead electrocardiogram, two pulse oximeters, one on each index finger, two non-invasive blood pressure cuffs, one on each upper arm, a peripheral nerve stimulator, and a nasopharyngeal thermometer. The second set of pulse oximeter and non-invasive blood pressure cuff was attached to each arm as a contingency plan in case one monitor malfunctions during the procedure as there is no means to access the patient due to the docked robotic arms. Likewise, two large bore intravenous access were secured in case of massive bleeding. Two units packed red blood cells and two units fresh frozen plasma blood products were secured for possible perioperative use. Pre-induction,

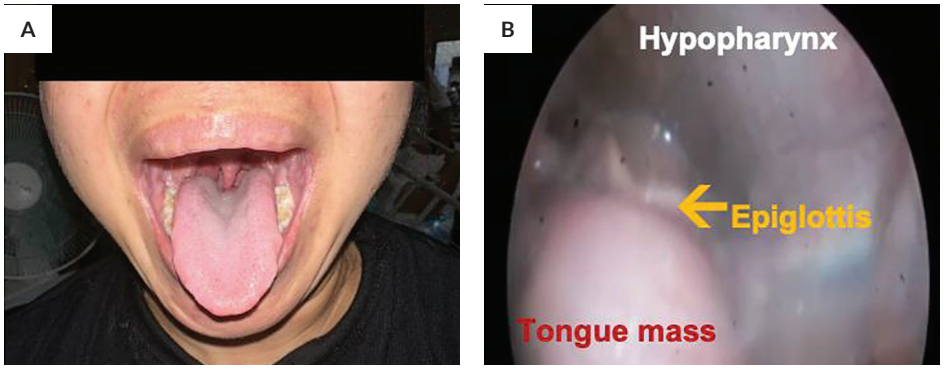

Figure 1. **(A)** Full mouth opening, no visible tongue mass, and **(B)** indirect laryngoscopy showing vallecular mass, abutting the epiglottis.

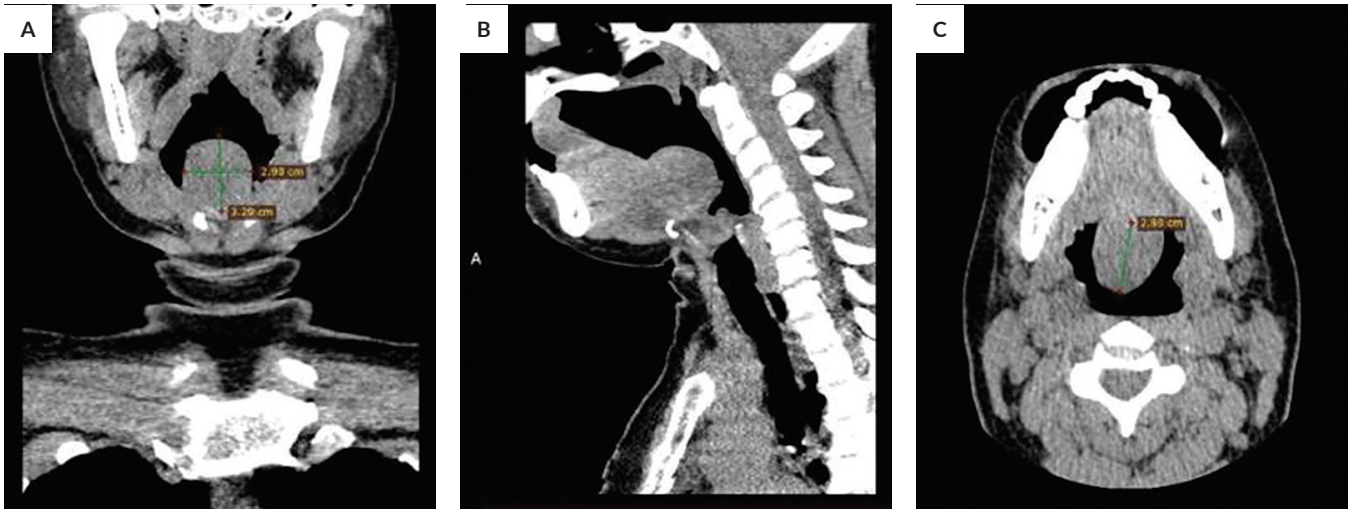

Figure 2. **(A, B, C)** Oral CT scan contrast enhancement showing isodense nodular focus seen on the base of the tongue measuring 2.9 x 2.8 x 3.3 cm indenting the oropharynx.

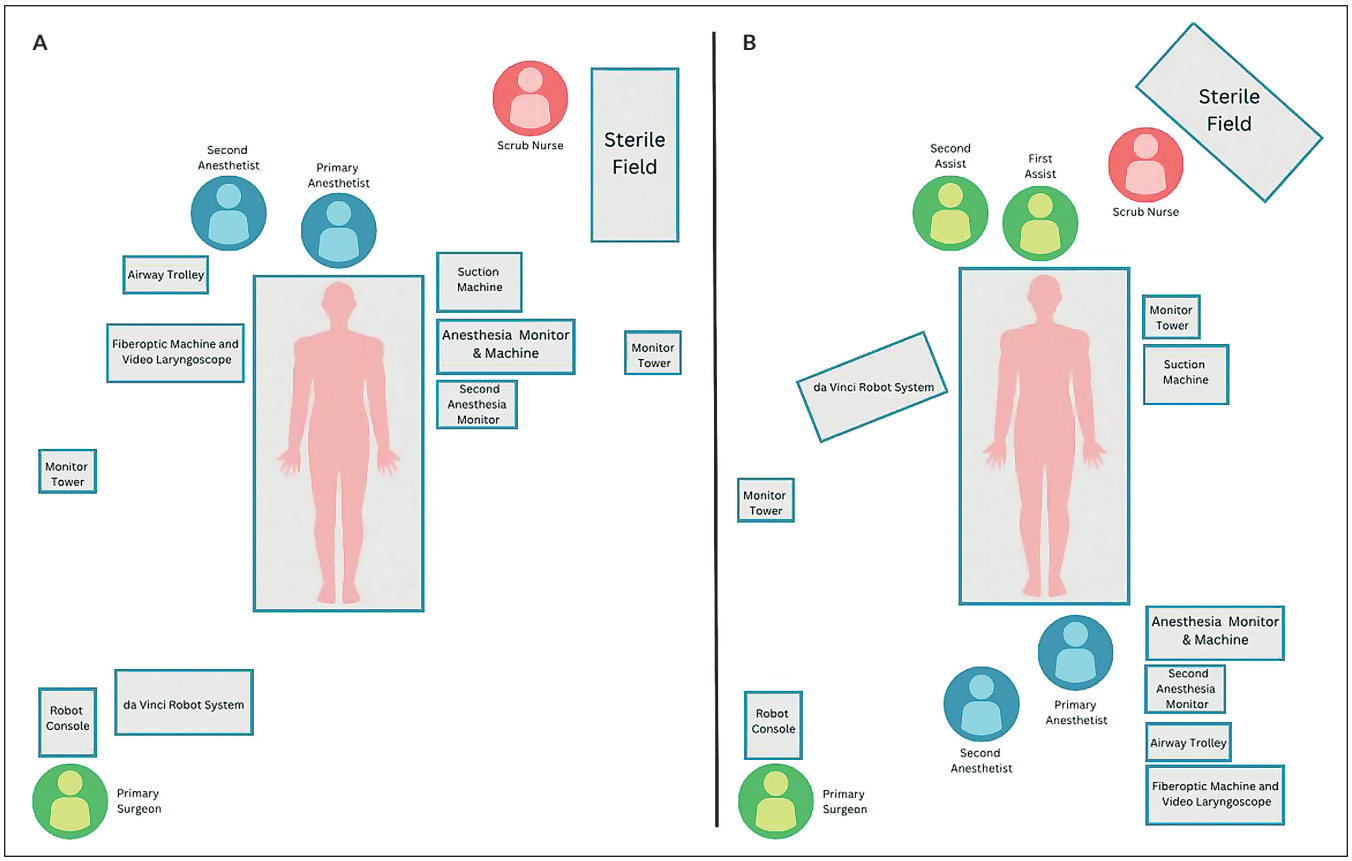

Figure 3. **(A)** Pre- and **(B)** Post-induction operating room set-up.

the anesthesiologist and anesthesia machine were situated at the head part of the operating table. Post-induction, the anesthesia machine and the anesthesiologist were positioned at the lower end of the operating table away from the patient's airway (Figure 3). As a result of the intraoperative operating room set-up, an extended breathing circuit was utilized.

The airway management plan was to perform awake nasal fiberoptic intubation under remifentanil TCI and topical anesthesia using a spray-as-you-go (SAYGO) technique with 3 ml of lidocaine 2%. Cotton pledgets soaked in lidocaine 2% + oxymetazoline were used to block the branches of the anterior ethmoidal nerve and the sphenopalatine ganglion and for nasal vasoconstriction simultaneously. Lidocaine 10% spray was applied to the tonsillar pillars, oropharynx, and base of tongue via atomizer. A total of 120 mg of lidocaine 10% was used. Remifentanil TCI was started at a predicted effect site concentration of 1 ng/ml. The fiberoptic endoscope was pre-loaded with a softened and lubricated, cuffed size 7.0 nasal RAE endotracheal tube.

Once the patient was calm and comfortable yet awake, the primary anesthesiologist proceeded with the fiberoptic navigation of the airway. Once the carina was visualized, the tracheal tube was advanced through the fiberoptic anterograde guide. The position of the tracheal tube was also confirmed by end-tidal capnography and clinical confirmation of bilateral equal air entry. Anesthesia was induced using intravenous propofol (2 mg/kg). Remifentanil TCI rate was then adjusted to achieve a maintenance level of analgesia (1-2 ng/ml), and general anesthesia was maintained using sevoflurane to maintain a MAC value of 0.7-1.0. Neuromuscular blockade using rocuronium infusion at 5 mcg/kg/min was initiated to achieve continuous muscle relaxation for optimal surgical operating conditions. Throughout the procedure, the anesthesia team continuously monitored the patient's oxygen saturation, end-tidal CO_2, and other vital signs.

The surgical team utilized the da Vinci Surgical System to access and operate on the base of tongue mass. A Dingman retractor was used and the robotic arms were positioned to provide access to the oral cavity (Figures 4A-B). The surgeon controlled the robotic arms using a console (Figures 4C-D). The base of tongue mass was identified and resected with negative margins (Figures 4E-F). The surgery was unremarkable and lasted for 1 hour and 10 minutes. Neuromuscular blockade was then reversed with Sugammadex (4 mg/kg) and a 100% train-of-four value was achieved.

Patient was monitored in the post-anesthesia care unit (PACU) after being extubated in the operating room fully awake. The patient was transferred to the ward after two hours and was discharged from the hospital on the second postoperative day.

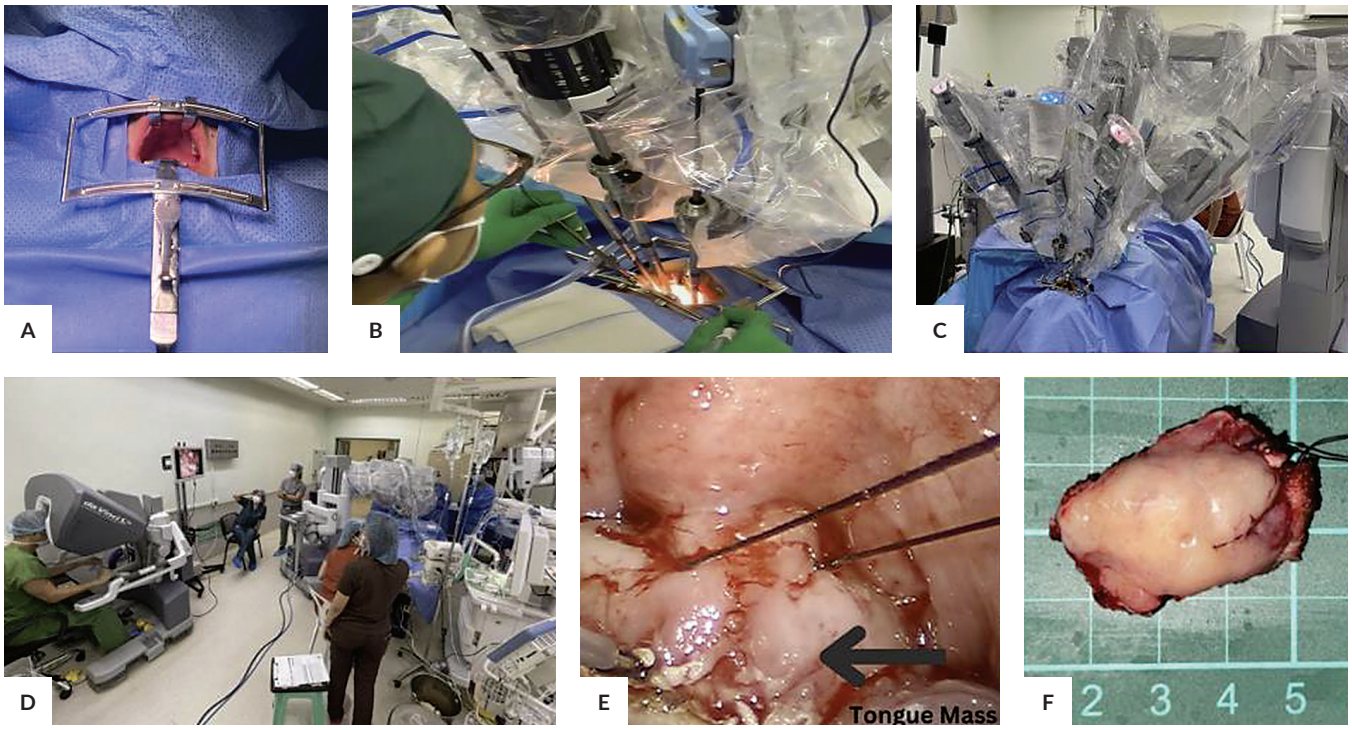

Figure 4. **(A)** Placement of the Dingman retractor with the dental hooks engaged on the anterior direction of the teeth for better operative view. **(B)** Trans-oral robotic surgery in progress. The da Vinci Surgical System docked into the patient's oral cavity. **(C)** Positioning of da Vinci Robot System. **(D)** OR Set-up, the anesthesia machine is located at the lower end of the operating table away from the patient's airway. Identification of tongue mass before **(E)** and after **(F)** surgery.

DISCUSSION

Management of a patient with a base of tongue mass presenting with obstructive symptoms usually requires surgical intervention. One of the emerging surgical interventions for patients with oral mass lesions is TORS. Unlike traditional or open surgery, TORS does not involve an extensive incision to access hard-to-reach areas such as the base of the tongue and hypopharynx.[8] Indication for TORS includes an oral mass that is less than 6 cm in size and an adequate mouth opening.[9,10] TORS decreases the risk of postoperative complications such as speech and swallowing dysfunction[7,8] and provides patients with a less invasive and more efficient option for a variety of surgical procedures[9].

General anesthesia is required in TORS procedure due to the shared access with the airway and operative site. In addition, adequate neuromuscular blockade is advised to ensure ideal surgical condition.[11] As of publication, there has been no documented TORS procedure done under sedation or regional anesthesia in our literature search.

Airway management planning is vital to ensure adequate oxygenation and ventilation during the induction of anesthesia in a patient with a difficult airway. Careful preparation and execution are key to securing the airway successfully.[12] Knowledge of the location of the lesion is essential for the anesthesiologist to bypass the mass with a given airway device or technique. Specifically, obstructive lesions in the oropharynx can be bypassed from above with nasal fiberoptic intubation or from below with cricothyroidotomy or surgical tracheostomy.[13]

Awake Fiberoptic intubation (AFOI), the gold standard for the management of anticipated difficult tracheal intubation, plays a special role in securing the airway in the presence of an oropharyngeal pathology.[12] It is usually performed while the patient is conscious and able to maintain airway reflexes.[14,15] As recommended by the 2022 ASA Practice Guidelines for Management of the Difficult Airway[12], nasal AFOI was performed in this case rather than a surgical tracheostomy owing to the anatomical and clinical presentation of the base of tongue mass.[13,15] Ideally, a reinforced tracheal tube should be used to prevent compression by the retractor or robotic arms.[11] However, to facilitate TORS procedure, it requires the head to be in full extension and the length of the tracheal tube needs to be appropriately chosen to allow for this head extension[16], hence the use of nasal RAE. The regular length of the reinforced tube available in our institution may not be sufficient. The tube was softened prior to nasal intubation and application of adequate lubricant was done to facilitate a smooth passage of the tube from the nasal curvature as well as nasotracheal intubation.[16] The use of antisialagogues such as glycopyrrolate and atropine reduces salivary and respiratory secretion and helps facilitate visualization during

awake fiberoptic intubation.[17] Unfortunately, glycopyrrolate is not readily available in the institution, hence not included. Atropine on the other hand, although it decreases secretions, increases the heart rate. This may compound the tachycardia in anxious patients for awake intubation[17], hence was not used.

The anesthesia was maintained with a volatile-based (sevoflurane at 2%) technique to maintain a MAC value of 0.7-1.0 with an intravenous agent (remifentanil TCI at 1-2 ng/ml). In the study of Kim HT et al.[18], on the effect of remifentanil on the consumption of sevoflurane, stated that the administration of a low dose of remifentanil (0.1 μg/kg/min) as a supplement to inhaled anesthetics, will allow for a reduced dose of inhaled anesthetics, compared to when inhaled anesthetics are used alone. In addition, balanced anesthesia with these two agents allows for shorter recovery without postoperative side effects such as post-operative nausea and vomiting.[19,20]

Remifentanil is an ultra-short-acting synthetic opioid drug that is metabolized by non-specific plasma esterases. It can suppress coughing and sympathetic responses caused by airway manipulation. In the study by Xu et al.[21], using a Shikani optical stylet, comparing Dexmedetomidine and Remifentanil for sedation during awake tracheal intubation showed that the proportion of patients coughing after awake tracheal intubation in the Remifentanil group was lower compared in the Dexmedetomidine group. This can be attributed to the greater analgesic effect of Remifentanil, which resulted in better tolerance of the tracheal tube insertion.[21] Additionally, the sedative effects of Remifentanil allow for a more cooperative patient during induction.[13]

Nasotracheal intubation may lead to certain complications, with epistaxis being the most common. Epistaxis can result from injury to the Kiesselbach's plexus located in the anterior section of the nasal septum.[22] The use of oxymetazoline, a nasal vasoconstrictor, prior to nasal intubation can minimize the incidence of clinically relevant traumatic bleeding and allows the maintenance of airway muscle tone.[13] In addition, Lidocaine 2% was applied to provide nasal analgesia.[23]

As recommended by the Difficult Airway Society (DAS), an awake extubation is the preferred technique for patients with a known difficult airway or those at high risk for airway obstruction. This involves allowing the patient to regain consciousness and spontaneous breathing before removing the endotracheal tube.[24] However in this relatively short procedure with no significant fluid shifts, delayed extubation was deemed not warranted. In addition, the initial airway-obstructing mass has been removed hence, improvement of the patient's airway post-operatively. Nonetheless, airway adjuncts must be readily available, such as oral airways or nasopharyngeal airways and an intubation set in case of the need for reintubation.[11] In addition, close monitoring of the patient post-extubation for signs of respiratory distress, airway obstruction, or other complications is essential. Appropriate supportive care and interventions should be provided as needed.

CONCLUSION

TORS is a safe and effective treatment option for tongue masses, offering improved visualization, precision, and recovery times compared to traditional surgical techniques. The anesthesia management in TORS requires careful preoperative evaluation, a thorough airway management plan, precise positioning, and continuous monitoring. Awake intubation is a safe and effective technique for securing the airway in high-risk patients, but it requires careful planning, preparation, and execution to minimize the risk of complications. Anesthesiologists should be prepared to manage the airway using appropriate techniques to prevent possible life-threatening complications.

Statement of Authorship

Both authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

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