

Management of Difficult Airway in a Patient with Oral Cavity Cancer: Case Report

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ABSTRACT

For the anesthesiologist the management of a difficult airway is crucial to avoid serious complications that can endanger the life of a patient, so multiple strategies and tools have been developed to prevent mishaps. In this case report we present a patient with a diagnosis of inferior alveolar ridge carcinoma who presents with modifications in the head and neck anatomy, due to a history of previous surgical interventions and radiotherapy and chemotherapy treatment. The patient was scheduled to undergo surgery to take and apply a free graft in the neck, which was successfully performed with rapid sequence intubation in an awake patient. The Royal College of Anesthesia's fourth National Audit Project (NAP4) conducted a study in which it was reported that approximately 40% of patients presenting with an airway complication during anesthesia were related to head and neck tumors, so the following is an analysis of predicted difficult airway management.

KEYWORDS: difficult airway, anesthesia, cancer, head and neck surgery.

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INTRODUCTION

Oral cavity cancer is among the main sites of neoplasms in the aerodigestive tract, representing 37% of these (1). Epidermoid carcinoma is the most frequent presentation, followed by adenocarcinoma. It can be located in the oral mucosa, floor of the mouth, anterior third of the tongue, alveolar ridges, retromolar trigone, hard palate and in the internal portion of the lips (4). The associated risk factors are: tobacco use, alcohol, tobacco/alcohol association, cannabis use, changes in local immunology, alterations of P53 oncogenes and presence of human papillomavirus (HPV 16-18) (2). The incidence is 1.3 to 10 times higher in males than in females. It occurs between the fifth and sixth decade of life with an average age of 50 years (2) (3). Most of these neoplasias are diagnosed in their terminal stage through clinical examination and confirmed by histopathological study (4). The initial treatment is the surgical approach, which consists of total resection of the tumor and ipsilateral cervical lymph node dissection, due to the high recurrence of metastasis in this area, approximately 15-75% (3). In addition to surgery, treatment includes chemotherapy and/or radiotherapy depending on the patient's stage.

According to the practice guidelines for the management of difficult airway of the American Society of Anesthesiologists (ASA) 2022, a difficult airway is defined as a clinical situation where the physician trained in anesthetic care has difficulty or fails in one or more laryngoscopies, assisted ventilation with face mask or supraglottic mask, tracheal intubation, extubation or surgical airway (5).

Difficult intubation is defined as the failure of tracheal intubation or the requirement of multiple attempts and difficult laryngoscopy is the inability to observe any portion of the vocal cords after multiple laryngoscopy attempts. (5) Patients with head and neck tumors present certain characteristics that predict a difficult airway approach, such as: restriction of head and neck movement, decreased oral opening, presence of the tumor itself, fibrosis due to previous surgery, chemotherapy or radiotherapy; airway edema due to previous surgical manipulations and risk of bleeding due to friability when performing laryngoscopy. 1

The importance of predicting a difficult airway lies in avoiding possible complications by making decisions regarding the personnel designated for airway management and the availability of the necessary equipment for the different management plans.

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CLINICAL CASE

30-year-old male patient diagnosed on February 12, 2024 with epidermoid carcinoma of oral cavity in the right lower alveolar ridge cT4a cN0 M0 EC IVA. History of smoking for 20 years, at a rate of 10 cigarettes per day, smoking index of 10 points, social alcoholism and daily consumption of marijuana. Surgical history of right hemimandibulectomy, myocutaneous flap reconstruction of left pectoralis major and tracheostomy on July 2, 2024 and cervical exploration on July 3, 2024. No complications in any surgical event. Chronic,

allergic, traumatic and transfusion history denied. She received 3 cycles of chemotherapy and radiotherapy 27 Grays fractions. Physical examination: Mallampati IV, Oral opening IV, Patil Aldretti not assessable, Sternomentonian distance not assessable, Bellhouse Dore III (**FIGURE 1, 2 and 3**) Laboratory tests: Leukocytes 7.07, hemoglobin 14.3, hematocrit 44.1, platelets 299, prothrombin time 13.8, activated thromboplastin time 31.8, INR 1.00, glucose 90, urea 34, creatinine 0.91, uric acid 5.6.



Figure 1, 2 and 3. Airway assessment.

The patient was scheduled for a surgical procedure to take and apply a free graft in the neck. Prior to admission to the operating room, topical lidocaine 10% is administered in the oropharyngeal area 15 minutes before the start of the anesthetic procedure. Upon admission to the operating room, non-invasive monitoring was performed: electrocardiography, pulse oximetry, blood pressure, bispectral index (BIS) and plethysmographic variability index (PVI), showing vital signs at the beginning of the procedure: Blood pressure 124/72 mmHg, Mean blood pressure 92 mmHg, Heart rate 81 beats per minute, respiratory rate 18 breaths per minute, Oxygen saturation of 97%. Pre-oxygenation is started with 100% inspired oxygen fraction and remifentanil perfusion is started at a plasma concentration of 0.002-0.004 mcg/ml for 10 minutes, a total of 135 mcg intravenously, then intravenous lidocaine 2% 60 mg intravenously is administered, assessing the possibility of

ventilating the patient and diagnostic videolaryngoscopy is performed to verify airway patency, finding POGO 50% (**FIGURE 4 and 5**). Therefore it was decided to perform rapid sequence induction via intravenous real weight with standard doses, midazolam 1 mg, propofol 100 mg fractionated total dose and rocuronium 50 mg, obtaining bispectral index of 45 and deep neuromuscular blockade again a videolaryngoscopy was performed with CMAC D-Blade sheet, placing at the second attempt an orotracheal tube # 7.0 with a pneumotapponation of 35 CMH₂O. Surgical procedure was started without incident. Anesthetic maintenance with sevoflurane at a CAM 0.9. Surgical procedure is finished, secretions are aspirated and the patient emerges reversing neuromuscular blockade with sugammadex 200 mg. When the laryngeal protection reflexes are present and the patient is awake, the endotracheal tube is removed.



Figure 4 and 5, Videolaryngoscopy image showing erythema and edema of the glottis.

DISCUSSION

Both the Fourth National Audit Project of the Royal College of Anesthetists (NAP 4) and the Hard Airway Society in the United Kingdom (DAS) conducted studies of approximately

3 million patients under anesthesia demonstrating complications in the management of the airway with 40% being related to head and neck tumors, and approximately 75% of these required an emergency surgical airway (6) (7).

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Therefore, these groups have been dedicated to establish algorithms that help us to make better decisions regarding the planning of difficult airway management and to have alternatives in case of complications.

As in all our patients we have to perform a pre-anesthetic assessment including a complete medical history. In this case, ask about specific antecedents such as: uncontrolled hypertension, coronary disease, chronic renal insufficiency, advanced liver disease, obstructive sleep apnea (OSA). Ask about tobacco and alcohol consumption, since they predispose us to heart disease, liver disease and kidney disease. Another important point to consider is the history of chemotherapy and/or radiotherapy, which can produce dryness in the oral cavity, airway edema, mucositis, dysphagia, dehydration, tissue fibrosis, restricted oral opening, neck extension limitation, glottic edema and epiglottis. (1)(8) In our case the patient had a history of smoking and alcoholism, which conditioned us to a low pulmonary capacity and treatment with radiotherapy and chemotherapy, finding a stiff neck, difficulty in oral opening and at the time of diagnostic laryngoscopy edema was observed both laryngeal and glottic (Figure 4 and 5). (**Figure 4 and 5**).

It is important to make an evaluation of our airway to know the challenge we are facing. As in any assessment, a physical examination should include the main airway scales: Mallampati-Samsoon-Young, Patil-Aldreti, Bellhouse-Doré, sternomentonian distance, buccal opening, Cromack Lehane, evaluation of predictive factors of difficult/impossible mask ventilation, its association with difficult direct laryngoscopy (DL) and predictive factors of difficult video laryngoscopy (VL). (1) However, let us remember that in our case several of these tests are of limited value since we are faced with a tumor located in the airway and multiple surgeries that have conditioned us to modify our anatomy, mainly in the neck.

The Fourth National Audit Project (NAP4) is a project conducted by the College of Anesthesiologists of the United Kingdom and Ireland designed to identify and study airway complications during anesthesia, intensive care and in the emergency department. A total of 184 cases were reviewed, within these 75 cases required an emergency surgical airway and 51 cases had some failure of airway management either failed intubation, erroneous endotracheal tube placement, difficult intubation requiring fiberoptic or aspiration of gastric contents. In NAP4 of the 21 cases of severe airway difficulty in the induction of anesthesia, 13 occurred in patients with upper airway tumors. Among the main observations found in this project were: adequate planning and communication is always required, preoxygenation with positive ventilation, presence of two operators, rapid intubation sequence is suggested, confirmation of intubation through capnography line and as a last option the surgical airway performed by an experienced surgeon (6).

The UK Difficult Airway Society (DAS) has been dedicated to advanced airway management since 1987. In 2019 they

published a guideline for tracheal intubation in the awake patient creating strategies for predicted difficult airway management, i.e. when mask ventilation, supraglottic device placement or ventilation, tracheal intubation or a surgical airway is anticipated to present a challenge. The incidence of difficult mask ventilation is 0.66-2.5%, difficult oenoventilation placement 0.5 - 4.7% difficult tracheal intubation 1.9-10% and combined difficulty in both mask and tracheal intubation 0.3-0.4%. (9)

The main recommendations prior to intubation are the administration of high oxygen flows of 3-7 liters/minute, topicalization of the airway with lidocaine at a dose of 9 ng/kg, minimal sedation with remifentanyl 1.0 - 3.0 ng/kg site effect or initial bolus dexmedetomidine 0.5-1 mcg/kg for 5 minutes followed by an infusion of 0.3-0.6 mcg/kg/hr. Subsequently, the use of videolaryngoscopy is recommended over fibroscopy as it has a higher success rate than fibroscopy, it is advised to limit to 3 attempts. In case of failure in the first attempt, it is suggested to verify and correct some of the recommendations prior to videolaryngoscopy and perform a second attempt. If the second attempt fails, a third attempt should be considered if the pre-videolaryngoscopy recommendations can still be modified. A fourth attempt can be made but it is advised that it be done by a more experienced operator. If we continue to be unsuccessful, the first step to take is to call for help, raise the oxygen flow to 100% and stop sedation and postpone the surgical procedure or if emergency surgery has to be performed proceed with a surgical airway either cricothyroidotomy or tracheotomy.

In July 2022 an article was published on considerations in the evaluation of the airway in the patient with head and neck tumor, which specifies the management of difficult airway in the type of patients of our clinical case in which it begins by mentioning the categorization of our airway with the T.R.S. scale (tumor, radiation and surgery) justifying algorithms for the approach of airway with tumors, sequelae of radiotherapy and the repercussions they can cause. This classification gives us scores in which 0 points is a very low risk, a routine induction of general anesthesia can be performed. 1 point low risk, caution is suggested. 2 points moderate risk, intubation with the patient awake. 3 points high risk, so intubation with awake patient with surgical team immediately available for surgical airway approach is advised. 4 points very high risk, awake tracheostomy. 5-6 points exceptionally high risk, tracheostomy not effective to ensure ventilation (tumor obstructing distal third of the trachea, carina or both main bronchi) Femoral cardiopulmonary bypass. (1) (11).

In 2017, Dr. Alvarado et al. based on experiences at the National Cancer Institute of Mexico described an algorithm called VADO (Via Aerea Oncologica), which is divided into plan A, B, C and D. Plan A: perform indirect videolaryngoscopy and visualize anatomical structures and if it is possible to intubate the patient, it is suggested to make only 2 attempts and if it fails, change the plan. Plan B: tracheal intubation with fiber optic through supraglottic

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device is recommended, consider a flexible guide. If unsuccessful, we move to plan C, which consists of considering postponing surgery and evaluating surgical measures. In plan D, surgical airway measures must be considered, whether tracheotomy or cricothyrotomy (1).

In our case we opted for a management based mainly on the recommendations of the DAS intubation in the awake patient, since from the beginning we classified our case as a difficult airway, following the measures of oxygenation, topicalization and sedation in our patient to later integrate the recommendations of the VADO algorithm, performing an indirect videolaryngoscopy and deciding if we had to change the anesthetic plan. Combining different algorithms focused on this type of patient resulted in an effective intubation at the first attempt without complications, as well as maintaining a controlled scenario from the beginning, since we were prepared with supraglottic devices, fiberscope and a surgical team in case it was necessary to change the initial plan.

It is important to have a plan for extubation in this type of patients. The DAS suggests a laryngoscopy prior to extubation and topicalization with lidocaine, but it is mentioned that the use of lidocaine is controversial since it may prolong the return time of the laryngeal protective reflexes(7). Other recommendations are supplemental oxygen techniques, use of steroids and racemic epinephrine (10)(12).

For extubation of the patient in our case, we opted to secure the airway by performing an awake extubation to reduce the risk of reintubation.

CONCLUSION

It is of great importance to take a complete clinical history, as well as an exhaustive physical examination in this type of patients to give us a broader picture and thus be able to anticipate a difficult airway, especially in cases in which the surgical management is focused in or near the airway, since these patients are more prone to complications during management.

Both for the anesthesiologist in training and for the experienced anesthesiologist it is essential to know and update the algorithms in the management of predicted difficult airway, these help us to develop strategies in the management and to know alternatives in the case of any complication and to avoid putting the life of our patients at risk.

Nowadays we have multiple devices and medications, on which we can rely to create alternatives to conventional plans in case of not having a high cost equipment such as a fiberscope, the relevant thing in many occasions is to condition our situation through a better analgesia, patient position or give adequate sedation.

Similarly, we must be trained in extubation techniques in patients with predicted difficult airway or at the time of intubation we find a difficult airway, since these patients

represent the same risk of finding a complication both at the time of intubation and at the time of extubation.

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