ISSN: 1607-8322, e-ISSN: 2220-5799 Anaesthesia, Pain & Intensive Care
Vol 28(3); June 2024 DOI: 10.35975/apic.v28i3.2206

CASE REPORT AIRWAY MANAGEMENT

An inconspicuous problem in the management of an Anticipated difficult airway

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ABSTRACT

Patients with head and neck cancer are at an increased risk of airway complications, not only because of the tumor itself and the need for a shared airway, but also the treatment of cancer (including surgery, radiotherapy, and chemotherapy) poses major challenges in airway management. The perioperative assessment, therefore, needs to be comprehensive to allow us to predict possible airway difficulty. Moreover, the suitability and feasibility of primary and rescue plans are needed to be assessed for each individual patient. In this case report, we describe a case of a patient, with recurrent tongue cancer with prior history of surgery and radiotherapy to the head and neck region. The difficulty in managing the airway in this case was anticipated correctly and subsequently encountered in almost every step, including bag-mask ventilation, video-laryngoscopy, and laryngeal mask airway (LMA) insertion in a patient. Despite the presence of visual aids and algorithms for the management of a difficult airway, a premeditated airway management plan, and the availability of all necessary equipment and expertise, a break in structure and sequence was encountered, which was quickly corrected and saved the patient from any harm.

Abbreviations: FOI – Fiberoptic intubation; MRI – Magnetic Resonance Imaging; DAS – Difficult Airway Society; ASA – American Society of Anesthetists; SAD – Supraglottic Airway Device; CICO – Can't intubate, can't oxygenate.

Keywords: Anesthesiology, Difficult Airway, Human Factors, Fiberoptic Intubation

Citation: Ahmed WN, Khan SA, Ali S, Ashraf A. An inconspicuous problem in the management of an Anticipated difficult airway. Anaesth. pain intensive care 2024;28(3):571−576; **DOI:** 10.35975/apic.v28i3.2206

Received: April 14, 2023; **Reviewed:** February 09, 2024; **Accepted:** April 04, 2024

1. INTRODUCTION

The primary intention of this article is to: direct attention towards the plethora of airway complications that may be encountered in patients with head and neck cancer and, more importantly, to emphasize upon the fact that even with adequate assessment and planning, deviation from a preformulated management plan may occur. There is a high likelihood that such a cohort of patients would have undergone therapies such as primary surgical tumor resection and/or radiotherapy, which may predispose towards the development of a difficult airway in subsequent surgery. Surgery as well as radiotherapy causes anatomical changes both in upper and lower airway including fibrosis in neck which may make both face mask ventilation and laryngoscopy difficult.[1]

A safer technique is fiberoptic intubation (FOI), however, this technique is dependent upon the availability of expensive equipment and the presence of a skilled operator. Nonetheless, there are case reports where even FOI proved to be difficult because of limitations in neck movement caused by radiation. In these scenarios obtaining front of neck access (cricothyroidotomy and tracheostomy) in an awake

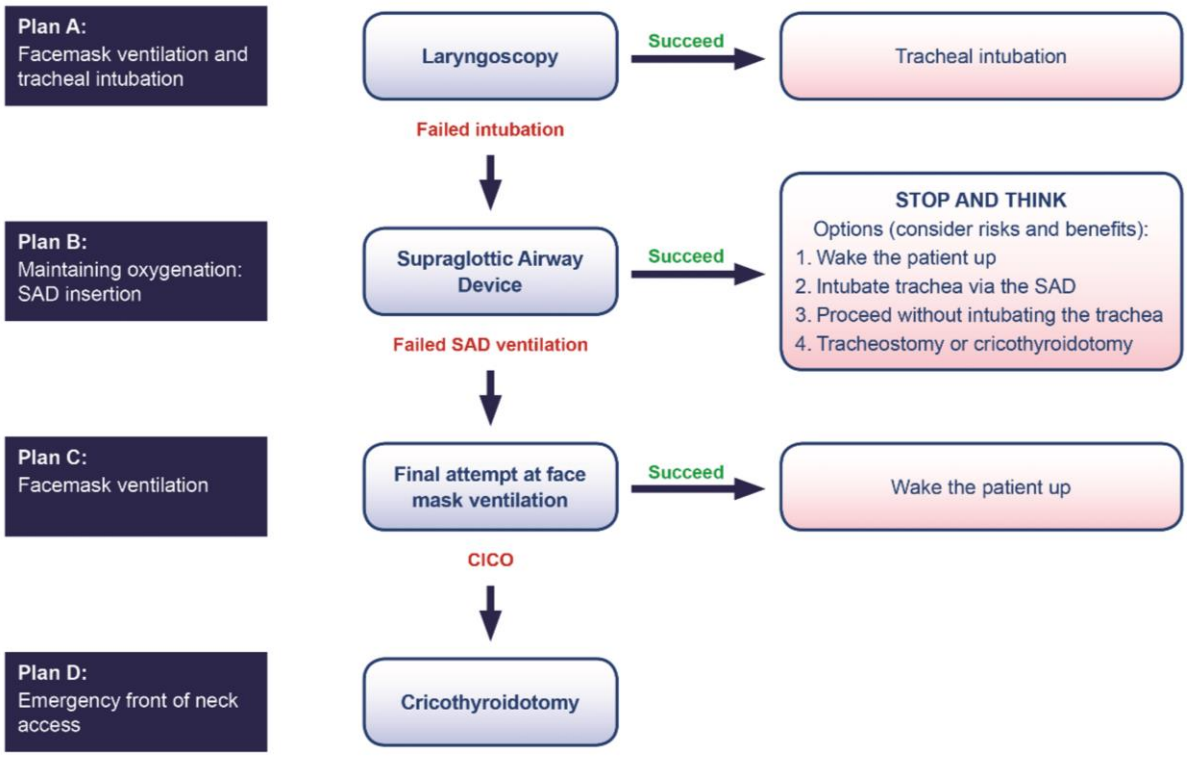

Figure 1: DAS guidelines for the management of unanticipated difficult intubation (2015)

patient may be the only safe option. This mandates thorough assessment to devise an appropriate airway plan for each case in redo surgeries. It includes suitable imaging techniques to assess the site, size and extent of the tumor and preoperative airway assessment including nasal endoscopy. Although several guidelines and simplified algorithms exist for management of anticipated difficult airway,[2,3] anesthetists continue to find themselves in situations where it becomes increasingly difficult to translate these simple steps into sound clinical decisions in a complex clinical situation.[4] It can therefore be assumed that there are various unrecognized or underrepresented factors that contribute to this inconsistency.

2. CASE REPORT

A 47-year-old male presented for redo surgery for recurrent tongue cancer. The patient presented to a surgical clinic for follow-up with continuous discharge from the left lateral side of the tongue. Subsequent magnetic resonance imaging (MRI) of the head and neck region and a tongue lesion biopsy report showed recurrence of the tumor without significant airway compromise. The patient was planned for a wide local excision of the left posterior tongue. On pre-operative assessment the patient was found to have had an uneventful course of anesthesia previously for left partial glossectomy and neck dissection which was followed by adjuvant radiotherapy 60 Gray in 30 fractions. The patient had a 2-year long history of diabetes mellitus controlled on oral medication. He reported a history of occasional smoking and drinking.

On questioning for focused respiratory issues, he did not have any symptoms of obstruction such as dyspnea, orthopnea, or snoring. The airway examination revealed limited mouth opening (2 finger breadth), Mallampati grade 3, and mild restriction in the extension of the atlantoaxial joint. Keeping the above patient factors in mind, the patient was deemed to have an anticipated difficult airway. A comprehensive airway management plan was formulated which was discussed with the patient in the preoperative anesthesia assessment clinic where informed written consent was taken. The salient features of this plan included; topically anesthetizing the airway using lignocaine 4% gargles while the patient was still awake, premedication with intravenous (IV) midazolam 2 mg, administration of 1-2 µg/kg of fentanyl IV, propofol infusion titrated to effect, and administration of an inhalational agent (sevoflurane). Asleep fiberoptic intubation (FOI) would then be performed by a skilled operator and a muscle relaxant given after securing the airway. An airway management algorithm,[2] as shown in Figure 1, would serve as a rescue

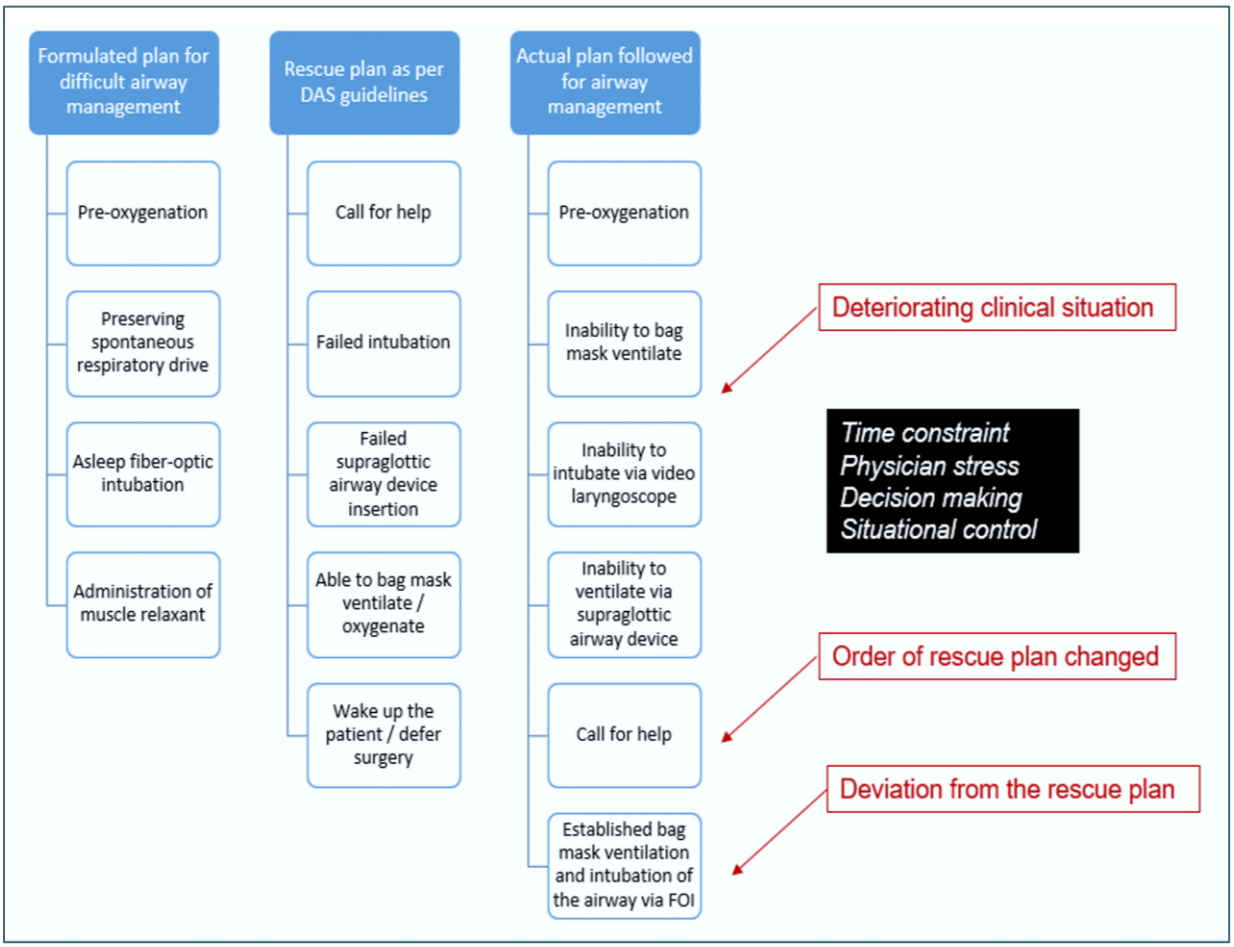

Figure 2: Schematic diagram highlighting the differences in airway management from the proposed and rescue airway plan

plan in case of difficulty. All the anesthetists involved in the case were familiar to this algorithm.

On the day of the surgery, the patient was shifted to the operation theater after topicalization of the airway. The patient was monitored with standard monitors. Preoxygenation was done for 3 min with 15 L/min of oxygen via a tight-fitting face mask. Anesthesia was induced with midazolam 2 mg IV, fentanyl 100 µg IV, followed by propofol 100 mg in slow and titrated IV doses along with sevoflurane in O_2. Before the FOI could proceed, there was a loss of capnography trace on the monitor, therefore it was decided to support the airway with bag mask ventilation. Difficulty in bag mask ventilation was encountered. hence two-hand bag mask ventilation was started.

At this point there was a drop-in oxygen saturation from 100% to 90%. Due to the rapidly changing clinical picture, the anesthesia team tried to intubate the patient with the help of a video laryngoscope, but failed. Bag mask ventilation was attempted again but adequate ventilation could not be achieved as evidenced by an absent capnography trace and decreasing oxygen saturation. There was an unsuccessful attempt at establishing oxygenation via a second generation supraglottic airway device, laryngeal mask airway. At this point, a call for help was made while the oxygen saturation dropped to 40% during the wait time. On arrival of help, bag mask ventilation was started with the help of 3 members; one at reservoir bag, one administering a jaw thrust maneuver, and one ensuring a tight seal of the face mask. Equipment for front-of-neck access was made available. Oxygen saturation improved to 88-92% and a capnography trace appeared. At this stage, an attempt was made for asleep FOI; however, we failed to visualize the airway via the fiberscope. Bag mask ventilation was restarted and a second attempt at FOI was made. Once the scope 2 of 6 reached the posterior pharyngeal wall, a jaw thrust maneuver and pulling on the tongue with the help of a gauze piece helped visualize the airway and fiberoptic nasal intubation was done successfully. It was then decided to

proceed with the surgical procedure. The actual series of events and actions were significantly different from the pre-formulated airway management and airway rescue plan as shown in Figure 2.

The intraoperative course was uneventful. The patient was extubated fully awake in a sitting position while obeying commands. He was transferred to Post Anesthesia Care Unit (PACU). His postoperative course was uneventful with no neurological and cardiorespiratory complications.

3. DISCUSSION

Head and neck surgical cases accounted for 39% of airway complications in the fourth National Audit Project of the Royal College of Anesthetists.[5] Surgery and radiotherapy have drastic effects on upper and lower airway anatomy.[1] A review of 50,000 anesthetics found radiotherapy to the neck as the strongest predictor for impossible face mask ventilation.[6] Awake or sleep fiberoptic bronchoscopy is often warranted in anticipated difficult airway. Schmitt et al found 6% incidence of difficult awake fiberoptic intubation in 86 patients who had radiotherapy for carcinoma of the head and neck.[7]

The anesthesia team correctly anticipated difficult airway during the pre-operative assessment. So, this patient was scheduled as the first case of the day, and a difficult airway trolley and a working flexible fiberscope were kept ready. The experience of the operator was also adequate. Successful airway management is a complex process. Even though several tests have been proposed for the prediction of difficult airways, we remain woefully underprepared in actual clinical scenarios as evidenced by 93% of difficult airways being unanticipated. Even when difficulty is anticipated, clinical decisions and management may not be at par with the existing standards introduced by many international societies.

There are previous incidents where the decisions made by the anesthetists regarding appropriate airway management have been legally challenged.[8] The complexity of airway management may be due to subtle influences of a variety of different factors; an interplay of human, patient, operator and equipment factors.[9] When reflecting upon the influence of these domains on our patient management retrospectively, we find that although adequate consideration was given towards optimization of three of the factors, the remaining three might have contributed to an inability to adhere to the proposed guidelines. Figure 3 below provides a pictorial representation of this retrospective analysis.

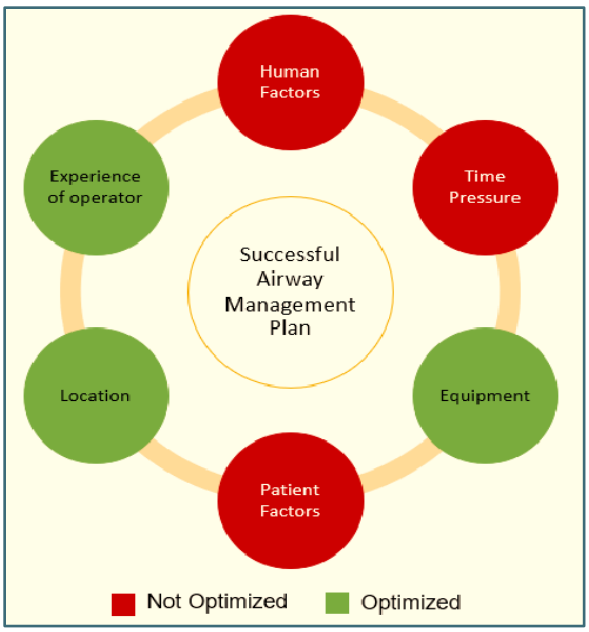

Figure 3: An interplay of factors influencing the management of the difficult airway in the case presented

Two of the factors i.e., patient factors and time pressure were unmodifiable to begin with. This leaves us with human factors that could have been optimized further to influence the outcome. Even though the provision of algorithms and visual aids is one way to account for human factors when trying to mitigate errors in patient care, another aspect, the non-technical skills of the team leaders and members,[10] is seldom mentioned in medical literature from Pakistan. Non-technical skills incorporate a range of personal and social abilities that help in delivering appropriate patient care. Core components include; situational awareness, decision-making, teamwork, and task management. Several validated tools have been used to assess, train, and then reassess healthcare providers to improve these skills. There has been an increased interest in the incorporation of human factors in difficult airway management guidelines. This is evidenced by human factors being well represented in 26 international difficult airway guidelines in 2022.[11] Our case highlights the importance of these guidelines and identifies an area for improvement going forward. Even though the anticipation of a difficult airway led to the formulation of an anesthetic plan, the situation unfolding in the operating room led to deviation from the algorithm. It is to be noted that to date there is little or no formal teaching on non-technical skills and human factors as part of the training curriculum for anesthetists in Pakistan. This holds true for many low-income countries around the world, where there is a lack of incorporation of validated non-technical skills tools for education of medical providers.[12] According to a study

conducted in one public and one private hospital in Pakistan, 50 medical practitioners identified training of medical staff, teamwork and work distribution as important aspects that influence patient safety. The same study failed to identify attitude, leadership, communication and physician stress or fatigue as being important factors to consider when it comes to safe patient care.[13] Our case highlights the need for physician education and training in these aspects as well to further improve healthcare related outcomes and healthcare delivery.

There is a growing interest in the role of simulation training as means of assessment and enhancing the effectiveness of medical education at a post graduate level.[14,15] It has been used successfully to educate medical professionals regarding human factors and the essential non-technical skills mentioned above.[15] Simulation training has successfully been used in a Tertiary Care Centre in Pakistan to improve the process of obtaining informed consent from patients.[16] It stands to reason that the incorporation of these simple tools of education will have far-reaching implications when it comes to the improvement of medical education, and consequently, medical practice and patient safety in this part of the world.

4.CONCLUSION

Presence of risk factors for a difficult airway must make an anesthetist wary of impending difficulty while providing airway management. A premeditated airway management plan is vital to improve patient outcomes and avoidance of complications. Even with a comprehensive plan for management of an anticipated difficult airway and availability of equipment and written guidelines/algorithms, rapidly unfolding clinical events may compel a change in the clinical decisions. There is a dire need to incorporate formal training in non-technical skills and human factors in medical training in order to fully utilize the tools and algorithms that aim to universalize patient care. Incorporation of simulated training in medical education curriculum may be a feasible and cost-effective tool for improvement in practitioner's skills and, ultimately, patient care.

5. Disclosures

Consent was obtained by all participants in this study. Institutional Review Board Shaukat Khanum Memorial Trust issued approval EX-09-06-21-02.

6. Authors' contribution

WNA: Concept, manuscript writing

SAK: Manuscript editing

SA: Literature review

AA: Supervisor, proof reading

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