

# Management Of Unpredicted Difficult Tracheal Intubation Due To Soft Tissue Swelling: A Report Of Five Cases

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## Abstract

Background: Inspite of the development of algorithm for difficult intubation, publication of guidelines and development of modern methods to visualize the larynx; the unanticipated difficult airway is still challenging for the anesthesiologist.

Setting: Three modern theatres at King Khalid University Hospital, Security Forces Hospital (Saudia Arabia) and Princess Basma Teaching Hospital (Jordan).

Patients and intervention: We report 5 cases of unpredicted difficult intubation, which occurred during induction of anesthesia, either due to excessive bleeding from the site of necrotic tumor tissues, or the derangement of laryngeal anatomy. After rapid sequence, or inhalational induction of anesthesia, the anesthesiologist could not intubate the trachea and/or could not ventilate the lungs via a face mask. That was because of extraordinary hyperplasia of the tumor tissues and/or anatomical derangement.

Results: All of the reported cases were saved by immediate emergency tracheostomy performed by the attending surgeons in four cases and the anesthesiologist in one case.

Conclusion: Although many methods have been recommended for unexpected difficult intubation, the anesthesiologist and the surgeon may still in very rare occasions embark on emergency tracheostomy to save the patient. We concluded that the surgical and anesthesia team should not discard this technique for life saving moments

## INTRODUCTION

Tracheal intubation, using direct laryngoscopy, became an essential part in the anesthesia management of the surgical patient. In the majority of cases the larynx and glottis are easily visualized by direct laryngoscopy, however in few cases, the anesthesiologist unexpectedly faces difficult intubation. Difficult or failed intubation is a common cause of mortality and morbidity related to anesthesia (1).

The anatomical factor in regard to difficult intubation has been studied extensively (2). Inspite of the development of algorithms for difficult intubation, publication of guidelines, and development of modern methods to visualize the larynx, there are those cases when difficult intubation will be encountered unexpectedly (3). Soft tissue factors can cause life-threatening airway obstructions.

Some reported cases were due to:

- fetal rhabdomyosarcoma of the tongue,
- lingual hematoma, lingual tonsils and or abscess,
- laryngeal carcinoma,
- retropharyngeal hematoma,
- and severe laryngeal edema after extubation (4,5,6).

The advancement of different optical technology including fiberoptic visualization did not solve the problem completely. The unanticipated difficult airway is still challenging for the anesthesiologist. In the ASA algorithm there are options for surgical airway (most of it evade but

not eliminate tracheostomy). This paper examines five cases from the author's practice in which a surgical technique was used to secure the airway and save the patient's life. In addition, the literature regarding soft tissue airway obstruction was reviewed.

## **CASE REPORTS**

### **PATIENT NO.1: ADENOCARCINOMA OF THE LARYNX**

A 24-year-old woman presented with inability to open the mouth due to severe pain. The patient had a history of nausea and vomiting. Her temperature on admission was 38.5°C with a white blood count of 8900/mm<sup>3</sup>. The patient always had "nasal" voice. She did not seek medical care before. Clinical examination revealed enlarged cervical lymph nodes.

She was scheduled to undergo lymph node biopsy under general anesthesia. Airway examination showed limited mouth opening (attributed by the patient to pain), there were no other abnormalities. She had protruding upper incisors, with normal thyromental distance. The neck was short and thin, with normal mobility of the cervical spines. After pre-oxygenation, the patient was induced with inhalation anesthesia using halothane and oxygen. Direct laryngoscopy with a Macintosh blade revealed enlarged tissue at the base of the tongue and redundant folds of pharyngeal tissue. The vocal cords, arytenoids, and epiglottis could not be exposed. Oxygen saturation was 98% for approximately 1 min and the heart rate and arterial blood pressure did not change.

One blind nasal intubation was attempted. The tip of the tube was watched from the mouth and found to hold massive pieces of necrotic tissues with a gush of oxygenated bright red blood. The opening of the mouth was limited and hardly accommodated the laryngoscope but not the laryngeal mask airway.

The attending anesthesiologist discussed the situation with the surgeon and requested emergency tracheostomy. Tracheostomy was completed within one minute and a 7.0 mm internal diameter tracheostomy tube was placed. Anesthesia was maintained and muscle relaxation was achieved using atracurium in dose of 0.3 mg.kg<sup>-1</sup>. Afterward, the patient made uneventful recovery.

### **PATIENT NO 2: UNDIAGNOSED ADENOCARCINOMA OF THE LARYNX**

A 65-year-old male patient was presented with anterior

compartment neck swelling and scheduled for biopsy under general anesthesia Fig 1. The preoperative evaluation revealed loss of voice and inability to communicate verbally. Although the breathing was noisy it directed no attention to the possibility of difficult intubation, since the mouth opening, Mallampati classification and thyromental distance were within normal limit.

#### **Figure 1**

Figure 1: A patient represented for neck biopsy for a nodule in the neck (Arrow)



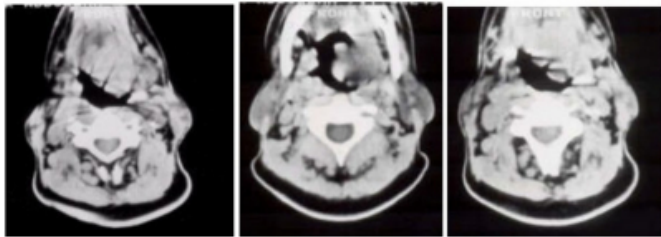
Induction of anesthesia was achieved by rapid sequence induction (pre-oxygenation, thiopentone 250 mg and 75 mg suxamethonium). Laryngoscopy was performed and the anesthesiologist could not recognize any normal anatomy of the larynx. At the second laryngoscopy, irregular masses of tumor could be seen engulfing the larynx. By that time, partial recovery of respiration was noticed and bubbles of secretion were seen coming out from in-between the fungating mass. Oxygen was administered and the general surgeon was requested to perform an emergency tracheostomy. Anesthesia was maintained throughout the tracheostomy tubeplacement. Then, a biopsy of the tumor was taken and the results of pathological examination confirmed adeno-carcinoma of the larynx. Tracheostomy was kept till the consent for laryngectomy could be taken. The family and the patient rejected the operation. Therefore, tracheostomy became permanent.

### **PATIENT NO 3: KAPOSI'S SARCOMA OF THE TONSIL**

A 70 years old diabetic man was scheduled to undergo tonsils biopsy and possible tonsillectomy. The preoperative evaluation indicated space occupying lesion fungating from the left palatine tonsil extending downwards the left pyriform fossa. CT scan of the neck confirmed the diagnosis, Fig 2. He was having small palpable cervical lymph node. Mouth opening and thyromental distance were within normal range.

**Figure 2**

Figure 2. Case no 3. Three sections in the neck CT scan showing the lingual extension of Kaposi's sarcoma.



After connecting the patient to the monitors and preparing for difficult intubation, induction of anesthesia was achieved with pre-oxygenation, 100 ug fentanyl, and incremental doses of propofol mounting to 120 mg till consciousness was lost, followed by suxamethonium 50 mg. The lungs were ventilated using a facemask. On the trial of laryngoscopy, massive bleeding occurred which made visualizing the vocal cords impossible. Oxygen saturation dropped, and on the second attempt pieces of the tumor and blood clot made it difficult to ventilate the lungs. The patient was allowed to recover consciousness but he had paradoxical respiration and became cyanosed. The surgeon prepared for tracheostomy while the patient became unresponsive with deterioration of cardiovascular parameters ending in nodal bradycardia and ventricular fibrillation.

Cardio-pulmonary resuscitation (CPR) started through cricothyrotomy and defibrillation, which recover to sinus rhythm, with improved oxygenation. The surgery was progressed into tracheostomy, and debulking of the tumor. At the end of surgery the patient recovered consciousness and in the next day the tracheostomy was closed. All blood gases and chest x-ray were within normal. The tumor turned to be a Kaposi's sarcoma of the left tonsil.

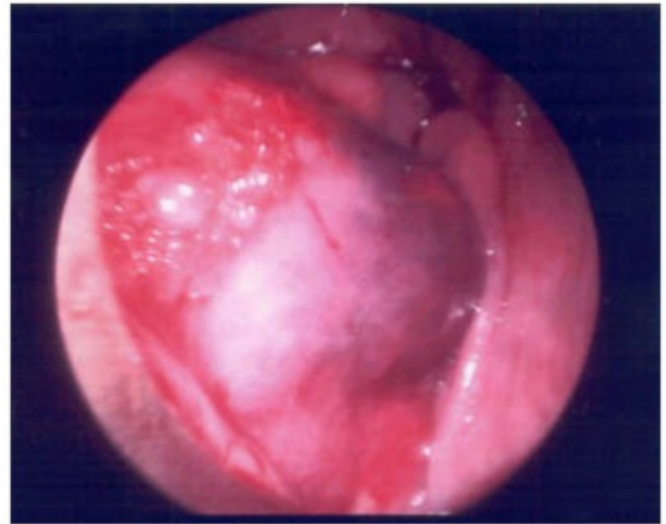
**PATIENT NO 4: ADENOMA OF THE LARYNX**

A 62-year-old man was admitted to the emergency department due to progressive breathing difficulty and voice changes. He was given oxygen, intravenous fluids and

racemic epinephrine nebulization. He was apprehensive and could not cooperate for indirect laryngoscopy. Examination under anesthesia was contemplated on the ground of increased respiratory distress and the possibility of foreign body inhalation or acute inflammation. After pre-oxygenation, anesthesia was induced with propofol and inhaling sevoflurane in nitrous oxide/ oxygen mixture.

**Figure 3**

Figure 3. Case no 4. Polypus adenoma.



The examination of the larynx showed a ball of soft tissue obstructing the airway Fig 3. Intubation of the trachea was difficult and emergency tracheostomy was performed. Fiberoptic visualization confirmed and documented the diagnosis. The patient was transferred to the SICU for further period of ventilation and consultation with the patient and family. The patient was sustained on tracheostomy and was breathing spontaneously till the third day when laser excision of the tumor was performed. Later on, the tracheostomy was closed. The tumor nature was benign adenoma.

**PATIENT NO 5: NECROTIZING TONSILLITIS IN THE PRESENCE OF CHRONIC LYMPHOTIC LEUKEMIA**

A 75-yr-old female patient, known to have chronic lymphatic leukemia, was admitted to the hospital suffering from fever and dysphagia. The diagnosis of necrotizing tonsillitis due to pseudomonas aeruginosa was made. She received antibiotics for two days. She was scheduled for tonsillectomy under general anesthesia.

Preoperative assessment revealed morbid obese patient (BMI>40), with history of hypertension on treatment. The

cardio-pulmonary examination was normal. Airway examination showed Mallampati class II, and thyromental distance was within normal limit. There were huge necrotizing tonsils. EKG, CXR were within normal limits. Laboratory investigation showed leukocytosis with 90% lymphocytes. Hemoglobin (Hb) 9.6g/dl. Packed red blood cells and platelets were prepared. Patient received 500 mg imipenem, 40mg pentazol and 10 mg metoclopramide two hours prior to surgery. The patient was classified as ASA III E. In theater the standard monitoring was established. A trolley for difficult intubation was made readily available.

Before induction of anesthesia blood pressure (BP) and heart rate were 155/95 mmHg, 92 beat/minute and tissue oxygen saturation was 94%. After preoxygenation, rapid sequence induction was performed. At laryngoscopy a "ball" size mass obstructing the view of the mouth was noticed. It was the right tonsil. The anesthesiologist tried to remove or move it aside when it started to bleed; also it was impossible to put the smallest airway. At that time the patient started to desaturate and it was impossible to ventilate the lungs. The surgeon was asked to perform a tracheostomy. He declined the request on the context that he has no experience with emergency tracheotomies. The anesthesiologist interfered and performed a very fast tracheostomy. After stabilization of the patient's condition, tonsillectomy was performed. At the end of the procedure the patient was fully awake. She was admitted to the ICU. Two days later the tracheostomy stoma was closed and she was discharged home four days after the procedure.

## **DISCUSSION AND REVIEW OF LITERATURE**

Reviews on the management of the difficult airway emphasize the importance of preoperative recognition, and securing definitive airway for adequate ventilation.

The practice of intubation used generally in these patients was as follow: after induction of anesthesia, direct laryngoscopy was used. If difficulties were encountered, trials of intubation were limited to three attempts with different-sized straight and curved laryngoscope blades. In three cases, fiberoptic intubation attempt was also unsuccessful because of bleeding from fragile tissue. Ideally, the surgical airway (tracheostomy or cricothyrotomy) should be considered early in the management of the patient with failed intubation and inability to secure the airway, noting that this would be especially true in patients with obstructing airway tumors. The indication for tracheostomy in these

cases was the desperate situation, which developed due to bleeding, airway obstruction or inability to ventilate the lungs resulting in desaturation and/or cardiac arrhythmia.

Most predictive studies on difficult intubation in the past considered anatomical factors in healthy individuals or a patients with known history of difficult intubation. In a recent study both, clinical and anatomical factors were studied. With the clinical data alone, discriminate analysis identified four risk factors that correlated with the prediction of difficult laryngoscopy and intubation: thyrosternal distance, thyromental distance, neck circumference and Mallampati classification. Taking the combination of clinical and radiological data, discriminate analysis identified five risk factors: thyrosternal distance, thyromental distance, Mallampati classification, depth of spine C2 and angle A (the most antero-inferior point of the upper central incisor tooth). The positive predictive value of this combined (clinical and radiological) model was greater than that of the clinical model alone (7).

In another study exploring soft tissues of the neck, in all 40 studied patients, a soft tissue radiograph and an MRI scan of the neck were obtained. The measurement included 21 parameters from both radiographic studies. There were no significant differences between the two groups in 20 of 21 measured parameters on MRI scans and soft tissue radiographs. Only one measurement -the distance between the uppermost visible part of the airway and the posterior pharyngeal wall (measured from MRI scans only) - between the two groups achieved statistical significance. The values recorded from MRI and soft tissue radiographs were not significantly different (8). The soft tissues obstruction still may surprise the anesthesiologist at intubation for the first time. Soft tissue airway obstruction was reported to hinder the intubation, ventilation and causes death of the patient during induction of anesthesia (9). Lingual tonsillar hypertrophy is one of the causative elements. The usual symptoms of lingual tonsillar hypertrophy include: sore throat, a globus sensation, voice hoarseness, speech changes, dysphagia, and otalgia (10). Ludwig angina and local inflammation is another well-known cause of inability to visualize the cord and intubation and may contribute to total loss of airway after induction. The third type of soft tissue obstruction is due to polypus adenomas or adenocarcinoma mass of the larynx in adult population. This may be presented as neck tissue biopsy in adults or rhabdomyosarcoma of the tongue in newborn. Other

transient, but fatal reasons for airway obstruction, which have been reported, are oropharyngeal hematoma related to injury and edema related to surgery.

Most of these conditions are treated with tracheotomies. In the present report, the choice of tracheostomy was a life saving issue and there were uncertainty of the patients courses if the operation was cancelled. The lesson learned from these cases is to look in suspicious cases for indirectly or fiberoptic laryngoscopy preoperatively while the patient is awake. Surgical airway like tracheostomy is an acceptable choice in difficult airways. Patients die due to difficult ventilation but not because of difficult intubation.

## CONCLUSIONS

In summary, tumors of the larynx are known causes of total loss of the airway during anesthesia and hypertrophied lingual tonsils may cause difficulty and sometimes inability to ventilate via a mask or endotracheal intubation during anesthesia. Lingual tonsil hypertrophy is an important pathologic finding to recognize at the time of laryngoscopy. Also cases presented for different type of surgery and harboring enlarged lingual tonsils either due to infection or malignant infiltration can contribute in the same way for difficult intubation. Equally important is recognizing the degree of difficulty in using fiberoptic endoscopy due to the redundant pharyngeal tissue interfering with fiberoptic exposure.

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