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CASE REPORT AIRWAY / EMERGENCY MEDICINE

Successful emergency management of hemorrhagic shock due to carotid artery aneurysm: the role of awake intubation in difficult airway control

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ABSTRACT

We describe the clinical scenario, analyze the decision-making process in airway management, and application of the Difficult Airway Society (DAS) guidelines for awake tracheal intubation (ATI) in a patient involving life-threatening bleeding from an internal carotid artery aneurysm caused by a fistula following radiotherapy for tongue cancer at Hong Ngoc Phuc Truong Minh General Hospital, on March, 2024.

A 53-year-old male, diagnosed with tongue cancer, underwent surgery. Days before admission, he experienced pain and bleeding from the right lateral neck due to an internal carotid artery aneurysm. An attempt at tracheal intubation for endovascular intervention at another hospital failed. Upon arrival at our emergency department, he exhibited massive neck hemorrhage, remained conscious, pale, with ongoing bleeding from a right neck fistula, and limited cervical motion due to irritation. A treatment strategy for permanent occlusion of the aneurysm was devised.

Awake tracheal intubation using a fiberoptic scope via the nasal route was performed. The patient received light sedation with midazolam, and the airway was topicalized with 10% lidocaine spray over the mouth, tongue, and oropharyngeal mucosa. Continuous monitoring of heart rate, ECG, and oxygen saturation showed no decrease in oxygen levels, and the patient maintained spontaneous breathing throughout. Intensive treatment with crystalloid fluids and blood transfusion, along with right internal carotid embolization with a spring coil, effectively prevented massive hemorrhage. The patient was successfully extubated after three days in the ICU and discharged 15 days post-surgery without any neurological deficits.

Keywords: Awake Tracheal Intubation; Difficult Airway Management; Fiberoptic Scope; Emergency Airway Management

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1. INTRODUCTION

A strategy for managing difficult airways is crucial when anticipating challenges in one or more steps: mask ventilation, placement of a supraglottic airway device, tracheal intubation, or front-of-neck access.[1, 2] Awake tracheal intubation (ATI) is a technique performed while the patient maintains spontaneous breathing, either awake or under light sedation, typically using a flexible fiberoptic scope or a videolaryngoscope.[1] ATI boasts a high success rate and low risk, making it the gold standard to manage predicted difficult airway as it ensures a secure airway before inducing anesthesia.

Despite its advantages, the use of ATI remains restricted, with statistics indicating a usage rate of less than 0.2% in the UK. Barriers to its adoption include technical challenges and equipment availability.[1] These obstacles are particularly pronounced in emergency situations, where time pressure and the urgency of the patient's condition leave little to no time for preparation and execution.[1,3] This case report emphasizes early identification of factors related to difficult airway and

meticulously planning to secure oxygenation and ventilation.

2. CASE REPORT

A 53-year-old male patient, with a history of Ca tongue, had large lymph nodes, and twice received surgery plus radiotherapy two years ago. He was also undergoing targeted chemotherapy. The patient has been experiencing pain in the right supraclavicular region with blood oozing from an ulcerated area, and restricted neck movement for several days. His CT scan neck revealed a pseudoaneurysm of the subclavian artery, and a plan was made for embolization to control the bleeding. However, an attempt at tracheal intubation at another hospital for surgical intervention was unsuccessful, so the procedure was halted. Two hours prior to hospital admission, the patient experienced significant bleeding and was transferred to Hong Ngoc Hospital at 6:30 AM on March 7, 2024.

2.1. Emergency department examination

The patient appeared pale with rapid, shallow breathing, was agitated, panicked, sweating, and had cold extremities. His vital signs were: pulse: 125 bpm; blood pressure: 98/53 mmHg; respiratory rate: 28 breaths/min and SpO_2: 93% (with a 10 L/min oxygen mask).

Initial treatment included administration of crystalloid and colloid fluids and maintaining a mean arterial pressure above 60 mmHg using two vasopressors; e.g., adrenaline 0.3 µg/kg/min, and noradrenaline 0.6 µg/kg/min.

Physical examination revealed an ulcer of approximately 4x5 cm in the right neck and supraclavicular region with active bleeding, which was being compressed. The neck movement was restricted, with a tilt towards the right. The patient was breathing spontaneously through an oxygen mask at a rate of 28 breaths/min, SpO_2 was 93% with oxygen, and the auscultation of both lungs revealed clear breath sounds.

2.2. Diagnosis

- Neck profuse bleeding (suspected carotid artery hemorrhage)
- History of tongue cancer with surgery, chemotherapy, radiotherapy, and metastatic cervical lymph nodes complicated by ulceration and necrosis in the right supraclavicular fossa.
- The patient required either embolization or surgical intervention to control the hemorrhage.

2.3. Airway assessment

We performed general physical examination.

Figure 1: Patient in the emergency room

The patient was unable to move his neck, with the neck fixed in a right tilt position following two years of radiotherapy. He could not extend his neck, and access to the anterior neck was not possible. There was a spurting ulcer on the right side of the neck, with two medical staffs using their hands to compress the wound with gauze (Figures 1 & 2).

Figure 2: Ulcer at the right neck area (post-hemostasis)

The patient could open his mouth and had good jaw movement, Mallampati class IV, with no clear abnormalities observed in the mouth. He could eat and swallow normally, had no difficulty in breathing, did not snore, and did not have stridor. His BMI was 20 kg/m^2.

We decided to go for awake tracheal intubation with a flexible bronchoscope. In the emergency department, the patient was oxygenated at 10 L/min of oxygen for 5 min. Otrivin 0.1% nasal solution was administered, followed by sedation with 1 mg midazolam IV.

Lidocaine 10% solution was sprayed at the tongue, oropharynx, mouth, and base of the tongue. After a few minutes, a flexible bronchoscope preloaded with a 7.0 endotracheal tube (ETT) was introduced into the oral cavity. Lidocaine 2% (3 ml) was sprayed along the pathway to anesthetize the route. The bronchoscope was advanced past the vocal cords into the trachea, where the carina was visualized. The ETT was then advanced into the trachea, and the patient started breathing through the endotracheal tube. The bronchoscope was withdrawn while observing the tracheal wall. The procedure was smooth, without causing stimulation, trauma, or bleeding.

Sedation and mechanical ventilation through the endotracheal tube was continued, and the patient was transferred to the interventional radiology suite.

2.4. In the interventional suite

The patient remained sedated, on mechanical ventilation, and vasopressors were maintained as blood continued to flow from the neck wound. The patient received continuous compression to control the neck bleeding, colloid and crystalloid fluids, packed red blood cells (PRBC) and plasma. After one hour, endovascular intervention was performed, successfully stenting the carotid artery, which stopped the bleeding (Figure 3).

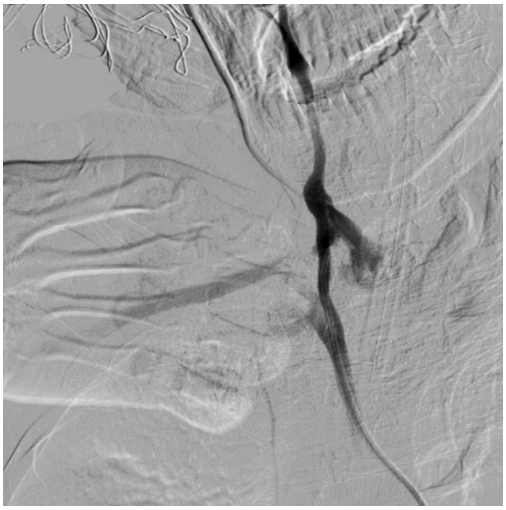

Figure 3: Carotid artery stent

After the intervention, the patient was transferred to the ICU for intensive care. He was weaned off mechanical ventilation and stabilized with repeat tests. The ETT was removed after one day, and the patient was discharged in stable condition after 15 days of treatment.

3. DISCUSSION

Airway management involves identifying difficult airway factors across various steps: mask ventilation, direct laryngoscopy for intubation, supraglottic airway device placement, and front-of-neck access through the cricothyroid membrane. Various criteria have been established to predict difficulties in these steps.[1,2] In this case, several challenges were identified for each airway management step:

1. **Mask ventilation:** Mask ventilation would be extremely difficult due to the immobility of the neck, which was fixed in a right tilt position with soft tissue adhesions from prior radiotherapy, preventing the alignment of the airway axis. Additionally, a large, bleeding fistula on the right side of the neck required gauze packing, preventing a proper mask seal. These conditions align with the American Society of Anesthesiologists' (ASA) 2003 guidelines, which highlight that an inability to achieve a mask seal can impede effective mask ventilation.[4]
2. **Direct laryngoscopy for intubation:** The patient was predicted to have difficult intubation due to the inability to extend the neck, a Mallampati IV classification, and a history of tongue cancer with surgery, leaving diffuse anatomical structures. These factors are part of the LEMON criteria, which predicts difficult intubation.[3]
3. **Front-of-neck access:** This last-resort option for failed ventilation was also problematic. The patient's neck was fixed in a tilted position, obscuring anatomical landmarks such as the thyroid and cricoid cartilages and the cricothyroid membrane. Additionally, active bleeding from the neck required continuous compression, further complicating access.
4. **Supraglottic airway devices:** While potentially viable, their effectiveness was uncertain due to the patient's history of tongue cancer and possible airway trauma from previous failed intubation attempts.

This case exemplifies the presence of multiple difficult airway factors. After thorough consideration and multidisciplinary consultation, we decided to proceed with awake tracheal intubation (ATI) using a flexible bronchoscope, following ASA guidelines.[4] The patient was breathing spontaneously with adequate oxygen saturation (SpO2 98%) on a 10 L/min oxygen mask, showing no signs of respiratory distress, stridor, or airway compromise. This allowed the emergency team time to plan and prepare for the procedure. However, general anesthesia was not an option as mask ventilation would not be feasible during apnea.[4] Furthermore, the patient was in hemorrhagic shock, with pale skin, rapid pulse, and spurting blood, and the vasodilatory effects of anesthetics could exacerbate hypovolemic shock.

The optimal choice was awake tracheal intubation with a flexible bronchoscope, allowing the patient to maintain spontaneous breathing and avoid the hemodynamic instability associated with anesthetic agents.[1,4] The primary concern was whether there was sufficient time to perform ATI. From decision to successful intubation, the process took 5 min. During equipment setup, the patient was preoxygenated with a 100% oxygen mask, premedicated with 1 mg Midazolam, and topicalized with 10% lidocaine spray to the oropharynx and tongue, while circulatory support was maintained with colloids, crystalloids, blood and vasopressors.

The benefit of ATI is the maintenance of spontaneous breathing and airway reflexes until airway control is achieved via the endotracheal tube, with minimal hemodynamic disturbance. Contraindications include patient refusal, immediate need for intubation, uncooperative patients, local anesthetic allergy, or massive airway bleeding.[1]

For this patient, a crucial consideration was whether to prioritize circulatory resuscitation or airway management. Despite the massive bleeding, effective resuscitation hinged on addressing the bleeding source. According to the American Heart Association (AHA) guidelines, securing the airway remains paramount. We simultaneously resuscitated with fluids and blood while prioritizing airway management. During the 5-minute intubation, light premedication with 1 mg Midazolam was administered, and the patient's mean arterial pressure was maintained above 65 mmHg with noradrenaline and adrenaline. In retrospect, we concluded that failure to secure the airway initially would have necessitated emergency intubation during cardiac arrest due to emorrhagic shock.

Another important question is whether there were alternative methods for managing this patient. If equipment or training for flexible bronchoscopy is unavailable, alternatives include supraglottic airway devices due to the patient’s good mouth opening or front-of-neck access (cricothyrotomy or tracheostomy). The Difficult Airway Society recommends second-generation supraglottic airway devices, which can facilitate endotracheal intubation or serve as a combitube. However, both methods require deep anesthesia, increasing the risk of airway control loss. Additionally, anatomical changes from surgery and radiotherapy further complicate these approaches.

Another potential method considered for this patient was awake intubation using a video laryngoscope. The patient could open his mouth, had no airway bleeding, and good jaw movement, indicating no difficulty with the upper lip bite test – a predictor of difficulty with video laryngoscopy.[3] However, the patient had multiple failed intubation attempts with video laryngoscopy while awake at another facility before being transfered to our hospital. Upon review, we concluded that flexible bronchoscopy for awake intubation was the correct choice for this patient.

The key to successful awake intubation, especially in emergency situations, is based on the STOP approach: Sedative, Topicalize, Oxygenate, Perform.[1]

1. **Sedative:** Maintain light to moderate sedation to prevent cough reflex while ensuring the patient follows commands and breathes well.
2. **Topicalize:** Apply 10% lidocaine spray to the oropharynx, base of the tongue, and nasopharynx, and administer 3 ml of 2% lidocaine via the bronchoscope to anesthetize the mucosa, minimizing stimulation during scope passage.
3. **Oxygenate:** Preoxygenate the patient with 100% oxygen using a mask. Maintaining spontaneous breathing is crucial, especially since this patient had no stridor during examination. In cases of airway narrowing or trauma, high-flow nasal oxygen (HFNO) is beneficial for maintaining oxygen saturation 1
4. **Perform:** Ensure correct endotracheal tube placement in the trachea by visualizing the trachea or vocal cords and confirming with capnography ($EtCO_2$) to avoid esophageal intubation. Confirm secure endotracheal intubation before initiating anesthesia for hemostatic intervention.

4. CONCLUSIONS

Based on the clinical case presented, we draw the following conclusions:

In the strategy for managing difficult airways in emergency patients, rapid assessment and evaluation of the airway and associated factors for difficult intubation are critically important.

For patients in hemorrhagic shock who require early airway control for hemostatic intervention, with anticipated anatomical challenges, difficulties in mask ventilation, supraglottic device placement, and expected challenges in performing a tracheostomy, awake intubation is highly recommended.

In such cases, maintaining spontaneous breathing and airway protective reflexes until successful endotracheal intubation ensures respiratory stability.

In well-equipped medical facilities with trained physicians proficient in the technique, awake intubation using a flexible bronchoscope remains a safe and preferred choice.

Even in emergency situations, awake intubation is contraindicated only if the patient refuses, requires immediate intubation, is uncooperative, has a local anesthetic allergy, or is experiencing massive airway bleeding.

The key to successful execution of this technique involves sedation, local anesthesia, oxygenation, and skilled training and practice.

And never ever fail to “Call for help”.

5. Ethical considerations

Written consent of the patient was obtained to publish his story for educational purposes.

6. Author contribution

Nguyen Thi Thu Ba is the sole author of this case report.

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