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Case Report

EMERGENCY TRACHEOTOMY IN TRACHEAL STENOSIS – A CASE REPORT

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SUMMARY – Airway management in an emergency department is the first step in critical care of an urgent patient. When orotracheal intubation is not possible due to upper airway obstruction, such an emergency is known as a 'cannot intubate – cannot ventilate' situation. Then, emergency tracheotomy is indicated. We present a case of a 70-year-old patient complaining of progressive dyspnea. The patient was conscious, highly tachydyspneic, and tachycardic. Loud stridor and a scar from previous tracheostomy suggested upper airway obstruction. Patient history confirmed previous partial laryngectomy and temporary tracheostomy due to laryngeal cancer 10 months before. Differential diagnosis of tracheal stenosis was set, and an ENT specialist was requested. Flexible fiberoptic laryngoscopy demonstrated a 1-mm subglottic tracheal stenosis. Emergency surgical tracheotomy below the obstruction in awake state using local anesthesia was performed to secure the airway. Early postoperative care was complicated by incipient right-sided pneumonia, which may have provoked narrowing of the existing subglottic stenosis in the first place. Tracheal stenosis is an important differential diagnosis of airway obstruction in patients with previous malignant diseases of the upper respiratory system. Emergency physicians should promptly recognize these situations based on clinical examination to secure appropriate airway management.

Key words: *Emergency medicine; Tracheal stenosis; Tracheotomy; Respiratory sounds; Airway obstruction*

Introduction

First examination of a patient in the emergency department must detect a critical condition, mostly using the Airway, Breathing, Circulation, Disability and Exposure (ABCDE) approach[1]. Airway management is the first step in vital care of an emergency patient with the idea of providing first pass success in orotracheal intubation serving as the most desirable outcome due to a higher incidence of adverse events in multiple intubation attempts[2]. Difficult orotracheal intubation occurs in 4.3% of patients in the 'prehospital setting'[3] and 1.5% to 8.5% of all patients[4,5]. Failed intubation is known as the 'cannot intubate – cannot ventilate' situation, occurring in 0.003% of cases[6]. Then, emergency tracheotomy may be necessary if specific requirements are satisfied, and other options excluded[7].

Patient history may reveal risk factors for tracheal stenosis, such as a history of tracheostomy or prolonged tracheal intubation. The incidence of iatrogenic tracheal stenosis is varying from 1% to 20%[8,9], with a mean incidence of 8.9%[10]. Very few cases of critical stenosis require emergent intervention[11]. Subglottic

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tracheal stenosis is more frequent after percutaneous tracheostomy than surgical tracheostomy[12]. Complete clinical examination and endoscopic imaging of the upper respiratory tract are essential in identifying precise localization of the stenosis and severity of airway obstruction.

Emergency surgical tracheotomy is a life-saving procedure performed under local anesthesia if needed, on an awake dyspneic patient, which precedes cardiopulmonary arrest with a relatively low rate of complications[13].

Case Report

A physician in the ambulance team examined a 70-year-old male patient complaining about breathing difficulties. The patient complained of progressive dyspnea in the last few hours. Clinically, the patient was highly tachydyspneic with a pulse of 140 *per* minute and oxygen saturation of 75%. The emergency physician on the field administered intravenous aminophylline and corticosteroids, as well as oxygen therapy with no significant improvement. The patient was promptly transported to the nearest hospital. Upon arrival at the emergency department, the patient was conscious, tachycardic around 120 *per* minute, breathing around 35 respirations *per* minute with oxygen saturation of 79%, and normal blood pressure of 120/80 mm Hg. Verbal contact was difficult due to worsening dyspnea. Poor general condition was presented with cyanotic lips, loud stridor, and usage of the accessory respiratory musculature. Inspection detected scars from previous tracheostomy and laryngeal operation while auscultation of the lungs revealed secretion in the large airways. Patient history confirmed previous partial laryngectomy and temporary tracheostomy due to laryngeal cancer 10 months before. Decannulation was performed a few months after the end of the treatment because of good recovery and no signs of cancer relapse. Furthermore, the patient suffered from arterial hypertension and diabetes, he developed a stroke 1 year prior to laryngeal cancer with consequent left hemiplegia and dysarthria.

Considering clinical presentation, upper airway obstruction was suspected. Patient history disclosed a differential diagnosis of tracheal stenosis, which led to the immediate need for endoscopic examination of the upper respiratory tract. The otolaryngologist was familiar with this case, explaining that the patient was referred to the tertiary center due to asymptomatic tracheal stenosis that was diagnosed three months before. The last computerized tomography (CT) scan of the neck described a 3-mm tracheal stenosis (Fig. 1). However, at that point, flexible fiberoptic laryngoscopy revealed a 1-mm subglottic tracheal stenosis.

Fig. 1. CT scan of the neck showing tracheal stenosis with a 3-mm diameter at the thyroid gland level.

Emergency surgical tracheotomy in awake state using local anesthesia was indicated. Considering the COVID-19 pandemic and the unknown status of the patient, surgical team was wearing mandatory personal protective equipment that made the procedure more challenging. The incision was placed in the medial neckline below the obstruction. The upper flap was secured, and flexible tracheostomy tube number 9 was placed. The procedure was well tolerated with no complications observed. The patient slowly achieved adequate oxygen saturation and dyspnea diminished.

Several hours later, the patient developed difficulty breathing again. Oxygen saturation dropped to 83%. Flexible fiberoptic laryngoscopy showed a properly positioned and passable tracheostomy tube with no mucus plug in the trachea. Auscultation revealed lung rales. Laboratory tests showed leukocytosis and elevated C-reactive protein, which indicated an inflammation. Chest radiograph revealed a diffuse interstitial lung pattern with intense shading in the right perihilar area along with horizontal interlobar infiltration.

Diagnosis of the incipient right-sided pneumonia was made. Intensive care measures, oxygen therapy, antibiotics, and other symptomatic treatments were administered. The patient's condition improved significantly within 24 hours. Otolaryngologist's follow up examination showed no signs of swelling or tumor relapse in the larynx. Weaker mobility of the left hemilarynx was observed due to prior left cordectomy. Cervical lymphadenopathy was not palpable. Follow up laboratory results showed normalization of inflammatory parameters and the patient was discharged in good general health and referred to a tertiary medical center for laser treatment of subglottic stenosis.

Discussion

Acute respiratory distress caused by upper airway obstruction presents one of the most stressful situations for an emergency physician. The patient in distress may be nearly suffocating and can quickly collapse and fall into respiratory and then cardiac arrest. That is why quick but appropriate action is needed on the very first examination. Signs such as shortness of breath, dyspnea, and stridor followed by low oxygen saturation should indicate upper airway obstruction. Difficulty breathing often disables a patient from adequately sharing his illness history; therefore, a physician needs to pay special attention in searching for possible hidden signs that would help in differential diagnosis, such as a scar from previous tracheotomy or neck dissection. It is crucial to adequately recognize a situation where trying oropharyngeal intubation could seriously jeopardize the patient, causing adverse events and possible respiratory arrest. Cooperation between an emergency physician and otolaryngologist is needed to quickly assess the exact location and level of obstruction, using flexible fiberoptic laryngoscopy or rigid bronchoscopy, whichever is appropriate.

Iatrogenic tracheal stenosis is an important differential diagnosis of airway obstruction in patients with malignant diseases of the upper respiratory system due to previous tracheostomy. Tracheal stenosis is mostly asymptomatic considering that symptoms start to manifest when tracheal diameter is reduced by 50%[14], therefore only 3%-12% of stenosis are clinically important and require intervention[15]. A patient can tolerate a 3-mm tracheal stenosis in good health, but in case of an infection, such tracheal diameter becomes inadequate in transporting air in and out of the lungs due to higher oxygen demands. In our case, tracheal stenosis was a known diagnosis, and its treatment was previously planned in a tertiary center. However, edema produced by inflammation resulted in narrowing the already thin passage causing insufficient oxygen transportation and acute upper airway obstruction. Furthermore, pneumonia itself could precipitate a mismatch in the alveolar ventilation and pulmonary perfusion leading to hypoxic respiratory failure[16].

Emergency surgical tracheotomy using local anesthesia was the method of choice for securing the airway in this patient. The procedure itself was demanding due to the patient's critical condition and uncooperativeness. The other aggravating circumstance was the presence of the pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), known as the COVID-19 pandemic. This respiratory virus transmits mainly through the respiratory route *via* aerosol that contains viral particles. A large quantity of aerosol is generated throughout emergency tracheotomy due to direct opening of the trachea and reflex coughing[17]. Considering the high risk of transmission of SARS-CoV-2 to healthcare workers, emergent tracheotomy should be performed using maximal safety equipment to minimize the chance of contagion. The filtering respirators such as filtering face piece 2 masks (FFP2) are the required personal protective equipment in aerosol-generating procedures, as well as a liquid-resistant surgical gown, disposable gloves, apron, and face shield[18]. The equipment makes visibility difficult, especially for bespectacled healthcare workers. Despite all difficulties, an experienced ENT surgeon performed successful tracheotomy lower to the tracheal stenosis and a flexible tracheostomy tube was placed. Early postoperative care was complicated with incipient right-sided pneumonia. Pneumonia may have provoked narrowing of the existing subglottic stenosis in the first place, resulting in combined upper and lower airway obstruction.

Conclusion

This case emphasizes that acute respiratory failure can occur due to simultaneous upper and lower airway obstruction. In patients with previous malignant disease of the head and neck, an important differential diagnosis of airway obstruction is tracheal steno-

sis. Emergency physicians should promptly recognize acute respiratory distress based on clinical examination to secure appropriate airway management.

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Sažetak

HITNA TRAHEOTOMIJA KOD TRAHEALNE STENOZE – PRIKAZ SLUČAJA

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Zbrinjavanje dišnoga puta u hitnoj službi prvi je korak u procjeni i liječenju hitnog bolesnika. Situacije u kojima orotrahealna intubacija nije moguća zbog opstrukcije gornjih dišnih putova poznate su pod nazivom 'nemoguće intubirati – nemoguće ventilirati' (*cannot intubate – cannote ventilate*). U takvim situacijama indicirana je hitna kirurška traheotomija. Autori prikazuju slučaj 70-godišnjeg bolesnika koji se žalio na progresivni osjećaj nedostatka zraka. Bolesnik je bio pri svijesti, izrazito tahidispnoičan i tahikardan. Glasan stridor i ožiljak od prethodne treaheotomije ukazali su na opstrukciju gornjih dišnih putova. Anamnestički se doznaje da je kod bolesnika prije 10 mjeseci učinjena parcijalna laringektomija i privremena traheotomija zbog karcinoma grkljana. Postavljena je dijagnoza trahealne stenoze i pozvan je specijalist otorinolaringologije. Fleksibilna fiberoptička laringoskopija pokazala je subglotičnu trahealnu stenozu promjera 1 mm. Zbog osiguranja dišnog puta učinjena je hitna kirurška traheotomija ispod mjesta opstrukcije u budnom stanju u lokalnoj anesteziji. Rani poslijeoperacijski oporavak kompliciran je početnom desnostranom upalom pluća koja je možda i izazvala suženje postojeće subglotičke stenoze. Trahealna stenoza važna je diferencijalna dijagnoza opstrukcije dišnih putova u bolesnika s prethodnim malignim bolestima gornjega dišnog sustava. Na temelju kliničkog pregleda nužno je odmah prepoznati ovakve situacije kako bi se primjereno zbrinuo dišni put.

Ključne riječi: *Hitna medicina; Trahealna stenoza; Traheotomija; Stridor; Opstrukcija dišnih putova*