

The Airway Management of One Case of Closed Tracheal Rupture Caused by a Car Accident

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Abstract

Difficulty of tracheal intubation is caused by many reasons and among them tracheal rupture is an infrequent factor. Tracheal rupture leads to higher mortality and poorer prognosis especial for closed tracheal rupture which is hard to early diagnose and is generally fatal. We described a case of a 34-year-old narcose man after a car accident that accepted twice unsuccessful tracheal intubation with visualized laryngoscope and was diagnosed tracheal rupture through tracheotomy. We reviewed some of the present literature about the diagnosis of tracheal rupture and anaesthesiologic treatment in order to better guide the clinical practices.

Keywords: Closed tracheal rupture; Tracheotomy; Emergency treatment; Difficult tracheal intubation; Intubation failure

Introduction

Tracheal injuries are one of the common clinical situations that happen in blunt trauma but tracheal ruptures are rarely seen especially closed tracheal ruptures [1]. However closed tracheal ruptures are usually life-threatening before the timely medical management. Most of these patients need respiratory support therapy and sequentially emergent surgeries to maintain vital signs. Different anaesthetic techniques of tracheal intubation and tracheotomy may play different roles in the prognosis of patients. Early diagnosis of tracheal ruptures is vital to avoid inappropriate medical treatment and improving outcomes. This article describes one case of a man diagnosed with closed tracheal rupture, and also discusses the early diagnosis and emergency treatment of tracheal rupture.

Case Report

A 34-year-old male was admitted to the emergency department for a multiple trauma of head, trachea, chest and abdomen caused by a car crash of two taxis. A loss of consciousness occurred during transportation with massive blood loss manifesting as non-response and cold limbs. When he arrived at the hospital, there were no obvious abnormalities of respiratory rate and rhythm. Considering that the patient had multiple organ injuries and was in a state of unconsciousness, he was given orotracheal intubation in order to protect airway and prevent asphyxia. The operation was carried out by an experienced anesthetist with a 6.5 mm ID (inside diameter) tracheal catheter. However the intubation failed to carry on after 16 cm into the trachea. And after the exchange of a 5.5 mm ID catheter and 50 mg rocuronium intramuscular injection the tracheal catheter stuck in that depth again. At this time the patient faced a sudden decrease of heart and breathe rate, the anesthetist implemented tentative balloon ventilation and the symptoms of cervical and thoracic swelling and

subcutaneous crepitation began to appear. The heart rate was progressively decreased to 43/min and the oxygen saturation was 20%. In that case a primary diagnosis of trachea rupture was considered. To avoid further damage of tracheal mucus and establish an efficient respiratory support, the patient received an immediate tracheotomy below the cricoid cartilage. In the surgery the tracheal catheter was found to be stuck at the ruptured trachea and tracheal mucus pseudo canal was formed. Then a new catheter was then inserted from the incised trachea. During this series of operations the heart rate was decreasing to zero and oxygen saturation was 1%, and the patient was give mechanical ventilation and external cardiac compression at once. The clinical examination showed the breath and heart rate were absent, the bilateral pupils were unequal (left 3.5 mm, right 2.0 mm), and light reflex was weak positive, ecchymosis. Whereafter the heart rate recover to 119/min after mechanical ventilation and external cardiac compression.

After vital signs of the patient maintain at a stable level, the patient had a examination of chest radiography (Figure 1) and combined CT scan of head, neck, chest and abdomen. The CT scan showed that he had a primary brainstem injury, extensive subarachnoid hemorrhage, bilateral pulmonary contusion, bilateral pneumothorax, multiple trachea rupture, subcutaneous emphysema of neck and chest (Figure 2). The patient was then transferred to ICU and was given bilateral closed drainage of pleural cavity. And one week later he has received a surgery of cervical tracheal injury repairment. Because of the severe brainstem injury the patient is still in coma under strict monitoring.

Discussion

Difficulties and failure in airway management are one of the most important factors in mortality related to anesthesia. And difficult tracheal intubation is the third most common factors that leads to death and cerebral injury according the American Society of Anesthesiologists analysis [1,2]. The American Society of Anesthesiology (ASA) defined as the clinical situation in which a

conventionally trained anesthesiologist experiences difficulty with face mask ventilation of the upper airway, difficulty with tracheal intubation, difficulty with laryngoscopy, and failed intubation [3]. Among them tracheal rupture is a comparatively infrequent factor especially closed tracheal rupture but causes more serious consequence [4]. Difficult intubation may result in traumatic endotracheal intubation with serious complications such as esophageal perforation, pneumomediastinum, desaturation and hypopharyngeal pseudodiverticulum which may casuse devastating consequences for patient [5,6]. Therefore difficult intubation of patients suffered multiple injuries deserves more attentions to early diagnose and repair restoring structure and function and to avoid intubation complications [1].



Figure 1: The patient had received tracheotomy and closed drainage of pleural cavity.

Closed tracheal rupture usually results from moderate to severe force causing lacerations of tracheal cartilage and mucosa but the skin remains integral or grazed. The lack of dermatic wounds may delay the diagnosis of tracheal rupture and misdirect the operation of airway management. Dyspnea in varying degrees, coughing, hemoptysis and hoarseness are the main manifestations of tracheal rupture and physical examination may display as extensive subcutaneous emphysema, pneumothorax, aphonia and bruising. As for this case the patient was insensible and there were no obvious clinical signs prompting the diagnosis of tracheal rupture when he was sent to the emergency ward. This condition seriously obstructed the diagnosis and disturbed the choices of further airway manage. For that reason the patient was given orotracheal intubation and in the process clinical features of dyspnea, subcutaneous emphysema arised contributing to the rapid diagnosis of tracheal rupture. And further tracheotomy confirmed the diagnosis. Airway management of patients with tracheal

rupture should be based on the clinical condition of the patients and the degree of injury [7]. The management may vary from immediate intervention for rapidly desaturating patients to observation for clinically stable patients. Emergency intubation is appropriate for airway trauma patients with impending respiratory failure, unconscious patients requiring airway protection and haemodynamically unstable patients [8].

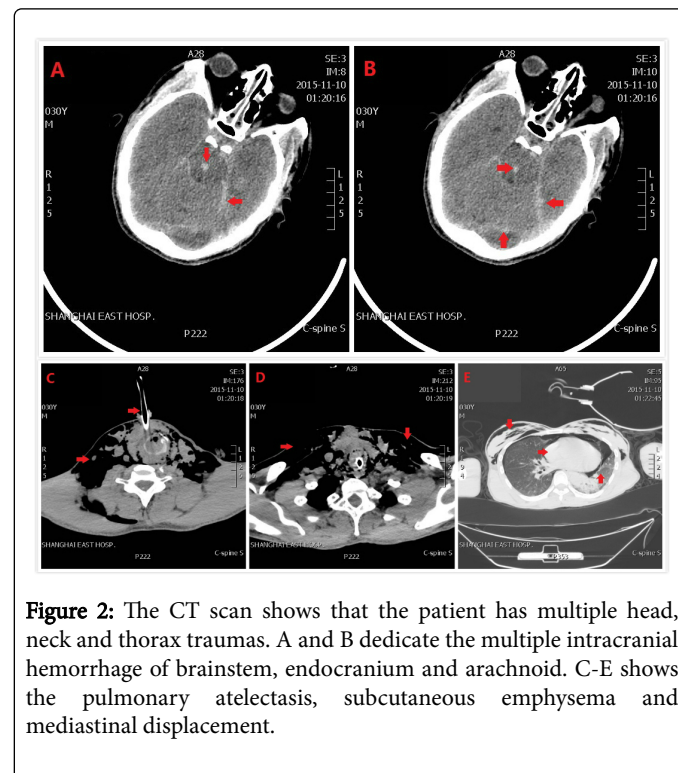


Figure 2: The CT scan shows that the patient has multiple head, neck and thorax traumas. A and B dedicate the multiple intracranial hemorrhage of brainstem, endocranium and arachnoid. C-E shows the pulmonary atelectasis, subcutaneous emphysema and mediastinal displacement.

Fibreoptic bronchoscopy is the fibreoptic bronchoscopy to secure the airway but it requires skilled endoscopists and relatively better environment. Chu et al. [9] found that majority of desaturating airway trauma patients are intubated orotracheally in the emergency room using direct laryngoscopy. Meta-analyses of RCTs show that video-assisted laryngoscopy provides a higher frequency of first attempt intubations comparing to direct laryngoscopy [10,11]. Scores of researchers suggest that an emergency tracheostomy or a cricothyroidotomy should be the first approach to restore the airway in blunt laryngeal trauma in consideration of the risk of causing a false passage by oral intubation especially for patients suspicious of tracheal rupture [12]. In this case the patient has repeatedly received failed orotracheal intubation and tracheotomy proved the formation of false passage. Therefore as for asymptomatic closed tracheal rupture patients the selection of techniques to maintain the airway is more complicated. The chance of tracheal rupture must be taken into consideration.

According to our experience the management of patients with multiple injuries and uncertain tracheal rupture depends on the state of patients' vital signs, degree of trauma severity and available facilities. As for patients with rapid desaturating or progressive respiratory failure tracheotomy or cricothyroidotomy should be immediately performed to maintain the airway and secure saturated ventilation. At the environment of emergency ward aerocyst face mask assisted pressure respiration can be applied to help recover the ventilation

before operative airway management and to induce the symptom of cervical subcutaneous emphysema of closed tracheal rupture patients. And if the vital signs are stable or prospectively stable, a rapid computed tomography (CT) examination is essential to clarify the diagnosis of tracheal rupture and avoid further damages and complications caused by tracheal intubation. Furthermore CT examination helps to assess the seriousness of combined organ traumas.

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Competing Interests

The authors declare no competing interests.

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