CASE REPORT

Airway management of major blunt tracheal and esophageal injury: A case report

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ABSTRACT

Trans-sectional injuries of trachea are quite rare and can be extremely challenging for anesthesiologists to deal with. About 25% of post-traumatic deaths are due to thoracic traumas in which blunt injuries take a rather small place within and the resultant damage of respiratory tract is quite rare with an incidence of 0.5–2%. A recent review from a single trauma center revealed an incidence of 0.4% for tracheobronchial injury (TBI) due to blunt thoracic injuries. Most of the patients having tracheal transection lose their lives on the field due to loss of airway. Patients mostly present with a large spectrum of clinical features varying from hoarseness to respiratory collapse; though subcutaneous emphysema is the most common presenting sign which should remind possible TBI. Emergent surgery is preferred seldomly; such in cases of partial damage or because of late diagnosis, due to favorable outcome of conservative approach. Herein, we report the management of a case on TBI due to blunt thoracic trauma, experiencing difficult ventilation despite tracheal intubation. Fiber-optic bronchoscope (FOB) seems obligatory to visualize site and severity of injury and to ensure safe airway during procedures such as the neck exploration, primary end-to-end anastomosis of the trachea, tracheostomy, diversion pharyngostomy, and feeding jejunostomy.

Keywords: Blunt thoracic trauma; fiberoptic bronchoscope; injuries of trachea.

INTRODUCTION

Transectional injuries of trachea are quite rare occasions which can be extremely challenging for anesthesiologists to manage. It is known that a quarter of post traumatic deaths are caused by thoracic traumas in which blunt forces take a rather small place. According to severity of the trauma, clinical symptoms may vary from asymptomatic to massive bleeding. Among them, subcutaneous emphysema is the most common symptom pointed out in the reports.[1] There has been a tendency to stay conservative with partial respiratory injuries lately and it seems to show some benefit.[2] However it is inevitable to proceed surgery if the injury is complete just as in this case and most of the patients with trachea transection die in the field due to loss of airway.[3,4] So these situations require lots of preparation and experience especially for the prehospital healthcare providers. Here in this case report, we tried to explain management of tracheoesophageal rupture in a young male person caused by a blunt force to the neck; simply because it can be such great challenge to secure airway and maintain adequate ventilation in whole perioperative period.

CASE REPORT

A 16-year-old male patient with a history of motor vehicle accident occurred 6 h ago had been admitted to the emergency department (ED) of university hospital. He had hit a tethered string which was stretched between the two trees while rid-

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ing a motorbike. He was initially intubated by an emergency medical technician on the field and then had been transferred to the tertiary hospital where airway trauma had been suspected. Afterward, he had been transferred to the ED of our hospital during when he was under sedation with both of his pupils being responsive to the light test. On his physical examination; broad subcutaneous emphysema beginning from the eyes expanding to the scrotum had been observed with large areas of ecchymosis around the neck. He had two thorax tubes inserted on both sides of the chest wall due to hemothorax, and an abdominal drain for his broad subcutaneous emphysema showing oscillations on each inspirium. His neck had been stabilized with a collar.

His ventilation had been achieved manually through Ambu® with elevated airway pressures since transport ventilator could not ensure it, and also some amount of pressure on trachea was mandatory to maintain ventilation. Every insufflation demonstrated elevation of soft tissue around the neck which possibly had been caused by air leakage from the upper trachea. A peripheral oxygen saturation of 94% had been hardly preserved which showed declines under lower airway pressures. No hemodynamic disturbance had been recorded. The staff anesthesiologist had decided to evaluate the airway with fiber-optic bronchoscope (FOB) in the emergency room. After the bronchoscopic evaluation remained inconclusive, the patient had been transported to radiology department for further evaluation. Computed tomography (CT) scan had revealed complete detachment of trachea at the level of the clavicle with extensive images of air around the neck which extended throughout the thoracic and abdominal subcutaneous tissue (Fig. 1a and b). In addition, a fracture line on the level of 2nd cervical vertebra was apparent on sagittal view. Later on, he had been transferred to the operating room. The second bronchoscopic evaluation had been performed by a senior thoracic anesthesiologist. FOB had been directly exposed to mediastinum with the nasogastric tube on posterior and distal part of the ruptured trachea lying beneath the pulmonary artery (Fig. 2; see also in video). By means of FOB, tracheal tube had been replaced over detachment line and fixed at 27 cm depth. Minimum peripheral O_2 saturation had been recorded as 92% during the procedure. Blood gas parameters ameliorated with acceptable airway pressures (from a peak airway 39 cmH_2O–25 cmH_2O) (Table 1). Surgical exploration had showed bilaterally injured recurrent laryngeal nerves. Thus, end-to-end anastomosis of the trachea and a tracheostomy had been performed. Esophageal injury had been managed with diversion pharyngostomy and feeding jejunostomy. Following the operation, the patient had been transported to intensive care unit (ICU) with a tracheostomy cannula on. He had been hospitalized in ICU for 9 days due to mediastinitis and then transferred to the service. He was discharged from the hospital 22 days later.

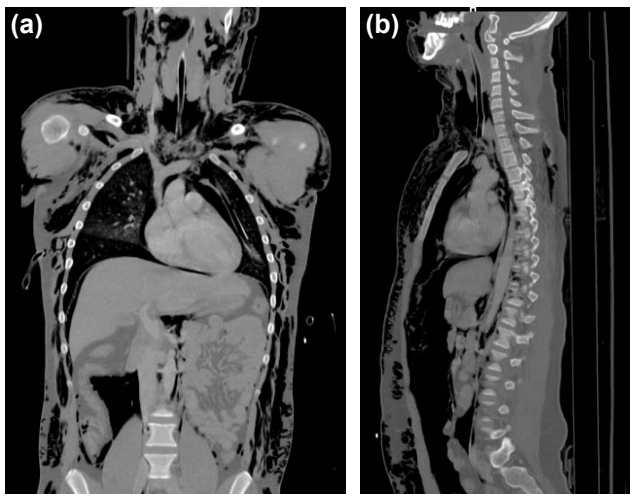

Figure 1. (a) Computed tomography scan showing tracheal detachment at clavicle level. Note extensive subcutaneous emphysema. **(b)** Computed tomography scan (sagittal view).

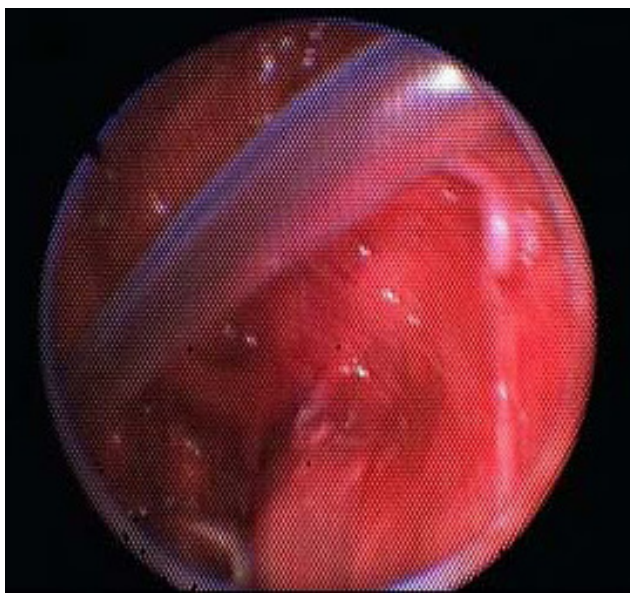

Figure 2. Fiber-optic view: The end of tracheal tube exposed to mediastinum with nasogastric tube on posterior.

Table 1. Scheme of arterial blood gas samplings during the surgery

Blood gas parameter	Before surgery	1st h	2nd h	3rd h	Before the transport
pH	7.16	7.13	7.26	7.32	7.37
Base excess	–1.9	–6.1	–3.8	–3.6	–2.3
PaO_2 (mmHg)	454	169	109	155	283
$PaCO_2$ (mmHg)	74	77.5	54	42.7	37.9
Hemoglobin (g/dl)	14.8	13.7	13.8	13.5	13
Glucose (mg/dl)	145	138	126	115	76
Lactate (mmol/L)	3.6	3.7	3.7	4.5	3.5

DISCUSSION

Airway injuries may occur in motor vehicle accidents when chest is compressed in anterior-posterior axis, or when

shearing forces develop at fixed point of airway in case of deceleration injury. Tracheobronchial injury (TBI) does occur in explosive pattern due to reflexively closed glottis.[4,5] The patient had a violent impact to the neck resulting compression of trachea to rigid cervical spine and probably which had led to simultaneous hyperextension. As trachea is quite mobile between cricoid cartilage and carina which makes it vulnerable to injury after blunt trauma. Complete disruption of trachea had been reported one in nearly 4500 trauma admissions.[6] Establishing a secure airway has the highest priority in trauma management. Airway management is a unique and a defining element to the specialty of emergency medicine. Surviving following trachea-esophageal transection is uncommon. Relevant literature states that intact peritracheal tissue seems crucial to maintain ventilation through disruption.[7–9] Considering our case, adequate ventilation was achievable only when pressure was applied upon neck. Whereas, anesthesiologist on charge had performed on Ambu® manually for effective ventilation. The pressure probably helped to restore the integrity of peritracheal soft tissue which was also compromised to some extent. However, every insufflation increased further subcutaneous emphysema.[9,10]

The initial concern about TBI is the make the accurate diagnosis, since its clinical presentation may vary in a large spectrum with dyspnea, aphonia, hemoptysis, hypoxemia, etc. Subcutaneous emphysema is common though. Increase in subcutaneous emphysema and/or persistent pneumothorax despite chest drainage should alert physicians for TBI.[9–13] Here, we report a case of blunt trauma following high-velocity road traffic accident, in whom we noticed "failed airway" which turned out to be due to complete tracheal transection. This case was suspected for airway injury at first evaluation in which the main problem was inadequate ventilation. In our ED, first FOB performed by staff anesthesiologist was inconclusive and CT scan had showed signs of tracheal rupture. CT scan detect about 90% of TBI by showing abnormal air images around the injured airway, or by directly giving clues for defects in bronchial lumen[10–13] (displacement, blockage, etc.). Prokakis et al.[5] asserted that CT was highly diagnostic for laryngeal traumas, but less specific for TBI. Multi-slice CT, MRI, or virtual bronchoscopy are newer modalities to improve diagnosis of TBI.[5,10] Besides its diagnostic contribution, FOB is useful in achieving a safe airway. If these patients have a partial tracheal transection, intubation intervention can turn it into a full transection.[14] In case of total rupture of trachea, distal part may retract in thorax which may constitute a life-threatening challenge to the anesthesiologist.[15] Moreover, partial laceration may lead to a total rupture due to unintentional blind tracheal intubation. Therefore, any attempt of blind intubation should be avoided when airway injury is suspected. Trauma patients should be evaluated carefully to avoid inappropriate interventions and subsequent complications.[11] Spontaneous ventilation is encouraged if gas exchange does not deteriorate.[5,8] If it is not possible to reach the distal end of the trachea, extracorporeal systems should be available at hand.[12] Considering that, we had alerted the cardiovascular surgeons in case of intervention. Correct position of endotracheal tube had been achieved with ease thanks to senior thoracic anesthesiologist who was familiar with use of bronchoscope and tracheobronchial anatomy. Furthermore, esophageal transection had been diagnosed with second attempt of bronchoscopic evaluation when nasogastric tube was directly visualized at the end of transected trachea.[16]

Esophageal injury is seen more common in penetrating injuries; however, it should be carefully investigated after blunt trauma if tracheal damage is suspected. In a similar way, esophagus can be compressed against cervical spine. Clinical signs are mostly insidious and non-specific for esophageal injury. Early diagnosis and surgical repair has upmost importance for the management of TBI. While awake fiber-optic intubation can be an alternative or assist in tracheostomy in patients with airway injury who are hemodynamically stable and not in respiratory distress.[13,16,17]

The most important take-home message of this case report is that anesthesiologist should have the ability to predict "difficult airway," recognize "failed airway" and be skilled in performing rescue techniques when routine oral tracheal intubation fails. Any delay at any step in the "failed airway" management algorithm may not save the critically ill patient.[16,17]

To conclude, the presence of life-threatening tracheal trauma even in the absence of signs and symptoms of an external injury is a real probability and securing the airway promptly remains top priority.

Conclusion

Airway injuries after blunt trauma are rare and can easily be misdiagnosed. In case of need, FOB is highly efficacious to evaluate airway tree. Blind tracheal intubation should be avoided in case of suspicion about the integrity of airway anatomy. Esophageal evaluation can be postponed to resolution of emergent situation, but should not be omitted.

Informed Consent: Written informed consent was obtained from the patient's parents for the publication of the case report and accompanying images.

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OLGU SUNUMU - *ÖZ*

Majör künt trakeal ve özofagus hasarında havayolu yönetimi: Olgu sunumu

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Trakeanın transeksiyonel yaralanmaları oldukça nadirdir ve bu durumla anestezistlerin başa çıkması zor olabilir. Künt travmaların içinde oldukça küçük bir yer kaplayan toraks yaralanmaları, travma sonrası ölümlerin %25'ini oluşturmaktadır. Bunun sonucunda ortaya çıkan solunum yolu hasarı %0.5–2 oranında görülür. Tek bir travma merkezinden yakın zamanda yapılan bir çalışmada, künt toraks yaralanmaları nedeniyle trakeobronşiyal hasar insidansı %0.4 olarak saptanmış. Trakeal transeksiyonu olan hastaların çoğu, hava yolu kaybı nedeniyle olay yerinde hayatını kaybeder. Hastalar çoğunlukla, ses kısıklığından solunum kollapsına kadar değişen klinik özellik yelpazesine sahiptir. Derialtı amfizem olası trakeobronşiyal hasarı (TBH) düşündürmesi gereken en yaygın bulgudur. Konservatif yaklaşımın olumlu sonuçları nedeniyle acil cerrahi girişim nadiren tercih edilir. Künt toraks travmasına bağlı trakeobronşiyal yaralanma sonrası trakeal entübasyona rağmen zor ventilasyon kliniğine sahip bir vakanın yönetimini sunuyoruz. Bu hastalarda fiberoptik bronkoskop (FOB), bölgeyi ve yaralanmanın ciddiyetini göstermek ve boyun eksplorasyonu, trakeanın primer end-to-end anastomozu, trakeostomi, faringostomi ve beslenme jejunostomisini sırasında güvenli hava yolunu sağlamak için zorunlu görünmektedir

Anahtar sözcükler: Fiberoptik bronkoskop; künt toraks travması; trekea yaralanması.

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