

Case Report

Tracheal Air Leakage After Orotracheal Intubation in a Patient with Cricoid Fracture

Ying-Che Lo, Chih-Yu Liang, Cheuk-Kwan Sun, I-Ting Tsai

A comatose 55-year-old man presenting with a horizontal abrasion on the anterior neck was sent to the emergency department after a motor vehicle accident. Swollen supraglottis and displaced vocal cords were noted on endotracheal intubation after which subcutaneous emphysema developed. Computed tomography showed cricoid fracture with air leak through an injury on the trachea distal to the cuff of the endotracheal tube. After pericardiocentesis for pericardial effusion, the patient expired following hemodynamic collapse. The results indicate that tracheobronchial injury is a critical condition that should be considered in patients with blunt chest or neck trauma. It is mandatory to identify other associated injuries to the respiratory and cardiovascular systems after establishment of advanced airway. Fiberoptic-guided intubation might be considered for patients with tracheal injury.

Key words: blunt neck trauma, tracheobronchial injury, endotracheal intubation

Case Report

A 55-year-old man was involved in a motor vehicle collision in which he was the restrained driver of a car without air bag when his car crashed into another motor vehicle head-to-head at high speed on a freeway. On arrival at the emergency department (ED), the patient was comatose with response only to pain (GCS: E1M4V1). The systolic blood pressure was 209 mmHg on the ambulance but dropped to 89 mmHg on arrival at ED. He had

spontaneous breathing with a rate of 22 breaths per minute. The arterial oxygen saturation increased from 75% to 99% after the application of a non-rebreathing mask.

On physical examination, a horizontal abrasion was noted on his anterior neck without evidence of open wound, subcutaneous emphysema, anatomical deformity, or stridor. Since the first attempt of endotracheal intubation using a 7.5 Fr. endotracheal tube failed because of swollen supraglottis and displaced vocal cords, a 6.5 Fr. endotracheal tube was used instead for the second attempt. After

From the Department of Emergency Medicine, E-Da Hospital, I-Shou University, Kaohsiung, Taiwan.

Received: November 4, 2014

Accepted: May 21, 2015

Address reprint request and correspondence to: I-Ting Tsai, Department of Emergency Medicine, E-Da Hospital, No. 1, Yida Road, Jiaosu Village, Yanchao District, Kaohsiung City 82445, Taiwan.

Tel: +886-7-6150011 ext. 3166, Fax: +886-7-6150915, E-mail: edahospitaled@gmail.com

intubation, his breath sound was clear and symmetrical bilaterally without attenuation. However, subcutaneous emphysema over his neck began to develop after mechanical ventilation. Then resuscitation continued according to the protocol of advanced trauma life support.

Although sonographic study at ED demonstrated no remarkable abdominal fluid accumulation, pericardial effusion was shown for which contrast-enhanced chest computed tomography was performed that revealed cricoid fracture (Fig. 1). Besides, the endotracheal tube was found to pass through the swollen larynx, and air leakage from tracheal injury beyond the cuff of the endotracheal tube

tube was also noted together with pneumomediastinum and hemopericardium (Fig. 2). There was no evidence of intracranial hemorrhage on computed tomography of the brain, but the serum alcohol level was as high as 314.6 mg/dL.

This patient resumed a stable hemodynamic status after timely echo-guided percutaneous pericardiocentesis and adequate oxygenation. Cardiovascular surgeon was then consulted who did not suggest emergent thoracotomy for his blunt cardiac injury. However, a significant amount of pericardial effusion was noted again on bedside sonography two hours later which failed to be drained through pericardiocentesis. The patient eventually expired due to cardiac tamponade with hemodynamic collapse.

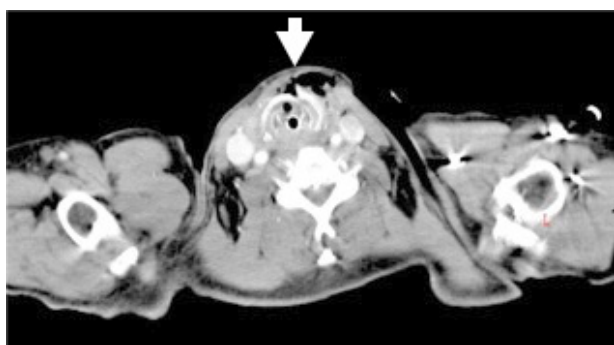


Fig. 1 Contrast enhanced CT scan showing cricoid cartilage fracture, swollen laryngeal mucosa surrounding the endotracheal tube, and subcutaneous emphysema (white arrow).



Fig. 2 Contrast enhanced CT scan revealing an air leakage from tracheal injury beyond the cuff of the endotracheal tube (black arrow) with pneumomediastinum and hemopericardium.

Discussion

Laryngeal injury is a potentially life-threatening condition from trauma. Since the larynx is protected both by the mandible and sternum, laryngeal injury may indicate significant head or chest injury. In addition to blunt laryngeal trauma from direct impact to the steering wheel, dashboard, or airbag, the larynx of a restrained passenger may encounter a shearing force during sudden deceleration on motor vehicle collision or the larynx may be strangulated by the seat belt.¹ Since up to 80% of patients with trachea or bronchus injury die at the scene,² laryngotracheal injury accounts for less than 1% of the trauma patients at a trauma center.³ Therefore, timely recognition of the condition with protection of the airway is crucial for minimizing mortality.⁴ Although initial clinical presentations including arterial oxygen desaturation, subcutaneous emphysema, or laryngeal edema are tell-tale signs of laryngeal injuries,⁵ none of the manifestations was present in our patient before endotracheal intubation. Moreover, physical examination alone may not be diagnostic, especially for

an unconscious patient as in our case.

For our patient, the horizontal neck abrasion may be a hint to potential laryngeal injury. Although successful endotracheal intubation was performed through the edematous laryngeal tissue, subcutaneous emphysema after mechanical ventilation may arise from the tracheal injury beyond the cuff of the endotracheal tube. Therefore, advancing the cuff beyond the site of the air leakage might have alleviated subcutaneous emphysema. For our patient, a flexible bronchoscope could have been used to direct the endotracheal tube past the tracheal lesion. Double lumen endobronchial intubation with lung isolation has also been reported to be beneficial for distal airway injury.⁶

Laryngeal or tracheobronchial injury should be considered in the patients who have blunt or penetrated trauma in neck and chest area. Local skin wound, ecchymosis, subcutaneous emphysema, dyspnea, tenderness, bleeding airway are important clinical clues that should be evaluated carefully. The diagnosis could be confirmed through laryngoscopy, bronchoscopy, or imaging studies.

For patients with suspicious laryngeal or tracheal injuries, the establishment of a definite airway through the oral or nasal route with direct or fiberoptic laryngoscopy may be considered if the airway is compromised. Despite an intact laryngeal inlet, occult airway injury such as laryngeal or tracheobronchial injury may exist. So a forced oral or nasal intubation may aggravate the pre-existing trauma. Although cricothyroidotomy may also be performed after failure of oral or nasal intubation,⁷ tracheostomy is preferred to orotracheal intubation or cricothyroidotomy which may worsen an existing injury or create a false passage.³ Nevertheless, though tracheostomy with local anesthesia is preferred in alert patients due to relatively low incidence of potential iatrogenic sequelae, all methods for maintaining airway patency are indicated

for evidence of acute airway obstruction or impending death.^{2,3,8} It is preferred to maintain spontaneous ventilation for patient with acceptable oxygenation. On the other hand, rapid-sequence intubation, which is indicated in some patients, may cause the loss of spontaneous ventilation. To minimize iatrogenic airway trauma, fiberoptic-guided intubation may be considered for all patients with suspected laryngotracheal injury.⁶ Rarely, median thoracotomy might be indicated for failure of other methods to provide adequate oxygenation.⁶ The results of the present study suggest that repeated physical examination and imaging studies might be necessary after the establishment of an advanced airway for such patients, especially when the clinical condition deteriorates.

There are different strategies for repairing airway injury. Although the decision of surgical intervention is straightforward for patients with unstable hemodynamics and severe aerodigestive injuries, the choice of treatment strategy (i.e., conservative vs. surgical) for hemodynamically stable patients remains controversial.

In conclusion, tracheobronchial injury is a critical condition, which should be considered in patients with blunt chest or neck trauma. It is mandatory to identify other associated injuries to the respiratory and cardiovascular systems after establishment of advanced airway. Fiberoptic-guided intubation might be considered for patients with suspected laryngotracheal injury.

References

1. Kelly SP, Steelman CR, Pate MF: Traumatic tracheal injury in the pediatric patient. *AACN Adv Crit Care* 2011;22:185-9.
2. Bertelsen S, Howitz P: Injuries of the trachea and bronchi. *Thorax* 1972;27:188-94.
3. Schaefer SD: The acute management of external laryngeal trauma. A 27-year experience. *Arch Otolaryngol Head Neck Surg* 1992;118: 598-604.

4. Jalisi S, Zoccoli M: Management of laryngeal fractures-A 10-year experience. *J Voice* 2011;25: 473-9.
5. Cross KJ, Koomalsingh KJ, Fahey TJ 3rd, et al: Hypopharyngeal rupture secondary to blunt trauma: presentation, evaluation, and management. *J Trauma* 2007;62:243-6.
6. Nelson LA: Airway trauma. *Int Anesthesiol Clin* 2007;45:99-118.
7. Kim JP, Cho SJ, Son HY, et al: Analysis of clinical feature and management of laryngeal fracture: Recent 22 case review. *Yonsei Med J* 2012;53: 992-8.
8. Verschueren DS, Bell RB, Bagheri SC, et al: Management of laryngo-tracheal injuries associated with craniomaxillofacial trauma. *J Oral Maxillofac Surg* 2006;64:203-14.