



Isolated tracheal rupture: A case report

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ABSTRACT

Tracheobronchial injuries are well-recognized sequelae of massive blunt or penetrating injuries of the neck or chest especially from motor vehicle accidents, and rarely due to simple trauma. Tracheal laceration is more common in adults, since adult's trachea is relatively more unprotected compared to children. Bronchoscopy is fundamental for diagnosis. CT is useful in visualization the level of rupture. Herein, we report on an instance of a minor cervical trauma leading to isolated posterolateral tracheal wall laceration in a 46-year-old woman. We emphasize the importance of suspected tracheal injury, even with minimal trauma. We also review the literature on posterolateral tracheal wall laceration as an isolated feature after blunt cervical trauma in adults, the mechanism of membranous tracheal rupture, diagnostic features and management options.

Keywords: Blunt trauma; cervical; tracheal rupture.

An injury to the anterior part of neck that may seem minimal can cause a tracheal rupture, which requires fast and proper treatment. Subcutaneous emphysema is the most important physical examination finding of tracheal injury.^[1] Tracheal disruption occurs in only 14% of penetrating neck trauma and in only 0.34 to 1.5% of all blunt neck trauma.^[2] The most common site of injury is the carina and main-stem bronchi (80%) followed by the trachea (15%), and the distal bronchi (5%).^[3]

Blunt neck trauma can lead to life-threatening complications that can be easily overlooked. Diagnosis and emergency management are essential to reduce morbidity and mortality. Although the initial clinical findings are minimal, important airway problems should always be

considered. The aim of this present case was to describe the diagnosis and management of a patient with isolated cervical tracheal rupture after minimal blunt neck trauma and to emphasize the importance of suspicion of tracheal injury in these patients.

CASE REPORT

A 46-year-old woman was admitted to our clinic with pain after neck trauma. She told us that she had fallen and hit the left side of her neck on the edge of a coffee table. She had no skin lesion, prominent swelling, respiratory distress or altered voice. She was agitated because of the injury and had very little pain on the neck. Heart rate, blood pressure, respiratory rate

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and oxygen saturation were normal limits. On physical examination, there was mild crepitus on both sides of her neck and supraclavicular region. Flexible fiber-optic laryngoscopy showed a normal larynx and vocal cords. Trauma to the tracheobronchial tree was suspected. The computed tomography (CT) scan showed marked cervical and mediastinal emphysema extending from the nasopharynx to the mediastinum (Figure 1) and a leak at the right posterolateral wall of the trachea below the cricoid cartilage (Figure 2). The CT scan confirmed that there was no lung contusion or spinal fracture.

She was transferred to the operating room with suspicion of a ruptured trachea. Anesthesia and otolaryngology team members agreed to continue spontaneous ventilation to avoid increasing the tracheal tear and emphysema with positive pressure ventilation. The patient was given 100% oxygen by mask with no positive pressure applied. A continuous infusion of propofol was initiated at 3 mg/kg/h and a bolus of 2 mg/kg was given to induce anesthesia. The patient was positioned for bronchoscopy and esophagoscopy. The airway was suctioned and a rigid bronchoscope was passed through the glottis for visual examination. A mucosal tear was evident on the right side of the posterior membranous trachea. The tracheal tear was

located approximately 1.5 cm below the vocal cords and was 3 cm in length (Figure 3). The tear was not circumferential. After bronchoscopy, esophagoscopy revealed no blood or mucosal damage in the esophagus. Following anatomical assessment of the airway, we planned a tracheotomy distal to the traumatic tracheal tear to bypass the proximal portion of the laceration. Tracheotomy was performed with a horizontal incision above the third tracheal ring and an endotracheal tube placed in a position lower than the tracheal tear. Thus, positive pressure ventilation was successfully continued. We decided to repair the tracheal tear primarily because of the length. The tracheostomy incision was extended up the right side and strap muscles were cut for mobilization of the trachea. The 3 cm longitudinal tear in the membranous portion of the trachea was identified (Figure 3). The tear contained only mucosa and trachealis muscles. The right recurrent laryngeal nerve was identified and preserved. The tracheal tear was repaired primarily with 4-0 Vicryl. At the end of the operation, a number 8 tracheostomy tube was placed. No problems relating to the anesthesia were encountered during the operation. She had an uncomplicated recovery and did not require

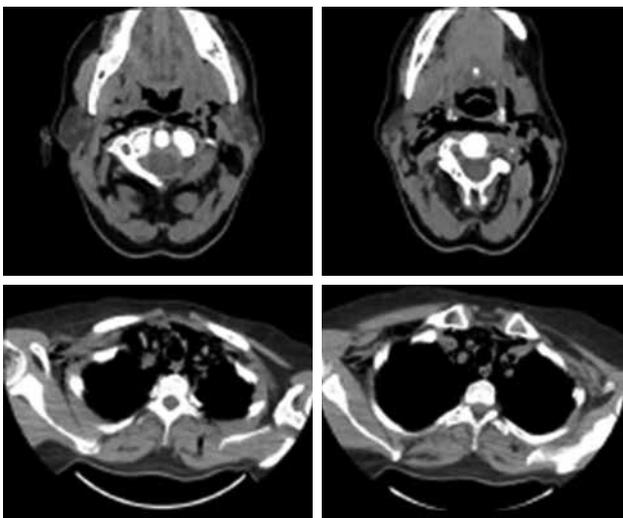


Figure 1. Computed tomography scan of the neck and thorax showing marked emphysema throughout the cervical tissues, starting from the nasopharynx and extending around the trachea and into the mediastinum.

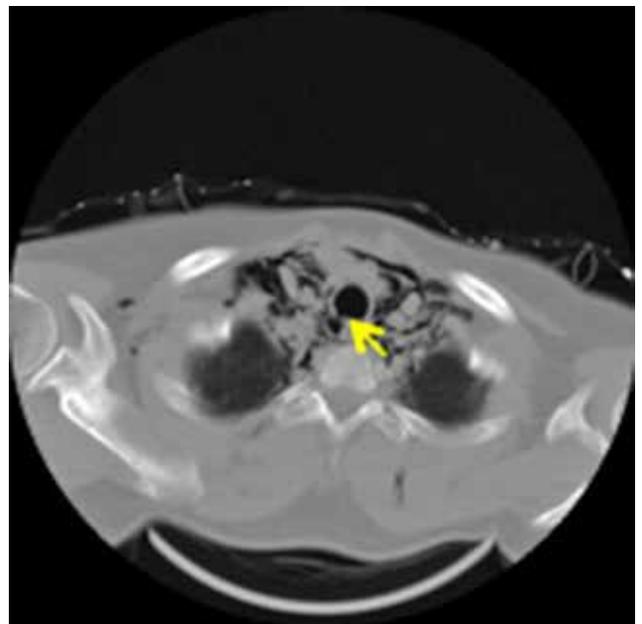


Figure 2. Axial computed tomographic images of the neck. Extensive subcutaneous emphysema and right posterolateral tracheal laceration.



Figure 3. Right posterolateral tracheal wall rupture visualized intraoperatively.

intensive care. Cervical emphysema declined over time. On flexible fiber-optic laryngoscopy, vocal cord movements and larynx were normal. Decannulation was performed five days after surgery. She was discharged six days after injury with a normal airway and normal voice. She was asymptomatic at her eight-month follow-up.

DISCUSSION

There is a large population of patients with significant tracheal or bronchial injuries after major trauma reported in the literature, especially from motor vehicle accidents. These high-energy injuries can transmit forces to the tracheobronchial tree and cause rupture of the airway.^[1,4] The exact mechanism of rupture of the membranous trachea following minor trauma is less clear. Perhaps the increased intratracheal pressure following a brief compressive force against a closed glottis is sufficient to exceed the tensile strength of the membranous trachea. Another significant mechanism of a tracheal membranous tear is the contribution of direct blunt trauma to the anterior trachea, which could crush the U-shaped cartilage rings against the cervical spine.^[1,5] This may explain why tracheal rupture tends to occur at the exact level of trauma. The U-shaped strong cartilage structure of the trachea anteriorly and weak membranous tissue posteriorly can explain lesions in the posterior wall.^[6] The ends of the U-shaped cartilage rings can distort and directly tear membranous trachea mucosa longitudinally, evidenced by lesions located opposite the point of impact.^[6] In the present case, the involved

forces were much smaller. The potential causative mechanism of tracheal rupture in our case may have been compression of the trachea with the glottis closed, exceeding the tensile strength of the membranous trachea.

A careful history of the trauma and physical examination should be sufficient for diagnosis. Dyspnea, pain, cough, pneumothorax and subcutaneous emphysema are significant enough to point to a lesion of the airways. Our patient had only minimal blunt neck trauma and moderate pain symptoms on history, and minimal cervical crepitus on both sides of her neck and supraclavicular region on physical examination. The external signs of tracheal injury were not indicative of the extent of trauma. Suspicion of tracheal injury should be considered for timely diagnosis in such patients.^[2,7] Delays in diagnosis are the most important factor influencing outcome and long-term complications.

Emergency bronchoscopy in the early diagnosis of airway injury is usually required to confirm the location, nature and extent of tear as well as plan the treatment.^[5-9] Evaluation of the esophagus is mandatory after examining the airway because subcutaneous emphysema may also result from cervical esophageal perforation. Laryngoscopy and bronchoscopy should be performed under spontaneous ventilation, which prevents increasing the emphysema.^[1]

Imaging plays an important role in the diagnosis, and includes chest and neck X-rays, thorax and neck CT scans. Some authors recommend that CT be done if a

tracheobronchial injury is suspected with chest and neck X-rays.^[10,11] Chen et al.^[12] reported that the overall sensitivity of CT for the diagnosis of tracheal rupture was 85% and CT can lead to early confirmation and treatment. Definitive diagnosis of a tracheobronchial tear is made by bronchoscopy or surgical exploration but CT scans may be useful in visualizing the level of the rupture.

For management, securing the airway safely is the primary objective. The definitive method of treatment for tracheal rupture is controversial. The placement and length of the lesion, the existence of additional pathology including pneumothorax, cartilage fracture, and laryngeal trauma are important factors in deciding whether an open operation or conservative treatment is needed. Some authors suggest that a longitudinal tracheal tear can heal without further complications with tracheostomy or intubation with the cuff inflated distal to the tear, preventing an increase in intratracheal pressure until reabsorption of the emphysema. They propose that surgical repair indications include widely dehiscent and devitalised margins, involvement of more than one third of the tracheal circumference, associated esophageal and vessel injuries, and persistent subcutaneous emphysema.^[3,6,9,13] Other authors reported that open repair is a safe procedure that will ensure a stable airway and prevent increasing of subcutaneous emphysema and long-term complications of intubation and tracheotomy.^[1,14,15] Even if the patient is not confined in intensive care for concomitant serious injuries, a tracheotomy will be more comfortable than an endotracheal tube to bypass the proximal portion of the tear. In our case, a tracheotomy was performed for bypass and primary repair was preferred because the location of the tracheal tear was close to the tracheotomy incision. This reduced healing time and length of hospital stay. It is also important to calm the patient to avoid coughing and crying. Antibiotics may be administered to prevent secondary infection including tracheitis or mediastinitis.

In conclusion, our case demonstrates that external signs of blunt neck trauma may not be indicative of extent of trauma. Suspicion of

tracheal injury should be considered for timely diagnosis and preventing further complications in such patients. Bronchoscopy remains the gold standard of diagnosis and CT is useful in visualizing the level of rupture.

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