



A case of anterior tracheal rupture following trivial trauma.

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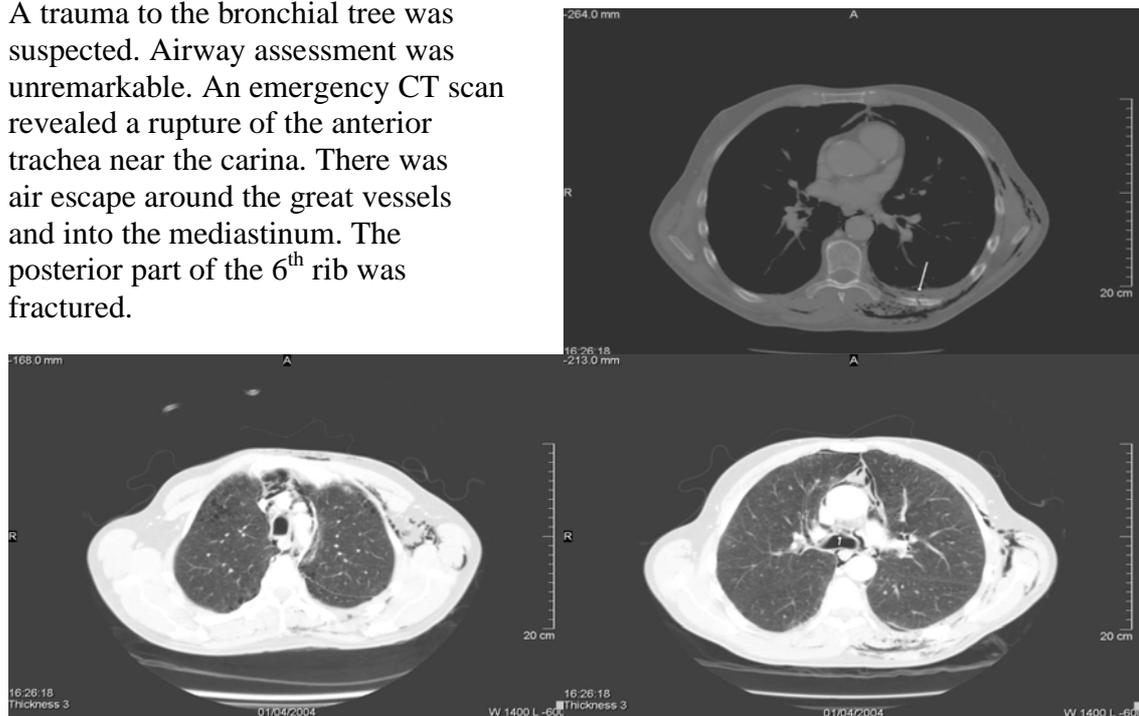
Key words: Blunt trauma, Tracheal rupture, Mediastinal Emphysema.

Abstract: Blunt trauma to the chest can cause tracheal rupture. The posterior membranous part of the trachea is the commonest site of rupture. Anterior rupture of the trachea near the carina is not only rare but can be catastrophic. The air leak from the site of trauma can spread through the mediastinum and along the great vessels. It can cause cardiac tamponade by spread into the pericardium. Here we describe an interesting case of anterior tracheal rupture at the carinal level following trivial trauma.

Case: A 61-year-old man presented to the Medway Accident and Emergency department with swelling in the neck. He told us that he had a fall from a garden ladder from a height of 6 feet the night before. He did not have any open injury and the pain was not severe. Hence he took two paracetamol tablets and went to bed.

The next morning he noticed a swelling in the neck and a change in his voice. On examination the patient was conscious and was not distressed. The swelling was circumferential extending from the mandible to the sternal notch. The patient had a hoarse voice with an occasional cough. His heart rate, blood pressure, respiratory rate and oxygen saturation were normal. On examination of the swelling, it was soft and had crepitus.

A trauma to the bronchial tree was suspected. Airway assessment was unremarkable. An emergency CT scan revealed a rupture of the anterior trachea near the carina. There was air escape around the great vessels and into the mediastinum. The posterior part of the 6th rib was fractured.



The patient was discussed with the thoracic surgeons at Guy's and St. Thomas Hospital. On their advice the patient was transferred, unintubated, in an ambulance with an anaesthetic escort. Equipment for emergency intubation and emergency intercostal chest drain insertion was available during the transfer. The patient had an uneventful transfer.

The patient underwent fiberoptic examination of the tracheobronchial tree and no significant finding was noted. The patient was kept under observation in the intensive care unit for 24 hours. The next morning the symptoms and signs were the same with no further complications. A conservative approach to management was decided on during the consultant ward round. The patient had an uneventful stay in the hospital and was discharged home after a few days.

Discussion:

Tracheal tear is a rare injury usually related to blunt trauma that involves a partial or complete laceration or puncture of the tracheal or bronchial wall.

Pathophysiology:

The following can cause tracheal tear:

1. Shearing forces between the fixed carina or proximal bronchus and the mobile distal bronchi/lungs as in a deceleration injury
2. Rapid anteroposterior compression of the chest causing lateral traction on the lungs and tearing of the bronchus from the fixed carina
3. Rupture resulting from an abrupt increase in pressure against a closed glottis
4. Compression of the trachea between the sternum and spinal column

5. Blunt trauma to the cervical trachea
6. Necrosis resulting from compromised mucosal blood flow after overinflation of an endotracheal tube cuff
7. Perforation by a stylet or endotracheal tube
8. Other penetrating injury

Frequency:

Tracheal injury occurs in 0.4-1.5% of major blunt trauma patients and is found in 2.8-5.4% of trauma-related autopsies. Tracheobronchial tears have also been reported in 18% of autopsies after emergency intubation. However, since minor injuries are often not identified, the actual frequency of tracheal tear may be higher. Posterior tears are commoner than anterior tears. Statistics for pure tears of the anterior tracheal wall are unavailable. There has been one reported case of spontaneous rupture at the carina due to oesophageal carcinoma spread¹

Morbidity:

Death occurs in approximately 30% of patients with tracheal tears, with 50% of fatalities occurring within the first hour. Mortality may be due to:

- . an inadequate airway
- . tension pneumothorax
- . occlusion of the airway by protrusion of the oesophagus into the tear, or accompanying injuries.

In two thirds of survivors, diagnosis is delayed, occasionally for many years, resulting in complications such as airway stenosis, atelectasis, pneumonia, mediastinitis, sepsis, and decreased pulmonary capacity⁶. No specific data are available regarding racial predilection. Blunt trauma accounts for the preponderance of all tracheobronchial injuries. Tracheal injury from blunt trauma is 3 times more common in males. Women have a greater chance of iatrogenic injury from endotracheal tubes, because their tracheas are smaller⁸. A higher incidence of serious chest trauma is seen in patients younger than 40 years; therefore, tracheal tear is seen more often in younger patients overall. Patients older than 40 years who suffer blunt chest trauma and who have diabetes, or generally are in poor medical condition, are at higher risk for tracheobronchial tear. As in women, children have a greater possibility of iatrogenic injury from endotracheal tubes, because their tracheas are smaller.

Multiple anatomic variables and common mechanisms of injury account for local susceptibility to tracheal tears. The trachea and proximal bronchi have varying amounts of cartilaginous support, which strengthens them against injury, but the posterior tracheal membrane is unsupported by cartilaginous rings. Occasionally, blunt trauma to the anterior neck results in rupture of the cervical trachea; this usually is a longitudinal tear of the posterior tracheal membrane. Anterior tracheal tears usually result as a result of direct traumatic puncture of trachea rather than shearing force

The stronger proximal cartilage framework tends to fix the trachea and proximal bronchi in place, while the distal bronchi and lungs are more mobile. Consequently, deceleration injury from blunt trauma typically occurs at the transition zone between the fixed and mobile bronchus, within 2.5 cm of the carina⁹.

Clinical signs of anterior tracheal tear include the following:

- Dyspnoea
- Cough
- Haemoptysis
- Cyanosis
- Cervical subcutaneous emphysema
- Tracheal shift and mediastinal emphysema
- Signs of airway obstruction

Immediate treatment depends on the patient's condition and associated injuries. At a minimum, emergency bronchoscopic confirmation of the diagnosis and location is important if tracheobronchial tear is suggested. This may aid in placing the endotracheal tube cuff beyond the injury or selectively intubating the unaffected bronchus. Small tears may be treated conservatively. Non-operative treatment can result in scarring and stenosis. Surgical repair is indicated when a transmural tear longer than 1 cm causes a pneumothorax that is unrelieved by tube thoracostomy or in cases of mediastinal emphysema with hemodynamic instability.

Preferred Examination: Chest radiography is the standard initial screening examination for evaluation of most chest conditions, including possible tracheobronchial injury. CT is preferred if tracheobronchial tear is suggested. In appropriate circumstances, multiplanar or virtual endoscopic reconstructions from the CT data can be performed to clarify questionable findings^{5,7}. Definitive diagnosis of tracheobronchial tear is made by bronchoscopy or surgical exploration. If clinical or radiographic findings suggest airway injury, diagnostic bronchoscopy is recommended.

In the most severely injured patients, the airway separates completely at the site of injury with a visibly obvious distortion of tracheobronchial anatomy. Pneumothorax and/or pneumomediastinum usually are present in these extensive injuries.

The location of the tear is important in determining whether pneumomediastinum or pneumothorax develops. Tears within the mediastinal pleura cause a pneumomediastinum; tears beyond the mediastinal pleura cause a pneumothorax. Note that in severe injuries, both pneumomediastinum and pneumothorax may be present. A pathognomonic indication of tracheobronchial tear, the *fallen lung sign*, is visible in some patients with severe injury.

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