

Tracheal Injury Causing Massive Pneumoperitoneum Following Change of a Tracheostomy Tube

Dear Editor,

We describe a 75-year-old female with a known long tracheal stenosis who underwent an open tracheostomy after complicated coronary artery bypass grafting surgery in 2005. She was weaned off the tracheostomy and had not required any intervention to the trachea. She presented with recurrent episodes of congestive cardiac failure, requiring prolonged mechanical ventilation. A technically challenging redo open tracheostomy was performed. Her initial postoperative course was uneventful. However, she developed respiratory distress with high airway pressure the next day. Bronchoscopic surveillance showed the tracheostomy tube abutting the narrowed trachea posteriorly. There was a short segment of pristine trachea 3 cm above the carina. Hence a decision was made to change to a longer tracheostomy tube to bypass the tracheal stenosis. During this difficult procedure, a 2 cm tracheal laceration was inadvertently created along the side of the trachea. Meanwhile, she was unknowingly ventilated via a bag and valve mask. With difficulty, the new tracheostomy tube

was then secured in optimal position under bronchoscopic guidance.

Post-procedure, her abdomen became grossly distended and tympanic, with no tenderness or guarding. She also had subcutaneous emphysema over her neck and chest wall. A chest radiograph was performed (Fig. 1A). Further computed tomography scans of the chest (Fig. 1B) and abdomen (Fig. 1C) confirmed the chest radiograph findings. As the subcutaneous emphysema and pneumoperitoneum remained stable, and satisfactory tidal volumes and oxygen saturations were being achieved with mechanical ventilation, we decided to adopt a conservative approach and monitored her closely with serial abdominal examinations and chest radiographs. Meanwhile, she was covered with broad spectrum antibiotics while being kept on mechanical ventilation. Her pneumoperitoneum showed significant clinical and radiological improvement by the next day (Fig. 1D), and eventually resolved without the need for active intervention. Surveillance bronchoscopy performed 10 weeks later showed local healing and no evidence of

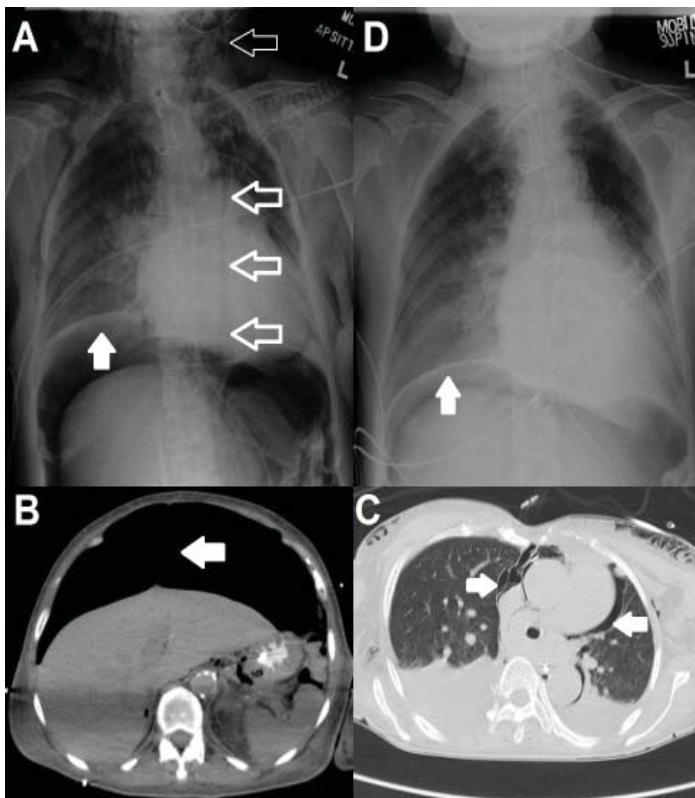


Fig. 1. (A) Chest radiograph showed subcutaneous emphysema over the neck (thin-lined white arrow) and pneumomediastinum with air dissecting along the aorta and oesophagus (thick-lined white arrows), into the abdominal cavity, causing massive pneumoperitoneum (solid white arrow). (B) Computed tomography scan of the abdomen showing massive pneumoperitoneum (arrow). (C) Pneumomediastinum (arrows) seen on computed tomography scan of the chest. (D) Chest radiograph performed the following day showed marked improvement of the extent of pneumoperitoneum (arrow) and decreased subcutaneous emphysema of the neck.

residual injury apart from the existing tracheal stenosis.

Iatrogenic tracheobronchial lacerations and ruptures are rare but potentially life-threatening complications of endotracheal intubations. The reported incidence is approximately 0.005% for orotracheal intubations,¹ with a higher incidence of 0.05% to 0.19%² for double-lumen intubations. It is impossible to estimate the true incidence of these injuries accurately due to the large number of intubations performed worldwide. Such injuries are more common in short females,² with our patient's height of 140 cm supporting this finding.

Tracheal injuries following the change of tracheostomy tubes are very rare.¹ Patients with severe tracheobronchial injuries may present with dyspnoea or haemoptysis. Clinical signs include soft tissue emphysema, pneumomediastinum and pneumothoraces, occurring in 38%, 72% and 7% of patients respectively.³ Isolated pneumoperitoneum is exceptionally rare.² These signs may not always be readily apparent, leading to a delay in diagnosis. Bronchoscopy is used as a diagnostic tool to localise and determine the extent of the injury. The time interval to diagnosis varies widely, ranging from 0 to 126 hours.^{2,3} In our case, diagnosis was immediate as there was a very high index of suspicion of tracheal injury during the difficult change of tracheostomy tube.

Tracheal tears may be caused by trauma during tube insertion or by hyperinflation of the cuff, the latter being more common. Massard et al² reported that after single-lumen intubation, 77% of tracheal tears occur in the lower third of the trachea with the remaining occurring in the middle and lower third. The average size of these tears was 4.8 cm $\pm$ 1.5 cm.

Until recently, surgical repair has been the treatment of choice. The aim of surgery is to close the defect in order to restore effective ventilation, to prevent mediastinitis secondary to contamination from the airways and to reduce the risk of healing complications, such as tracheal stenosis. The surgical approach is determined by the location of the tear: the cervical and thoracic trachea are accessed via a right thoracotomy and anterior trans-cervical approach respectively. Intraoperative ventilation is an important consideration during these repairs. Bronchoscopic repair with fibrin glue has recently been described as an alternative to open surgery.⁴

In recent years, some authors have proposed that conservative treatment is a safe option for selected patients with iatrogenic tracheal lacerations. This group of patients had uncomplicated ventilation with no loss of tidal volume, superficial or sufficiently covered tears, and moderate, non-progressive emphysema.³ Low tidal volumes and low positive end-expiratory pressure were used to avoid

exacerbating the tracheal injury under positive pressure mechanical ventilation. Surgical repair was reserved for patients where mechanical ventilation was not possible, the subcutaneous or mediastinal emphysema was progressive, or if there was an open perforation into the pleural cavity,³ associated oesophageal injury or mediastinitis.^{4,5}

Despite iatrogenic tracheal lacerations being life-threatening injuries, the prognosis depends on the general health of the patient as well as the timing of diagnosis and treatment. Survival depends on the primary disease rather than the tracheal injury.

Currently, there is still no clear consensus on the management of iatrogenic tracheal lacerations. Our case illustrates that these injuries may present rarely with atypical clinical signs such as pneumoperitoneum. The successful conservative management here follows the recent trend towards non-operative therapy in a selected group of these patients.

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