

A novel approach to the management of acute tracheal tear

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Abstract

Objective: We describe the emergency use of a covered, expandable, removable tracheal stent in a patient who developed a large posterior tracheal tear complicating endobronchial therapy for large airway obstruction.

Method: Case report and review of the literature concerning management of acute tracheal tear.

Results and conclusion: Our patient demonstrates that endotracheal stenting is an option for managing acute large airway tear. Moreover, the use of a removable stent allows not only for rapid closure of the defect but also removal once the defect has healed, thus avoiding long-term complications of stent deployment.

Key words: Trachea; Lacerations; Stents; Mediastinal Emphysema

Introduction

The management of acute tracheal injuries can be challenging. We describe the emergency use of a covered, expandable, removable tracheal stent in a patient who developed a large posterior tracheal tear complicating endobronchial therapy for large airway obstruction.

Case report

A 68-year-old man was admitted electively for endobronchial treatment of a squamous cell bronchial carcinoma causing left main bronchial obstruction. The patient was breathless on minimal exertion. Besides hypertension (well controlled on antihypertensives), he had no previous medical history.

After establishing routine monitoring, the patient was preoxygenated and general anaesthesia was induced with propofol and neuromuscular blockade with atracurium. An appropriately sized, rigid bronchoscope was introduced and anaesthesia maintained as previously described in the literature.¹

Immediately after introduction of the bronchoscope, ventilation became difficult and inefficient and the patient's oxygen saturation fell to 84 per cent. A 3 cm tear in the posterior tracheal wall was seen, extending to 2 cm above the carina. Immediate management included advancing the bronchoscope distal to the lesion in order to achieve satisfactory ventilation, to avoid further trauma to the airway and to minimise mediastinal insufflation. Once airway stability was achieved, an 18 × 60 mm, covered, expandable, hybrid stent (Alveolus Aero™, 9013 Perimeter Woods, Suite A, Charlotte, NC 28216, USA)² was deployed into the trachea, ending 5 mm above the carina. The nickel–titanium stent was covered with a biocompatible polyurethane membrane and was self-expanding (Figure 1). The deployed stent sealed the defect and did not obstruct either main bronchus. Given the acute nature of the patient's tracheal injury (believed to be iatrogenic, due to rigid bronchoscope introduction) and his clinical instability, we did not proceed to treat his left bronchial lesion.

Following the procedure, the rigid bronchoscope was removed and the patient awoke without incident. Post-operatively, a chest X-ray revealed widespread pneumomediastinum and air within the patient's soft tissues (Figure 2). He had no symptoms, and within two days his chest X-ray had improved and he was discharged.

Two weeks post-operatively, the patient had his left main bronchus debulked with Neodymium yttrium-aluminium-garnet laser therapy and a covered, expandable metallic stent was deployed. This resulted in significant symptomatic improvement in his dyspnoea. At six weeks, he had the tracheal stent removed; the posterior tracheal defect was observed to be fully healed.

Discussion

Endobronchial therapy for large airway pathology is becoming more common.³ The risk of tracheal tear with rigid bronchoscopy is well recognised,⁴ and there are several approaches to management.

Minor, posterior, incomplete tears are more common and usually heal without intervention. Larger, complete tears may present with airway bleeding, air leak around the tracheostomy tube or into the mediastinum, inability to achieve adequate ventilation, or pneumothorax. Such cases may be managed surgically but only in specialised centres. Such surgery is complex and may necessitate cardiopulmonary bypass. The operation has an attendant

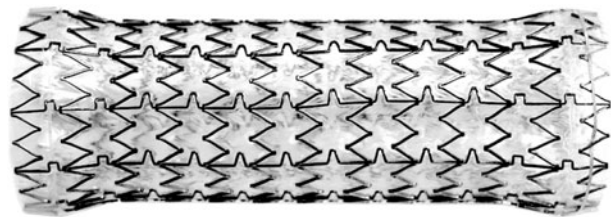


FIG. 1
The Alveolus Aero™ stent.

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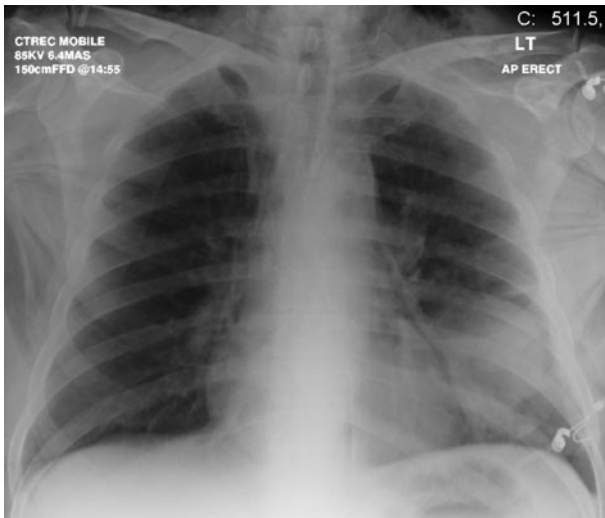


FIG. 2

Immediate post-operative chest X-ray. The left lower zone mass represents known malignancy. The stent is seen in the trachea, and air is seen in the mediastinum, pericardium and soft tissues.

mortality, which can significantly increase if there are other serious co-morbidities. Furthermore, complications such as tracheal stenosis, dehiscence, bleeding and infection can occur.⁵

However, tracheal stenting can be achieved without delay or need for transfer. Stenting the trachea promotes healing through tissue apposition and seals the defect, thereby improving ventilation and decreasing the risk of mediastinal contamination.

- **Tracheal stenting has an established role in managing selected patients with tracheoesophageal fistula**
- **The role of stenting in acute airway injury or in trauma is less clear**
- **This case report demonstrates that endotracheal stenting is an option for managing an acute large airway tear**
- **The use of a removable stent not only allows for rapid closure of the defect, but also permits removal once the defect has healed, thus avoiding long-term complications of stent deployment**

The use of non-removable, self-expanding, metallic stents in the tracheobronchial tree can be associated with subsequent complications and associated morbidity:⁶ development of granulation tissue necessitating repeated endobronchial therapy; fracture of stent struts; infection;

halitosis; mucus plugging; migration; and, rarely, fistulae formation.⁷ Metallic airway stents can be difficult or impossible to remove, and removal can be associated with serious complications.⁸ Stents which are potentially removable would therefore have an advantage.

Tracheal stenting has an established role in managing selected patients with tracheoesophageal fistula. However, its role in acute airway injury, such as occurred in our patient, or in trauma is less clear. Our patient demonstrates that endotracheal stenting is an option for managing acute large airway tear. Moreover, the use of a removable stent not only allows for rapid closure of the defect, but also permits removal once the defect has healed, thus avoiding long-term complications of stent deployment.⁹

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