CASE REPORT

Fracture and aspiration of a tracheostomy tube

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SUMMARY

A 70-year-old woman presented with a fracture and aspiration of her polyvinyl chloride tracheostomy tube. Her chest X-ray showed that a foreign body was lodged in the right main bronchus. She was otherwise asymptomatic. The foreign body was removed under general anaesthesia using a flexible bronchoscope. The patient developed pneumonia after the procedure and was admitted to the intensive care unit. She was discharged home 5 days after the event with no permanent complications.

BACKGROUND

Tracheostomy is an essential and common part of modern airway management. It is commonly seen in a variety of specialties, including surgical, medical and critical care settings. A significant number of patients have permanent tracheostomies that require long-term care and management. Improper tracheostomy care can result in adverse outcomes.

Fracture of tracheostomy tubes with subsequent aspiration of the fragment into the airway is a rare complication of tracheostomy. The failure of any airway device or any airway foreign body requires emergent attention due to the inherent risk of airway compromise. Hence, there is a need to understand the factors contributing to this complication, in order to prevent its occurrence and to recognise and manage it promptly.

CASE PRESENTATION

A 70-year-old woman presented to the emergency department after her carer fractured her tracheostomy while attempting to remove it for cleaning. The patient was tracheotomised 12 years ago after an ischaemic stroke that resulted in a left hemiparesis and vocal cord palsy. She was lost to follow-up from the hospital where she was initially treated for her stroke. There was no specialised follow-up apart from her general practitioner, who visited her home once or twice a year. Her (PVC) polyvinyl chloride tracheostomy tube was last changed 2 years ago by her carer.

The patient was haemodynamically stable and not in respiratory distress on presentation. Chest auscultation was unremarkable. A chest X-ray showed that a radio-opaque foreign body was lodged in the right main bronchus (figure 1).

TREATMENT

The patient was transferred to the operating theatre for emergent removal of the fractured tracheostomy tube. An awake procedure was attempted but was unsuccessful due to the patient's cough reflex.

Figure 1 Chest X-ray of the patient showing the radio-opaque tube in the right main bronchus.

A transoral rigid bronchoscopy was unsuccessful as the patient had severe glottic stenosis. The fractured segment was removed with much difficulty using a flexible bronchoscope through the tracheostomy stoma (figure 2). The patient was ventilated intermittently via the stoma to maintain oxygen saturation. The tracheostomy tube was fractured mid-shaft, close to the neck plate of the tracheostomy (figure 3). A new size 8 Portex cuffed tracheostomy tube was inserted into the tracheostomy site after removal of the foreign body. The patient was admitted to the intensive care unit (ICU) for monitoring postoperatively.

OUTCOME AND FOLLOW-UP

There was significant mucosal trauma secondary to the attempts at removing the tracheostomy fragment. The patient developed a right-sided pneumonia, which resolved over the next 5 days with

Figure 2 Tracheostomy tube fragment in the right main bronchus. The edges of the fractured segment were jagged, causing significant mucosal trauma on retrieval.

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Figure 3 Tracheostomy tube fragment postretrieval.

intravenous antibiotics. The patient was discharged after the above treatment. She was followed up at the outpatient clinics where her Portex (PVC) tube was changed to a Moore (silicone) tracheostomy tube. This was chosen for its properties—that is, the inert nature of silicone and its flexibility. The patient has been scheduled to return to the clinic every 6 months for a tracheostomy review and change.

DISCUSSION

Bassoe and Boe¹ reported the first case of an aspirated fractured tracheostomy tube. Since then, similar cases have been reported every 1–2 years. They have been reported in paediatric and adult populations. The largest case series was reported by Gupta and colleagues, which consists of nine cases seen over 8 years in an otolaryngology unit in Allahabad, India.

Fracture and aspiration of tracheostomy tubes have been described in tubes of various materials, including silver, sterling silver, stainless steel,² PVC and silicone.^{3–4} The large majority of the tubes fracture at the tube–flange junction. Several factors are thought to contribute to the weakening and subsequent fracture of the tubes. Repeated boiling and sterilising can lead to weakening of the tube material, predisposing to fracture.^{5–6} This is especially so when bleaching solutions are used.⁷ Repeated mechanical stresses due to repeated use and out-and-down movements are likely to be greatest in the tube–flange junction area.⁸ When tracheostomy stenosis occurs, the force required to remove and replace the tube can be even greater, hence further increasing the risk of fracture.⁹ Most authors agree that the alkaline bronchial secretions that accumulate around the tracheostomy tube are corrosive. They play a major role in the weakening of tubes with prolonged use, particularly in metal tubes.^{1–10–13} In a minority of cases, the tube fractures within hours to days of insertion, most likely due to manufacturing defects.^{1–13–14} Another less common fracture site is the fenestration site on fenestrated tubes.¹⁵

Clearly, prolonged use of tracheostomy tubes is a major factor in the causation of their failure. The bulk of these cases occur in developing countries. Most of these patients would have continually used their tubes for prolonged periods, from 1 to 5 years, before the fracture occurred. This is most likely due to the economic cost associated with replacing the tubes and restricted access to follow-up. This can also occur in patients who are non-compliant with follow-up, such as the patient in our case. In a developed world setting, this highlights the importance of social factors with regard to quality tracheostomy care. Barriers to accessing tracheostomy care should be

addressed through a multidisciplinary approach involving social interventions, allied health, nursing, primary care physicians and specialists.

RECOMMENDATION

Most patients with aspirated tracheostomy tubes self-present with little or no symptoms. Thus, it would be prudent to perform close checks on tracheostomy tubes on follow-up to identify pending failure. A high index of suspicion is crucial in infants, young children and the critically ill who are unable to point out the failure and aspiration of the tracheostomy device. We would recommend that tracheostomy tubes be changed at least twice yearly—most of the reported cases of tube fracture occur after about 1 year of use. Prior to insertion, each tube should be closely inspected for manufacturing defects.

Any foreign body in the airway poses a risk of obstruction. Tracheostomy tubes usually have a large lumen that enables airflow. However, deaths secondary to acute airway obstruction have been noted in several cases, mostly in the paediatric population—possibly due to the smaller airway calibre.^{7–14} In stable cases with no airway obstruction, the most common retrieval method is to use a flexible bronchoscope. An awake procedure in the operating theatre is ideal for spontaneous ventilation, although in our experience, coughing has been difficult to control. A stomal release may be necessary to allow instrumental access. An alternative to this is to use a flexible nasopharyngoscope as a guide, combined with bronchoscopy forceps.¹⁶ In their unstable case with impending airway obstruction, Lynrah *et al*¹⁴ performed a blind stomal release in the wards as a temporising measure to enable oxygenation. When removal of the foreign body is difficult, prolonged and traumatic, high-dependency care may be necessary.

Learning points

- ▶ Tracheostomy tube fracture and subsequent aspiration is a rare complication that may be potentially fatal.
- ▶ Regular follow-up and tracheostomy tube change is recommended to prevent this adverse event.
- ▶ Bronchoscopic removal on an emergent basis should be performed in a controlled environment like the operating theatre.

Contributors TLL was responsible for the care of the patient perioperatively and postoperatively and he is the primary author of the manuscript. RC, PF and SJ reviewed, edited and finalised the manuscript.

Competing interests None.

Patient consent Obtained.

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