A Fractured Tracheobronchial Suction Catheter and Fractured Tracheostomy Tube in the Tracheobronchial Tree: Two Case Reports

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The most common tracheobronchial foreign bodies in adults are food items such as peanuts. Aspirated medical appliances are less frequently seen. If a tracheobronchial foreign body is not discovered and retrieved early, severe complications such as pneumonia and lung atelectasis can result. We report two cases of tracheobronchial foreign bodies not commonly seen in adults. In one case, a fractured tracheobronchial suction catheter was found in the right main bronchus of an 81-year-old man with Alzheimer’s disease. The second case involved a fractured tracheostomy tube which was found in the left main bronchus of a 95-year-old woman with a tracheostomy and dementia. In both cases, the fractured tubes were successfully retrieved by a bronchoscope without complications.

Key words: tracheobronchial foreign body, fractured tracheostomy tube, fractured tracheobronchial suction catheter

Introduction

A foreign body (FB) in the tracheobronchial tree in adults is usually seen in patients with a neurological deficit or decreased level of consciousness due to either alcohol intoxication or sedation from a drug overdose or medical procedures[1]. In the west, the most commonly reported FBs are foods such as peanuts, popcorn, and grapes[1], and in Chinese people, chicken bones[2]. In 1990, Lampier and Prakash reviewed a total of 60 cases of adult foreign bodies aspirated into the tracheobronchial tree, and only 19 cases involved appliances that were inadvertently lost during dental or medical procedures. Ten of these cases included dental equipment or prostheses, and 9 involved medical appliances including tracheostomy tube segments and endotracheal tubes[1]. In 1996, Warshawsky et al reported a case in which an endotracheal intubation performed for acute respiratory distress resulted in respiratory failure that completely resolved after removal of the endotracheal tube, with concomitant expulsion of a latex glove from the mouth[3].

We report a fractured tracheostomy tube and a fractured tracheobronchial suction catheter found in the tracheobronchial tree after medical procedures.

Case 1

An 81-year-old bedridden man with a history of chronic obstructive pulmonary disease,
Alzheimer’s disease, chronic hepatitis C and benign hypertrophy of the prostate had been on home care with a nasogastric tube feeding for 5 months. He was brought to our emergency department (ED) where his foreign caretaker and family reported loss of a piece of a tracheobronchial suction catheter after the patient had bitten the catheter during sputum suction at home. No cyanosis, respiratory distress or seizures were noted by the family at home. His blood pressure (Bp) was 115/70 mmHg, respiratory rate (RR) 18/min, heart rate (HR) 80/min and body temperature (BT) 36.6℃. Physical examination showed no symptoms or signs of respiratory distress. The patient had a vigorous cough initially at ED arrival but this improved after bronchodilator-medication inhalation treatment. His complete blood cell count and biochemistry data were within normal limits, except arterial blood gas analysis showed hypoxemia (pH: 7.364; PO$_2$: 59.9 mmHg; PCO$_2$: 234.8 mmHg; BE (B): -5.1 mml/L; O$_2$SAT: 90.4%). The tip of a 12.5 cm fractured tracheobronchial suction catheter was found in the right main bronchus after chest radiography (Fig. 1). It was then retrieved by a flexible bronchoscope (Fig. 2). Empirical antibiotics (Cefazoline 1.0 gram intravenously q6h for 5 days), bronchodilators (Aminophylline 100 mg tid and procaterol HCL 25 mcg bid orally) and mucolytic agent (Ambroxol HCL 30 mg tid orally) were given during hospitalization. The patient was discharged without complications seven days later.

**Case 2**

A 95-year-old bed ridden woman in a nursing home had a medical history of cerebral vascular disease, and senile dementia, with nasogastric tube feeding and sputum suction from a tracheostomy for years. The patient was brought to our ED by a foreign caretaker from the nursing home who reported loss of a tracheostomy tube during routine nursing chest care.

At ED arrival, the vital signs were BP 144/95 mmHg, BT 36.5℃, HR 113/min, and RR 24/min. Physical examination showed respiratory distress with bilateral coarse rales and left focal wheezing. There was no tracheostomy tube or neck plate on the patient’s

![Fig. 1 The black arrow indicates a fractured tracheobronchial suction catheter lodged in the right main bronchus](image-url)
tracheostomy orifice. The oxygen saturation measured by O₂ pulse oxymeter was about 85%. The respiratory distress symptoms and oxygen saturation improved after a new tracheostomy tube was placed into the patient’s tracheostomy orifice. The missing part of the fractured tracheostomy tube was found in the patient’s left main bronchus after chest radiography study (Fig. 3). It was then retrieved under general anesthesia. An obvious fracture site was noted at the junction between the neck plate and outer tube. Also, multiple sputum plugs were found inside the retrieved outer tube (Fig. 4). The patient was discharged without complications three days later.

Discussion

Tracheostomy tubes have been reported as tracheobronchial foreign bodies both in adults and children⁴,¹⁰,¹²,¹₄. In 1960, Bassøe and Bøe reported a patient with a tracheostomy tube made of silver with 18 per cent nickel which broke after only 14 days of use. The authors attributed the broken metallic tracheostomy tube to a basic manufacturing fault and recommended pure silver tubes for patients with chronic respiratory problems⁴. In 1972, Kaker and Saharia attributed fracture of a zinc and copper alloy tracheostomy tube to erosion of the tube by alkaline tracheobronchial secretions⁵. Causes of fracture of metallic tracheostomy tubes suggested in the literature, include the following: (1) Lack of patient follow-up to change tubes⁶. (2) Weakening of the metallic tube, especially for those made with alloys of copper. Basic carbonates form by the action of alkaline secretions from the tracheobronchial tree, resulting in green deposits and erosion of the metal, described as “season cracking” by Bassøe and Bøe⁵,⁶,¹⁰. (3) Repeated removal, cleaning and boiling of the tube causing mechanical stress and early erosion⁶. (4) Manufacturing defects⁶,⁸,⁹.

In 1973, Sood reported a polyvinyl chloride (PVC)-made synthetic tracheostomy tube which fractured at the junction of the flange and the endotracheal portion. This was attributed to prolonged use and repeated boiling of the tracheostomy tube by the patient for economic reasons¹⁰,¹¹. A study of 6 cases of fractured synthetic tracheostomy tubes suggested that
Fig. 3  The black arrow indicates a fractured tracheostomy tube in the left main bronchus. The white arrow indicates the new tracheostomy tube placed by ED medical staff.

Fig. 4  The fractured tracheostomy tube retrieved by a bronchoscope and the neck plate. The white arrow indicates sputum plugs inside the tube.
all synthetic tubes can be sterilized by boiling. The tube becomes cloudy or opaque because of absorption of water into the material. The physical properties of tube will not change if tube transparency is restored after drying\(^\text{10}\).

Factors that could contribute to fracture of a synthetic tracheostomy tube are similar to those with metallic tubes, including alkaline bronchial secretions, defective fusion at the junction of the canula and flange, repeated sterilization, aging of the tube and mechanical stress from repeated removal and reinsertion of the tube for economic reasons\(^\text{10,12-14}\).

A review of cases reported from 1960-1992 suggested the most important factor contributing to fracture of synthetic tubes made of silicone rubber, plastic and PVC was mechanical defects, particularly at the fused joint at the junction of the tube and neck plate\(^\text{15}\). Also, granulation tissue in the synthetic tracheostomy tube can weaken the fused joint site\(^\text{15}\). This study also suggested that the neck plate was a common site of fracture in both metallic and synthetic tracheostomy tubes\(^\text{15}\). The duration of use of fractured tracheostomy tubes ranged from 0.5-6 years for metallic and 0.5-7 years for synthetic tubes\(^\text{15}\).

Another review of cases reported from 1960-1988, suggested the most common site of fracture in metallic tracheostomy tubes is the outer tube and neck plate and in synthetic tubes is the tube itself and the neck plate\(^\text{16}\).

Recent reports, which are mostly case reports, have focused on the importance of routine daily care of the tracheostomy tube\(^\text{14,17-19}\). In 2002, Oysu et al. reported a case of right lung atelectasis caused by a fractured tracheostomy tube in a 53-year-old homeless man with a total laryngectomy. The author suggested elderly, alcoholic, and homeless patients may frequently ignore routine care\(^\text{17}\). In 2006, Qureshi et al. reported aspiration of a fractured tracheostomy tube which had dislodged in the left bronchus of a 6-year-old boy\(^\text{14}\). In 2010, Patorn et al. reported a 14-year-old Thai boy with a stainless steel tracheostomy tube who presented with complaints of an intermittent cough for 2 months, which did not improve after a new tracheostomy tube was placed. It was found that the cough was due to an inner tube of a tracheostomy tube that had dislodged in the right main bronchus\(^\text{18}\). Both reports emphasize regular check-ups of tracheostomy tubes, including daily cleansing of the tube, changing the dressing and retying the tube weekly. Also, patients and caregivers should be properly trained in the care of tracheostomy patients and instructed on possible complications\(^\text{14,18}\).

There are few reports of fractured tracheobronchial suction tubes. In 1996, Tabuchi Y. et al. reported a 5 Franch (Fr) reused suction catheter that had been sterilized by ethylene oxide gas broke and lodged in the tracheobronchial tree of an 8-month-old intubated infant after a forceful extraction of the tube during sputum suction. They found that small diameter catheters break easily even with weak force. One resterilization by EOG did not change the length and force at the breaking point. There was less elongation of the broken catheter (85.5%) than with a new sample (155%). They found that the break may have started from a crack which had occurred at insertion or during resterilization\(^\text{20}\). Rogan et al. also reported on a 32-year-old intubated HIV-positive patient with persistent right basal infiltrates and atelectasis after a tracheostomy performed 14 days after admission. The symptoms were caused by a 14-cm tip of a closed suction tube that had presumably fractured during suctioning and lodged in the right main bronchus\(^\text{21}\). Garcia-Aparicio et al. also reported fracture of a closed tube endotracheal suction catheter presenting as a persistent pneumothorax in the left main bronchus of a premature infant\(^\text{22}\). Neither case report mentioned possible factors
contributing to suction tube fracture.

In conclusion, we suggest an another etiology for fractured tracheostomy and tracheobronchial suction tubes in addition to those mentioned above. Fractures could be caused by improper nursing care by caretakers who are not care professionals or are not well-trained. The chest care and procedures in our reported cases were done by foreign caretakers, not by a nurse or assistant nurse. In the first case, the tracheobronchial suction catheter was fractured after forceful extraction after the patient had bitten the catheter during suctioning. In the second case, the fractured tracheostomy tube had presumably been used for a prolonged time with improper care, as shown by multiple sputum plugs inside the fractured tracheostomy tube and the opaque, cloudy, yellowish external appearance. The nursing home caretaker refused to report how long the tube that had been used.

Our cases also reflect that most care of the elderly in our country is given by foreign caretakers, who have no nursing background or are not properly trained. Therefore we strongly suggest a test of qualified basic nursing care and a program of periodic review of the techniques should be provided by the government for domestic caregivers, foreign caretakers, and family members caring for patient.

In order to avoid fractured tracheostomy and tracheobronchial suction tubes we suggest the following: (1) Regular checks of tracheostomy tubes for signs of aging, such as cloudiness of the tube and also, possible cracks in tube (7). (2) Patients with a permanent tracheostomy should have 2 sets of tracheostomy tubes which should be regularly cleaned and changed under the supervision of a qualified nurse or physician (10,20). (3) The patient should be in a head-up position with an oral bite block placed before sputum suction, to prevent biting of the tongue and medical appliances, choking and aspiration. (4) Regular check-ups and nursing care are important, including cleaning and daily dressing of the tracheostomy tube. (5) Patients and caregivers should be properly trained in the care of tracheostomy patients. (6) Follow-up systems should be established in any hospital that is involved in caring for patients who undergo a tracheostomy.

References

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一斷裂氣管支氣管抽吸導管和斷裂氣切軟管在氣管之內：兩例個案報告

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常見的氣管支氣管內異物大多是食物，例如花生，但是醫療器材則較不常見。如果沒有盡早發現併取出氣管支氣管內異物，經常會造成病患嚴重的併發症，如肺炎、肺塌陷等。我們報告兩例成人不常見氣管支氣管內異物的個案。第一例個案是斷裂的氣管支氣管抽吸導管被發現斷落在一名81歲阿茲海默氏性病患的右側主支氣管內。第二例個案是斷裂的氣切管被發現斷落在一名95歲失智的氣切女性病患的左側主支氣管內。兩例個案的斷裂物品都在無併發症情況下，經由支氣管鏡成功的取出。

關鍵詞：氣管支氣管內異物，斷裂氣切管，斷裂氣管支氣管抽吸導管