CASE REPORT

Fractured tracheostomy tube presenting as a foreign body in a paediatric patient

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SUMMARY

Tracheostomy tube fracture and aspiration into the tracheobronchial tree leading to airway obstruction is a dangerous complication after tracheostomy. We report a case of a fractured tracheostomy tube in a 6-year-old child who had been maintained on a tracheostomy tube for the past 5 years. The tracheostomy tube got fractured at the junction of the tube and neck plate, and impacted in the trachea and right main bronchus. Rigid bronchoscopy performed through the tracheostomy stoma to retrieve the fractured tracheostomy tube and the anaesthetic management during the period are discussed.

BACKGROUND

Tracheostomy is a life-saving procedure carried out routinely for several indications. In some cases, because of the primary disease process, decannulation cannot be performed and the tracheostomy tube has to be maintained for a long duration. But when maintained for an extended period of time, it is important that the patient undergo regular follow-up since other late complications including fracture and displacement of the tube with airway obstruction are possibilities.

Anaesthetic and surgical management during extraction of a fractured tracheostomy tube is challenging and technically different from regular procedures.

CASE PRESENTATION

A 6-year-old boy presented to casualty with a history of breathing difficulty and stridor for 4 h prior to admission. On examination, it was found that the child had undergone tracheostomy in the past but only the outer neck plate was found and the inner tracheal portion of the tube was missing.

The child's medical history and records revealed that he had suffered from repeated attacks of respiratory infection since birth. He was a term male child, did not cry at birth and had a history of admission to the neonatal intensive care unit. He had suffered an episode of respiratory distress and fever at 3 months of age, was diagnosed to have bronchopneumonia and was treated with antibiotics. He had a history of recurrent episodes of pneumonia and had developed a left side chest wall abscess. Multiple aspirations had been performed to treat the abscess. Chest X-ray revealed an osteolytic lesion on the fifth rib, D4 and D7 vertebral body collapse with mediastinal widening, which was suggestive of tuberculosis of the spine with paraspinal abscess and fifth rib osteomyelitis.

The patient was started on antitubercular therapy (ATT).

At 7 months of age, the patient was admitted for surgical stabilisation of the spine and drainage of the abscess, in the course of which he was diagnosed to have subglottic stenosis during intubation, so the airway was secured using emergency tracheostomy. At the time, he had multiple episodes of prolonged ventilator support in ICU.

Decannulation of the tracheostomy tube was attempted several times but failed as the child desaturated and became drowsy. Since the child could not tolerate a metal Fuller's tube, a 3.5 Portex tracheostomy tube was retained in situ.

At nine months of age, indirect laryngoscopy revealed grade 3 subglottic stenosis. Dilation was attempted with a 10 size bougie, which failed. The child completed 12 months of ATT and had been thriving with the 3.5 size uncuffed tracheostomy in situ.

At the latest hospitalisation, the child was aged 6 years and had presented with breathing difficulty and stridor. He had one episode of generalised tonic clonic seizures and had bluish discoloration of the skin. Examination revealed that the inner tracheal portion of the 3.5 size tracheostomy tube was missing, and only the external plate was strapped to the neck. The child was cyanosed, with SPO₂ 45%, and his pulse rate was 138/min. Respiratory rate was 40/min. Blood pressure was 90/60 mm Hg. Respiratory system examination revealed decreased air entry on the left side and bilateral crepitations were present. A 3.5 endotracheal tube was inserted through the stoma site and ventilated with 100% oxygen. Oxygen saturation improved to 85% and chest X-ray was taken, which revealed the dislodged portion of the tracheostomy tube in the right main bronchus (figure 1). The endotracheal tube was removed and a size 4 Portex tracheostomy tube placed and resuscitation continued. Seizures were controlled with injection of Midazolam and saturation improved to 100%. The patient's blood gas analysis revealed PH 7.098, HCO₃ 19.1, PO₂ 68.2, BE 11.4, PCO₂ 63.4, Na/K -135/4. The patient was shifted to the operation theatre, with the tracheostomy tube connected to T-piece with 100% oxygen. Rigid bronchoscopic removal of the dislodged portion under general anaesthesia was planned. After shifting to the operation theatre, standard monitors were connected and baseline parameters noted. The tracheostomy tube was connected to a Jackson-Rees circuit and the child was preoxygenated with 100% oxygen. He was induced with sevoflurane (up to 8%) and a

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Figure 1 Chest X-ray showing fractured tracheostomy tube.

24 G intravenous line was secured in the right upper limb. Injection of fentanyl 40 µg was given, along with intravenous injection of atracurium 5 mg and dexamethasone 2 mg, and anaesthesia was maintained with sevoflurane along with an air and oxygen mixture.

For the purpose of bronchoscopic removal, the tracheostomy tube was removed and the rigid bronchoscope inserted through the tracheostomy stoma. The anaesthesia circuit was connected

Figure 2 Fractured and displaced tracheostomy tube after removal.

to the ventilating port of the bronchoscope and bronchoscopic removal was attempted. During bronchoscopy, the patient desaturated to 90%—the procedure was withheld and ventilation continued, with the bronchoscopy port closed for 5 min, with 100% oxygen and saturation improving to 100%. Bronchoscopic removal was attempted again and the dislodged portion of the Portex tube was retrieved from the right main bronchus through tracheostomy stoma with the aid of a long foreign body bronchoscopy forceps through the bronchoscopy port in the bronchoscope. Detachment at the junction between the inner tube and the neck plate was found (figure 2). Once the specimen was removed, a size 4 uncuffed Portex tracheostomy tube was reinserted and ventilation resumed. The child was reversed with neostigmine and glycopyrrolate, and regained adequate spontaneous respiratory effort.

Postoperatively, the child had bilateral wheeze and basal crepitations and saturation was maintained at 100%. Epinephrine and salbutamol nebulisation was given in the postoperative ward.

Postoperative chest X-ray revealed the tracheostomy tube to be in position.

The child was discharged with a size 4.5 uncuffed Portex tube in situ.

DISCUSSION

Tracheostomy is a life saving procedure undertaken for various indications including relieving airway obstruction, tracheobronchial toileting or to prevent aspiration of secretions. In most cases, it is performed as a temporary measure and is removed once the patient has recovered from the disease process for which it was indicated. But in some cases, as in this case, the tracheostomy tube has to be kept permanently due to persistence of the primary disease. If the tracheostomy tube is retained for a long time, several late complications can occur, including fracture and dislodgement of the tube. The earliest report of a fractured tracheostomy tube was by HH Bosso in 1960, involving a silver nickel alloy tube.¹ Fractures have been reported to occur more commonly in metallic tracheostomy tubes.^{2–4} Metal tubes are usually preferred for long-term use, but in our case mentioned above, a Portex tube had been used since the child could not tolerate a metal tube. There are some specific sites at which the tracheostomy tube more commonly gets fractured. The most common site is the junction between the tube and the neck plate,^{2–5} other sites of fracture reported include the distal end of the tube and fenestration site.^{1 5 6} In this case, it was at the junction of the tube and neck plate. Some of the mechanisms proposed include prolonged usage leading to increased wear and tear, accumulation of alkaline tracheobronchial secretion leading to softening and weakening of the tube, and manufacturing defects.^{2–4 7 8} In the above mentioned case, the child had undergone tracheostomy very early in life, at around 7 months of age, and it had been retained until 6 years of age. A PVC tube may stiffen and become rigid after 4 months of regular usage, and a rigid tracheostomy tube may develop cracks, which would predispose it to fracture.⁹ Exchange of the tracheostomy tube at regular intervals can prevent such complications. The most common area at which tubes get impacted is the right main bronchus.¹⁰ In this case, dislodgement had occurred in the trachea and right main bronchus. Since the tube had caused obstruction at the origin of the left main bronchus, there was diminished air entry in the left side of the chest. There was preserved air entry in the right side since the lumen had not been obstructed.

Anaesthetic management of a tracheobronchial foreign body is always a challenging situation, with the airway being shared by the surgeon and anaesthesiologist. Tracheobronchial obstruction caused by a detached portion of a fractured tracheostomy tube is a rare occurrence with dangerous implications. In the case mentioned above, we faced additional challenges because the patient already had a compromised airway anatomy with subglottic stenosis. During initial resuscitation, as an emergency measure, we introduced a 3.5 mm endotracheal tube through the stoma site and ventilation through the endotracheal tube helped in improving SPO₂ and stabilised the patient. Airway instrumentation could be carried out only via the stomal site because of subglottic stenosis. Bronchoscopic removal was performed with the surgeon inserting the bronchoscope through the stoma, and subsequent ventilation was achieved through the ventilating port of the bronchoscope. The detached portion of the tracheostomy tube was also subsequently extracted through the stoma. In a paediatric case reported earlier, this had been carried out through wound exploration through the tracheostomy stoma, without bronchoscopy,³ which can be considered

as an alternative option in the absence of a facility for bronchoscopy. This case highlights that, in a patient with tracheostomy presenting with sudden onset of respiratory distress, fracture of a tracheostomy tube should also be considered as a differential diagnosis. It also highlights the importance of care and regular periodic examination of the tracheostomy tube, alongside regular tube change, to prevent such catastrophe.^{2 9}

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Learning points

- If a tracheostomy tube has to be maintained for a long period of time, follow-up and tube change at regular intervals, depending on the material used in the tube, are necessary to prevent complications such as fracture and airway obstruction.
- The most common area of fracture is the junction of the tube and neck plate.
- Extraction of the fractured portion of the tracheostomy tube can be achieved by rigid bronchoscopy through the stoma.

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