CASE REPORT

Bronchoscopic removal of foreign body from airway through tracheotomy or tracheostomy

José C. Fraga, Alexandra F. Pires, Marcia Komlos, Elisiane E. Takamatu, Luciano G. Camargo, Fabio H.A. Contelli

Abstract

Objective: most foreign bodies in the airway are removed by respiratory endoscopy. Rarely, the removal of the foreign body has to be performed through endoscopic control by tracheotomy or tracheostomy. This article reports three cases of foreign body removal in children performed by tracheal opening.

Description: retrospective review of records with report of three cases of children who aspirated foreign bodies into the airway. In the first case, there was rupture of the tracheostomy tube, with aspiration of its distal portion. Endoscopic removal was performed by tracheostomy. The second child aspirated a pen cap. It could not be removed by endoscopy because it would not pass through the subglottic region. Cervical tracheotomy was performed and the foreign body was removed with endoscopic control. In the last case, the foreign body was in the left main bronchus. It was removed by bronchoscopy through tracheotomy opening. All children presented good outcome after the endoscopic procedure. The trachea of the patient submitted to tracheotomy was sutured after the foreign body removal. Tracheostomy was not necessary. In the children with previous tracheostomy, the tube was put back after the foreign body removal.

Comments: most foreign bodies in the airway of children can be removed by endoscopy. When the foreign body is too large to pass through the subglottic region, or so sharp that it can injure the airway, the use of tracheotomy or tracheostomy is indicated.
Introduction
The majority of foreign bodies (FBs) aspirated into the airways of children are removed by means of respiratory endoscopy, with endoscopic instruments introduced through the mouth. However, on rare occasions when the FB is too large to pass the subglottic region, or is sharply pointed and risks perforating the airway, the removal of the FB may be performed by opening the trachea.

Below we report on three clinical cases of children who aspirated FBs into their airways, in which FB removal was performed with an endoscopic instrument inserted by tracheostomy or tracheotomy.

Case descriptions

Case 1
F.P.P., 6 years old, female, diagnosed with Central Alveolar Hypoventilation Syndrome idiopathic (“Ondina’s Curse”), having been tracheostomized during the neonatal period for apnea and requiring prolonged mechanical ventilation. While interned in the Intensive Care Unit she presented sudden respiratory dysfunction after the PVC tracheostomy tube (Portex™) was accidentally dislodged. The initial assessment revealed that the tube had broken at the junction with the horizontal plate used for fixation to the throat, and that the distal portion had been aspirated. Radiography of the thorax confirmed that a portion of the tube was located in the distal trachea. The child underwent respiratory endoscopy, with a rigid bronchoscope introduced through the tracheostoma and the aspirated portion of the tube was removed. The patient had an excellent post-endoscopic evolution.

Case 2
A.S.J., 8 years old, male, asthmatic, referred to our hospital due to acute respiratory dysfunction with suspicion of having aspirated vomit. Presented severe respiratory difficulties requiring tracheal intubation. On internment presented radiography of the thorax showing atelectasis of the whole right lung. Fibrobronchoscopy performed at the ICU, by means of the endotracheal tube, revealed an inorganic FB, blue in color and plastic in aspect at the ostium of the main right bronchus. The patient then underwent rigid bronchoscopy at the Outpatients Surgery Unit of the HCPA, under general anesthetic, with a rigid bronchoscope with 0º optics connected to video equipment. It was observed that the FB completely occluded the main right bronchus. This was secured with endoscopic forceps and tractioned. The FB came easily as far as the subglottic region, but would not pass this point. As the FB in the trachea obstructed breathing and was provoking oxygen desaturation, it was pushed into the right bronchus with the bronchoscope.

The child was ventilated, and, after ventilation was established, a further attempt was made to remove the FB. After a third attempt without success, during which the patient presented severe oxygen desaturation, with cardiac arrhythmia, the decision was taken to use an endotracheal tube and perform a tracheotomy. The trachea was exposed with a cervical incision and prepared for opening. The tracheal tube was then removed, and the bronchoscope inserted into the airway once more. Endoscopic forceps were used to pull the FB to the subglottic region. At this point a transverse opening was made in the trachea, at the third tracheal ring, and the FB removed through the tracheotomy with hemostatic forceps. It was a pen lid. After the child’s ventilation had been established, the bronchoscope was removed and nasotracheal intubation put in place. The trachea was closed with separate stitches using PDS 5-0, and next the cervical incision was closed by planes. The cervical opening was closed without tracheostomy tube insertion. The child remained with the tracheal tube inserted for 3 days when he was extubated in the Pediatric ICU. He continued to present stridor and mild intercostal retraction for 02 days, improving thereafter. A follow-up 1 month after the procedure showed an absence of respiratory symptoms and radiography of the thorax revealed both lungs expanded.

Case 3
C.S., 4 years old, female, carrying a tracheostomy due to severe subglottic stenosis, resulting from prolonged intubation in the past. Consulted the emergency service because of fever, tachypnea and yellow secretions from the tracheostomy. Under examination presented myiasis of the tracheostoma, and radiography of the thorax showed bronchopneumonia. Antibiotics were started, and, under general anesthetic the tracheostoma was cleaned, and innumerable larvae were removed. Respiratory endoscopy with a rigid bronchoscope inserted through the tracheostoma revealed larvae in the intrathoracic trachea and a foreign body (a wooden toothpick/cocktail stick) in the main left bronchus. The foreign materials were removed with endoscopic forceps introduced through the bronchoscope. The child recovered well and was later referred to the Child Protection Service (Serviço de Proteção da Criança).

Discussion
The presence of foreign material within the airways of children continues to be a significant cause of morbidity and mortality. In some countries FBs are even the most common cause of accidental death among children less than one year old.

Soon after inspiration of the foreign material, the child may present intense coughing, wheezing, vomiting, pallor,
cyanosis or brief episodes of apnea. After these initial dramatic manifestations, the clinical status generally attenuates or even disappears completely. This short interval during which the child does not present overt symptoms can give an observer the false impression that the FB may have been expelled by the cough or even swallowed. This is why it is important that doctors are always alert to this diagnostic possibility.2

The treatment for children who have aspirated FBs is their endoscopic removal with either rigid or flexible equipment. However, in rare situations, certain materials cannot be removed by endoscopy, and must be removed through an opening in the airway. A revision undertaken by Marks et al.,3 studying 6,393 patients with FBs in the airway showed that when open surgery is indicated for the removal of the FB, thoracotomy (2.5%) is more commonly required than tracheostomy (2%). Of the 104 patients who needed tracheostomy, 52 were because of laryngeal edema after bronchoscopy, 12 as a route for the introduction of a bronchoscope, 11 in order to permit assisted ventilation, and only 10 to enable the removal of large objects which would not pass the subglottic region.3 In 19 patients the indications for tracheostomy were not commented upon.3 It is important to note that tracheotomy indication for removal of tracheobronchial FBs, as described for one of our patients, is reported in only 11 cases in the literature,3,4 suggesting that this is an extremely rare event. Despite our patient having been described in an earlier international publication,4 we judged its inclusion in this series of cases to be important since, while rarely necessary, it is important that doctors removing FBs from the airways of children be familiarized with the possibility of tracheotomy in order that it may be performed when necessary.

As the subglottic region is the narrowest part of the airway of a child, any edema caused by the passage of a large caliber FB can reduce even further the caliber of this area and make it impossible for the FB to pass a second time when removed. This is a dramatic moment during the performance of an endoscopic procedure, since an FB that does not pass the subglottic region completely obstructs the trachea with hypoxemia, bradycardia and cardiac arrest resulting. Before this catastrophic event can occur it is important that the surgeon pushes the FB with the bronchoscope into one of the main bronchi, in order to allow respiration with at least one of the lungs. This is a lifesaving maneuver and is indispensable.

During removal of a tracheobronchial FB, the removal of such an object through a tracheal opening is indicated when the FB is overly wide and will not pass the subglottic region, as was observed with one of our patients. Other indications for opening the trachea are the removal of sharply pointed FBs whose points lodge in the subglottis or in the vocal cords and when the FB impacts the subglottic region and provokes an acute obstruction.3,5,6 Furthermore, in patients who have had previous tracheostomies, as in the cases reported in this study, the introduction of endoscopic equipment through the tracheostomy facilitates the removal of large objects which have been aspirated into the airway.

When the removal of FBs from the airway requires a tracheal opening, it is important that two trained teams work together: one for the cervical approach, tracheal opening and removal of the FB viewed directly; and the other for the bronchoscopy, to grip the FB and to pull it up to the tracheotomy region. That these teams act in synchronization and quickly is fundamental to the removal of the FB and to ensure sufficient ventilation of the child.

Reports in the scientific literature describe the necessity of performing a tracheostomy after a tracheotomy for the removal of an FB of the airway. However, this is not necessarily an absolute indication for tracheostomy, as may be seen with one of our patients. If it is possible to suture the trachea firmly without leakage, it is only necessary to maintain tracheal intubation for between 2 and 5 days. This is sufficient time to lower the local edema and allow safe extubation.4

Aspiration into the airway or a fragment of a tracheostomy canula is an uncommon event.6 The first case of aspiration of a fractured metallic tracheal cannula was in 1960;7 and aspiration of part of a PVC canula (Portex™) by one child was reported by Sood,8 and by three others by Bhatia et al.9 The aspiration described here is the third history published in the literature. In all cases, as in our patient, the cannula fractured at the union between the tube and the horizontal plate used to fix the cannula in the throat.6 The authors attribute the breakage to prolonged use or to a defect in the connection of the tracheostomy tube with the external horizontal portion used for cervical fixation. While PVC cannulae (Portex™) do not have joints at this point, wear makes the fracture more likely to occur.6

We conclude that a minority of child FB aspirations cannot be removed by endoscopy alone, even when performed by an experienced surgeon. The concomitant performance of a tracheotomy, or even the use of a previously created tracheostoma, is indicated for patients who have aspirated particularly wide FBs, which do not pass the subglottic region, sharply pointed FBs whose points lodge in the subglottis or in the vocal cords, or FBs which impact the subglottic and provoke acute respiratory obstruction.

References


