Case Report

Use of cryoprobe for removal of a large tracheobronchial foreign body during flexible bronchoscopy

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ABSTRACT

Foreign body (FB) inhalation in the tracheobronchial tree is an infrequently encountered event in adults. The diagnosis is suspected in the presence of a clinical history of aspiration and the presence of respiratory symptoms. Management involves confirmation by flexible bronchoscopy, which may be both diagnostic as well as therapeutic. However, in certain situations including those with large FB, FB embedded in granulation tissue or FB with very smooth margins, rigid bronchoscopy may be superior to flexible bronchoscopy in the retrieval of the FB. An alternative to rigid bronchoscopy in such situations may be the use of a cryoprobe. Herein, we describe a patient with a large tracheobronchial FB causing a complete collapse of the left lung and hypoxemia. The FB was successfully extracted using a cryoprobe during flexible bronchoscopy, obviating the need for rigid bronchoscopy.

KEY WORDS: Anesthesia, bronchoscopy, foreign body, hypoxia, lignocaine, respiratory failure

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INTRODUCTION

Tracheobronchial foreign body (FB) is a rare occurrence in adults with the proportion of flexible bronchoscopy performed as an indication for FB being as low as 0.24%.[1,2] The most common type of FB in adults is inorganic (pin, needle, nail, screw, and others), and is usually visualized on a chest radiograph.[1] Treatment involves extraction of the FB using flexible bronchoscopy, which has a reported success rate of 90%.[1] However, in certain instances (large FB, friable organic FB, FB embedded in the granulation tissue, FB in children, and in patients with respiratory failure), rigid bronchoscopy may be required for retrieving the FB.[1,2] Another alternative in such situations may be the use of cryotherapy. Cryotherapy with cryoprobe freezes the concerned object or tissue, enabling quick, and easy removal.[3,4]

The use of cryotherapy has been described in the ablation of benign (granulation tissue, carcinoid, and airway strictures) and malignant (bronchogenic carcinoma, salivary gland tumors of the trachea) lesions of the airways, and for cryo-recanalization (restoring the patency of the airway by removal of the tumor).[4-7] Other uses include the performance of endobronchial and transbronchial lung biopsy and pleural cryobiopsies.[6,8-10] Cryoprobe has also been used for the extraction of tracheobronchial foreign bodies such as tablets, food particles, and blood clots using the technique of cryoextraction.[3,11,12] Herein, we describe the use of cryoprobe in the successful extraction of a large tracheobronchial FB during flexible bronchoscopy.

CASE REPORT

A 60-year-old male with no prior comorbid illness presented with breathlessness, cough, and wheezing of 10 h duration following accidental inhalation of the *harad* (*Terminalia chebula*) seed. On examination, he

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was tachypneic, had audible wheeze with a room air oxygen saturation of 94%. Chest radiograph and computed tomography of the thorax revealed collapse of the entire left lung [Figure 1]. An urgent flexible bronchoscopy (Olympus, Tokyo; BF1T180; working channel diameter, 2.8 mm) was performed through the oral route under conscious sedation and continuous oxygen supplementation. Bronchoscopy confirmed the presence of a large FB in the left main bronchus with inspissated secretions [Figure 2]. Several attempts to dislodge the FB with the flexible grasping forceps and the Dormia basket were unsuccessful as the FB was fairly large [Figure 2]. A decision was then made to use the cryoprobe to extract the FB. The cryoprobe (ERBE, Tubingen, Germany; outer diameter 2.4 mm, length 780 mm) was introduced through the working channel of the flexible bronchoscope and was placed at the center of the FB, avoiding any contact with the surrounding mucosa. The cryoprobe was then frozen for 10 s, and the cryoprobe with the adhered FB was removed *en bloc* along with the flexible bronchoscope [Figure 3]. During the procedure, the oxygen saturation transiently dropped to 85% despite high flow oxygen supplementation (15 L/min). Following the procedure, the patient developed transient hypoxemia that was managed with supplemental oxygen inhalation (6 L/min), nebulization with salbutamol (2.5 mg) and systemic corticosteroids (100 mg of hydrocortisone). After 30 min, the patient was comfortable and was discharged after 6 h of observation.

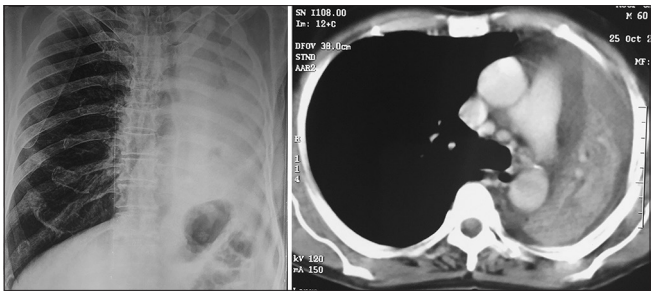

Figure 1: Chest radiograph (right panel) and computed tomography of the thorax (left panel) revealing complete collapse of the left lung

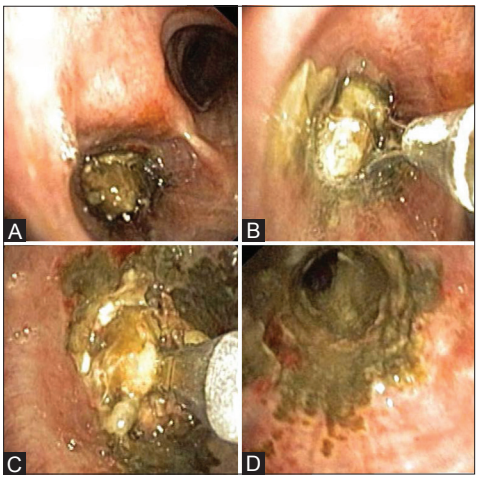

Figure 2: Bronchoscopic view showing foreign body with inspissated mucous that is completely occluding the left main bronchus (Panel A). Panel B shows the inability of shark tooth forceps to grasp the large foreign body. Panel C shows the cryoprobe adhered to the center of the foreign body. After bronchoscopic removal of the foreign body, there was a patent left main bronchus with significant mucosal edema (Panel D)

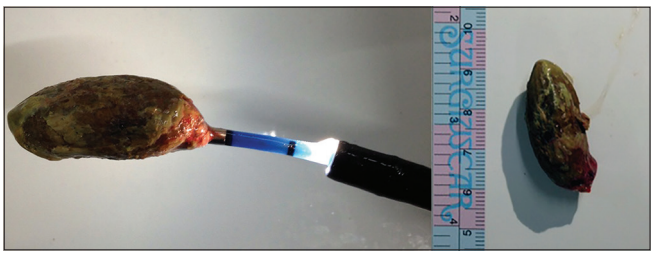

Figure 3: Flexible bronchoscope with cryoprobe and the adhered foreign body (*Terminalia chebula*) measuring 4.5 cm in length

DISCUSSION

The index case highlights the successful use of cryoprobe in the extraction of a large tracheobronchial FB during flexible bronchoscopy. Most adult patients present with innocuous symptoms due to the peripheral location of the FB.[1,2] However, occasional patients may present with acute symptoms such as stridor, cough, wheeze, and respiratory failure in cases of a large FB that is located in the proximal airways.[13,14] This was also highlighted in the index case that presented with acute symptoms and was found to have a large FB in the left main bronchus.

The diagnosis of an airway FB is made based on the history of aspiration and the clinical presentation with respiratory symptoms.[1,2] The diagnosis is supported by chest imaging, either chest radiograph or computed tomography of the thorax. Imaging may either reveal a radio-opaque FB (metal pin, screw, and nail) or may manifest with indirect signs such as localized infiltrates, atelectasis of a segment or a lobe in the case of organic FBs.[1] The index case had characteristic history and symptoms of FB inhalation and radiological feature of left lung collapse. The most common location of a tracheobronchial FB is the right lower lobe or the right intermediate bronchus due to the vertical orientation of the right main bronchus; however, it may also be seen in the other locations such as the left main bronchus as was the case in the index patient.[1] The diagnosis is confirmed by flexible bronchoscopy that may also be used simultaneously for retrieving the FB, as was performed in the index subject.[1] However, in certain situations as mentioned before, rigid bronchoscopy is preferred.[1,2,14] In our patient, the FB was large and could not be grasped easily with the small shark tooth forceps or the Dormia basket during flexible bronchoscopy.

Cryoprobe has been used to extract large mucus plugs and blood clot that could not be removed using the flexible grasping forceps.[3] Although endobronchial objects or foreign bodies with high water content are ideally suited for cryoextraction, recent evidence suggests that

this technique can also be extended to extract inorganic objects with low water content.[11] Cryoextraction has also been used in the removal of metallic and inorganic tracheobronchial FBs that are embedded in the granulation tissue.[15,16] The presence of airway secretions and spraying of normal saline over the FB enables crystallization of the water molecules.[15] This results in strong attachment of the cryoprobe to the FB leading to its successful removal, as demonstrated in our patient.

Finally, the use of cryoprobe is not without limitations. Although the cryoprobe enabled successful removal of a large airway FB, it resulted in hypoxemia both during and after the procedure that required supplemental oxygen and nebulized bronchodilatation. It is important to realize that patients with comorbid illness and those with low cardiorespiratory reserve may not tolerate even transient hypoxemia. In such cases, flexible bronchoscopy may not be safe, and one should directly resort to rigid bronchoscopy performed under general anesthesia.

CONCLUSION

A large tracheobronchial FB may occasionally be successfully removed with a cryoprobe during flexible bronchoscopy, precluding the need for rigid bronchoscopy and general anesthesia.

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Conflicts of interest
There are no conflicts of interest.

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