An Alternative Approach to Management of Fogarty Catheter Disruption Associated with Endobronchial Foreign Body Extraction

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The Fogarty balloon catheter is a useful adjunct in removing aspirated foreign bodies, but its use is not without risks. A case is presented of Fogarty catheter disruption while attempting to remove a foreign body. The resulting debris in the distal airway was inaccessible to bronchoscopic retrieval. An effective treatment plan is outlined to deal with this problem. (Chest 1988; 94:882-84)

Foreign body aspiration remains an important cause of morbidity and mortality in children under four years of age. Although fewer children die today than previously, this event is a major cause of emergency hospitalization. The current accepted therapy is rigid bronchoscopic examination with manipulation and extraction of the foreign body, which is generally safe and successful. With the advent of miniaturized telescopic fiberoptics, management without bronchoscopy is rarely necessary. This therapy of bronchodilator aerosols and thoracic physiotherapy and drainage was shown to be effective but often required hours or days.

Bronchoscopic removal of aspirated foreign bodies may be accomplished with the aid of fiberoptics, Fogarty balloon catheters, wire baskets, or atraumatic forceps. Balloon catheters have usually been employed to remove smooth aspirated objects from the tracheobronchial tree while minimizing the risks of fragmentation. Nevertheless, fragmentation of the foreign body or disruption of the balloon catheter may occur. Fragmentation may cause pneumonia or bronchiectasis, and balloon rupture may allow pieces of rubber or the metal spring tip to lodge in the distal airway, where this debris is often inaccessible to the rigid or flexible bronchoscope. Extraction, even with fluoroscopic techniques, may be extremely difficult.

Fogarty disruption is considered rare but has been occasionally reported. The usual treatment for aspirated sterile debris includes (1) attempt at immediate bronchoscopic removal, (2) thoracotomy with division or resection of pulmonary parenchyma, and (3) leaving the object permanently lodged in the distal airway. Bronchoscopy is generally unsuccessful, and thoracotomy is invasive and potentially morbid, while leaving the debris in place may allow migration or cause pneumonia or abscess formation. We recently treated a patient after catheter rupture with an effective alternative similar to that proposed by Burritt and Cotton 15 years ago.

Case Report

A nine-month-old boy had a sudden choking and coughing spell at home with subsequent tachypnea. Chest roentgenography with fluoroscopy demonstrated hyperinflation of the right lung and no motion of the right hemidiaphragm (Fig 1). On examination there were intercostal retractions, mediastinal shift to the left, and no breath sounds over the right hemithorax. Emergency bronchoscopic evaluation for a probable aspirated right main-stem bronchus foreign body was undertaken.

A 3.5-mm rigid ventilating bronchoscopy was employed. The carina and left main-stem bronchus were normal. A large, white foreign body filled the right main-stem bronchus and was impacted into the orifice of the right upper lobe bronchus. Manipulation with atraumatic forceps was unsuccessful. A 3F Fogarty catheter (American V. Mueller, CV1039) was passed distally and carefully inflated with 0.2 ml of sterile saline. Gentle traction was applied, and the foreign body began to rotate. However, the catheter suddenly disrupted, and inspection showed that the Fogarty balloons metal spring tip was missing. After further manipulation, a single large piece of peanut was removed. Immediate repeated bronchoscopic study showed marked inflammatory reaction distal to the point of the foreign body impaction but no residual peanut or metal could be visualized in the distal airway. Post operative chest roentgenogram showed the metallic spring at the base of the right lung (Fig 2).

The child immediately began receiving metaproterenol (Alupent) nebulizer doses of 0.1 ml every four hours, dexamethasone (Decadron), 4 mg IV every six hours, and chest percussion with postural drainage to the right lung base every two hours. He was placed in a 28 percent O2 mist tent to maintain a hemoglobin saturation of 95 percent by oximetry and was given IV maintenance fluids. The morning following bronchoscopic study, the child was asymptomatic, but had a 95 percent saturation on room air and was tolerating a liquid diet. At home, his postoperative course was uneventful. The infant had a normal breathing pattern and good activity level. Two weeks later, chest and abdominal roentgenograms detected no evidence of a metallic foreign body (Fig 3). The infant had either coughed up the metal spring or swallowed it and passed it through his gastrointestinal tract.

Discussion

This case illustrates a known danger in employing the Fogarty catheter for tracheobronchial foreign body removal. The soft balloon component can easily tear if it is overinflated or compressed by a rough object. It is understandable that the balloon may rupture when used on a hard object within a rigid lumen, since it was originally designed

![Figure 1. Chest roentgenogram demonstrating hyperinflation of the right lung and flattening of the diaphragm.](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21584/)
to remove a soft embolus or thrombus from within a distensible lumen. Complications of use of this catheter to remove an intravascular thrombus are well recognized, and standardized techniques to be employed during manipulation have been defined. While appropriate care of the Fogarty balloon was likely used during the procedure on this patient, the possibility of a defective product must also be considered a cause of the disruption.

Satisfactory treatment of catheter disruption has not been uniformly delineated. When this complication occurs, the resulting debris is scattered into the distal airway. Therapy is directed toward removal of a small foreign body in the periphery of the tracheobronchial tree. Extraction with a rigid or flexible bronchoscope is often unsuccessful, so another approach must be considered. Because of its invasive nature, thoracotomy is usually only employed as a "last resort" when pulmonary symptoms are evident. Furthermore, the risks of foreign body migration or abscess formation leads to a distinct uneasiness regarding the "observation only" approach. This discomfort is enhanced by today's litigious environment.

In the past an indirect method for removal of foreign material in the airway has centered around the use of vigorous chest physiotherapy and inhalation bronchodilators. Campbell et al outlined this therapy in 1982 for treatment of peripherally located foreign bodies and demonstrated it to be effective 64 percent of the time. An earlier report of a similar therapeutic regimen used in a small group of patients was shown by Burrington and Cotton to be successful in 80 percent of all aspirated foreign bodies, either located centrally or peripherally. While larger series have been less successful, this mode of therapy may still be applicable in the situation of Fogarty balloon catheter disruption where the metal or rubber material resides in the bronchial periphery. In theory, inhalant bronchodilator drugs should help to reduce bronchial edema and inflammation by smooth muscle relaxation and suppression of bronchospastic mediator generation and release. When combined with aggressive thoracic percussion and postural drainage, a foreign body in small airways may be spontaneously expelled.

The described treatment protocol for dealing with Fogarty balloon rupture and its resulting debris is a reasonable
alternative to the risks of thoracotomy or leaving the material in place. Therapy must be instituted immediately to maximize chances of success, and the treatments must be performed by professionals experienced in their administration. Fogarty catheters are important adjuncts in bronchial foreign body removal, but their use is without risks. Clinicians who employ the catheter for this purpose should be aware of the risks and consider the described regimen if balloon disruption occurs.

REFERENCES

Streptokinase in a Loculated Pleural Effusion*

Effectiveness Determined by Site of Instillation

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A patient with a large loculated pleural effusion had streptokinase instilled into the loculation, and this was ineffective; however, when the same amount of streptokinase was instilled into the space around the loculation, there was rapid lysis of the loculation, resulting in the drainage of purulent fluid through the chest tube. (Chest 1988; 94:854-56)

Instillation of streptokinase into the pleural cavity is an accepted form of treatment for loculated pleural effusions. This seems to obviate the need for decortication; however, in some patients, streptokinase is not effective in lysing loculations. Based on the following experience, we believe that the treatment might be more effective if the streptokinase were instilled into the area adjacent to the loculation.

CASE REPORT

A 35-year-old black man was admitted to Van Etten Hospital on April 12, 1987, with a two-week history of left-sided pleuritic chest pain, increasing shortness of breath, and cough with production of yellowish sputum. He was not an intravenous drug user or alcohol abuser but had snorted cocaine. The patient had a 15 pack-year smoking history.

The medical history was significant for right-sided pneumonia in 1985, and a shrapnel injury to the left leg and head in Vietnam. On examination the patient had tachypnea, with a respiratory rate of 36/min, temperature of 38.9°C (101.2°F), pulse rate of 92 beats per minute, and blood pressure of 150/90 mm Hg. He had no nuchal rigidity or photophobia. There was shotty inguinal lymphadenopathy and a mobile 2-cm to 3-cm left axillary lymph node. The heart sounds, S1 and S2, were normal, with a 2/6 systolic ejection murmur at the apex.

Chest examination revealed tenderness over the fifth rib on the left side in the midaxillary line, dullness to percussion at the left base with decreased breath sounds, and E to A changes over the same area.

Findings from the remainder of the physical examination were normal. The chest roentgenogram showed a patchy left lower lobar infiltrate with a left pleural effusion.

Laboratory data were significant for a leukocyte count of 14,000/ cu mm (68 percent segmented neutrophils, 11 percent band cells, 20 percent lymphocytes, and 1 percent monocytes). Gram stain of the sputum showed numerous polymorphonuclear leukocytes but no organism. Therapy was begun with intravenous penicillin (2 million units every four hours) and oral indomethacin for the pleuritic chest pain.

The first thoracentesis (April 13, 1987) in the left eighth intercostal space in the infrascapular region revealed turbid yellow fluid with a pH of 7.22, erythrocytes count of 11,459/cu mm, and 10,213 leukocytes/cu mm with 68 percent neutrophils, 28 percent lymphocytes, and 4 percent monocytes. The glucose was 95 mg/dl, the protein was 3.2 g/dl, and the LDH was 11 units.

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Streptokinase in Loculated Pleural Effusion (Ogirala, Williams)