reported so far the shunt was not discovered until the patient was at an advanced age, and that there was no chest pain or other sign of ischemic heart disease, it appears that the existence of such a vessel does not affect myocardial perfusion and so does not in itself indicate surgical intervention.

REFERENCES

New Procedure: Bronchoscopic Endobronchial Sealing*

A New Mode of Managing Hemoptysis

Parthasarathi Bhattacharyya, MD, DNB, DM; Anjan Dutta, MBBS, DA; Ananta Narayan Samanta, MBBS; and Samrat Roy Chowdhury, MBBS

Six patients with hemoptysis were treated by endobronchial sealing, with n-butyl cyanoacrylate, of the bleeding segment or subsegment. There was an immediate arrest of bleeding without any recurrence for a mean follow-up period of 127 (± 67.17) days. Endobronchial sealing appears to be an effective method of managing hemoptysis. (CHEST 2002; 121:2066–2069)

Key words: endobronchial sealing, fiberoptic bronchoscopy, hemoptysis, n-butyl cyanoacrylate

Hemoptysis is a common clinical problem.1 The source of bleeding lies, usually, in the tracheobronchial tree and rarely in the nose, pharynx, or larynx.2 Management of hemoptysis aims to stop the bleeding, replenish the blood loss, and treat the underlying etiology. Hemostasis is often difficult to achieve when the conservative treatment fails. Several bronchoscopic techniques, such as the bronchial tamponade, have been used to arrest bleeding.3 We have adopted a method of treating hemoptysis by selective placement of a catheter in the bleeding segment (or subsegment), with the help of a fiberoptic bronchoscope, and instillation of a sealant, n-butyl cyanoacrylate, a biocompatible glue that has been used successfully in other hemostatic and sealing procedures.4

Methods and Materials

Selection of Patients

Patients with prolonged (> 7 days) hemoptysis despite continued conservative therapy were selected for the endoscopic procedure. Proper informed consents were obtained. A total of six patients (4 were male, 2 were female), with an average (±SD) age of 56.1 (± 8.33) yr, were treated with the endoscopic procedure (Table 1). Each patient was clinically evaluated for the possible site and cause of bleeding, and the approximate amount of blood loss was determined. The baseline investigations, such as percentage hemoglobin, packed cell volume, total and differential leucocyte count, erythrocyte sedimentation rate, prothrombin time, partial thromboplastin time, platelet count, and chest roentgenograms were obtained in all of them. CT scan (thorax) was done in four patients. There was no coagulation problem in any of the patients. Sputum smears for acid-fast bacilli were negative in all the patients on at least three different occasions. Two patients (Table 1), who were diagnosed to have pulmonary tuberculosis from the radiologic appearances, showed good clinical response to antitubercular drugs. One patient with past history of treatment for tuberculosis had multiple patchy areas of fibrosis and bronchiectasis. In the other three patients, the etiologic diagnoses were not clear. Fine needle and/or transbronchial needle aspirations revealed no malignancy on cytological examinations in two patients. The aspiration smears did not reveal any infective agent on Gram and Ziehl-Neelsen staining. The patients, however, responded positively to antibiotics. There was no contraindication to bronchoscopy in any of the patients according to the guidelines of the American Thoracic Society.7

Fiberoptic bronchoscopy was done in the morning hours after an overnight fasting. After mild sedation (intramuscular injection of promethazine, 25 mg, with atropine, 0.6 mg, 30 min before the procedure), the nose, pharynx, and upper airways were sprayed with lidocaine (4% solution), and fiberoptic bronchoscopy was performed (Pentax FB 18 P bronchoscope; Pentax, Tokyo, Japan) through transnasal route. Intra-airway spray of lidocaine (2%) was used as necessary. Blood from the tracheobronchial wall was cleared by saline, and the bleeding segment/site was detected. This was further confirmed by asking the patient to cough, resulting in fresh bleeding. A polyethylene catheter with an outer diameter of 2 mm was passed through the bronchoscope channel to place it slowly into the bleeding segment (Figure 1). Thereafter, 0.5 mL n-butyl cyanoacrylate glue was injected through the catheter with a water column behind, which was just adequate to flush the glue into the targeted area. The catheter was withdrawn within a few seconds along with the bronchoscope. The scope was passed again after 2 to 3 min to confirm the absence of bleeding. The same procedure was repeated until the hemostasis was achieved. Fresh bleeding was noticed after removal of the clot in one patient, but the procedure was successfully performed at the same sitting after ensuring hemostasis with bronchoscopic wedging and local instillation of adrenaline solution.
Results

The bleeding stopped immediately following the procedure in all the patients. Repeat endoscopic examination after a few minutes revealed the glue as a shiny white substance on the adjacent bronchial wall in two patients; no glue was seen in the bronchoscopic examinations performed after 72 h. All the patients experienced post-procedure cough on the same evening or the next morning, and five of them required cough suppressants. One patient complained of expectoration of a whitish crispy material and resumption of bleeding in the same afternoon. The procedure was successfully repeated the next morning. All the patients complained of expectoration of granular material for a few days after the procedure. They were discharged from hospital in stable condition after 4 to 7 days.

There was no recurrence of bleeding in any patient during the follow-up period, which lasted from 70 to 250 days (Table 1), except in one patient in whom there were patchy areas of bronchiectasis and a past history of treatment.

Table 1—Details of Bronchoscopic Endobronchial Sealing

<table>
<thead>
<tr>
<th>Age/sex</th>
<th>Basic diagnosis</th>
<th>Duration of bleeding, days</th>
<th>Volume of blood loss, mL</th>
<th>Site of bleeding</th>
<th>Units of blood transfused</th>
<th>Amount of glue used, mL</th>
<th>Days of hospitalization for gluing</th>
<th>Follow-up period,* days</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/F</td>
<td>Bronchiectasis with history of tuberculosis</td>
<td>12</td>
<td>≥ 500</td>
<td>Medial segment, right middle lobe</td>
<td>2</td>
<td>1.5</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>68/M</td>
<td>Pulmonary tuberculosis</td>
<td>18</td>
<td>≥ 1000</td>
<td>Posterior and apical segment, right upper lobe</td>
<td>4</td>
<td>1.5</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>60/F</td>
<td>Unknown infective cause</td>
<td>8</td>
<td>≥ 200</td>
<td>Apical segment, left lower lobe</td>
<td>nil</td>
<td>1.0</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>48/M</td>
<td>Unknown infective cause</td>
<td>7</td>
<td>≥ 250</td>
<td>Apical segment, left lower lobe</td>
<td>nil</td>
<td>1.0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>66/M†</td>
<td>Unknown infective cause</td>
<td>45</td>
<td>nil</td>
<td>Anterior segment, right upper lobe</td>
<td>12</td>
<td>1.0</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>54/M‡</td>
<td>Pulmonary tuberculosis</td>
<td>9</td>
<td>≥ 250</td>
<td>Apicoposterior segment, right upper lobe</td>
<td>nil</td>
<td>0.5</td>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>

*Follow-up period was calculated until August 30, 1999.
†The patient had a recurrence of scanty hemoptysis after 1 month. No repeat bronchoscopy was done; the hemoptysis subsided after conservative treatment.
‡On two occasions the patient had been admitted to another hospital for a total of 14 days and had received blood transfusion. At the time of this study, he was admitted for a total of 8 days.

Figure 1. (A) A catheter meant for passing through the fiberoptic bronchoscopic channel for gluing; (B) the bronchoscope in situ, with the catheter tip out from the distal end; and (C) placement of the catheter in the bleeding subsegment and instillation of the glue endobronchially.
for tuberculosis. She had a relapse of scanty bleeding after 1 month that stopped after conservative treatment.

**DISCUSSION**

Hemoptysis poses serious problems, especially when the conservative treatment fails. In such circumstances the problem is managed with several bronchoscopic (both rigid and fiberoptic) and nonbronchoscopic interventions. Cold saline lavage with 50-mL aliquots of iced saline at 4°C (total of 500 mL) showed good results when instilled through a rigid bronchoscope in 23 patients; recurrence of hemoptysis was observed in two cases.9,9 Wedging of the bleeding segment with the flexible bronchoscope tip is effective in controlling bleeding after transbronchial lung biopsy.10 Local administration of adrenaline solution (1:20,000), thrombin (Warner Lambert; New York, NY), and fibrinogen-thrombin (Green Cross; Tokyo, Japan) have been attempted in a small number of cases.10,11 The Nd-Yag laser used bronchoscopically can effectively stop bleeding from endobronchial pathology and can also allow more definite therapy at the same sitting.12,13 Balloon tamponading of the bleeding bronchial segment is also helpful, with variable success rates.14,16 None of these procedures is completely satisfactory.

Bronchial artery embolization effectively stops bleeding from a bronchial arterial source, although failures and complications occur despite technical and instrumental excellence.1,17–19 There is also occasional difficulty in cannulating the vessel, and complications, including vessel perforation, intimal tears, and postbronchial artery occlusion sequences, are reported.1,20 Though rare, problems secondary to inadvertent ectopic embolism are also seen.1 Superselective bronchial catheterization may avert such complications to a great extent.21 Radiation therapy may be helpful in patients who have aspergilloma with hemoptysis.22 Surgical resection is sometimes the only plausible solution in some situations, but there have been reports of significant mortality and morbidity.23–25 Surgery is currently recommended when the facilities for bronchial artery embolization are not available or deemed technically impossible or unsuccessful; when the bleeding is so massive that any delay in arranging the embolization is very risky; and when the underlying cause is unlikely to be controlled by embolization, as in a case of suspected rupture of pulmonary artery or a mycetoma at the tip of the endoscope.

We have adopted sealing of the bleeding segment or subsegment with n-butyl cyanoacrylate. It is a biocompatible adhesive that solidifies quickly on exposure to humidity with antibacterial effects.26 Cyanoacrylate glues are already in use in different procedures in deep tissues with high degrees of success and safety.4–6,27,28 They have been used to prevent postoperative air leak from the bronchial stump after lung resectional surgery.4,27 The cyanoacrylate glues have prothrombotic properties such as increased platelet aggregation and possible enhancement of local thromboxane production.29,30 Although cyanoacrylates are significantly safe, they are volatile and chemically active materials reported to cause eczema, rhinitis, and asthma in occupational exposure.31 Occupational contact dermatitis has also been reported.32 There is also a chance of spillage of the glue more proximally on the bronchial tree or even at the tip of the endoscope.

In using cyanoacrylate for endobronchial sealing for hemoptysis, we have not found any significant side effects. Moreover, the glue is expectorated gradually over the next few days. In conclusion, it appears that endobronchial sealing with n-butyl cyanoacrylate glue is a simple, less invasive, and safe procedure to control hemoptysis.

**References**

8 Conlan AA, Hurwitz SS. Management of massive hemoptysis with rigid bronchoscope and cold saline lavage. Thorax 1980; 35:901–904
10 Zava DC. Pulmonary hemorrhage in fiberoptic transbronchial biopsy. Chest 1976; 70:584–588
Endobronchial Actinomycosis Associated With Foreign Body*

Four Cases and a Review of the Literature

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Four cases of primary endobronchial actinomycosis associated with an inhaled foreign body are described. In the light of these cases and those previously reported in the literature, we describe the main features of this uncommon association. All patients were > 55 years old, were predominantly men, and were usually in a debilitated state. In > 50% of cases, the clinical presentation was suggestive of lung cancer. Thoracic CT rarely revealed a foreign body, but the granulomatous reaction of the bronchial wall was sometimes suggestive of bronchial thickening. Sulfur granules identified on bronchial biopsies were highly suggestive of actinomycosis in most cases, but microbiological culture findings were usually negative. Antibiotics generally ensure good recovery. Extraction of the foreign body was delayed after antibiotic therapy in one half of cases, suggesting the need for endoscopic follow-up in bronchial actinomycosis.

(CHEST 2002; 121:2069–2072)

Key words: actinomycosis; bronchus; endoscopy; foreign body; thoracic CT

Actinomycosis is a chronic suppurative infection due to a group of anaerobic or microaerophilic bacteria belonging to the resident flora of the oropharynx and GI tract. Actinomyces israelii is the main representative pathogen in human infection, although most cases of actinomycosis are thought to be polymicrobial. Twenty percent of cases of actinomycosis are located in the thorax. Primary endobronchial actinomycosis is rare and very uncommon in association with foreign body aspiration. In this context, bronchial infection is thought to result from direct aspiration of an Actinomyces-contaminated foreign body.

We report four cases of endobronchial actinomycosis associated with bronchial foreign body. In the light of these cases and those previously reported in the literature, we describe the diagnostic, pathologic, bacteriological and therapeutic features of this association, which must be considered more systematically.

Case Reports

Between January 1996 to September 1999, four cases of endobronchial actinomycosis associated with foreign body were observed at Reims University Hospital. Clinical data, diagnostic procedures, and treatments are summarized in Table 1.

These four patients were men between the ages of 56 and 79 years (mean age, 70 years) with a history of smoking (19 to 33 pack-years). Each patient presented in a debilitated state: metastatic cervical node (patient 1), noninsulin-dependent diabetes mellitus (patient 2), previous lung cancer treated by upper and middle lobectomy 1 year previously (patient 3), and alcoholism (patient 4).

Presenting symptoms were left chest pain with fever related to pleural effusion (patient 2) and persistent purulent bronchitis (patients 3 and 4). One patient (patient 1) had no respiratory symptoms. None of the patients reported any history of choking. Laboratory data revealed a raised leukocyte count (11.9 × 10^9/L) in one case (patient 2) and inflammatory signs in two cases (patient 2 and patient 4). The pleural effusion in patient 2 was a cloudy exudate containing 1,500 leukocytes per microliter with a predominance of polymorphonuclear leukocytes.

Chest radiography revealed a tooth in the right hilar region in...