Pulmonary Artery-Bronchial Fistula Complicating Chronic Lymphocytic Leukemia*

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A 52-year-old man with chronic lymphocytic leukemia (CLL) entered the hospital because of repetitive bouts of massive hemoptysis requiring a right pneumonectomy. A bronchus intermedius-pulmonary artery fistula was found and felt to be due to necrosis of a peribronchial lymph node which was infiltrated by chronic lymphocytic leukemia cells. This represents another pulmonary complication in the clinical course of advanced CLL.

Pulmonary bleeding in chronic lymphocytic leukemia (CLL) is most commonly caused or abetted by vascular leukostasis with infarction, thrombocytopenia, or bronchiectasis often associated with hypogammaglobulinemia and recurrent infection.1-4 Another cause of pulmonary bleeding in CLL is described in this report. The patient experienced massive, recurrent hemoptysis due to a pulmonary artery-bronchial fistula which occurred at the site of a necrotic peribronchial lymph node infiltrated by leukemia cells.

**CASE REPORT**

A 52-year-old white man with stage II chronic lymphocytic leukemia was admitted to the Beth Israel Hospital after expectorating 200 ml of blood.

His admission physical examination was notable for the presence of bilateral inspiratory crepitations, diffuse lymphadenopathy, and splenomegaly, and he had no signs of pulmonary hypertension or of clubbing.

Laboratory data on admission showed marked leukocytosis (35,000/cu mm) with 95 percent mature lymphocytes, mild thrombocytopenia (172,000/cu mm), and normal clotting parameters. Serum chemistry values were normal save for a slight decrease in total globulins to 1.5 g/L. The chest roentgenogram revealed right middle lobe consolidation with otherwise clear parenchyma and no effusions, and a contrast-enhanced computerized axial tomographic scan on hospital day 5 showed mediastinal lymphadenopathy and parenchymal consolidation in the right middle, right lower, and left lower lobes with discrete 1 cm, noncalcified nodules in these same lobes. Admission arterial blood gas levels on nasal oxygen revealed a PaO2 of 74 mm Hg, PaCO2 of 33 mm Hg, and a pH of 7.45.

His hospital course was complicated by recurrent episodes of hemoptysis. Flexible fiberoptic bronchoscopy was performed on the first hospital day and showed no active bleeding site but a large amount of clotted blood in the right middle lobe and in the basal bronchi of the right lower lobe, which appeared extrinsically compressed. There was a soft, white, nonpulsatile plaque on the medial wall of the bronchus intermedius, which was approximately 1 cm in diameter and was not manipulated for fear of inducing further bleeding.

On the basis of closely spaced episodes of significant hemoptysis, surgical resection (possible bilobectomy) was recommended but declined. Instead, a course of radiation therapy to the right hilum and central right middle and right lower lobe bronchi was initiated, and after 1,200 rads were administered, hemoptysis recurred. The patient expectorated 500 ml of blood, became hypotensive and hypoxic for the first time, and underwent emergency right pneumonectomy. His postoperative course was complicated by septicemia with disseminated intravascular coagulation, hypoxemia, and, eventually, breakdown of the right mainstem bronchial stump. After an incessant deterioration, he died on the 14th postoperative day.

**RESULTS**

Examination of the right pneumonectomy specimen revealed a fistula between the bronchus intermedius and the adjacent branch of the pulmonary artery (Fig 1). A soft, 1.2 cm, tan-white nodule that probably represented a hilar lymph node was present at the site of bronchoarterial communication. This necrotic nodule was composed mainly of eosinophilic, cellular debris and occasional foci of infiltrating small, mature lymphocytes. The pulmonary parenchyma showed an interstitial and peribronchiolar infiltrate of small, mature lymphocytes, as well as intra-alveolar hemorrhage.

Salient findings at post-mortem examination included the following: (1) diffuse lymphadenopathy with node infiltration by lymphocytes; (2) disruption of the right main bronchial stumps; (3) severe acute and organizing left pneumonitis; and (4) disseminated colonies of gas forming Gram-positive rods compatible with an agonal Clostridia sepsis. There was neither evidence of another malignant tumor nor of any opportunistic infection.

**DISCUSSION**

The patient presented here experienced significant hemoptysis due to a pulmonary artery-bronchial fistula which occurred at the site of a necrotic nodule thought to be a peribronchial lymph node replaced by leukemic cells. Although the occurrence of peribronchial and endobronchial leukemic infiltration in patients with CLL has been recognized in the past, the progression of leukemic bronchial invasion to pulmonary artery interruption has not, to our knowledge, until now been described. Specifically, Vieta and Craver5 reported direct bronchial invasion by leukemic cells in two of 31 post-mortem examinations of unselected patients with CLL. Green and Nichols6 reported full thickness bronchial infiltration by leukemic cells in four patients, but in no instance was there vascular impingement or interruption by these infiltrates. More recent series by Banks et al4 and by

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Kilgore and Chasen describe patients with non-Hodgkin's lymphoma and endobronchial nodules seen at bronchoscopy, but none of these five collected patients carried the diagnosis of well-differentiated lymphocytic lymphoma or CLL and in none was a bronchial fistula observed. The bronchus intermedius plaque we observed closely recalls the intrabronchial leukemic infiltrates noted in these earlier studies, and although we felt it prudent not to perform a biopsy on this lesion, we strongly suspect the plaque seen at bronchoscopy to be the site of the leukemic endobronchial infiltration and pulmonary artery interruption.

It was considered whether other processes abetted the formation of the pulmonary artery-bronchial fistula in this patient. Such recognized causes as penetrating trauma to the chest, tuberculosis, and bronchogenic carcinoma, had not occurred here. Also, although bronchial fistulae have resulted as complications of Swan-Ganz catheter placement, this too could not be implicated in our patient's course; because a pulmonary artery catheter was first placed only after surgical resection of the affected right lung, the catheter position was limited to the uninvolved left pulmonary artery.

The containment of the fistula site within a field of radiation therapy raises the obvious possibility that the short course of X-irradiation helped create the fistula. Again, the fact that the hemoptysis antedated any radiation therapy excludes radiation-induced necrosis as the primary cause of the fistula formation. How much the radiation may have contributed to later hemoptysis in this patient cannot be determined, but again, this would be an unusual complication of thoracic radiation in CLL. In available series of patients with CLL receiving mediastinal X-irradiation, no instance of pulmonary arterial rupture or bleeding was reported among the pooled group of 71 patients receiving this treatment.

The key management lesson to be taken from this patient's course is the importance of considering an exhaustive differential diagnosis in evaluating patients with massive hemoptysis. Common causes of massive hemoptysis in large series include tuberculosis, bronchiectasis, and bronchogenic carcinoma, and it has been widely suggested that bronchoscopy is a useful early diagnostic intervention to determine the cause and source of pulmonary bleeding. We would underscore this point and call to the bronchoscopist's attention the possibility of other endobronchial clues to the etiology of bleeding, which, as with the lesion reported here, are best recognized and not manipulated without special precautions. There is little question that our bronchoscopic recognition of the plaque as a pulmonary artery-bronchial fistula would have provided an even stronger impetus to early resection of involved lung. In the least, postbronchoscopic consideration that a bronchial fistula might be the cause of this patient's hemoptysis would have led to further tests to safely confirm its presence. We suspect that a carefully done pulmonary arteriogram would have rendered the diagnosis and may have altered the outcome.

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REFERENCES

2 Sosnowski K, Szenkier E, John W. Fatal pulmonary hemorrhage in the course of chronic lymphatic leukemia. Gruzlica 1975; 43:381-95