Recurrent pulmonary infections are common among patients with chronic obstructive pulmonary disease. Imaging of the thorax beyond a routine chest radiograph, such as computed tomography imaging, should be considered for these patients. Fiberoptic bronchoscopy should also be considered for these patients, especially in cases in which respiratory cultures do not provide guidance for antibiotic therapy. The patient in the present case report experienced recurrent pneumonias despite adequate treatment with intravenous and oral antibiotics. He underwent computed tomography imaging of the thorax, which demonstrated a suspicious lesion in the left mainstem bronchus. This finding prompted a fiberoptic bronchoscopy, which revealed an endobronchial tumor. Given the patient’s history of cigarette smoking, it was surprising to find that he had a benign endobronchial neurogenic tumor, which was removed in subsequent rigid bronchoscopy.

It is common to see patients with underlying structural lung disease, such as chronic obstructive pulmonary disease (COPD), present multiple times per year to the hospital for treatment of recurrent infections. Such multiple presentation is especially true for patients with end-stage lung disease. However, if the patient has recurrent pneumonia in the same segment of the lung, the physician should be prompted to suspect a pathologic condition other than just simple pneumonia. Bronchial obstruction, whether it is extrinsic or intrinsic, should be considered as a cause for recurrent pneumonia.

These suspicions guided the clinical course of a man with COPD and recurrent pneumonia. This case serves as a review that not all lung tumors cause weight loss and night sweats, especially if the tumors are benign, and that lung tumors can also result in endobronchial obstruction and infection.

Report of Case
In 2008, a 65-year-old white man presented to the emergency department of a community hospital for the third time in 2 months with recurrent complaints of shortness of breath, productive cough, and pleuritic, constant chest pain. The patient described no additional symptoms other than anxiety. He denied fever, chills, or sweating. His medical history included COPD (manifested as chronic bronchitis), recurrent pneumonia, type 2 diabetes mellitus, Lewy body dementia, bipolar disorder, and colitis. He resided at a skilled nursing facility as a result of his progressive dementia. Medications used by the patient at time of presentation were albuterol sulfate nebulizer (as needed), amantidine hydrochloride, amitriptyline hydrochloride, donepezil hydrochloride, fluticasone propionate/salmeterol xinafoate inhaler, lithium carbonate, loperamide hydrochloride, olanzapine, omeprazole, quetiapine fumarate, and tiotropium bromide inhaler.

The patient reported that he had a history of cigarette smoking (about 30 packs/year), but he quit 47 years ago. He denied alcohol or intravenous drug abuse. He was not oxygen-dependent at the time of presentation.

Physical Examination
On presentation, the patient’s blood pressure was 142/73 mm Hg, his heart rate was 114 beats per minute, his respiratory rate was 22 breaths per minute, and his body temperature was 97.9°F (36.6°C). The patient’s pulse oximetry level (ie, oxygen saturation) was 96% on 2 L/min of oxygen via nasal cannula. Pulmonary examination revealed coarse breath sounds bilaterally, with an expiratory wheeze and cough on deep inspiration. The remainder of the physical examination was unremarkable.

After physical examination, the patient was admitted to the hospital by the hospitalist service with the diagnosis of decompensated COPD. He was prescribed intravenous steroids and continued on inhaled bronchodilators.
Laboratory Findings
Upon admission, the patient’s complete blood count showed a leukocyte level of 9300 cells/mm³, a platelet count of 141,000 cells/mm³, and a hemoglobin level of 14.1 g/dL. His chemistry profile demonstrated a sodium level of 140 mmol/L, a potassium level of 3.9 mmol/L, a chloride level of 100 mmol/L, and a bicarbonate level of 28 mmol/L. The patient’s blood urea nitrogen concentration was 14 mg/dL and his creatinine concentration was 1.4 mg/dL, with a baseline creatinine level of 1.0 mg/dL.

A chest radiograph of the patient revealed cardiomegaly and no infiltrates. One month before hospital admission, the patient’s echocardiogram demonstrated left ventricular hypertrophy with diastolic dysfunction and an ejection fraction of 55%.

Radiologic Findings
A repeat portable chest radiograph on the patient’s second day of hospitalization showed a previously undetected retrocardiac opacity. This retrocardiac density, together with the patient’s history of pneumonia, prompted a computed tomography (CT) scan of the chest, followed by a flexible, video-assisted bronchoscopy on the next day. The chest CT scan with intravenous contrast revealed some atelectatic changes in the upper lobe of the left lung and patchy parenchymal density in the left lung base—findings that were consistent with pneumonia. Radiologic findings also included a 1.4-cm soft tissue nodular density at the junction of the left upper and left lower lobe bronchus, suggestive of neoplasm (Figure 1).

Throughout hospitalization, the patient remained afebrile, and leukocytosis was not observed. His renal function improved, leading to a creatinine level of 1.0 mg/dL with volume repletion some 48 hours after admission.

Diagnosis and Tumor Removal
The bronchoscopy results revealed a large, pedunculated, mobile, left-sided endobronchial tumor, which appeared to be in the lower lobe of the left lung. Figure 2 shows a close-up view of the tumor, and Figure 3 shows how the tumor obscures the entire bronchus. Bronchial alveolar (BAL) washes of the lingual, left upper, and left lower lobes, as well as forcep biopsies of the endobronchial mass, were performed at the time of the bronchoscopy. The size and location of the tumor prevented resection through the flexible bronchoscope. Thoracic surgery was planned for excision of the tumor.

In preparation for removal of the endobronchial mass, a CT scan of the patient’s head was performed to rule out possible metastasis, and pulmonary function tests were conducted to assess perioperative performance status. The CT scan of the head showed no masses. The pulmonary function tests indicated a forced expiratory volume in 1 second (FEV₁) of 2.43 L (ie, 72% of predicted); a forced vital capacity (FVC) of 3.04 L (ie, 84% of predicted); a FEV₁/FVC ratio of 68%; and a diffusing capacity of the lung for carbon monoxide (DLCO) of 26 mL/mm Hg/min (ie, 123% of predicted). Small airways disease was indicated by an FEV between 25% and 75% of 2.56 L, which was 40% of predicted. The total lung capacity was normal.

The BAL washes and biopsy results from the flexible bronchoscopy indicated both chronic and acute inflammation, with no evidence of malignancy, acid-fast bacilli (AFB), or other infections. Although no malignant cells were seen on pathologic sampling, the endobronchial mass required removal because it caused recurrent postobstructive pneumonia.

The patient’s symptoms of dyspnea and chest pain improved with intravenous steroids, intravenous analgesic medications, and nebulized β-agonists. The following week, he was discharged for outpatient follow-up with the thoracic surgeon for a rigid bronchoscopy and tumor removal.

During the rigid bronchoscopy, the tumor was removed without complication. The gross pathologic characteristics of the tumor consisted of a smooth, pale soft tissue mass measuring 5 cm × 1.4 cm × 0.8 cm (Figure 4). Tissue cultures of the mass revealed no abnormal flora, AFB, or fungi. Only typical, normal flora were identified in the cultures. The tumor tested immunohistochemically positive for S-100 protein, which is diagnostic for neurogenic endobronchial tumors.1,2

All other findings were similar to the endobronchial biopsy and BAL wash results, showing chronic and acute inflammatory changes, no AFB, no fungi, and no malignancy. The final pathology report for the patient identified the tumor as consistent with a benign endobronchial mass, with histologic findings compatible with either a schwannoma or angiofibroma.
Common symptoms associated with the tumor are those of bronchial obstruction (e.g., cough, wheeze, or recurrent pneumonias).

Patients with neurofibromatosis type 1 and type 2 are at increased risk for development of schwannomas, though most patients diagnosed as having schwannomas do not have a diagnosis of neurofibromatosis. Endobronchial schwannomas have no sex or age predilection.

Pathologically, endobronchial schwannomas are often smooth and yellowish, and they can be vascular. Histologically, schwannomas show prominent interdigitating cell processes, basal lamina, and Luse bodies (i.e., elongated collagen fibers that are widely spaced compared to other collagen matrices). The diagnostic stain for a neurogenic endobronchial tumor reveals the presence of S-100 protein.

Endobronchial tumors cannot be visualized on standard

**Follow-Up**

The patient had a follow-up flexible bronchoscopy 6 months after the rigid bronchoscopy to check for recurrence of the schwannoma. The patient had been without symptoms during that 6-month period. The repeat bronchoscopy showed no recurrence of the tumor and completely patent (i.e., unobstructed) bronchi on both the right and left sides. No secretions or evidence of residual infection were detected.

The patient has since repeated pulmonary function testing, which showed mild restrictive disease though no evidence of obstruction. He has not required inhaled pulmonary medications, and he continues to be symptom-free.

**Comment**

Approximately 1% to 5% of tumors that arise from the bronchial tree are benign. Of these benign endobronchial tumors, those with a neurogenic origin are even more rare. Benign endobronchial tumors can present as a single mass or as multiple masses, depending on the histologic type. In most cases, the mass is solitary in nature, as it was in the case of our patient. Common symptoms associated with the tumor are those of bronchial obstruction (e.g., cough, wheeze, or recurrent pneumonias).

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Endobronchial tumors cannot be visualized on standard
two-view chest radiographs. The tumor is often associated with other phenomena, such as postobstructive pneumonia, atelectasis, and adenopathy. Chest CT scans may demonstrate a mass or adenopathy. In the present case, no mediastinal or hilar adenopathies were noted.6,7 Although there is a better chance of visualizing an endobronchial tumor by means of a CT scan than by means of a standard radiograph, endobronchial tumors can remain elusive on CT scans.1,7 Three-dimensional computer reconstruction (eg, virtual bronchoscopy) may be helpful in visualizing elusive tumors before invasive imaging becomes necessary. Virtual bronchoscopy uses CT images and various computer graphic systems to create a computerized graphic image of the endobronchial tree.8,9 The role of virtual bronchoscopy has yet to be fully defined with data to support its use in diagnosing endobronchial lesions.8,9 The preferable method for diagnosing an endobronchial tumor is direct visualization by means of flexible or rigid bronchoscopy.10-12

The prognosis of benign endobronchial tumors depends on the histologic type.3,6,7 Benign endobronchial tumors often have a favorable prognosis, especially in the case of schwannomas.3,10 Certain tumors with viral etiologic factors, such as myoblastomas and papillomas, have a tendency to recur. Therefore, patients with myoblastomas and papillomas need to be followed clinically. Repeat bronchoscopic evaluation is needed if recurrent symptoms are experienced.7 Most patients with such tumors can be cured with a single resection, but follow-up bronchoscopies are needed to ensure resolution of the tumor and patency of the bronchus.3

Conclusion
Six main points associated with the present case should be kept in mind when treating patients. These points are as follows:

- **Endobronchial tumors, both benign and malignant, need to be considered in cases of unexplained chronic cough, mucus, hemoptysis, and recurrent pneumonia.**
- **Benign endobronchial masses account for less than 2% of all endobronchial masses, and schwannomas encompass about 2% to 3% of all benign endobronchial masses.**
- **Patients with type 1 or type 2 neurofibromatosis are at increased risk for development of schwannomas, but most patients with endobronchial schwannomas do not have a diagnosis of neurofibromatosis.**
- **Advanced, indirect imaging techniques, such as virtual bronchoscopy, are options in cases in which direct imaging of potential endobronchial masses may not be possible.**
- **Basic histologic and immunohistochemical evaluation is required for all endobronchial tumors, because it is not possible to distinguish benign from malignant endobronchial tumors by bronchoscopic visualization or by gross pathologic evaluation.**
- **Prognosis is very good for a patient diagnosed as having a benign endobronchial tumor. Follow-up bronchoscopies are the best way of evaluating tumor recurrence if symptoms return.**

References