Recurrent Endobronchial Soft Tissue Tumors*

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Two benign appearing endobronchial soft tissue lesions in two young patients (ages 33 and 26) were incompletely excised to conserve normal lung. Both tumors recurred four and seven years later. The first tumor had abundant small vessels in a myxomatous background (angiomyxoma); myofibroblasts formed the invasive component of the second tumor. To the best of our knowledge these two types of tumor have not been reported in the endobronchial location. Endobronchial lipoma, epithelial papilloma, inflammatory polyps, nodular sarcoid or amyloid and lymph nodes should be managed endoscopically. The potentially recurring and locally invasive endobronchial tumors such as granular cell myoblastoma, pleomorphic adenoma, angiomyxoma, and tumors of myofibroblast, and probably all other sessile benign tumors should be excised completely with part of the bronchial wall. The maximum preservation of normal lung usually does not conflict with this type of radical procedure.

An endobronchial tumor should be considered malignant until proven otherwise; bronchogenic carcinomas are most common, although endobronchial metastasis from tumors in other organs is probably not rare.1,2 Most also agree that bronchial adenoma is a misnomer; instead, bronchial carcinoid, adenocystic and mucoepidermoid carcinomas should be treated separately as malignant tumors with different degrees of aggressiveness.1,3,4

Benign endobronchial tumors are relatively rare; they should be identified early for a treatment aiming at the conservation of lung parenchyma.5,6 They include hamartoma, chondroma, lipoma, fibroma, leiomyoma, etc. The diagnosis of these tumors, if adequately sampled, usually poses little problem by light microscopy; endoscopic removal of them, however, may be inadequate in practice.6,12

Histologically benign but potentially recurring or locally invasive tumors, some of them bordering between reactive hyperplasia and neoplasia, have been well recognized in soft tissues.13 They have been very rare in the bronchial tree. Recently, we have encountered two such endobronchial tumors with unusual histologic appearances which, we believe, are heretofore unreported in this location. The biologic behavior of these two tumors prompted us to reevaluate the ultrastructural details of them and also the adequacy of the customary treatment of the histologically benign endobronchial lesions.

Case Reports

Case 1

A 33-year-old Italian man had recurrent bouts of pulmonary infection with productive cough for six months in April 1978. He was a one pack a day cigarette smoker for 20 years and had no known occupational exposure. The chest roentgenogram taken nine months prior to admission was normal.

At admission, the physical examination revealed bronchial breathing and poor air entry of the left lower lung field. The chest roentgenogram showed total obstruction of the intermediate bronchus with collapsed left lower lobe. At bronchoscopy, a lobulated firm tumor was found obstructing the intermediate bronchus. A biopsy specimen revealed only acute and chronic inflammation.

On May 15, 1978, the consolidated and fibrosed left lower lobe was resected. A 1.5 cm, wide based tumor on the membranous portion of the intermediate bronchus was excised through the transected bronchus to conserve the left upper lobe which appeared normal grossly. The result of frozen section was called benign without further specification; the base of the tumor was cauterized and the bronchus sutured. The postoperative course was uneventful.

In February 1982, almost four years later, the patient returned with a ten-day history of hemoptysis. He had been completely well during the last four years. A recurrent tumor at the previous site of excision was found by bronchoscopy and the partly consolidated remaining left lung was excised. The patient was well one year following the second operation.

Case 2

The initial presentation of this 26-year-old female patient was reported previously.14 Briefly, she was admitted in 1974 following vague chest complaints for six months and acute onset of chest pain for 24 hours. She smoked less than one package of cigarettes per week. Physical examination and chest roentgenogram confirmed a completely collapsed left lung. Bronchoscopy revealed an endobronchial tumor, 2.5 cm from carina at the left main bronchus. Biopsy specimens revealed only nonspecific inflammation. At thoracotomy, the left lung was collapsed but otherwise normal. A sessile mass was then excised down to the cartilage through a bronchotomy. The postoperative course was uneventful.

Seven years later, she returned with similar symptoms. Chest roentgenogram revealed a large nodular density at the previous site of resection. At surgery, the tumor was found to compress the left main bronchus and extend into the mediastinum indenting the main pulmonary artery. The left lung was indurated and fibrosed. Left pneumonectomy was carried out. In addition, partial excision of the main pulmonary artery and reconstruction was necessary with cardiopulmonary bypass. The tumor in the mediastinum was re-

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Manuscript received June 30; revision accepted November 29.

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moved in pieces. Following the surgery, the patient had a difficult
and complicated course but recovered with appropriate treatment.
Radiation therapy was added later. One year after the second
surgery, she showed no evidence of recurrence.

MATERIAL AND METHODS

All tumors and lungs received were either fixed in 4 percent
phosphate buffered formaldehyde solution for light microscopy or
in 3 percent buffered glutaraldehyde solution for electron micro-
scopy. Seven-micron thick sections were stained with hematoxylin-
eosin. PAS, Masson’s trichrome, reticulin, Alcian blue, Crocott
silver methenamine, and acid-fast stains. The tissue for electron mi-
croscopy was processed routinely and embedded in epoxy resin.
Selected areas from the 1 μ thick sections were cut and examined in a
transmission electron microscope. The second tumor from case I was
also processed routinely for scanning electron microscopy.

RESULTS

CASE 1

The tumor from the first operation was dome shaped, 1.5 cm in diameter, and obviously in-
completely excised. The tumor from the second
operation protruded out from the sunken stump of the
previous resection site and measured 1.5 × 1 cm in size.
At the cut surface, both tumors were grayish white, glistening with ill-defined borders. The re-
current tumor protruded into the lumen and expanded laterally under the mucosa with ill-defined borders
(Fig 1). The resected lungs showed diffuse consolidation.

The light microscopy confirmed the ill-defined border between the lesion and the surrounding structures and demonstrated further that tumor cells extended between cartilage to infiltrate the peribron-
chial soft tissue. The lesion showed a monotonous loose stroma with arborescent network of thin-walled small vessels and capillaries (Fig 2). The stroma had few scattered multipolar cells and was rich with acid mucopolysaccharide but scanty with collagen fibers by Alcian blue and trichrome stains. The resected
lungs showed typical features of obstructive pneumonitis.

Electron microscopy revealed that the multipolar cell had the general appearance of a primitive fibroblast. The cell had a slightly notched nucleus, moderate amount of mitochondria, rough endo-
plasmic reticulum, and intermediate fibrils (Fig 3).
The cisterna of the rough endoplasmic reticulum was occasionally dilated containing loose and amorphous material similar to that observed in the stroma. A well
developed Golgi apparatus and lipid droplets were rarely found. The cellular borders were not only multipolar but also exceedingly irregular. Cellular processes tapered off abruptly, branched and angu-
lated irregularly, and might reflect acutely to form varied types of intercellular junctions with themselves or between adjacent cells (Fig 3 and 4). The basal lamina was absent. Loosely arranged networks of fine
collagen fiber bundles not appreciated by light micro-
scopy were ubiquitous by scanning electron micro-
scopy (Fig 4). The capillaries and small vessels frequently showed corrugated walls with obliterated lumens, elongated endothelial processes, increased number of Weibel-Palade bodies, and cytoplasmic actin fibrils. The basal surface of the endothelium and occasional pericytes formed multiple spike-like protru-

![Figure 1. Gross photograph of recurrent tumor from case 1. The tumor arises from stump of previous resection (bottom), expands laterally beneath mucosa, and bulges into bronchial lumen. The tumor is well circumscribed but the boundaries are ill-defined (original magnification ×5).](image1)

![Figure 2. Arborescent small vessels (dark bands) in a myxoid stroma with loosely scattered multipolar cells (case 1). The cytoplasm of multipolar cells form a complicated network. Collagen fibers are not appreciable in this photograph (hematoxylin-eosin, original magnification ×250).](image2)
FIGURE 3. A multipolar cell (case 1) showing slightly notched nucleus, elongated and tapered cellular processes. Mitochondria and rough endoplasmic reticulum are moderate in number. The cellular process may angle back acutely and form junction like structure with itself (arrows and inset). Besides a few small aggregates of collagen fibers (C) and speckles of fine fibrils, the stroma appears empty (original magnifications, ×12,500, and inset, ×38,000).

FIGURE 4. A scanning electron micrograph (case 1) of a multipolar cell with branched and acutely tapered cellular processes (arrows). Although not appreciated by light microscopy, loosely arranged networks of thin collagen fibers are also present (original magnification ×8,000).

FIGURE 5. The predominant cellular pattern in the recurrent tumor of case 2. Spindle cells are arranged in whorls of interlacing bundles (storiform pattern) (hematoxylin-eosin, original magnification ×250).

sions of cellular processes enveloped by irregularly interrupted and multilayered basal laminae.

Besides small vessels and primitive multipolar cells, some nerve fibers and mast cells were also found. Occasionally, a close contact between the mast and the multipolar cells was present. As noted in the light microscopy, the stroma only showed focal small foci of collagen fibers, their precursor fibrils, and amorphous material. The main portions of the stroma appeared empty.

CASE 2

The primary tumor was well circumscribed and 2 cm in diameter. The recurrent tumor appeared grayish tan and was removed in piecemeal fashion from the mediastinum following left pneumonectomy. The light and electron microscopy of the primary tumor had been reported in detail previously.12 Briefly, it showed predominantly spindle cell type areas alternated with
focal accumulations of plasma and foamy histiocytes (see below).

The resected lung from the second operation revealed a narrowed left main bronchus with atelectasis and focal consolidation. The narrowing of the bronchus was due mainly to an extrinsic growth of grayish tan tumor which did not bulge into the bronchial lumen. Approximately 15 g of grayish tan fragments of tumor were also received. The light and electron microscopic findings of this tumor were identical to that of the first one although the spindle cell type area predominated. The cellularity was relatively high in areas with occasional storiform pattern (Fig 5); mitotic figures were very rare and pleomorphism was mostly absent.

The electron microscopy showed no transitional forms between plasma and spindle cells although they might be closely abutted with each other. The spindle cell showed an ovoid and knotted nucleus, moderate to abundant amount of rough endoplasmic reticulum, mitochondria, polyribosomess, and cytoplasmic fibrils with occasional dense bodies. The Golgi apparatus was well developed. The basal lamina was seen focally and intermediate type intercellular junctions connected adjacent cells. The lung showed an active granulomatous disease with acid-fast bacilli, but not tumor. Conversely, the mediastinal tissue and bronchial wall were invaded by the tumor, but not the granuloma.

**DISCUSSION**

Most patients with benign endobronchial tumors are young with acute onset of a collapsed lobe or lung. 

The transbronchial biopsy specimen may be nondiagnostic, in contrast to malignant tumors, unless carried out with an intention of excision since the true lesion is usually beneath the inflamed and thickened mucosa and submucosa. Because of the strategic location of the endobronchial tumor, the young age of the patient, and the benign appearance of the lesion at frozen section, a conservative excision of the tumor may be performed to preserve normal lung parenchyma.

Our electron microscopic studies appeared to have characterized the main cellular derivations of the two tumors. The tumor cells from case 1 had multipolar cytoplasmic projections with features of primitive fibroblasts which probably produced excessive mucopolysaccharides, as in myxoma cells of soft tissue found elsewhere in the body. 

The corrugated small vessels and capillaries and their multilayered basal laminae might be the consequences of excessive stromal expansion from the accumulation of mucopolysaccharides. The functional implication of the increase in the number of Weibel-Palade bodies is uncertain.

Case 1 had been reviewed by three eminent pathologists who suggested diagnoses of myxoid liposarcoma, (angio-)myxo-lipoma, angiomyxoma and myoepithelial origin tumor with a predominant myxoid component. We elected to call this lesion angiomyxoma mainly to include the two major components of the lesion, but implied also that this was an atypical form of a myxoma even though we cannot find such an entity reported in the literature. 

The electron microscopic findings were compatible with the first three diagnoses.

The tumor cells from the second case were mainly myofibroblasts by electron microscopy. Although occasional areas of storiform pattern were seen, plasma cells and foamy histiocytes were away from spindle cells, especially in the recurrent tumor, suggesting that these cells were the reactive components and the lesion was not a fibrous histiocytoma.

The tumor grew slowly; seven years elapsed between the two operations. Although this study does not delineate further the fundamental borderline problem of this lesion, in retrospect, we believe the diagnosis of a reactive plasma cell granuloma is unwarranted due to the subsequent clinical course; a tumor of myofibroblast of probable low grade malignancy is at least descriptive of this lesion. The behavior of endobronchial borderline or low grade malignant soft tissue tumors is probably as unpredictable as those found elsewhere in the body.

Nonmalignant endobronchial lesions can be divided into the following three major categories (Table 1): the nonneoplastic processes including true inflammatory polyps, lymph nodes with or without calcification (broncholiths), nodular sarcoïd, amyloid, etc; benign tumors, including hamartoma and chondroma, benign bronchial mucus gland

**Table 1—Endobronchial Tumors or Tumor-Like Lesions**

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
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<tbody>
<tr>
<td>1. Nonneoplastic processes</td>
<td>Inflammatory polyp, lymph nodes</td>
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<tr>
<td></td>
<td>with or without calcification (broncholiths)</td>
</tr>
<tr>
<td></td>
<td>Nodular sarcoïd</td>
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<tr>
<td></td>
<td>Nodular amyloid</td>
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<tr>
<td>2. Benign tumors</td>
<td>Hamartoma</td>
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<tr>
<td></td>
<td>Chondroma</td>
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<tr>
<td></td>
<td>Lipoma</td>
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<td>Fibroma</td>
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<td>Leiomyoma</td>
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<td>Cystoadenoma</td>
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<td></td>
<td>Oxyphilic adenoma</td>
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<td>3. Border-line tumors</td>
<td>Epithelial papillary tumors</td>
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<td></td>
<td>Granular cell myxoblastoma</td>
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<td></td>
<td>Pleomorphic adenoma</td>
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<td></td>
<td>Angiomyxoma</td>
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<td></td>
<td>Tumor of myxofibroblast</td>
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<td>4. Malignant tumors</td>
<td>Bronchogenic carcinomas with endobronchial growth</td>
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<tr>
<td></td>
<td>Carcinosarcoma</td>
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<tr>
<td></td>
<td>Bronchial carcinoid and other bronchial gland cancers</td>
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<td></td>
<td>Sarcomas</td>
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<td>Metastatic tumors</td>
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tumors, lipoma, fibroma, leiomyoma, etc.; and the potentially recurring and invasive tumors. The best documented in this category are the epithelial papillary tumors and granular cell myoblastoma. We add angiomyxoma and tumor of myofibroblast. Myxoma, malignant fibrous histiocytoma, and tumor of myofibroblast have been reported in the peripheral lung tissue, but not in the endobronchial location.

By far, the most common endobronchial tumors are the endobronchial growth of various types of bronchogenic carcinoma, and less frequently, carcinosarcoma, bronchial carcindoid, malignant tumors of bronchial gland and mesenchymal or neural origins, and metastasis from peripheral lung cancers and other organs. Differential diagnosis between these malignant tumors and the benign or borderline tumors is usually straightforward except when the biopsy is inadequate.

Potentially invasive soft tissue tumors, however, may appear deceptively innocuous, as in our cases, and recurrence or malignant changes may follow an incomplete excision of benign endobronchial tumors such as leiomyoma. The benignity of some endobronchial soft tissue tumors, therefore, cannot be predicted from its morphology alone.

An endobronchial diagnostic biopsy or excision is sufficient for small pedunculated endobronchial tumors such as inflammatory polyps and lesions like lipoma, epithelial papilloma, nodular amyloid, or sarcoid and lymph nodes. All other sessile lesions, especially those obstructing the lumen, probably should be excised completely with the attached portion of the bronchial wall following an initial bronchoscopic study. Conservation of normal lung usually can be achieved in most cases by segmental resection and reanastomosis of the involved bronchus.

ACKNOWLEDGMENT: We are grateful to Drs. F. B. Askin, C. Kuhn III, and J. Rosai for reviewing case 1; Mrs. H. Minnassian and Miss M. Charbonneau for technical assistance; and Miss G. Powałac for secretarial assistance.

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