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52

Bronchial Gland Tumors

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The tracheobronchial tree is endowed with a rich supply of serous and mucous glands in the submucosa, similar in structure to the major and minor salivary glands, and they can give rise to various benign and malignant neoplasms. Bronchial gland tumors were categorized in the past as bronchial adenomas, but this term is no longer used because it encompasses several benign tumors and malignant tumors such as mucoepidermoid carcinoma, adenoid cystic carcinoma, and bronchial carcinoid tumor.[1] However, there are true bronchial adenomas with distinct morphologic features, such as mucous gland adenoma, monomorphic adenoma, and pleomorphic adenoma.

Bronchial gland tumors are unusual and account for about 0.5% of the primary tumors of the lung; adenoid cystic carcinoma is the most frequent, followed mucoepidermoid carcinoma.[1]

BENIGN BRONCHIAL GLAND TUMORS

Mucous Gland Adenoma

Adenomas arising from bronchial glands of the mucous type are unusual, benign neoplasms, with fewer than 20 cases described in the literature.[2–16] They have been reported under various names, including mucous gland cystadenomas, papillary cystadenomas, or adenomas of mucous gland type.[12–14] They can occur in all age groups and exhibit no gender predilection. The lesions are usually asymptomatic; however, patients may present with hemoptysis, cough, or symptoms related to bronchial obstruction. Mucous gland adenomas appear grossly as soft, well-circumscribed, polypoid endobronchial tumors. They are covered by a pseudostratified ciliated epithelium that may become ulcerated or metaplastic. Mucous gland adenomas can produce partial or complete bronchial obstruction, and the bronchi distal to the lesion are usually dilated and filled with inspissated mucus.

Histologically, mucous gland adenomas are composed of acini or papillary structures lined by flat to columnar epithelial cells with numerous goblet-type cells (Fig. 52-1). The glands are often cystically dilated and filled with inspissated mucus, imparting a microcystic appearance to the lesion under low-power magnification (Fig. 52-2). The tumor cells exhibit minimal nuclear pleomorphism and have an amphophilic or eosinophilic cytoplasm that occasionally exhibits prominent oncocytic features. The stroma frequently contains acute or chronic inflammatory cells and may become fibrous, resembling the stroma of adenofibromas in other locations (Fig. 52-3).

The epithelium of mucous gland adenomas can become pseudostratified, with elements resembling intermediate cells. Lesions with this morphologic feature are difficult to differentiate from well-differentiated mucoepidermoid carcinomas. However, the latter usually have foci of squamous cells and more prominent areas of intermediate cell differentiation. Mucous gland adenomas are treated by local excision. A few lesions have been resected by lobectomy in patients with chronic obstructive pneumonia distal to the lesion or because local resection of the tumor was not feasible.[6–16]

Bronchial Oncocytoma

The bronchial glands of children and young adults normally have no oncocytic cells.[17] These cells, characterized by a large, granular, eosinophilic cytoplasm, develop in the bronchial glands of patients in their fourth decade of life or later. Oncocytes are characterized ultrastructurally by numerous mitochondria and have been shown to be metabolically active cells.[18]

True oncocytomas of the lung are extremely unusual, but a few patients with well-circumscribed bronchial tumors fully composed of oncocytes have been described.[18–23] The latter cells form solid sheaths, with no neuroendocrine differentiation under electron microscopy.[20] The reported patients with oncocytomas were cured after resection of their lesions, except for one patient who had a local recurrence.[20] Another patient with a malignant bronchial oncocytoma has been reported.[21] The lesion was composed of multiple, confluent tumor nodules composed histologically of

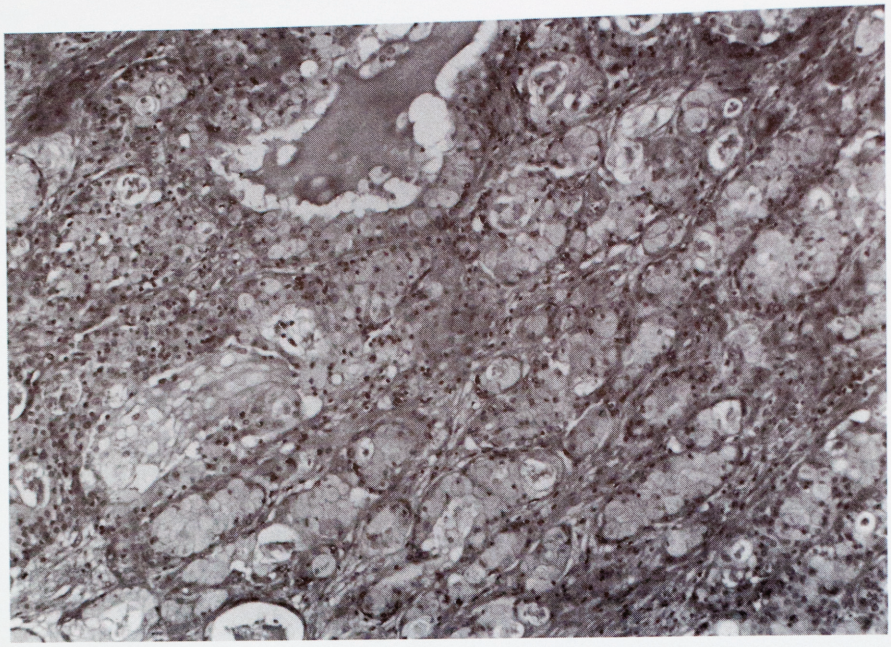

FIGURE 52-1. A mucous gland adenoma is composed of acini lined by columnar globlet-type mucinous cells. (H & E stain; low magnification.)

oncocytes with no nuclear pleomorphism or increased mitotic activity. This patient had a single lymph node metastasis and did well 2 years after lobectomy with no evidence of recurrence or dissemination of the tumor.

Bronchial oncocytomas are so unusual that the diagnosis of other tumors with focal oncocytic features must be considered first. The most difficult diagnosis to exclude is that of a bronchial carcinoid tumor. There are several reports of oncocytic carcinoid tumors of the lungs, which are composed almost exclusively of cells with granular eosinophilic cytoplasm.[24–26] However, these tumors exhibited immunocytochemical features of neuroendocrine differentiation, such as positive staining with antibodies to chromogranin or dense-core neuroendocrine type granules by electron microscopy. Oncocytes can be seen occasionally in mucous gland adenomas, adenocarcinomas, and squamous cell carcinomas arising from the bronchial wall.

Monomorphic and Pleomorphic Adenomas

There are no reports in the literature of monomorphic adenomas arising from bronchial glands. Seven patients with pleomorphic adenomas (*i.e.*, mixed tumor) arising from bronchial glands have been reported.[2,27–30] The tumors present as well-circumscribed, firm, gray-white, polypoid endobronchial tumors, composed histologically of epithelial cells, myoepithelial cells, and a myxoid or chondroid stroma (Figs. 52-4 and 52-5).

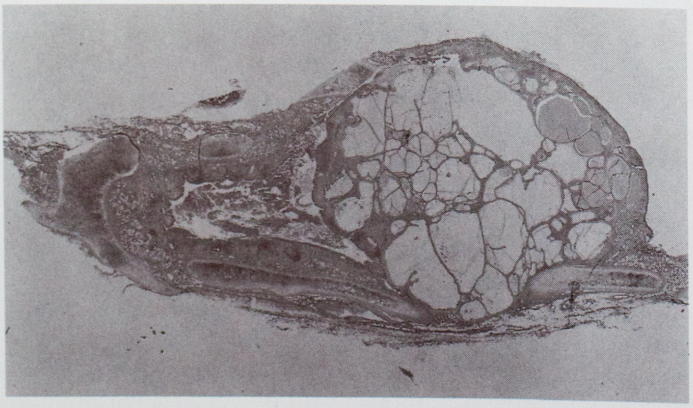

FIGURE 52-2. In this example of a mucous gland adenoma, the lesion protrudes into the bronchial lumen and has a microcystic growth pattern. (H & E stain; panoramic view.)

The epithelial elements of pleomorphic adenomas form solid sheets with focal acinar spaces lined externally by myoepithelial cells (Fig. 52-6). Myoepithelial cells can also form solid sheets that blend imperceptively into the myxoid or chondroid stroma. Sakamoto and associates reported a recurrent pleomorphic adenoma of the lung that presented as a peripheral tumor, with no apparent relation to the bronchial tree.[2] The stroma of pleomorphic adenomas can become hyalinized or calcified. The tumor cells of pleomorphic adenomas exhibit immunoreactivity with antibodies to S-100 protein, keratin, actin, and glial fibrillary acid protein (Color Fig. 52-1).[2] Pleomorphic adenomas of bronchial gland origin are so unusual that they can be easily mistaken for an adenocarcinoma invading the bronchial wall. It is important to recognize the lack of nuclear pleomorphism of the epithelial cells lining the acinar spaces and the presence of a double cell layer composed of inner epithelial cells and outer myoepithelial cells. Immunocytochemical stains with S-100 protein can be helpful, because this marker readily stains the cytoplasm of myoepithelial cells. Pleomorphic adenomas of bronchial gland origin are difficult to differentiate from cellular mucous gland adenomas lacking a prominent myoepithelial cell component. Pleomorphic adenomas of bronchial gland origin are benign tumors that are cured by local resection or lobectomy.

Myoepithelioma

A patient with a benign myoepithelioma of the lung was reported by Strickler and associates.[31] The lesion was a well-circumscribed, firm, tan-yellow pulmonary nodule that had no continuity with the bronchial tree. Histologically, it exhibited similar features to myoepitheliomas of salivary gland origin and was composed of sheets of spindle-shaped cells forming interdigitating fascicles (Fig. 52-7). The tumor cells expressed prominent intracytoplasmic S-100 protein immunoreactivity. Ultrastructurally, there were multiple myofilaments with no dense bodies, desmosomes,

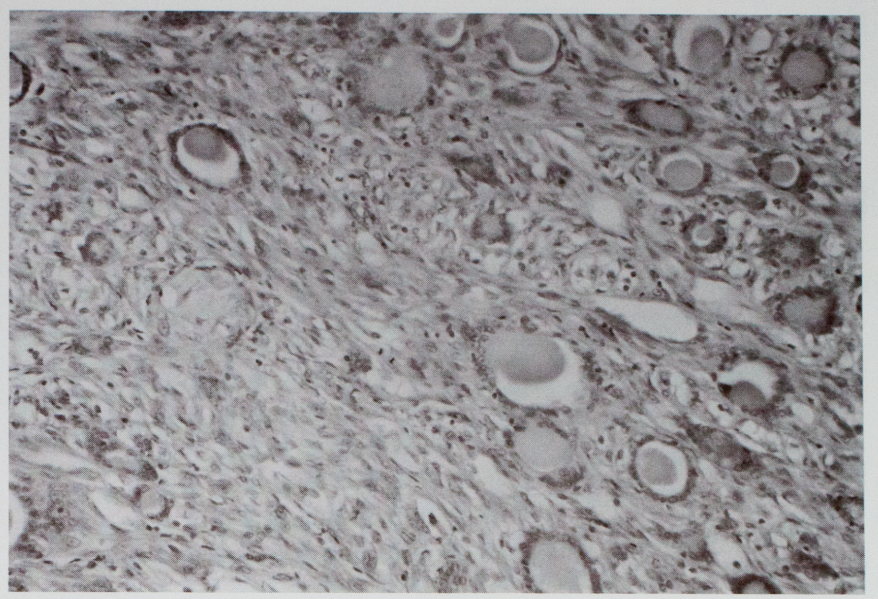

FIGURE 52-3. Bronchial adenoma with a fibrous stroma resembles adenofibromas in other locations. (H & E stain; intermediate magnification.)

adherent-type cell to cell attachments, or basement membrane formation. The tumor showed no evidence of metastasis.

MALIGNANT BRONCHIAL GLAND TUMORS

Several malignant tumors of bronchial gland origin have been described. These tumors have identical microscopic features to those arising from major or minor salivary glands.[32–34] The diagnosis of a primary bronchial gland malignant tumor can only be established after other primary sites have been clinically excluded. Most patients with adenoid cystic carcinomas, mucoepidermoid carcinomas, and other malignant tumors of salivary gland origin metastatic to the lung present with multiple pulmonary nodules, usually with no direct relation to the bronchial tree. However, the presence of an endobronchial tumor does not rule out the possibility of a metastasis, because some tumors from salivary glands and other organs metastasize in this fashion.

Adenoid Cystic Carcinoma

Adenoid cystic carcinoma is the most frequent tumor of airways arising from mucosal glands.[34–45] It can arise from the trachea and the major bronchi. Adenoid cystic carcinomas are relatively frequent tumors in the trachea, where they account for approximately one third of all malignant tumors.[1] Adenoid cystic carcinomas of bronchial gland origin have been described in patients between 18 and 65 years of age, but they are more frequent in the fifth decade of life.[35–38] Patients with adenoid cystic carcinomas arising from a major bronchus present with cough, hemoptysis, or symptoms related to bronchial obstruction, such as wheezing and postobstructive pneumonia. Southgate and associates reported a patient with acromegaly secondary to ectopic secretion of growth hormone–releasing factor and adrenocorticotrophic hormone by a pulmonary adenoid cystic carcinoma.[39] No association has been reported between cigarette smoking or other carcinogens and adenoid cystic carcinomas.

Adenoid cystic carcinomas can be difficult to detect on chest radiographs because of their central location, but they usually present as hilar masses. The lesions are readily identified by rigid or flexible bronchoscopy as a polypoid mass or as a concentric area of narrowing of the lumen of a major bronchus and ulceration of the overlying bronchial mucosa. Primary and metastatic adenoid cystic carcinomas can be diagnosed by transthoracic fine needle biopsy.[34,49] Adenoid cystic carcinomas present less frequently as peripheral pulmonary nodules.[37]

When adenoid cystic carcinoma involves the bronchial wall in an annular pattern (Fig. 52-8), the tumor usually spreads distally along the tracheobronchial tree into smaller airways. On section, the tumor nodules are firm and white-gray with ill-defined infiltrating borders. The bronchial mucosa overlying the lesion may be intact or focally ulcerated, with hemorrhage and acute inflammation. It can also undergo squamous metaplasia.

Adenoid cystic carcinomas present at low-power microscopy as ill-defined lesions that infiltrate the bronchial wall, adjacent vascular spaces, lymph nodes, nerves, and pulmonary tissue (Fig.

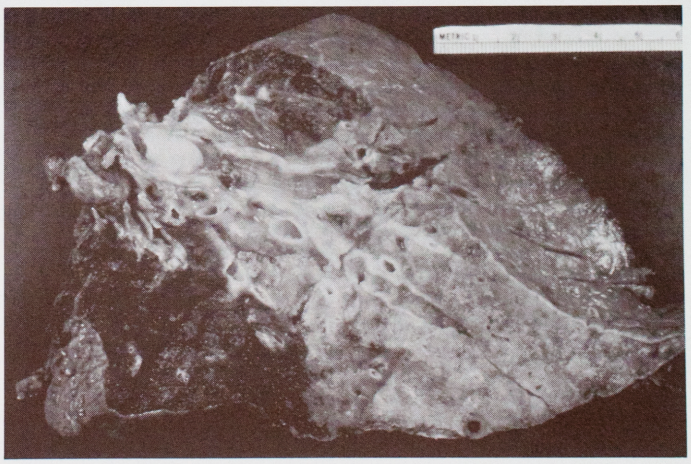

FIGURE 52-4. Pleomorphic adenoma of bronchial gland origin presents as an endobronchial mass obstructing a lobar bronchus and produces obstructive pneumonia, represented by clear areas of lung tissue.

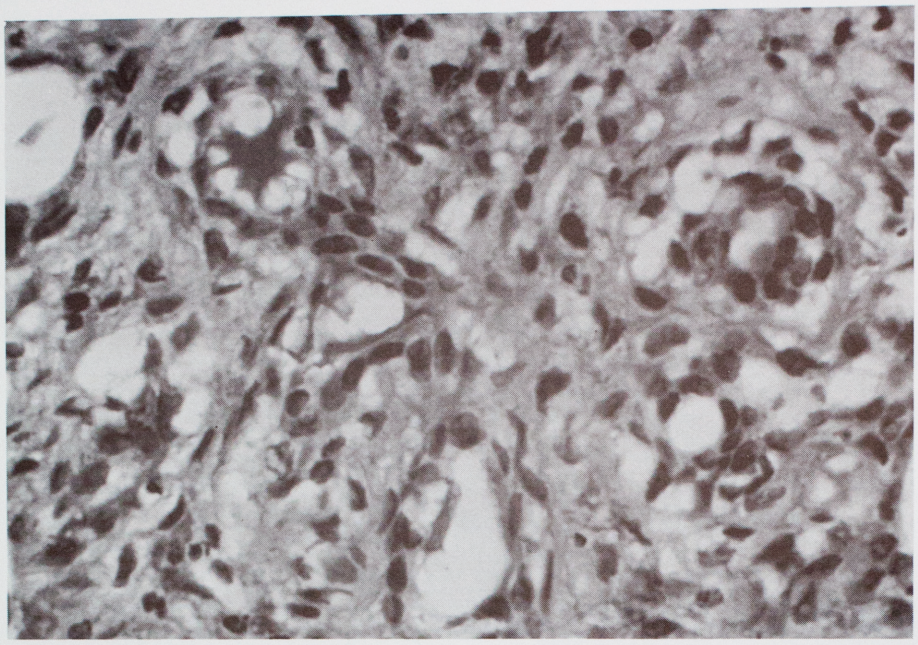

FIGURE 52-5. This pleomorphic adenoma is composed of acini lined by two cell layers in a fibrous stroma. The glandular spaces contain mucin. (D-PAS stain; high magnification.)

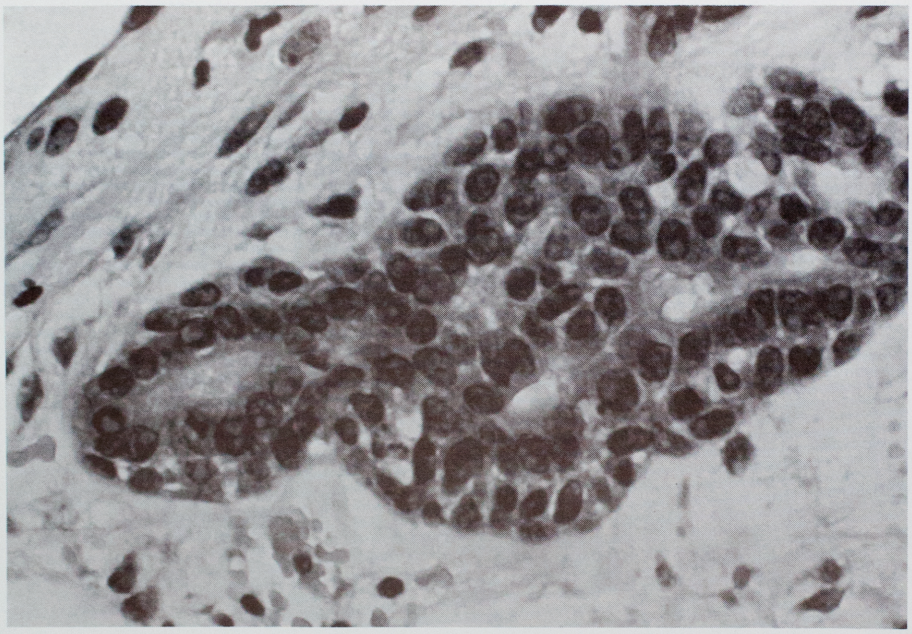

FIGURE 52-6. The glandular space of a pleomorphic adenoma is lined by an internal epithelial cell layer and an external myoepithelial cell layer. (H & E stain; high magnification.)

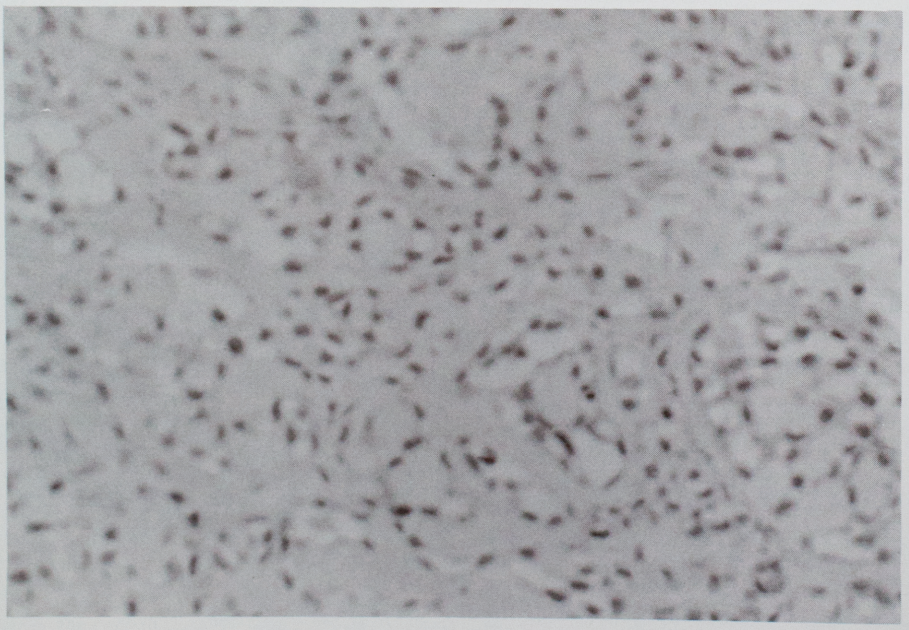

FIGURE 52-7. A myoepithelioma of bronchial origin is composed of myoepithelial cells with round-to-oval nuclei and clear cytoplasm. (H & E stain; intermediate magnification.)

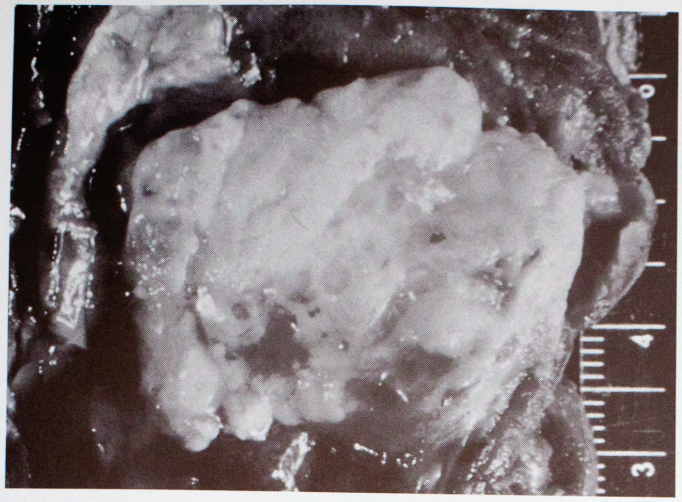

FIGURE 52-8. Adenoid cystic carcinoma of bronchial origin presenting as a white, firm, endobronchial mass.

52-9). Although they frequently extend through the bronchopulmonary bundles into the more distal airway, they can also extend proximally as subepithelial nodules that need to be examined by frozen section at the time of surgery to ensure a complete resection of the lesion.[36]

Adenoid cystic carcinomas in general can exhibit three major histopathologic growth patterns: cribriform, trabecular or cylindromatous, and solid. Tumors with a cribriform growth pattern are more frequent in the lung and are composed of multiple glandular spaces of irregular size and shape, with focal cribriform formation (Fig. 52-10). The glandular spaces contain in their central area a hyaline material with ultrastructural features of replicated basement membrane material. These spaces have been compared with reversed glands, in which the basement membrane is present within the central space.

Adenoid cystic carcinomas with a trabecular or cylindromatous pattern are composed of solid sheets of tumor in a trabecular arrangement, with marked fibrosis and hyalinization of the stroma, focal acinar differentiation, and focal cribriform formation (Fig. 52-11). Cells with myoepithelial differentiation are seen. The densely fibrotic stroma may show areas of mucinous degeneration. The cells of adenoid cystic carcinomas exhibit atypical cytopathologic features that are not seen in benign tumors of bronchial gland origin. They have round or oval, moderately pleomorphic, and markedly hyperchromatic nuclei with high nucleocytoplasmic ratios and amphophilic cytoplasm with ill-defined cellular borders. Mitotic figures are usually frequent, and foci of necrosis can be prominent. Frequent lymphatic and perineural invasion is a prominent feature of these tumors.

The glandular spaces of adenoid cystic carcinomas contain intracytoplasmic mucous materials that can be stained with mucicarmine, Alcian blue, diastase with periodic acid-Schiff (PAS), and Alcian blue with PAS stains. They exhibit immunoreactivity with antibodies to secretory components, lactoferrin, and epithelial membrane antigen.[48] The myoepithelial cells exhibit intracytoplasmic desmin, S-100 protein, and muscle-specific actin immunoreactivity.[36–40,48]

Electron microscopy can be helpful for the diagnosis of adenoid cystic carcinoma, because it demonstrates a dual cell population composed of epithelial and myoepithelial cells. Myoepithelial cells exhibit numerous 6-nm intracytoplasmic myofilaments that are oriented longitudinally without focal densities or dense body formation. Ultrastructural studies confirm the presence of basement membrane material in the central lumen of the cribriform areas of the tumor. Higashi and associates described chromosomal aberrations with rearrangement of 9p13 in a pulmonary adenoid cystic carcinoma.[35] Adenocarcinomas of the lung occasionally exhibit prominent trabecular pattern or cribriform features that resembles adenoid cystic carcinomas of bronchial gland origin.[46,47] The latter diagnosis should be reserved for tumors clearly arising from the bronchial tree and with the typical histopathologic features described above. Immunocytochemical stains and ultrastructural studies to demonstrate the presence of myoepithelial cells in the lesion can be helpful for the differential diagnosis.

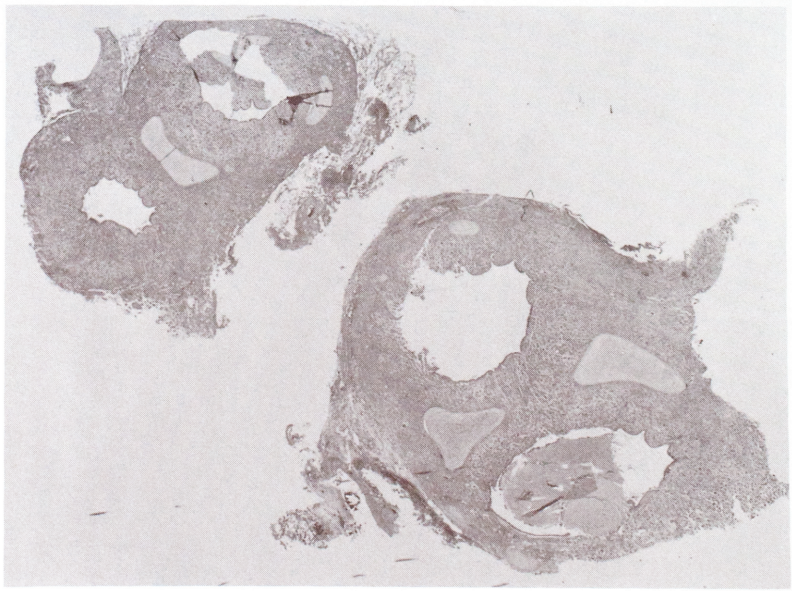

FIGURE 52-9. Adenoid cystic carcinoma of bronchial origin grows concentrically along the bronchial walls, creating a partial obstruction of the bronchial lumen. (H & E stain; panoramic view.)

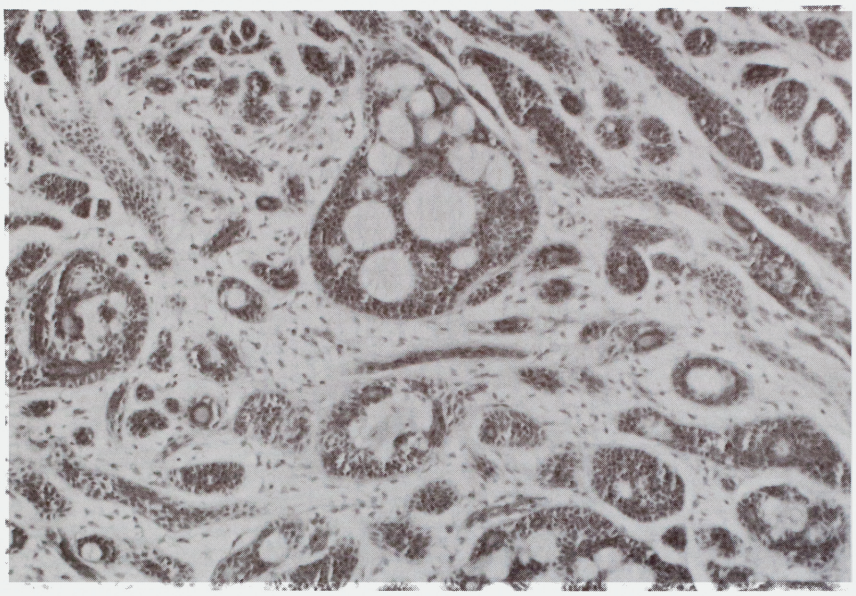

FIGURE 52-10. This adenoid cystic carcinoma of bronchial gland origin has a cribriform growth pattern. (H & E stain; low magnification.)

Adenoid cystic carcinomas occasionally appear on bronchial biopsies as small round cell tumors that are difficult to differentiate from small cell carcinomas of the lung. The cells of adenoid cystic carcinomas have a more irregular chromatin pattern than those of the oat cell variant of small cell carcinoma and usually lack the nuclear molding characteristic of the oat cell tumor. Immunocytochemical stains to demonstrate the presence of intracytoplasmic neuron-specific enolase, chromogranin, and other neuroendocrine markers can help to establish the diagnosis of small cell carcinoma of the lung.[48] Electron microscopy can also be helpful by demonstrating the presence of myoepithelial cell features and the lack of dense-core neuroendocrine granules in adenoid cystic carcinomas.

Adenoid cystic carcinomas of bronchial gland origin are treated by lobectomy or pneumonectomy, according to their location in the bronchial tree.[40–46] Because of the frequent location of adenoid cystic carcinomas in the major bronchi, some of these lesions can be difficult to resect. Bronchoplastic surgical procedures have been used in patients with tumors close to the carina.

Adenoid cystic carcinomas can recur locally and metastasize to regional lymph nodes. Metastases to bone, liver, adrenal glands, and other extrathoracic organs occur less frequently.[1] Adenoid cystic carcinomas of the lung can have a long natural history, with local recurrences or distant metastases developing as long as 30 years after the initial therapy.[1] The value of adjuvant chemotherapy and postoperative radiotherapy to control local recurrences or metastasis it not well established. The long-term prognosis for large series of patients with pulmonary adenoid cystic carcinomas is not well documented. Patients with similar tumors arising in the trachea have death rates of 15%, 45%, and 80% at 5 years, 10 years, and 20 years, respectively, after initial surgical resection.[38,40,42] Adenoid cystic carcinomas of the trachea and the bronchial tree have been treated with laser therapy for palliation, with good local control.[50]

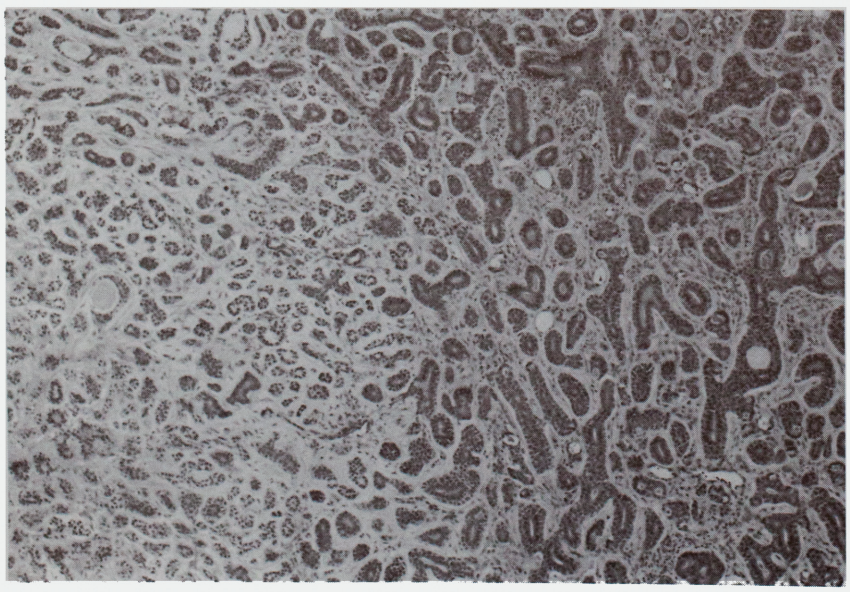

FIGURE 52-11. This adenoid cystic carcinoma of bronchial gland origin has a trabecular growth pattern. (H & E stain; low magnification.)

Mucoepidermoid Carcinoma

Mucoepidermoid carcinoma is the second most frequent pulmonary tumor of bronchial gland origin after adenoid cystic carcinoma.[51–62] It has been described in all age groups, including children.[60] The tumors occur slightly more frequently in women. Patients with mucoepidermoid carcinomas present with clinical symptoms similar to those with other bronchial gland tumors, including hemoptysis, cough, wheezing, and bronchial obstruction. No relation to cigarette smoking or other carcinogens has been described. Mucoepidermoid carcinomas of the lung have been classified, as their counterparts arising from the salivary glands, as low-grade and high-grade tumors.[63] This classification is based on clinicopathologic studies demonstrating that patients with low-grade tumors have a much better prognosis than those with high-grade lesions. However, a few patients had low-grade tumors that behaved in a highly malignant fashion despite bland histopathologic features.[53, 63, 64]

Low-grade mucoepidermoid tumors present as polypoid, exophytic, endobronchial masses covered by bronchial mucosa that can exhibit focal ulceration or squamous metaplasia (Fig. 52-12). The lesions can extend through the bronchial wall into the pulmonary parenchyma as an exophytic mass. High-grade mucoepidermoid tumors can exhibit similar gross features but tend to be larger, with areas of hemorrhage, necrosis, and more prominent infiltration of the pulmonary parenchyma. The airways distal to mucoepidermoid tumors frequently show secondary bronchiectasis, and the pulmonary parenchyma has areas of postobstructive pneumonia.

Low-grade mucoepidermoid tumors appear under low-power microscopy as well-circumscribed polypoid masses that usually do not infiltrate extensively through the bronchial wall into the pulmonary parenchyma (Fig. 52-13). They exhibit solid and cystic areas with glandular elements, intermediate (*i.e.*, transitional) cells, and squamous cells. The glands are lined by tall, columnar, mucin-rich, goblet-type cells and low cuboidal cells. The solid areas are composed of basaloid, intermediate, squamous, oncocytic, and clear cells (Figs. 52-14 through 52-16).[63]

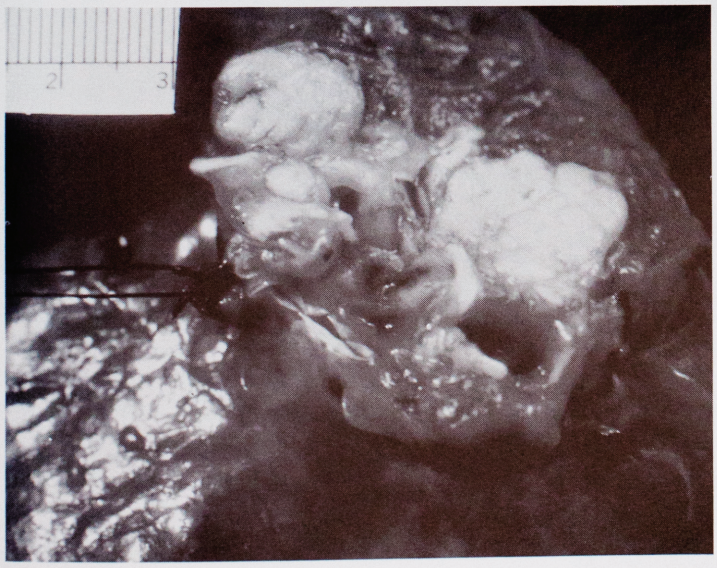

FIGURE 52-12. This mucoepidermoid carcinoma of bronchial origin presented as an endobronchial polypoid mass that focally infiltrated the adjacent pulmonary parenchyma.

The squamous cells are identified by the presence of eosinophilic cytoplasms and distinct intercellular bridges. It is unusual to see extensive keratin pearl formation or marked individual cell keratinization in low-grade mucoepidermoid carcinomas. The lesions exhibit minimal nuclear pleomorphism, few mitoses (<1 mitosis/20 high-power fields), and no necrosis. The stroma of low-grade mucoepidermoid carcinomas can exhibit hyalinization, chronic inflammation, calcification, or ossification.

High-grade mucoepidermoid carcinomas resemble low-grade tumors but are differentiated by moderate to marked nuclear pleomorphism, increased mitotic activity (average, 4 mitoses/10 high-power fields), and areas of necrosis (Fig. 52-17).[63] They have large hyperchromatic nuclei with focally prominent nucleoli, a more prominent intermediate cell, and squamous component with fewer glands than low-grade variants. It is unusual to have regional lymph node metastases with low-grade mucoepidermoid tumors.[63] They occur more frequently in patients with a high-grade variant.[64]

Low-grade mucoepidermoid tumors can be difficult to differentiate from mucous gland adenomas. These benign lesions can be cellular with focal pleomorphism. Low-grade mucoepidermoid lesions also exhibit minimal nuclear atypia, and this feature cannot be reliably used for the differential diagnosis. It is therefore important to recognize the presence of intermediate cells and foci of squamous differentiation in low-grade mucoepidermoid tumors, features lacking in mucous gland adenomas.

High-grade mucoepidermoid tumors can be difficult to separate from poorly differentiated squamous cell carcinomas of the lung.[63] Poorly differentiated squamous cell carcinomas lack glandular differentiation. Stains for mucin (*e.g.*, mucicarmine, Alcian blue, diastase-PAS) frequently help to highlight this glandular component (Color Fig. 52-2).

The differential diagnosis between high-grade mucoepidermoid tumors and adenosquamous carcinomas of the lung is difficult and has been the subject of controversy.[63, 65–68] Klacsman and associates and Yousem and Hotchholzer have suggested the various criteria presented in Table 52-1 to differentiate mucoepidermoid tumors from adenosquamous carcinomas of the lung.[55, 63] In general, mucoepidermoid tumors have a clear association with a bronchus with an endobronchial component, lack extensive individual cell keratinization and squamous pearl formation, and exhibit pleomorphic morphologic features with an admixture of glandular elements, intermediate cells, and squamous cells. Adenosquamous carcinomas lack a prominent endobronchial component, have two distinct cell populations that can be intimately admixed with each other or present as distinct elements in different areas of the tumor, and exhibit prominent squamous differentiation. Patients with mucoepidermoid tumors of the lung are treated primarily by surgical resection with lobectomy or pneumonectomy according to the location of the neoplasm.[60–64] Central lesions can be treated by sleeve resection procedures. The endobronchial component of the tumor can respond to treatment with laser therapy.[50] The prognosis of patients with low-grade mucoepidermoid tumors is excellent with only a rare patient developing widespread metastases.[63] The prognosis is particularly good after resection in children with a low-grade variant of the tumor. Patients with high-grade lesions can receive postoperative radiotherapy with controversial results.[60–64] The prognosis of patients with high-grade mucoepidermoid tumors is somewhat controversial, reflecting the lack of uniform diagnostic criteria. In some reports, it is much worse than that of patients with a low-

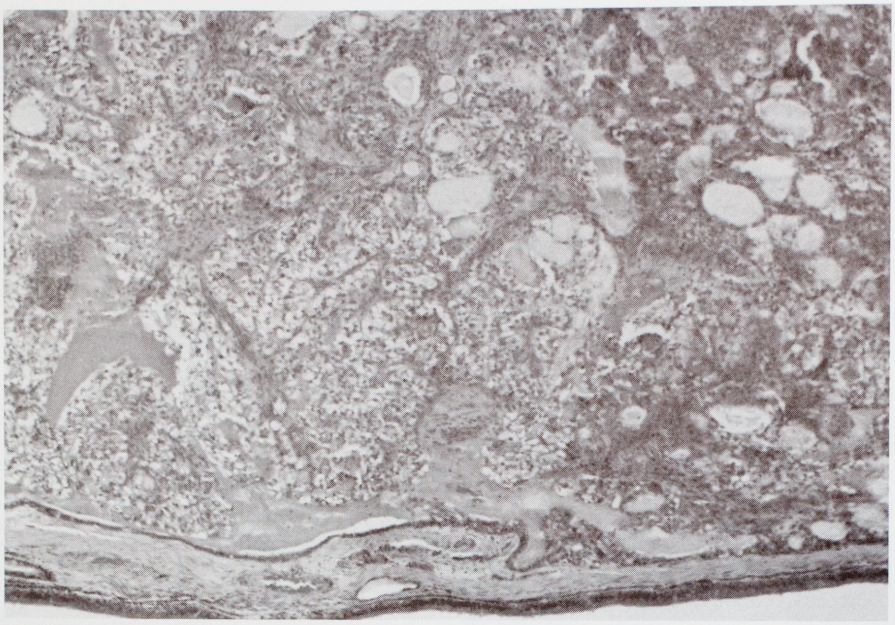

FIGURE 52-13. This low-grade mucoepidermoid carcinoma contains glandular spaces and clear cells. (H & E stain; low magnification.)

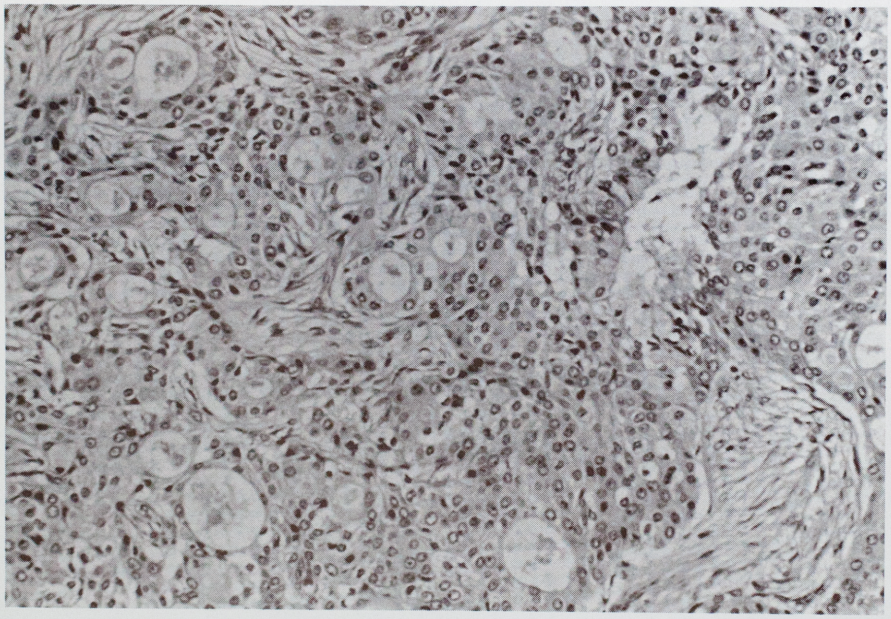

FIGURE 52-14. This low-grade mucoepidermoid carcinoma contains glandular spaces and intermediate cells. (H & E stain; low magnification.)

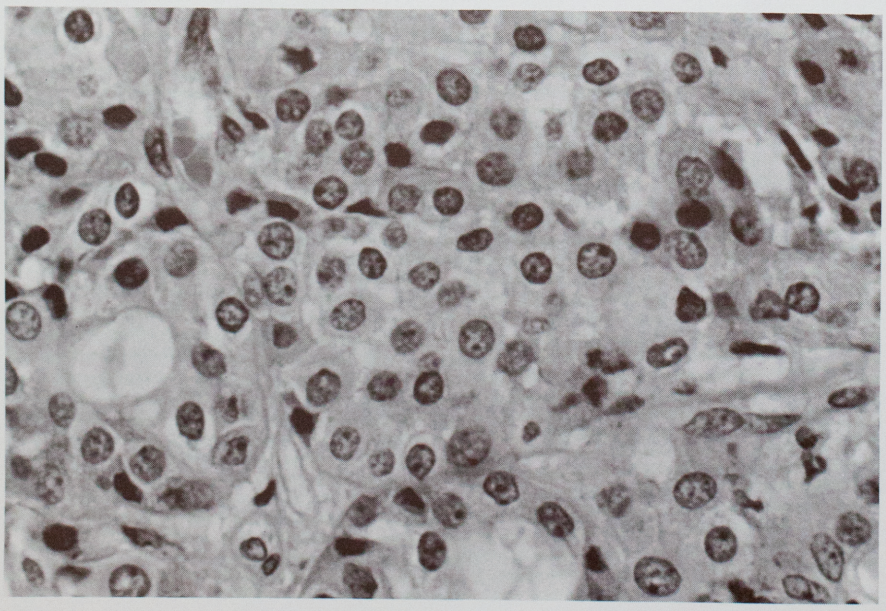

FIGURE 52-15. This low-grade mucoepidermoid carcinoma contains glandular spaces lined by cuboidal cells and solid nests of intermediate cells. There is a lack of nuclear atypia. (H & E stain; high magnification.)

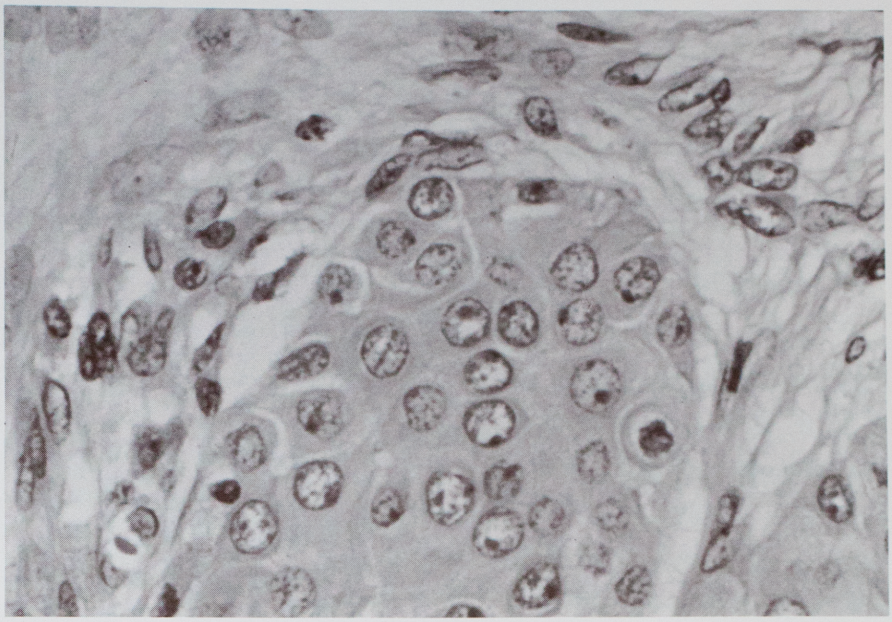

FIGURE 52-16. In this low-grade mucoepidermoid carcinoma with squamous differentiation, keratin pearls are absent, which is unusual in mucoepidermoid carcinomas. (H & E stain; high magnification.)

grade variant of the disease, with average survivals of 5.3 months after surgical resection.[1]

Other studies have reported better survival rates for patients with high-grade mucoepidermoid carcinomas. For example, in the study of Yousem and Hotchholzer, 8 of 13 patients were alive 4 years after treatment, 3 patients died from the disease, and 1 died of unknown causes.[63] The difference in results is probably related to the lack of precise histopathologic features to differentiate high-grade mucoepidermoid tumors from adenosquamous carcinomas.[65–69] The latter tumors represent one of the more aggressive variants of non-small cell carcinoma of the lung.

Acinic Cell Tumor

Several patients with acinic cell tumor of the bronchus, an unusual tumor of glandular origin, have been described.[70–73] The lesions presented as polypoid, endobronchial tumors, similar in gross appearance to other bronchial gland tumors described earlier. Histologically, acinic cell tumors are composed of sheets of clear cells, forming small nests or trabecula admixed with fewer cells and exhibiting a basophilic cytoplasm (Color Fig. 52-3). The diagnosis of acinic cell tumor is confirmed with the aid of histochemical stains that demonstrate the abundant D-PAS positive intracytoplasmic granules.

The tumor cells lack glycogen and features of neuroendocrine differentiation (*e.g.*, argyrophilic and argentaffinic granules, immunoreactivity with antibodies to neuron-specific enolase, chromogranin). Acinic cell tumors exhibit under the electron microscope numerous membrane-bound, electron-dense secretory granules that are as large as 800 nm in diameter and surrounded by a wide clear halo.[70–73] The lack of neuroendocrine granules in acinic cell tumors helps to differentiate them from bronchial carcinoids, because the latter lesions can occasionally present with a prominent clear cell component. The membrane-bound granules of acinic cell tumors are also different from those seen in clear cell (*i.e.*, sugar) tumors of the lung (see Chap. 58).

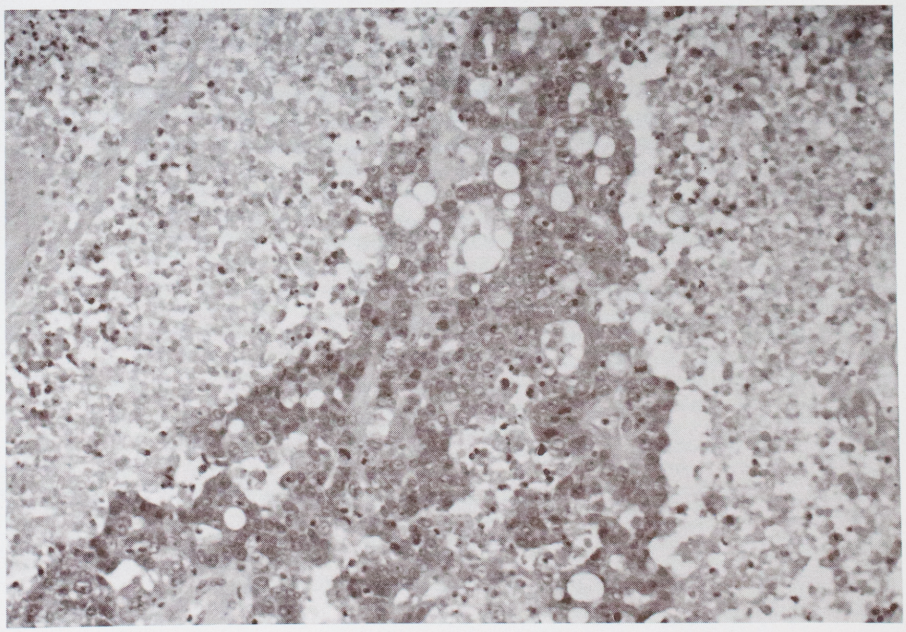

FIGURE 52-17. This high-grade mucoepidermoid carcinoma demonstrates extensive necrosis and nuclear pleomorphism. (H & E stain; low magnification.)

TABLE 52-1
Differential Diagnosis Between Adenosquamous Carcinoma and High-Grade Mucoepidermoid Tumor of the Lung

Diagnostic Characteristic	Adenosquamous Carcinoma	High-Grade Mucoepidermoid Tumor
Central tumor	+	+ + + +
Peripheral tumor	+ +	−
Endobronchial component	+	+ + + +
Squamous cell carcinoma *in situ*	+ + +	−
Squamous pearl formation	+ +	−
Individual cell keratinization	+ + +	+
Presence of low-grade mucoepidermoid tumor	−	+ + + +

+, occasionally present; + +, present; + + +, usually present; + + + +, always present; −, absent.

Malignant Mixed Tumors

A few patients with malignant mixed tumors of bronchial gland origin have been described.[27] These tumors have features of benign mixed tumor admixed with areas of adenocarcinoma. Malignant mixed tumors of bronchial gland origin can metastasize. They must be differentiated from malignant mixed tumors metastatic to the lungs from a salivary gland primary.[74] These tumors usually metastasize to the lung as single or multiple nodules, rather than presenting as a single endobronchial mass.

Other Malignant Bronchial Gland Epithelial Tumors

Unusual examples of malignant oncocytoma of the lung have been described.[21] A patient with a low-grade adenocarcinoma with polymorphous features containing areas of benign mixed tumor, solid adenocarcinoma, adenoid cystic changes, and a benign glandular component was described by Dail.[33] This tumor was similar to those described in the salivary gland by Evans and Batsakis.[75]

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