output. The marked fall of 53 percent in the right ventricular systolic pressure cannot be explained by a fall in the cardiac index. If one compares the infundibular gradient of 80 mm Hg in the first cardiac catheterization with the gradient of 18 mm Hg in the second procedure then a 67 percent decline in the infundibular stenosis has occurred. It appears inescapable that the severity of the infundibular hypertrophy in this patient did not increase with the passage of time but actually diminished. One can only speculate on the genesis of these findings. However, the clinical deterioration in this patient cannot be explained by the increasing severity of pulmonic stenosis or infundibular stenosis. Perhaps the right ventricular myocardial fibrosis has become so extensive that the muscle in the infundibulum has been extensively replaced with fibrotic material. Unfortunately the patient still refuses to have cardiac surgery performed, and this concept must remain conjectural.

The extensive development of right ventricular myocardial fibrosis has been stressed as an important determinant of the natural history of pulmonic stenosis. Further the right ventricular myocardium of patients with pulmonic stenosis has significantly more fibrosis than the right ventricular myocardium in normal individuals of the same age or in patients with tetralogy of Fallot. However this hypothesis must be rejected in our patient in view of the marked decline in the right ventricular peak pressure which is out of proportion to the decline in the cardiac output. The alternate and more likely explanation is that the right ventricular volume has so increased thereby minimizing obstruction at the infundibular level. Unfortunately right ventricular angiograms were not obtained at both cardiac catheterizations and a comparison of volume of this chamber is therefore not possible.

The first cardiac catheterization in 1963 revealed an elevated right atrial mean pressure and an elevated right ventricular end diastolic pressure. Ayres and Lukas* previously observed that this was a frequent hemodynamic finding in mild pulmonic valvular stenosis. Decreased compliance of the right ventricle has been the explanation offered for this finding. The second catheterization in 1970 now revealed a normal right atrial mean pressure, and a normal right ventricular end diastolic pressure. One can only offer a possible explanation for this phenomenon. With the passage of time the volumes in the right atrium and right ventricle may have increased with an increase in compliance. In such a setting, a decrease in the pressure may result.

Obviously one cannot come to definite conclusions about the natural history of pulmonic stenosis in the adult based on one case. However, since this is the first adult with infundibular and pulmonic stenosis who underwent serial cardiac catheterization it does offer additional insight into this disease state.

REFERENCES

Mucocoeidermoid Tumor of the Trachea*
G. P. Trentini, M.D. and B. Palmieri, M.D.

We describe a rare case of mucocoeidermoid tumor of the supracarinal region of the trachea in a 25-year-old man, who died three months after resection, following local recurrence of the tumor. On the basis of clinical course and of gross and microscopic examination, the tumor has been classified as a medium-high grade mucocoeidermoid tumor. Occurrence of this lesion in the trachea has only been reported once, moreover not in pure form, but in combination with squamous cell carcinoma.

Although mucocoeidermoid tumors as occasional findings are included in bronchial neoplastic pathology, they are not mentioned normally in the classification of tumors of the trachea.

Review of the literature on this subject shows only the previous report of Larson, Woolser and Payne.7 Their report concerns a 26-year-old woman with a mucocoeidermoid tumor of the supracarinal region of the trachea, whose symptoms had started three years before, with dyspnea, cough and blood-streaked sputum. The extreme rarity of this pathologic condition prompted us to describe our case of mucocoeidermoid tumor.

CASE REPORT
History and Clinical Data
The patient was a 25-year-old man, whose past and personal history was not contributory. His illness started four months previously with mild dyspnea. Each episode of

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MUCOEPIDERMOID TUMOR OF TRACHEA

Dyspnea became more disabling and the patient became severely dyspneic and cyanotic on exertion.

During the last four weeks, the patient experienced fits of asphyxia and had blood-streaked sputum, which at first was intermittent, then recurrent. These conditions were treated by antispastic therapy at high dosage. In the interval between the attacks, he had neither cough nor expectoration.

On admission he was found to be moderately dyspneic, with coarse inspiratory and expiratory ronchi and wheezes through both lungs. In the suprasternal area, an inspiratory thrill was present on palpation. The remainder of his physical examination revealed nothing abnormal. Routine studies of blood, urine and sputum gave normal results.

The chest x-ray films were normal except for the widening of the mediastinal shadow at the level of the tracheal bifurcation. Endoscopic examination revealed a large polyoid mass, which almost completely occluded the lumen of the trachea and the left main-stem bronchus except for a narrow semilunar space on the right. Its smooth base was implanted on the left posterolateral wall of the lower part of the trachea. At operation, after inspection and evaluation of the extent of the tumor, a complete sleeve resection for approximately 3 cm of the tracheal carina was carried out.

After mobilization of the pulmonary ligaments, primary end-to-end tracheobronchial anastomosis was accomplished, with reconstruction of the carina; some lymph nodes of the tracheobronchial chain were removed. The patient's postoperative course was free from complications. He had no difficulty in raising secretions and required only routine tracheotomy care. He was dismissed from the hospital on the 20th postoperative day and enjoyed excellent health for the next ten weeks. Afterwards he began to complain of dyspnea at first on exertion, later even while at rest.

Repeated endoscopic examination revealed at the anatomic site an annular stenosis; a biopsy specimen was taken.

HISTOLOGY AT TIME OF OPERATION

Gross Examination

The tumor was located on the left posterolateral wall of the trachea, just above the origin of the left main-stem bronchus. It extended upwards from the origin of the bronchus to a point 2.5 cm on the trachea and protruded into the lumen without apparent infiltration of the fibrocartilaginous tunica. It appeared as a vegetating mass 3 by 2.5 by 1.7 cm, covered by an irregular gray-white surface, finely granular, and which bled easily. The cut surface was firm, grayish in color, and somewhat homogeneous, with multiple small translucent and mucinous-like points.

Microscopic Examination

At low power (Fig 1), the profile of the tracheal wall appeared to be severely altered by an atypical epithelial growth, which almost completely replaced the normal structures. The basic pattern of the tumor consisted of solid areas with seccrotic or mucous cystic centers, and cords and strands of cells surrounded by slight reticulal stroma, which in the basal portion of the tumor were interrupted with abundant fibrous connective tissue infiltrated by small neoplastic plugs.

At high power, the neoplastic tissue consisted of two main cellular types: epidermoid and mucous-secreting cells. The predominating cell type was epidermoid with eosinophilic cytoplasm and oval nucleus, without keratin production or pearl formation (Fig 2). The mucous-secreting cells were polyhedral with vacuolated cytoplasm, foamy or optically empty, forming pseudo-analicular tubules or, more often, lining small cysts containing a basophilic amorphous substance, analogous to the intracytoplasmic one. This substance gave positive reactions with periodic acid-Schiff and alcian blue (Fig 3) at pH 3.5 and was responsible for the intense inflammatory reaction, predominantly of the plasma cell type caused by its leakage through the adjacent stroma. There was a third cell type, less numerous and commonly seen in stratifications lining duct-like structures or in solid cords infiltrating the stroma. These cells, named basal or intermediate, were spindle-shaped, distinctly smaller than either epidermoid or mucous-secreting cells, and had hyperchromatic nuclei. The lymph nodes were not infiltrated by the tumor.

FIGURE 1. General view of the specimen, showing the cut surface of the lesion and the complete histologic section (PAS-hematoxylin, × 7).

FIGURE 2. Solid areas of epidermoid differentiation; the stroma appears infiltrated by lymphocytes and plasma cells (hematoxylin-eosin, × 320).

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Stewart, co-workers, nature once cellular microscopic as case, in therefore, a of bronchi, and moreover in the neoplasm was described only once in the tracheal wall (Larson and co-workers,1) and moreover not in pure form, but in combination with a rapidly growing squamous cancer.

Our case, therefore, seems to be the first of a pure mucoepidermoid tumor of the trachea. The presence of three cellular types and of transitional structural relationships between intermediate cells and mucous-secreting and epidermoid cells, testifies to the mucoepidermoid nature of the neoplasm, excluding the possibility of a combination of two different tumors. Just as in the bronchi, also in the trachea the mucoepidermoid tumor probably arises from the excretory ducts of the mucous glands (Houston and co-workers1). This origin in our case seems to be confirmed apart from the duct-like structure of the tumor, by the greater development of the neoplasm from the posterior wall of the trachea, where the mucous glands are normally found in larger numbers. In general the clinical course of mucoepidermoid tumors is variable according to the different degrees of malignancy, classified on a histologic basis as low, medium and high grade (Foote and Frazell5). In our case, duration of the tumor prior to admission had only been four months, which reflects a rather vigorous rate of growth, considering also the great size reached by the tumor. Moreover there was very little tendency to cyst formation and the cut surface was firm, gray-white and homogeneous. These features, as well as the microscopic picture characterized by epidermoid and intermediate cells, the latter with hyperchromatic nuclei, and by the infiltrative tendency of the neoplastic growth, make the prognosis poor, even in the absence of metastases.

The patient died three months after resection with local recurrence of tumor, implanted on an exuberant granulation tissue, a common late complication of resection of the intrathoracic trachea.

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