FILE NAME: Smoking (SMOK)

DATE: 1956

DOC#: SMOK025

DOCUMENT DESCRIPTION: Book Excerpt - Bronchiogenic Carcinoma

Diseases of the Chest

H. CORWIN HINSHAW, M. D., PH. D. *Clinical Professor of Medicine*
Stanford University School of Medicine

L. HENRY GARLAND, M. B., B. CH. *Clinical Professor of Radiology*
Stanford University School of Medicine

634 Illustrations on 288 Figures

W. B. SAUNDERS COMPANY
1956 *Philadelphia and London*

The undifferentiated bronchogenic carcinomas constitute a heterogenous group. The small cell cancers are sometimes called oat cell, round cell and spindle cell types. The tumors may resemble sarcomas and in the past were sometimes erroneously considered to be sarcomatous in nature.[4] Undifferentiated large cell bronchogenic carcinomas are somewhat less rapid in growth than are the small cell types.

The simplified classification chosen here has clinical significance, for patients with these three different types of tumors may require different treatment. The squamous cell type of tumor appears to offer the best chance of cure to the patient, for surgical extirpation may be accomplished while the tumor is still localized. Adenocarcinoma of the bronchus grows more rapidly as a rule than does the squamous cell variety, but not so rapidly as the undifferentiated types. The adenocarcinoma has the advantage of arising more frequently in smaller bronchi, an attribute which makes surgical removal easier but also makes endoscopic diagnosis more perplexing because the growth may be beyond the range of bronchoscopic vision. The undifferentiated types of bronchial cancer are likely to spread widely before producing significant signs or symptoms and the chance of cure is very unlikely by the time the diagnosis is achieved.

Metastatic Proclivities

All bronchogenic cancers tend to metastasize early and this accounts for the high mortality rate and places a heavy responsibility upon the clinician when the possibility of cancer appears on clinical or radiographic grounds. Some patients have lost their lives while "under observation," perhaps because the physician was too timid to even mention the *possibility* of cancer to an apprehensive patient. By the time a possibility has become a probability the tumor may well have metastasized, sometimes to far distant parts of the body.

There is little clinical meaning to tabulations of metastases as observed at autopsy, for when death has arrived the disease may have invaded many organs, including regional lymph nodes, distant lymph nodes, liver, pleura, other pulmonary segments, bones, adrenals, kidneys, brain, spinal cord, pericardium and myocardium.[5]

Bronchogenic cancer is spread by both lymph and blood streams, but lymphatic spread probably is earliest in many cases, although small primary tumors have rather frequently caused early death by cerebral metastasis. The lymph nodes at the root of the lung often are involved early, after which metastases may soon localize in such a manner as to yield distinct clinical syndromes which the physician can recognize readily. These are described in later paragraphs (indications of inoperability).

ETIOLOGY

Many brilliant minds are concentrating on problems relating to the causes of malignant growths in general and of bronchial carcinoma in particular, but no satisfying answers have yet appeared. There are, however, some intriguing possibilities which apply to bronchogenic carcinoma, and especially to the squamous cell variety.

Of foremost interest is the information relating tobacco smoking to cancer of the lung.[6] Most studies of this problem have led to conclusions to the effect that there is an association between prolonged heavy smoking and the development of bronchial cancer. This relationship seems to hold for the squamous cell variety of bronchogenic carcinoma and not for the adenocarcinoma and perhaps not for the undifferentiated types. There seems to be an asso-

[4] True primary sarcomas of the lung do occur, but are extremely rare. Primary and secondary lymphosarcomas and reticulum cell sarcomas are reported (see Chapter 21).

[5] R. A. Willis: The Spread of Tumors in the Human Body. Churchill, London, 1934.

[6] R. Doll (Brit. M. J., *2*:521 and ibid., *2*:585, 1953) summarizes the evidence favoring this theory.

ciation with cigarette smoking and not with the smoking of cigars and pipes. Authors frequently emphasize that association does not necessarily indicate a cause and effect relationship. There are deficiencies in all of the data which have been reported because there are inadequate data as to the frequency with which tobacco is abused by those who do not develop bronchogenic carcinoma. Until such statistically acceptable data are accumulated this relationship must remain a *theory*, but the reported studies are certainly suggestive. Carcinogenic materials in cigarette smoke may become condensed in the tracheobronchial tree. It has even been suggested that the defect incident to calcified tuberculous lesions may serve to trap these irritants.[7]

Other respiratory irritants have been incriminated, especially the atmospheric pollution incident to modern civilization. Most interesting have been studies correlating the incidence of the disease with the proximity of the victims' residency to industrial plants which expel derivatives of chromic acid into the atmosphere. In this connection it must be noted that those who dwell in such areas are likely to belong to lower income groups which may be more susceptible for other reasons, and also that the atmosphere in such areas must contain vast assortments of gaseous and particulate debris, other than chromates which possibly could be carcinogenic. This problem is complicated further by evidence that excessive tobacco smoking is a more prevalent habit among city dwellers where lung cancer rates are higher than among those who breathe the less contaminated air of rural and suburban communities.[8]

Carcinogenic agents are said to be present in the tars which are used to pave modern highways and it has been postulated that they might also be contained in the complex exhaust gases of internal combustion motors, especially motors of the Diesel type.[9] This does not explain all the increased incidence of bronchogenic cancer for such is reported in regions where these atmospheric pollutions do not exist.

The high incidence of bronchogenic carcinoma among workmen in certain mines of central Europe has been attributed to the radioactive qualities of the atmosphere in these mines.[10] If this be a fact, it is conceivable that atmospheric pollution with materials derived from atomic power plants and instruments of war during coming decades may have a similar deleterious effect upon large numbers of people.

The sum total of the surface area lining the ramifications of the respiratory tract is so enormous and the amount of air respired during a lifetime is so great that those cells which line the respiratory tract come into greater contact with the external environment than almost any other part of the human body. Whatever the carcinogenic materials may be in our environment, it is not strange that the bronchial tree should respond by producing malignant growth frequently if we accept the theory of exogenous origin of new growths.

Interesting thoughts are aroused as to the reasons for the sex incidence of this disease. The possibility of hormonal influence seems to be remote since we know of no hormonal control over bronchial epithelium and sporadic attempts to use hormonal therapy have shown no beneficial influence. But our knowledge of hormones and growth remains in a primitive state, despite a voluminous literature and the vast effort expended.

There is reason to believe that men come in contact with carcinogenic substances more

[7] C. E. Woodruff and H. C. Nahas (Am. Rev. Tuberc., *64:*620, 1951) suggest this possibility.

[8] W. C. Hueper (Indust. Med., *23:*463, 1954) discusses environmental lung cancer. C. A. Mills and J. Porter (J. Nat. Cancer Inst., *13:*1283, 1953) discuss the relative smoking habits of those who live in different environments.

[9] J. A. Campbell (Brit. J. Exp. Path., *18:*215, 1937) discusses this in relation to experimental tumors of mice.

[10] E. G. Lorenz (J. Nat. Cancer Inst., *5:*1, 1944) reviews the problem of the high incidence of lung cancer among miners in this area.

Laboratory Findings

The one laboratory examination which may be of diagnostic help is the study of sputum cytology. Characteristic groups of exfoliated cells can be found in the sputum of more than half of all cases of bronchiolar carcinoma. If these cells are still found in the sputum after pulmonary resection it proves that the tumor has not been removed completely.

Treatment

Surgical removal of bronchiolar carcinoma has been but rarely accomplished, chiefly because the growth has extended to involve the contralateral lung before a diagnosis was made. When the lesion is a small one the operation of lobectomy is preferable to segmental resection. If more than one lobe is involved it is almost certain that the opposite lung is invaded and pneumonectomy would be useless.

Roentgen therapy is of moderate value for palliation.

SUMMARY

Bronchogenic carcinoma has increased in incidence during recent decades and has now become the second most frequent visceral malignant disease of men. It is at least five times more frequently encountered in men than in women.

Squamous cell carcinomas tend to develop in larger bronchi and to metastasize more slowly than do other types. Adenocarcinomas are more frequent in smaller bronchi and metastasize more rapidly than squamous cell carcinomas but not so rapidly as do carcinomas composed of undifferentiated (anaplastic) cell types. The latter are most often incurable when detected.

Excessive cigarette smoking, air pollution with industrial dusts (especially chromates) and inhalation of radioactive materials are suspected of being among the causative agents in bronchogenic carcinomas.

Symptoms of bronchial cancer, when present, may resemble those of non-specific bronchial irritation, pneumonia and asthma. Hemoptysis should lead to suspicion of cancer.

Symptomless bronchial cancer may be revealed as an abnormal roentgen shadow. Interpretation of such shadows requires good clinical judgment, skillful reontgenography and careful investigation.

Physical examination may reveal signs of bronchial obstruction or evidence of palpable metastasis.

Bronchoscopy frequently demonstrates bronchogenic carcinoma and permits biopsy and aspiration of secretions for study.

Cytologic examination of bronchial secretions may reveal exfoliated malignant cells recognizable to the pathologist who is specially trained for such work.

Needle biopsy of the lung is but rarely indicated.

Exploratory thoracotomy frequently is recommended for diagnosis and possible treatment of pulmonary disease suspected of being malignant.

Exploration for nonpalpable cervical lymph nodes (Daniels operation) should be undertaken frequently.

Treatment of bronchogenic carcinoma consists of pulmonary resection, lobectomy or pneumonectomy and, in certain cases, radical radiotherapy.

Bronchogenic carcinoma is inoperable when extrathoracic lymph nodes or other structures are involved; when physical signs of superior vena cava obstruction are present; when a recurrent laryngeal nerve, a phrenic nerve or the brachial plexus is involved; or when the growth is so located as to be incapable of being resected.

body is a fiber of the mineral surrounded by protein deposits. The ordinary stains used in histology do not demonstrate asbestos bodies well, but the Prussian blue staining procedure may be helpful. When seen in tissue sections or in sputum, these elongated fibers are recognized by their beaded appearance and rounded bulbous ends which may resemble an elongated dumbbell.

The clinical manifestations of asbestosis include progressive shortness of breath on exertion, cough, weakness, weight loss and clubbing of the fingers. Emphysema, bronchiectasis, and occasionally pulmonary tuberculosis, complete the clinical picture. While it is generally believed that asbestosis predisposes to tuberculosis the tendency is not so striking as in the case of silicosis. It has also been surmised that asbestosis may predispose to bronchogenic carcinoma—a hypothesis which has not been fully confirmed.

The earliest radiographic signs of asbestosis are those of a fine haziness in the lower lung fields due to a so-called reticular network of shadows, creating a "ground glass" appearance. Subsequently, there is increasing evidence of more extensive and coarser fibrosis with variable degrees of pleural thickening. A feature sometimes noted is a "shaggy" appearance of the cardiac silhouette resulting from the combination of parenchymal and pleural changes in later stages.

The diagnosis of asbestosis depends upon a radiographic appearance consistent with diffuse pulmonary fibrosis, a history of prolonged exposure (two years or more) to asbestos dusts, and the finding of asbestos bodies in the sputum. In obscure cases diagnosis by lung biopsy may be advisable.

There is no treatment known to be of value. Patients with early signs of asbestosis should be removed from such exposure, and it is probable that the disease will not progress significantly after exposure is terminated. Patients with asbestosis should avoid contact with tuberculosis and should be examined at frequent intervals to detect the earliest sign of tuberculous infection so that prompt and energetic specific antituberculosis treatment may be undertaken.

Pneumoconiosis due to Mica

The micas are a group of complex aluminum silicate compounds of several types. At least some of these are known to be capable of producing pulmonary fibrosis if inhaled in finely divided form in high concentration over a prolonged period. An exposure of several years to ordinary industrial environments containing these substances is necessary to produce disease.

The micas are used in the manufacture of paper products (especially that type of wall paper which has a high gloss surface), in the production of some paint products, as lubricants in combination with oils, and for insulating materials in electrical devices (condensors, motors and electrical heaters).

A study by the United States Public Health Service revealed 10 cases of pneumoconiosis in a group of 57 workmen who had been exposed to mica dust which was free from silica.[11] Policard found that the inhalation of mica dust can produce pathologic changes in the lungs which he believed to be identical to those produced by the inhalation of silica dust.[12]

Talc Pneumoconiosis

Talc is a natural finely powdered hydrous magnesium silicate. Commercial talc is of variable composition and is often mixed with other mineral substances. Talc is widely used in industry in the manufacture of paint, rubber, paper, insecticides and ceramics as well as

[11] Pub. Health Bull. No. 250, Washington, D. C., U. S. Public Health Service, 1940.
[12] J. Indust. Hyg., *16*:160, 1934.