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PRIMARY CARCINOMA OF THE LUNG

A DIAGNOSTIC STUDY OF ONE HUNDRED AND THIRTY-FIVE CASES IN FOUR YEARS

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Primary carcinoma of the lung is not a rare disease but constitutes about 6 to 8 per cent of all carcinomas.[1] In frequency it ranks next to malignant conditions of the gastro-intestinal tract. Twenty years ago only 5 per cent of the cases were diagnosed clinically; today about 50 per cent are recognized during life. After a ten year study of this subject we are convinced that at least 90 per cent of the cases can be diagnosed. The clinician who is familiar with the pathologic and clinical manifestations of primary lung carcinoma can recognize most cases from the history, physical examination and roentgen study. In some cases a bronchoscopic examination, injection of iodized oil or artificial pneumothorax will be necessary. The diagnosis can be confirmed by a biopsy of the frequently enlarged cervical or axillary lymph nodes, by microscopic examination of pleural exudates or pieces of tissue in the sputum, or by removal of a piece of tissue from a bronchus.

During a four year period we have studied 135 cases of primary carcinoma of the lung. Most of these patients were seen at the Cook County Hospital, the rest in private practice and in other hospitals. Seventy-four cases were confirmed by necropsy, twenty-six by biopsy and thirteen by bronchoscopy, and twenty-two were diagnosed from the characteristic clinical and roentgen manifestations. This study has indicated that cancer of the lung is one of the most important pulmonary diseases in people past 40 years of age. It must always be considered in dealing with cases of lung abscess, bronchiectasis, recurrent pneumonia, empyema, hemorrhagic pleurisy and chronic pneumonia.

Pain in the chest or in other parts of the body, accompanied by a cough and bloody sputum and sooner or later followed by dyspnea, is the cardinal symptom. An area of pulmonary infiltration or atelectasis, enlarged supraclavicular or axillary lymph nodes, a hemorrhagic pleural effusion, paralysis of a diaphragm or of one of the vocal cords, a Horner syndrome, and evidence of bone, brain, liver or other metastases make the diagnosis quite certain. Tuberculosis is usually easily excluded but may occasionally accompany lung carcinoma. The roentgen signs are diagnostic in a high percentage of cases. The bronchoscope is of great value in confirming the diagnosis and in treatment, but the correct diagnosis can be made in most cases without its use. The finding of carcinoma in a biopsy from an enlarged lymph node, a bronchus, tissue in the sputum, sediment from a pleural effusion, or a piece of tissue obtained by thoracotomy completes the diagnosis. We shall at this time discuss our observations, with special attention to the diagnosis of primary carcinoma of the lung, and shall publish a more complete study at a later date.

AGE, SEX AND RACE

Among our 135 cases we find that 72 per cent occurred between the ages of 41 and 60 years. Twelve patients, or about 9 per cent, were from 21 to 40 years old. Table 1 gives the age incidence.

Ninety per cent of all our patients were chronic smokers, and we believe that the inhalation of tobacco smoke may be an important factor in producing chronic irritation with epithelial metaplasia in the bronchi or bronchioles. There were only twelve cases, or 9 per cent, among Negroes, all of whom were patients at the Cook County Hospital, where about 30 per cent of all the patients are colored. There were 125 men and only ten women in our series.

PATHOLOGIC CHANGES

Certain pathologic changes in this series are of great importance from the diagnostic standpoint, and these will be considered. Of the 135 cases eighty-two, or 60 per cent, occurred in the right lung and fifty-three, or 40 per cent, in the left lung. In the seventy-four necropsy cases there were forty-two in the right lung and thirty-two in the left. The greatest number of carcinomas were found in the right upper lobe with twenty-four, left upper thirteen, left lower twelve, and right lower eleven. Seven involved the entire left lung and six the entire right lung. Only one was primary in the right middle lobe.

All carcinomas of the lung are bronchogenic in origin.[2] They arise in the trachea, bronchi or bronchioles. There can be no carcinoma primary in the alveoli, as they have no epithelial lining. The tumors arise from a metaplasia of the basal cell layers of epithelium, less differentiated multipotential cells which can reproduce

From the Medical Service of Dr. Aaron Arkin, Cook County Hospital, and the Cook County Graduate School of Medicine.

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columnar epithelium, squamous epithelium, or undifferentiated round or spindle cells. Such metaplasia of the bronchial epithelium has been found in influenza.[3] Some tumors may arise from the mucus-secreting glands of the bronchi. There are, therefore, three types of carcinoma: (1) adenocarcinoma, (2) squamous cell and (3) undifferentiated round or spindle cell. In our seventy-four necropsy cases twenty-one, or 28 per cent, were adenocarcinomas, eighteen, or 24 per cent, were squamous cell and thirty-one, or 41 per cent, were undifferentiated round or spindle cell.

TABLE 1.—*Ages of the Patients*

Age	Number of Patients	Per Cent
21 to 30	1	1.3
31 to 40	9	12.0
41 to 50	20	29.0
51 to 60	29	41.7
61 to 70	12	16.2
71 to 80	1	1.3

The round and spindle cell carcinomas are the ones which were in the past often erroneously diagnosed as lung or mediastinal sarcomas.[4] All this type presented metastases at necropsy. All showed involvement of the bronchial lymph nodes. The abdominal lymph nodes were invaded in 50 per cent of the cases, the brain in 16 per cent and the bones in 21 per cent.

The adenocarcinomas are almost as malignant as the round cell form. All this group presented metastases. Bone lesions were most frequent, with 48 per cent of the cases showing bone metastases.

The squamous cell carcinomas are less malignant than the other forms and offer the best prognosis for early surgical removal. Still six of eighteen cases presented brain metastases. Metastases in the liver, kidneys and adrenals were only one-third as frequent as in the other types.

The great importance of the frequent lymphogenic and hematogenic metastases in the diagnosis of primary carcinoma of the lung will be emphasized when we discuss the different clinical types of this disease. Not only is dissemination by the blood stream (owing to the ready access of the tumor to the pulmonary veins and vena cavas) a common occurrence, but also extension from the tracheobronchial lymph nodes to the periaortic, peripancreatic, perigastric, periportal and retroperitoneal nodes. The presence of abdominal tumor masses may easily lead to an erroneous diagnosis.

Of the seventy-four necropsy cases all but one presented metastases, and this case was a squamous cell carcinoma. A knowledge of the histologic types of lung carcinoma is of importance to the clinician as well as to the pathologist. The physician should order a biopsy whenever there are accessible cervical or axillary gland masses, pleural effusions, tumor tissue on bronchoscopic examination, or operation on the chest wall. Bone metastases, tumor tissue found during an exploratory laparotomy, or skin nodules may furnish material for the diagnosis. A knowledge of the three important histologic types is therefore of great diagnostic value. Undoubtedly in the past adenocarcinoma of the lung with abdominal metastases was sometimes mistaken for a primary carcinoma of an abdominal organ unless a complete and careful necropsy was obtained. We know that most of the round cell, oat cell, or spindle cell "sarcomas" of the lung are really carcinomas of bronchogenic origin. A round cell carcinoma metastasis in a lymph node may be mistaken for a lymphosarcoma.

Anatomically we have divided our cases of lung carcinoma into five types: (1) intrabronchial, (2) hilar or central, (3) intermediary, (4) peripheral and (5) lobar or diffuse. Such a division is of importance in the early diagnosis of this disease. The physical and roentgen changes, symptoms, and operability depend largely on the location of the tumor in the early stage. These types, of course, are not sharply defined and merge into one another with the progress of the disease.

Associated pathologic lung changes are very frequent and may mask the underlying primary disease. Lobar pneumonia and bronchopneumonia occurred in 28 per cent, chronic pneumonia in 20 per cent, and bronchiectases in 43 per cent. Abscess or gangrene, either in the tumor itself or in the surrounding lung parenchyma, developed in 20 per cent. Pleural involvement with a carcinomatous lymphangitis, hemorrhagic, serous or purulent exudate or marked thickening was found in 50 per cent of the cases at necropsy. Atelectasis of part of a lobe or an entire lobe was often due to bronchus stenosis. Active pulmonary tuberculosis was found in only three of seventy-four cases and is certainly not a factor in the causation of lung cancer. Pneumoconiosis was rare.

SYMPTOMS

The failure to recognize lung carcinoma more frequently can be attributed in part to the great variation in the symptoms of this disease. These symptoms depend on the location and size of the primary tumor, the secondary changes that so often occur, and the location of metastases. In a small group, about 15 per cent, the primary tumor produces no signs or symptoms. Some of these cases can be diagnosed by bronchoscopy if the lesion is in a large bronchus, but this is seldom done when there are no pulmonary symptoms. This occult type causes symptoms when lymphogenic or hematogenic metastases develop.

TABLE 2.—*Metastases in Seventy-Four Necropsy Cases*

	Number	Per Cent
Regional lymph nodes (tracheobronchial, bronchial)	66	89
Cervical lymph nodes (clinical finding)	40	54
Axillary lymph nodes (clinical finding)	20	27
Abdominal lymph nodes	38	50
Pleura	33	45
Adrenals	32	43
Liver	29	40
Kidneys	24	32
Lungs	22	30
Bones	21	28
Nervous system	18	24
Pancreas	11	15
Heart and pericardium	10	14
Compression of superior vena cava	9	12
Intestinal tract	8	11
Pulmonary veins (main vessels)	7	10
Spleen	6	8
Skin	7	10
Esophagus	5	7
Thyroid	4	5
Cervical sympathetics	7	10
Inferior vena cava	3	4
Pulmonary artery (compression)	2	3
Testicle	1	1.4
Urinary bladder	1	1.4
Seminal vesicles	1	1.4
Aorta (compression)	1	1.4

In our large series of 135 cases sixty-nine patients, or 51 per cent, had chiefly extrapulmonary manifestations. The signs and symptoms were predominantly outside the lungs. Only sixty-six patients, or 49 per cent, had symptoms that were largely pulmonary. We have classified our cases into clinical types with reference to the outstanding clinical manifestations (table 4).

3. Askanazy, M.: Ueber die Veränderungen der grossen Luftwege bei der Influenza, Cor.-Bl. f. Schweiz. Aerzte 49:445 (April 12) 1919. Winternitz, M. C.; Wason, J. M., and McNamara, F. P.: The Pathology of Influenza, New Haven, Conn., Yale University Press, 1920.

4. Barnard, W. G.: The Nature of the "Oat-Celled Sarcoma" of the Mediastinum, J. Path. & Bact. 29:241 (July) 1926.

Pulmonary Type.—In the pulmonary type the symptoms are usually a cough, hemoptysis, pain in the chest, and dyspnea. These symptoms in a person past the age of 40 are very suggestive of carcinoma of the lung. The average duration of symptoms at the time of the first examination was eight months. In a few cases the symptoms dated back three years or longer, and it is interesting that these were mostly cases of squamous cell carcinoma. In other cases the complaints were of short duration, a few days to a few weeks, with onset with a chill and fever as in pneumonia. A history of repeated attacks of bronchitis, pleurisy or pneumonia was given by 25 per cent of the patients.

TABLE 3.—*Metastases in the Different Histologic Types of Lung Carcinoma*

No. of Cases	Type	Tracheobronchial Bronchial Nodes	Abdominal Nodes	Central Nervous System	Liver	Kidneys	Adrenals	Bones
24	Round cell	24 (100%)	12 (50%)	4 (16%)	14 (58%)	8 (33%)	12 (50%)	5 (21%)
21	Adenocarcinoma	17 (81%)	10 (48%)	5 (24%)	10 (48%)	9 (43%)	12 (57%)	10 (48%)
19	Squamous cell	13 (72%)	1 (6%)	6 (33%)	3 (16%)	4 (22%)	3 (16%)	3 (16%)
7	Spindle cell	7 (100%)	4 (57%)	2 (28%)	0	1 (14%)	3 (43%)	2 (28%)
4	Miscellaneous	4 (100%)	1 (25%)	1 (25%)	2 (50%)	2 (50%)	2 (50%)	1 (25%)
75	Totals	65 (86%)	28 (38%)	18 (24%)	30 (40%)	24 (32%)	32 (43%)	21 (28%)

The cough is usually progressive and fails to respond to rest or medication. It is dry at first, later often productive of a blood-streaked mucoid or purulent sputum. In some cases there is a sudden onset of the cough with pneumonic symptoms. Because of the bloody sputum a diagnosis of tuberculosis is frequently made, although tubercle bacilli are absent. Later a brassy pressure cough, often with an asthmatoid wheeze, causes great discomfort. A persistent cough was present in 106 of our 135 cases, about 80 per cent.

Hemoptysis is often the first symptom of lung carcinoma. At first the sputum is blood streaked only at intervals. Later a severe hemoptysis may occur. We have seen several cases in which there was fatal hemorrhage. Bloody expectoration in the absence of pulmonary tuberculosis or mycosis or cardiac disease is very suggestive of lung cancer. The sputum should always be carefully examined for tissue fragments. Fixation and microscopic sections may make the diagnosis certain. We have found tumor tissue in the sputum in several cases. Hemoptysis occurred in fifty-eight of our cases, or 43 per cent.

Pain is the second most frequent symptom. It is more continuous than in any other thoracic disease except possibly aortic aneurysm with bone destruction. The pain is sharp and lancinating and is usually due to involvement of the pleura, intercostal nerves or bony structures. Metastases in the spine and ribs are very frequent. In patients with pleural effusion the pain does not disappear with the development of the effusion but becomes more and more severe. Such continuous pain in the chest, in the absence of an aneurysm or metastases from some other source than the lungs, is almost diagnostic. Often the pain is aggravated or induced by percussion of the chest. This finding we consider highly significant. Thoracic pain occurred in seventy-nine, or 58 per cent, of all cases, and extrathoracic pain in fifty-eight patients, or 43 per cent. Ninety-nine, or 73 per cent, suffered severe pain.

Dyspnea may be an early or a late symptom. It may be due to stenosis of a bronchus by the tumor or compression of the trachea or bronchi by lymph node metastases. With the dyspnea there is often an asthmatoid wheeze or brassy cough. Other causes of dyspnea are large pleural effusions, pressure on the superior vena cava or pulmonary blood vessels, pericarditis, atelectasis, or acute or chronic pneumonia. Dyspnea was marked in seventy patients, or 52 per cent.

The general effects of lung carcinoma are mainly loss of weight, fever, weakness, night sweats, and fatigue. A leukocytosis is common. Clubbed fingers occurred in 15 per cent of the cases. The symptoms due to metastases or extension from the primary tumor are of great importance, as will be seen from a discussion of the other clinical types.

Osseous Type.—This is one of the most frequent forms encountered by us. Of thirty-five patients with bone metastases among 135 cases, we have placed twenty-one in this group. The first complaint is sharp severe pain in the chest wall, often limited to certain ribs, or in the spine, skull, pelvic bones or an extremity. The patient may enter with a pathologic fracture, as did three of our patients. A careful history usually but not always elicits the presence of a cough or hemoptysis. Roentgenograms of the painful parts usually present the changes of osteolytic or osteoclastic metastases. There are irregular small or large areas of bone destruction. We have found them most often in the ribs, skull, pelvic bones, sternum, ends of the long bones, scapula and clavicle. Sometimes large soft tumor masses develop, which may be mistaken for a bone sarcoma. In all cases of osteoclastic bone metastases a lung carcinoma must be considered as the primary site. In our experience lung cancer is one of the most frequent causes of osteoclastic bone metastases. In the differential diagnosis of bone metastases breast, thyroid and kidney carcinoma, melanoblastoma, ovarian carcinoma, and any other malignant condition must be considered. We have recently had two cases of stomach carcinoma presenting bone metastases in the ribs, clavicles and spine.

Cerebral Type.—This group is next in frequency. Twenty of 135 patients presented symptoms in the central nervous system. Of these we have included thirteen cases in this group because of the outstanding cerebral changes. Five of the patients were admitted to neurologic services. Some were at first diagnosed as cerebrospinal syphilis, meningitis, brain abscess, encephalitis, cerebral hemorrhage, or brain tumor. When a person of middle age has an abrupt onset of signs and symptoms of a rapidly developing intracranial lesion a metastatic lung carcinoma should be considered and the lungs carefully examined and roentgenographed. Any part of the brain or cord may be affected. The cranial nerve centers are often involved, or there is a hemiplegia. Headache is common. The patient may be admitted in coma. A careful neurologic exam-

TABLE 4.—*Clinical Types of Lung Carcinoma*

	Cases	Per Cent
1. Pulmonary	80	60
2. Osseous	21	16
3. Cerebral	13	10
4. Cardiac	12	9
5. Gastro-intestinal	11	8
6. Lymphoglandular	9	6
7. Hepatic	3	2

ination is indicated in every patient with lung cancer. Brain metastases were found in eighteen of seventy-four necropsy cases, or 24 per cent. Not all these presented clinical symptoms.

Cardiac Type.—This series includes twelve cases in which heart signs and symptoms were outstanding and the lung changes less evident. The heart, pericardium and great vessels are frequently invaded by the tumor. Cancer of the right upper lobe often compresses or invades the superior vena cava or innominate vein, with symptoms like those of a mediastinal tumor. The clinical picture of a right heart hypertension or decompensation has occurred in a number of cases. In two cases the pulmonary artery was surrounded and compressed; in seven the pulmonary veins were stenosed. The extensive perivascular carcinomatous lymphangitis may cause narrowing of many smaller pulmonary vessels. Infiltration of the pericardium and myocardium occurred in ten cases. Sometimes the inferior vena cava or hepatic veins are involved, producing hepatic enlargement and stasis with ascites, and edema of the lower extremities. The chief symptoms in this cardiac group are dyspnea, cyanosis, edema, cardiac enlargement and occasionally ascites.

Gastro-Intestinal Type.—Here we have included eleven cases. The chief cause of the gastro-intestinal signs and symptoms is the presence of abdominal metastases. Thirty-eight per cent of our necropsy cases revealed metastases in the abdominal lymph nodes. These form huge masses in the periaortic, peripancreatic, perigastric and periportal nodes. The liver was enlarged in 24 per cent of all our cases and showed metastases in 40 per cent of the necropsy cases. In four cases a large nodular epigastric tumor was mistaken for a carcinoma of the stomach or colon. Even the roentgen examination may be misleading. We have seen filling defects due to compression or infiltration of the stomach wall. In two cases the metastases led to pyloric obstruction. In three, gastric or duodenal hemorrhages followed compression with secondary ulceration. With jaundice, which occurred in six cases, a carcinoma of the pancreas may be suspected. Nine of our patients complained of difficulty in swallowing, and in six of these the dysphagia was the first complaint. We were able to demonstrate compression of the esophagus by gland metastases in all these cases on roentgen examination with thick barium paste.

Lymphoglandular Type.—This form is due to extensive metastases in the supraclavicular, cervical or axillary lymph nodes as well as in the deeper nodes. One of our most valuable aids in the diagnosis of primary lung cancer has been a careful examination for enlarged cervical or axillary nodes. A large hard node is frequently found above the clavicle or behind the head of the clavicle. The diseases that cause the greatest difficulty in differential diagnosis are Hodgkin's disease and lymphosarcoma. When a node is accessible, a biopsy should always be done. In nine of our cases large hard cervical or axillary gland tumors were the outstanding manifestation. In two cases it was difficult to distinguish the gland masses from a primary carcinoma of the thyroid until the lung examination and biopsy showed lung carcinoma. Small carcinomas of the piriform sinus, nasopharynx or accessory nasal sinuses may produce large cervical metastases, and these must be excluded in a differential diagnosis.

Hepatic Type.—Here we have placed several cases presenting extensive liver metastases and great enlargement of the liver accompanied by jaundice. The jaundice is usually due to compression of the larger bile ducts or the common duct. Liver enlargement was found on physical examination in 24 per cent of all our cases. The large liver and icterus may easily lead to the diagnosis of a carcinoma of the head of the pancreas with liver metastases, or a primary malignant hepatoma when the gastro-intestinal tract is normal.

LUNG CHANGES

The physical changes vary greatly with the size and location of the tumor. In about 15 per cent of the cases there are no positive lung changes. These are the patients who present themselves because of bloody expectoration, pain or cough. Until the tumor produces stenosis of a bronchus with atelectasis or involves the peripheral lung tissue the percussion and auscultation may reveal nothing. However, the roentgen examination may be diagnostic even in the early stages.

The endobronchial form produces stenosis of a bronchus with atelectasis. There is dulness with suppressed or absent breath sounds. The chest wall is retracted with reduced mobility. The diaphragm is often elevated and the heart displaced toward the affected side. The absence of adventitious sounds speaks against tuberculosis. With partial bronchial occlusion there may be the characteristic cornage breath sounds, a peculiar type of tubular breathing.

The hilar or central form is one of the most frequent types, because many of the carcinomas originate in a main bronchus. There is often dulness or flatness on percussion to the right of the sternum or to the left of the heart. We have often found paravertebral dulness at the level of the second to fourth dorsal spines. Hard enlarged supraclavicular or axillary lymph nodes point to lung carcinoma. In the nodular type of tumor the phenomena are those of a mediastinal tumor with dulness and pressure symptoms. There is often an asthmatoid wheeze, brassy cough, distention of the veins of the head and neck, and cyanosis. When flatness extends to the infraclavicular region with suppressed or absent breath sounds, the diagnosis is easy. A high diaphragm with paradoxical movement, a Horner syndrome, paralysis of a vocal cord or dysphagia often occurs and assists in making the correct diagnosis. The abdomen should always be carefully examined for liver enlargement or tumor masses.

The lobar form occurs most often in the upper lobes, where the diagnosis is usually easy to make. There is a peculiar flatness with increased resistance on percussion. The flatness often has a convex lower border. It extends beyond the sternum to the opposite side, because of mediastinal infiltration. This observation one of us[1] emphasized in 1930. Over the area of flatness the breath sounds are weak or absent and the auscultatory changes are minimal. Occasionally loud bronchial breathing is heard when the bronchus is not obstructed. Cornage breath sounds, flatness, bloody sputum and enlarged supraclavicular nodes are the chief characteristics of this form. In the late stage the entire lung may be involved or an extensive hemorrhagic pleural effusion may develop, with little or no cardiac displacement. Aspiration and artificial pneumothorax may be necessary to reveal the underlying lung tumor. The fluid should be examined for tumor cells.

ROENTGEN EXAMINATION

In the diagnosis of primary carcinoma of the lung the roentgen ray is an indispensable aid. Not only will it confirm the clinical diagnosis in a high percentage

of cases but it will also reveal certain cases that cannot be diagnosed in any other way. After a wide experience with numerous postmortem studies we are prepared to state that about two thirds of the cases can be diagnosed from the roentgen study alone. In the other one third a pleural effusion or empyema, pneumonia or lung abscess, marked pleural thickening, or involvement of an entire lung may make the roentgen diagnosis difficult or impossible. Even in this difficult group greater exposure of the affected side will often reveal diagnostic changes. Injection of iodized oil often discloses stenosis of a bronchus by the tumor. An enlargement, distortion and increased density of the hilar shadow on the opposite side, bone metastases, paralysis of a diaphragm, a massive effusion with little or no cardiac displacement, or lung metastases, are all x-ray aids to a correct diagnosis. In difficult cases the bronchoscope may be necessary for the final decision.

The hilar type leads to an enlarged dense hilar shadow. It is often composed of the nodular tumor, bronchial gland metastases, and lymphangitis along the blood vessels and bronchi. A branching radiary shadow invades the lung field, with increase in the size, density and number of the lung markings. The picture is so characteristic that the diagnosis is usually easy. In some cases Hodgkin's disease or lymphosarcoma may produce a similar picture, and then a biopsy of a lymph node or piece of tissue from a bronchus may be necessary for diagnosis. Often there is the picture of a lymphangitis carcinomatosa with numerous small shadows connected by a fine network. Obstruction of a bronchus leads to the picture of atelectasis with traction of the heart to the affected side, often a high diaphragm, and marked reduction in size of the lobe. The border is often sharply defined before tumor infiltration takes place. Atelectasis plays an important rôle in producing the early shadows of lung carcinoma.[5]

The lobar type produces a very dense shadow. The outline at the interlobar fissure may be sharp and convex. Later it becomes irregular, with many projections into the adjacent lobe. In the upper lobe the convexity of the lower border usually distinguishes carcinoma from tuberculosis or pneumonia. The hilar markings are enlarged, sometimes with nodular tumor shadows. Soon the shadow invades the adjacent lobe, sending numerous branching strands into the lung parenchyma. The diaphragm may stand high, owing to involvement of the phrenic nerve. Iodized oil often reveals the bronchus stenosis. Bronchiectases or abscesses are frequent occurrences in the tumor or surrounding lung tissue. A long exposure of the film is often necessary to reveal them. The tumor is usually radioresistant and does not decrease much after roentgen therapy.

Table 5 gives the important clinical observations in this series of 135 cases of primary carcinoma of the lung. Further details with illustrative cases will be published later.

SUMMARY

Primary carcinoma of the lung is one of the most frequent forms of malignancy in adults. It ranks second to gastro-intestinal carcinoma and constitutes from 6 to 8 per cent of all malignant tumors. About 75 per cent of the cases occur between the ages of 40 and 60 years. In our series of 135 cases it was twelve times as frequent in males as in females.

The right upper lobe is the most common site. The tumors are all bronchogenic in origin and begin as a metaplasia of the basal epithelial cells. There are three important histologic types: (1) undifferentiated round or spindle cell, (2) adenocarcinoma and (3) squamous cell. All types have a marked tendency to produce lymphogenic and hematogenic metastases, but the squamous cell is usually less malignant than the other two types. Of seventy-four cases that came to necropsy only one presented no metastases. Eighty-eight per cent showed hilar gland metastases, 38 per cent abdominal lymph node, 40 per cent liver, 32 per cent kidney, 43 per cent suprarenal, 28 per cent bone, and 24 per cent brain metastases. The chief associated lung changes were pleural effusions (47 per cent), bronchiectases (43 per cent), acute pneumonias (28 per cent), chronic pneumonia (20 per cent), abscess or gangrene (20 per cent) and purulent bronchitis (19 per cent).

In 51 per cent of all cases the signs and symptoms were predominantly outside the lungs; only 49 per cent presented changes that were largely thoracic. This important fact explains the present failure in most clinics to diagnose 50 per cent of the cases. In the hope of bringing the correct diagnoses to 90 per cent, where we think they ought to be, we have divided the cases into the following clinical types and discussed each: (1) pulmonary, (2) osseous, (3) cerebral, (4) cardiac, (5) gastro-intestinal, (6) lymphoglandular and (7) hepatic.

The peculiarly characteristic history of pulmonary well being to within an average period of eight months before seeking medical aid, the development of bronchitis or recurrent attacks of pneumonia or pleurisy, followed by persistent cough, pulmonary or extrapulmonary pain, hemoptysis, and dyspnea, should enable the physician to suspect lung carcinoma. A characteristic complex of physical changes is observed in most cases. The roentgen study alone makes the diagnosis possible in at least two thirds of the cases. The bronchoscope is of great value in confirming the diagnosis, but most cases can be recognized without it. The presence of one of the three types of carcinoma in a biopsy specimen from a bronchus, lymph nodes, pleural exudate, or tissue found in the sputum will establish the diagnosis.

TABLE 5.—*Observations in One Hundred and Thirty-Five Cases of Primary Carcinoma of the Lung*

	Cases	Per Cent
Positive physical changes in the chest	110	82
Cough	108	80
Pain (thoracic, extrathoracic)	99	73
Loss of weight (10 pounds or more)	88	64
Dyspnea	70	52
Hemoptysis	58	43
Purulent sputum	19	14
Cervical adenopathy	53	40
Axillary adenopathy	37	28
Leukocytosis (10,000 or more)	37	28
Fever (1 degree F. or more)	37	28
Demonstrable bone metastases	35	26
Liver enlargement	33	24
Cyanosis	29	21
Clubbed fingers	21	15
Dilated veins of neck, chest	21	15
Paralysis of diaphragm	20	15
Central nervous system involvement	20	15
Hoarseness	18	13
Asthmatoid wheeze	13	10
Recurrent laryngeal nerve paralysis	10	8
Dysphagia	9	7
Horner syndrome	8	6
Skin metastases	7	5
Subleukemic blood picture	6	4
Jaundice	6	4
Anisocoria	4	3

5. Cohn, Max: Die nichttuberkulösen Lungenkrankheiten im Röntgenbilde, Würzburger Abhandlungen a. d. ges. d. Med. 23:1, 1924.

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