PRIMARY CARCINOMA OF THE LUNG, WITH INVASION OF THE RIBS

PNEUMONECTOMY AND SIMULTANEOUS BLOCK RESECTION OF THE CHEST WALL

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CLINICAL REPORTS have directed little attention to the incidence, behavior, and treatment of carcinoma of the lung invading the bony thorax, and such extension has been accepted generally as a contraindication to curative surgical attempts.[2, 3, 9, 11] The purpose of this communication is to question the relegation of these patients to an incurable group and to emphasize a method of treatment based upon sound principles of cancer surgery.

The incidence of bony thorax invasion is probably between five and ten per cent of all patients with carcinoma of the lung. Pathologic studies[5, 6, 7] have not only pointed out the frequency of chest wall invasion, but have emphasized the behavior of the cell type in relationship to rib erosion. In Koletsky's[5] study, five, or 8.3 per cent, of the 40 patients with squamous cell carcinoma of the lung showed an associated rib destruction, and this observation was confined to this cell type. A histologic diagnosis of primary cancer of the lung was made in 88 consecutive cases during the past eight years by the author. Seven patients, or 8 per cent, showed invasion of the chest wall, characterized by rib destruction in six cases.

The relationship of the cell type of carcinoma of the lung to erosion of the ribs or vertebrae is striking; however, there is a paucity of literature in attempting to confirm this correlation. The majority of so-called Pancoast[8] tumors are carcinomas of the lung. These tumors have as one clinical feature the local and adjacent destruction of a rib, and it was of interest to review the cell types of some of the published cases. Stein[10] reported 27 cases of malignant lesions in the region of the pulmonary apex, so-called superior pulmonary sulcus tumors. In nine bronchogenic carcinomas in which the cell type was determined, six were of the squamous cell variety and three were classified as adenocarcinomas. Habein and Miller[4] were able to collect, in 1938, a series of 27 reported cases fulfilling the requirements for a diagnosis of a Pancoast tumor. The cell type was given in 19 tumors, and in 14, where the bronchogenic origin seemed most probable, the squamous cell variety accounted for ten, adenocarcinoma two, medullary carcinoma one, and undifferentiated carcinoma one. Five of the 100 patients with carcinoma of the lung studied at autopsy by Koletsky[5] showed rib destruction, and in each instance the squamous cell type of tumor was present. In my series of 88 histologically proved carcinomas of the lung, the incidence of the squamous cell variety was 47 per cent, adenocarcinoma 24.1 per cent, and small cell carcinoma 28.9 per cent. The cell type was unclassified in five cases. The six cases showing invasion and destruction of a rib or ribs were of the squamous cell type. One

adenocarcinoma showed pericostal invasion of the soft tissue of the chest wall, but there was no osseous extension of the tumor. In our study of cases, 15.4 per cent of the squamous cell variety of lung cancer invaded the ribs, and this behavior was limited to this cell type. Squamous cell carcinomas of peripheral bronchogenic origin constitute the majority of primary lung tumors characterized by invasion of the chest wall with rib destruction.

The behavior of peripheral squamous cell carcinomas is not unlike the more centrally placed tumors of this type. This variety of tumor invades contiguous structures, infiltrates, grows slowly and metastasizes late in the course of the disease. In 100 postmortem examinations, Koletsky[5] found no extrathoracic dissemination in 65 per cent of the 40 cases with the squamous cell type. Olson[7] found regional node metastasis in 55 per cent and no nodal involvement in 14 per cent of 27 squamous cell carcinomas studied at autopsy. The behavior of this cell type is well-appreciated clinically. Thirteen of the 14 surviving patients in Adams[1] series of 49 pulmonary resections belong to the squamous cell group. In my series of 88 patients with carcinoma of the lung, it was possible to undertake a curative resection in 17, and of this group eight were of the squamous cell variety.

Although extension of carcinoma of the lung to the bony thorax is indicative of a well-advanced lesion, it is not indicative of a hopeless situation. If the local lesion can be excised with a healthy margin of soft tissues and bony thorax, the prognosis is favorable. In four cases accompanied by rib destruction, Koletsky[5] found no metastasis to the regional nodes at autopsy. In the six patients herein reported, there was no extension to the regional nodes.

Primary carcinoma of the lung accompanied by rib destruction in the majority of instances is due to the squamous cell type of tumor. The favorable pathologic behavior of this cell type lends itself well to radical cancer surgery. This has prompted the following case reports.

CASE REPORTS

Case 1.—C. C., a 40-year-old white female, had an 11 months' history of pain in the right chest unaccompanied by cough or other symptoms suggesting pathology of the right lung. The pain did not radiate down the right arm but remained localized to the right side of the chest. The pain was described as being of a sharp and "tearing" character, and for two months prior to her hospital admission morphine had been used daily to alleviate this symptom. The past history did not contribute any pertinent information, and the family history was irrelevant.

Physical Examination: The patient was having acute pain. Tenderness was present over the third rib adjacent to the spine. No other physical findings of pathology were present. The routine laboratory studies were negative. Roentgenologic examination of the thorax revealed a right apical tumor mass adjacent to the spine. The diagnostic bronchoscopy was negative and the right upper lobe orifice did not appear to be retracted upward. A diagnostic pneumothorax revealed a tumor mass involving the right upper lobe and the adjacent thoracic wall (Fig. 1). The third rib was partially destroyed adjacent to its respective transverse process.

Operation.—February 2, 1940: A right upper lobe lobectomy was performed, removing a block of the chest wall with the specimen. Posteriorly, the second, third, fourth and fifth ribs and their respective transverse processes were divided. The neurovascular

bundles were ligated. The ribs and intercostal bundles were divided in the anterior axillary line. The tumor mass had invaded and destroyed the head of the third rib and the tip of the third transverse process. There was no metastasis present in the mediastinal nodes.

Pathologic Report: Squamous cell carcinoma of the lung with osseous invasion of the third rib and transverse process.

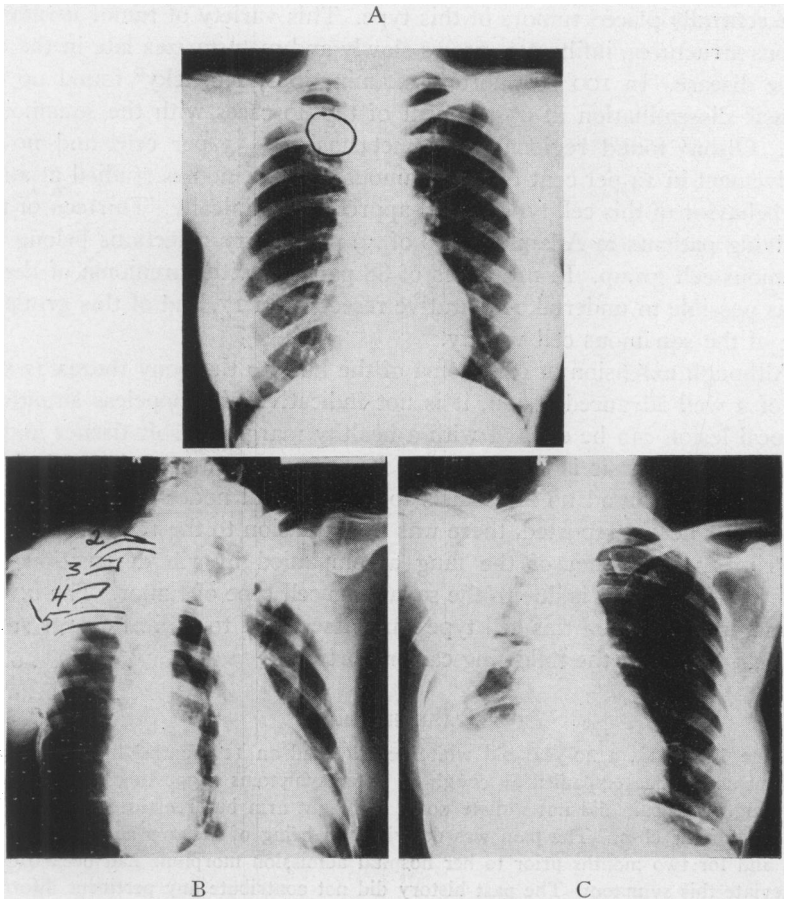

FIG. 1.—(A and B) Case 1: Routine and overexposed roentgenograms showing destruction of 3d, and 4th ribs adjacent to transverse processes.

(C) Postoperative roentgenogram showing upper lobe lobectomy and block excision of chest wall.

Postoperative and Late Course: On the 21st postoperative day this patient was discharged from the hospital, after an uneventful convalescence. She was entirely symptom-free for a period of eight months. At this time the patient complained of pain in the region of the third dorsal vertebra and one month later a paraplegia developed at this level. She grew progressively worse and died 11 months after the pulmonary resection.

Autopsy: There was no evidence of metastasis to the hilar lymph nodes. There was a local extension of the tumor which could not be removed at the time of the operation. Extensive invasion of the third dorsal vertebra and spinal cord was evident.

COMMENT: This was a palliative lobectomy, with simultaneous block resection of the chest wall. When such tumors invade the vertebrae a curative resection would appear impossible.

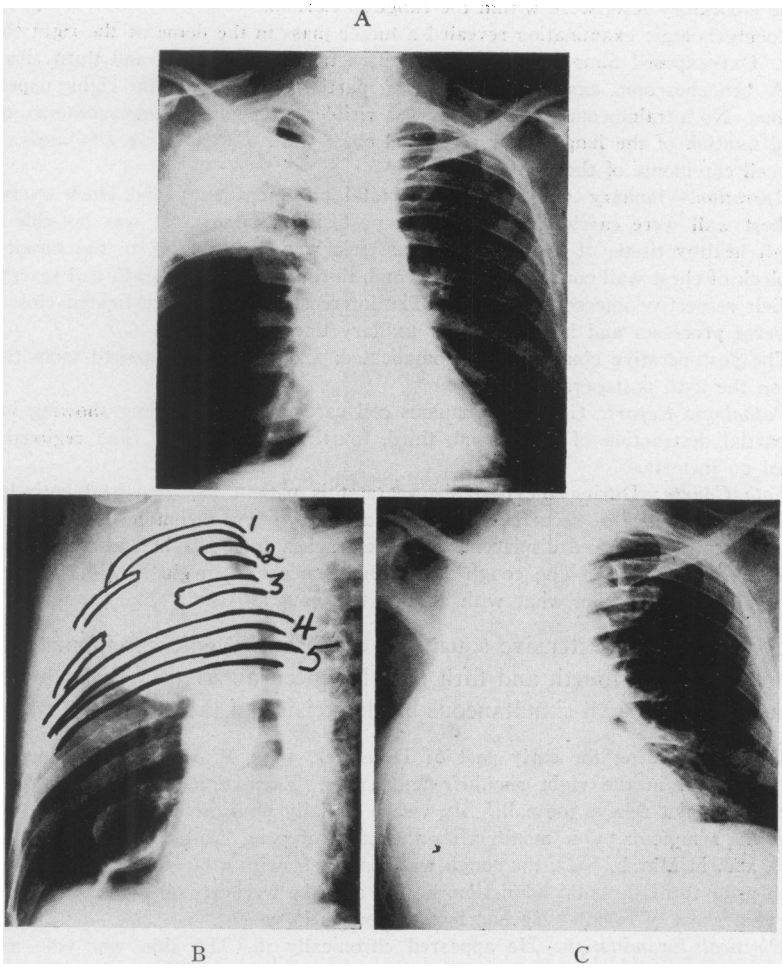

FIG. 2.—(A and B) Case 2: Routine and overexposed roentgenograms showing a large peripheral squamous cell carcinoma of the lung, with destruction of the 2d and 3d ribs. Note in (A) the clear zone between the mesial border of the tumor and mediastinum.
(C) Routine roentgenogram of chest six years after operation.

Case 2.—J. B., a 55-year-old white male, had a nine months' history of pain in the right chest. The pain was severe in character and localized to the right infraclavicular region. Three months prior to his hospital admission he developed hemoptysis, and consulted a number of physicians relative to this complaint. During the ensuing three

months he lost 20 pounds in weight, and dyspnea became a troublesome symptom. The past history and family history were not significant.

Physical Examination: This examination revealed all the positive findings to be limited to the chest. Deep inspiration exaggerated the pain in the right chest, which corresponded to the distribution of the third intercostal nerve. There was an inspiratory lag on the right. Tenderness over the third rib posteriorly was elicited by percussion. Dullness was present in the right scapular region and high in the right axilla. The breath sounds were decreased in these two locations. No neurologic signs were present. The routine laboratory tests were within the range of normal.

Roentgenologic examination revealed a tumor mass in the dome of the right thoracic cavity. Overexposed films showed partial destruction of the second and third ribs (Fig. 2). A bronchoscopic examination revealed partial fixation of the right upper lobe bronchus. No intralumenary tumor mass was visible. Preoperative pneumothorax demonstrated fixation of the lung, tumor mass and chest wall. *Preoperative Diagnosis:* Squamous cell carcinoma of the lung.

Operation.—January 4, 1941: A right total pneumonectomy and block excision of the chest wall were carried out through a posterior approach. It was possible to cut through healthy tissue of the chest wall posteriorly and anteriorly to the tumor mass. The block of chest wall consisted of the second, third, fourth, fifth, sixth and seventh ribs and their respective intercostal bundles. The intercostal vessels were ligated close to the transverse processes and in the anterior axillary line.

The postoperative course was uncomplicated, and he was discharged from the hospital on the 25th postoperative day.

Pathologic Report: Grade 4 squamous cell carcinoma of the lung showing invasion and partial destruction of the second, third, fourth and fifth ribs. The regional nodes showed no metastasis.

Late Course: During the past six years, this patient has remained entirely well. There is no evidence of recurrence. He has a cough, but a recent bronchoscopic examination revealed a marked displacement of the trachea to the right and a smooth, well-healed bronchial stump. The cough appears mechanical in origin. A soft and yielding chest wall interferes somewhat with an effective cough.

COMMENT: An extensive squamous cell bronchogenic carcinoma invading the second, third, fourth and fifth ribs, has been apparently cured by a right pneumonectomy, with simultaneous block excision of the chest wall.

Case 3.—During the early part of December, 1942, F. P., a white male, age 41, developed pain in the right shoulder and axilla. Extraction of two teeth for apical abscesses did not relieve the pain. Six weeks of daily physical therapy seemed to exaggerate his symptoms. One month after the onset of pain, he developed a nonproductive cough, and, in March, 1943, the cough was associated with a blood-streaked sputum. One month prior to his hospital admission, he felt as if he were growing weaker, and he was somewhat short of breath. He had lost 15 pounds in weight.

Physical Examination: He appeared chronically ill. The skin was pale and dry. The positive physical findings were limited to the chest. Tenderness was present over the right scapular region. Dullness to percussion and suppression of the breath sounds were present in this region. There were no positive neurologic findings and no evident extrathoracic extension of a possible tumor of the lung. The routine laboratory work was within normal limits. Roentgenologic examination showed the apex of the right lung to be obscured by a dense opacity measuring 6.5 cm. in diameter. The mass lay posteriorly and extended into the costovertebral gutter. Overexposed films revealed partial destruction of the second rib posteriorly (Fig. 3). The preoperative diagnosis was squamous cell carcinoma of the lung.

Operation.—May 15, 1943: A posterolateral incision was made, entering the right

pleural cavity through the seventh intercostal space. A large tumor mass replaced the apical one-half of the right lung and had invaded the second, third, fourth and fifth ribs. Resection seemed feasible, in that disarticulation of the ribs accompanied by partial resection of the transverse processes would encompass the tumor and permit block excision through healthy tissue. The first, second, third, fourth, fifth, sixth and seventh ribs were treated in this manner posteriorly and then divided in the midaxillary line. This left attached to the tumor mass and right lung the seven ribs and their respective intercostal bundles. A right pneumonectomy was then carried out. He withstood the operative procedure satisfactorily, and at no time was he in any particular danger.

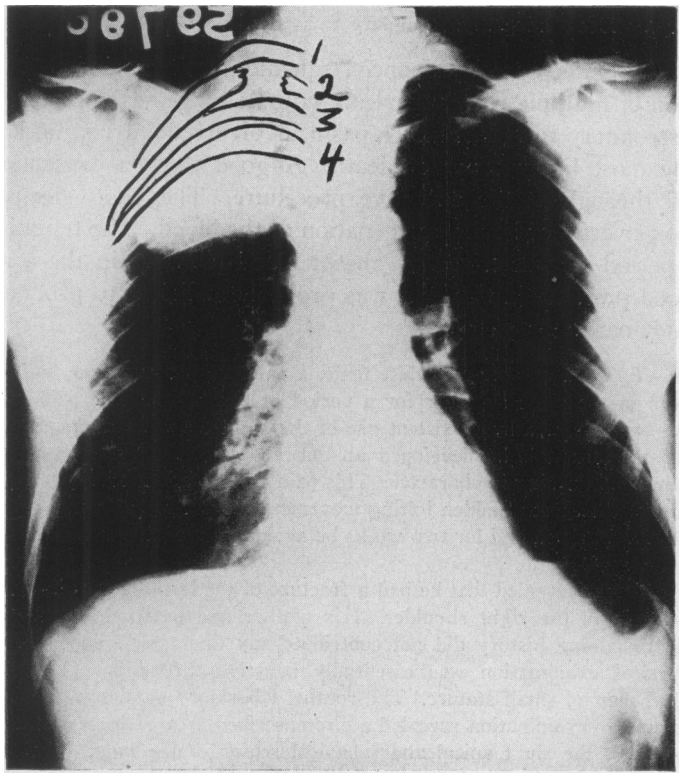

FIG. 3.—Case 3: Overexposed roentgenogram revealing a peripheral squamous cell carcinoma of the lung, with destruction of the 2d rib.

Twenty minutes after completion of the operation, the blood pressure was not obtainable in the arms. Such a marked change could not be explained on the basis of blood volume loss, for adequate blood replacement, 2,500 cc. of citrated blood, had been given; however, it was soon discovered that his blood pressure was normal in his legs and absent in the arms. A marked vasospasm following trauma and dissolution of the right sympathetic trunk was then considered as a possible etiologic factor. Papaverine effected an immediate response, and the blood pressure level in the arms returned to 100/70. This return of a satisfactory blood pressure level was delayed for approximately ten minutes, for the apparent disturbing factor was not recognized. During the ensuing 32 hours, this patient temporarily regained consciousness; however, he developed intermittent generalized convulsions associated with a variable pulse rate and blood pressure.

The respiratory exchange of the left lung was good. The convulsions were controlled by 25 per cent magnesium sulfate solution intravenously. The clinical picture was that of a decerebrated animal. The rectal temperature gradually rose to 108°F., and death occurred approximately 39 hours postoperatively.

Autopsy: The specimen of lung and adherent seven ribs revealed partial destruction of the second, third, fourth and fifth ribs by a Grade 4 squamous cell carcinoma of the lung. The regional nodes removed at operation were free of metastasis.

The findings at postmortem revealed, grossly, no cause of death. The left lung was normal. There was no evidence either grossly or microscopically of residual carcinoma. Examination of the brain revealed findings compatible with cerebral asphyxia. *Cause of Death:* Encephalopathy, secondary to asphyxia.

COMMENT: This was an advanced squamous cell carcinoma of the lung with erosion of multiple ribs, apparently curable by radical surgery. Cerebral asphyxia secondary to marked vasospasm involving the arms, neck and head seemed the most likely cause of death. A good oxygen concentration was maintained throughout the operative procedure. The photo-electric cell revealed a 90 per cent, or better, oxygenation of the blood. The ten-minute postoperative period, characterized by absent blood pressure in the arms with a normal blood pressure in the legs, was probably sufficient to produce irrevocable brain damage.

Case 4.—T. H., a 41-year-old white male, a painter by occupation, had a history of recurrent pain in the right shoulder for a period of two years. The pain was exaggerated by damp weather and by persistent use of the right arm. Four months prior to his admission to the hospital, he developed an entirely different type of pain which was sharp, shooting and burning in character. This pain would radiate from the right shoulder to the midline of the chest. Sudden jolting movements of the right shoulder would initiate the pain in the right chest, and for two weeks he avoided use of the arm. He had no cough and no shortness of breath.

The past history revealed that he had a fracture of the left humerus in 1938, at which time he had pain in the right shoulder. His mother and paternal grandfather died of cancer. The remaining history did not contribute any findings of importance.

The physical examination was essentially negative throughout. He was a fairly well-nourished man of small stature. The routine laboratory studies were negative.

Roentgenologic examination revealed a circumscribed area of increased density in the middle one-half of the right apical and subapical region of the lung. The total area of involvement measured six centimeters in diameter. In the lateral view there was a circumscribed shadow of slightly increased density in the mediastinal region measuring three centimeters in diameter (Fig. 4). This produced a wedge-shaped density quite characteristic of a lobular atelectasis. Bronchoscopic examination was negative and there were no secretions arising from the right upper lobe orifice. *Clinical Diagnosis:* Bronchogenic carcinoma of the upper lobe of the right lung.

Operation.—February 2, 1943: A total pneumonectomy was carried out on the right for a carcinoma involving the apex of the right lung and infiltrating the soft tissue of the chest wall. A frozen-section diagnosis of the soft tissue removed from the third interspace confirmed the clinical suspicion of invasion of the chest wall. Following removal of the right lung, a block resection of the chest wall was carried out removing the second, third, fourth, fifth and sixth ribs. The intercostal bundles were ligated adjacent to the transverse processes posteriorly, and anteriorly the bundles were divided in the anterior axillary line.

The pathologist reported bronchogenic adenocarcinoma of the lung, Grade 3, upper lobe bronchus right lung, with soft tissue extension to the chest wall. The regional nodes were not involved by metastasis.

The postoperative course was uneventful, with the exception of the development of a small residual empyema which was drained on March 4, 1943. The empyema cavity was unaccompanied by opening of the bronchus and rapidly decreased in size. Six weeks after drainage of the empyema, he returned to his home. He has been unable to return for follow-up examination.

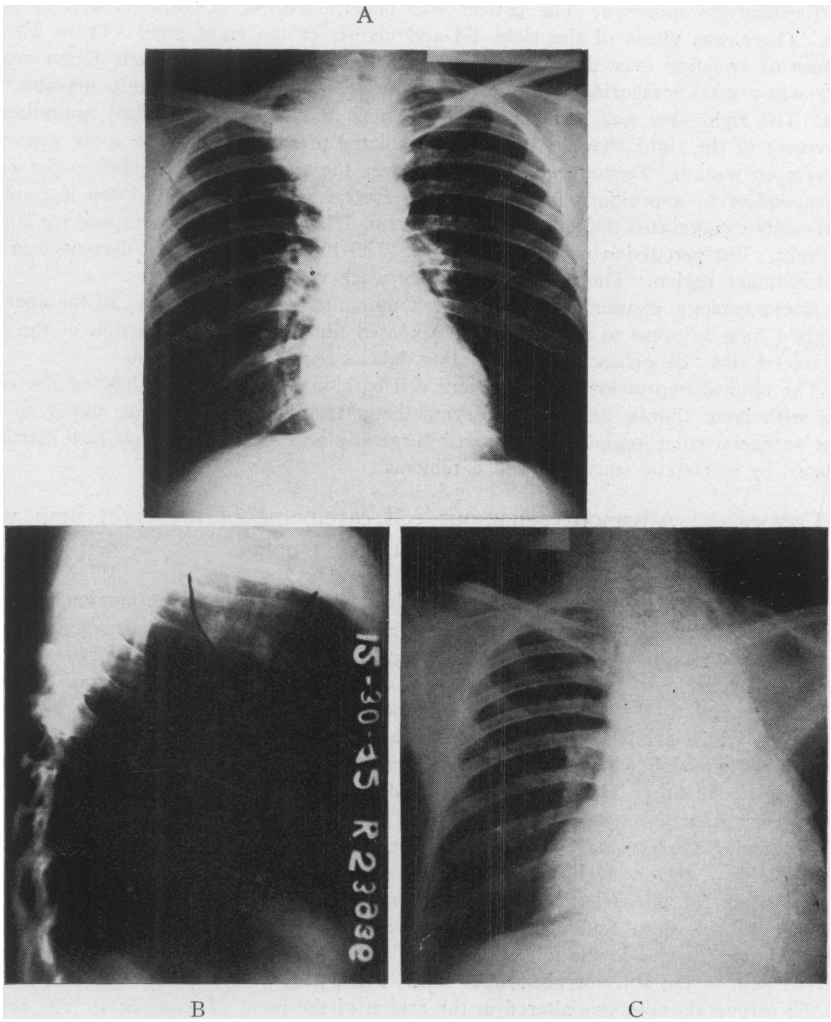

FIG. 4.—(A and B) Case 4: Routine PA and lateral roentgenograms of chest showing an apical tumor. Note the triangular area of atelectasis in the lateral film. (C) Routine roentgenogram six months after right total pneumonectomy and block excision of the chest wall.

COMMENT: This was an advanced adenocarcinoma of the right lung invading the soft tissue of the chest wall, unaccompanied by regional lymph node involvement. There was no associated rib destruction in spite of soft tissue involvement of the chest wall adjacent to the ribs.

Case 5.—T. J. was a colored male, age 42, who had a history of severe pain in the right shoulder and right side of the neck for a period of eight months. He had taken numerous drugs for the relief of pain without benefit, and two weeks prior to his admission to the hospital, the pain began to run down the inner aspect of the arm. He had been placed on morphine for the relief of pain. He had a cough for five months and a three months' history of repeated attacks of hemoptysis.

Physical Examination: The patient was undernourished, dehydrated, and in acute pain. There was ptosis of the right lid and myosis of the right pupil. There was an absence of sweating over the right side of the face. In the right supraclavicular region there was a mass measuring 1 x 2 cm. in diameter. This mass was freely movable and firm. The right arm was held close to the trunk and there was marked limitation of movement of the right shoulder. The pain radiated primarily down the inner aspect of the arm on motion. Tenderness was present over the suprascapular region on the right corresponding to approximately the first and second ribs posteriorly. Deep inspiratory movements exaggerated the pain in the right arm. There was a slight respiratory lag on the right. The percussion note was negative. The breath sounds were decreased in the right scapular region. The routine laboratory work was negative.

Roentgenologic examination revealed a tumor, measuring 4 x 6 cm., in the apex of the right lung adjacent to the spine. Overexposed films revealed destruction of the first and second ribs. Bronchoscopic examination did not seem to be indicated.

The clinical impression was squamous cell carcinoma of the upper lobe of the right lung with bony thorax and cervical sympathetic trunk extension. The tumor in the right supraclavicular region was removed surgically and showed a lymph node partially replaced by metastatic squamous cell carcinoma.

COMMENT: Advanced squamous cell carcinoma of the right lung with extension to the ribs and cervical sympathetic trunk.

Case 6.—M. R., a 64-year-old white male, and a salesman by occupation until the onset of severe pain in the right chest in June, 1939. The pain was exaggerated by coughing and by deep inspiratory efforts. Deep heat therapy and numerous remedies had been used for the relief of the pain. The pain was severe in character and radiated from the back around to the upper part of the abdomen. In February, 1940, he developed hemoptysis which persisted until the time of admission to the hospital on May 5, 1940. He had had a cough which was different from the customary "cigarette cough" for a period of six months. He had lost 15 pounds in weight and was short of breath on moderate exertion.

Physical Examination: The patient was an elderly white male, with acute pain in the right side of the chest. He described an area of tenderness and could easily point out its location in the midaxillary line. The examination was essentially negative with the exception of the chest findings. There was an area of localized tenderness over the sixth and seventh ribs in the midaxillary line, and pressure at this point reproduced the referred pain to the anterior abdominal wall. There was a respiratory lag on the right and the percussion note was altered in the region of the point of tenderness. The breath sounds were diminished over the lower lobe of the right lung. The routine laboratory studies were within the range of normal.

Roentgenologic examination revealed a 6 x 8 cm. mass involving the lower lobe of the right lung and partial destruction of the sixth, seventh and eighth ribs. A bronchoscopic examination revealed no evidence of an intralumenary tumor.

On May 9, 1940, a biopsy of the chest wall and partially destroyed eighth rib revealed squamous cell carcinoma apparently of bronchogenic origin.

This patient was discharged from the hospital two weeks after his admission and advised to take morphine for the relief of his pain. He lived for a six-month additional period during which time he had severe and persistent pain in the right chest.

Autopsy: A squamous cell carcinoma of the lower lobe of the right lung was identified. Extensive destruction of the sixth, seventh, eighth and ninth ribs was present; however, there was no metastasis to the regional lymph nodes. A bronchopneumonia involved primarily the right upper lobe and lower lobe of the left lung.

COMMENT: This extensive squamous cell bronchogenic carcinoma, associated with rib destruction, was operable and apparently curable at the time this patient presented himself for treatment. The author's experience in managing this type of patient suggested the likelihood of curability in such cases by a total pneumonectomy, with simultaneous block resection of the chest wall.

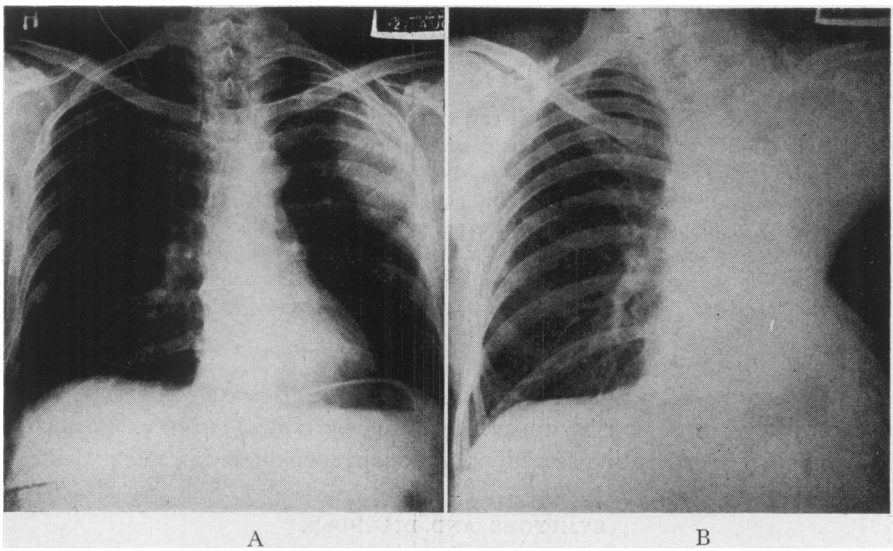

FIG. 5.—(A) Case 7: Regular PA roentgenogram of chest showing large peripheral squamous cell carcinoma of the lung, left.
(B) Case 7: Postoperative roentgenogram showing block excision of chest wall and total pneumonectory, left.

Case 7.—C. L., a 53-year-old white male, a farmer by occupation, developed pain in the left chest in January, 1946. The pain radiated from the precordial region posteriorly to the midportion of the back. Pain had been persistent in character and there had been frequent exacerbations of severe pain which required narcotics for symptomatic relief. Soon after the onset of pain in January, he began to have attacks of hemoptysis. Dyspnea had not been a troublesome symptom, except during the attacks of severe pain.

Past History: He had had a chronic cough for 20 years, but there was no change in the cough until January, 1946. Six years prior to this hospital admission, he sustained a blow to the left chest which rendered him unconscious. Pain and soreness followed this injury, but he entirely recovered within a period of one month. He had pneumonia as a child which was complicated by a lung abscess. This healed without operative intervention. The family history is irrelevant.

Physical Examination: The patient was in a good state of nutrition. The positive findings of the examination were limited essentially to the chest. There was a respiratory lag on the left. Percussion note was dull high in the axillary region and over the left scapular region. Breath sounds were diminished and vocal and tactile fremitus were

increased in these regions. Tenderness to palpation was present over the fourth, fifth, sixth and seventh ribs in the midaxillary line. The heart sounds were of good tone and quality. Blood pressure was 116/78. Kidney function tests revealed normal findings. Roentgenologic examination revealed a ten-centimeter mass in the lateral one-half of the left chest extending from a level of the third rib to a level of the seventh rib in the posterior axillary line (Fig. 5). Overexposed films showed destruction of the fourth, fifth and sixth ribs in the posterior axillary line. *Clinical Diagnosis:* Squamous cell carcinoma of the lung, with invasion of the ribs. Bronchoscopic examination was not carried out in view of the peripheral location of the tumor.

Operation.—September 5, 1946: A total pneumonectomy on the left was performed, removing a block of the chest wall with the specimen. The second, third, fourth, fifth, sixth, seventh and eighth ribs were removed *en bloc*, dividing the ribs and neurovascular bundles posteriorly at their junctions with the transverse processes. The ribs and intercostal bundles were divided again at the anterior axillary line. This wide excision included the infiltrating tumor of the chest wall. During the operation 2,500 cc. of citrated blood were given.

Pathologic Report: Squamous cell carcinoma of the lung, with osseous invasion of the second, third, fourth, fifth, sixth and seventh ribs. The regional nodes showed no evidence of metastasis.

Postoperative and Late Course: This patient's immediate postoperative course was complicated by his inability to cough and expel pulmonary secretions. Extensive decostalization of the chest wall was responsible for his inability to cough. This complication was managed by five postoperative bronchoscopic aspirations and repeated intratracheal catheter suction. Ten days postoperatively, he was able to be up and about, and the pulmonary secretions could be evacuated with ease.

COMMENT: This was an advanced squamous cell carcinoma of the lung, with erosion of multiple ribs, apparently cured by radical surgery. Postoperative difficulty in evacuating secretions was again encountered in this patient.

SYMPTOMS AND DIAGNOSIS

Delay in diagnosis of this particular group of patients can be ascribed partially to the late manifestation of symptoms in carcinoma of the lung of peripheral origin. Pain preceded other symptoms, and it was of a severe character, persistent, and well-localized. Pain of months' duration often failed to direct attention to the possibility of a lung tumor. In the early stages, pain may be present, but the roentgenographic appearance may easily be overlooked. Other than pain, there are few symptoms until late in the course of the disease. Tenderness to percussion and palpation was present in each case and the rib or ribs invaded could be identified with ease.

Roentgenologic examination constitutes one of the best methods of diagnosis of either a peripheral or centrally-placed carcinoma of the lung. These cases reveal evidence of a peripheral, sharply cicumscribed, and dense tumor mass. In the early stages the tumor mass is small and may be overlooked. Rib destruction is revealed by overexposing the films, and this examination frequently underestimates the extent of bony destruction. Intrapleural pneumothorax adds little additional information. Direct biopsy of the invaded rib will establish a tissue diagnosis, but it carries with it the danger of soft-tissue implantation in apparently operable patients. Needle biopsy has the objec-

tionable features of seeding cancer along the needle track, hemorrhage, and infection. Bronchoscopy is not indicated, for the tumors are peripheral in location. Exploratory thoracotomy is the method of choice in select cases for determining the tissue diagnosis and operability. The pleural cavity is entered a rib and full rib's interspace below the lesion. In addition to determining operability; this site of approach facilitates the technical procedure of block excision of the chest wall and lung. Involvement of the brachial plexus, sympathetic trunk, phrenic nerve and the transverse processes of the vertebrae contraindicate curative surgical attempts, but a palliative resection must be considered in view of the associated severe pain. If the postero-anterior roentgenologic view of the chest delineates lung tissue between the mesial border of the tumor mass and mediastinum, local operability has been established. Invasion of the serratus anterior muscle is not a contraindication to block excision, for such occurred in one patient (Case 2), who has survived for a period of six years.

TREATMENT AND RESULTS

The successful treatment of cancer of the lung invading the ribs depends upon extirpation of the local lesion and regional lymphatics. This embraces block excision of the chest wall leaving a margin of healthy tissue attached to the involved structures, total pneumonectomy, and resection of the regional lymph nodes. Although radical excision of the chest wall accompanying pneumonectomy will probably increase the mortality rate in general for cancer of the lung, it seems of little importance when the prognosis of these patients subjected to block excision and pneumonectomy is considered. The pathologic behavior of the type of cancer of the lung invading the ribs makes it suitable to block excision and a good prognosis will eventually be established by further experience. The postoperative management of these patients is more difficult in that decostalization of the involved hemithorax renders the cough ineffective. Repeated catheter suction and frequent bronchoscopic removal of the secretions has been necessary in my experience.

Five of the patients herein reported were subjected to block excision of the chest wall and pulmonary resection. A total pneumonectomy was carried out in four, and a palliative lobectomy in one. There was one operative death. The patient with a palliative lobectomy died 11 months postoperatively. The remaining three patients are living and well, one for six years, one for two years, and one for five months.

SUMMARY

Invasion of the ribs by primary carcinoma of the lung is not uncommon. The symptoms and methods of diagnosis have been discussed. The cell type and favorable pathologic behavior of these tumors makes them amenable to radical cancer surgery. Successful treatment embraces block resection of the chest wall, total pneumonectomy and removal of the regional lymph nodes. Five of the seven cases herein reported illustrate this method of treatment.

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