

ADENOMA OF THE BRONCHUS

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Bronchial adenoma is a type of tumor peculiar to the tracheobronchial tree about which controversy has existed for fifteen years. Disagreement among pathologists as to terminology and interpretation of the morphologic picture hinders proper classification and correct management. The great variability in the clinical course of malignant lung tumors in general also helps confuse the issue. Undoubtedly many of these tumors have been classified adenocarcinoma, alveolar carcinoma, and mucous gland carcinoma, the true nature of the lesion not being recognized.

Two widely different opinions exist as to proper management of bronchial adenomas. One group classifies the tumors as benign and treats them by bronchoscopic removal.¹ By the second group they are considered malignant or potentially malignant, and lobectomy or pneumonectomy is recommended.²

Because of the tumors' glandlike structure and absence of the usual criteria of malignancy, the term *benign glandular tumor of the bronchus* has been suggested. Ultimately malignancy may be evident by direct extension and involvement of adjacent or distal structures. The term *mixed tumors* is advocated by Womack and Graham,³ because of the similarity in behavior and origin of this neoplasm to mixed tumors of the parotid gland. They advise regarding the neoplasms as potentially malignant, although many are benign when first recognized.

Incidence. Bronchial adenoma is not uncommon and must be considered in every case of bronchial obstruction. In eighteen months I encountered 5 cases diagnosed histologically as bronchial adenoma. Adenoma is most frequently observed in young women and in the second and third decades of life. Carcinoma, on the other hand, occurs most often in men and after 40.

Symptoms. The symptoms are primarily those of bronchial obstruction and depend upon the tumor's location in the tracheobronchial tree and the degree of obstruction and of inflammation or infection of the lung distal to the lesion. *Chronic cough* is the most common symptom. In 3 patients it was productive and more pronounced at night when the patient was lying down, and in 2 it was nonproductive. In the presence of pulmonary suppuration, the cough is identical with that observed in bronchiectasis. *Hemoptysis*, characterized by sudden onset with massive hemorrhage requiring transfusion, may be the chief symptom and is often severe owing to the pronounced vascularity of these

tumors. *Recurrent pneumonia* with recovery is characteristic, whereas in malignant lung tumors the symptoms are more likely to be progressive. Because of periods of acute pulmonary infection with increased bronchial obstruction, a previous diagnosis of pneumonia is not uncommon. Two patients had an initial diagnosis of pneumonia. Four had a history of frequent pneumonia. Severe *dyspnea* and symptoms of acute laryngo-tracheobronchitis were the outstanding features in 1 case. All 5 of the reported patients were ill for long periods and previously received treatment for unresolved pneumonia, recurrent acute laryngotracheobronchitis, asthma, and bronchiectasis. Two patients had atelectasis of one or more lobes. In 3 others atelectasis was associated with clinical signs of suppuration. None had emphysema. Because of the tumor's slow growth, extensive fibrosis and bronchiectasis develop. In 1 patient the roentgenogram showed the tumor and evidences of pulmonary disease of many years' duration.

Bronchoscopy. The usual finding is partial or complete occlusion of a bronchus by a smooth reddish or purplish lobulated mass. Small adenomas may appear as a sessile elevation, giving the appearance of an endobronchial tumor. More commonly the bronchial lumen is filled with a large pedunculated mass. The bronchial wall is not fixed or rigid as in carcinoma. Following the course of least resistance, the pedunculated type of tumor tends to grow toward the trachea, so that the proximal portion is movable.

The tumors are usually covered with epithelium, although suppuration may produce superficial erosions. The consistency varies greatly; but softer tumors are usually very vascular and bleed readily with slight trauma.

Pathology. The important question is whether the tumor is benign or malignant, and if benign, whether it will remain benign. All 5 of these patients had polypoid, highly vascular, intrabronchial tumors.

Microscopic examination. The tumor is composed of fairly uniform, polyhedral, cuboidal or low columnar, undifferentiated, epithelial cells held together by abundant stroma. The stroma is fairly vascular and sometimes hyalinized. Mitotic figures are not seen, and necrosis is not present. According to Brunn and Goldman,⁴ Jackson and Konzelmann,⁵ and others polypoid tumors of the bronchi may be either benign or malignant.

Treatment. Bronchoscopic removal of the endobronchial portion usually reestablishes drainage of the lung distal to the growth and with electrocoagulation may be sufficient to reestablish and maintain an adequate bronchial lumen. The tip of the bronchoscope is very useful for

coring out the tumor and scrubbing the bronchial wall to remove remaining particles of tumor. If chronic pulmonary changes with bronchiectasis distal to the tumor have developed, reestablishment of drainage may greatly relieve symptoms, although extirpation of the bronchiectatic portion of the lung is usually indicated.

If compression stenosis of the bronchus is caused by extrabronchial tumor, lobectomy or pneumonectomy is indicated, depending on the location of the lesion. When the tumor is in the upper lobe bronchus and inaccessible to bronchoscopic removal, surgery is indicated.

CASE REPORTS

Case 1—A white boy, aged 12, was admitted to the hospital on September 13, 1943 because of labored breathing, orthopnea, fever, and productive cough. In July of the preceding year he was admitted to a local hospital with a diagnosis of bronchopneumonia and laryngeal stridor necessitating tracheotomy. In November 1942 he was again hospitalized for acute laryngotracheitis for which another tracheotomy was performed. His third admission was in May 1943 when a diagnosis was made of chronic bronchitis, emphysema, obstruction, and possible bronchiectasis. On September 7 he had fever and malaise followed by cough productive of yellow sputum, labored breathing, and orthopnea preceded by abdominal pain.

The boy was thin and pale. Respirations were wheezing and orthopneic. Loud râles and rhonchi were present throughout the chest. Bronchial breathing was present, especially on the left side.

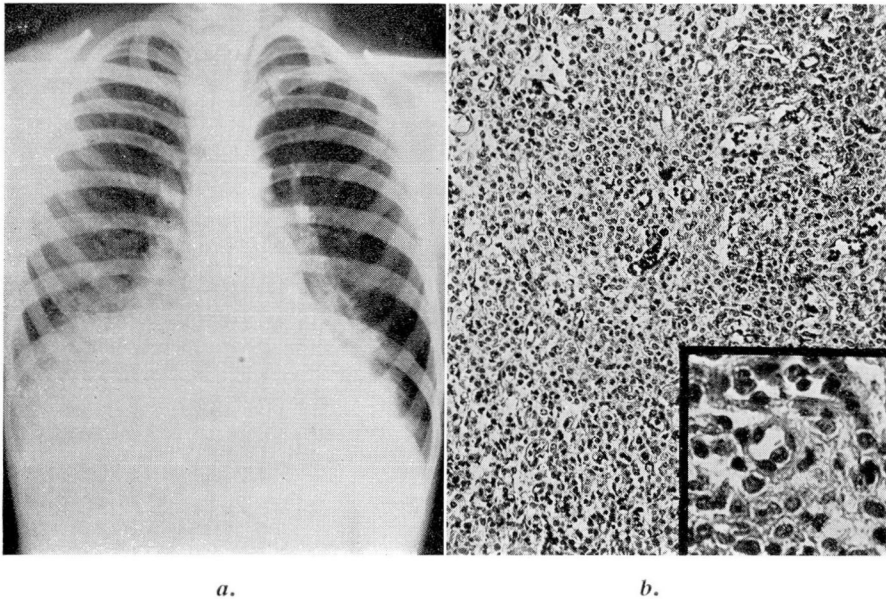


FIG. 1—Case 1. a. Pronounced infiltration along bronchovascular trunks to both lower lobes. Upper halves of lung fields clear. Appearance suggests advanced bilateral bronchiectasis. b. Masses of small round or polygonal cells with poorly defined cytoplasm and relatively large dark nucleus. Stroma contains goodly number of capillaries filled with blood.

Roentgenogram of the chest showed extensive fibrous and exudative infiltration at the hilus and lower lobe of both lungs, believed to represent bilateral lower lobe bronchiectasis. Clinical impression was bronchiectasis with superimposed bronchial asthma. Sputum culture showed pneumococcus, type 8, and was negative for tuberculosis and fungi.

During hospitalization the patient obtained relief with symptomatic treatment and sulfadiazine and was discharged improved on the tenth hospital day.

He was readmitted on September 26, 1943 with severe dyspnea and apprehension, and a diagnosis of laryngeal or tracheal obstruction with secondary bronchiectasis was made.

Bronchoscopy revealed a reddish pedunculated tumor mass, friable and vascular, almost completely obstructing the lower end of the tracheal lumen and orifice of the left main stem bronchus. A large quantity of mucus below the level of the lesion was aspirated. Upon removal of the tumor tissue and passage of the bronchoscope beyond the tumor mass, a foreign body (pickle rind) was encountered in the left main stem bronchus. This had been aspirated September 7 at the onset of the present illness.

Bronchoscopy completely relieved the dyspnea. Culture of aspirated bronchial secretions showed nonhemolytic streptococcus. Biopsy report was polypoid adenoma with no evidence of malignancy.

In spite of apparent relief from symptomatic treatment, postural drainage, and sulfadiazine, convalescence was complicated, and the patient died on October 2, 1943 on the sixth hospital day. Permission for necropsy was not granted.

Case 2—A white married woman, aged 43, was seen on July 25, 1944 with a complaint of severe productive cough of seven months' duration and discomfort over the left subternal area and shoulder, which was aggravated by deep breathing. In January she had a severe episode of "flu" from which she apparently recovered. However, coughing persisted and gradually became productive of white mucoid sputum, which later became purulent. She became easily dyspneic and wheezed frequently. Other symptoms were weight loss of 35 pounds, recurrent bouts of chills and fever, generalized aches and pains, and occasional night sweats.

Mobility of the chest was decreased, especially on the left. Percussion note was resonant throughout. Breath sounds were distant. There were a few coarse expiratory rhonchi over both lungs. Clinical impression was lung neoplasm.

Chest roentgenogram showed thickened pleura at the hilus of the left lung and some fibrosis in the upper left lobe indicating an old inflammatory process. Laboratory findings were within normal limits.

Bronchoscopy revealed a round smooth reddish pedunculated tumor mass projecting from the orifice of the left upper lobe bronchus and partially obstructing the left main stem bronchus. Because of its location, the tumor could not be removed completely. There was no bronchoscopic evidence of secondary bronchiectasis.

Pathologic report of tumor tissue removed by bronchoscopy was bronchial adenoma (left upper lobe) with squamous cell metaplasia of the bronchial mucosa. Aspirated bronchial secretions were negative for tuberculosis, spirochetes, and fungi but were loaded with pus.

A total left pneumonectomy was advised and carried out on October 7, 1944 with an uneventful recovery.

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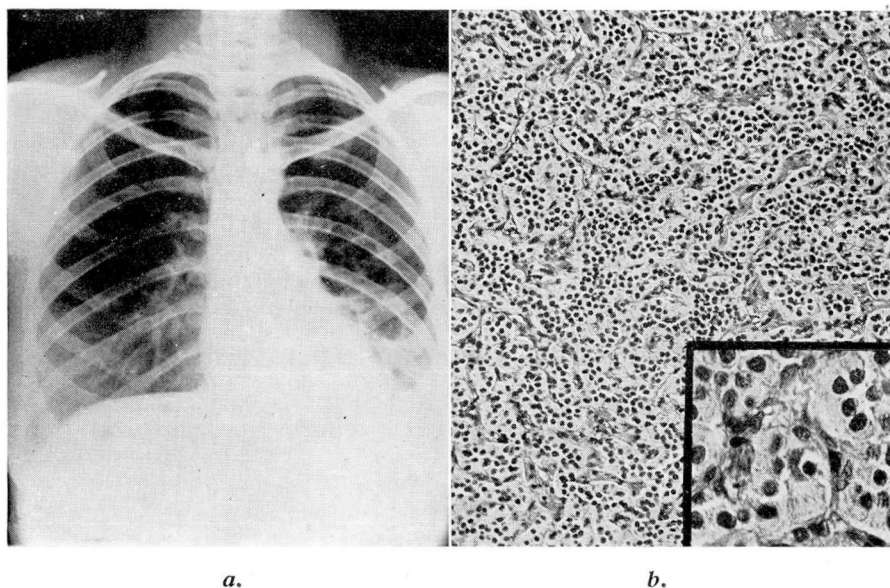


FIG. 2—Case 2. a. Triangular lesion with apex at left hilus close to the mediastinum and fanning out toward apex of lung, where it becomes less distinct. Suggests inflammatory lesion of left upper lobe. b. Closely packed, medium-sized, cuboidal cells subdivided into alveoli and trabeculae by rich sinusoidal circulation. Neoplastic cells intimately related to endothelial wall of vascular sinusoids. No tumor seen within blood vessels.

Case 3—A white housewife, aged 25, was seen on September 11, 1944 with the complaint of intermittent pain in the left lower chest around the entire costal margin and in the left shoulder of approximately two years' duration. In July 1942 she had whooping cough and in November, left lobar pneumonia. Intermittent chest pain persisted as well as a cough with alternately clear and purulent sputum. Hemoptysis of one week's duration occurred initially after a severe coughing spell two months prior to admission. During the summer of 1943 she lost 35 pounds and had intermittent bouts of fever reaching 104 to 105 F. An unconfirmed diagnosis of tuberculosis kept her at bedrest for several months. She was afebrile from August 1943 until a few days prior to admission, when her temperature averaged 100 F. and was associated with recurrent chest pain aggravated by deep breathing and motion. In all she had pneumonia on eight different occasions in the previous eight or nine years.

Her temperature on admission was 98.7 F. There was some decrease in resonance at the base of the left lung and tenderness about the lower angle of the left scapula. A few fine scattered rhonchi were audible over the left chest, and breath sounds were decreased over the left base.

Roentgenogram of the chest revealed evidence of extensive bronchiectasis in the lower left lobe. The upper left lobe and the right lung were clear. Laboratory reports were within normal limits.

Bronchoscopy on September 12, 1944 revealed a purplish smooth round nodular tumor completely obstructing the left lower lobe bronchus and extending up to and partially including the left upper lobe bronchus. Tumor tissue was removed and the left lower lobe bronchus found to be filled with pus.

Pathologic report of tumor tissue removed at bronchoscopy was adenoma of the bronchus (left lower lobe). Aspirated bronchial secretions showed few acid-fast bacilli and a culture of nonhemolytic streptococcus.

The patient was placed on sulfadiazine therapy and postural drainage and upon returning on November 7, 1944 was found to be symptomatically improved, although cough with purulent sputum persisted. Bronchoscopy showed tumor tissue partially obstructing the left lower lobe bronchus, which biopsy revealed to be adenoma with superficial ulceration, acute inflammation, and necrosis. Culture of bronchial aspirations showed many acid-fast bacilli, nonhemolytic streptococcus, and *Staphylococcus albus*. The pulmonary lesion did not suggest tuberculosis either clinically or roentgenologically.

A left lower lobectomy was advised, but after her last visit to the clinic, she showed personality changes, possibly caused by brain abscess secondary to pulmonary infection. She was admitted to a state hospital where a diagnosis was made of dementia praecox and catatonic excitement. No improvement was reported, and her mental condition remained unchanged.

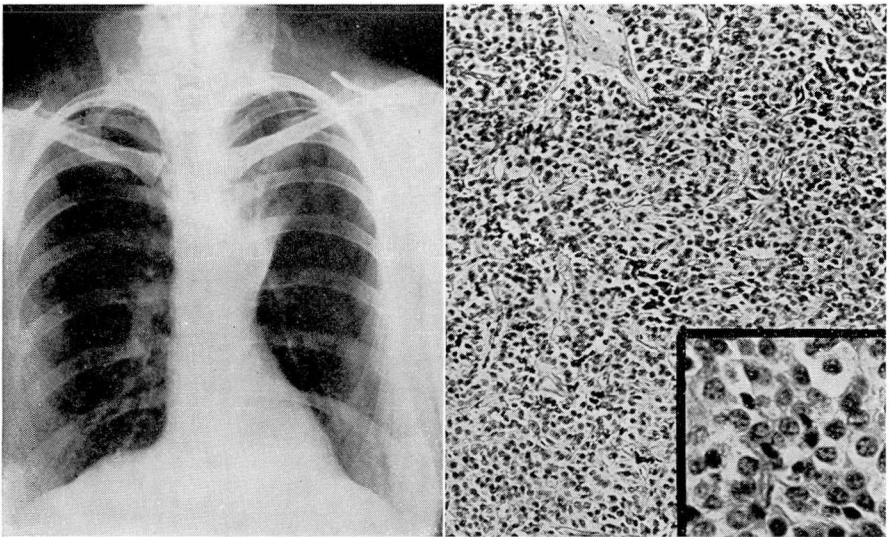


FIG. 3—Case 3. a. Group of thin walled cavities in lower two-thirds of left lung. Posterior position of lesions indicates they are in left lower lobe. Appearance suggests severe saccular bronchiectasis. b. Tumor cells uniform in size and shape with abundant acidophilic cytoplasm. Majority are cuboidal and have fairly dark nuclei. No abnormal nuclear forms or mitoses. Connective tissue stroma contains usual cells of inflammation. Many tumor cells surround small clear spaces, resembling well formed glands; others present in parallel columns and groups.

Case 4—A white single woman, aged 20, was seen on October 3, 1944 with a complaint of occasional slight pain in the left chest of approximately ten months' duration. She had two episodes of "flu" the previous winter, after which pleurisy developed in the left chest. Thoracentesis on two occasions was apparently followed by recovery except for the present complaint.

Breath sounds were somewhat decreased in the lower left chest; there was impaired resonance and moderate increase in tactile fremitus, but no clinical evidence of pleural

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effusion. Clinical impression was thickened pleura on the left as sequela of postinfluenzal hydrothorax. Roentgenogram of the chest showed thickened pleura and atelectasis of the left lung. The right lung was entirely clear. Laboratory reports were within normal limits.

Bronchoscopy on October 3, 1944 revealed a smooth reddish nodular tumor mass obstructing the left main stem bronchus approximately 1 cm. below the carina. It was found to be attached to the posterior wall, and when removed, profuse bleeding occurred, necessitating packing the bronchus with gauze.

Pathologic report was bronchial adenoma. Aspirated bronchial secretions were negative for tuberculosis, spirochetes, and fungi, but showed nonhemolytic streptococcus and *Staph. albus*. The remaining tumor was electrocauterized on two subsequent occasions. Bronchoscopy three months later revealed no evidence of tumor, and the patient was symptom free.

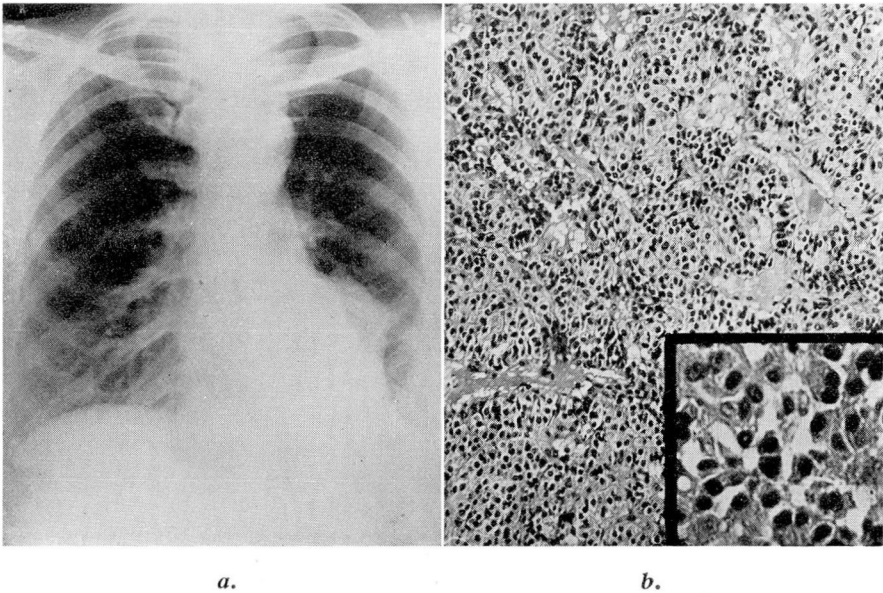


FIG. 4—Case 4. a. Mediastinal structures displaced far to left. Left lung shadows replaced by homogeneous density. Shadow of left main bronchus can be traced out from carina for approximately 2 cm. where an indefinite tumor mass can be seen, the margin being convex at end of bronchial shadow. b. Highly cellular tumor with uniform type cells. Both circular and oval nuclei are vesicular and moderately chromatic. No abnormal nuclear forms or mitoses. Tumor cells tend to be radially arranged about small vessels or small clear spaces. No well formed glands.

Case 5—A colored housewife, aged 42, was admitted to the hospital on November 5, 1944 for thyroidectomy for nodular goiter without hyperthyroidism. She also complained of a persistent cough after a severe cold approximately eight to nine months before. The nodular goiter was found upon a previous hospital admission on November 19, 1942, when she was treated for pelvic inflammatory disease.

Physical examination revealed nodular bilateral enlargement of the thyroid, particularly the right lobe. The temperature was 98 F., pulse rate 110 per minute, and blood pressure in millimeters of mercury 174 systolic and 96 diastolic. Examination of the

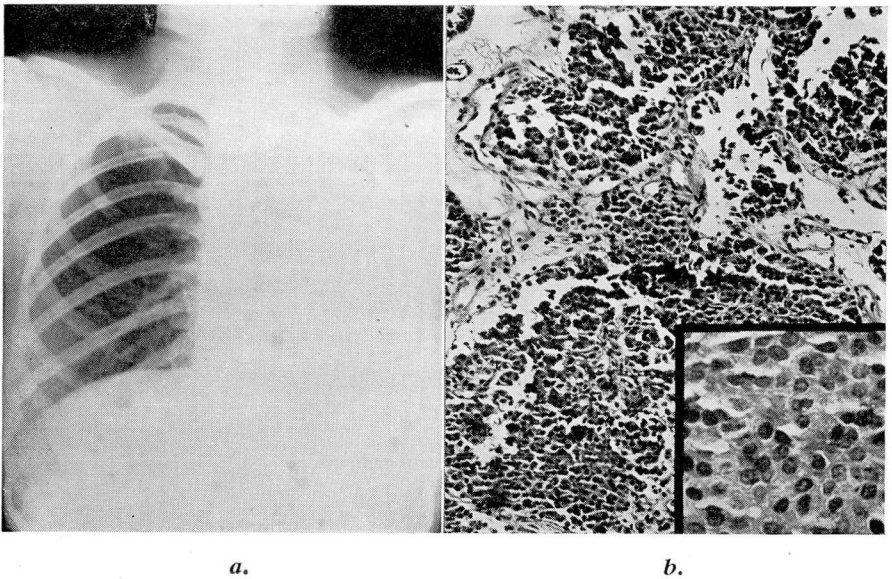


FIG. 5—Case 5. a. Heart displaced slightly to left. Convex margin of dense lesion, which stereoscopically is posterior to heart and extends about 2 or 3 cm. beyond left ventricle. This nodular lesion suggests a well circumscribed tumor. b. In a partly hyalinized matrix of fibrous connective tissue are masses and anastomosing bands of epithelial cells with clear cytoplasm and circular nucleus. No mitoses seen. Occasional pseudoacinar structure and a few well formed acini.

chest was negative. Clinical impression was nodular goiter without hyperthyroidism, benign essential hypertension, and mild obesity.

Roentgenologic examination revealed a nodular lesion in the left lung extending out from the mediastinum and some fibrosis in the right lower lobe. The basal metabolic rate was plus 2.

Bronchoscopy on November 8, 1944 revealed a smooth reddish rounded tumor mass obstructing the left lower lobe bronchus. Profuse bleeding followed removal, and the area was electrocauterized on three subsequent occasions. No evidence of tumor remained on the last examination on March 19, 1945. Pathologic report of tissue removed was bronchial adenoma.

SUMMARY

Bronchial adenoma is not an uncommon cause of bronchial obstruction and should be suspected with recurrent symptoms of bronchial obstruction in young or middle-aged women. A correct diagnosis can be made only after bronchoscopy and removal of adequate tissue for microscopic study, since bronchoscopy alone cannot determine the extent of tumor outside the bronchial wall. These tumors are usually benign but tend to recur locally. If accessible to the bronchoscope, they can be successfully destroyed by electrocautery; if inaccessible or peribronchial, lobectomy or pneumonectomy is advisable.

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MASSIVE DOSES OF PENICILLIN IN THE TREATMENT OF PERITONITIS*

A Preliminary Report

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The purpose of this report is to call attention to the fact that large doses of penicillin (100,000 units or more intramuscularly every two hours) exert a striking effect in controlling peritonitis arising from mixed flora of the intestinal tract. Penicillin, first in large doses and then in diminishing amounts for a week or ten days, will profoundly inhibit dissemination of peritonitis and will result in spontaneous resolution of many intraperitoneal abscesses. Large initial doses of penicillin and protracted therapy produce results far superior to those observed with the usual doses or the sulfonamides.

Early reports on the use of penicillin in peritonitis were equivocal and gave little promise that this drug would be superior to the sulfonamides.¹ At that time penicillin was scarce and expensive, and the average dose was not more than 30,000 units intramuscularly every three or four hours. Penicillin in these doses exerted a striking effect in controlling peritonitis from hemolytic streptococcal or staphylococcal infections, but appeared to do little to control mixed infections from perforated appendixes. Although peritonitis seemed less likely to spread and the patients were less sick, penicillin exhibited little advantage over the sulfonamides. Formation of intraabdominal abscesses was not prevented, and a prolonged febrile course with eventual suppurative complications was the rule.

During the past four months 30 patients with established peritonitis or with extensive contamination of the peritoneal cavity from rupture of intraabdominal abscesses were treated at the U. S. Naval Hospital, San Diego. There were 2 cases of spontaneous perforation of carcinoma

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