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COMPLICATIONS OF AMEBIASIS

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PLEUROPULMONARY COMPLICATIONS OF AMEBIASIS

AN ANALYSIS OF 153 COLLECTED AND 15 PERSONAL CASES*

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UNTIL relatively recently amebiasis attracted little attention in non-tropical localities; although as early as 1902 Sir Leonard Rogers¹ demonstrated that complicating hepatic abscess, which previously had been designated "tropical abscess," occurred in other than tropical climates. The recent epidemic of amebiasis has more forcefully emphasized its ubiquitous distribution; although it is our opinion that the actual incidence of amebiasis in temperate climates probably has not increased in recent years. According to the authoritative opinion of Colonel Craig,² 10 per cent of the people of this country harbor the *Endameba histolytica*, and frequently the diagnosis of amebiasis is overlooked because of the mildness of the clinical manifestations.

Amebiasis is of significance to the surgeon because of the relatively high incidence of hepatic and the less frequent incidence of pulmonary suppuration. The importance of pleuropulmonary complications of amebiasis cannot be sufficiently appreciated without some knowledge concerning the high incidence of hepatic amebic abscesses, because thoracic complications are generally the result of extension of the suppurative process in the liver through the diaphragm into the thorax. In a previous study on amebic hepatic suppuration we³ collected 4,392 fatal cases of amebiasis, of which 37.9 per cent (1,664 cases) were complicated by hepatic suppuration. In our study there were 59 clinical cases of amebic abscess of the liver among 388 cases of amebic dysentery admitted to the Charity Hospital in New Orleans during the six-year period 1928 to 1933, inclusive, an incidence of 15.2 per cent. Seven (13.5 per cent) of our 59 cases of amebic hepatic abscess were complicated by extension of the suppurative process to the thorax with involvement of the lung in 6 and the pleural cavity in 1. Pleuropulmonary amebic infections are second to hepatic

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lesions as complications of amebiasis. The present report is based on a study of 15 cases of pleuropulmonary complications of amebiasis admitted to the Charity Hospital in New Orleans from January 1, 1928, to April 1, 1935, and an analysis of 153 cases collected from the literature.

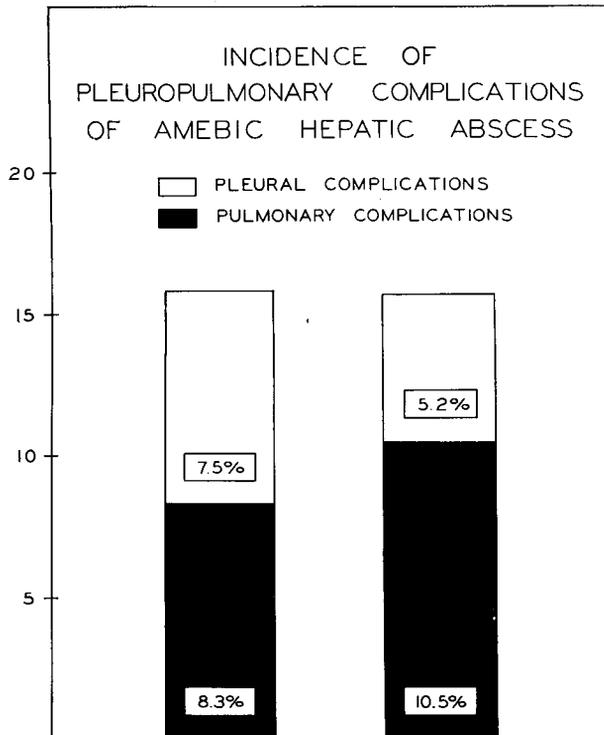
Historical.—According to Lemierre and Bernard,⁴ Pringle in 1752, Portal in 1813, Larrey in 1829, Budd in 1845, and Cambay in 1847 observed cases in which hepatic abscesses, probably amebic, ruptured into the pleural cavity. Similar cases were observed by Duplay⁵ in 1829 and by Behier⁶ in 1836. Gaillard,⁷ in 1856, reported a case of abscess of the liver with perforation into the pleura and the pericardium. Rouis,⁸ in 1860, reported that in 162 autopsies on patients with amebic abscess of the liver 11 had perforated into the pleura. Other cases of historical interest are included among the collected cases analyzed in the present study (Hospel,⁹ Rouis,⁸ P'oiret,¹⁰ Bellot,¹¹ Gouran,¹² Morvan,¹³ Debergues,¹⁴ Gueschwind,¹⁵ Simon,¹⁶ Lafleur,¹⁷ Ferrhon,¹⁸ Bertrand and P'ontan¹⁹ and Osler.²⁰

Incidence.—The frequency of pulmonary complications in amebiasis varies considerably according to different statistics. The incidence reported by different authors varies from 3 per cent in Strong's²¹ series of 100 fatal cases of amebiasis in which the lung was involved once and the pleura twice, to 58.8 per cent of 170 cases reported by Thierfelder.²² In a series of 2,490 reported amebic hepatic abscesses, pleural complications

TABLE I
INCIDENCE OF PLEUROPULMONARY COMPLICATIONS IN REPORTED SERIES

	CASES OF LIVER ABSCESS	LUNG COMPLI- CATIONS	PLEURAL COM- PLICATIONS
Clark ²³	95	5	
Craig ²⁴	22	1	7
Waring ²⁵	300	15	28
Dutroulan ²⁶	66	7	10
Roux ²⁷	162	14	17
Hospel ⁹	25		2
Cambay ²⁸	10		2
Fletcher ²⁹	27	9	3
Sambuc ³⁰	102	7	4
Murray and Koh ³¹	23	4	
Strong ²¹	100	1	2
Thompson ³²	27	7	4
Rendu ³³	563		31
Harris ³⁴	95		3
Talbot ³⁵	15	1	
Vergoz-Hermemjat-Gerin ³⁶	80		28
Thierfelder ²²	170	74	26
Cyr ³⁷	563	59	31
Manson-Bahr ³⁸	45	5	
	2,490	209 (8.3%)	198 (7.5%)
Authors ³	95	10 (10.2%)	5 (5.2%)

occurred in 198 (7.5 per cent) and pulmonary complications in 209 (8.3 per cent) (Cases 3, 9, 21, 22, 28-38) (Table I). Of 95 consecutive cases with amebic hepatic abscess admitted to the Charity Hospital and the Touro Infirmary in New Orleans from January 1, 1928, to April 1, 1935, 15 (15.7 per cent) had pleuropulmonary complications. In 7 (7.3 per cent) the hepatic abscess perforated into the lung, in 5 (5.2 per cent) into the pleura, and in 3 (3.1 per cent) there was a bronchopleural fistula. The total incidence of pleuropulmonary complications in our series (15.7 per cent) is practically the same as that obtained in the collected series (15.8 per cent) (Graph 1).

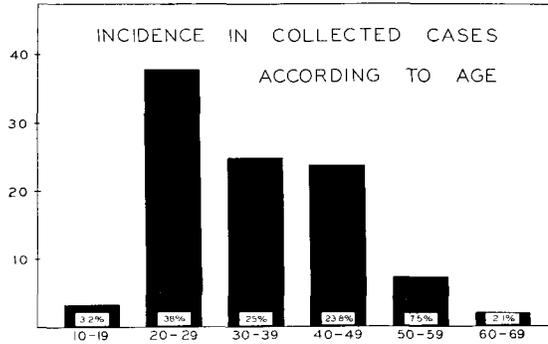


Graph 1.—Graph showing incidence of pleuropulmonary complications in collected series and in authors' series.

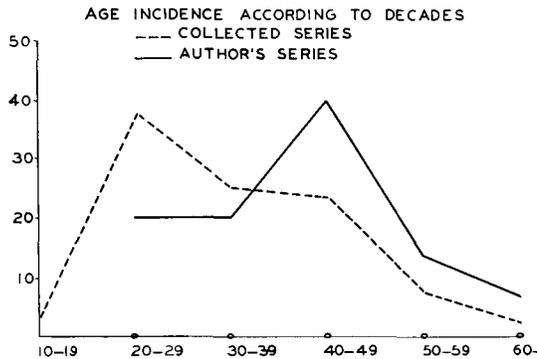
Pleuropulmonary amebic infections occur most frequently in the third and fourth decades of life. In the collected series of cases there were 92 in which the age was stated. Of this group, 3 (3.2 per cent) were in the second, 35 (38 per cent) in the third, 23 (25 per cent) in the fourth, 22 (23.8 per cent) in the fifth, 7 (7.5 per cent) in the sixth, and 2 (2.1 per cent) in the seventh decades (Graph 2). The youngest was fourteen years old, the oldest sixty-two years, and the average age was thirty-four and five-tenths years. In our series the youngest was twenty-one,

the oldest sixty-three, and the average age was forty and six-tenths years. Three (20 per cent) were in the third decade, 3 (20 per cent) in the fourth, 6 (40 per cent) in the fifth, 2 (13.3 per cent) in the sixth, and 1 (6.6 per cent) in the seventh decades. The majority of our patients were approximately two decades older than in the collected cases (Graph 3), a fact which we are unable to explain.

The sex incidence is similar, as would be expected, to that of amebic abscess of the liver, i.e., a preponderant occurrence in males. In the collected cases the sex was stated in 120, of which 115 (96.2 per cent)



Graph 2.—Graph showing age incidence in collected series.

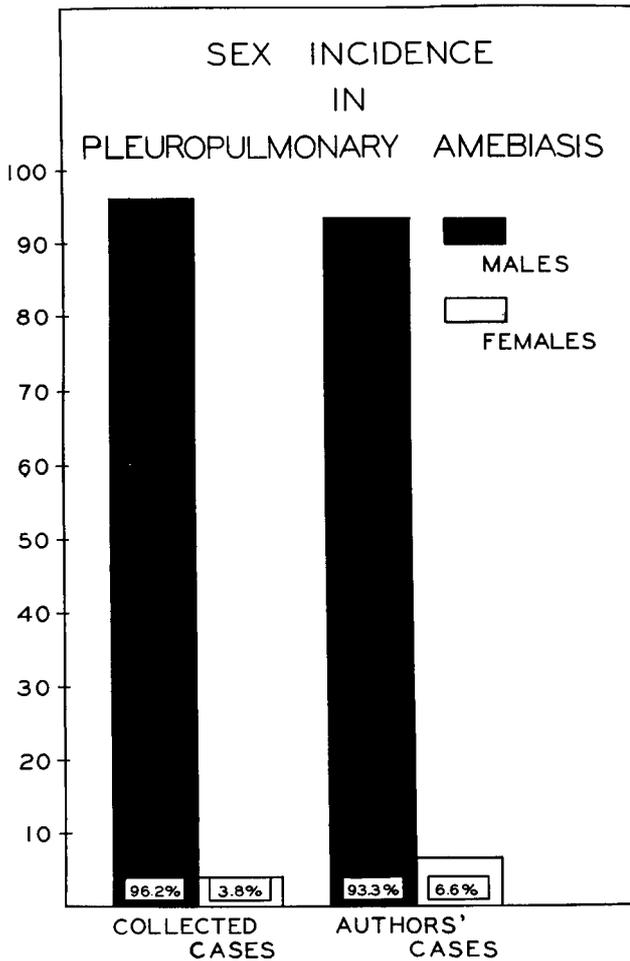


Graph 3.—Graph showing comparison of age incidence in collected series and in authors' series.

were males and 5 (3.8 per cent) females. In our series there were 14 males and 1 female (Graph 4). This considerably higher incidence in males is explained by the apparently greater susceptibility of males to amebic abscess of the liver. In the collected cases there were 4 in which it was stated the patient was colored and 14 were white. Presumably the other 135 were white. In our series of 15 cases there were 9 white and 6 colored patients.

Etiology and Pathogenesis.—Pleuropulmonary amebic involvement is

probably always secondary to amebiasis elsewhere and is generally the result of extension of the process from an amebic infection of the liver. Most, if not all, amebic infections begin in the large bowel, from which area the amebas may be carried probably through the blood stream to other parts of the body. As the intestinal tract is drained by the portal vein, involvement of the liver occurs relatively frequently. In most instances the amebic infection of the pleura and the lungs is the result



(Graph 4.—Graph showing sex incidence in collected series and in authors' series.

of direct extension from an amebic hepatic abscess, perforation occurring through the diaphragm into the lung, bronchus, or pleura. Rarely transphrenic migration of the amebas from a subphrenic amebic process to the thorax may occur without gross perforation. This according to Loison³⁹ is the result of amebas being carried in the diaphragmatic

lymphatics. Relatively rarely involvement of the pulmonary parenchyma may occur as a result of hematogenous infection, the amebas gaining entrance to the lung either by the blood stream or through the lymphatics and blood stream. In the former, amebas may be carried through the portal vein, hepatic capillaries, and hepatic veins to the vena cava or through the anastomotic collaterals of the hemorrhoidal veins into the vena cava (Petzetakis⁴⁰). In the latter the amebas may be carried from the colon through the thoracic duct to the left subclavian vein and hence to the lungs. Strong,²¹ on the other hand, is of the opinion that the pleuropulmonary complications are never metastatic, but always occur by direct extension from a liver abscess.

Rarely, if ever, primary amebic infection of the lung occurs. Panayalou and Netter⁴¹ described a case which they considered primary amebic bronchitis. Petzetakis⁴² described 2 cases of amebic bronchitis in which amebas were found in the sputum, one of which was not associated with any bowel disturbance. A similar case was reported by Habersfeld,⁴³ who believes that although there is no history of amebic infection of the bowel, one is not justified in assuming such never was present. In many of the reported cases a liver abscess and pulmonary abscess occurred concomitantly without any apparent connection between the two. The majority of amebic abscesses of the liver occur on the convex surface and in the posterior portion of the right lobe; and as the abscess enlarges, its periphery approaches the diaphragm, gradually incorporating it in the wall of the abscess, facilitating the perforation of the hepatic suppurative process into the thoracic cavity. In most instances there is an accompanying pleurisy with adhesions which obliterate the pleural cavity, so that rupture occurs into the base of the right lung. In those instances, however, in which extension of the hepatic process is more rapid and in which there is no antecedent pleurisy, the abscess ruptures into the pleural cavity. Many times rupture of an hepatic abscess into the lung produces relatively little inflammatory pulmonary reaction, the contents of the hepatic abscess being evacuated through the communication between the liver abscess and a bronchus. In such instances the clinical manifestations rapidly subside, especially under adequate therapy.

Pathology.—There are a number of types of pleuropulmonary amebic infections, and in our study of the collected cases we have divided the lesions into five different groups, depending upon the type of the pleuropulmonary involvement: (1) hematogenous pulmonary abscess without liver involvement; (2) hematogenous pulmonary abscess and independent liver abscess; (3) pulmonary abscess extending from liver abscess; (4) bronchohepatic fistula with little pulmonary involvement; (5) empyema extending from liver abscess (Fig. 1). In our collected series of 153 cases there were 22 in which the pulmonary amebic infection

occurred without liver involvement (Fig. 1). In one of these reported by Panayatalou and Netter⁴¹ (Case 115), the amebic infection of the lung was supposedly primary. In the other 21 the amebic infection was embolic and secondary to a process in the colon. Kofoid, Boyers, and Swezy⁴⁴ believe that hematogenous transportation of amebas occurs more frequently than is generally supposed. In the investigations in fatal cases they found amebas in practically every tissue of the body examined. Strong,²¹ on the other hand, contends that amebic infections are never embolic and believes in those cases in which a communication between the hepatic abscess and the thoracic lesion cannot be demonstrated that

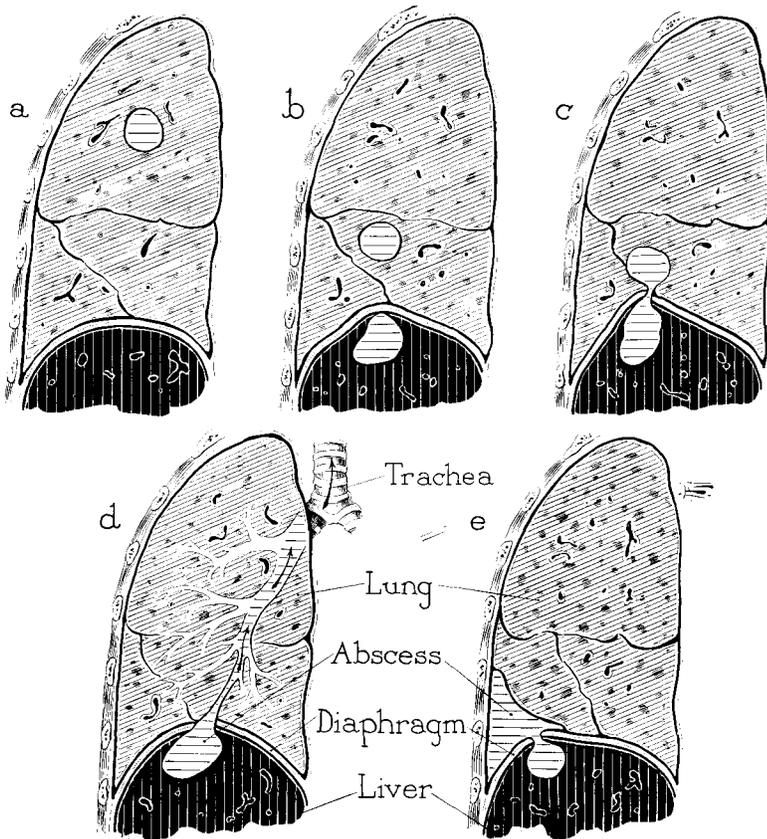


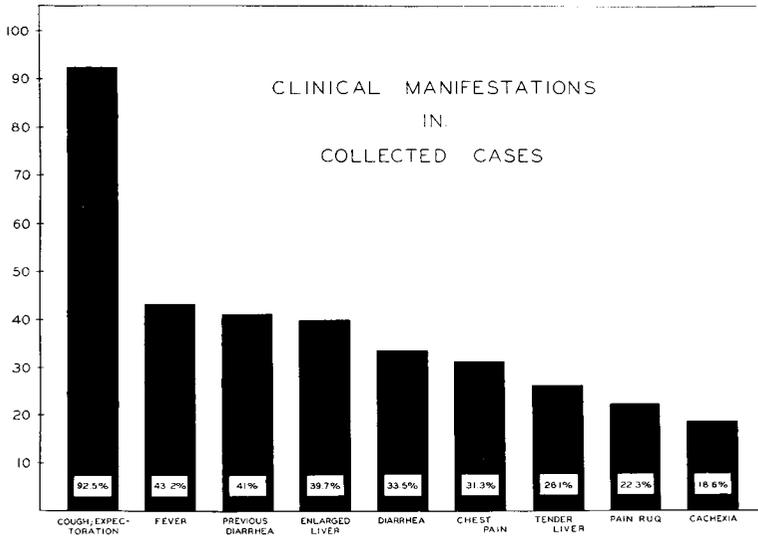
Fig. 1.—Diagrammatic representation of various types of pleuropulmonary amebic infections. *a*, Hematogenous pulmonary abscess without liver involvement; 14.3 per cent of the collected series and none of our cases were of this type. *b*, Hematogenous pulmonary abscess and independent liver abscess. As illustrated in the drawing the pulmonary process is separated from the hepatic process by normal lung; 10.4 per cent of the collected series and none of our cases were of this type. *c*, Pulmonary abscess extending from liver abscess. In contrast to Group 2, intervening portion of lung between pulmonary and hepatic process is involved; 37.2 per cent of the collected series and 46.6 per cent of our cases were of this type. *d*, Bronchohepatic fistula with little pulmonary involvement. In this type, communication between hepatic abscess and bronchus is more direct and large, permitting evacuation of hepatic abscess contents with little involvement of pulmonary parenchyma; 19.6 per cent of the collected series and 20 per cent of our cases were of this type. *e*, Empyema extending from liver abscess. Because of absence of pleural adhesions, perforation of hepatic process occurs into pleural cavity; 17.6 per cent of the collected and 33.3 per cent of our cases were of this type.

the perforation has healed. In the collected series there were 16 cases in which a hematogenous pulmonary abscess and a liver abscess occurred concomitantly without any apparent communication between the two (Fig. 1). There were 5 of the group of 16 cases in which a perforation of the liver abscess into the pleura or lung occurred, although the original lung abscess in the 16 cases was supposedly hematogenous. In 4 of these (Cases 77, 150, 151, 152) the liver abscess ruptured into the pleural cavity; whereas in 1 (Case 57), the liver abscess ruptured into the lung. In by far the greater majority of cases the amebic infection of the lung occurs in the right lower lobe. This is probably due to the fact that in most instances the infection gains entrance to the lung by direct extension from the liver. In our previous study³ on amebic hepatitis we found the right lobe of the liver involved in 92.9 per cent. Adhesions are usually present between the inferior surface of the right lower lobe of the lung and the diaphragm and between the superior surface of the liver and the diaphragm so that perforation of liver abscess is usually directly into the lung or bronchus without passing through the uninvolved pleural cavity. In cases with no limiting adhesions, perforation of the liver abscess into the pleural cavity occurs. In the collected series of 153 cases there were 58 in which a liver abscess had extended into the lung, producing amebic pneumonitis and abscess (Fig. 1). In each series the pulmonary abscess was located in the lower lobe. In our series 7 of the 15 were of this type. Occasionally perforation of the liver abscess into the lung occurs in the region of a large bronchus with the development of a bronchohepatic fistula which permits adequate evacuation of the liver abscess and produces little reaction in the pulmonary parenchyma (Fig. 1). In the collected series of 153 cases there were 30 patients with bronchohepatic fistulas and with little or no pulmonary involvement. In our series there were 3 of this type (Cases A 3, A 11, A 12). These cases must be distinguished from the communicating hepatic and pulmonary abscesses in which there is also a communication with a bronchus. In the collected series of cases there were 27 in which a liver abscess was complicated by empyema (Fig. 1). In our series of 15 cases, 5 were of this type. In those cases in which a localized abscess in the inferior portion of the pleural cavity communicates with an abscess below the diaphragm, Pruvost⁴⁵ describes the abscess as a "shirt stud" abscess. Strong²¹ has described the amebic liver abscess as being filled with a grayish yellow or yellowish red fluid material. He differentiates between amebic pulmonary abscess and liver abscess in that the walls of the former are less even than those of the latter. In some areas the walls are smooth and are composed of connective tissue. He describes three zones in the walls of the older abscesses, the first, a necrotic one containing fragmented nuclei, degenerated cells, and amebas. The second layer is composed of connective tissue fibers, epithelial cells, elastic fibers, and groups of alveoli with occasional amebas.

The third consists of a layer of small round cell infiltration in which fibrin and some proliferation of connective tissue fibers are visible between the alveoli. The walls of the bronchi in the region of the abscesses are infiltrated with numerous round cells, and the bronchi usually contain purulent or serous fluid. The contents of the abscess may vary according to its type. In the hematogenous amebic abscess the contents are purulent and are in no manner characteristic; whereas in those cases in which a communication between the liver abscess and the pulmonary or pleural lesion exists, the contents are usually chocolate sauce pus.

Clinical Manifestations.—Clinical manifestations of amebic infections of the lung and pleura vary according to the mode of the infection. In those cases in which the infection extends from a liver abscess, the first manifestation is usually a severe pain in the lower portion of the chest on the right side. This is undoubtedly due to the involvement of the diaphragmatic pleura by the inflammatory process. Bernard⁴⁶ has emphasized the importance of shooting pains at the right base accompanied by slight pyrexia. Pruvost⁴⁵ describes the pain as violent and as being aggravated by respiration. The pain is frequently referred to the right shoulder, a symptom which was especially emphasized by Thompson.³² A distressing, unproductive cough in the beginning, probably due to pleural involvement, is a prominent symptom. Expectoration of large quantities of purulent material and particularly chocolate sauce pus occurs in cases with communication between the abscess and a bronchus. Dyspnea may occur, especially in cases in which there is a communication with a bronchus and in which there is considerable encroachment upon a large portion of the lung field. In the 153 collected cases a statement was made concerning symptoms in 134. The chief complaint was cough and expectoration in 87 (64.9 per cent), fever in 24 (17.9 per cent), pain in the chest in 21 (15.6 per cent), pain in the right upper quadrant in 15 (11.1 per cent), diarrhea in 13 (9.5 per cent), pain in the right shoulder in 4 (2.9 per cent), loss in weight in 3 (2.2 per cent), dyspnea in 2 (1.4 per cent), malaise in 2 (1.4 per cent), swelling of the right chest in 1 (0.7 per cent), and weakness in 1 (0.7 per cent). In our cases the chief complaints were as follows: cough and expectoration in 6 (40 per cent), pain in the chest in 6 (40 per cent), pain in the right upper quadrant in 4 (26.6 per cent), fever in 1 (6.6 per cent), and pain in the right shoulder in 1 (6.6 per cent). Aside from the chief complaint there were other symptoms described in 134 of the 153 collected cases. One hundred and twenty-four (92.5 per cent) of these complained of cough and expectoration, 58 (43.2 per cent) of fever, 55 (41 per cent) of a previous diarrhea (Graph 5). In 1 case a previous diarrhea was denied. Forty-six patients (33.5 per cent) had diarrhea at the time of admission to the hospital. Forty-two (31.3 per cent) had chest pain. Thirty (22.3

per cent) had pain in the right upper quadrant. Twenty-five (18.6 per cent) had cachexia. Twenty-one (15.6 per cent) had dyspnea. Seventeen (12.6 per cent) had pain in the right shoulder. In our 15 patients all (100 per cent) had fever. Fourteen (93.3 per cent) had cough and expectoration. Five (33.3 per cent) had pain in the chest. Four (26.6 per cent) had pain in the upper right quadrant. Three (20 per cent) had pain referred to the right shoulder. Three (20 per cent) had dyspnea. Only 2 (13.3 per cent) had had previous diarrhea, and only 1 (6.6 per cent) had diarrhea during the present illness. Two (13.3 per cent) were emaciated, and 1 (6.6 per cent) had chills. Profuse expectoration of chocolate sauce pus is pathognomonic in amebic infections of the lung and indicates rupture of amebic hepatic abscess into a bronchus. In 74 instances of the 153 collected cases it was stated

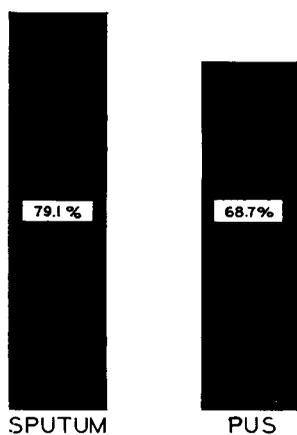


Graph 5.—Graph showing incidence of clinical manifestations in collected cases.

definitively that chocolate sauce pus was present in the sputum. In the majority of other instances no statement was made concerning the character of the expectorated material. In our series of cases chocolate sauce pus expectoration was present in 14 cases, an incidence of 100 per cent, as there were only 14 with bronchial communication. The fifteenth case in our series was one with a perforation of the hepatic abscess into the pleural cavity alone.

The chest findings are usually those of consolidation and cavitation. As a matter of fact, in many instances a diagnosis of pulmonary tuberculosis is made erroneously. Dullness over the affected portion of the lung is the most frequent pulmonary sign. Statements regarding physical signs were made in 134 of the 153 collected cases. In 33 of the collected series and in 9 of our 15 cases there was thoracic dullness.

Râles were found in 17 of the reported cases and in 9 of our cases. Diminished breath sounds were found in 9 of the collected cases and in 3 of our cases. In those relatively rare cases in which the liver abscess first perforates into the pleural cavity with the development of an empyema, the clinical manifestations are those of pleural effusion, i.e., dullness, diminished breath sounds, and limitation of motion of the involved hemithorax. In addition to the thoracic manifestations the abdominal manifestations of amebic infection are important. In the majority of instances the liver is enlarged and tender. The liver was enlarged in 53 (39.7 per cent) and tender in 35 (26.1 per cent) of the collected cases. The same signs were found in 6 (40 per cent) of our 15 cases. The absence of liver enlargement was explicitly stated in 5 of the collected cases. The finding of concomitant involvement of the liver and lung is suggestive of amebic pulmonary infection. In practically all



Graph 6.—Graph showing incidence of positive findings of amebas in sputum and pus of collected series. The percentages are based on the number in which a statement was made concerning this examination.

cases there is a moderate pyrexia. Characteristically, however, as in the amebic infections elsewhere in the body, the elevation of the temperature is not high. In our series of cases the highest temperature on admission was 103° F. In the majority, however, it ranged between 100° and 101° F. Hyperpyrexia and chills in cases of amebic infections of the pleura and lungs probably indicate secondary infection and are not caused by the amebic infection per se.

Laboratory Findings.—As in amebiasis elsewhere in the body, a moderate leucocytosis is usually encountered in amebic infections of the pleura and lungs. In our previous publications^{3, 47} we emphasized that in amebic hepatic suppuration there is a moderate leucocytosis without a concomitant increase in the polymorphonuclear leucocytes. In the collected cases of pleuropulmonary amebic infections the highest leucocyte count observed was 52,000, the lowest 9,700, the average 18,860.

The highest polymorphonuclear count was 91 per cent, the lowest 53 per cent, and the average 72.8 per cent. In our series of cases the highest leucocyte count was 51,250, the lowest 7,500, the average 17,000. The corresponding polymorphonuclear percentages were 92 per cent, 70 per cent, and 79 per cent, respectively. Obviously the leucocyte count and polymorphonuclear percentage are not so high in amebic infections of the lung as in corresponding pyogenic infections, especially pneumococci. In those cases of amebic infections of the lung which are accompanied by high leucocyte and polymorphonuclear counts a secondary infection probably has supervened. In recent pulmonary amebic infections, amebas are generally present in the sputum and can be demonstrated by microscopic examination. Petzetakis⁴⁸ emphasizes the importance of immediate examination of the sputum. A moist, warm preparation is best for the microscopic study. In the collected cases amebas were found in the sputum in 19, and in 5 cases it was explicitly stated that amebas were not present (Graph 6). In 7 of our cases the sputum was examined for amebas, and it was found positive in 2 (28.5 per cent). The stools may or may not contain amebas or cysts. The reason there are not more positive stool findings is that frequently the colonic amebic infection has subsided by the time the pulmonary symptoms develop. In the collected cases the stools were examined in 8, and amebas were found in 2. According to Fletcher,²⁹ the sputum in these cases contains pus cells, elastic tissue, hematoidin crystals, and occasionally Charcot-Leyden crystals. Bernard⁴⁶ believes that a diagnostic point in regard to the sputum is the small number of organisms which are in the sputum early in the condition, although later, as a result of secondary infection, many organisms may be present.

Roentgenologic Examination.—X-ray examinations in amebic infections of the lung and pleura are quite characteristic, especially those in which perforation of a liver abscess has occurred into the lung. In the latter instance, prior to the perforation into the thorax, liver abscess produces a localized bulging of the diaphragm (Figs. 2 and 3). In cases, however, in which the intrahepatic abscess has ruptured into the subphrenic space with the development of a hepatic subphrenic abscess there is elevation of the diaphragm, especially in the cardiophrenic portion in the anterior posterior roentgenogram and an obliteration of the anterior costophrenic angle in the lateral roentgenogram (Granger,⁴⁹ Ochsner and DeBakey⁴⁷). In those cases in which perforation into the lung has occurred a triangular shadow with the base toward the liver can usually be visualized in the roentgenogram (Figs. 4 and 5). This is particularly true in the lateral roentgenograms, although it is also seen in the anteroposterior roentgenogram. Our Case A 12 demonstrates these findings especially well. Thoracic roentgenograms taken while the patient was ambulatory showed typical localized bulging of the dia-

Fig. 2.

Fig. 3.

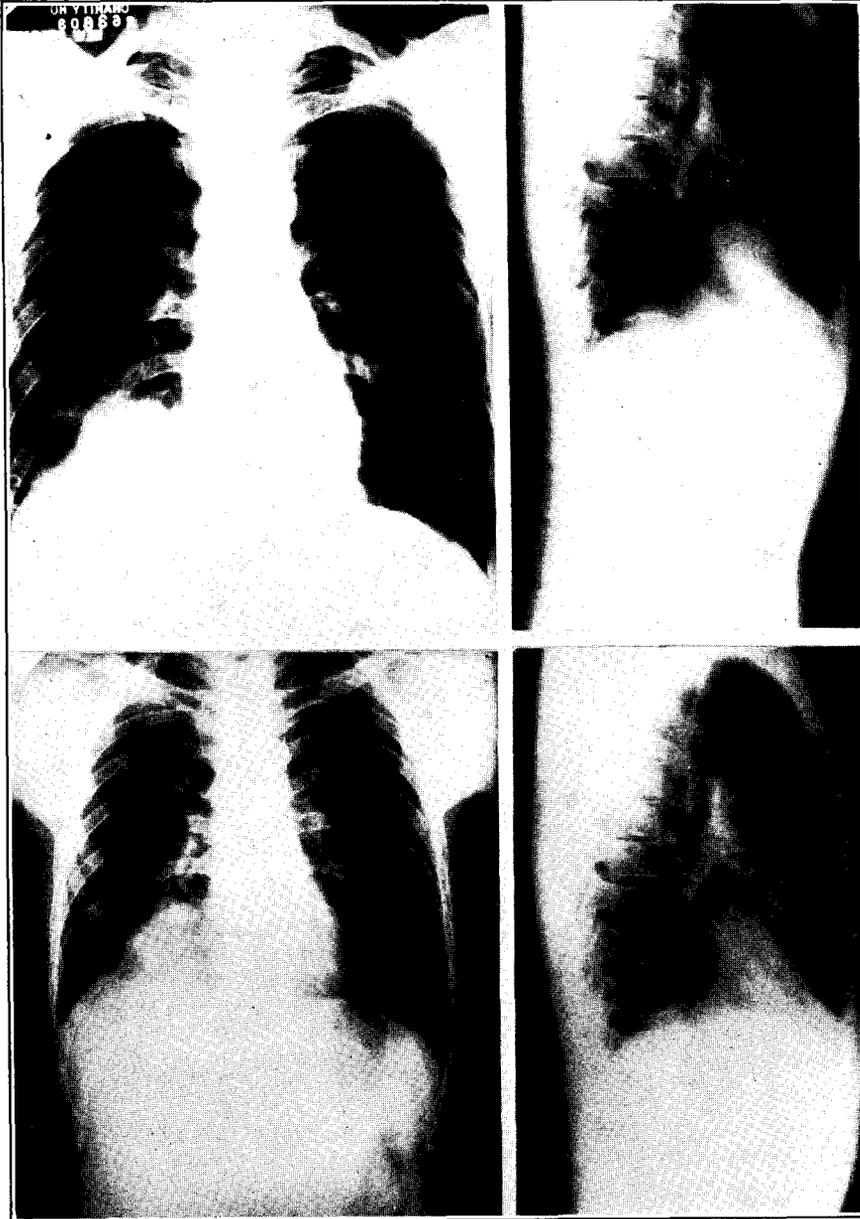


Fig. 4.

Fig. 5.

Fig. 2.—Anteroposterior roentgenogram of Case A 12 with amebic hepatitis, showing localized upward bulging of diaphragm in its medial portion.

Fig. 3.—Lateral roentgenogram of same patient as in Fig. 2, showing triangular shadow in lower portion of thorax with base below and apex pointing upward and posteriorly.

Fig. 4.—Anteroposterior roentgenogram of Case A 12 (shown in Fig. 2) taken several hours after perforation of amebic hepatic abscess into the lung and bronchus. In contrast to the shadow in Fig. 2, the edges of which are sharply defined, the shadow at the right base in this roentgenogram is less distinct, particularly in the upper portion.

Fig. 5.—Lateral roentgenogram of Case A 12 (shown in Fig. 3) taken several hours after perforation of amebic hepatic abscess. The shadow at the right base has extended upward and in contrast to the shadow in Fig. 3 the edges are less distinct, especially in its uppermost portion.

phragm into the lower lung field (Figs. 2 and 3). Hospitalization was advised, but was deferred by the patient for two weeks. On the day of admission the patient experienced a severe pain at the base of the right thorax and began to expectorate large quantities of chocolate sauce material. Roentgenograms taken approximately three hours after the onset of these symptoms showed extension, especially upward, of the previously demonstrated amebic hepatic abscess and irregularity of the apex of the shadow which on previous examination was sharply defined (Figs. 4 and 5). In cases with hematogenous lung abscess the shadow may be located in any part of the lung, and usually there is a clear zone between the shadow produced by the abscess and that produced by the liver. Flynn and Warren⁵⁰ believe the following are cardinal roentgenographic signs of bronchohepatic fistulas: (1) high fixed right diaphragm; (2) abscess mass near the diaphragm and involving the liver; (3) column of fluid extending from this to the trachea; and (4) expectoration of bile-stained sputum. In the collected series of cases relatively few x-ray pictures were made. In 19 of the group there was a shadow at the right base; in 10 the right diaphragm was elevated; in 6 there was evidence of abscess in portions of the lung other than the base, and in 1 there was evidence of fistula between the liver and the lung. In our series of 15 cases a shadow at the right base was found in 12, there was elevation of the diaphragm in 11, abscess of the lung in 3, and abscess with fistula in 2. In these last 2 cases the fistula was demonstrated by means of lipiodol filling.

Diagnosis.—The diagnosis of amebic infections of the pleura and lung are usually not difficult if the condition is only kept in mind. Generally, there is a history of previous diarrhea, moderate elevation of the temperature, and enlargement and tenderness of the liver. When these symptoms and signs are associated with pulmonary manifestations, one should suspect an amebic infection of the lung. If, in addition to this, there are elevation and fixation of the diaphragm and a basal shadow on the right side together with expectoration of large quantities of chocolate sauce pus, one is justified in making a positive diagnosis. We have found, as suggested by Pellé and Baron⁵¹ and Lemierre and Bernard,^{4, 46} that the well-defined edge of the roentgenographic shadow is of diagnostic value (Figs. 4 and 5). Cannavò and Cola⁵² emphasize the advantage of using contrast substances introduced into the bronchial tree perorally to visualize the communications from the liver, pulmonary abscesses, and the bronchi. In 2 of our cases the fistulous communication between the hepatic abscess and the bronchi was demonstrated by lipiodol filling of the tracheobronchial tree. Cannavò and Cola⁵² also advocate the use of pneumoperitoneum and pneumothorax as diagnostic procedures. The finding of amebas in the sputum together with **relatively few microorganisms** is conclusive proof of the correct diagnosis.

The demonstration of a clear zone between the pulmonary shadow and that produced by the liver is indicative of a hematogenous abscess. In those cases in which a communication between the amebic process and a bronchus has not been established, as in empyema resulting from perforation of an hepatic abscess, aspiration of the fluid is a valuable diagnostic procedure. The finding of characteristic sterile chocolate sauce pus, especially if it contains amebas, is pathognomonic. Amebas, however, are found infrequently in the aspirated material. In the collected series they were found in 11 of the cases (Graph 6). In our 15 cases the aspirated material was examined for amebas in 5, in 4 (80 per cent) of which negative results were obtained. In only 1 (Case A 4) were amebas in the aspirated material.

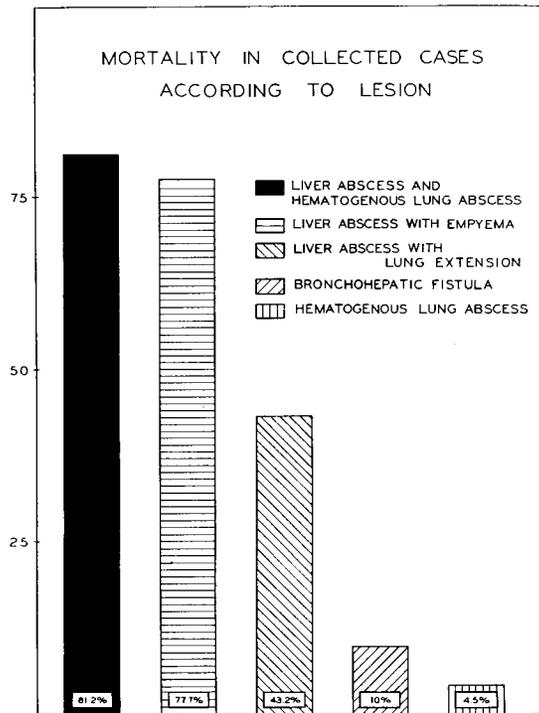
Amebic infections of the lung are likely to be confused with tuberculosis, primarily because of the chronicity of the condition and because of the profuse expectoration of bloody sputum. The physical findings of consolidation and cavitation support this diagnosis. In tuberculosis, however, the greatest amount of involvement is usually at the apex; whereas in amebiasis the lesion is generally at the base and associated with hepatic involvement. Tuberculosis can easily be eliminated as a diagnostic possibility by the absence of tubercle bacilli in the sputum. Some cases, because of the acute onset, are confused with pleurisy, and pneumonia. It is exceptional, however, that the high leucocyte count seen in the pyogenic pneumonias occurs in cases of amebic pneumonitis; and, when such does occur, it is usually indicative of secondary infection with pyogenic bacteria. Then, too, as a rule, the amount of material expectorated in cases of amebic infections of the lung is considerably greater than that expectorated in pyogenic infections. The temperature reaction in amebic infections is considerably lower than that in the usual pyogenic infections. Characteristically the fever in amebic pneumonitis is only moderately elevated, and the patient, although cachectic, usually is not so ill as the patient with a pneumonic process. The presence of characteristic chocolate sauce pus in the sputum is diagnostic of amebic hepatic suppuration communicating with a bronchus and is of value in distinguishing such lesions from other pulmonary processes. Rarely the sputum is bile stained. In suspected pleuropulmonary complications of amebic hepatic abscess, aspiration of the hepatic abscess is justified. This should be done, as emphasized in our previous communications,^{3, 47} in such a way that an uninvolved portion of a serous cavity is not traversed by the aspirating needle in order to prevent contamination of the respective cavity.

Prognosis.—The prognosis in amebic infections of the pleura and lung depends upon a number of different factors. Hussenet⁵³ and Valence⁵⁴ state that the prognosis in amebic pulmonary suppuration is dependent upon the presence or absence of bile in the sputum. When bile is present,

TABLE II
RESULTS IN COLLECTED SERIES

TYPE OF THERAPY	HEMATOGENOUS PULMONARY ABSCESS WITHOUT LIVER INVOLVEMENT		HEMATOGENOUS PULMONARY ABSCESS AND INDEPENDENT LIVER ABSCESS		PULMONARY ABSCESS EXTENDING FROM LIVER ABSCESS		BRONCHOHEPATIC FISTULA WITH LITTLE PULMONARY INVOLVEMENT		EMPHYEMA EXTENDING FROM LIVER ABSCESS		TOTAL	
	RECOVERED	DIED	RECOVERED	DIED	RECOVERED	DIED	RECOVERED	DIED	RECOVERED	DIED	RECOVERED	DIED
Operation	63			43, 45, 57, 58, 59, 77, 106	29, 30, 40, 41, 42, 52, 53, 54, 61, 62, 66, 67, 81, 83, 92, 95, 99	46, 47, 49, 55, 56, 64, 65, 69, 82, 86, 96, 98, 100	19, 28, 44, 68, 70, 73, 75, 128	36, 37	22, 76, 97	14, 17, 51, 74, 89	29	27
Operation and emetine	117		150	151, 152	87, 127, 137, 146		85, 108, 132		107		10	2
Emetine	109, 110, 113, 114, 115, 116, 118, 119, 122, 129, 133, 135, 136, 138, 141, 143, 144, 145, 153		111, 112	123	84, 125, 134, 139, 140, 142	130	79, 80, 126, 131, 147, 148, 149		105		35	2
No statement made or insufficient data		48		60, 88, 121	20, 33, 39, 94, 120	6, 9, 12, 18, 21, 23, 24, 31, 34, 50, 93	16, 25, 26, 27, 32, 35, 38, 71, 72	15	90	1, 2, 3, 4, 5, 7, 8, 10, 11, 13, 91, 101, 102, 103, 104, 124	15	32
Postural drainage					78						1	
Total	21	1	3	13	33	25	27	3	6	21	90	63
	22		16		58		30		27		153	

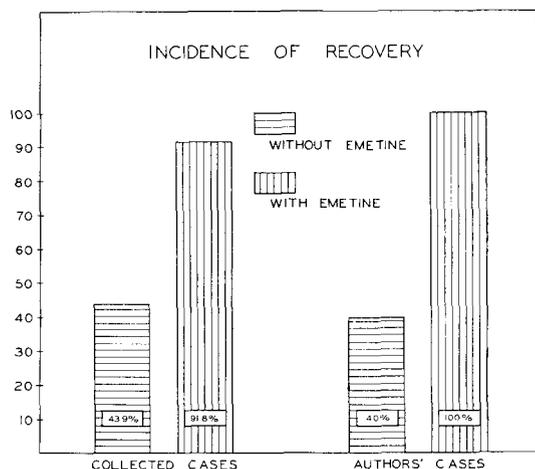
the prognosis is much worse than when it is absent. The type of pleuro-pulmonary involvement is important as regards prognosis, the prognosis being gravest in those cases in which an hepatic abscess ruptures into the pleural cavity and best in those cases in which there is a direct communication between the hepatic abscess and a large bronchus with a minimal amount of pulmonary reaction. According to Thompson³² the chances of spontaneous cure are fairly good in those cases with a communication between the liver abscess and the bronchus without involvement of the pleura; whereas, if the pleural cavity is involved, there is little chance of spontaneous cure. The prognosis is dependent not only



Graph 7.—Graph showing mortality in collected cases in pleuropulmonary amebiasis according to type of lesion.

upon the type of the pleuropulmonary involvement but also upon the type of therapy. According to Miginiac,⁵⁵ one must differentiate between acute and chronic amebic pulmonary abscesses. In the former there is usually a large communication between the hepatic abscess and the bronchus, permitting rapid evacuation of the hepatic abscess contents; whereas in the latter the communication is small, not infrequently there are multiple abscesses, and as a result of the incomplete evacuation, hyperpyrexia, cachexia, anemia, and weakness persist. The prognosis in this type of case is bad. The importance of adequate drainage through the bronchus in cases of pleuropulmonary amebiasis is shown by the results

obtained in the collected cases. Of the 30 patients with liver abscess and bronchohepatic fistula with little or no involvement of the lung parenchyma, 27 recovered (90 per cent) (Table II, Graph 7). In contrast to the high incidence of recoveries in this group of cases is the low incidence of recoveries in those cases in which a liver abscess was complicated by an empyema. In the collected series there were 27 cases with only 6 recoveries (22.2 per cent) (Table II, Graph 7). The importance of the use of amebicides as regards the prognosis in amebic infections of the pleura and lung is illustrated by the results obtained in the collected cases; 91.9 per cent of the patients receiving emetine recovered as contrasted with 43.9 per cent recovery in those patients not receiving emetine. In our cases similar results were obtained in that there was a 40 per cent recovery in the patients not receiving emetine and 100 per cent recovery in those cases in which emetine was used (Graph 8). The effect

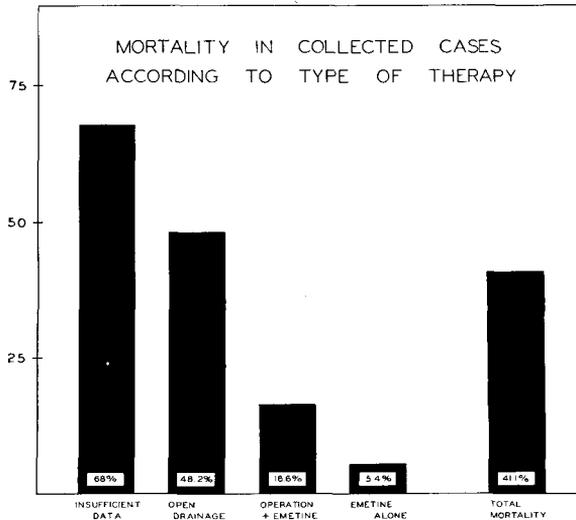


Graph 8.—Graph showing incidence of recoveries in collected series and in authors' series in those patients treated with and without emetine. The importance of emetine in the treatment is graphically illustrated.

of emetine administration on the prognosis is further illustrated by the results in the collected cases. In the cases treated by open drainage without amebicides the mortality rate was 48.2 per cent; whereas in those cases treated by open drainage and emetine the mortality rate dropped to 15.3 per cent, and only 5.5 per cent of the patients treated by emetine alone died (Graph 9). Theoretically the prognosis in hematogenous pulmonary abscess should be much worse than in those cases in which there is direct extension into the lung from the liver, because in the former the amebas are circulating in the blood stream. In the collected series of hematogenous lung abscess occurring concomitantly with liver suppuration there were 16 cases with 13 deaths, a mortality rate of 81.2 per cent. In the group of cases, however, in which a hematogenous abscess of the lung occurred without any involvement of the liver, there were 22

cases with 1 death, a mortality rate of 4.5 per cent. The great discrepancy in the results obtained in these two groups, both with amebic blood stream infections, is due to two factors: (1) patients with hematogenous lung abscess and concomitant liver abscess have two suppurative processes, either one of which is a burden for the organism to carry; (2) the type of therapy employed in each. We believe the latter factor to be the more important of the two. A large number in the group with the hematogenous lung abscess alone received emetine; whereas relatively few of those with concomitant liver abscess received emetine. In the former group of 22 cases all but 2 patients received emetine, and the only fatal case did not. In the latter group of 16 cases only 6 received emetine.

Treatment.—Before the suggestion of Sir Leonard Rogers,⁵⁶ in 1912, that emetine be employed in the treatment of amebic dysentery and



Graph 9.—Graph showing mortality in the collected series according to type of therapy.

amebic hepatitis the results obtained in the treatment of these conditions were unsatisfactory. Whereas at the present time there are many amebicides which are more efficacious and much safer in the treatment of amebic lesions in the bowel; emetine still remains the sheet anchor in the treatment of amebic infections of the liver and lung. As mentioned in our previous publication,³ Leake⁵⁷ is of the opinion that although other amebicides (acetarsonc, carbasone, trepasol, chinophon, and vioform) are safer and more efficient in the treatment of intestinal amebiasis, they should not be used in amebic hepatic infections, because they themselves are toxic to the liver. After the treatment with emetine and the subsidence of hepatic and pleuropulmonary manifestations, however, the underlying intestinal amebiasis is most safely and efficiently treated by one of the above mentioned amebicides. Manson-Bahr⁵⁸ has emphasized

that emetine is more efficacious in the treatment of pleuropulmonary amebiasis than in the intestinal lesion. The value of emetine in the treat-

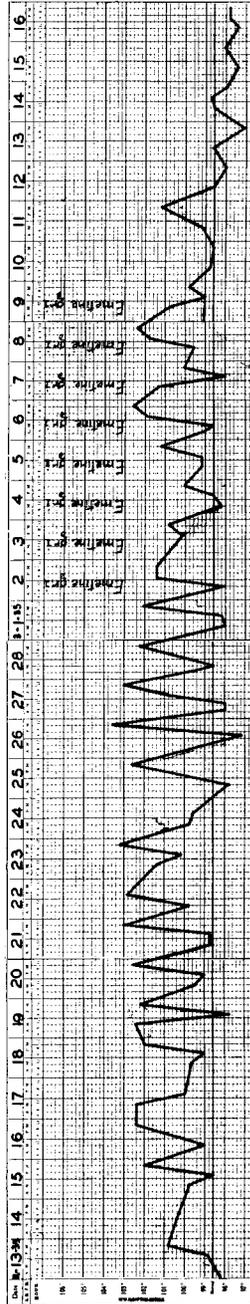


Fig. 6.—Temperature chart of Case A 12, showing septic type of fever and definitive response to emetine therapy.

ment of pleuropulmonary amebiasis is illustrated by the results obtained in the collected cases and in our cases (Figs. 6 and 7). In the former group there was a recovery incidence of 43.9 per cent in patients not re-

ceiving emetine as compared with 91.8 per cent in those who received emetine. In the latter group, the authors' cases, the recovery incidence in the group not receiving emetine was 40 per cent as compared with 100 per cent in those patients who received emetine (Graph 8). Similarly in the collected series the effect of the administration of emetine is illustrated by the comparison of results obtained in those cases in which

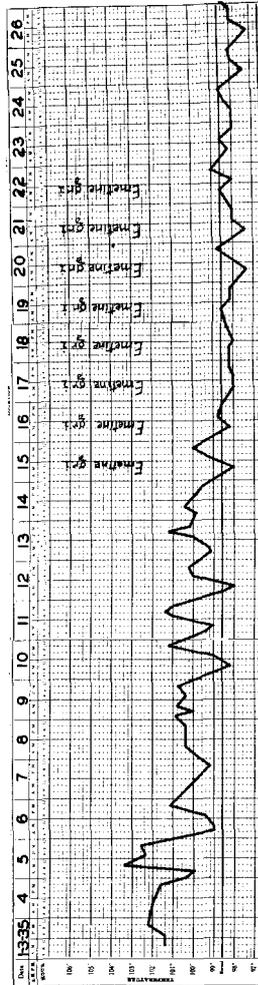
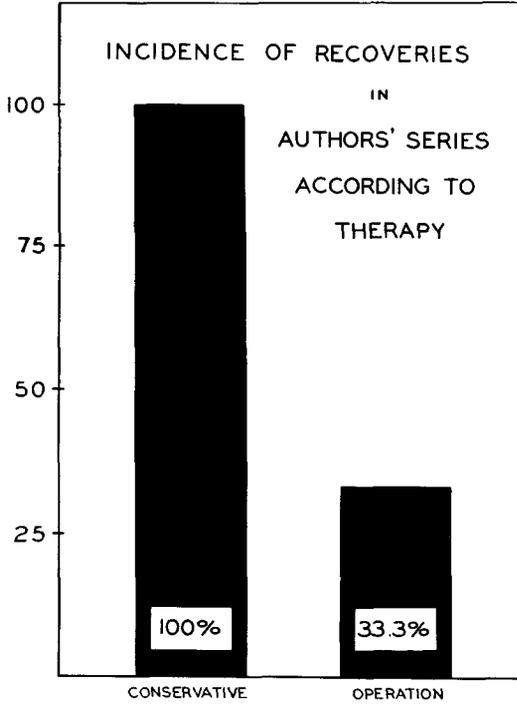


Fig. 7.—Temperature chart of Case A 13, showing moderate irregular pyrexia and dramatic response to emetine therapy.

open operation and drainage of the abscess was done with those in which the abscess was drained together with administration of emetine. In the former group the mortality rate was 48.2 per cent, whereas in the latter group it was 15.3 per cent, and in a third group of cases in which emetine alone was used, the mortality rate was 5.5 per cent (Graph 9). As suggested in our previous publications^{3, 47} on amebic hepatic suppuration and as a result of our personal experience in pleuropulmonary complications of this condition, we are of the opinion that emetine should be

administered in grain doses daily until 6 to 10 grains (0.39 to 0.65 gm.) have been given. According to Leake⁵⁹ the amount of emetine administered over any given period of time should not exceed 10 milligrams ($\frac{1}{6}$ gr.) per kilogram of body weight. A maximum dose for a person weighing one hundred and fifty pounds would be approximately 10 grains. Emetine should be used cautiously, because as shown by Rhinehart and Anderson,⁶⁰ working in Leake's laboratory, it produces in the experimental animal severe injury to the cardiac muscle. Similarly, as in uncomplicated amebic abscess of the liver, external open drainage is undesirable in nonsecondarily infected amebic infections of the pleura



Graph 10.—Graph showing incidence of recoveries in pleuropulmonary amebiasis in authors' series according to operative and nonoperative therapy.

and lung. Although theoretically the possibility of secondary infection of a hepatic abscess as a result of communication with a bronchus is possible, the danger of such a complication occurring if prompt therapy is instituted is relatively slight as evidenced by the results obtained by conservative therapy. In the collected cases the mortality rate was much higher when open drainage was used (48.2 per cent) than it was when emetine alone was used (5.5 per cent). When open drainage was combined with emetine therapy, the mortality rate was 15.3 per cent. The undesirability of operating upon patients with pleuropulmonary amebiasis is illustrated by the results obtained in our cases in which a 33.3

per cent recovery incidence was obtained in the group which was operated upon as contrasted with 100 per cent recovery incidence in the group which was treated conservatively with amebicides (Graph 10).

The necessity of evacuating an hepatic abscess or a pleural effusion resulting from the rupture of an hepatic abscess into the pleural cavity cannot be overemphasized. In those cases, however, in which there is a free communication between the hepatic abscess and a large bronchus, evacuation of the contents of the abscess usually occurs spontaneously. If the evacuation is incomplete, however, it is essential that the hepatic abscess be treated as an uncomplicated one, viz., by aspiration combined with emetine administration. Similarly in those cases in which perforation of the hepatic abscess into the pleural cavity has occurred, aspiration without open drainage should be done unless complicated by secondary infection. Similarly, as we^{3, 47} have previously suggested in the treatment of amebic abscess of the liver an immediate smear of the pus should be made at the time of aspiration to determine the presence of microorganisms. If bacteria are found, especially if there is leucocytosis and hyperpyrexia, external drainage of the pus should be done because of the secondary infection; otherwise, aspiration alone should be done. Pellé⁶¹ advocates the use of pneumothorax as an aid in preventing or controlling hemorrhage. This procedure may be an especially valuable adjuvant in those cases in which there is a large cavity and in which collapse is desirable, but the procedure can be used in relatively few cases because of the pleural adhesions which are usually present. Pellé⁶¹ also suggests postural and bronchoscopic drainage. Thompson³² advocated immediate operation in those instances in which the abscess failed to drain through the bronchus and in cases in which the pleural cavity was involved. He advised evacuation of the lung and liver abscess at the same time the pleural cavity was drained. Vergoz and Hermenjat-Gerin³⁶ advocate open drainage in those cases and immediate examination to determine whether microorganisms are present or not. If none are present, they advocate primary closure of the wound; otherwise, open drainage. We believe that the open evacuation of the abscess contents is not only unnecessary but also undesirable because of the greater danger of contamination. We cannot agree with Miginiac⁵⁵ that operation should be done in all cases of amebic abscess of the lung or empyema. As mentioned above, although the possibility of the contamination of the liver abscess through a hepatobronchial fistula is possible, apparently this rarely occurs, as evidenced by the statistics obtained in our collected and personal cases. We agree heartily with Craig² that many, if not most, cases of amebic infections of the lung will respond to emetine therapy alone and that relatively few will require surgical intervention. In the majority of the latter, simple aspiration of the originating focus in the liver will suffice.

Results.—In the present investigation in which 153 collected cases of pleuropulmonary amebiasis were analyzed, the cases were divided into five different groups according to the type of pleuropulmonary amebic infection:

1. *Hematogenous Pulmonary Abscess Without Liver Involvement.*—There were 22 cases in this group, of which only 1 (4.5 per cent) died (Table II, Graph 7). Although it would seem that the mortality rate should be high in this group, because in hematogenous pulmonary abscess amebas must be circulating in the blood stream, the low mortality rate obtained was undoubtedly due to the fact that all except 2 patients received emetine. One of those not receiving emetine was the fatal case mentioned above and another was a patient operated upon, but who recovered. One other patient was operated upon, but received emetine. In our series of cases there were no hematogenous pulmonary abscesses. The importance of emetine administration is well illustrated in this group, because even though a blood-borne infection or an amebiemia must be accepted, the mortality rate of 4.5 per cent is exceptionally low, undoubtedly due to the high incidence of emetine administration.

2. *Hematogenous Pulmonary Abscess and Independent Liver Abscess.*—There were 16 cases of hematogenous lung abscess occurring concomitantly with a liver abscess, the two, however, being unassociated (Table II, Graph 7). In the 16 cases there were 13 deaths (81.2 per cent mortality). Of the 13 fatal cases, 9 patients were operated upon, only 2 of whom received emetine. Three of the other 4 fatal cases had no therapy; one, however, received emetine. Three patients recovered, all of whom received emetine and 1 of whom was operated upon. Of the entire 16 cases, only 6 patients received emetine, 3 of whom recovered and 3 died. One of the former was operated upon; whereas 2 of the fatal cases were also operated upon. The high mortality rate in this group (81.2 per cent) as contrasted with the low mortality rate (4.5 per cent) in those cases of hematogenous lung abscess not associated with liver abscess is probably due to two factors. Even though in both groups of cases an amebiemia was present, in those cases in which there was a concomitant liver involvement the patient was undoubtedly more toxic because of the additional focus. The more important reason, to our minds, is the fact that relatively few, less than a third of the patients, in whom a liver abscess and hematogenous lung abscess occurred concomitantly received emetine as contrasted with 90 per cent of those patients in whom a hematogenous lung abscess alone was present. In our series of cases there were none in this group.

3. *Pulmonary Abscess Extending From a Liver Abscess.*—This comprised the largest group of the collected series. There were 58 cases, 25 of which (43.2 per cent) were fatal (Table II, Graph 7). Of the 25 fatal cases, 13 were operated upon. In 11 no therapy was used or the details

were incomplete and 1 received emetine alone. Of the 33 patients who recovered, 21 were operated upon, 4 of whom received emetine. The 6 additional patients who recovered received emetine alone. In 5 no statement was made concerning the therapy. In 1 postural drainage alone was used. Of the 11 patients who received emetine only, 10 recovered and only 1 died. Of the 58 cases there were only 42 in which details were given as regards therapy. Of these, 11 received emetine with 90.9 per cent recoveries. Of the 31 patients not receiving emetine, 13 died and 18 recovered (58 per cent). Of 34 patients operated upon, 13 died and 21 recovered (61.7 per cent). The effect of the administration of emetine is well illustrated by these cases, a 90 per cent recovery incidence in those cases in which emetine was given as contrasted with 58 per cent incidence

TABLE III
RESULTS IN AUTHORS' SERIES

TYPE OF THERAPY	PULMONARY ABSCESS EXTENDING FROM LIVER ABSCESS		BRONCHO-HEPATIC FISTULA WITH LITTLE PULMONARY INVOLVEMENT		EMPHYEMA EXTENDING FROM LIVER ABSCESS		TOTAL	
	RE-COVERED	DIED	RE-COVERED	DIED	RE-COVERED	DIED	RE-COVERED	DIED
Operation					A 15	A 7	1	1
Operation and amebicides						A 8		1
Emetine or other amebicides	A 2, A 4, A 5, A 6, A 13, A 14		A 3, A 11, A 12		A 1		10	
No statement made or insufficient data		A 9			A 10		1	1
Total	6	1	3		3	2	12	3
	7		3		5		15	

in the group in which emetine was not given. The value of conservative therapy is also illustrated by the results obtained in our cases of pulmonary amebic abscess secondary to liver abscess rupture. Seven patients were of this type, 6 of whom received amebicides, all of whom recovered (Table III). Only 1 who had no treatment died.

4. *Bronchohepatic Fistula With Little Pulmonary Involvement.*—In the collected cases there were 30 patients with liver abscess and bronchohepatic fistula in whom the liver abscess evacuated through the bronchus with a minimal amount of pulmonary reaction (Table II, Graph 7). Of the 30, 27 recovered (90 per cent) and 3 (10 per cent) died. Two of the 3 fatal cases were operated upon. In 10 of the 30 cases insufficient data concerning the type of therapy were given. Emetine was administered to 10 of the 27 patients who recovered. Three of these were also operated

upon. All the patients receiving emetine recovered. Two of the 13 patients operated upon died, neither of whom had received emetine. Thus it is seen that half of the cases in which sufficient data are available received emetine, and all of these patients recovered. The only death in the series occurred in that group of patients who were operated upon and who did not receive emetine. There were 3 patients of this type in our series, all of whom recovered following the conservative treatment with amebicides (Fig. 8). It is obvious that bronchohepatic fistula with complicating amebic liver abscess with adequate evacuation of the abscess through the bronchus offers a relatively good prognosis and especially if emetine is administered.

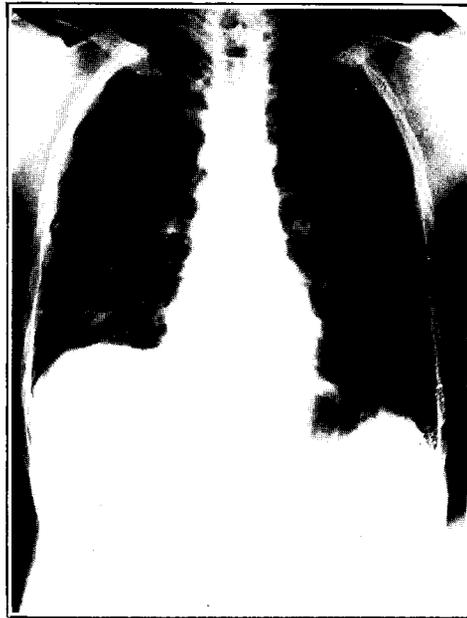


Fig. 8.—Anteroposterior roentgenogram of Case A 12 (shown in Figs. 2, 3, 4, 5). This plate was made approximately six weeks after those shown in Figs. 4 and 5, showing almost complete disappearance of shadow at base of right lung. The patient was symptom free at the time this roentgenogram was taken.

5. *Empyema Extending From Amebic Liver Abscess.*—In the series of collected cases there were 27 with liver abscess in which the abscess ruptured into the pleural cavity with the development of an empyema. In this group there were 21 deaths (77.7 per cent) (Table II, Graph 7). In 16 of the 21 fatal cases no details concerning therapy were given. Ten of these were observed early, before 1900. The other 5 fatal cases were operated upon. Of the 6 patients who recovered, 4 were operated upon, 1 of whom received emetine and 1 not operated upon also received emetine. Only 2 received emetine, both of whom recovered. In our series (Table III) there were 5 with empyema complicating amebic hepatic abscess. In 1 the pleural cavity alone was involved (Case A 7) and in

4 the pleural cavity and lung were involved concomitantly. Two (40 per cent) of the 5 patients died. Three (60 per cent) of the 5 were operated upon, 2 of whom died. Only 1 of the 5 patients received amebicides; he also was operated upon and died. These figures would indicate that the prognosis in empyema extending from amebic liver abscess is grave. On the other hand, the high mortality rates obtained in the collected series (77.7 per cent) and in our series (40 per cent) are probably due to the fact that emetine was used in few instances (20 per cent in both the collected and our series) and that open drainage was frequently employed (90 per cent in the collected cases and 60 per cent in our series). It is our prediction that had open operation been used less frequently and emetine administered more frequently, the mortality rates would have been much lower. It is important, however, that in these cases evacuation of the pleural contents be accomplished by aspiration in the noninfected cases and by some type of drainage in those cases which are secondarily infected.

The results obtained by the various methods of treatment in pleuropulmonary complications of amebiasis vary considerably (Table II, Graph 9). Of the 153 collected cases, 63 patients died (41.1 per cent). Of the entire group there were 47 cases in which insufficient data were given or in which nothing was done and in which no conclusions can be drawn concerning the results obtained by various therapeutic measures, of which 32 patients (68 per cent) died. Fifty-six patients were treated by open drainage alone, of which 27 (48.2 per cent) died. Twelve patients were treated by open operation and emetine, of whom 2 died (16.6 per cent). Thirty-seven patients were treated by emetine alone, of whom 2 (5.4 per cent) died. Of the entire group of 153 cases, 49 patients received emetine with only 4 deaths (8.1 per cent); whereas 59 of the remaining 104 died (56.7 per cent). The results obtained in these cases demonstrate that operation offers relatively little in the treatment of pleuropulmonary amebiasis. The mortality rate in this group is extremely high (48.2 per cent), but can be definitively decreased (16.6 per cent) by the administration of emetine. The best results, however (5.4 per cent mortality), were obtained in those patients who were not operated upon, but in whom emetine alone was used. In our 15 cases, 3 patients died (20 per cent). Of the 15 cases only 14 patients were treated, 1 dying before treatment could be instituted. Of these 14, 3 were operated upon, 2 (66.6 per cent) of whom died. Of the remaining 11 treated conservatively, none died (Graph 10). In our series there were 6 patients who received emetine alone or in combination with other amebicides; all of whom recovered. Seven received amebicides other than emetine, with one death. Two received no amebicides, both of whom died. As mentioned under treatment, we are of the opinion that emetine is the specific drug in the treatment of pleuropulmonary amebiasis.

SUMMARY AND CONCLUSIONS

1. An analysis of 153 collected and 15 of our own cases of pleuropulmonary amebiasis is presented.

2. Pleuropulmonary complications of amebiasis occur much more frequently than is generally supposed. They occurred in 15.8 per cent of 2,490 reported and in 15.7 per cent of our 95 consecutive cases of amebic hepatic abscess.

3. The greatest number of patients in the collected series (38 per cent) were in the third decade of life; whereas the greatest number in our series (40 per cent) were in the fifth decade of life.

4. Males are involved much more frequently than females (96.2 per cent in the collected and 93.3 per cent in our series). In our series 9 patients were white and 6 colored.

5. Pleuropulmonary complications of amebiasis occur, as a rule, resulting from an extension of amebic hepatic abscess. Perforation of the abscess rarely occurs into the free pleural space, but more frequently into the lung or bronchus. Exceptionally hematogenous pulmonary amebic abscesses may occur.

6. Pleuropulmonary amebic infections are classified into five groups, depending upon the type of pleuropulmonary involvement: (1) hematogenous pulmonary abscess without liver involvement; (2) hematogenous pulmonary abscess and independent liver abscess; (3) pulmonary abscess extending from liver abscess; (4) bronchohepatic fistula with little pulmonary involvement; (5) empyema extending from liver abscess. In 14.3 per cent of the collected series the pleuropulmonary lesion was a hematogenous pulmonary abscess without liver involvement. In 10.4 per cent the lesion was a hematogenous pulmonary abscess together with an independent liver abscess. In 37.2 per cent the lesion was a pulmonary abscess extending from a liver abscess. In 19.6 per cent the lesion was a bronchohepatic fistula with little pulmonary involvement, and in 17.6 per cent the lesion was an empyema extending from a liver abscess. Pulmonary abscess extending from a liver abscess comprised 46.6 per cent of our 15 cases, bronchohepatic fistula with little pulmonary involvement, 20 per cent, and empyema extending from a liver abscess, 33.3 per cent.

7. The clinical manifestations of pleuropulmonary amebiasis consist chiefly of cough and expectoration, fever, diarrhea, enlarged and tender liver, pain in the chest, and cachexia. Cough and expectoration were observed in 92.5 per cent of the collected cases, fever in 43.2 per cent, a history of a previous diarrhea was obtained in 41 per cent, an enlarged liver present in 39.7 per cent, diarrhea at the time of admission in 33.5 per cent, and pain in the chest in 31.3 per cent. The expectoration of chocolate sauce pus is indicative of a communication between a

liver abscess and a bronchus and is of diagnostic importance. Pulmonary manifestations consist of consolidation and cavitation.

8. There is characteristically a moderate leucocytosis without concomitant increase in the polymorphonuclear leucocytes. A marked leucocytosis is indicative of a secondary infection.

9. X-ray examination shows elevation and fixation of the diaphragm and a shadow at the right base, particularly in those cases in which a pulmonary abscess extends from a liver abscess. Characteristically the shadow is triangular with the base below and the apex above.

10. Diagnosis can be definitively established by the characteristic chocolate sauce pus and the finding of amebas in the sputum and aspirated material.

11. The prognosis in pleuropulmonary amebiasis is dependent upon the type of the lesion and the therapy employed. The mortality rate in the collected series was extremely high (41.1 per cent). In the group with liver abscess and hematogenous lung abscess the mortality rate was 81.2 per cent. In the cases of liver abscess with empyema it was 77.7 per cent. In cases of lung abscess extending from liver abscess it was 43.2 per cent. In cases of bronchohepatic fistula with a minimal amount of pulmonary involvement it was 10 per cent. In the cases of hematogenous lung abscess without liver abscess it was 4.5 per cent. The prognosis depends probably more upon the type of therapy than upon the type of lesion. The mortality rate obtained in the cases treated by open drainage was 48.2 per cent, that in the cases treated by open drainage and emetine, 16.6 per cent, whereas that obtained by emetine alone was 5.4 per cent.

12. The treatment of pleuropulmonary amebiasis consists of the administration of emetine and the aspiration of those abscesses not sufficiently evacuated through the bronchus. Open drainage should never be done except in those cases with secondary infection. The importance of emetine in the treatment of amebic pleural pulmonary complications is illustrated by the results obtained in the collected and in our cases. The incidence of recovery in cases treated without emetine in the collected cases was 43.9 per cent and in our cases 40 per cent; whereas in those cases receiving emetine the respective incidences were 91.8 per cent and 100 per cent.

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