A THESIS ON

AMOEBIC ABSCESS OF THE LIVER.

(A Study of 32 Cases)

Submitted by

J. S. McNAIR, M.B., Ch.B., D.T.M.& H.

For the Degree of

M. D. GLASGOW.

I wish to acknowledge my indebtedness to Drs. G. Carmichael Low, P. H. Manson-Bahr, N. Hamilton Fairley and to Mr. T. Pomfret-Kilner and Mr. A.H. McIndoe for their kindness in allowing me access to their cases in the preparation of this Thesis.

3. The pathology of the condition is considered in detail with special reference to microscopic appearances, and to the mode of spread of the protozoon from the bowel to the liver.

4. The symptoms and clinical signs are amassed from the 32 cases under review and it is not suggested that all of them will be found in any given case of liver abscess. The relative value and frequency of these clinical manifestations is discussed.

5. The special investigations undertaken for diagnosis are enumerated and discussed, and an indication is given of those which we have found to be of most value.

6. The treatment used in the cases has been presented with special reference to the value of liver puncture and aspiration, as opposed to open drainage.

7. Full reports on cases which were of special interest are given in detail as concrete examples of the condition under investigation.

GEOGRAPHICAL DISTRIBUTION.

Recent statistics and investigations show that the dysenteric syndrome is essentially ubiquitous.

At one time amoebic dysentery was thought to be the predominant, if not the only form of dysentery encountered in the tropics and subtropics. Increasing use of laboratory methods for the aetiological diagnosis of the dysenteries, and for detecting carriers has brought about a change in these traditions and dysentery now stands as a noteworthy element in world pathology.

It will be, perhaps, of interest to review the findings of the League of Nations investigations with regard to the distribution of dysentery, as published in the Epidemiological Report of March-April 1933.

EUROPE.

Both amoebic and bacillary dysentery are met with in European countries, but the bacillary form is much the more prevalent, that due to E. histolytica only attaining notable incidence in certain areas of the Mediterranean Basin and of the Union of Soviet Socialist Republics.

In 1931 out of 113 deaths attributed to dysentery in England and Wales, only 10 were of amoebic origin, while 47 were bacillary and 59 undetermined. No mention

was made as to whether the individuals contracted the illness in this country or abroad.

During the war the fear that amoebic dysentery might be spread throughout the country by infected soldiers returning from the fighting areas of the Eastern Mediterranean led to many investigations being made into the incidence of amoebic infection among the troops, as well as among the civilian population.

If the data collected in this country during these investigations are grouped together a total of 107 carriers out of 3,146 subjects, who had never left this country, is obtained, i.e. 3.4 per cent of these people were found to be infected with E. histolytica.

Dobell considered that if it had been possible to carry out several examinations instead of only one on these subjects, the proportion of carriers would have risen to between 7 and 10 per cent.

In other European countries such as Germany, Norway and Sweden, The Netherlands, Jugoslavia, Bulgaria, amoebic infection is by no means rare, but amoebic dysentery is uncommon.

In Spain, the few autochthonous cases of amoebic dysentery reported, seem to have contracted the infection either in Morocco or in the Colonies - Garcia 1929: McDonald 1931.

In Italy the bacillary form predominates but, nevertheless, in the southern provinces and particularly in Sicily an increasing proportion of cases of amoebic dysentery is being found. Sicily is considered to be an endemic centre of amoebiasis - Papallardo 1929: Castellani 1929.

In the Union of Soviet Socialist Republics the considerable increase of dysentery in the summer demonstrates the preponderance of the bacillary form, but the amoebic form is far from being absent even in latitudes as far north as the Leningrad region.

Philiptschenke 1929, examining 225 patients affected with acute intestinal infections during the months of July and August found 14.2 per cent carriers in E. histolytica.

ASIA.

In Asia we find that the carrier rate, though varying from place to place, is very high, while the morbidity rate is much greater than in European countries.

The statistics for 1930 of the French Army in the Levant show a dysentery morbidity rate of 40.9 per 1,000; of which 0.9 are bacillary, 27.9 amoebic and the remaining 12.2 per 1,000 of indetermined aetiology.

In India the Army Statistics for 1930 show that 64.6 per cent of the dysentery cases are of bacillary origin, both for British and Native troops. Amoebic infections account for 8.4 per cent among the native and 15.6 per cent among the British troops, giving 10.7 per cent for the combined army. These figures are probably too low, as they are based only on serious cases needing hospitalisation.

From 1920 to 1925 the large majority of cases of dysentery were reported as being due to amoebic infection, while from 1925 onwards the bacillary form was said to predominate in the proportion of 6 to 1. The League of Nations Report notes this alteration in figures and remarks that the apparent decline is due chiefly to a change, assisted by the laboratories, of the diagnostic habits of the physicians.

In Hong-Kong and Indo-China (Annam) amoebic dysentery is the more common form. Of 27 cases of dysentery among Europeans in Annam 24 were amoebic and 3 were bacillary.

Tao in 1931 found 1000 carriers of E. histolytica amongst 9,533 hospital patients from North China (3.8 examinations of faeces per subject were made). It should be noted that 44.9 per cent of these cases were healthy; 30.8 per cent showed no symptoms of amoebiasis; only

4.3 per cent had dysenteric symptoms; 6 per cent diarrhoea; 17.4 per cent slight abdominal symptoms including constipation; 1.8 per cent had liver abscess; 11 per cent were mixed infections - B. dysenteriae being also present.

In the South Manchuria Railway zone 20 to 30 per cent of the people are carriers of E. histolytica, according to Hiyeda and Suzuki.

Lee in 1926 noted the prevalence of liver abscess amongst the Koreans, with a peculiar preponderance in men - 39 out of 40 cases of liver abscess were males.

AFRICA.

Amoebic dysentery is prevalent all over Africa and, while there are no reliable figures to show its proportion to bacillary infection, the amoebic form would seem to predominate.

In Africa the ratio of known amoebic to bacillary dysentery is approximately the same for Europeans as for natives.

AMERICA.

In America the prevalence of amoebic dysentery varies with the latitude and the local conditions, becoming gradually more prevalent as the Equator is approached.

Boeck and Stiles examined the stools of patients in 36 hospitals of the American Public Health Service and other institutions disseminated in about 30 States. They found a total per cent of 4.1 carriers of E. histolytica; the highest being observed in institutions in the district of Columbia; 12 per cent; 14 per cent; and 17.3 per cent.

The dysenteric syndrome is more prevalent in the Southern than in the Northern States. In Georgia there were 211 cases of dysentery among 3 million people, as compared with 17 cases among 4 million people in Massachussets.

In Guatemala, Costa Rica and Colombia amoebic dysentery is prevalent, according to the reports of the United Fruit Company. In Costa Rica out of 150 cases of dysentery admitted to the hospitals of the United Fruit Company, 147 were of amoebic origin.

In South America and among the islands of the Caribbean Sea, dysentery is prevalent. It is difficult to determine the preponderating type, but amoebic infection would appear to represent the larger proportion.

AUSTRALASIA AND OCEANIA.

In Australia and New Zealand the incidence of dysentery is relatively low, the majority of cases being of bacillary origin, except in the Northern Territories of Australia.

The incidence of dysentery and distribution of forms vary greatly from one archipelago to another in this part of the world. Fresh infection introduced to the Islands by ships gives rise to an annual fluctuation, causing one form or other to predominate.

In Papua, Marianne, Caroline and Marshall Islands, amoebic dysentery is rare and very mild. In Nauru amoebic dysentery was formerly prevalent, but is now rare.

Amoebic dysentery predominates in the New Hebrides and Caledonia, while bacillary dysentery is the most common form met with in Fiji, Gilbert and Ellice Islands and Western Samoa.

In the present series of cases the whole world is fairly well represented, the patients having contracted their infection in such places as Afghanistan, Calcutta, Rangoon, Darjeeling, Nigeria, Transvaal, Rhodesia, Gold Coast, East Africa, Palestine, Egypt, Mesopotamia, Japan, China and Brazil.

In reading epidemiological reports on dysentery from various parts of the world, one is struck by the marked variation in the figures from year to year and from one observer to another. Many of the statements

made with regard to the relative distribution of amoebic and bacillary dysentery seem to be unreliable and no adequate explanation of this can be given without being unkind to the observers. Without going into detail and without seeking for explanation of the discrepancies it appears to be definitely determined that infection with E. Histolytica is world-wide.

PREDISPOSING FACTORS.

AGE.

Age	Males	Females	Total	Percentages
0 - 10	0	0	0	0
11 - 20	0	0	0	0
21 - 30	7	0	7	21.9
31 - 40	10	1	11	34.4
41 - 50	9	0	9	28.1
Over 50	3	2	5	15.6
Total	29	3	32	-
Percentages	90.6	9.4	-	-

The above Table shows the age and sex incidence of 32 cases of liver abscess.

It will be seen that no cases occur in the first two decades of life, whilst the larger number fall between the ages of 31 and 40. Between 41 and 50 the disease is also quite common, 28.1 per cent of the cases being in this age group. There is also a considerable number between 21 and 30 and it is to be noted that 15.6 per cent are above the age of 50.

There is nothing worthy of note in comparing the age incidence of the disease in the two sexes.

While 32 cases is perhaps too small a number on which to base statistical data, the above figures are found to coincide in the main with those of Rogers, which were based on a series of 300 cases. His figures show a smaller percentage above the age of 50, as compared with the figures under consideration, but like the latter, his highest incidence occurs between the ages of 31 and 40.

SEX.

From the above figures it can be seen that liver abscess is much more common among males; in this series they represent 90.6 per cent of the total. Most observers are agreed on this point, as witness the figures of the previously quoted under the "Geographical Distribution" (p. 4).

No adequate explanation for this preponderance among males has ever been given, but I am inclined to believe that it is due, in part, to the fact that women are less frequently affected with amoebic dysentery. I am unable to give any definite figures on this point, as many of the cases admitted to the hospital as amoebic dysentery are diagnosed only on clinical and therapeutic grounds, but on taking out rough estimations on this point from the hospital records, it seemed to explain in part the preponderance in males.

Until recently, alcohol in its various forms was almost exclusively a man's drink, and this fact has been used by many observers to explain, in part, the preponderance of males affected with amoebic liver abscess, with what degree of truth I am unable to say.

EXPOSURE AND FATIGUE.

Exposure and fatigue, in that they lessen the general resistance of the individual, have been considered as exciting causes. While this is probably true they do not play any more important a part in the onset of liver abscess than in the onset of many common infectious diseases.

Some patients first develop symptoms of hepatic amoebiasis on reaching cool or cold climates, and in one

of the cases under consideration the individual developed a liver abscess following exposure, having slept out in the open for several nights prior to the onset of symptoms.

It is difficult to estimate the part played by fatigue in the onset of liver abscess but I think there can be little doubt that these two factors - exposure and fatigue - in some inadequately explained manner, do predispose to the development of the disease.

TRAUMA.

Local injury of the part has been considered of importance in the onset of some diseases, especially with regard to diseases of bones and joints. In two of the cases here considered there was a history of injury immediately preceding the onset of the condition, one of the patients having fallen heavily from a ladder on to the side of his chest. Such an injury might produce a thrombosis of a small vessel in the liver, and the degenerating area thus formed might provide a nidus for the amoebic infection.

With regard to injury and the onset of liver abscess, the most important point is to guard against diagnosing a given pain as being caused by some local bruising or strain, when there is a possibility of the real cause being an amoebic hepatitis or abscess.

MALARIA.

Certain diseases, especially malaria, have frequently been held to be responsible for the onset of the condition. Infection with the subtertian parasite of malaria commonly gives rise to an enlarged and tender liver, probably due to engorgement of the organ, but in none of the cases of liver abscess here considered was the illness preceded or accompanied by malarial infection.

ALCOHOL.

Alcohol, especially in excess, has been considered by authorities on tropical medicine to be an important predisposing factor in hepatic amoebiasis. In support of this idea Rogers gives some figures which are very suggestive as to its significance. He found that among fifty-five Europeans suffering from liver abscess, all took alcohol in some form or other, and that 16 per cent of them did so to excess. Objection to this deduction might be raised by stating that the drinking of alcohol among Europeans abroad is almost universal, and that, therefore, it is impossible to determine the part played by a constant factor, but if we take into account the incidence of liver abscess among Hindus and Mohammedans, we find that it is twice as common among the former, and this could be explained in part by the relatively greater indulgence in alcohol by Hindus.

Alcohol is considered to have a deleterious effect on hepatic sufficiency and to be a factor in producing cirrhosis of the liver, while alcoholic hepatitis is a not uncommon condition abroad. Such being the case, it would seem quite reasonable to consider alcohol as a predisposing cause of liver abscess.

In the present series of cases most of the patients took alcohol in one form or another, no definite quantities being stated, but in two instances the individuals concerned said that they did not take alcohol in any form, so that while we do consider alcohol to be a predisposing factor in this condition, it is not an essential one, as liver abscess, like cirrhosis of the liver, may arise in an individual who has been a total abstainer.

PATHOGENESIS AND PATHOLOGY.

The close association of "Tropical Abscess" with dysentery had been recognised by medical men in India many years before E. histolytica was discovered and classified as a pathogenic agent, but it was only when the clinical condition of dysentery was discovered to have a varied pathology that we were able to form a proper appreciation of the invariable relationship between amoebiasis and the pathological process under consideration.

Most observers at the present time are convinced that E. histolytica is directly responsible for the production of "Tropical Abscess", but there is just the possibility that other factors may also play a not unimportant part. Acton and Knowles (1928), working at the Calcutta School of Tropical Medicine, discovered that the stools of patients suffering from acute amoebic dysentery or milder diarrhoea frequently show a culture of haemolytic streptococci, while the stools of "healthy" carriers have failed to show any growth of these organisms. They suggest, as a possibility, that haemolytic streptococci may, by invading small amoebic ulcers, produce an acid environment which is favourable to the rapid growth and multiplication of E. histolytica. The work of Boeck and Drbohlav (1925) on the culture of E. histolytica shows that an acid environment is not essential for good growth, so that whether or not an acid medium is of importance is a point which requires further investigation.

In a similar manner bacilli or cocci may play an important rôle in the production of the lesion in the liver, either by their actual presence in the organ or by the action of their toxins on the liver cells producing small foci of degeneration or small focal thrombosis of the vessels.

Is there any evidence from the present investigation to give support to this theory? Of the 32 examples of liver abscess in this present series, culture of the pus for organisms was made in 14. Of these 9 proved to be sterile - one even after 7 days incubation. In 2 cases the pus on first aspiration was sterile, but as the two patients did not respond to treatment, a second culture of freshly aspirated pus was carried out in each case. In one of them a growth of B. coli, and in the other of Streptococcus longus was obtained. These two cases demonstrate that the presence of these organisms in the abscess is secondary to the amoebic infection. Of the remaining 3 cases, one showed a growth of streptococcus longus and brevis and the other two the presence of Staph. aureus. In one of these the growth of Staph. aureus was so scanty that there was reason to believe that its presence was due to contamination from the skin. These results demonstrate that the infection of the liver abscess with B. coli, streptococcus longus and brevis is only secondary and that E. histolytica alone can be responsible for the production of the lesion.

It has not been possible in this investigation to determine the part, if any, played by toxins, other than those of E. histolytica, absorbed into the portal circulation.

Various writers have described hepatic changes occurring in amoebiasis in the absence of hepatic abscess. Bartlett (1917) described swelling and fatty changes in the central zone; infiltration of the connective tissue of the portal regions with lymphocytes and plasma cells; increased portal fibrosis and occasional parenchymatous necrosis accompanied by infiltration with pus cells. Rogers considered that the frequent development of hepatic cirrhosis in India might be due to toxic irritation having its origin in intestinal amoebiasis. These facts and opinions would rather incline one to believe that toxins absorbed into the portal circulation from amoebic ulceration of the colon may play a part in the onset of amoebic abscess of the liver. If this is true then one would expect to find liver abscess more commonly associated with chronic than with acute dysentery, and this is true of the present examples to a certain extent.

Howard and Hoover (1897) believed that abscess of the liver was more likely to develop in chronic cases of amoebic dysentery than in acute; whereas Musgrave (1910) in a study of 50 cases of chronic dysentery was able to discover liver abscess in only four.

In these 32 cases of liver abscess the duration of infection with E. histolytica is definitely known

in 20. The time elapsing between the first attack of dysentery and the development of symptoms of abscess formation varied from one month to 40 years. Sixteen of them, i.e. 80 per cent, had a history of dysentery of one year and over, and of these 16 cases, 9 had been infected with E. Histolytica for 3 years or more. Of the 4 cases with a history of less than one year, the time elapsing between the first attack of dysentery and the development of symptoms of hepatic infection varied from 1 to 9 months. While chronicity of infection with E. histolytica is not an essential feature of liver abscess, it would appear from these cases to be much more frequent in people who suffered from chronic dysentery. Of course, it might be argued that the chances of developing a liver abscess in a dysentery of 3 months duration are manifestly less than in one of 3 years. It may be that the duration of infection with E. histolytica and toxic changes in the liver have a direct relationship.

MODE OF TRANSMISSION OF E. HISTOLYTICA FROM THE BOWEL TO THE LIVER.

As amoebic infection of the liver is the most frequent complication of amoebic ulceration of the bowel, it becomes of great interest and importance to determine

the mode of transmission of the parasite from the bowel to the liver.

Any theory which seeks to explain this transmission must take into account all the known and established physiological, clinical and pathological data. I propose to examine all the possible channels of transmission in the light of established facts and to determine to what extent they explain the clinical and pathological findings in this series.

Taking a broad view of this subject we might consider five possible channels of transmission to exist.

1. Direct from the lumen of the bowel.
2. Direct spread through the bowel wall to the liver.
3. Transperitoneal, without perforation of the colon and in the absence of adhesions between the liver and the colon.
4. By the lymphatic system.
5. By the portal vein.

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1. <u>Direct from the Lumen of the Bowel.</u>

Carnegie Brown (1910) states that, unless primary infection of the liver is admitted as a possibility, it is difficult to explain rare instances of hepatic suppuration in which there has been no precedent dysentery and in which the most minute post-mortem search has failed to reveal any lesion of the bowel. "It is

almost inconceivable that intestinal infection should have been so slight as to leave no trace of its presence, and yet to have developed sufficiently to allow penetration of the portal radicles by entamoebae." He believes that it is possible for the liver to be infected by way of the bile ducts, and as proof for this he states that living entamoebae have been found repeatedly in the gall bladder. He does not consider bile to be inimical to the existence of E. histolytica.

Councilman and Lafleur (1891) state that it would not seem impossible for the amoebae to enter the liver from the duodenum, along the biliary passages, but adduce no evidence for their opinion.

The only other evidence which I am able to quote in support of this theory is the finding of active E. histolytica in the material withdrawn through a duodenal tube, in a case of hepatitis. This observation was first made by Bibert (1924) and confirmed in 1925 by Boyers, Kofoid and Swezy, but the finding is questioned by Wenyon and other observers.

There are many objections to this theory of transmission and it fails to explain many of the clinical and pathological findings. For example, it does not explain the frequency of abscess in the right side of the liver, nor does it shed any light on the condition of acute hepatitis. I find it difficult to believe that

E. histolytica ever reaches the liver by way of the bile ducts, and I have been unable to find any confirmation of Brown's statement that E. histolytica is frequently found in the gall bladder.

2. Direct Spread through the Bowel Wall to the Liver.

Rogers, in discussing the route of infection, states that he has seen one case of liver abscess, which was secondary to post-colic abscess, due to perforation of the ascending colon by an amoebic ulcer, with adhesions to the liver.

Councilman and Lafleur also describe one case in which the lower surface of the liver was adherent to the adjacent viscera. An abscess was present in this region and was bounded by the lower surface of the liver, the stomach, the beginning of the duodenum and the colon.

Before accepting such a pathological process as above described as playing an essential part in the formation of liver abscess, it would be interesting to know if bacilli or cocci were present in these abscesses, and to what extent, if present, they were responsible for the involvement of the liver. Rogers does not describe the abscess in detail, nor does he state whether or not organisms were present in it. Therefore, while

this route of transmission still remains as a possibility, I am inclined to think that organisms such as B. Coli are responsible for the liver involvement and that the presence of E. histolytica is only incidental.

If we consider the sites of the colon where primary infection with E. histolytica is most liable to occur - Clark 1924 - we find that the hepatic flexure represents only 4.7 per cent - a point which suggests that, although the liver may be implicated in this manner on rare occasions, it cannot be the usual route of infection.

3. Transperitoneal (without perforation of the colon and in the absence of adhesions between the liver and the colon).

In the cases of liver abscess studied by Councilman and Lafleur, they direct attention to what appears to them a striking feature in the distribution of abscesses in the liver. The situations most frequently selected are on the under surface of the right lobe, in the neighbourhood of the hepatic flexure, and on the upper surface close beneath the diaphragm, and they find such a distribution difficult to explain by the theory of transmission via the portal vein. They also point out that the right base is the most commonly affected part

of the lung tissue. In some cases the lung abscess is a direct extension from the abscess in the liver, through the diaphragm, but they also note that in other instances the diaphragm is not involved. "Although the number of cases which we have studied is far too small to make any general statement on this head, it seems to us far more likely that the amoebae reach the liver by another route than through the blood or lymphatics vessels. This is by means of the abdominal cavity. The amoebae pass into this from the intestine; they either enter the liver direct from the hepatic flexure of the colon, or they wander or are carried, as other insoluble matters are, along the upper surface of the liver beneath the diaphragm. In the peritoneal cavity they may produce peritonitis, as in Case X; or they may enter the liver apparently without producing any effect on the peritoneum. One of our cases spoke very clearly in favour of the infection of the liver from the peritoneum. In this there was a circumscribed, fibrinous exudate on the surface of the liver, and some distance beneath this, in the tissue, there was a beginning abscess formation. Although we regard this as the most frequent route by which the amoebae enter the liver, it cannot be the only one. Case XV, which was autopsied after most of this paper was written, shows conclusively that there

must be infection through the vessels as well. In no other way could we explain the formation of great numbers of small abscesses both on the surface and on the tissue. These small abscesses were as numerous in the left as in the right lobe of the liver." In three cases Councilman and Lafleur found evidence of peritonitis, which they describe as being different from any of the ordinary forms produced by bacterial invasion of the peritoneum. The exudate was distinctly fibrinous and had a pale transparent appearance. In two of these cases amoebae were found in the peritoneal cavity. These cases have been considered as evidence of the transmission of amoebae from the bowel to the liver across the peritoneal cavity.

Rogers also inclines to the idea that in certain cases amoebae are conveyed from their primary site in the colon to the liver in the above manner.

Martin (1930) working with kittens, studied the pathology of amoebiasis minutely and he only once remarks on the presence of an exudate of the visceral peritoneum. In this case the exudate was found in the region of the rectum. He does not state whether or not amoebae were found in the peritoneal cavity.

In man abscess of the liver is more frequently associated with chronic infection, while in kittens amoebiasis is almost invariably an acute infection, so that the pathological processes in the peritoneal cavity of man and of the kitten are not strictly comparable.

It is not proposed to criticise this theory of transmission at present, but later I hope to produce evidence to show that it is not the usual route by which E. histolytica reaches the liver.

4. By the Lymphatic System.

Councilman and Lafleur (1891) and James (1928) noted the presence of amoebae in the lymphatic sinuses and spaces in the large gut, and Martin (1930), doing experimental work on kittens, described invasion by amoebae of the solitary lymph nodes of the colon.

Such being the case it would appear quite possible, on first glance, that the amoebae are carried from the bowel to more remote parts of the body by the lymph channels. There is, however, little or no evidence to support this theory.

Kofoid mentioned that the lymph nodes adjacent to the colon might frequently be invaded by amoebae, although James (1928) saw this in only one case, in which

a lymph node adherent to the bowel had become invaded by direct extension of an amoebic ulcer through the bowel wall.

Councilman and Lafleur described the lymphatic glands of the mesentery as being swollen, and the follicles of the glands as showing necrosis of the cells with nuclear fragmentation, but in no case were they able to demonstrate the presence of amoebae. Similar alterations in the lymph glands have been mentioned by Rogers (1913) and Bartlett (1928).

Most workers are agreed that there is little alteration to be found in the mesenteric glands in amoebic dysentery, and this, coupled with the absence of amoebae in the glands, is sufficient to exclude the possibility of extension of the infection along the lymphatics.

5. By the Portal Vein.

The most striking feature in the present series of cases was the frequency with which the right lobe of the liver was involved. Out of 32 cases, in 30 was the right lobe affected; in one the left lobe; in the remaining case there was a chronic abscess in the right lobe and an acute one in the left.

Cantlie (1916) tells of a Chinaman, who committed suicide by hanging, in the jail at Hong-Kong. Post-mortem examination of this man showed that the right side of the liver was completely destroyed, while the left side had become hypertrophied to compensate for this destruction. This prompted him to investigate the liver more fully, and he was able to show that this organ is divided into two halves along a line running from the gall-bladder notch to the point at which the hepatic veins enter the inferior vena cava.

This bilaterality of the liver in man has been experimentally and clinically verified by many observers and completely established by the work of McIndoe and Counseller (1927).

In 1901 Sérège injected indian ink into the splenic vein of the dog and found particles only in the left lobe of the liver. When the injection was made into a branch of the large mesenteric vein, particles were found only in the right lobe. Glenard confirmed these experimental findings in 1901. Several other workers, and among these Bauer and Brissant, repeated the experiments, but did not come to a like conclusion. In 1914, Bartlett, Corper and Long, working on dogs, concluded from their experiments that a dual portal current exists in the dog's portal vein.

Then in 1928 Copher and Dick made some beautiful experiments to prove the existence of a "Stream Line" phenomena in the portal vein of dogs. They injected trypan blue into various branches of the portal vein in the dog, and they were able, by trans-illumination, , to visualise the position of the dye in the portal vein. Their summary and conclusions are here quoted:-

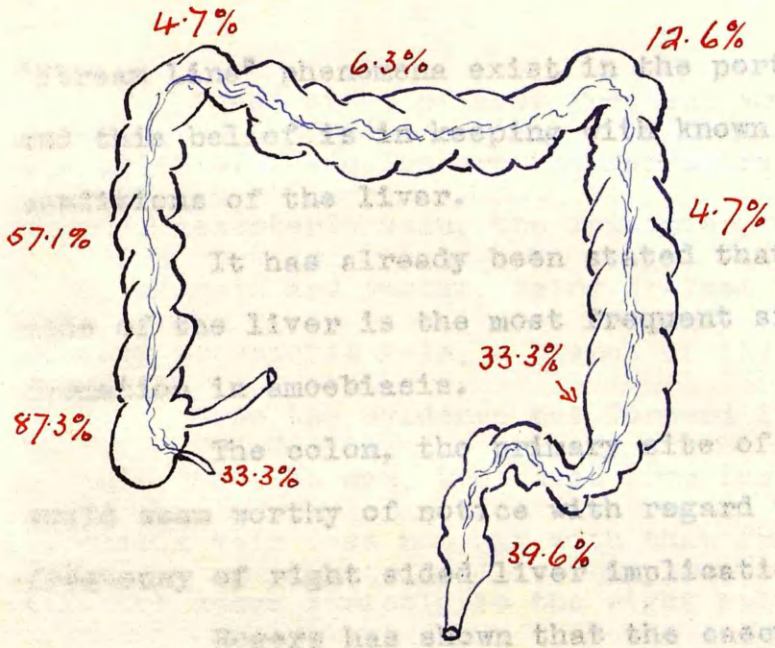
"1. The distribution of the portal blood in the liver of the dog was determined by the injection of a dye.

2. Blood from the spleen, the stomach and a greater part of the colon goes to the left lobe of the liver, whereas blood from the duodenum, the head of the pancreas and the upper part of the jejunum goes mainly to the right lobe of the liver.

3. A satisfactory method of visualising experimentally the individual currents of blood in the portal vein is presented.

4. There are at least three distinct and separate currents in the portal vein.

5. The anatomy of the portal vein and the intrahepatic distribution of its blood in the dog were studied and the results have been presented." Since bilaterality of the liver has been proved to exist in man, it seems reasonable to believe that just such



The distribution of amoebic lesions in the appendix, colon and rectum. (After Clark 1924).

The diagram shows the regional distribution of lesions in 63 cases examined post-mortem, where only one or few ulcers were present. This shows the sites where primary infection of the gut is most liable to occur.

Taken from "Dysenteries of India" by Acton and Knowles, p. 38.

"Stream Line" phenomena exist in the portal vein in many and this belief is in keeping with known pathological conditions of the liver.

It has already been stated that the right side of the liver is the most frequent site of abscess formation in amoebiasis.

The colon, the primary site of infection, would seem worthy of notice with regard to this frequency of right sided liver implication.

Rogers has shown that the caecum, the ascending colon and the transverse colon are the sites most frequently affected in chronic amoebiasis. This he found to be especially true when he investigated a series of patients who had single liver abscesses.

Clark has confirmed these pathological findings, as can be seen from the diagram.

Vallerino (1924) studied filling defects and distortions in the colon by use of the X-ray and barium suspensions given per os and per rectum. He does not claim that radiology, as used by him, is of diagnostic value, but considers that it is of value in determining the extent and locality of the amoebic ulceration. His results have shown that the caecum and ascending colon are much more frequently involved than the sigmoid and rectum.

These sites of most frequent amoebic ulceration of the colon are the parts drained by the superior mesenteric vein, the remainder, descending colon, sigmoid and rectum, being drained by the inferior mesenteric vein, a branch of the splenic vein.

From the evidence put forward it is probably true to state that, in man, the blood from the superior mesenteric vein does not mix with that from the splenic vein, but keeps strictly to the right half of the portal vein, and further, that the blood on the right half of the portal vein flows into the right branch of the portal vein, i.e., the blood drained from the caecum, ascending and transverse colon flows into the right side of the liver. It is not suggested that there is mechanical accuracy in the distribution of the portal blood; rather it should be considered as a physiological truth, and allowance made for any slight variation which almost certainly exists.

This theory explains satisfactorily the distribution of amoebic liver abscesses, and I consider that the most common mode of transmission of the amoeba from the bowel to the liver is by way of the portal system.

It is of interest to compare hydatid infection of the liver with that due to E. histolytica.

Hydatid infection also has a predilection for the right lobe, as the following paragraph taken from "Hydatid Disease", by H. R. Dew, shows.

"Hepatic cysts in the early stages of their development show a great predilection for the subserous zones, so that, even when quite small, they usually project under the peritoneum. They may, however, occur deeply in the substance of the organ, so that, even when they are comparatively large, they remain completely surrounded by liver tissue. The right lobe of the liver is more frequently affected than the left, even more than the difference in size would lead one to expect. The following table gives some published figures on this point:-

Relative Frequency of Site of Hydated Cysts in Right and Left Lobes of the Liver.

Observer	Right	Left	Both Lobes
Thomas	79%	16.5%	4%
MacLaurin	80%	18%	2%
Cignozzi	80%	18%	2.7%

"It is generally supposed that owing to its relatively straighter course and larger lumen, the

right hepatic vein receives a disproportionate number of embryos, accounting for the great preponderance of right-sided cysts. This supposition has been borne out by the observations of Castex, who, combining the injection of opaque substances into the portal vein with radiography has studied carefully the distribution of blood in the liver."

Dew attempts to explain the distribution of hydatid cysts in the liver by comparing the size and shape of the right and left branches of the portal vein, but probably it has the same explanation as I have suggested for the distribution of amoebic abscesses in the liver.

PATHOLOGY.

Amoebic abscess of the liver may be single or multiple and may vary in size from the very small ones, which are not readily distinguished by the naked eye, to those containing two or three pints of pus and having a diameter of three to five inches or more.

Councilman and Lafleur in their investigations found that out of six cases of hepatic amoebiasis four had more than one abscess. In all of the cases the right lobe was affected and, in two, also the left lobe.

They noted that the right lobe was involved in all cases and also considered from their investigations that there were certain places of predilection in this lobe, namely, near the periphery of the organ and either on the lower surface corresponding to the hepatic flexure of the colon, or on the upper surface close to the suspensory ligament of the liver. These findings are based on only six cases and are, therefore, somewhat misleading.

Roger's figures, the result of a much larger investigation, are probably more enlightening and nearer the true state of the liver in this condition. Out of 164 cases, in which he carried out post-mortem examinations, he found that 51.8 per cent had a single abscess, 23.8 per cent had two or more large abscesses, and 24.4 per cent had one large abscess, plus several small ones. With regard to the distribution of the abscesses, he considered the right lobe to be much more frequently affected than the left, especially the upper and posterior part of the lobe. Among 85 cases of single abscess only 14 were found in the left lobe, i.e., 16.4 per cent.

In the present series of cases 30 had the right lobe affected, i.e., 93.6 per cent; one showed the left lobe to be involved alone, and in one other case both right and left lobes were the seat of abscess formation. Only two cases had more than one abscess, one of them

having three abscesses in the right lobe, while the other showed a chronic abscess in the right lobe and a more recent one in the left lobe.

As judged by clinical observation and operation findings, the most frequently affected part of the right lobe appeared to be the upper and posterior portion.

Since the observations are chiefly based on clinical findings - a post-mortem examination being carried out in only 4 cases - it is obvious that they do not necessarily represent the true pathological state of the liver in each case. Some of those included in the 30 cases of single abscess of the right lobe may have had one or more small abscesses in addition, either in the right or left lobe, and from this point of view, the above observations may be considered to be misleading. When we have made due allowance for all these possibilities, however, two features still stand out:

(1) The part of the liver most frequently involved in amoebic abscess is the right lobe.

(2) In the right lobe, the most common site for abscess formation is the upper and posterior part.

The contents of the liver abscesses and the character of their walls vary greatly, both apparently depending on the chronicity of the process. In the most recent, the abscess does not empty itself on section.

A small amount of glairy semi-transparent material can be expressed, leaving behind an irregular sponge-like excavation. In the older abscesses the contents are more fluid, having the consistence of cream. The pus varies considerably in colour; sometimes it is greyish and opaque with more solid particles suspended in it; in other cases, through admixture with varying amounts of blood, it becomes brown or reddish-brown. Streaks of red or reddish-brown are frequently seen running through the liver pus, and again it is yellowish or even dark green, due to staining with varying amounts of bile pigments. The favourite simile used in this connection is to liken this pus to anchovy sauce, but that is only true in certain cases.

The character of the abscess walls vary as do the contents. In the recent small abscess there is no distinct line of separation between the liver tissue and the abscess proper, one appearing to merge into the other. In some older abscesses there is a sharper separation, but frequently there is no attempt at the formation of connective tissue at the margin between abscess and liver. In really chronic conditions fibrous tissue is definitely present. Rogers states that "The more common and characteristic large single abscess is surrounded by a dense fibrous wall which effectually

shuts if off from the surrounding healthy liver substance." He believes that once this is formed the abscess increases by expansion of this fibrous wall rather than by the progressive destruction of healthy liver substance. In one case which went to post-mortem we found that almost the whole of the right lobe had been destroyed by abscess formation, with compensatory hypertrophy of the left lobe. Evidently in certain cases the abscess does extend by actual destruction of the surrounding liver substance. Councilman and Lafleur found that in the older abscesses the character of the wall varied from place to place; at one point it was found to be hard and fibrous and at other points to be soft and oedematous.

The wall in certain cases has a very irregular outline, which may be due to the breaking down of tissue between adjacent abscesses. Protruding into the cavity from the wall are ragged fringes of tissue, which have resisted more effectively the lytic and degenerative effects of an amoebae.

The liver tissue surrounding the abscess shows varying degrees of congestion and is usually firmer than normal. Outside this area there is no constant alteration in the liver tissue.

MICROSCOPICAL APPEARANCES.

In the present series of cases there has been ample opportunity to examine liver abscesses in their different stages, from the small acute abscess to the large chronic one.

Manson-Bahr, while in Fiji in 1910 carried out an autopsy on a male Solomon Islander, who died of an acute attack of amoebic dysentery. In this case it is interesting to note that no amoebae were found in the discharge during the patient's lifetime. At the post-mortem examination the liver was found to be pale, and scattered throughout its substance were numerous miliary abscesses, none of which was larger than a small pea. Although this case does not come into the present series, a section from one of the smallest abscesses has been examined microscopically for the purpose of studying abscess formation in its very earliest stages.

There are two striking features seen on microscopical study of liver abscess. The first is the absence of any real inflammatory reaction on the tissues, even in the smallest acute process, and the second, the distinct difference between the pus of amoebic origin and that produced by the action of ordinary pyogenic organisms.

Strictly speaking, there is nothing to justify the contents of a liver abscess being called pus. The contents are formed of fatty granular material, the end product of disintegrated liver tissue. Scattered through it are densely staining particles of varying shapes and sizes which would appear to be of nuclear origin. Towards the periphery of the abscess these particles assume a

distinct nuclear appearance, being rounded or oval and having a distinct outline. In the small abscess few if any red cells are seen, and the few leucocytes which are occasionally present are merely incidental and not part of the pathological process. In the more chronic abscesses red cells are frequently present in larger numbers.

Working from the periphery towards the centre of the abscess, one can see liver cells in all stages of degeneration. The liver cells which are first affected are those in the centre of the lobules. They become more granular and vacuoles make their appearance in the cells. At one point each liver cell stands alone, separated entirely from the neighbouring cells, while in another part the cells have fused to form a syncytium, in which no distinct cell outline can be seen. This primary necrosis of the central cells of the lobules was a characteristic feature in one case examined by Councilman and Lafleur and it was found to extend far beyond the immediate surroundings of an abscess, and was even seen to be present in the absence of any abscess formation. In the sections examined in this series of cases, the central necrosis was only found associated with, and in the immediate environment of an abscess. Nearer the centre of the abscess the liver cells show an absence of nuclei and are of various shapes: elongated, pointed at

one or both ends and standing out distinctly from the surrounding granular débris. These findings are fairly constant, both for acute and chronic abscesses.

The characters of the wall of small acute abscesses differ distinctly from that of the chronic process. In the very small acute abscess there is really no wall, the healthy liver tissue merging gradually into the granular débris, without any distinct line of demarcation, and the necrotic process is frequently seen to extend into the healthy liver tissue for varying distances. In the subacute larger abscess there is a more distinct line of separation and fibrous tissue is present in certain areas, while in the really chronic process there is a distinct fibrous wall of varying thickness, some of the fibres showing hyaline degeneration. In the wall and outside it extravasations of blood are frequently found, and the liver cells are elongated and arranged in a concentric manner, probably as the result of pressure from the increasing abscess.

The little solid particles in the contents of the abscess and the fringes which are seen to protrude into the cavity, after evacuation of the pus, are composed of fibrous tissue arranged round the portal systems. Sections of these show them to be formed of fibrous tissue surrounding a branch of the portal vein. One or several

small bile ducts are present in the centre of the fibrous mass, along with a branch of the hepatic artery. The vessels are collapsed in some cases, while in others the lumen is filled with granular material or blood which has apparently clotted. The granulation cells stain distinctly and there is often a lymphocytic infiltration. Liver cells, which are undergoing degeneration, can be seen at the edge of these fibrous masses.

The amoebae are usually found in the so-called wall of the abscess, at a point between the healthy liver tissue and the granular débris which fills the abscess cavity, though in the very small abscesses they will frequently be found in the centre of the granular débris itself, as is shown in one of the sections.

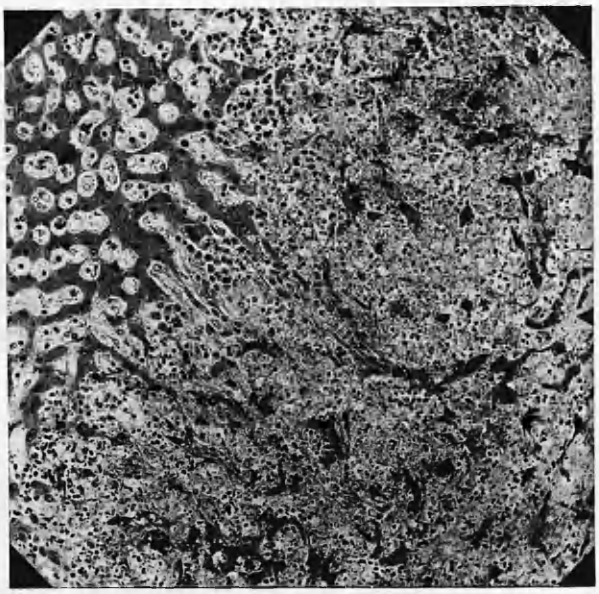
The former fact accounts for the absence of amoebae in liver pus which has been aspirated, and it also explains why amoebae appear in the material discharged from a drained abscess about the second or third day, after having been absent in the pus evacuated furing the first two days. Occasionally amoebae are seen surrounded by apparently healthy liver tissue at a little distance from the abscess wall, but this is an unusual site for them and is not a frequent finding. Some authorities have described the amoebae as having been seen in radicles of the portal vein, but I was unable to confirm this,

(13) **Section of liver showing two acute liver abscesses of moderate size, with typical margin and fringes of tissues protruding into the abscess cavity.**

(14) Plate showing the condition of the liver with a portion of lung attached at the upper left corner of the plate. On the right side can be seen the hypertrophied left lobe, while on the left the remains of the right lobe containing a large abscess are shown. The right lung was adherent to the diaphragm, which in turn was adherent to the liver. For details see report on case 5.

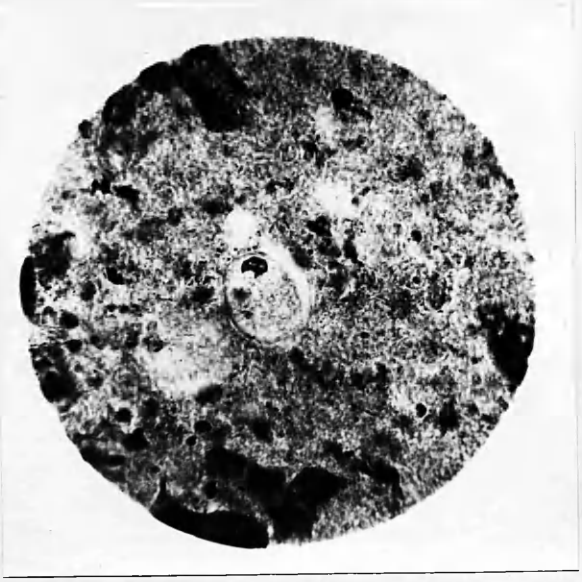
(1) Fixed Schaudinn's Method. Stained with iron haematoxylin and Eosin. X 150.

Section through necrotic area in amoebic hepatitis. In the top left part of the section are seen almost normal liver cells, while elsewhere is degenerating and necrotic tissue. The gradual change from normal tissue to granular débris is well illustrated. No fibrous tissue and little inflammatory reaction can be seen.



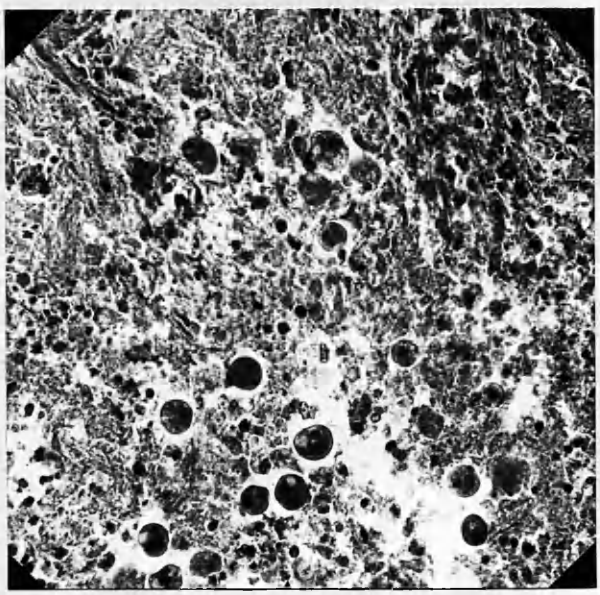
(2) Fixed Schandinn's method and stained with iron haematoxylin and eosin. X 600.

Small part of No. 1 under higher magnification showing two amoebae in the centre of degenerating liver tissue.



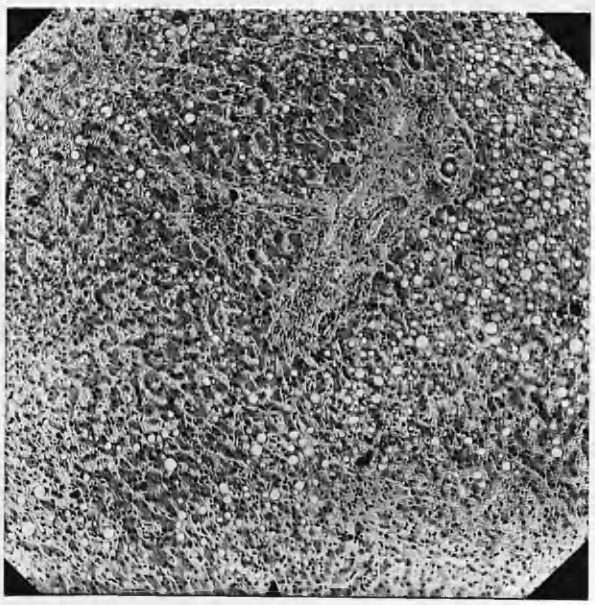
(3) Fixed Schaudinn's method and stained with iron haematoxylin and eosin. X 340.

Section through wall of liver abscess showing numerous E. histolytica surrounded by degenerating liver tissue. The amoebae are rarely found elsewhere than in the wall.



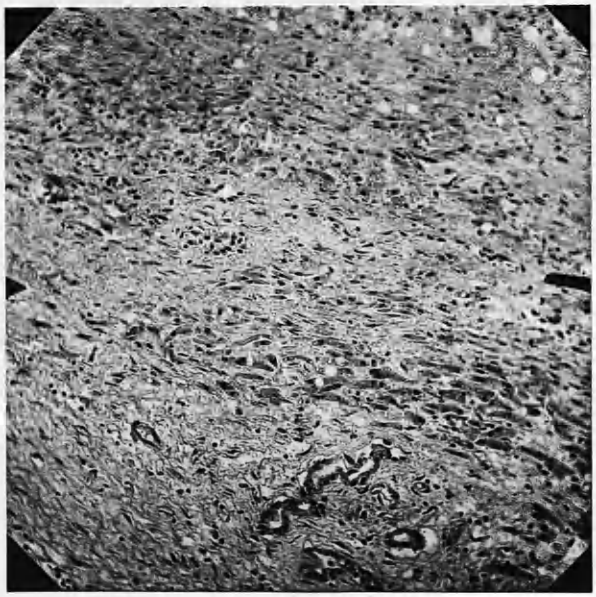
(4) Stained with haemalum and eosin. X 70.

Section through wall of liver abscess showing preservation of liver cells in proximity to a portal system, while in the periphery cells are seen in all stages of degeneration, vacuolation being well marked.



(5) Stained with haemalum and eosin. X 130.

Section through wall of chronic liver abscess showing the planes of fibrous tissue, with consequent distortion and parallel arrangement of the liver cells. A disintegrated portal system is seen in the lower part of the section, with some attempt at formation of new bile ducts. The difference between the wall of the chronic and acute abscess is well seen by comparison of this section with section No. 1.



even after prolonged search of the sections at my disposal.

THE RELATIONSHIP OF ANTECEDENT DYSENTERY TO AMOEBIC LIVER ABSCESS.

A previous history of dysentery is frequently of extreme importance in diagnosing a case of amoebic liver abscess.

While investigating these cases with regard to preceding bowel symptoms some very interesting points were brought to light. Among the 32 cases of liver abscess investigated 22 (68.8 per cent) gave definite histories of dysentery; 6 (19.8 per cent) were very indefinite as regards previous history of bowel disturbances, and in one case there was no history of dysentery or of any bowel symptom which could be interpreted as being produced by amoebic ulceration of the colon. This last is one of extreme interest in that the patient had previously had hepatitis and amoebic liver abscess, and yet at no time was there any disturbance of the bowels. It is, of course, recognised that an abscess of the liver is occasionally the first indication of infection with E. histolytica. What is even more surprising is the fact that in some examples of liver abscess in which

autopsy has been carried out, there is no evidence of ulceration of the bowel. In such cases, too, there is frequently no history of bowel disturbance. It may well be that the ulceration of the colon, which allowed the spread of E. histolytica to the liver, either was so minute as to have been missed at examination or had healed up before the abscess in the liver proved fatal to the patient. Frequently amoebic ulcers of the colon are so minute as to be missed by naked eye examination, and their presence is only revealed by microscopical examination of serial sections of the colon.

Whatever may be the explanation of the apparent absence of amoebic ulceration of the colon, there must have been some destruction of bowel mucosa at some time prior to the onset of amoebic liver abscess, as has been demonstrated when considering pathogenesis.

Rogers, in his investigations in India, recorded some interesting figures:

In a series of 45 personally conducted post-mortem examinations on people who had died from liver abscess, he found that 97.8 per cent showed evidence of recent or healed amoebic ulceration of the bowel, while in only one case, 2.2 per cent, did he fail to demonstrate lesions of amoebic infection of the bowel.

Frequently the only clinical evidence of amoebiasis is a looseness of the stools amounting to a mild diarrhoea, a symptom which may be elicited only by close questioning, as inhabitants of tropical countries are prone to regard occasional mild diarrhoea as being a normal incident in their life. This fact is, probably, sufficient to explain the relatively low percentage of patients in the present series who gave a history of amoebic dysentery.

LATENCY.

Under this heading there are two points to be considered. First, by latency one might mean the time which elapses between the original attack of dysentery and the onset of symptoms of hepatic involvement. Taking this interpretation we find that the latent period is very variable. The shortest period among our cases was only one month, while the longest was forty years. Between these times the other cases are scattered at irregular time intervals, the most common being between one and two years. Secondly, latency might be taken to represent the time which elapses between the last attack of dysentery and the onset of liver abscess. Here also latency is most variable. Commonly an attack of dysentery immediately precedes, or less frequently accompanies, the hepatic

symptoms, whereas, in one instance, the last attack of dysentery preceded the onset of hepatic involvement by twenty-nine years.

This question of latency is only a recognition of the much larger and fundamental problem, of why only certain cases of amoebic dysentery show liver infection, and why only some 10 per cent of people infected with E. histolytica ever develop symptoms of dysentery.

SYMPTOMATOLOGY.

Amoebic liver abscess, like most other pathological states, presents a fairly well defined clinical picture in the majority of cases, but at the same time, one is often surprised at the atypical picture produced by this condition.

The onset of the illness varies from that seen in the very acute condition to that of the more chronic, with cases of differing degrees of severity coming in between these two extremes.

Rather than describe a typical example of liver abscess, it is proposed to discuss each symptom separately and then, towards the end of the thesis, to give one or two examples from the case-notes actually collected.

APPEARANCE.

The appearance of the patient depends to a great extent on the acuteness of the condition and the duration of the symptoms. In acute cases the patient really looks ill with pinched anxious face, sunken cheeks and moderately increased shallow breathing. He shows an unwillingness to move about to any extent and frequently finds greatest comfort in lying on one side or the other. If he is first seen walking or standing, it will be noticed that the right shoulder droops, if, as is usual, the abscess is on the right lobe. This last is, perhaps, better illustrated in the more chronic cases, when the individual has the appearance of carrying some invisible heavy object under his right arm. In the more chronic cases the patient is emaciated, with pale or sallow dry skin, especially when there has been diarrhoea of long standing duration preceding the onset of the liver abscess. Occasionally one comes across examples of this condition in which there is little in their appearance to suggest that they have a liver abscess. This is true even of cases in which the abscess contains one or more pints of liver pus.

RIGORS.

Many writers have commented on the rigors which accompany the onset of this condition, but among these

32 cases only 5 gave any definite history of a rigor. Most frequently the rigors occur at the onset, but sometimes they occur at irregular intervals throughout the illness, simulating a sub-tertian malarial infection. More common than an actual rigor is a sense of chilliness at the beginning of, or at intervals throughout the illness.

SWEATING.

Sweating is a common symptom in this illness, especially in those cases of acute onset and rapid progress. The sweating most frequently occurs at night, and this is stated to be fairly typical of the condition. Occasionally the sweating recurs several times during the twenty-four hours and may be so copious as to make it necessary to change the patient's garments, if not the bed-clothes.

MALAISE.

This is perhaps a word of indefinite meaning, but it seems most suitable to describe the sense of unwellness, the lassitude, the depression, the lack of energy which is frequently experienced by those with the more chronic liver abscess.

Dizziness, headache and fainting or faintness are occasional symptoms, but while they are not of any value in the diagnosis of liver abscess, it must not be forgotten that they may be the first and only symptoms of amoebic abscess of the brain - a very rare complication but one found most frequently secondary to liver abscess.

Vomiting may be classed also with the above symptoms, especially if it be recurrent, projectile and unassociated with nausea. Of course, vomiting may occur as a symptom in an uncomplicated case of liver abscess, but it is associated with nausea and most commonly is present at the onset of the illness.

SHOULDER TIP PAIN.

This is one of the most common and often earliest symptom of liver abscess. It may or may not be associated with local pain over the liver or in the right hypochondrium. In one of the present cases there was, in addition, a hyperaesthesia of the skin over the right shoulder.

As an abscess is most frequently found in the right lobe of the liver, it is not surprising that the right shoulder is the one most commonly affected. If the abscess is located in the left side of the liver,

the pain may be referred to the left shoulder, as was found in one of our patients. A similar type of referred pain is found in cholecystitis with or without gallstones. The anatomical basis for this symptom lies in the fact that both the phrenic nerve and the cutaneous branches of the fourth and fifth cervical nerves arise from the same segments of the cord, and these cutaneous branches supply the skin in the region of the corresponding shoulder. This referred pain is said to occur from inflammation in the more central part of the diaphragm. If the periphery of the diaphragm is involved, the pain is referred along the cutaneous distribution of the lower intercostal nerves to the skin covering the abdomen. Pain in the right iliac fossa was occasionally noted among the cases under consideration, but I consider that this was due to amoebic ulceration of the caecum rather than to a peripheral irritation of the diaphragm.

The shoulder tip pain is most frequently found associated with an acute abscess and where the abscess is near the surface of the liver and impinging on the diaphragm.

Deep seated abscesses do not give rise to this referred pain.

PAIN OVER THE LIVER AND IN THE RIGHT HYPOCHONDRIUM.

Pain in one or other of these situations or in the epigastrium is also one of the most constant symptoms of the condition. In the acute cases the pain is sharp and stabbing, like the pain of a pleurisy, and it may be localised to one small area which, presumably, is the situation of the abscess.

In contrast to this acute localised pain, there is often a general aching pain in the region of the liver, or there may be only a sense of weight in the upper part of the abdomen. Occasionally all localising symptoms are absent and the patient presents a picture of a general toxic state, rendering a diagnosis most difficult.

SYMPTOMS REFERABLE TO THE BOWEL.

Diarrhoea, with or without blood, and mucus in the stools, or perhaps only a looseness of the bowels, are symptoms which commonly precede and accompany the onset of liver abscess. These symptoms of amoebic dysentery are often noticed to clear up or become less severe with the onset of the symptoms of hepatic-infection. This point was noticed in several of the present cases.

Accompanying this diarrhoea, or less frequently in its absence, there is a complaint of pain in one or

both iliac fossae, the right iliac fossa being that more commonly affected.

Loss of appetite, flatulence and vague abdominal discomfort are among the most constant symptoms of this condition.

Because a patient does not complain of looseness of the bowels, it must not be presumed that there is no amoebic ulceration of the bowel present, for in four of these thirty-two cases of liver abscess the individuals complained of constipation.

One patient gave a history of recurring haematemesis and melaena. This is a very rare symptom of the condition and was presumably due to interference with the portal circulation.

Manson mentions dysphagia as being a not uncommon symptom of liver abscess, but in none of the present series was this noted.

SYMPTOMS REFEREBLE TO THE LUNGS.

In several of the patients all the symptoms pointed to some pathological state of the lungs. This was most commonly seen when the liver abscess had ruptured into the lungs, but even when this had not happened, there were symptoms refereble to the chest.

Cough is a common complaint in this condition, and it may vary from the short, irritating and unproductive cough to the slack, easy cough, accompanied by copious sputum. This cough and spit may be due to several causes, such as actual pneumonic consolidation, compression of the right base or rupture of the liver abscess into the lung tissue or into a large branchus.

Shortness of breath is less commonly noted and it may or may not be associated with actual cyanosis. The shortness of breath may be due to pneumonia, widespread amoebic infiltration of the lung, or to pleural effusion, and it is probably aggravated by the state of the heart muscle and the secondary anaemia, which is frequently found in this condition.

Twice there was a history of haemoptysis, bright red blood being present in the sputum.

In one case in which the abscess was located in the left lobe, palpitation was a marked feature. This probably had a close connection with the palpitation produced in some people by gaseous distension of the stomach, a result of gastritis.

CLINICAL FINDINGS.

As in dealing with the symptoms so, in discussing the clinical findings, it seems meet to consider them as individual entities without reference to any particular

case. Later we shall give examples of particular instances of this condition.

The appearance of the patient has previously been described under Symptomatology and there is little to add to what has already been said.

GASTRO-INTESTINAL SYSTEM.

Tongue.

It may be taken as a general rule that the tongue in this disease is always furred to a greater or lesser degree. Of course, there are exceptions to this general statement, and in one or two of the cases in the present series the tongue was moist and clean, while occasionally it was red, raw and fissured. It is usually moist, but where the illness has been acute, with high fever and of several days duration, we should be prepared to find it quite dry, as will be the buccal-mucous-membrane.

ABDOMINAL WALL.

The abdomen is usually quite lax and moves fairly freely with respiration, but, where the illness is acute and especially if it is accompanied by dysentery, the abdominal wall-muscles will be found to be rigid, particularly in the right hypochondrium and all down the

right side. In only one case was there generalised rigidity of the abdomen.

An indefinite fullness of the upper abdomen is frequently seen, while inthose cases in which the abscess is in the anterior part of the lower margin of the liver, a definite local tumour may be visible. In one of the cases a tumour was visible in the epigastrium, and this proved to be an abscess in the left lobe. It is the general experience that an abscess of the left lobe is very frequently found to point towards the abdominal wall. Local pain and tenderness are present in these cases and fluctuation may be elicited. Inflammation and oedema of the overlying skin is also a not uncommon feature.

In one case, which was accompanied by haematemesis and melaena the veins on the right side of the abdomen were dilated and prominent, probably as the result of partial obstruction of the portal circulation.

COLON.

In uncomplicated amoebic dysentery the colon is frequently found to be palpably thickened and tender, so that this is a point which should always be looked for in any case of suspected liver abscess. The caecum and the sigmoid colon are the parts of the large bowel most readily accessible for examination and these are the parts which are most frequently found to be thickened and tender.

Amongst our 32 cases the sigmoid colon was palpably thickened in 9 and the caecum in 5.

Tenderness over these two areas may exist in the absence of any palpable thickening. This is to be noted particularly, as the tenderness may occur in the right iliac fossa and may be associated with rigidity of the right side of the abdomen. In this type of case a mistaken diagnosis of acute appendicitis with portal pyaemia may readily be made.

LIVER.

Amongst the 32 cases in this series 30 were found to have clinical enlargement of the liver, and in all of them this was demonstrable by palpation, the edge of the organ being felt at varying distances below the costal margin, with an average distance of two inches; in one case the edge could be felt four inches below the right costal margin in the nipple line.

The lower edge of liver is even and sharp, except where normal liver tissue is replaced by degenerating tissue. The part of the liver which is palpable is usually found to be definitely tender, but in two of the cases this was not so.

Enlargement of the organ upwards was also frequently determined by percussion and radiology. Both

of these findings are of great value in coming to a diagnosis. The upper limit of liver dullness in many of these cases was found to extend into the right axillary region and to meet the midline posteriorly at points varying from the ninth to the eleventh dorsal spines.

Frequently tender areas are elicited in the interspaces overlying the area of liver dullness and more rarely there are areas of local oedema and inflammation. These areas are of value in determining the probable site of the abscess and can be taken as the point of choice at which to make the liver puncture, when attempting to locate the abscess. In addition, a general bulging of the lower half of the right chest is commonly present.

In one case, in which the abscess had destroyed most of the right half of the liver, there was compensatory hypertrophy of the left lobe. During lifetime this hypertrophied left lobe was mistaken for an enlarged spleen.

SPLEEN.

Enlargement of the spleen was not a common finding in these cases, and of the three in which it was present, one was associated with a secondary B. coli infection of the liver abscess, while no definite cause

was found to account for the condition in the other two examples.

I have already drawn attention to the rare condition in which the hypertrophied left lobe of the liver was mistaken for an enlarged spleen.

CHEST.

Mention has already been made of the changes produced in the chest by the enlarged liver, but there still remain many features worthy of notice. It cannot be too emphatically urged that the right base of the chest should be most carefully examined,in every case of obscure fever in patients who have spent some time in the tropics.

Many different pathological conditions may exist at the right base in this disease. Most frequently there is compression of the right base with impairment to percussion and diminished breath sounds with moist râles at the end of inspiration. Pleural effusions of varying degree are not uncommon complications of liver abscess and rarely there is definite pneumonic consolidation of the right base with its characteristic clinical findings.

Where the abscess has ruptured into the lung, we have impairment to percussion and moist râles, while

the respiratory murmur may be diminished or actually tubular.

Occasionally the only clinical sign to be made out in the chest is pleural friction.

Sometimes the chest signs are so dominant as to overshadow any primary liver condition, and it is well to remember amoebic liver abscess in all cases where there is some pathological condition at the base of the right lung.

The area of cardiac dullness may be displaced by pleural effusion or from the upward pressure of an enlarging liver abscess, especially if it is located in the left lobe.

In three cases oedema of the feet was present, this being evidence of cardiac failure and anaemia, while in one case a tender enlargement of the cervical glands was found. It was impossible to determine whether this had any direct relation to the liver abscess or not.

TEMPERATURE.

It may be taken as a general rule that a patient suffering from amoebic abscess of the liver has fever during the illness. The usual type of temperature is a remittent-intermittent one, which reaches its highest

point in the evening or late afternoon. The pulse rate varies correspondingly.

The temperature rarely rises above 104° F, although, as here recorded, temperatures of 105° F or slightly over occasionally occurred. Sometimes one finds a double rise of temperature in the twenty-four hours, as in Kala Azar, but this is not a frequent occurrence.

In three of these cases fever was absent. These were all undoubted cases of liver abscess, as pus was found in the liver in each case. In one case the patient was under observation in hospital for two months, and during that period the axillary temperature never rose above 98.4° F, although there was a difference of 1° F. between the morning and evening temperatures, with a morning temperature of 97° F. The pulse rate in this case was raised and varied between 88 and 104 per minute. These facts are all the more interesting when one considers that eventually 64½ ounces of liver pus were aspirated. Temperature charts are shown later in the thesis along with the description of actual cases of liver abscess.

LABORATORY EXAMINATIONS.

FAECES.

In the practice of tropical medicine examination of the faeces has become part of the routine work, and the value of this amply repays any trouble which it entails.

In the condition under consideration the faeces may vary macroscopically from the normal to the frankly dysenteric. In 16 of the cases the stools were of normal colour and consistence; 11 had loose stools of normal colour; and 2 had stools formed of hard faeces. In only 4 cases were blood and mucus present and in 3 mucus was present alone. The stool from one other case gave a positive reaction for occult blood, after the necessary precautions had been taken.

Microscopic examination of the faeces also gave varying results. Eighteen were quite negative for cysts, active amoebae or Charcot-Leyden crystals; in 4 cases active amoebae were found; in 9 cases cysts of E. histolytica were present and in only one case were Charcot-Leyden crystals present.

The point to be appreciated in the examination of faeces in this condition is the variability of the presence of cysts in the stools from time to time. In one of our cases cysts were found in the stools for the first time on the sixteenth examination, and in other cases they were detected only after three or four examinations.

Obviously in most of the cases of amoebic liver abscess, one cannot afford to wait on the findings of cysts or active amoebae in the stools before coming to a diagnosis but, where the patient's condition admits and

where the diagnosis is difficult, as it is in many instances, then repeated examination of the stools will prove of great value. Most authorities insist on the value of repeated examination of the faeces. Wenyon and O'Connor remarked on this fact in 1917, and the work of Kessel and Svenssen with regard to this is interesting.

They, working on the carrier problem of E. Histolytica, found the following:-

A single examination revealed	44	per cent	of	carriers.		
Two examinations	"	66	"	"	"	"
Three "	"	75	"	"	"	"
Four "	"	88	"	"	"	"
Five "	"	95	"	"	"	"
Six "	"	100	"	"	"	"

Other authorities have had similar findings. Dobell, in a single examination, discovered 33 to 40 per cent of carriers and in three examinations this figure rose to 5o to 66 per cent. In corresponding examinations by Jepps the figures rose from 43 per cent to 73 per cent, while Matthews'and Smith's figures were 33.4 per cent and 64.6 per cent.

PUS ASPIRATED FROM THE LIVER.

In all of our cases pus was aspirated from the liver in amounts varying from three ounces to four pints. The typical liver abscess pus has been compared to "anchovy sauce", and while this may be correct for many cases, there is marked variation in the colour and consistence of the pus. The colour may vary from dark red, reddish brown or chocolate, to green, according to the amount of altered blood and bile pigment present. In a long standing abscess the pus may be quite yellow or creamy yellow, as in one of our cases.

It is usually of a creamy consistence, but occasionally it may be so viscid and thick as to cause great difficulty in aspiration. It is usually odourless, but it may have a mawkish smell, while in cases which have been secondarily infected with organisms, especially with B. coli, it may have a definite faecal odour.

Microscopically the pus is seen to be composed mainly of débris and fat with varying numbers of leucocytes, red cells and degenerating liver cells. In none of the present cases were active amoebae found in the aspirated pus. The cysts of E. histolytica have never been found in liver pus. This points to the fact that the liver is the unnatural habitat of E. histolytica. In 15 cases the pus was cultured for organisms; 10 proved to be

sterile, even after incubating as long as seven days. Of the remaining 5 cultures, 2 grew streptococci; 2 staphylococcus aureus and one B. coli. In one of the cultures the growth of S. aureus was so scanty as to lead us to believe that this was a contamination from the skin.

HAEMATOLOGY.

Examination of the cellular constituents of the blood in a suspected case of liver abscess will frequently prove to be of the greatest value in coming to a diagnosis.

There is usually a normocytic hypochromic anaemia, the severity of which depends on the duration and severity of the amoebic abscess. In the cases under consideration the average red cell count was 4,266,000 per c.mm. with haemoglobin of 74.9 per cent and colour index of 0.88. In a few of the cases the diameters of the red corpuscles were taken, and these were either within the normal limits or slightly smaller. The most severe case of anaemia in this study was one showing a red cell count of 2,600,000 per c.mm. with 60 per cent of haemoglobin. The red cells showed only slight alteration in shape and size from the normal.

Of much greater value than a study of the red cells is a study of the white cells. It may be quite definitely stated that all cases of active liver abscess show a leucocytosis of moderate degree with a preponderance of polymorphonuclear cells. In 29 of the cases in this series full differential white cell counts were made and the average count over these cases were as follows:-

Total white cells,	16,175	per c.mm.
Polymorphonuclear leucocytes,	77.7	per cent.
Lymphocytes,	17	" "
Large mononuclears	4,8	" "
Eosinophils	0.35	" "
Basophils	0	" "

These figures quite definitely demonstrate the leucocytosis with a preponderance of polymorphonuclear cells and a relative decrease in the other types of cells included in the differential count.

LIVER FUNCTION TESTS.

In 7 cases liver tolerance tests were carried out. Van den Bergh's reaction was used on six occasions; the bromosulphalein test on three, and the galactose and laevulose tolerance tests on two. No abnormality of the liver was demonstrated by these tests in any one instance,

even when an abscess contained as much as 80 ounces of pus. We must conclude that, in this condition, these tests are of no diagnostic value.

COMPLEMENT FIXATION IN THE DIAGNOSIS OF AMOEBIASIS.

Craig, working in the Department of Preventive Medicine and Clinical Pathology, Army Medical School, Washington, D.C., has demonstrated the value of a complement fixation test in the diagnosis of amoebiasis. Since he has found it to be of definite value, as have the physicians at Walter Reed General Hospital, for whom the tests were made, it is of interest to quote his conclusions from a series in which 786 cases were tested. These cases were carefully controlled by examination of the faeces for evidence of infection with E. histolytica. His conclusions were as follows:-

"(1) There occur in the blood serum of individuals infected with Endamoeba histolytica, specific substances, which can be demonstrated by complement fixation, when alcoholic extracts of cultures of this parasite are employed as antigens.

(2) These complement fixing bodies disappear from the blood serum after treatment, resulting in the disappearance of Endamoeba histolytica from the feces of the infected individuals.

(3) Individuals free from infection with Endamoeba histolytica very rarely give a positive reaction, and in the very small percentage of cases in which infection with this parasite could not be demonstrated, it is probable that the failure to demonstrate it was due to an insufficient number of examinations of the feces.

(4) Individuals infested with Endamoeba coli, Endamoeba nana, Iodamoeba williamsi, chilomastix mesnili, Trichomonas hominis or Giardia intestinalis do not give a positive reaction with the complement fixation.

(5) With the exception of rare cases of syphilis, the complement fixation test for amebiasis does not occur in individuals suffering from other infestations or diseases.

(6) Positive complement fixation reactions occur in individuals suffering from symptoms of infection with Endamoeba histolytica, and also in those in whom symptoms are absent, i.e., the so-called "Healthy Carrier" of the parasite. It has been noted that when symptoms are very acute the complement fixation reaction is sometimes absent or weak."

The practical application of this reaction carries with it some difficulties, as Craig himself admits. First of all, there is the difficulty of preparing the antigenic extract, which has to be made from a large number of cultures of E. histolytica and the difficulty of maintaining these cultures is not inconsiderable, even in the hands of a competent and experienced person. Secondly, the technique of the test is such as to require the services of a protozoologist and a serologist. Thus this reaction is not of great practical value, except for those for whom the necessary facilities are readily available.

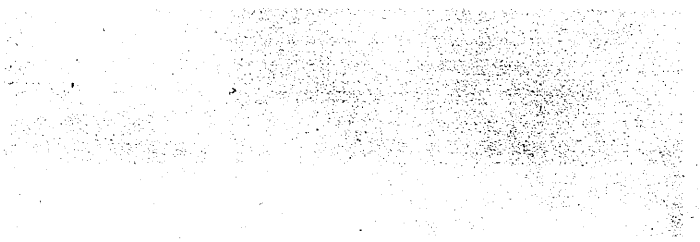
SIGMOIDOSCOPY.

In the more chronic cases of amoebic abscess of the liver and when the diagnosis is in doubt, sigmoidoscopic examination may be of value. It is quite remarkable how little there is to be seen through the sigmoidoscope in many instances, even where the patient has undoubted infection with E. histolytica, but there is always the chance that it might prove of value. An ulcer or reddened papules may be seen, and by scraping these areas and examining the scrapings, one can occasionally demonstrate the presence of cysts or active amoebae.

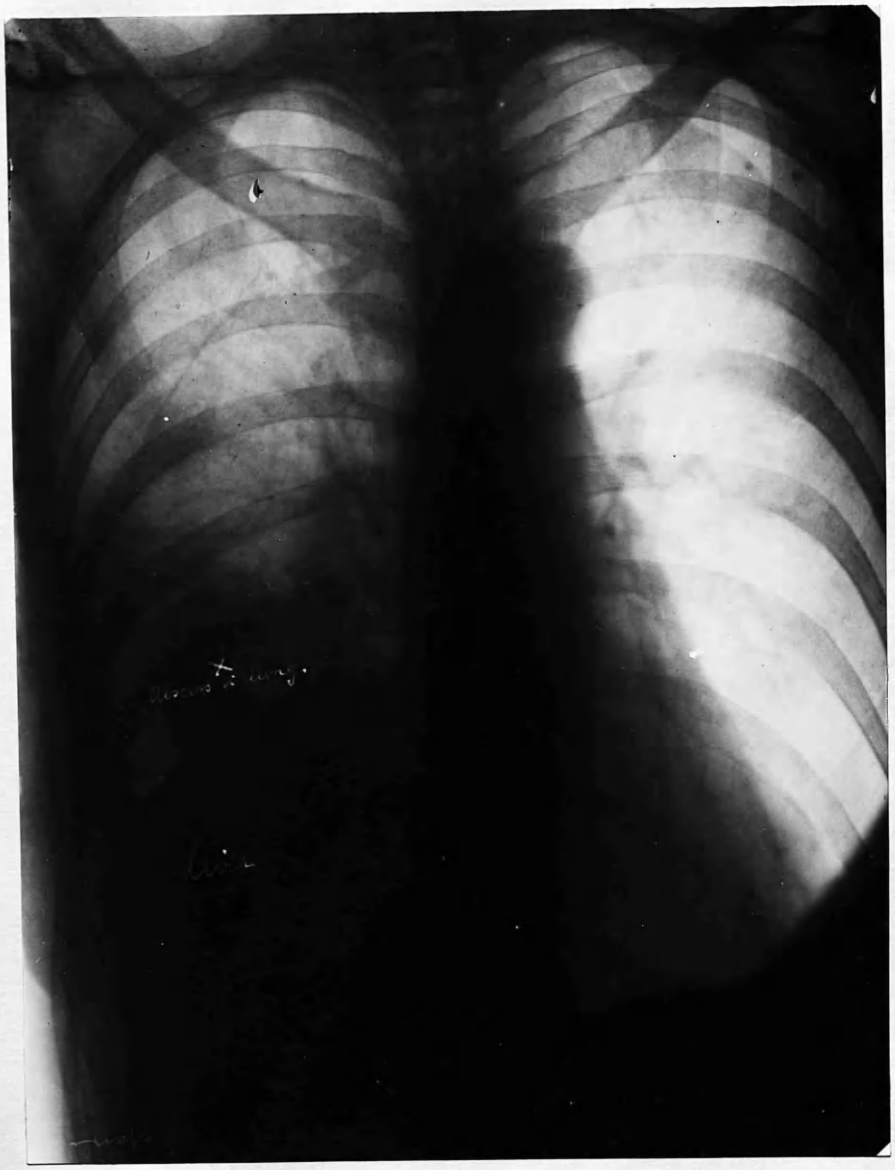
(1) October 17, 1924. Plates of pulmonary abscess, secondary to liver abscess. Diaphragm drawn up towards pulmonary abscess. Resected ribsseen.

(2) Plate showing oval opacity with periphery partly calcified situated in the liver immediately below the right cupola of the diaphragm.

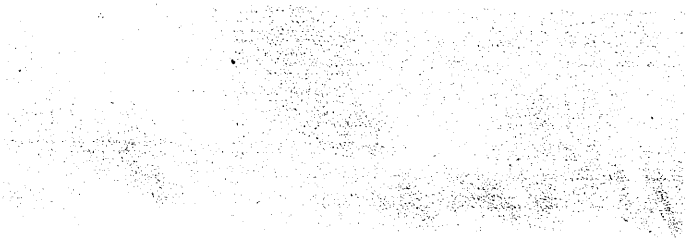
Plate taken two weeks later showed no alteration in the appearance. Skin Test and complement fixation test for Hydatid - negative. Case of calcified liver abscess.



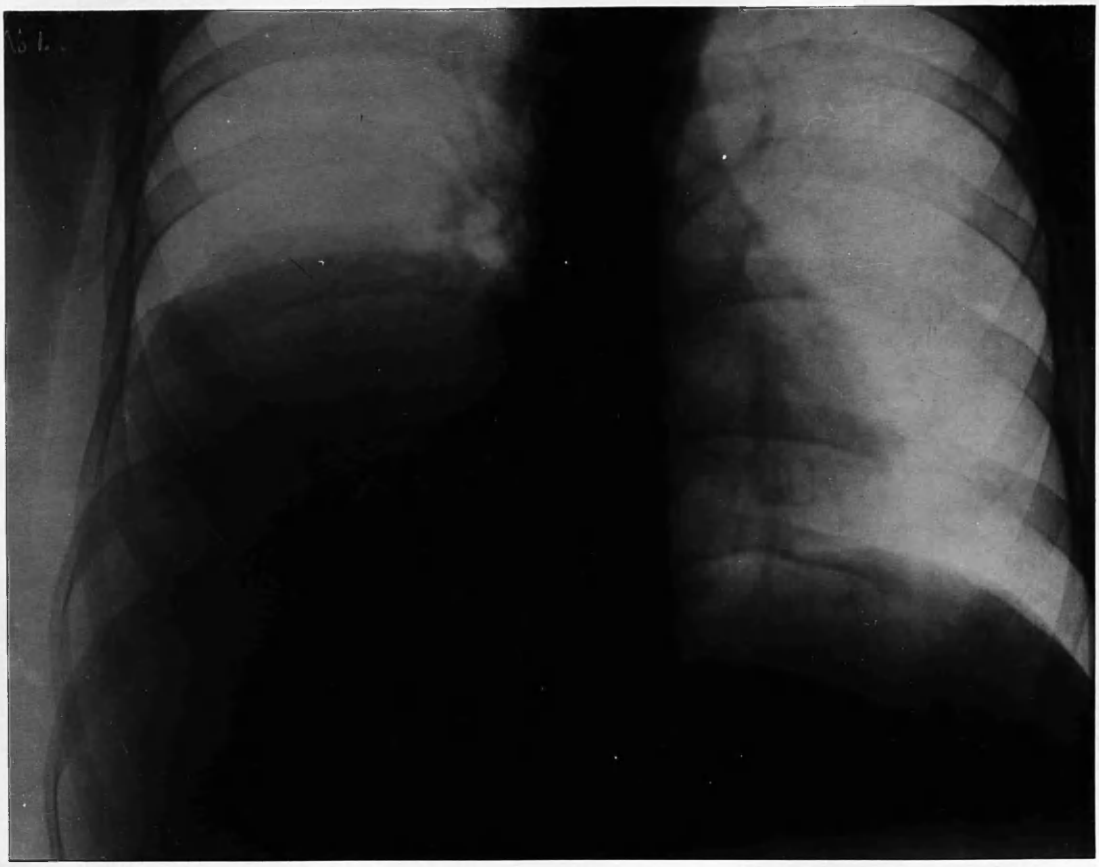
(3) Plate showing liver abscess which has ruptured into the lung. The positions of the liver and the pulmonary abscess are indicated in writing. This case is of interest in that it closely simulated malignant disease of the lung and was primarily treated as such. Recovery satisfactory.



(4) - Plate showing definite doming of the right cupola of the diaphragm, which was also quite immobile on screening. Definite case of liver abscess of the right lobe.

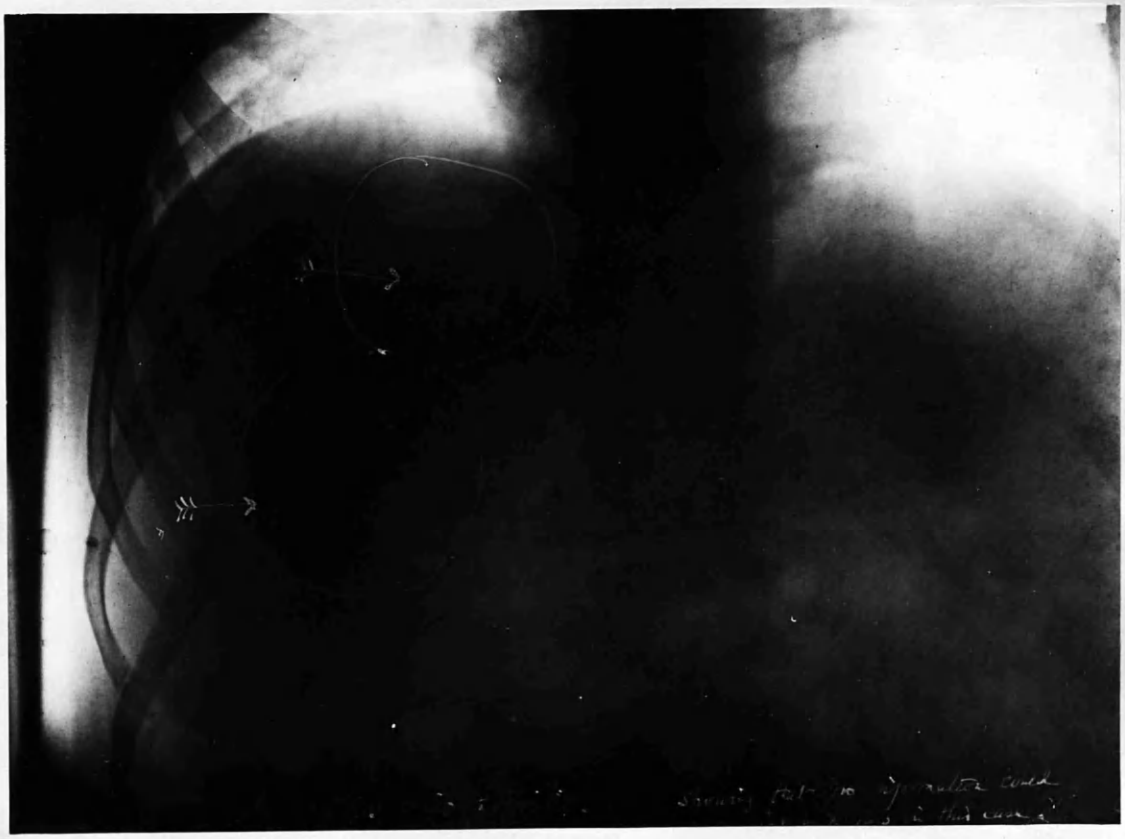


(5) Plate showing marked doming of the right side of the diaphragm. The diaphragm in this case showed a good range of movement on screening. Forty six ounces of pus were aspirated. Recovery good. Case fully reported No. 2.

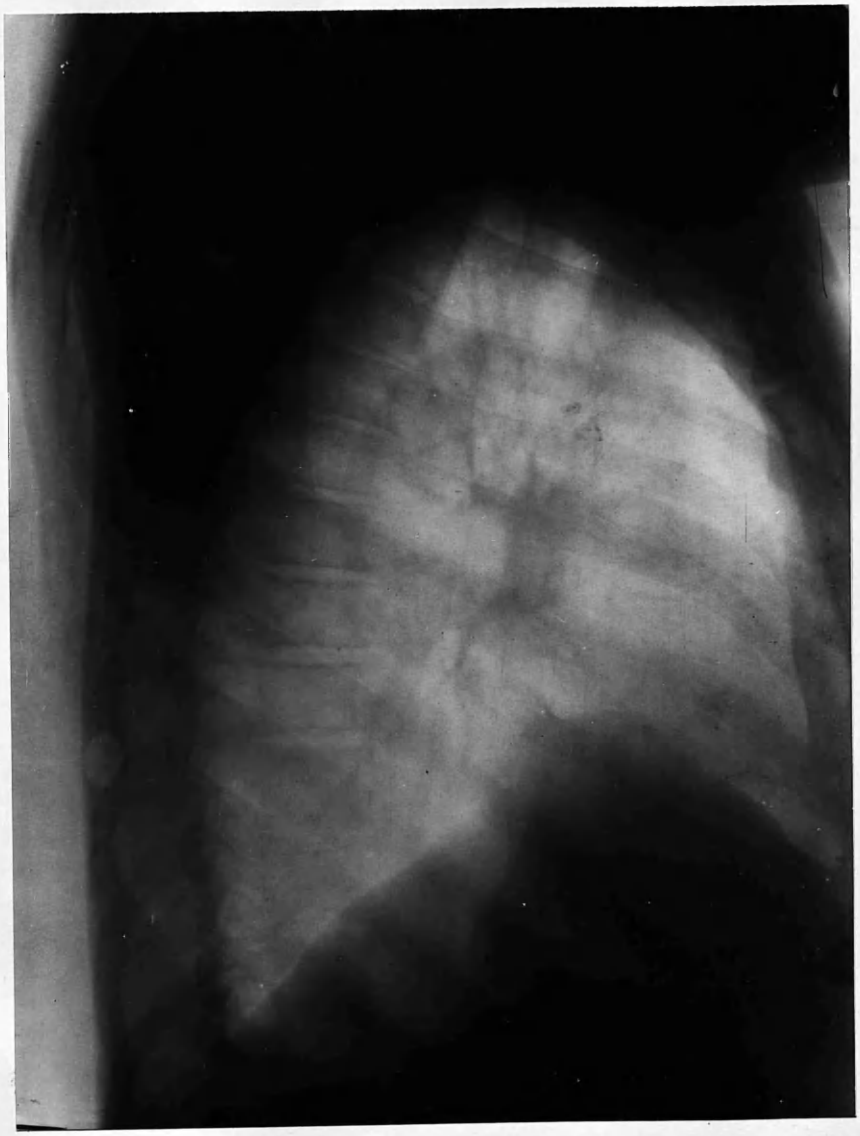


(6) Radiologist's Report. "Rt. diaphragm of normal contour, but slightly raised. Movements good. Liver shadow enlarged but no radiological evidence of liver abscess."

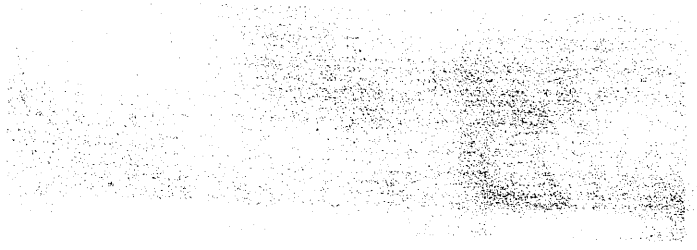
In this case there were two large abscesses present in the right lobe, as was proved at post-mortem. Their positions are indicated by the arrows. Radiology of little value in this case. See Case 5 Report.



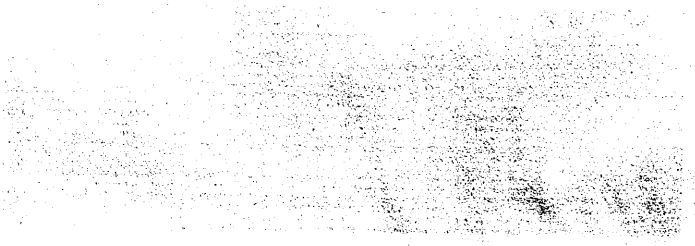
(7) Plate taken from lateral aspect, showing marked raising and tenting of the diaphragm due to liver abscess in the right side of the liver. Fibrosis of the lung present also and continuous with diaphragm. Diaphragm was immobile on screening.



(8) Same case as 7, taken from an antero-posterior position, showing also the marked irregularity in the outline of the diaphragm.

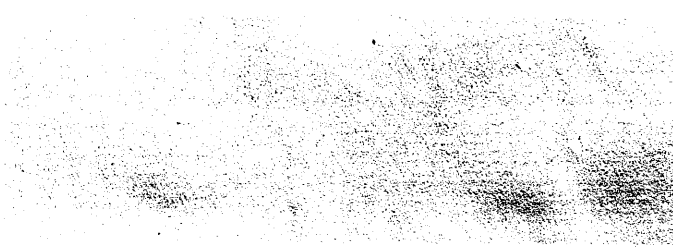


(9) Same case as 7 and 8, taken from an antero-posterior position 4 weeks later. Outline of diaphragm has altered, but it is still raised.

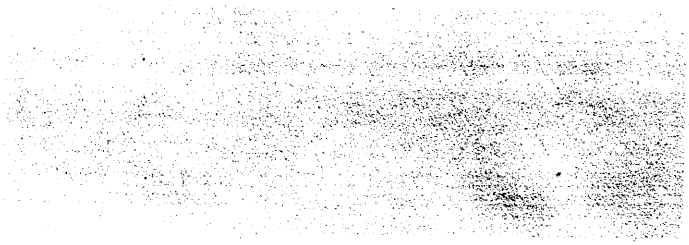


(10) Plate taken from a lateral aspect showing marked doming of the diaphragm with regular contour. Diaphragm was immobile on the Right side on screening. Definite case of liver abscess.

(11) "Liver shadow enlarged. A definite oval opacity is situated over the 11th. rib on the right side, the appearances suggesting a liver abscess." Forty-one ounces of pus were aspirated from right lobe of liver. See Report Case 30.



(12) X Ray of same case as 11 after the aspiration of the pus. A cavity containing air is seen where the original abscess was. This air had been completely absorbed by the end of one week, as shown by radiography.



RADIOGRAPHIC FINDINGS.

Occasionally the patient who is suffering from amoebic liver abscess is too ill to have any radiological investigation carried out, but mostly it is possible to have these examinations performed without undue disturbance of the individual. Sometimes radiography fails to reveal any abnormality, either in the size and the density of the liver shadow or in the movements of the diaphragm. In these 32 cases there are many points of radiological interest, as will be seen in the accompanying plates.

Significant features in a radiological investigation are as follows:-

(1) Impairment of movement of the diaphragm. Vide plates 4 & 10.

As the abscess is usually in the right side of the liver, the right dome of the diaphragm is that more frequently affected and may be seen to move less freely than the left dome, or to be quite immobile. This evidence, of course, does not make the diagnosis of liver abscess definite, but it is of value in the absence of any local symptoms.

(2) Elevation of the dome of the diaphragm. Vide plates 4, 5, 7. Here again the right dome is the one more frequently displaced.

(3) Irregularity of diaphragmatic contour. Vide Plates.7 & 8.

An irregular outline of the diaphragm may be due to an abscess pointing towards the lung, or may equally be due to pleural adhesions which have produced "tenting" of the diaphragm.

(4) Increased opacity within the liver shadow. Vide plates 11 & 12.

Occasionally there is an increased density in the liver shadow. This is not a frequent finding, however, and it is really surprising how often there is little evidence of this nature, even in the case of an abscess containing as much as two pints of pus. In one instance in this series calcification of the wall of the abscess was detected, while in another the abscess was outlined through the pressure of air in the cavity. This was found subsequent to aspiration of the abscess. Plates taken some time later failed to reveal the presence of the air or any other evidence of liver abscess.

(5) Opacity in the lung area. Vide plate.1.

Where the abscess has ruptured into the lung there can frequently be seen an opacity of irregular

and indefinite outline, and occasionally this opacity is seen to be contiguous with an irregular projection of the diaphragm, the point at which the rupture through the diaphragm has occurred.

(6) Opacity due to pleural effusion.

There may be evidence pointing to fluid in the pleural cavity and it is well to remember that pleural effusion is a not infrequent complication of this condition.

(7) Displacement of the cardiac shadow.

Rarely the cardiac shadow is seen to be altered in position to the right, to the left, or upwards, according to the size and position of the liver abscess.

These are the main points with regard to radiographic findings in liver abscess and, in our experience, they have frequently proved of definite value, both in the diagnosis and in following the progress of patients suffering from this condition.

COMPLICATIONS.

Many complications of liver abscess have been described, but in the present series only a few were of any practical importance.

The most common complication in liver abscess in these cases was involvement of the chest, and the pathology underlying these chest complications has been of particular interest. In most cases of liver abscess, and particularly in those in which the lesion is situated close to the dome of the diaphragm, there is a varying degree of impairment to percussion at one or other base, most commonly the right. The base of the lung in these cases is partially collapsed, due to pressure from the raised diaphragm, and in addition, there is some congestion of the base as the result of the static diaphragm, which is not uncommonly present in this condition. The physical signs at the bases of the lungs are usually indefinite, but one may expect slight impairment to percussion with diminished breath sounds and occasional moist râles.

Not infrequently the liver abscess is found to have ruptured into the lung. The symptoms preceding this complication are cough with a mucoid spit. With the rupture of the abscess into the lung the sputum alters in character and becomes brownish-red in colour and of creamy consistence - the so-called "Anchovy Sauce" sputum. The lung in this condition shows a varying degree of consolidation of the base with disintegration and degeneration of the lung tissue. Secondary infection of the degenerating lung tissue probably aggravates the pathological process, but it is most remarkable how this

complication reacts to emetine treatment - a point which would seem to indicate that the amoebae play the chief rôle in the production of the lesion.

More frequent than the preceding complication is that of pleural effusion. This was present in 4 out of the 32 cases - 12.5 per cent. They were of peculiar interest in that the pleural fluid proved to be sterile, even after incubating it for long periods. In three of these cases the liver abscess was sterile for organisms, while in the remaining case the liver abscess was secondarily infected with S. aureus.

This effusion is probably due to the spread of a toxin, either bacterial or protozoal from the liver abscess to the parietal pleura via the lymphatics, which are numerous on both sides of the diaphragm. In one case a full examination of the pleural fluid was made, and the results were as follows:-

50 c.cs. of slightly turbid Canary yellow fluid were withdrawn.

Differential Call Count.

Polymorphonuclear leucocytes	- 21	per cent.
Lymphocytes	- 71	" "
Large Mononuclears	- 8	" "

The fluid on standing developed a fine gossamer-like clot.

The above findings correspond closely to those found in pleural effusion of tuberculous origin - a fact to be remembered from the point of view of differential diagnosis.

Secondary infection of the liver abscess occurs fairly frequently, and this is of particular practical importance, as it alters the prognosis and the mode of treatment of the condition. In the present series 4 out of 32 cases were secondarily infected with organisms; 2 with streptococcus longus and streptococcus brevis; one with B. coli and one with staphylococcus aureus. In all cases of liver abscess it should be the rule to make a culture of the aspirated material, since it is essential to establish drainage of a secondarily infected abscess as soon as possible, as opposed to aspirations, which is usually sufficient in a straightforward case.

Many other complications of liver abscess have been described from time to time, such as rupture of the abscess into the stomach, the colon, the duodenum and through the skin, but such complications were not found in these present cases, although one or two patients gave a history of previous liver abscess which had apparently ruptured into the stomach.

Amoebic abscess of the brain, a very rare condition, is said to occur most commonly as a sequel

to evacuation of a liver abscess, but there were no symptoms in any of the cases investigated even to suggest such a complication.

HEPATITIS.

A study of amoebic abscess of the liver would be incomplete without some reference to the clinical condition of amoebic hepatitis.

What has already been written on the geographical distribution, predisposing causes, symptomatology and the clinical findings of liver abscess, applies on the whole to hepatitis.

With regard to the pathology of the condition, I believe that hepatitis is due to the presence of active amoebae scattered widely throughout the liver tissue. These amoebae give rise to multiple pin-point abscesses. through their lytic action on the liver cells.

If the patient receives no treatment, or inadequate treatment, when the pathological process is manifested clinically by hepatitis, then one or more of these small areas of degeneration may become enlarged into a true liver abscess. These statements are based on a study of the liver sections from a case which had been diagnosed as hepatitis; the patient died soon after the onset of his illness from the severity of the diarrhoea.

In many cases it is impossible to say clinically whether one is dealing with hepatitis or liver abscess; especially is this true when there are no local symptoms or signs of the presence of the abscess. This is not surprising, of course, when one considers that hepatitis is but one stage in the pathological process which ultimately results in liver abscess.

To clinch the diagnosis, in many of these cases one has to resort to liver puncture. Even then, in those cases where the puncture has been negative, there is always the possibility that an abscess was missed by the puncturing needle, owing to its small size.

The treatment of an amoebic hepatitis does not differ essentially from that of liver abscess, which will be discussed in detail in a later part of the paper.

PROGNOSIS.

In the pre-emetine days amoebic abscess of the liver was one of the commonest causes of death in the British Army in India, but with the increasing use of emetine and the earlier diagnosis of the condition, the mortality rate has fallen to a very much lower figure. Prior to 1907, (when Rogers published his paper on pre-suppurative hepatitis) liver abscess was the second largest cause of death in the British Army in India. Since 1907

with the revival of the use of ipecacuanha the number of admissions has fallen to one-fifth the former number of admissions and the death rate to one-seventh. (This is up to 1916).

In 1931 only ten cases were diagnosed as liver abscess, and among these there were no deaths, although one patient had to be invalided home to England.

Of the 32 cases under our care 6 ultimately died - giving a mortality rate of 18.7 per cent. This is a heavy mortality rate and an examination of the cause of death in each case is instructive.

No.	Cause of death	Duration of symptoms prior to admission to hospital.
1.	Pneumothorax & empyema	7 months
2.	Multiple abscesses of liver. Abscesses secondarily infected. Sub-phrenic abscess. Empyema.	3 months.
3.	Secondarily infected liver abscess. Empyema.	2 months.
4.	Multiple liver abscess. Abscess secondarily infected. Acute dysentery.	Indefinite.
5	Liver abscess. Chronic Nephritis. Enteritis.	1 year.
6.	Secondarily infected abscess. Right basal pneumonia.	2 months.

The outstanding feature in the above cases is the length of time which elapsed between the onset of symptoms and the patient's admission to hospital. In no instance was this shorter than 2 months. Again, the part played by secondary infection of the abscess is manifest. It seems justifiable to consider that if the patients had been admitted earlier, the secondary infection might have been obviated.

From our experience it can be stated that the prognosis is good in a case of uncomplicated liver abscess, but that secondary infection makes it much more grave, though by no means hopeless.

The rare complications of amoebic liver abscess, such as rupture into the inferior vena cava or into the pericardium are immediately fatal. Rupture into the duodenum or stomach are occurrences slightly more dangerous than aspiration.

Those cases where rupture takes place into the pleura or into the lung tissue and where secondary infection is absent are, on the whole, amenable to treatment, and the prognosis is good.

Stress again should be laid on the necessity of making an early diagnosis, and so reducing the liability to secondary infection.

TREATMENT.

Prophylactic.

Since amoebic abscess of the liver is aleays secondary to infection of the bowel, it is not too much to say that such a complication could be prevented by:-

(1) Taking the necessary precautions in personal hygiene and public sanitation, so as to avoid contracting amoebic infection of the colon.

(2) Establishing early and adequate treatment of amoebiasis where such an infection exists, as is emphasised by Rogers.

The truth of this can be seen by comparing the incidence of amoebic liver abscess in the pre-emetine days with its incidence during the past five years. In this connection the figures of the British Army in India, which have already been quoted, are very instructive.

Active. - Medical.

As soon as the diagnosis of amoebic hepatitis or liver abscess has been established, or even considered as a probability, emetine treatment should be instituted.

The preparation used in the cases under review was emetine hydrochloride, one grain, dissolved in 20 minims of distilled water, as injections of this solution have been found to be less irritating than those made up

with normal saline.

The complete course consists of ten daily intramuscular injections of one grain each, but, in some cases, it may not be necessary to give the complete course, while occasionally it may be found essential to repeat the course after an interval of one or two weeks. In very urgent cases Rogers has advocated the intravenous injection of the drug.

In most cases this treatment has a markedly beneficial effect, as shown by the temperature returning to normal, the fall in leucocytes and the disappearance of symptoms with subsidence in the size of the liver.

In cases of hepatitis, and in cases where there is only a small recent abscess, such a course of treatment will probably suffice, but we have found that it is advisable to give these patients an after-course of emetine-bismuth-iodide by mouth and yatren lavage of the colon. This after treatment will be discussed in another part of the paper.

In those cases where there is no doubt as to the presence of a liver abscess, it is a wise procedure to give two or three injections of emetine hydrochloride prior to any surgical interference, as this lessens the congestion of the liver and so minimises the possibility of haemorrhage from that organ following punctures or drainage. That is the ideal method of treatment, but

in actual practice, as judged from the present series of cases, it is found that haemorrhage is not a common complication, even in those cases where emetine has not been given prior to surgical intervention.

Surgical.

As previously indicated, there are certain cases where it is difficult to determine whether a hepatitis or liver abscess is present. In such cases an exploratory puncture should always be performed, for the following reasons:-

(1) The operation is comparatively simple; is not attended by any real danger, if proper care is taken, and does not greatly distress the patient.

(2) It can be performed under a local anaesthetic or under short general anaesthesia.

(3) Such an exploratory puncture discloses with surprising frequency the presence of an abscess.

(4) Even in the event of the puncture proving negative, the withdrawal of blood from the congested liver may shorten the period of illness and relieve symptoms.

Site and method of liver puncture.

In certain cases of liver abscess there are localising symptoms and signs, which indicate the point at which the exploring needle should be introduced. Such indications may include:-

(1) A point where constant pain is felt.

(2) A point where tenderness is most marked.

(3) An area of oedema in the overlying skin.

(4) Actual pointing of the liver abscess.

(5) Radiological findings which indicate the site of the abscess. This is of special value when the abscess is seen to be pointing towards the lung, giving rise to "tenting" of the diaphragn.

In the absence of any localising signs the needle, in exploring the right lobe, should be introduced through the 7th. or 8th. interspace in the right anterior axillary line. Working from this point as centre the needle should be introduced into the liver six to eight times, so that a different area of liver tissue is explored on each occasion. As demonstrated by Cantlie in 1916 the needle can be introduced into the liver to the extent of $3\frac{3}{4}$ inches without any danger of puncturing the large vessels. In this way the greater part of the right lobe is explored. Any abscess

whose presence is not disclosed by the above method is probably of very small size and will react to emetine treatment.

Other methods of liver puncture have been described. In one the inferior vena cava is considered to be the centre of a circle whose circumference is the chest wall. The needle in this method is introduced at different points in the circumference and always directed towards the centre - the inferior vena cava - for a distance of $3\frac{3}{4}$ inches. A second variation is to introduce the exploring needle always in a lateral direction, using a different site on each occasion; this avoids the needle point always being directed towards the inferior vena cava. Whatever method is chosen the operator should satisfy himself that a sufficient number of punctures has been made to include all areas of the right lobe.

When an abscess has been located the entire contents should be aspirated. In most cases one aspiration is sufficient to effect a cure, but occasionally it may be necessary to repeat the operation. In one of our cases aspiration was carried out on three occasions, yielding successively 80, 45 and 30 ounces of pus. Even then, open drainage had ultimately to be established before the patient finally recovered.

Formerly liver abscesses were treated by open operation, and the establishment of some form of drainage, but such a procedure is quite unnecessary in the majority of cases. Wherever possible preference should be given to aspiration, for the following reasons:-

(1) The chance of secondary infection of the abscess cavity is thus reduced to a minimum.

(2) The period of convalescence is shortened.

(3) The chance introduction of infection into the pleural space is obviated.

(4) The final result in most of the cases is more satisfactory with aspiration than with drainage.

Open operation.

In certain cases of liver abscess open operation is the treatment of choice.

If secondary infection be present, open operation becomes necessary, and should be performed at once. The secondary infection should have been discovered by examination and culture of the material obtained at a preliminary aspiration. This culture and microscopical examination will frequently disclose unsuspected secondary infection, and many save valuable time in enabling the open operation to be performed, while the patient's condition is yet good. It has been the practice in

this hospital in these cases to open the abscess and to introduce a fairly large rubber tube, to allow free drainage. Irrigation of the abscess cavity by the Carrel-Dakin method has frequently proved of definite value, as shown by Manson-Bahr and Kilner.

When secondary infection exists, a two stage operation would appear to have much to commend it, similar in type to that advocated by some surgeons in lung abscess. In the first stage the pleura covering the diaphragm is stitched to the parietal pleura in the lower part of the chest. A few days are allowed to elapse before opening the abscess, in the hope that adhesions will have formed between the two layers of the pleura. Such an operation minimises the risk of pleural infection. Not infrequently the lower portion of the pleural cavity is quite obliterated by the upward pressure of the diaphragm and inflammatory adhesions. Where the two layers of pleura cannot be approximated closely enough to permit of stitching, packing the pleural cavity with gauze may produce the desired effect. Of course this two stage operation of drainage by a transpleural route will only be possible in cases where the position of the liver abscess is such as to render it desirable to drain by this method.

In certain cases it may be necessary to drain the abscess through an incision in the hypochondrium or in the epigastrium. Here also it may be possible to carry out a similar two stage operation. Where the abscess is pointing in the upper part of the abdomen or where it is in the left half of the liver the best procedure is to open the abdomen and then to aspirate the contents under direct vision. By this procedure an abscess in the left side of the liver is readily approached and aspirated. In one case in this hospital where the abscess was pointing in the right hypocondrium a laparotomy was performed prior to aspiration and a portion of the colon was found to be fixed between the liver and the abdominal wall. This case provides an excellent example of the dangers which accompany aspiration of the anteriorly pointing abscess without first performing a laparotomy. In the above case it is quite conceivable that the aspirating needle, if it had been introduced directly through the abdominal wall, would have perforated the gut and perhaps have given rise to unexpected complications.

AFTER TREATMENT.

During the late stage of convalescence I think it is desirable to carry out treatment directed against the original bowel infection.

At the present time there are numerous drugs in vogue for treatment of amoebic infection of the bowel, such as Yatren, Stovarsol, Carbarsone and the various preparations of Emetine. Each of these drugs has its advocates but, in our experience, a combined treatment with emetine-bismuth-iodide and yatren has been found to give the best results.

The patient is put on a light diet with plenty of fluid and carbohydrate. No food is taken in the evening after 6 p.m. In the morning the large bowel is washed out with a 2 per cent solution of sodium bicarbonate, and then 8 to 10 ounces of 2½ per cent yatren solution are introduced. This latter the patient retains for as long as possible - the average time being about six hours. About 9.30 p.m. the patient is given emetine-bismuth-iodide, put up in gelatine capsules. For the first dose 1 grain of the drug is given and, if this is well tolerated, the dose may be increased to 2 or even 3 grains. The drug is better tolerated if luminal $\overline{I}$ gr. or tincture of opium m $\overline{XV}$ is given thirty minutes previously. The treatment is continued for a period of ten days.

If emetine-bismuth-iodide is not well tolerated by the patient emetime periodide in similar doses may be used, though we consider it to be less efficient than the bismuth salt.

This after treatment would appear to be justified in that one not infrequently comes in contact with patients who still show signs of amoebic infection, even after receiving treatment effective for amoebic liver abscess.

C A S E S.

CASE 18.

W. M. H. Under Dr. Manson-Behr.

This patient, an Englishman, aged 39 years, went out to Nigeria in 1914 and lived there, with periodical furloughs, until 1925. While abroad he had several attacks of malaria, the last being in 1923. He gave no history of dysentery, but had suffered from slight transient attacks of diarrhoea. He returned to Britain on 18th. January 1925. Next day he suddenly developed acute abdominal pain with pyrexia but no vomiting. A diagnosis of acute appendicitis was made and the appendix was removed, but it was not found to be inflamed. At operation the liver was seen to be enlarged and he was given 4 injections of emetine, each 1 gr., at daily intervals.

He recovered from the illness and remained well for one month, when the pyrexia returned. Since then he has been subject to frequent attacks of abdominal pain,

which have been variously diagnosed as due to "gastric influenza" and "bronchial catarrh".

He was admitted to the Hospital for Tropical Diseases on 6th. July, 1925. For 4 weeks prior to admission he had been running a continuous temperature.

On admission he complained of occasional pains in the right side of chest and abdomen and in the right shoulder, together with nocturnal perspiration and loss of appetite. He had lost 1½ stones in weight since the onset of the illness, which was presumably on 19th. January 1925.

Physical Examination.

Examination of the patient showed a dry, heavily coated tongue, earthy coloured, rough skin, and he looked decidedly ill. The respirations were laboured and there was bulging of the right side of the chest. There was dullness of the right base, up to the level of the angle of the scapula behind, and to the third interspace in front. Over this dull area the breath sounds were diminished or absent, with diminished vocal fremitus; numerous moist râles were audible. The heart was displaced upwards and to the left; heart sounds pure, but of poor quality; the pulse was soft, regular and rapid. The edge of the liver was felt at the level of the umbilicus in the right nipple

line and was very tender. The spleen was not palpable, nor was any part of the colon.

Laboratory Examination.

Erythrocytes - 4,650,000 per c.mm.:
Haemoglobin - 80 per cent.: Colour Index - 0.86:
Leucocytes - 9,000 per c.mm.: Neutrophils - 82 per cent:
Lymphocytes - 14 per cent: Monocytes - 4 per cent:
Eosinophils - 0 per cent: Basophils - 0 per cent:

The faeces were found to contain cysts of E. Histolytica. The urine was normal.

On admission liver abscess was diagnosed and one grain of emetine daily for twelve days was ordered. Two days after admission liver puncture was carried out, when 18 ounces of amoebic pus were aspirated. The patient made an uninterrupted recovery, and when he was discharged twenty days later (25th. July) he looked and felt much better. The colour of his skin had come back to normal, the signs in the chest had disappeared and the liver had returned to its normal size and position - nor was it tender.

This patient reported back to hospital 4th. September 1925, when examination failed to reveal any abnormality.

During convalescence yatren lavage of the colon was given daily for 5 days. The effect of the treatment on the temperature is seen on the accompanying chart.

COMMENTS.

The therapeutic response to emetine is very striking in this case, and it also demonstrates the value of liver puncture, as it is difficult to believe that the pus would have been absorbed, unless after a long period of time.

The absence of a history of dysentery is to be noted in this case, as is also the recurrence of the symptoms after inadequate treatment with emetime.

It is not uncommon for a patient who is suffering from amoebiasis to be operated on for appendicitis, as probably happened in this case. This is an example of a straightforward case of liver abscess.

Four-Hour Chart.

DISEASE.

PARTICULARS.

Name W. M. H.

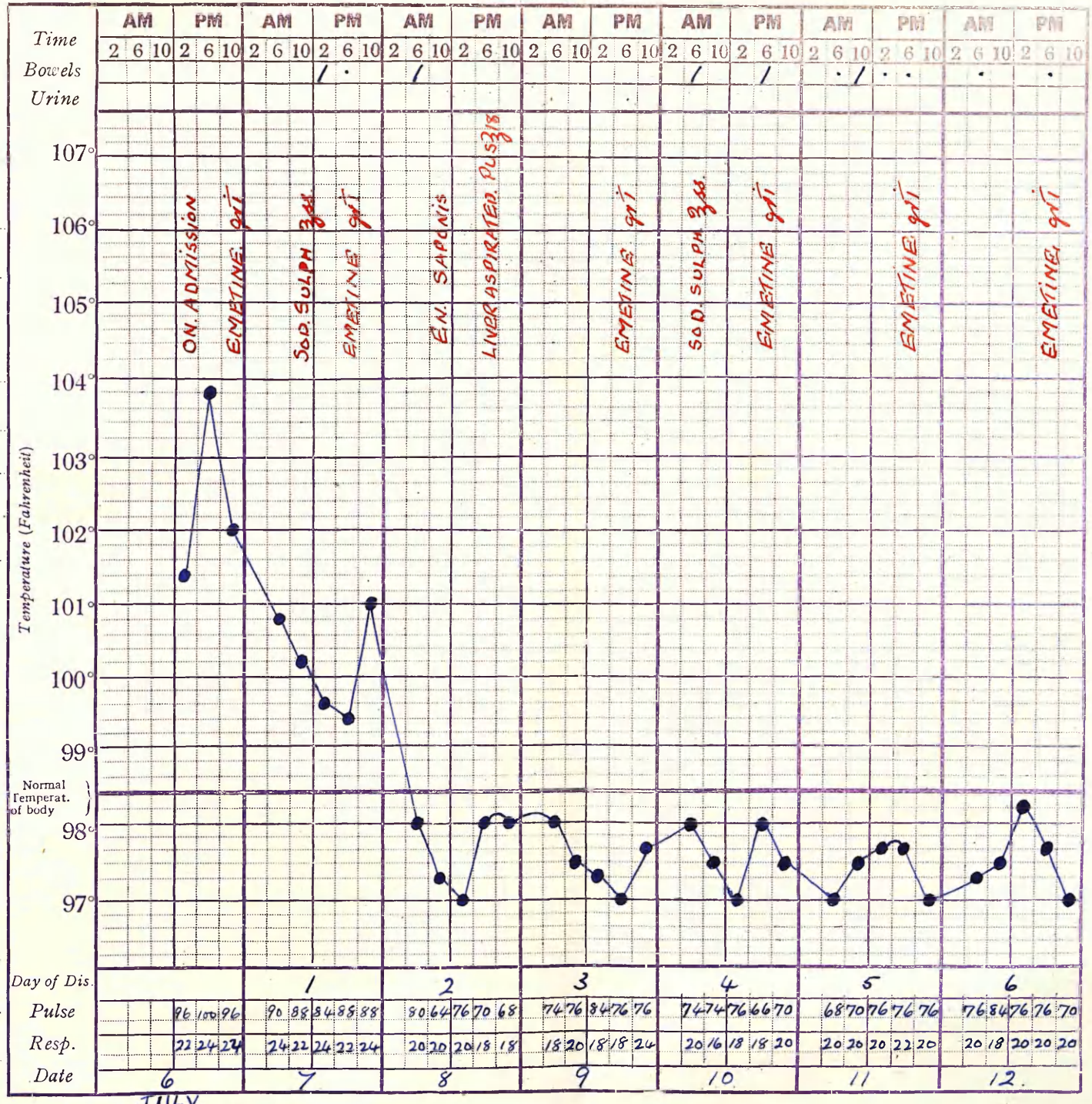
Age 39 yrs.

Diet

Case Book No.

Admitted 6th July 1925

Result



CASE NO. 31.

T. W. Under Dr. Manson-Bahr.

T. W. an Englishman, aged 26 years, was admitted into the Hospital for Tropical Diseases on 3rd. September 1921.

He did war service in France and was badly gassed in 1918. He went to Palestine at the beginning of 1920 and in September of the same year he developed dysentery. He was hospitalised for this illness for a period of three months, and while there he received two injections of serum (anti-dysenteric?) and a course of injections of emetine. He felt well when he left hospital, but soon afterwards relapsed. He did not return to hospital as he was waiting to be transferred to the United Kingdom, and in April 1921 he reached England. Following this he was troubled with dysenteric symptoms at intervals and he spent some time in a London hospital, where he was again given injections of emetine, with temporary relief.

Three weeks prior to admission into the Hospital for Tropical Diseases the patient felt generally unwell, breathless, faint, and he actually fainted in the street and struck his right shoulder against a lamp-post. This fall, the patient stated, gave rise to a pain in the right shoulder and chest which persisted up till the time of his admission to hospital. The pain in his chest and shoulder was aggravated by movement and deep breathing.

In addition he complained of thirst and heavy night sweats.

Physical Examination.

Well built and well nourished, with slight cyanosis of lips and finger nails. Tongue dry and furred.

The chest showed marked emphysema, but on the right side there was dullness extending up to the level of the angle of the scapula. Over this dull area the breath sounds were diminished or absent, while vocal resonance and fremitus were also diminished.

Examination of the abdomen showed the liver edge to be palpable below the right costal margin and tender. Tenderness was present over the caecum and ascending colon also, while there was definite rigidity of the right rectus muscles. No other abnormalities were detected except that the heart-sounds were of poor quality.

Laboratory Examination.

5th. September 1921.

Erythrocytes - 4,620,000 per c.mm.:

Haemoglobin - 80 per cent:

Leucocytes - 15,200 per c.mm.:

Neutrophils - 74 per cent: Lymphocytes - 19 per cent:

Monocytes - 7 per cent: Eosinophils - 0 per cent:

Basophils - 0 per cent: No parasites found in blood.

The stools contained mucus and a trace of blood, while microscopic examination revealed cysts of E. histolytica. The urine was acid and free from both albumen and sugar. Blood Wassermann reaction was negative.

Progress Notes.

The patient was diagnosed on the 4th. September to be suffering from amoebic liver abscess and he was started on emetine injections - grain $\dot{1}$ each -, and pulv. ipecac. grain V by mouth. On 5th. September liver puncture was performed, when two ounces of liver pus were aspirated from the right lobe. The pus was found to contain red cells, liver cells in all stages of degeneration and few pus cells. No amoebae were found.

The patient showed marked improvement after the liver puncture, and his recovery was uneventful, except for some trouble with bronchitis.

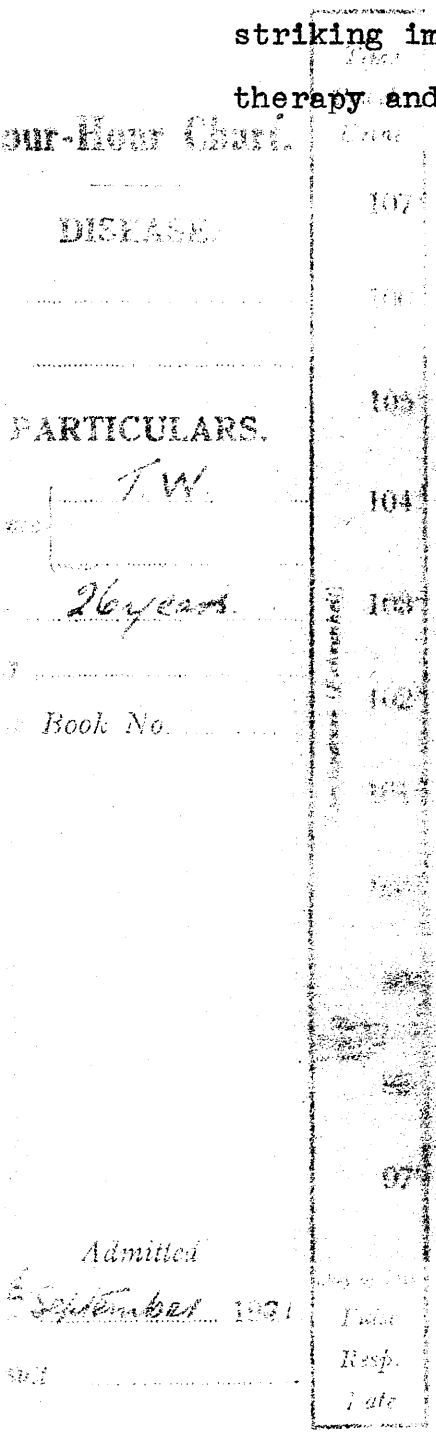
The course of the illness and the treatment are shown in the accompanying chart.

Prior to dismissal he was given treatment with emetine-bismuth-iodide by mouth.

COMMENTS.

This case illustrates a straightforward liver abscess. In spite of two courses of emetine injections he developed the liver complications, and it was only when he was given adequate treatment that the dysentery

finally cleared up. The temperature chart shows the striking improvement which took place following emetine therapy and aspiration.



Four-Hour Chart.

DISEASE.

PARTICULARS.

Name T. W.

Age 26 years.

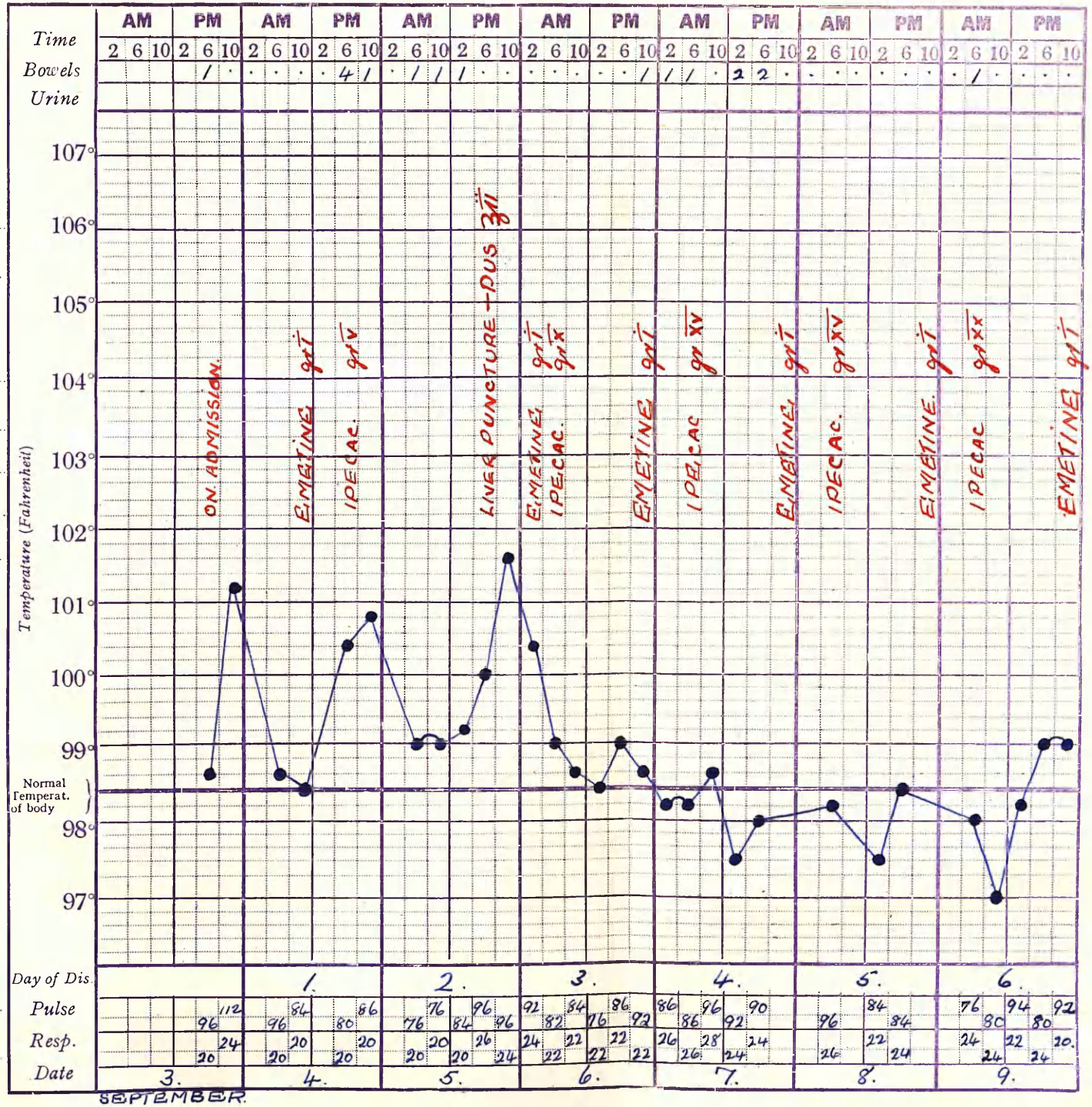
Diet

Case Book No.

Admitted

3rd September 1921

Result



CASE 2.

F. B. M. Under Dr. Manson-Bahr.

The patient, an Englishman, aged 34 years, was admitted to the Hospital for Tropical Diseases on 17th. November 1932.

He had worked as an engineer on board ship for 9½ years and had enjoyed good health until July 1932, when he developed amoebic dysentery while in Calcutta. He was treated in hospital for this condition, and on 5th. August 1932 he set sail for England. While in hospital he received one injection of emetine and at the same time he was given a course of stovarsol.

During the early part of the voyage he felt weak and had occasional griping pains in the abdomen.

One month after leaving India, and while off Spain, he developed a pain in the right side of the costal margin, accompanied by fever. He was treated in hospital ashore from 20th. September 1932 till 21st. October 1932. He felt better on dismissal, but soon afterwards developed a pain in the right side, and at the same time had pain in the right shoulder. During that period there was also a remittent temperature.

These symptoms were present at the time of his admission to the hospital in London, and in addition he had a cough with mucoid spit.

Physical findings.

He looked pinched and drawn and slightly cachectic. The tongue was furred, with raw red areas. The right base was dull to percussion to the 4th. rib anteriorly and to the 7th. rib posteriorly, with hyper-resonance above the dull area. The breath sounds were absent and vocal resonance diminished over the right base. The liver edge was palpable two inches below the right costal margin, and the thickened sigmoid colon was readily palpated. The liver was tender to pressure. Definite bulging of the lower intercostal spaces was present on the right side. His temperature on admission was 100.2° F, pulse 120 per minute and respirations 22 per minute.

Special Investigation.

Erythrocytes = 4,200,000 per c.mm. :
Haemoglobin = 80 per cent :
Leucocytes = 15,000 per c.mm. :
Neutrophils = 73 per cent : Lymphocytes = 20 per cent :
Monocytes = 6 per cent : Eosinophils = 1 per cent :
Basophils = 0 per cent : No parasite found in the blood.
Stools negative for ova and protozoa.

Progress Notes.

A diagnosis of amoebic liver abscess was made on 21st. November 1932; a course of emetine was started. In all he received ten daily injections, each one grain.

After the first injection his temperature which had been up to 100.8° F. came down to normal and remained so for the rest of his stay in hospital.

On 23rd. November 1932 the liver was explored under local anaesthesia through the 8th. intercostal space in the mid-axillary line and 46 ounces of typical liver pus were aspirated. No amoebae were found in the pus, and on culture there was a very scanty growth of Staphylococcus aureus. This was thought to be due to contamination from the skin.

The patient made an excellent recovery and was discharged from hospital 19th. December 1932.

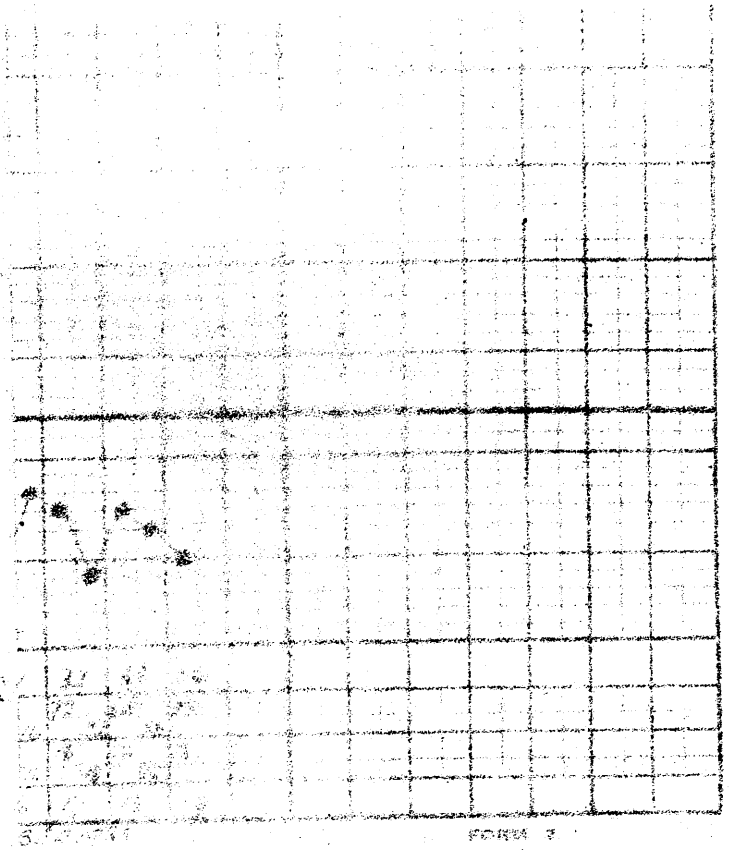
During convalescence the patient was given emetine-bismuth-iodide by mouth, grain I daily for ten days, and during the same period he received yatren lavage of the colon. This treatment was used to get rid of any persistent amoebic infection of the bowel.

COMMENTS.

This is an example of uncomplicated amoebic liver abscess.

The value of liver puncture and emetine treatment is again well demonstrated.

One is frequently tempted to believe that when the symptoms disappear after a few injections of emetine the amoebic infection is necessarily cured. This fallacy is well shown in the above case.



DISEASE.

PARTICULARS.

Name F.B.M.

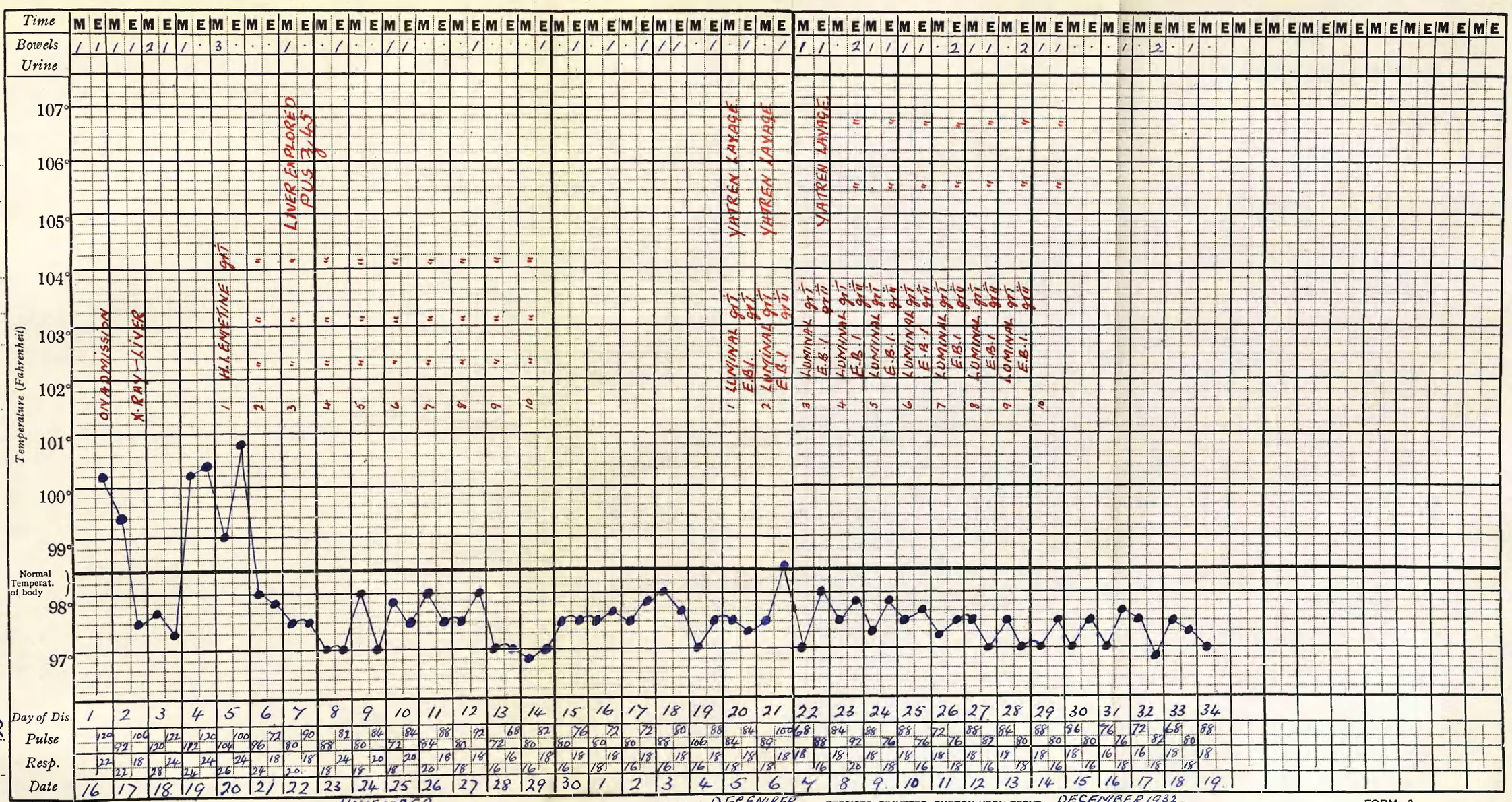
Age 34 yrs.

Diet

Case Book No.

Admitted 16th NOVEMBER 1932

Result



TRESISES, PRINTERS, BURTON UPON TRENT. FORM 2.

TRESISES, PRINTERS, BURTON UPON TRENT. FORM 2.

CASE 30. Under Dr. Hamilton Fairley.

J. L. B. The patient, a Scotchman, aged 61 years, was admitted to the Hospital for Tropical Diseases on 12th. May 1933.

He had been at sea for many years and had visited or lived in many tropical countries. He had been subject to malaria and dysentery while abroad and in 1904 was operated on in Calcutta for liver abscess. He had lived only in Britain since 1914.

The present illness began in 1930 with fever, haematemesis and melaena. This recurred in January 1933 and again in February, when he had a definite haematemesis. Examination of the gastro-intestinal tract at this time revealed no abnormality.

Throughout March and April 1933 he had a rise of tenperature in the evening, associated with sweating, anorexia, loss of weight, cough and pain in the right shoulder. His bowels were quite regular during that time.

When he was admitted to hospital on 12th. May 1933, examination showed a furred tongue, dry, yellow skin and pale mucous membranes. There was a systolic murmur at the apex. Dilated veins were visible on the right side of the abdominal wall and there was an old scar on the right hypocondrium - the site of drainage of the liver abscess

of 1904. The liver was tender and palpable three finger breadths below the right costel margin and the sigmoid colon was felt to be thickened.

Special Investigation.

Sigmoidoscopy revealed no abnormality, and the faeces did not contain cysts of E. histolytica. Examination of the blood showed:-

Erythrocytes - 3,100,000 per c.mm.:

Haemoglobin - 60 per cent:

Colour Index - 0.97:

Leucocytes - 10,400 per c.mm.:

Neutrophils - 77 per cent: Lymphocytes - 15 per cent:

Monocytes - 6 per cent: Eosinophils - 1 per cent:

Basophils - 0 per cent:

The van den Bergh reaction and the Bromsulphalein dye test were normal.

X ray examination showed enlargement of the liver with a definite oval opacity over the eleventh rib on the right side suggestive of liver abscess. (See plate 11).

Progress Notes.

The patient's condition remained stationary for eleven days and he had an evening temperature as high as 101° F. A provisional diagnosis of liver abscess

was made, and he was given one grain of emetine daily for ten consecutive days with dramatic result. Three days after the beginning of the treatment the temperature, which had been raised for the past four months, came down to normal and remained so during the rest of his stay in hospital. At the same time the tenderness over the liver decreased. Two days after the finish of this treatment hepatic tenderness and shoulder tip pain recurred. The liver was explored three days later, 42 ounces of liver pus being aspirated, after which the patient made an uninterrupted recovery. During the latter part of his stay in hospital he was given a combined course of emetine-bismuth-iodide by mouth, two grains daily, and yatren enemata for ten days.

Following aspiration X Ray examination revealed a collection of air in the abscess cavity (vide plate 12).

The patient was examined again on the 16th. August 1933, when he was found to be in good health.

COMMENTS.

It is exceptional to have a recurrence of liver abscess after the lapse of 29 years, especially in a patient who has left the tropics at least 16 years. Haematemesis is a most uncommon manifestation of liver abscess and evidently arose from some mechanical

interference with the portal circulation.

The dramatic result of emetine treatment also calls for comment, accompanied as it was by fall of temperature and leucocytes to normal, and by clinical improvement.

In this case the specific action of emetine on amoebic infections was demonstrated - a maximum reticulocytic response occurred 10 days after the first emetine injection and prior to the aspiration of the pus.

DISEASE.

....

PARTICULARS.

Name: J. L. B.

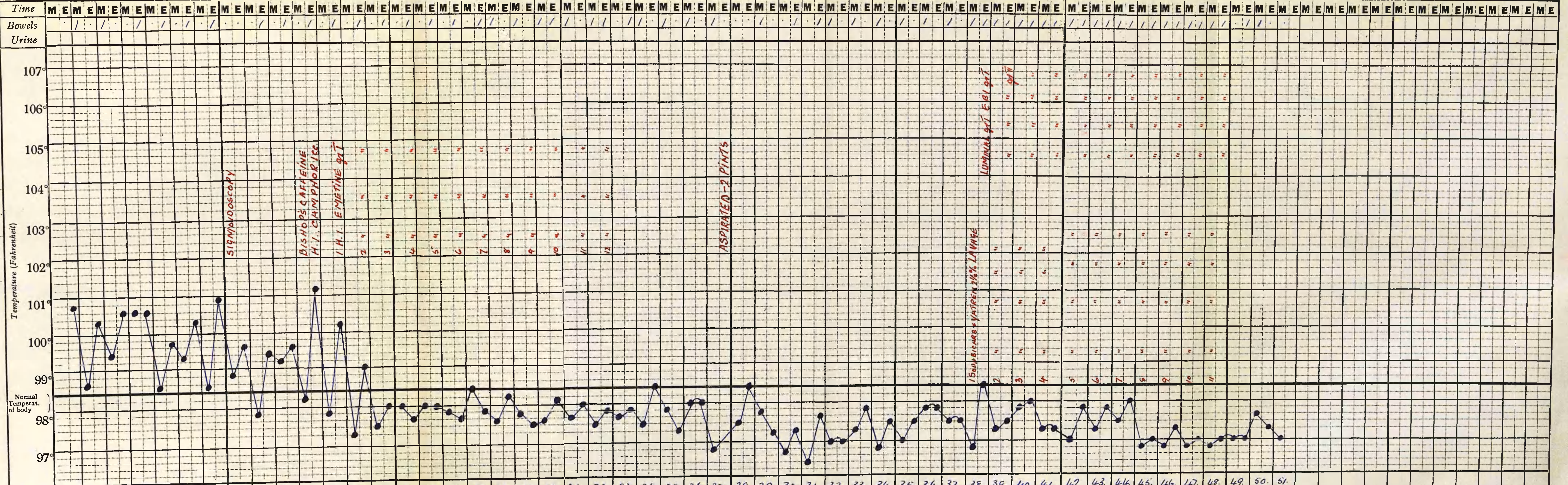
Age: 60 years

Diet ....

Case Book No. ....

Admitted: 12th May 1933

Result ....



Date	Day of Dis.	Pulse (M)	Pulse (E)	Resp. (M)	Resp. (E)
12 May			92		26
13	1	88	98	24	24
14	2	80	88	18	20
15	3	88	92	20	20
16	4	92	90	20	22
17	5	84	88	20	18
18	6	80	96	18	20
19	7	84	64	20	20
20	8	84	80	20	20
21	9	84	94	20	24
22	10	84	90	18	24
23	11	78	88	20	22
24	12	86	84	20	20
25	13	88	80	24	20
26	14	80	76	20	20
27	15	78	84	20	20
28	16	84	74	20	18
29	17	78	68	18	20
30	18	88	76	20	18
31	19	88	78	18	18
1 June	20	80	84	20	20
2.	21.	84	84	20	20
3.	22.	76	78	16	18
4.	23.	82	84	20	20
5.	24.	78	76	16	22
6.	25.	84	92	20	20
7.	26.	84	90	16	20
8.	27.	84	100	20	18
9.	28.	108	90	28	24
10.	29.	92	84	24	16
11.	30.	72	70	16	16
12.	31.	80	76	20	20
13.	32.	78	76	18	18
14.	33.	72	88	20	20
15.	34.	84	76	20	18
16.	35.	72	80	22	18
17.	36.	78	84	20	18
18.	37.	86	86	24	22
19.	38.	72	80	22	18
20.	39.	78	84	18	20
21.	40.	72	76	18	18
22.	41.	80	84	20	22
23	42.	72	76	18	16
24	43.	72	84	18	18
25	44.	72	80	18	18
26	45.	68	80	18	18
27	46.	72	80	16	16
28	47.	96	84	18	20
29	48.	74	76	19	20
30	49.	68	96	20	20
1 July	50.	72	88	20	20
2	51.	76		20	

CASE 5.

A. M. Under Dr. Manson-Bahr.

The patient, an Englishman, aged 58 years, went to Baluchistan in 1900, where he contracted malaria and amoebic dysentery. He received treatment for the dysentery, but since then he had been subject to "Low Fever", with looseness of the bowels. He left India in 1919 and went for a trip round the World in 1920. In 1921 he returned to India, but the febrile bouts recurred, and he finally returned to England in 1922. His health had been good since 1922.

13th. July, 1931. Fell from a ladder bruising his left side.

15th. July, 1931. Developed diarrhoea and three days later a rise in temperature accompanied by shivering. He noticed at this time that he was jaundiced. Typhoid fever or malaria was suspected, but laboratory examinations did not support either diagnosis, and in spite of anti-malarial therapy, the pyrexia persisted.

6th. October, 1931. Evidence of a right basal pleurisy noted.

9th. October, 1931. The patient was admitted to the Hospital for Tropical Diseases. Examination showed a tired, ill-looking man, with slight icteric tinge of

the skin and a red, raw, moist tongue. The abdomen was distended and the liver edge was felt 2 inches below the right costal margin. Spleen not palpable and no tenderness present in abdomen. Both bases of lungs were dull to percussion with diminished breath sounds and numerous adventitious sounds. Friction sounds were audible over the area of liver dullness on the front of the right side of the chest. His temperature was remittent and varied between 100° F. and 103° F. with a pulse rate between 104 and 120 per minute. Respirations were 36 per minute.

Special Investigations.

1. Erythrocytes - 3,460,000 per c.mm.
   Haemoglobin - 60 per cent: Colour Index 0.87:
   Leucocytes 10,800: Neutrophils - 79 per cent:
   Lymphocytes - 18 per cent: Monocytes - 2 per cent:
   Eosinophils - 1 per cent: Basophils - 0 per cent:
2. Stools negative for E. histolytica.

Progress Notes.

12th. October 1931. 3 ounces of pus, withdrawn from right pleural space. The pus was found to contain Streptococcus Brevis and Staphylococcus albus.

13th. October 1931. 30 c.c. of thick greenish pus aspirated from the liver; this pus yielded Staphylococcus albus on culture.

The patient showed some improvement for the next few days, but later became worse.

18th. October 1931. Resection of 6th. rib and liver abscess drained. Carrell-Dakin irrigation instituted. This was followed by some improvement in the patient's condition, but the temperature still remained elevated.

29th. October 1931. As the temperature was not settling further investigation of the liver was carried out, when 10 c.cs. of pus were aspirated.

In spite of frequent aspirations of pus from the right pleural cavity and subdiaphragmatic area, the patient gradually became worse: intravenous glucose and saline, blood-transfusions and anti-streptococcal serum had no effect on the course of the illness.

12th. December 1931. The spleen was noted to be enlarged at this period and the left lobe of the liver was also palpably enlarged.

The illness dragged on until the 2nd. January 1932, when the patient became comatose and died shortly afterwards.

Post-Mortem Examination.

An abscess containing greenish-yellow pus was found in the right posterior subdiaphragmatic space.

This abscess communicated through an aperture in the posterior surface of the liver, with a large intra-hepatic abscess of amoebic origin, containing one pint of greenish-yellow pus and occupying the upper portion of the right half of the liver.

Near the anterior surface of the liver were two whitish areas - old organised healed liver abscesses.

The left half of the liver, including the quadrate lobe, Spigelian lobe and left lobe, was markedly hypertrophied and constituted the great mass of liver tissue, since the right lobe had been mainly destroyed. No abscesses were present in the left half of liver, but it showed toxic spoiling and fatty change.

A small shallow loculated empyema, 3 by 2 inches, was found in contact with the chest wall posteriorly about the level of the 5th. and 7th. ribs.

No primary focus for liver abscess or terminal subphrenic abscess was discovered in duodenum, gall bladder or appendix, and there was no evidence of amoebic inflammation of the colon. The spleen was definitely enlarged.

COMMENTARY.

The case was of considerable interest as it showed multiple amoebic abscesses confined to the right half of the liver, the substance of which was mainly

destroyed, associated with great hypertrophy of the left half of the liver including the left lobe and the Spigelian lobe.

The hypertrophy of the left lobe, with its downward increase in size associated with a toxic spleen nearly four times its normal weight, illustrates how enlargement of viscera situated on the left side of the abdomen may be produced by a right sided abscess.

The patient had lived in England for 10 years prior to the onset of the liver abscess, and post-mortem examination of the bowel failed to show any amoebic inflammation or ulceration. This demonstrates that a liver abscess may develop in an individual long after he has left the tropics; also that in some cases there may be no evidence of amoebic infection of the bowel even in the presence of an active amoebic liver abscess.

It is also of interest to note that although there were three abscesses, healed or active, in the right side of the liver, there was no evidence of abscess formation in the left half of the liver, nor was there any spread of the right sided abscess to the left half of the organ.

This patient gave a history of jaundice, which is a most uncommon sign in amoebic liver abscess.

CASE 22.

L.J.R.H. Under Dr. G. Carmichael-Low.

The patient, an Englishman, aged 43 years, went to the Gold Coast in 1910, where he lived up till the time of this present illness, with leave periods at regular intervals. There was no history of malaria or dysentery, but in 1930 he was laid up for seven weeks with right-sided pleurisy. In 1931 he had a febrile illness lasting for two weeks. The temperature at that time rose to 101° F and he was delirious for part of the time. He was domiciled in England during the illness and his local doctor treated him with quinine in the belief that he was suffering from malaria. The patient seems to have taken very long to react to quinine, however, and there is little or no evidence to justify the diagnosis of malaria.

At the beginning of 1932 the man returned to the Gold Coast feeling fairly fit, but in October 1932 he was troubled for two weeks with furunculosis.

In November 1932 he developed a painful swelling in the epigastrium, which was never diagnosed. However, the condition disappeared in six weeks, nor did it recur.

In January 1933 a swelling similar to that in the epigastrium appeared on the right side of the neck and persisted for three weeks. He was again troubled

with furunculosis and before finally clearing up he had about fifty boils in all.

In May 1933 he had an attack of "influenza", and ran a temperature for three weeks. This illness left him with a persistent cough, although he felt fairly well in other respects.

In July 1933 he suddenly coughed up bright red blood. At first this was regarded as being due to a ruptured vessel in the throat, but as it recurred at intervals, he went to Accra for examination. There the sputum was examined for tubercle bacilli some 30 times, with negative result. The haemoptysis continued, but as he was feeling fairly well, he continued at his work.

On 9th. December 1933 he was wakened by an excruciating pain in the right side just below the ribs. Morphia was administered by the doctor, and there has been no recurrence of this symptom. He remained in bed for three weeks, with an evening temperature of 100° F. The condition was diagnosed as pleurisy.

Later he went to Accra and while there he was admitted to hospital, as there was a recurrence of the evening temperature. He stayed there for three weeks and then left for England. At this time he was coughing up blood at intervals. During the voyage home his general condition improved, but the haemoptysis persisted

up till the time of his admission to the Hospital of Tropical Diseases, London. There was no history of night sweats, and at the time of admission there was no complaint of pain. His bowels were regular. He was admitted to the above hospital on 6th. February 1934.

Physical Examination.

Well built, fairly well nourished man, with clean tongue.

There was impairment to percussion all over the right side of chest, with definite dullness up to the level of the third rib anteriorly. Over the dull area the breath sounds were diminished and crepitations were audible. Vocal resonance was also diminished over the right chest.

No tenderness was present in the abdomen, and although the liver dullness was increased downwards, no definite edge of liver was palpated. Spleen not palpable. On admission he was coughing up what appeared to be "anchovy sauce" sputum.

Special Investigation.

Haemoglobin - 80 per cent:

Leucocytes - 15,000 per c.mm.:

Neutrophils - 80 per cent: Lymphocytes - 18 per cent:

Monocytes - 2 per cent: Eosinophils - 0 per cent:

Basophils - 0 per cent:

No parasites present in the blood during the pyrexial period.

Sputum:- Fresh Film:- No amoebae found.
Gram Stain crowded with pus cells, mostly polymorphs; a fair number of gram + cocci in pairs and short chains.
Ziehl-Neelsen. No tubercle bacilli present.
Culture. Mixture of Gram + Streptococci; long filamentous bacilli and a few gram - cocci of the catarrhalis type.
Stool:- Cysts of E. histolytica present. No ova found.
X-Ray. "Right lower and middle lung zones opaque. The appearances are due to effusion, but in addition, I think there is some atalectasis. It is not possible to state the underlying condition, but new growth cannot be excluded. The appearances do not suggest T.B."

Progress Notes.

A provisional diagnosis of liver abscess was made and on 12th. February 1934 liver puncture was carried out, when 40 c.cs. of pus were aspirated from the right lobe. Examination of the pus showed it to be sterile and no amoebae were found. Injections of emetine, one grain daily, were given for six consecutive days, and this was followed by emetine-bismuth-iodide by mouth - three grains daily for six consecutive days.

The patient reacted extremely well to this treatment; the temperature, as shown in the accompanying chart, came down to normal; the cough and spit disappeared and the chest signs improved.markedly.

He was discharged from hospital on 2nd. March 1934.

He was examined again on 9th. August 1934, when no abnormality could be detected, except slightly diminished breath sounds at the right base. The patient stated that he was feeling better than he had felt for the past twenty years.

He was again examined in December 1935 and was found to be perfectly fit. He returned to the tropics at the end of December 1935.

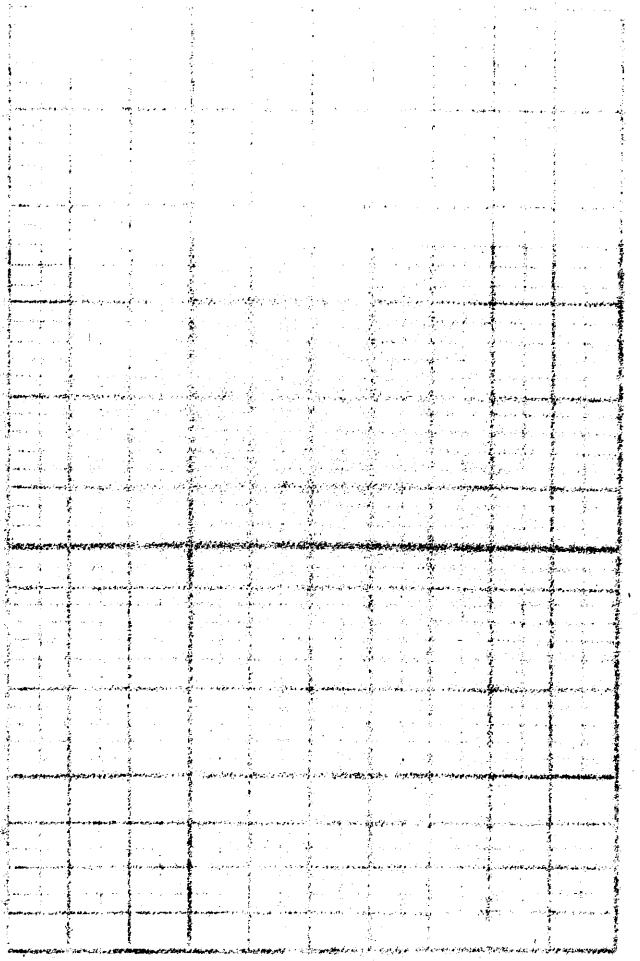
COMMENTS.

The absence of any bowel symptoms is quite a feature in this case, although there must have been infection of the colon at some time. Examination of the stools proved of value in the diagnosis, and the importance of liver puncture is well illustrated.

It should be mentioned that the patient was examined by as many as twelve doctors, and each one of them considered him to be suffering from phthisis, while the patient himself had little hope of recovery. The absence

of the usual symptoms and signs of liver abscess in this case is remarkable and a large field of differential diagnosis is opened out.

The striking reaction to emetine is again well demonstrated, and the clean appearance of the patient's tongue is most unusual.



DISEASE.

.....

.....

PARTICULARS.

Name L.J.R.H.

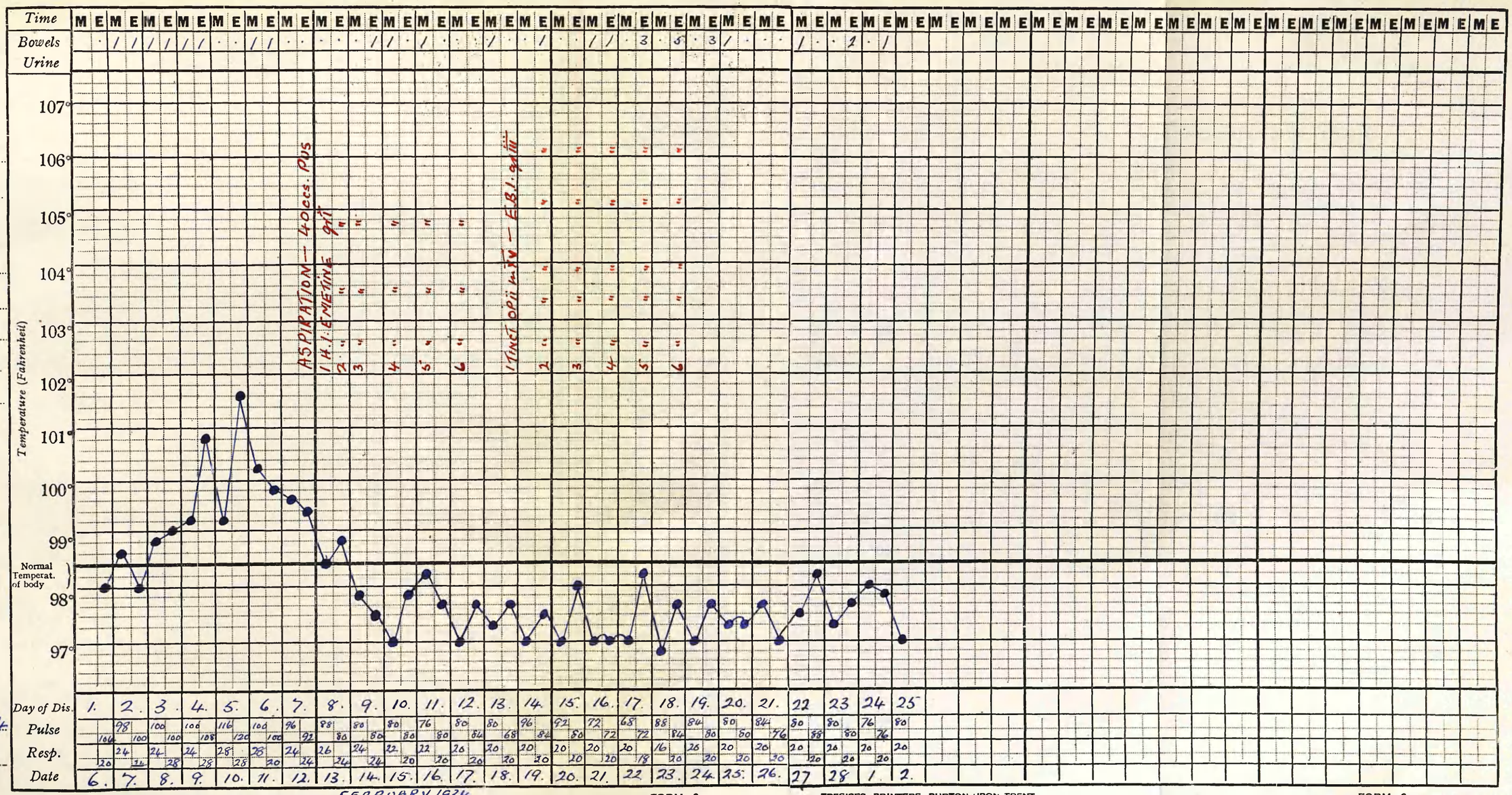
Age 43 years.

Diet .....

Case Book No. .....

Admitted 6th February 1934

Result .....



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