

shows that the smaller branches of the portal vein and the capillaries are blocked with micro-organisms; the liver cells in the neighborhood are swollen, hyaline-looking, and compressed; the nuclei stain badly, and there is a condition resembling coagulation necrosis. At the periphery of the necrosed area is a zone formed of inflammatory leucocytes which gradually insinuate themselves between the columns of liver cells. Necrosis and softening go hand-in-hand until a local abscess is the result. The liver substance between the abscesses usually shows parenchymatous degeneration. When the abscesses are near the surface, the Glisson's capsule is usually infiltrated, its serous covering granular and inflamed, with loss of the endothelial cells and often a deposit of fibrinopurulent exudate.

**SUPPURATIVE HEPATITIS OF BILIARY ORIGIN.**—Here infection takes place from the bile passages. The most common cause is cholelithiasis with consecutive cholecystitis and cholangitis. In this form the affection may arise in three ways: (1) Direct extension of an ulcerative process due to gall-stones, to the liver; (2) suppurative cholangitis and pericholangitis; (3) through the blood-vessels of the mucous membrane and the bile-passages extending to the portal vein.

The bacteria usually found in such cases are the streptococcus, the staphylococcus, the bacillus coli, and the proteus vulgaris.

Another cause is obstruction of the duct by carcinoma or by the presence of echinococcus-cysts. Sometimes the bile-passages are secondarily affected from the intestines, as in dysentery or typhoid. Lannois<sup>4</sup> has recorded a case of liver-abscess developing in typhoid; such an event seems to be excessively rare. Mayo Robson,<sup>2</sup> again, has pointed out the association of suppurative cholangitis with influenza. Rarely, intestinal worms (ascarides) may invade the common bile duct and, dying there, give rise to marked disturbance. Leick has tabulated nineteen instances of this.

The description already given of abscess arising from the portal vessels holds fairly well for this variety; the main difference is that the abscess contents are often stained with bile and contain gritty matter or concretions.

**SUPPURATIVE HEPATITIS PER EXTENSIONEM.**—A fairly common form of hepatic suppuration is that due to the direct extension of an inflammatory process from some organ in the neighborhood. In this case the suppuration is usually superficial, affecting the capsule and the tissue immediately beneath it. Among the lesions which may extend to the liver may be mentioned diaphragmatic and subdiaphragmatic abscess, suppurative cholecystitis and choledochitis, perforating ulcers of the duodenum and stomach, perinephritic abscess, and abscess of the head of the pancreas.

**SYMPTOMS AND PHYSICAL SIGNS.**—(a) In suppurative hepatitis of arterial origin the symptoms are those of general septicopyæmia with the addition of certain ones referable to the liver itself. Almost at any period after the infliction of a wound or the formation of a suppurative focus in the body the affection may appear. Rigors set in with the characteristic "church-steeple" temperature, with profuse sweating. The liver is uniformly enlarged, and there is pain in the right hypochondrium which may be spontaneous but more often is merely a dull sense of tension. The heart is weak and rapid, the respirations are shallow; the skin is often icteric or subicteric, and emaciation takes place rapidly. Diarrhœa almost invariably occurs, and the patient sinks into the so-called "typhoid state," with perspiration, drowsiness, delirium, subsultus, and finally coma and death.

(b) In suppurative portal pyelphlebitis the symptoms are rarely so striking as in the first form. There are usually irregular chills, fever, and sweating, followed by "typhoid" symptoms. In some cases rigors and sweating do not occur, and in still others the disease develops insidiously without fever, its existence being evidenced only by pain over the liver, and enlargement of the organ, with subsequent subsidence into the "typhoid" state. Sometimes, as in a case of appendicitis with liver-abscess

that occurred under my own observation, there are singularly few symptoms pointing either to the primary affection or to involvement of the liver.

(c) **Suppurative cholangitis.** When gall-stones are the cause there is severe pain occurring in paroxysms, each attack being associated with chills, fever, and jaundice; pain may, however, be entirely absent. Fever and profuse perspiration, followed by emaciation, are marked features. The so-called "fièvre hépatique intermittente" of the French writers is in the majority of cases due to cholelithiasis and abscess of the liver. There is usually a gradually increasing enlargement of the whole liver, which is tender on pressure; occasionally the gall-bladder is enlarged and can be felt, but it is more often contracted. These symptoms are usually followed by general systemic infection. Similar symptoms may be found in non-suppurative cholangitis, but when suppuration is present fever is constant and the deterioration is progressive.

**TROPICAL ABSCESS.**—This form is characterized by the development of one or more foci of colliquative necrosis in the liver, either with or without dysentery. As the name suggests, the disease is most common in tropical and subtropical regions. Unlike the forms incident to temperate climes, where the tendency is for multiple areas of suppuration to form, here large single or, at all events, relatively few abscesses are produced. The abscesses are often so extensive that they are enclosed by merely a thin shell of liver substance.

The etiological factors are as yet but imperfectly understood. It is probable that the liver parenchyma undergoes some form of gradual death previously whereby its resisting power is impaired, and thus infection is brought about more readily. In this it differs from the pyæmic forms in which the parenchyma is originally intact.

The exact relationship of tropical abscess to dysentery is still *sub judice*. There can be no question that the large solitary abscess occurs occasionally apart from any obvious intestinal lesion, but most authorities are agreed that the largest number of cases are associated with dysentery. As yet statistics are lacking to enable us to supply the relative frequency of the various etiological factors. Kartulis<sup>6</sup> states that in 500 cases of liver abscess which came under his notice, 55 to 60 per cent. gave a history of dysentery. Conversely, Lafleur<sup>7</sup> states that 20 to 25 per cent. of cases of dysentery in the tropics are complicated by liver-abscess, and these figures are corroborated by those of Manson,<sup>8</sup> who in 3,680 autopsies on dysenteric patients found liver-abscess in 21 per cent. Hirsch,<sup>9</sup> in 2,377 autopsies in tropical dysentery, found liver-abscess in 19.2 per cent. There must, however, be something peculiar in the form of the dysentery, for, as is well known, in the catarrhal dysenteries and the ulcerative forms found in the temperate zones, liver-abscess is excessively rare.

Some few cases appear to be due to some other affection apart from dysentery. A certain proportion of these seem to be brought about by dietetic errors; free living, excessive use of animal food, and particularly excess in alcohol, are said to be potent causes. Sachs<sup>10</sup> has advanced the view that in the temperate zones alcohol, as it affects the liver, is apt to lead to chronic fibrosis, but in the tropics to a suppurative lesion.

Race exercises an important influence, for whites are much more liable than the native races to abscess of the liver. The proportion is estimated by some to be 35 to 1. The disease affects adults rather than children and males rather than females. Rouis<sup>11</sup> and De Castro<sup>12</sup> lay stress upon the extreme rarity of the disease in females, and this is corroborated by the Berlin statistics collected by K. Bärensprung,<sup>13</sup> according to which only about 1.48 per cent. of the cases occurred in women. The disease is, furthermore, more common in the cold, changeable season which follows after the summer's heat.

With regard to the ultimate nature of the process, our information still lacks precision. It would seem probable—and this view is certainly in harmony with the

most recent studies as to the nature of infection—that the non-dysenteric forms are due to some preliminary deterioration of the resisting power of the liver parenchyma. Excess in diet, extreme heat, lack of exercise, sudden changes in temperature, may all play a part here. Congestion of the liver is no doubt readily induced in this way, and this leads to impairment of the liver function, stagnation of bile, and a tendency to portal congestion. Catarrh of the intestines and even trifling ulceration might easily follow, affording a ready mode of entrance for pyogenic micro-organisms. Again, the liver in its turn would suffer from the portal toxæmia thus produced, and a true vicious circle is the result. That under such circumstances an abscess of the liver might result is certainly not to be wondered at. The bacteria found are the pyogenic cocci.

As the studies of Kartulis, Löscher,<sup>14</sup> Kruse and Pasquale,<sup>15</sup> Councilman and Lafleur<sup>16</sup> have shown, a fairly large proportion of the dysenteric cases are due to a protozoan, the amœba coli, or amœba dysenteriae. What this proportion is is still uncertain. Flexner,<sup>17</sup> the most recent authority, is of the opinion that the great majority of dysenteric cases are of amœbic origin. The failure to find the amœba in the abscess in some cases is probably due to the fact that only a superficial examination has been made, for by scraping the walls of the abscess it is usually possible to demonstrate the living protozoan. It is further probable that many of the so-called "idiopathic" abscesses are really dysenteric in origin, for numerous instances are on record in which only after the most minute examination of the intestine was it possible to find traces, in the form of minute scars, of a dysenteric process which had healed, traces which might readily have been overlooked. In many cases bacteria have been found, notably staphylococci and streptococci, either alone or associated with amœbæ.

Some of the earlier authorities were of the opinion that liver-abscess was due to the pyogenic cocci and not to the amœba; still others took a modified view, viz., that the amœba acted merely as carriers of the germs, and by their growth and movements, which ruptured the capillaries, paved the way for subsequent infection. The most careful observers, such as Councilman and Lafleur, believe, on the contrary that the amœba are the direct exciting cause of the lesions when present, and this view has the preponderance of evidence in its favor.

The recent discovery by Shiga of a bacillus resembling that of typhoid in some forms of tropical dysentery, which is now very widely accepted as specific, opens up the question as to this germ being an etiological factor in the production of liver-abscess. Flexner in a large experience did not meet with a single case due to the bacillus of Shiga. A few writers, however, refer to the discovery of a typhoid or typhoid-like bacillus which possibly was this form. Pansini and Babes seem to have obtained the organism, or a similar one, in several cases of abscess of the liver.

**Morbid Anatomy.**—In seventy-five per cent. of cases the abscess is solitary and in more than half it is situated in the right lobe, commonly on the upper or outer surface. The abscess is at first usually somewhat deeply situated, but may become superficial. In amœbic cases there is a predilection for the dome of the liver or the under surface, near the hepatic flexure of the colon. The contents vary much; in some few cases the fluid is serous, but in most there is a mixture of pus and necrotic material. The pus is generally thick, white, yellowish, or greenish in color, often mixed with blood, and is usually very fetid. In amœbic cases the pus is somewhat characteristic, being in some cases glairy and translucent, in others grayish or brownish-red, and has been compared to anchovy sauce. The quantity varies from a few ounces to many pints. In the early stages the area of necrosis is often scarcely liquefied, being more or less hyperemic, coagulated, spongy, and infiltrated with a glairy tenacious material; but later, when liquefaction takes place, the abscess becomes diffuse and finally more or less irregular. Its walls are formed of necrotic and

shaggy debris of the liver parenchyma. In long-standing cases the abscess becomes walled off by pyogenic membrane or a fibrous capsule. The liver substance surrounding the abscess is generally congested, softened, cloudy, and friable, or shows other signs of degeneration, although in some cases the parenchyma has been found practically normal.

One or two special types may be just mentioned: (1) The "fibrous" abscess of Kelsch and Kiener.<sup>18</sup> In this the abscesses, numbering from three to twelve, are of about the size of a pigeon's egg. They are filled with grayish, grumous, semi-solid material and are enclosed in a stratified fibrous wall. (2) The "abcès aréolaire" of Chauffart,<sup>19</sup> in which the abscesses, extending toward the surface, are in close juxtaposition, and there is more or less free communication between the various cavities, so that a sort of spongy framework filled with rather viscid contents is the result. Adhesive inflammation about the capsule of the liver, the pleura, and the pericardium is not uncommon.

Microscopically, the contents of the abscess, when of the amœbic type, are composed of finely granular detritus, red and white blood cells, hæmatoidin, and degenerating liver cells. The amœbæ are most numerous in the small abscesses. There is widespread necrosis of the liver parenchyma. A somewhat characteristic and interesting point is that leucocytic infiltration is practically absent in the abscess contents and at the periphery of the area, except in cases in which secondary infection has taken place, such as occurs in abscess of the under surface of the liver near the bowel. In the early stages the disintegration always takes place in the interlobular regions. The amœbæ are found chiefly at the periphery of the abscess, in the capillaries, and about the portal sheaths.

**Results of Abscess.**—Cases of this disease almost invariably end fatally, at least in the multiple forms, but when death does not take place shortly, and if the condition be not relieved by operative interference, the abscess may rupture and give rise to further most serious consequences. The most frequent event is rupture into the right lung or pleura and next into the peritoneum. The latter event is not so grave as might be thought at first, since limiting adhesions, which prevent or delay the occurrence of peritonitis, are not infrequently formed. More rarely, the abscess ruptures into the pericardium; then sudden death may be the result. Again, the abscess may discharge externally or into the transverse colon, the stomach, or the duodenum; very rarely into the bile ducts, the hepatic veins, vena cava, or the pelvis of the right kidney. Pressure upon the bile-passages leads to icterus, and in rare cases obstruction of the portal vein has caused ascites.

In some few cases after a longer or shorter period the process becomes latent or comes to an end. The necrotic material is to a certain extent absorbed, the swelling becomes less marked, connective tissue is developed, and a regular capsule is formed about the abscess. Complete healing can occur, but this seems to be more frequent in the tropical abscess than in the other forms. Small foci of suppuration may be absorbed, with the formation of a scar; larger foci, through the removal of the more liquid contents of the pus, become cheesy and often calcareous. In the latter case the resemblance to a syphilitic lesion or to an old echinococcus-cyst is striking.

**Associated Lesions.**—Lung: Abscess of the right lung may occur and is always due to the extension of an abscess of the liver situated in the dome of the right lobe. The abscess is never metastatic. The diaphragm is usually adherent to the under surface of the liver and to the base of the lung. Occasionally empyema is present; the diaphragm may be perforated, but not invariably so. The abscess in the lung is usually situated in the basal portion of the organ; the lung tissue in the neighborhood is consolidated; the wall of the abscess is very irregular in shape, or again may be fibrous. Allowing for differences due to the tissue in which it is found, the lesion is strictly comparable, anatomically and histologically, to the process in the liver. Frequently perforation into a

bronchus takes place and the pus thus finds a vent. The material in the abscess generally resembles that found in the liver.

Peritoneum: Local or general acute peritonitis is sometimes found; it is sero-fibrinous in character. In amœbic cases amœbæ may be found free on the surface of the mucous membrane.

**Symptoms and Physical Signs of Tropical Abscess.**—In many cases the affection remains entirely latent, being discovered only accidentally at autopsy. In still other cases the abscess may remain latent for an indefinite period and then suddenly give rise to acute and fatal consequences, owing to rupture of the wall and involvement of some vital organ. Generally, however, symptoms more or less characteristic are present. These consist of a sense of fulness and weight in the right hypochondrium, inability to lie on the right side, fever, disturbance of digestion, and cough; the patients sometimes feel as if a stick of wood were laid transversely across the upper abdominal region (*sensation de barre*). Pain is extremely variable in amount, but may be an early symptom. When present it is of a dull, boring character or, when the liver capsule is inflamed, lancinating; it is often increased on pressure and when the patient breathes deeply or turns on the right side. A curious feature is that it may be referred to the right shoulder, where indeed it may be more severe than in the hepatic region. Cough is often present and is supposed to be due to reflex irritation. A rise of temperature of from one to three degrees is generally found; in a large number of cases fever is the first symptom. It is usually accompanied by pain in the hepatic region, but occasionally may persist for days or weeks before pain in and enlargement of the liver develop. The fever is not infrequently quotidian in type, or there may be two diurnal exacerbations; these are followed by perspiration.

The irregularity of the attacks of fever is a point of some value in differentiating from malaria. Rigors are not constant. Icterus is one of the rarest symptoms; it is said to arise from pressure of the abscess upon one of the main bile passages. According to Thierfelder,<sup>20</sup> it occurs in about sixteen per cent. of all cases. When hepato-pulmonary abscess exists the condition may be quite obscure. Although the liver is first involved, the physical signs as a rule direct attention first to the lung. The resemblance to pleural effusion is striking. Only when the abscess discharges into a bronchus can we get positive information. Here the expectoration of large amounts of characteristic sputum with a diminution in the size of the liver, signs of consolidation, tubular breathing with consonating râles, increased vocal resonance, and whispering pectoriloquy, are conclusive. Pain in the cardiac region, with signs of suffocation and evidence of pericardial effusion, points to rupture of the abscess into the pericardium. Rupture of the abscess into the stomach is often preceded by pain and irritation in the stomach, and is clearly evidenced by vomiting of necrotic matter; or, again, the material may be discharged by the bowel, an occurrence which also may take place whenever rupture has occurred into any part of the alimentary tract.

**PROGNOSIS IN LIVER-ABSCESS.**—The outlook in all forms of multiple abscess—as, for example, portal pyæmia and suppurative portal pylephlebitis—is practically hopeless. Treves has, however, recorded a case of abscess of the liver complicating appendicitis in which the patient recovered after an exploratory operation. Suppurative pericholangitis, inasmuch as it presents a greater tendency to form isolated large collections of pus, and therefore is amenable to operative interference, is perhaps more hopeful. At best, however, in all forms of hepatic suppuration the outlook is most grave. More is to be expected in those cases of solitary abscess which can be attacked by modern surgical methods. Much depends upon the position of the abscess, its cause, and the possibility of reaching and evacuating it. On account of the gravity of the primary disease, those cases which are associated with dysenteric symptoms are more liable to

turn out badly than those in which there is the so-called "idiopathic" abscess. The relatively favorable result in the case of tropical abscess is perhaps to be explained by the fact that the pus is liable to be less virulent and in some cases indeed sterile. It has been estimated that the mortality amounts to from fifty to sixty per cent.

**DIAGNOSIS.**—The diagnosis of liver-abscess is always attended with considerable difficulty, and in fact the condition may frequently only be suspected. This is especially true of multiple small abscesses or diffuse suppuration. The symptoms which should direct attention to the liver are the onset of a sense of weight and oppression, or of actual pain, in the region of the liver, more or less enlargement of the organ, rigors, irregular temperature, cough, dyspeptic disorders, and diarrhoea. Pain may be spontaneous or elicited only on palpation. Generally the whole liver is tender, but frequently more painful areas, corresponding to the abscesses, can be made out. Lancinating pain during respiration or a friction rub points to perihepatitis. The tendency for the pain to be referred to the right shoulder has already been referred to, but it is not pathognomonic. Enlargement of the liver is not striking in the very diffuse forms, but in the solitary abscess it is somewhat characteristic; the tendency is for the organ to be enlarged upward. Dulness at the base of the right lung in these cases can usually be made out, and there is some limitation of the free movement of the lung. The dulness reaches its highest point at about the mid-axillary line. When the abscesses are in the left lobe, or toward the anterior edge of the enlarged right lobe, they may sometimes be felt as flat nodules which may be so hard as to simulate cancer. Occasionally a fluctuation can be detected. The spleen is not enlarged except in cases of perityphilitis and septicopyæmia.

With the exception of acute yellow atrophy, abscess is about the only grave affection of the liver associated with fever, and here the course of the disease and the alteration in the size of the liver will differentiate. It must not, however, be forgotten that extensive suppuration may exist in the liver without fever.

A condition which will give rise to considerable trouble is croupous pneumonia when associated with enlargement of the liver and icterus. Again, the fever is often remittent or intermittent with chills, and so the affection may be confounded with malaria. A point emphasized by Kelsch and Kiener is the close association of "typhoid" symptoms, viz.: rapid, feeble, and irregular action of the heart, cold sweats, subsultus, drowsiness, emaciation and diarrhoea, ending in coma and death, with the presence of small multiple foci of suppuration in the liver.

The previous history of the case often affords valuable information. The presence of a recent wound or injury, a suppurating focus, or recent parturition will suggest a point of departure for a septicopyæmic process; a sudden onset of fever of a septic type, with chills and violent constitutional disturbance, will indicate a systemic generalization of the process, and these symptoms may be so violent as to mask those referable to the liver. In these cases, pain, either dull or lancinating, a sensation of weight or tension in the right hypochondrium, pain or tenderness on pressure with enlargement of the liver, point strongly to liver-abscess. Jaundice and involvement of the liver alone, however, are not of so much importance since they may be present in septicopyæmia even in the absence of hepatic involvement.

When the symptoms occur during the course of some ulcerative or infective process within the bounds of the portal tract, this will suggest a portal pylephlebitis or periportal abscess formation. In this form, the brunt of the affection falling upon the liver, the symptoms will at first be mainly referable to that organ. And while symptoms of systemic septicopyæmia, namely, metastatic deposits in the lungs, spleen, kidneys, heart, joints, and skin, may develop, they occur invariably later on. In most instances rigors and sweating are less marked than in the septic embolic form, or may indeed be absent.

The main conditions which may be confounded with abscess of the liver are, malaria, cholangitis, right-sided

TABLE FOR DIFFERENTIAL DIAGNOSIS.

Abscess of Liver.	Malaria.	Carcinoma.	Right-sided Empyema.	Abscess of abdominal wall.	Suppurating echinococcus cyst.	Cholelithiasis, cholangitis.
1. History of trauma, suppuration, dysentery, gall-stones, parturition, acute infective fevers.	History usually negative; possibly previous attacks.	Possibly a hereditary taint.	History of recent pleurisy; often insidious in onset.	Often a history of previous typhoid or tuberculosis.	A history of previous painless swelling of the liver; without marked deterioration of health.	History of biliary colic, intermittent jaundice.
2. Pain referred to the right hypochondrium or shoulder.	Pain absent or almost trivial.	Pain variable; usually slight.	Pain may be absent.	Local tenderness.	Pain trifling.....	Pain, paroxysmal, referred to hypochondrium, passing down the leg or through to the back. Moderate fever during the paroxysm, otherwise normal or subnormal.
3. High fever almost constant, of remittent or intermittent type, with sweats and chills; may be irregular; resists quinine.	Intermittent fever of quotidian, tertian, or quartan type; does not usually resist quinine; fever regularly returns, according to type.	Fever rare; usually continuous; may be intermittent, with rigors.	Fever often irregular; may be absent.	Irregular fever with chills.	.....	.....
4. Often an icteric or subicteric hue; rarely jaundice.	No jaundice.....	Jaundice in one-half the cases.	No jaundice.....	No jaundice.....	Rarely jaundice.....	Jaundice invariably present, recurrent or persistent. Liver rarely enlarged.
5. Liver may be enlarged and smooth.	May be moderately enlarged.	Liver enlarged and often nodular. May be bulging..	Liver may be pushed down.	Liver not enlarged.	Liver enlarged.....	.....
6. May be bulging in right hypochondrium.	Negative.....	May be bulging..	Negative.....	Local swelling...	May be bulging...	Negative.
7. Aspiration often detects pus.	Negative.....	No pus; sometimes cancer cells.	Negative.....	Aspiration will detect pus.	Fluid may contain glucose; pus may contain characteristic hooklets.	Negative.
8. Spleen not enlarged except in pylephlebitis or pyæmia.	Spleen enlarged; blood containing plasmodium malariae.	Negative.....	Negative.....	Negative.....	Negative.....	Negative.

empyema, abscess of the abdominal wall, carcinoma of the liver and bile passages, and suppurating echinococcus-cysts.

An examination of the blood for the hæmatozoon of malaria will clear up the first question and so also will the therapeutic test; an intermittent fever that resists quinine is not malarial.

The intermittent hepatic fever of cholangitis due to gall-stones presents great similarity to abscess, yet in such cases both fever and chills may occur for years without suppuration. The points of distinction are the paroxysmal attacks of fever, the rigors and sweats, an increase of jaundice during the attacks—all are characteristic of cholangitis, when they occur with intervals of apyrexia, cessation or amelioration of the symptoms, and the preservation of fair nutrition.

A right-sided pleural exudate may be excluded by differences in the curve of the upper level of the dulness at the base of the lung without change of this level by posturing, and by the fact that dislocation of the heart does not occur. These considerations will of course not apply when, as is sometimes the case, the liver-abscess is complicated by acute pleurisy.

In abscess of the abdominal wall the swelling lies more superficially and is not associated with enlargement of the liver. When it is aspirated the needle does not move up and down with the respiratory movement. If, however, the liver be firmly anchored to the abdominal wall by inflammatory adhesions, even in the case of abscess, the movements may be completely prevented.

Suppurating echinococcus-cysts can be differentiated from abscess of the liver only by a comparison of the histories of the two diseases and by an examination of the pus evacuated by aspiration. When the echinococcus is the cause of the suppuration there will be a history of a long-standing painless swelling of the liver, with preservation of fair health, followed by evidences of suppuration; and when the pus is aspirated it will be found to contain the characteristic hooklets.

In cancer of the liver, fever is rare, cachexia is marked, and the disease is essentially chronic. Usually the previous history will throw light on the case.

In all cases of doubt exploratory puncture may be tried without fear of evil consequences. It is well to place the patient under ether, as several punctures may

have to be made. The needle may be inserted in the lowest interspace in the anterior axillary line, in the seventh interspace in the mid-axillary line, or behind over the area of dulness. The stools and, if perforation has taken place into the lung, the sputum, should be examined for amœbæ in all cases of solitary abscess.

**TREATMENT OF LIVER-ABSCESS IN GENERAL.**—In the multiple abscesses found in the liver as a complication of septic infection elsewhere but little can be expected from treatment. As the condition is not often amenable to surgical interference, we have to fall back on the use of the medicinal measures adopted in septicopyæmia generally. Sponging with cool water at a temperature of 65° F. will often control the fever to some extent. Pain must be relieved by mustard, turpentine, or hot fomentations to the hepatic region, and if necessary by opium. Free stimulation and the use of full doses of quinine are advisable. If there are evidences of a large abscess being formed, operative interference may be discussed and the case treated on the same lines as the tropical abscess.

With regard to the tropical form, prevention is better than cure. All Europeans sojourning in the tropics should take special precautions. Sleeping and living rooms should be large and airy, suitable clothing should be worn, and care taken to avoid all sources of chill. Clothing when damp should be quickly changed; moderate exercise is advisable. Diet should be moderate and unstimulating and alcohol should be tabooed; all irregularities of the bowels should be controlled. When signs develop which are suggestive of hepatitis (apart from malaria), whether dysentery be present or not, the patient should be strictly confined to bed on a milk diet. Ipecacuanha should be given in full doses, and intestinal antiseptics, such as benzo-naphthol, should be employed. Occasionally a blue pill is of great benefit. When the acute symptoms have passed off, ammonium chloride should be exhibited in fifteen- to twenty-grain doses three or four times a day and continued for some time. Should an abscess form, it must be treated surgically on the merits of the case. Morphine hypodermically may be given to control pain and relieve cough.

Several methods have been advocated for dealing with large solitary abscesses. These in the main consist of aspiration, siphonage, or open incision. Which method is advisable depends largely upon the position of the ab-

scuss and the presence of surrounding adhesions. Aspiration with a stout needle is practically devoid of danger, and should be done under ether so that thorough exploration can be carried out. It is not always possible in this way completely to evacuate the pus, and in any case the cavity is liable to fill again. Nevertheless, some cases of cure after two or three repetitions have been reported. Puncture with a trocar and cannula followed by siphonage is advocated strongly by many Indian surgeons. The method of Manson is first to explore the liver with a hollow needle; when pus is found a small incision is made through the skin and a large trocar and cannula are inserted, care being taken to follow the direction of the preliminary aspiration which revealed the pus. The trocar is pushed in just far enough to reach the abscess, is then removed, and, without allowing any pus to escape, a rubber drain, about nine inches long, is stretched upon a metal rod and carried through the cannula to the bottom of the abscess. The metal rod is withdrawn and the rubber tube stitched to the skin. A long rubber tube is attached to the drain and the contents are allowed to siphon off into a bucket containing antiseptic solution placed at a suitable distance below the patient. An antiseptic dressing, of course, is applied to the wound. Washing out the cavity is not attempted unless the drainage is imperfect and the temperature begins to rise.

Cantlie<sup>21</sup> advocates this method very strongly and reports twenty-four cases cured out of a series of twenty-eight operated upon. When the method of open incision is adopted, a direct opening into the abscess can be made only when the liver is adherent to the anterior abdominal wall. If the wall over the liver is reddened and cedematous, it may be taken for certain that adhesion has taken place. A trocar may be first inserted and a free opening subsequently made. If it be not certain that adhesion has taken place, the operation may be done in two stages. An incision is made through the abdominal walls, the liver is then sutured to the wall, the wound plugged and left till adhesions have formed; subsequently, the trocar may be used till pus is discovered and the track then enlarged with the knife. The sac should be explored with the finger so as to empty any subsidiary pockets.

In more urgent cases and when skilled assistance is at hand an open incision may be made down to the liver; the assistant then holds the liver as nearly as possible in contact with the abdominal wall. Pads are placed so as to prevent infection of the peritoneal cavity, a trocar is thrust in, and when pus is found the opening is enlarged with the knife. After the contents have been evacuated the liver is then stitched to the parietes and the drain inserted. To explore the posterior part of the liver, it may be necessary to insert the trocar through both layers of the pleura and the diaphragm. If an abscess is here found, however, drainage should be established by resecting the rib, stitching the two layers of the pleura together with catgut, and then inserting the trocar and cannula.

Albert George Nicholls.

## REFERENCES.

- 1 Ford, W. W.: Bacteriology of Healthy Organs. Trans. Assoc. Amer. Phys., vol. xv., p. 389, 1900.
- 2 Birch-Hirschfeld: Path. Anat., Bd. xi., 2 Hälfte, Leipzig, p. 716, 1895.
- 3 Armstrong, G. E.: Brit. Med. Journ., vol. ii., p. 945, 1897.
- 4 Lannois: Rev. de Méd., November, 1895.
- 5 Mayo Hobson: Article Cholangitis. Allbutt's System of Medicine, vol. iv., 1897.
- 6 Kartulis: Zur Aetiol. der Leberabscesse u. über trop. Leberabscesse u. s. w. Ctbl. f. Bakteriologie, Bd. 2, 1887 and Virchow's Archiv, Bd. cxviii., 1889.
- 7 Lafleur: Article Amoebic Abscess of Liver. Allbutt's System of Medicine, vol. iv., 1897.
- 8 Manson: Quoted by Robinson. Journ. Amer. Med. Assoc., May 11th, 1901.
- 9 Hirsch: Handb. geo. and hist. Path., London, vol. iii., p. 412, 1886.
- 10 Sachs: Arch. klin. Chir., xix., p. 235, 1876.
- 11 Rouis: Sur les suppur. endém. du foie, Paris, 1860.
- 12 De Castro: Des abcès du foie, Paris, 1870.
- 13 Bärensprung, K.: Langenbeck's Arch. f. klin. Chir., 13, Heft 3, 1875.
- 14 Lösch: Massenhafte Entwicklung von Amöben im Dickdarm. Virch. Arch., 85, 1875.
- 15 Kruse and Pasquale: Untersuch. über Dysenterie u. Leberabscesse. Zeit. f. Hyg. u. Infectiouskrankh., Bd. 16, Hft. 1.

largely of malt liquors. Syphilis is thought by many to predispose to this affection, and it is said that at the commencement of the secondary stage acute yellow atrophy may become developed, following the jaundice sometimes seen at this period, and may terminate fatally, due to the impress of the syphilitic poison on the constitution. Lebert thought the extremes of heat and cold favored the development of the disease, but the analysis of Legg disproves the predisposing influence of the seasons. Series of cases have been described which appeared to show a marked family tendency to the disease, especially among those of the family who lived together under one roof. They possibly were cases of malignant jaundice, due to some micro-organism—epidemic or endemic in character. Quincke speaks of such cases in epidemics of severe icterus; they have usually been fatal, while the other individuals have merely shown more or less severe symptoms of a toxic jaundice with subsequent recovery. Pregnancy is one of the most marked predisposing causes. The disease usually occurs between the third and the sixth months of gestation. Cloudy swelling and parenchymatous degeneration of all the glands, more marked in the case of the liver and kidneys, is a physiological accompaniment of pregnancy and suckling. Frerichs has insisted upon the importance of this, in connection with the frequency of acute yellow atrophy of the liver in this state. It is known that epidemic jaundice is more fatal in pregnant women than in any other class of people.

The mode of action of the exciting causes of acute yellow atrophy is involved in much obscurity. Nervous influences are considered the most marked exciting cause. Grief, fear, or anxiety may be so great as to excite such morbid changes in the blood as would cause general tissue degeneration. Malaria has also been looked upon as an exciting cause, and the continued fevers and scarlatina have been placed in the same category. Cases have developed after osteomyelitis (Meder), sepsis (Dunkler and Babes), erysipelas, febris recurrens; these may have been nothing more than severe grades of parenchymatous hepatitis. The development of a special poison in the system by nervous influence, or from faulty digestion or assimilation, has been invoked for the causation of this disease. The growth of micro-organisms in the blood and organs has been demonstrated, usually, however, only the B. coli communis, streptococci and staphylococci, and no specificity of action can be claimed; it is more likely that the disease is due to organic or bacterial toxins or even to ptomaines absorbed from the intestines. Quincke insists that the disease is an intoxication and in no way to be considered an infection; further, that it may be produced by various poisons, giving rise to varying degrees of severity. As one possible cause he gives obstruction of the diverticulum of Vater and consequent overflow of pancreatic secretion into the bile passages and liver. Some of the intermediate products of digestion, the albumoses, have been found to possess highly poisonous qualities, and have been regarded by some as possible agents.

MORBID ANATOMY.—On section of the abdomen the liver cannot usually be seen. It is high up against the diaphragm, or placed backward toward the spinal column. It is small, weighing less than one-half or one-third as much as the healthy organ. Sometimes, however, the liver is enlarged, and Liebermeister, with others, believes that enlargement takes place in the early stage of the disease. Of course, acute yellow atrophy may occur in a liver previously cirrhotic or fatty. Its surface is smooth and of a mottled yellow color. The capsule is usually wrinkled, but free from opacity. The organ is thin and limp. On section marked changes in color are seen. The entire cut surface may be uniformly yellow, or yellow alternating with a dark red or purple color. The lemon yellow, ochre, gamboge, or Turkey-rhubarb yellow color is distinctly outlined, or shades into the deep red. In the yellow portion the lobules are indistinct or increased in size. In the red portion the lobules are diminished in size, and with a lens the interlobular connective tissue is observed to be increased. The red portion

is more shrunken and firmer than the yellow, which appears swollen and very soft. The red is considered by most pathologists to be a later stage of the yellow. The ducts are patulous; the mucous membrane is bile-stained or covered with mucus. In many cases a catarrh of the finer ducts has been observed. The gall bladder is empty, or contains light-colored bile or only some mucus.

The histological appearances of the yellow and red portions vary. The hepatic cells of the yellow portion are swollen and cloudy, are granular, or are filled with oil globules. In fact, all these changes are observed in each case. The nucleus is pushed aside or displaced entirely, and in many instances masses of fat represent the cell. In a section vacuoles or vacant places are often observed, indicating the former seat of destroyed liver cells.

On section of the red part, an increase of the interlobular connective tissue may be observed, with an abundance of young connective-tissue cells. The liver cells that remain—most of them having been destroyed—are atrophied and shrunken, and become arranged in rows which simulate bile ducts in appearance. The embryonic tissue invades the lobule between the cells. The central vein is thickened and often surrounded by a young growth of connective tissue. The capillary bile ducts must to a large extent diminish or disappear with the destruction of the rows of liver cells. Pigment is observed among the cells in all instances, hæmatin crystals are abundant, and crystals of leucin and tyrosin are almost constantly observed. A definite increase in the connective-tissue elements may be observed. It is not limited to the red areas, although perhaps apt to be here more marked, and often has the appearance of considerable age; proliferation of the interlobular bile ducts is an almost constant feature. Distinct regeneration of liver substance has been described by Marchand in the case of a patient who died six months from the onset of symptoms.

The blood is dark and fluid, the spleen is enlarged and pulpy; the kidneys are enlarged, swollen, and congested. On microscopical examination, cloudy swelling, and fatty and granular degeneration of the tubular epithelium are seen. The heart is soft and flabby, and marked fatty and granular degeneration of the muscular fibres is found. In some cases the degeneration extends to the blood-vessels, and in various parts of the body the endothelium is found to have undergone fatty and granular degeneration. No special lesions of the brain have been observed. The cerebral vessels are markedly the seat of fatty degeneration of the intima; consequently hemorrhages into the membranes and the brain tissue occur.

The mucous membrane of the stomach is congested and the seat of ecchymoses. The glands of the stomach and intestines are filled with granular and disintegrating epithelium. The stomach usually contains clotied or semi-coagulated blood. There is blood also in the intestines, in the lower part of which it assumes a tarry appearance.

In addition to the presence of ecchymoses in the gastro-intestinal tract, they are also seen in the skin and in the mucous membranes, in the pleura, the peritoneum and omentum, and in the brain and its meninges. The surface of the body and the mucous membranes are bile-tinged, and if a blister is applied, the serum is also bile-tinged.

The uterus, in cases occurring in pregnancy, either contains the fetus or presents signs of a recent abortion.

The relation of the red to the yellow portion of the liver has been a subject of careful inquiry. It is now believed by most pathologists that the red is a later stage of the general process, because of its absence in the more acute cases, because it shows greater destruction of hepatic cells, because the yellow portion gradually merges into the red, and because it (the red) is more abundant in old cases. If this theory of the relation of the red to the yellow portion is accepted, the question of the nature of the primary hepatic change becomes more easily soluble. Is the process in the liver a pri-