Multiple liver abscesses caused by
Klebsiella aerogenes

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Plates XIII and XIV

Liver abscess caused by Klebsiella is an unusual condition and, when encountered, presents a difficult diagnostic problem for the clinician and the pathologist.

A review of the literature since 1940 has shown Klebsiella to be incriminated in 19 cases of liver abscess (Boettiger, Weinstein and Werne, 1940; Rocher and Dubarry, 1941; Kinney and Ginsberg, 1943; Norman and Binford, 1945; Sheridan, 1945; Swedin and Liljestrand, 1945; Davidson, 1948; Bordes, 1949; Di Figlia and Cramer, 1951; Boardman and O'Brien, 1961; Sharma and Singh, 1966). With one exception (Rocher and Dubarry), all of these cases occurred in adults and were often associated with other debilitating conditions such as diabetes (Sheridan; Di Figlia and Cramer), agranulocytosis (Davidson; Swedin and Liljestrand), or biliary tract disease (Kinney and Ginsberg; Norman and Binford). Serological data on these organisms were available in only three cases (Kinney and Ginsberg; Boardman and O'Brien).

We have recently encountered an instance of multiple liver abscesses in a 5-yr-old child, from which cultures at necropsy yielded pure growths of Klebsiella aerogenes. In view of the rarity of this infection in young children, the diagnostic difficulties, and the unusual macroscopic appearances, we considered it worth while to report this case.

Case report

Clinical findings

The patient, a 5-yr-old female child, was admitted to hospital on 2 Jan. 1967 with a 4-wk history of abdominal pain and loss of appetite. She had previously been in good health. Presenting clinical features were a temperature of 102-6°F (39.3°C), pallor and generalised abdominal tenderness, maximal over the right hypochondrium. The liver was not palpable on admission, although some abdominal distension was noted. She was not obviously malnourished. The patient was treated as a case of pyrexia of unknown origin.

Haematological findings. Haemoglobin 7.5 g per 100 ml; total white cell count 16,000 cells per mm³: polymorphonuclear leucocytes 79, lymphocytes 10, monocytes 7 and eosinophils 4 per cent. ESR (Westergren) 120 mm in 1st hr. Bone marrow smears showed moderate myeloid hyperplasia.

Biochemical findings. Total serum protein 7 g per 100 ml (albumen 2.3 g, globulin 4.7 g). Serum electrophoresis showed a diffuse increase in γ-globulin. Results of other liver function tests were within normal limits. Blood urea concentration and serum electrolytes were normal.

Bacteriological findings. Blood cultures taken on three occasions between 6 and 13 Jan. were sterile. Agglutination tests with the blood serum against Salmonella typhi H and O antigens, and Brucella abortus were negative. Culture of material from the throat, and cultures of urine and faeces yielded no significant bacterial pathogen; Klebsiella was not demonstrated. Examination of stool for ova and parasites was positive for Trichiuris ova only. Three gastric washings did not yield acid-fast bacilli on direct examination or after culture and guinea-pig inoculation.

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Fig. 1.—General appearance of the liver at necropsy, showing the round pale nodules bulging above the surface. × c. $\frac{1}{3}$.

Fig. 2.—The appearance of the cut surface of the liver. × c. $\frac{1}{3}$. 
Fig. 3.—Microscopical appearances of the liver showing the abscesses. Haematoxylin and eosin. ×110.

Fig. 4.—Higher magnification of fig. 3. A necrotic area is surrounded by a zone of fibrous tissue infiltrated with numerous lymphocytes. Liver tissue with marked fatty change is also seen. HE. ×270.

Fig. 5.—Liver. Numerous giant cells are present in the zone surrounding the necrotic area. HE. ×450.

Fig. 6.—Microscopical appearances of one of the renal abscesses. HE. ×110.
Clinically the patient was diagnosed as a case of septicaemia. A swinging temperature of 99–102°F (37.2–39°C) continued and therapy with methicillin and chloramphenicol was instituted. In view of the anaemia, one pint of blood was given. A few days after admission the liver became easily palpable descending to 8 cm below the right costal margin. At this time the Mantoux test at a dilution of 1 in 100 was found to be positive; in view of this, streptomycin and isoniazid therapy was instituted. Three weeks after admission the patient's condition deteriorated with development of ascites and ankle oedema; nodules became palpable in the enlarged liver. As a diagnosis of neuroblastoma was considered, a laparotomy was performed on 24 Jan. 1967. The liver was found to be studded with round pale masses of varying size; these were thought to be either abscesses or metastases (fig. 1).

Liver biopsy showed necrotic areas within liver tissue with no evidence of neoplasia. After laparotomy, the child deteriorated gradually, developed congestive cardiac failure and died 1 mth after admission. Immediately after death, material was aspirated aseptically from the liver and sent for bacteriological investigation.

**Necropsy findings**

The body was of a thin, emaciated pale Negro child. The abdomen was distended and showed a right upper paramedian incision in the healing stage. There was oedema of the extremities.

**Abdominal cavity.** 100 ml of bloodstained ascitic fluid was present.

The liver (1360 g) presented very unusual appearances; it was markedly enlarged with numerous pale nodules bulging from the surface (fig. 1). These nodules contained opaque, greenish-yellow material and resembled abscesses rather than metastases (fig. 2). They were surrounded by a ring of congested liver tissue. These lesions were found both in the liver substance and on the surface of the liver. They were round with ragged walls and varied in size from 1 to 5 cm diameter. The liver parenchyma was pale and showed fatty changes. The lobular pattern was fairly well outlined.

The spleen (55 g) was plum-red in colour and firm in consistency. It contained a few lesions similar to those in the liver, with diameters of 0.5–1.5 cm.

The pancreas (60 g) was swollen and oedematous. In the tail of the pancreas two small abscesses of 1–5 cm diameter were present.

The kidneys (R. 70 g, L. 90 g) were congested and swollen. Both kidneys contained small abscesses of 0.5–1.5 cm diameter.

The mesenteric lymph-glands were enlarged and contained soft necrotic material similar to that seen in the other abscesses and present also in other lymph-glands. Material from the hepatic, splenic, renal and lymph-gland lesions was sent for bacteriological examination.

The lungs showed evidence of pulmonary oedema with some consolidation in the right lower lobe. None of the other organs showed any abnormality.

**Histological findings**

Microscopically the liver lesions present very unusual appearances. The centre of the lesions consists of homogeneous basophilic necrotic tissue surrounded by a zone of fibrous tissue and necrotic liver tissue (figs. 3 and 4).

In the latter zone, numerous eosinophils, lymphocytes and myelocytes, but very few polymorph leucocytes are seen. A few giant cells (fig. 5) and histiocytes are also present. The intervening liver tissue shows marked fatty infiltration. There is evidence of walling-off of some abscesses by fibrous tissue. In all the liver abscesses examined Gram-negative bacilli were found. The abscesses in the kidneys (fig. 6), pancreas, spleen, and peripancreatic lymph-nodes show similar appearances, except for a larger number of neutrophil polymorphs in the zone surrounding the abscess; clumps of Gram-negative bacilli are present. The lungs show evidence of pulmonary oedema and early bronchopneumonia in the right lower lobe. The mesenteric lymph-nodes show abscesses, as described above, but the mediastinal and cervical nodes show reactive hyperplasia. The appearances of the thymus are within normal limits.
Bacteriological findings

The first specimen examined from the liver was a quantity of thick yellow pus aspirated from the liver abscess immediately after death. Direct examination showed numerous pus cells and Gram-negative bacilli. Culture on blood agar for 18 hr produced a heavy pure growth of opaque, mucoid colonies with an abundance of slime. The organism was non-motile and fermented glucose, lactose, dulcitol, adonitol and glycerol within 18 hr. Starch was fermented after 4 days' incubation. The organism was citrate positive, urease positive, gluconate positive, malonate positive and indole negative. Gelatin was not liquefied after 14 days at 37°C. The organism grew in potassium cyanide, produced a lysine decarboxylase, but not arginine or ornithine decarboxylases. The methyl red test was negative; acetyl methyl carbinol was produced. Wet India ink preparations of the culture showed the presence of well-defined capsules. These gave a strongly positive capsular swelling reaction with *Klebsiella* type-7 antiserum. On Mueller and Hinton medium the organism was sensitive to 25 μg ampicillin, 15 μg ceporin, 100 μg polymyxin, 30 μg framycetin, and to albamyecin T disks containing 15 μg novobiocin and 15 μg tetracycline hydrochloride. It was resistant to 1.5 μg penicillin, 10 μg streptomycin, 10 μg tetracyncline, 10 μg chloramphenicol and 50 μg sulphonamide.

Specimens taken at necropsy on 7 Feb. consisted of pus from the liver abscesses and from mesenteric nodes, spleen and kidney. All these four sites yielded a heavy growth of *Klebsiella aerogenes* serotype 7, identical in biochemical tests and antibiotic resistance to the organism described above.

The two specimens of pus from the liver were examined directly for acid-fast bacilli and cultured for 8 wk on Löwenstein-Jensen slopes with negative results. Guinea-pigs inoculated with the pus showed no evidence of tuberculosis. Direct examination of pus smears for fungus was negative, and culture on Sabouraud's media for 3 wk yielded no growth.

DISCUSSION

We consider that the isolation of biochemically and serologically identical organisms of *Klebsiella aerogenes* with the same antibiotic resistance from the liver immediately after death, and from the liver, kidneys, spleen and mesenteric lymph-nodes at post-mortem examination is significant and is unlikely to have been produced by post-mortem contamination. In spite of the peripheral polymorphonuclear leucocytosis, a paucity of polymorphs in the zone surrounding the liver abscess was observed; this indicates a poor degree of local defence to the *Klebsiella* organism. Our inability to isolate the infecting organism from the blood is in keeping with the findings of others: of the 19 cases referred to above, *Klebsiella* was recovered from blood cultures in only four (Boettiger *et al.*, 1940; Kinney and Ginsberg, 1943; Norman and Binford, 1945; and Di Figlia and Cramer, 1951).

The lack of any positive bacteriological evidence during the course of the disease, the positive Mantoux test which led to institution of anti-tuberculosis therapy, and the hepatomegaly, fever and anaemia simulating the clinical picture of neuroblatoma, all produced considerable difficulties in establishing a correct diagnosis. The macroscopic appearances of the liver at laparotomy and even initially at post-mortem examination were not inconsistent with a malignant process. It is of interest that most other cases of *Klebsiella* liver abscesses have occurred in patients with a debilitating illness or primary pathological changes in the biliary tract. Our patient who was previously healthy succumbed to infection associated with an organism not generally regarded as highly invasive.

We should mention that there is a high incidence of *Klebsiella* infection in Jamaica. A survey of the clinical significance of infection by this organism and the serotypes encountered in Jamaica has just been completed by one of us (E. F.) and a report is in preparation.

SUMMARY

A fatal case of liver abscesses caused by *Klebsiella aerogenes* serotype 7 in a 5-yr-old female child is described. The occurrence of this type of infection in a previously healthy
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The patient is unusual and factors that confused the diagnosis in the present case are discussed.

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REFERENCES

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