secreted at all, but on the left side a moderately good renal shadow, with a slightly dilated ureter showing dye in its whole length, was made out. At the time the patient had a blood urea of 50 mg. per cent. ; the urea concentration test never reached more than 0.9 per cent. in the urine, and, after indigo-carmine, the dye appeared very faintly at twenty-five minutes on the left side, and not at all on the right. In this case the effects of a moderate degree of ureteric obstruction enhanced the shadow from an extremely defective kidney. The patient died in uraemia about a month later.

As a test of functional capacity the method is important in those cases where for some reason or another it is inadvisable or impossible to obtain the information by instrumental methods. Acute infections of the urinary tract lead to a delayed excretion of the dye, and the improvement in function of the kidneys can be demonstrated with the clearing up of the infection. Similarly in the case of stone in the ureter it is possible to tell whether or no there is complete obstruction (Fig. 12), and, after the removal of the obstruction, to watch the return of renal function.

COMPARISON WITH INSTRUMENTAL METHODS

In their inherent nature instrumental urograms must be regarded as artefacts produced by the cystoscopist for diagnostic purposes, yet capable of giving invaluable information. In this connexion I shall confine my remarks to a comparison of instrumental and excretion pyelograms. In carrying out an instrumental pyelogram the essential condition is that it shall be possible to introduce the opaque media directly into the renal pelvis, and this implies an absence of obstruction to cystoscopy and to the passage of a ureteric catheter. On the other hand, in the case of an excretion pyelogram, the first consideration is that there shall be a sufficient amount of renal tissue to excrete the dye in a concentration necessary to produce a radio-opaque shadow in the renal pelvis. An instrumental pyelogram records the anatomical outline of the calyces and pelvis. The excretion pyelogram records, first, the functional capacity of the kidney ; secondly, the anatomical outline of the calyces and pelvis ; and, thirdly, the dynamic function of these parts. So that in comparing the two methods we can only compare the instrumental pyelogram with the anatomical results of the excretion pyelogram.

Amongst the present series were thirty-four cases where the excretion pyelogram was checked by an instrumental one, but space does not permit a detailed consideration of these.

INDICATIONS FOR USE

The indications for the employment of excretion urography in diagnosis fall in the main into two groups. In the first group are those cases where, for some reason or other, instrumental methods are impossible or inadvisable. These are as follows: (1) in children, especially males, and in intolerant adults ; (2) in urethral obstructions, such as strictures or enlarged prostate, or in the presence of urethritis ; (3) in acute infections or tuberculosis of the bladder, or in the presence of haemorrhage, growth, or fistula in that organ ; (4) in ureteric lesions of the nature of stricture or fistula, or where malformations are suspected ; (5) in suspected calculus anuria. In the second group the indications are relative ones, and under this heading come all those pathological conditions of the urinary tract where it is desired to gain information as to the function of the kidneys on the two sides, or to determine the outline and motility of the ureters.

As regards contraindications to the employment of the method, I find it very difficult to formulate any. The available evidence does not suggest that excretion urography is contraindicated in the presence of even severe renal disease, though with severe associated hepatic disease it has been regarded as inadvisable. Personally, the only condition in the urinary tract in which I have deliberately refrained from this investigation has been in the presence of very acute infection associated with a high degree of fever.

CONCLUSION

It has been possible in the course of this lecture to touch upon only a few aspects of excretion urography, but I trust I have given you some idea of the scope and possibilities of the method. For the extravagant claims that have already been made by some, that the method is one which will replace the older methods of visualization of the urinary tract, and even in many cases do away with the need for cystoscopic examination, I hold no brief. But experience has shown that excretion urography is safe ; that it is, in addition, applicable to a wider range of cases than is the instrumental method ; and that it answers questions in terms of anatomy and function. On the other hand, it must be admitted that the interpretation of the urograms is not always easy, and that for the uninitiated the method may provide a large number of pitfalls.

With time, improvements in technique are bound to occur, and it may not be too great a hope that in the near future oral administration of the drugs may become a possibility. Meanwhile the extended use of the method will lead to a fuller knowledge of the physiology and pathology of the urinary tract, especially in regard to the effect of disease of one part upon the function and dynamics of another. In this way the method justly deserves to be incorporated with the older and more tried ones, with which its results must be checked and its advantages and limitations defined. If this is done, then many difficulties of urological diagnosis will be simplified, surgery will gain in outlook and technique from a renewed contact with physiology, and, most important of all, the slender barque of our patient's life is further safeguarded from shipwreck on those dangerous twin rocks of inaccurate diagnosis and ill-advised surgery.

A FATAL CASE OF ACUTE NECROSIS OF THE LIVER ASSOCIATED WITH EPIDEMIC CATARRHAL JAUNDICE

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(With Special Plate)

During the past few years considerable interest has been aroused, both in this country and abroad, by the occurrence of extensive outbreaks of epidemic catarrhal jaundice. In association with certain of these outbreaks, notably in Sweden, there have been reported a considerable number of deaths from either acute or subacute necrosis of the liver. In this country the disease has been comparatively mild, and relatively few deaths have been recorded. Nevertheless, Morgan and Brown (1927) and Okell (1931) have described fatal cases during epidemics in Northamptonshire and Surrey. The present case, however, is the first in this country in which it has been possible to carry out full pathological and bacteriological examinations.

The patient, a girl aged 3 years and 2 months, was resident in a town in Hampshire immediately adjoining the Surrey boundary. During the past two years, as

recorded by Findlay, Dunlop, and Brown (1931), there have been numerous small outbreaks of catarrhal jaundice in the south-western part of Surrey, affecting especially children attending the elementary schools. Owing to the fact that epidemic catarrhal jaundice is notifiable in the schools under the control of the Surrey County Council, it has been possible to follow up these outbreaks in some detail. In Hampshire, unfortunately, no such notification is in force, so that there is greater difficulty in determining the exact source of infection in the present case. There is, however, no reason to suppose that epidemic catarrhal jaundice is a respecter of county boundaries, nor are there lacking records that a number of cases of epidemic catarrhal jaundice have occurred during the past eighteen months on the Surrey side of the border in close proximity to the patient's house. In addition, one at least of the children of a fellow worker with the patient's father is known to have suffered recently from epidemic catarrhal jaundice.

CLINICAL HISTORY

The patient was a well-developed child, the daughter of healthy parents, and had no previous history of any serious illness. On August 22nd, 1931, she seemed rather out-of-sorts, and in the night she vomited. Vomiting recurred on the afternoon of the following day, and on the 24th the mother noted that the stools were a little lighter and the urine a little darker in colour than usual. During the next few days, apart from the development of a slightly jaundiced complexion, there was no indication that the disease was in any way serious, and in fact the patient appeared to be well on the way to complete recovery, after having suffered from the usual mild form of epidemic catarrhal jaundice. On September 2nd, eleven days from the beginning of her illness, she became somewhat drowsy. The drowsiness continued for three days, at the end of which period she complained of severe headache, and for the first time showed symptoms of irritability and restlessness. These symptoms gradually increased, ultimately developing into fits of violence, in which the child would throw herself about in bed or dash herself against the wall. Alternating with these attacks were periods of quiescence, when she lay in an apathetic, semi-comatose condition.

From September 4th till her removal on September 9th to the Royal Surrey County Hospital, Guildford, there was obstinate constipation, despite the administration of a variety of laxative medicines.

After admission to hospital the restlessness continued, and during the violent phases the child would bite or scratch anyone who attempted to restrain her. At times there was spasmodic contracture of the limbs. During this period she failed to recognize her parents, had no appreciation of her surroundings, and for the most part talked incoherently. Constipation still continued ; on one occasion a black tarry-looking stool was passed. For the first few days of her stay in hospital she refused both food and drink, but later she became thirsty, and also rather hungry, although attempts to feed her with anything but the lightest food invariably caused vomiting.

Under the influence of bromide and chloral, given at four-hourly intervals, the general condition improved, and from September 16th to 19th the movements were sufficiently co-ordinated to enable a feeding-cup to be held. On the latter date, however, she again became very restless, and though the jaundice was now fading, petechiae began to appear on the legs and buttocks, while attacks of epistaxis occurred at frequent intervals. Vomiting became intractable, and even nutrient and saline enemata were not retained. Coma gradually became the predominant symptom, and by September 23rd the restlessness had entirely ceased, the patient lapsing into a state of total unconsciousness, which ended in death in the early hours of September 24th, thirty-three days from onset of the illness.

Clinical examination on admission to hospital revealed the fact that the liver dullness was diminished, though the spleen was not enlarged. On palpation of the abdomen there was some generalized abdominal tenderness. Examination of the urine showed the presence of a few pus and squamous epithelial cells, though neither red blood cells nor casts were seen. A trace of albumin was found, together with bile. Sugar was not present.

Incontinence of urine, though not invariable, was a frequent symptom. The temperature throughout the patient's stay in hospital was subnormal. The pulse was regular, varying only from 100 to 120 per minute till September 19th, on which date it rose to 150 per minute, later falling to 80 per minute until shortly before death, when it became irregular and rapid. At the same time the respiration rate rose from 25 to 40 per minute.

An examination of the blood two days before death showed red blood corpuscles 2,690,000 per c.mm., with some variation in size but none in shape ; leucocytes, 12,100 per c.mm. ; differential count: polymorphonuclears, 54 per cent. ; small lymphocytes, 37 per cent. ; large mononuclears, 6 per cent. ; transitionals, 2 per cent. ; eosinophils, 1 per cent.

POST-MORTEM APPEARANCES

The necropsy was carried out six hours after death. The body was that of a well-developed female child. The skin and mucous membranes were of an icteric tint, while on the back of the legs and buttocks there were numerous small petechial haemorrhages. *Thorax*: Jaundice of the subcutaneous tissues and costal cartilages was well marked ; there was only a trace of fluid in the pleural cavities. No evidence of pleurisy ; both lungs were congested, while the lower lobe of the left lung was deep purplish-red in colour and consolidated. Small haemorrhagic spots were present in the upper lobe of the left lung and throughout the right lung. The lymph glands at the root of the lungs were not enlarged nor haemorrhagic, and the thymus appeared normal. The pericardium was deeply bile-stained ; the pericardial sac contained about 1 oz. of clear straw-coloured fluid. The heart muscle was pale in colour. There were no subpericardial or subendocardial haemorrhages ; the valves were normal, the aorta jaundiced with no arterio-sclerosis. *Abdomen*: The lining of the peritoneal cavity did not show any petechiae or evidence of peritonitis. There was no increase in the amount of fluid. The *liver* was slightly decreased in size, and of a deep reddish-brown colour; the right lobe was a little roughened on its anterior surface. On section the liver, with the exception of a portion at the upper posterior part, was of an orange tint with fine reddish mottlings (see Plate). The wall of the *gall-bladder* was pale and studded with small petechial haemorrhages. Scattered throughout the mesentery and omentum there were numerous small haemorrhagic foci. The *mesenteric glands* were slightly swollen, and in some there were minute haemorrhages involving the cortex. The spleen was not definitely enlarged, although deep red in colour and rather soft in consistence. The mucous membrane of the *stomach* was injected, and at the pyloric end were a few small petechiae. There was no evidence of any catarrhal change in the mucosa. In the *duodenum* also the mucous membrane appeared free from catarrhal change ; the opening of the common bile duct was patent, and the duct was unoccluded throughout its length. About one inch distal to the ampulla of Vater, however, the whole circumference of the duodenum was involved in a large haemorrhage, which extended about one inch along the duodenum and backwards on to the posterior abdominal wall. On the surface of the transverse colon immediately above the duodenum there was a dark-reddish swollen area about one inch in length, which at the time was regarded as also probably due to a haemorrhage involving the peritoneal coat. Small haemorrhagic areas were also present here and there throughout the course of the large intestine, being most numerous in the descending colon. The *kidneys* were normal in size and the capsule stripped readily ; on section the cut surface was pale yellow in colour, with some engorgement of the vessels in the boundary zone and medulla. The mucous membrane of the *bladder*, though red in colour, was not thickened, and no actual haemorrhages could be dis-

tinguished. There were no haemorrhages in the adrenals, while the pancreas, though deep yellow in colour, was otherwise normal in appearance. The uterus and ovaries appeared normal. On reflecting the scalp there was seen a haemorrhagic area about the size of half a crown, occupying an area on the left parietal bone just to the left of the sagittal suture. The meningeal vessels were congested, but there was no evidence of meningitis. The substance of the cerebral lobes was somewhat oedematous, but the brain itself did not exhibit any haemorrhages.

Histological Appearances

Liver.—The histological appearances were those of an acute necrosis of the liver, most advanced in sections taken from the anterior portion of the organ. Both the central and the intermediate zones of the lobules were necrosed, only a few cells adjacent to the portal spaces retaining their normal appearance. In the area round the central vein the cells of the liver parenchyma consisted of the cell membrane within which was a small amount of acidophilic granular debris. In the majority of the cells it was no longer possible to see any nuclear remains, though in a few the dim outline of a nucleus could still be distinguished. In the intermediate zone of the lobule the cytoplasm of the liver cells was either highly vacuolated or diffusely granular, The nuclei, however, were comparatively well preserved. In the periportal region the liver cells were normal, except for the occasional occurrence of vacuoles. In the intermediate zone many of the liver cells contained small masses of inspissated bile, and here also, in sections stained by Scharlach R, there was seen a certain amount of fatty degeneration of the liver cells. In the periportal region there was a small amount of fatty infiltration. Hyaline degeneration of the cytoplasm, as seen in yellow fever and Rift Valley fever, was not encountered. Except in the region around the central vein, where nuclei had undergone lysis, the nuclear structure was well preserved. In some nuclei, however, the chromatin was reduced to a thin ring applied to the nuclear membrane. Careful search failed to reveal the presence of any acidophilic material within the nuclei which could be interpreted as intranuclear inclusions such as are characteristic of yellow fever ; hypertrophy of the nucleoli was not seen. The Kupffer cells were relatively unaffected, even in the most necrosed areas; in some cases, however, the nuclei were hyperchromatic and the cells contained phagocytosed debris. In the sinusoids were seen occasional polymorphonuclear cells and large mononuclears. In the areas around the central vein these cells had penetrated between the necrosed liver cells, the normal arrangement of which into columns had largely disappeared. Excessive congestion of the intralobular capillaries was not a feature of the sections, nor were there any actual areas of haemorrhage. There was very little attempt at regeneration in the cells of the periportal region. In the portal tracts themselves the amount of cellular infiltration varied greatly. At some points there were but a few polymorphonuclear leucocytes present; in others considerable masses of small lymphocyte-like cells, polymorphonuclear leucocytes, and large mononuclears. There was no new formation of connective tissue in relation to the portal tracts. The epithelium of the small bile ducts appeared normal, though in the lumina of many of the bile ducts there were small masses of inspissated bile. There was no evidence of an ascending cholangitis. In sections stained by Levaditi's method neither spirochaetes nor leptospira were discovered, while in sections stained both by Gram's technique and by the thionin blue van Gieson method, careful search failed to disclose the presence of any bacteria.

In sections from the upper and posterior portion of the liver the degenerative changes, though still most noticeable in the region of the central veins, were definitely less advanced. Many of the liver cells, however, showed a slight degree of fatty infiltration, while here and there polymorphonuclear leucocytes were seen in the sinusoids.

Spleen.—The most noticeable change was the congestion of the sinuses, which were filled with large numbers of red cells. A few polymorphonuclear leucocytes could be seen both in the sinuses and within the germ centres. These latter did not exhibit any of the central necrosis recently described by Hudson (1931) as occurring in fatal cases of jaundice of unexplained origin from West Africa. Phagocytosis of red cells by the endothelial cells of the sinuses was occasionally seen.

Kidneys.—In these organs there was present a very intense toxic change affecting more especially the cells lining the convoluted tubules and the ascending and descending limbs of the loop of Henle. All the varying stages of degeneration could be distinguished, beginning with cloudy swelling and hyperchromatization of the nuclei, and going on to complete disappearance of the nuclei, with breaking up of the cytoplasm. The lumina of many of the convoluted tubules were filled with granular debris. The glomeruli were relatively unaffected, though the cells of Bowman's membrane were in some instances swollen and eosinophilic, with prominent nuclei. The glomerular capillaries were not unduly congested, and did not show any excess of polymorphonuclear leucocytes. The glomerular spaces were generally empty. The blood vessels in the cortical region were not congested, nor were infiltrating polymorphonuclear leucocytes seen. In the medulla degenerative changes affecting the cells of the straight tubules were comparatively slight, while bile-staining of the cells was not conspicuous. Here and there, however, groups of intensely congested capillaries had pressed upon and almost completely obliterated the intervening straight tubules. Spirochaetes could not be detected in sections prepared by Levaditi's method, nor were bacteria seen in sections suitably stained. In frozen sections stained by Scharlach R there were seen fine fatty granules in the cells lining the convoluted tubules and loops of Henle.

Abdominal Lymph Glands.—Sections of mesenteric lymph glands showed congestion of the blood vessels in the cortex of the gland and the presence of a small number of polymorphonuclear leucocytes in the lymph sinuses.

Alimentary Tract.—The only noticeable histological change in the *stomach* was the presence in sections from the pyloric end of small haemorrhages in the submucous layer. In the first part of the *duodenum* there were no obvious pathological changes. In order to determine whether there was any mechanical obstruction to the outflow of bile serial sections were cut of the ampulla of Vater and the common bile duct. No evidence was obtained that the duct was plugged with inspissated mucus, nor was there any inflammatory change in the wall of the duct. In the third part of the duodenum, which on naked-eye examination was the site of an extensive haemorrhage, there were found microscopically numerous small haemorrhages involving the submucous layer, associated with intense congestion of the blood vessels and some degree of compression of the glandular secreting cells. There was no evidence of any infiltration of the tissues with polymorphonuclear leucocytes, nor any pathological change in the mucous lining of the gut. On examining sections of the *transverse colon* there was found a localized swelling of the peritoneal coat. In this area there was considerable congestion of the capillaries, with oedema of the surrounding tissues, which contained many polymorphonuclear leucocytes, a few large mononuclear cells, and small collections of red cells. In sections stained by Gram's method, Gram-positive organisms could be seen, either lying free in the tissues or phagocytosed by the polymorphonuclear leucocytes and mononuclears of the exudate. No fibrin had been deposited in this oedematous area. These organisms were present either as diplococci or in short chains of streptococcal form. In the other layers of the transverse colon there was congestion of the blood vessels, but no haemorrhages. Occasional polymorphonuclear leucocytes were seen both in the muscular layers and in the submucosa. The lining epithelium was normal in appearance, and there was no evidence of epithelial desquamation.

Lungs.—Sections of the right lung and upper part of the left showed no change beyond congestion of the inter-alveolar capillaries and occasional small haemorrhages into adjacent alveoli. In the lower lobe of the left lung, however, all the alveoli were completely filled with a fibrinous and haemorrhagic exudate in which were a few large mononuclear cells. There was no polymorphonuclear infiltration of the alveoli, nor did the congested inter-alveolar capillaries contain an excess of polymorphonuclear leucocytes.

Heart.—The only pathological changes were those seen in frozen sections stained with Scharlach R. Occasional muscle cells were found to be the site of a fine, fatty degeneration. No cellular infiltration was seen in the heart, nor any haemorrhage. The heart valves were quite normal.

Adrenals.—Slight congestion of the vessels in the medulla was noted, but no actual haemorrhages were seen. Occasional pyknotic nuclei were present in the cells of the cortex. *Pancreas.*—No pathological changes observed. *Brain.*—Beyond congestion of the vessels both in the meninges and in the brain substance there was no obvious pathological lesion.

Bacteriological Examination

During life the only bacteriological examination made was an investigation of the stools. No organisms of the typhoid, dysentery, or Salmonella group were isolated. At the necropsy blood was removed aseptically from the heart and bile from the gall-bladder. Cultures in glucose broth, incubated aerobically and anaerobically, remained sterile.

In order to determine the presence or absence of leptospira, portions of minced liver and kidney were examined by dark-field illumination. No leptospira were seen. Animal experiments were also carried out in an attempt to isolate leptospira. Minced liver was rubbed on the scarified skin of two guinea-pigs, a similar experiment being carried out with minced kidney. The four guinea-pigs failed to show any temperature reaction, and remained in good health. Two other guinea-pigs had heart blood applied to the scarified skin ; these animals also remained in good health. Finally, the blood serum was examined for the presence of antibodies to leptospira by the adhesion test of Brown and Davis (1927). For carrying out this test our thanks are due to Major H. C. Brown. The result of the adhesion test was negative. Thus the only micro-organisms to which a pathological significance might be attached are the streptococci which were found in a localized area of the peritoneal coat of the transverse colon.

Discussion

Histological examination of the tissues shows that death was due to an acute toxaemia affecting the liver, kidneys, and heart muscle. So far as the changes in the liver are concerned, the case falls into the class which Mallory (1926) has described as a " toxic cirrhosis," in which the lesions are most advanced in the central and intermediate zones of the lobules. Of the many poisons which are known to produce this form of acute necrosis it is possible in this case to exclude quite definitely the action of organic arsenicals, trinitrotoluene, phosphorus, and cincophen.

Leptospiral jaundice, which has occurred in this country, both in epidemic and in sporadic forms, may be excluded on the following grounds: Clinically the present case was almost afebrile, and death was delayed till the thirty-third day of illness. Buchanan (1927), in the epidemic which he recorded in Midlothian, found that death took place from the tenth to the fifteenth day of illness. Pathologically, the changes in leptospirosis are very variable, ranging as they do from negligible histological alterations to severe damage of the liver cells. Haemorrhage into the adrenals is, however, very common. This lesion was not present in this case. Bacteriologically there was (*a*) failure to determine the presence of leptospira in minced liver or kidney by dark-field examination ; (*b*) failure to demonstrate leptospira in stained sections of the liver and kidney ; (*c*) failure to infect guinea-pigs with blood, liver, or kidney ; (*d*) failure to detect the presence in the serum of leptospiral antibodies, although in leptospiral jaundice antibodies should be well developed thirty-three days after the onset of illness. Though a negative result in any one of the above tests may be of questionable value, the fact that all were negative is strong presumptive evidence that the disease in the present instance was not due to infection with *Leptospira icterohaemorrhagiae.*

Congenital syphilis can be definitely excluded in this case, while infection due to typhoid or paratyphoid organisms may also be ruled out by the absence of any characteristic pathological changes and by the failure to isolate any non-lactose-fermenting bacilli from either the stools or bile.

There remains for discussion the relation of the case to epidemic catarrhal jaundice, and the role of the streptococcus in its causation. The following facts are in favour of the view that the primary cause of the present illness was an attack of epidemic catarrhal jaundice.

1. The patient resided in an area where, during the past few months, there have occurred numerous small outbreaks of epidemic catarrhal jaundice, affecting more especially young children. At least one child with whom the patient may have been in contact is known to have recently suffered from a typical attack of epidemic catarrhal jaundice.

2. Many outbreaks of epidemic jaundice have been associated with fatal cases of acute necrosis of the liver. In this country Morgan and Brown (1927) reported one fatal case in connexion with the epidemic which they investigated in Northamptonshire. In this case, that of a girl of 11 years, the clinical symptoms were at first those of a benign catarrhal jaundice. Later, symptoms of liver insufficiency developed, and at the post-mortem examination the chief pathological finding was a parenchymatous degeneration of the liver. Leptospira were not found in sections of the liver, nor were they isolated from any case examined during this epidemic. Okell (1931), in the epidemic described by Booth and Okell (1928), also reported one fatal case in the outbreak which they described in Surrey. Unfortunately no post-mortem examination was permitted. Incidentally it may be mentioned that among the patients in the recent epidemic in Surrey was another girl, aged 6 years, who after an attack of what appeared to be epidemic catarrhal jaundice, developed symptoms of liver insufficiency. This patient eventually recovered, though even now, ten months after her illness, there is present a very definite reduction in the size of the liver. Abroad, the association between epidemic catarrhal jaundice and acute necrosis of the liver has been extremely striking. In the United States of America, in association with the wave of catarrhal jaundice which occurred in the years 1920–22, Williams (1923), Roman (1927), and others have recorded a considerable increase in the incidence of cases of acute necrosis of the liver. A similar close connexion between epidemic catarrhal jaundice and acute necrosis of the liver has been noted in Germany. The most striking example of the interrelation of the two diseases comes, however, from Sweden, where it has been ably described by Wallgren (1930) and Bergstrand (1930). In the years 1914 to 1925, when catarrhal jaundice was not epidemic, there were in Stockholm only twenty-seven cases of acute necrosis of the liver, an average of just over two a year. In 1926 and 1927 epidemic jaundice was rife in Sweden. In the latter year forty-two cases of acute and subacute necrosis of the liver were seen in Stockholm alone, while throughout the country there were many more, especially in

Gothenburg, where epidemic catarrhal jaundice was extremely prevalent.

3. The clinical history of the case here described is similar to that of many recorded from Sweden—an onset resembling in every way that of a benign case of epidemic catarrhal jaundice: improvement, then quite suddenly the appearance of symptoms pointing to an acute liver insufficiency.

4. The pathological changes of epidemic catarrhal jaundice found in sections of the liver taken from living patients by Nordmann (1925) and Eppinger (1922), and confirmed by sections obtained from patients who had died from other conditions, are those of a hepatitis grading into acute atrophy. Eppinger states that severe cases of acute catarrhal jaundice are forms of acute atrophy of the liver in miniature. The pathological changes in many of the cases reported by Bergstrand (1930) are also very similar to those found in the present case.

5. Bergstrand (1930), and Findlay, Dunlop, and Brown (1931) have expressed the view that epidemic catarrhal jaundice is probably due to a virus which, though pathogenic for man, cannot be transmitted to monkeys or to the smaller laboratory animals, while acute necrosis of the liver is due to some superadded toxaemia in a patient whose liver has not fully recovered from the primary attack of the virus. In support of the view that a toxin and an infection together produce a more widespread necrosis of the liver than either alone may be cited the classic work of Opie (1910), who found that acute hepatic necrosis resulted from the combined action of chloroform and *Bacillus coli*. Hurst and Hurst (1928) also found that the toxic action on the liver of manganese chloride is reinforced by injections of *Bacillus coli*, while Findlay, Dunlop, and Brown (1931) showed that arsphenamine injections, combined with injections of *Bacillus coli*, produce far more hepatic necrosis than either the coliform infection or the arsphenamine alone.

6. The presence of secondary bacterial infections in association with acute necrosis of the liver has been recorded by McDonald (1918), while it is of considerable interest that in a number of Swedish cases Bergstrand (1930) has isolated a *Streptococcus viridans* in pure culture from the duodenum. This is a further point of similarity to the present case, in which a streptococcal focus was located in the wall of the transverse colon.

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SILICO-ANTHRACOSIS PRESENTING CURIOUS BODIES SIMILAR TO THOSE IN ASBESTOSIS

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(With Special Plate)

The arguments against anthracosis ever being a primary condition are so strong that the time would seem opportune to give to the disease a designation which is more correctly descriptive. Cummins,[1] Cummins and Sladden,[2] and Jousset[3] have shown that the primary factor in the production of coal-miners' lung is silicosis, and that coal dust is retained in large amounts only when there is a high silica content. And the converse is true: without a high silica content there is no important retention of coal dust in the lungs. Cummins and Sladden conclude that coal dust is retained only when the lymph drainage in the lungs has been impaired by the action of silica, and that anthracosis is a special variety of silicosis depending upon the accumulation of coal dust in the silica-damaged lung. The following case supports their contention.

CASE HISTORY

A man, aged 64, was admitted to the Wigan Infirmary on September 17th, 1931, with the history that at the age of 10 he had commenced work as a "half-timer" in a cotton mill; at 16 he was employed at the Park Lane Collieries, near Wigan, and worked there continuously as a drawer and collier until the collieries closed in 1926. He had had no other employment, nor had he lived outside the Wigan district. The seams in these mines are all soft coal, no anthracite being present. On admission the patient was found to be suffering from multiple myelomatosis, with collapse of the bodies of the fourth and fifth thoracic vertebrae and paraplegia. He gave a history of dyspnoea and chronic cough, with mucoid viscid sputum. The urine contained a large amount of Bence-Jones proteose. No tubercle bacilli were found. The radiologist's report on the chest stated that there was extensive fibrosis of both lungs, but no mottling or evidence of silicosis, and the right base showed pleural thickening. The patient died on September 27th, 1931.

POST-MORTEM FINDINGS

There was invasion of the sternum, ribs, and vertebrae by neoplasm. The bodies of the fourth and fifth thoracic vertebrae were collapsed and surrounded by a tumour mass.

Lungs.—There were dense pleural adhesions on both sides, more marked on the right. The thoracic glands were black and enlarged, but not hard. The lungs were black and uniformly fibrosed, with the exception that four or five small hard nodules could be felt in each lung substance. There was no gross anthracotic consolidation.

The diaphragm, the capsule on the upper surface of the liver, and the pre-aortic glands showed deposits of carbonaceous matter.

HISTOLOGICAL APPEARANCES

The bone tumours present the histological characteristics of myeloma multiplex.

Lungs.—There is marked excess of dust throughout the sections, and the interalveolar septa are thickened and laden with dust cells. The perivascular and peribronchial areas show extensive fibrosis with large accumulations of dust—the result of blockage of the lymphatics; an occasional fibrous whorl is present. There is a considerable degree of emphysema. The pleura is thickened, and there are subpleural carbonaceous deposits, but no subpleural lymphoid hyperplasia is seen in the sections. By polarized light doubly refractile particles are seen in large numbers. In addition, some sections show masses of golden yellow pigment (? altered haemoglobin) and large black angular particles measuring from 5 to 80 μ in length. Some of the shapes are seen in the illustrations as the bases of the curious bodies.

The Curious Bodies.—In sections and after digestion of the lung with trypsin, some of the large angular particles are

G. M. FINDLAY & J. L. DUNLOP: NECROSIS OF LIVER WITH EPIDEMIC CATARRHAL JAUNDICE

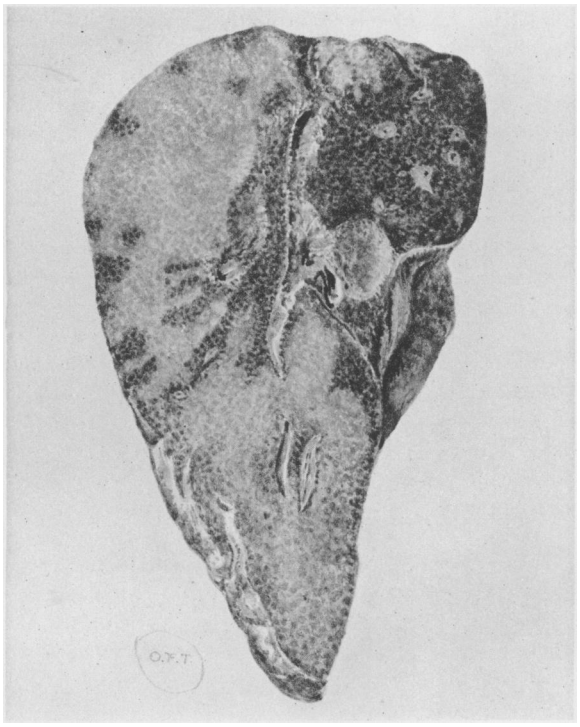

FIG. 1.—Acute necrosis of the liver associated with epidemic catarrhal jaundice in a child.

W. E. COOKE: SILICO-ANTHRACOSIS WITH "CURIOUS BODIES"

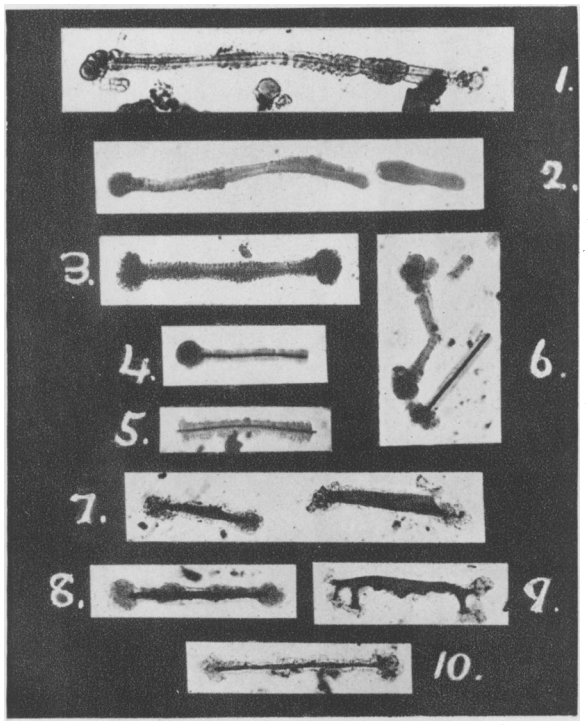

FIG. 1.—Curious body from a case of asbestosis, 137 μ in length. FIG. 2.—Curious body in asbestosis; colloidal coating fractured to show fine asbestos filament forming the core. FIG. 3.—A common form in asbestosis; elongated dumb-bell with annular or discoid appearance of deposit. FIGS. 4, 5, and lower figure in FIG. 6.—Curious bodies from a case of asbestosis showing biotite nuclei. FIGS. 7, 8, 9 and 10.—Curious bodies from the present case of silico-anthracosis. In Figs. 8 and 10. discoid arrangement of deposit is seen.

WILLIAM HUNTER: UNUSUAL BONE INJURY IN A CHILD

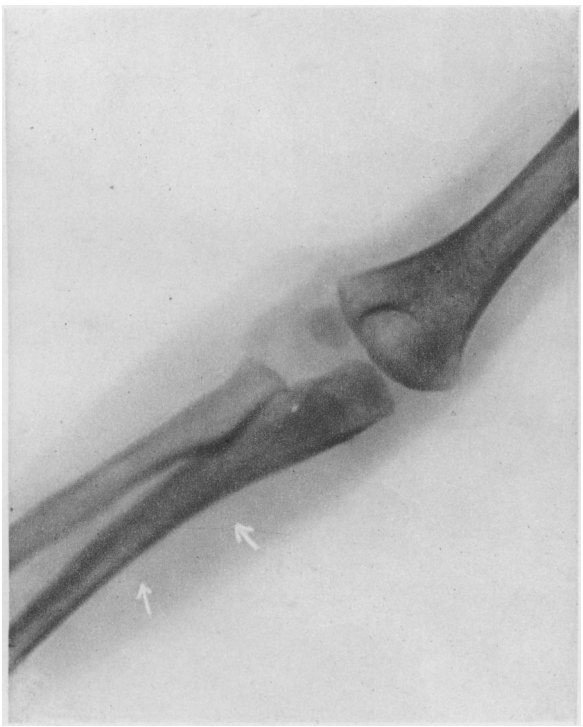

FIG. 1.—Greenstick bowing of ulna.

T. H. CROZIER: EXOPHTHALMIC GOITRE IN A CHILD

FIG. 1.—Shows classical "bulging" eyes and startled expression; also scar of dog-bite on right cheek.