TWO CASES OF RUPTURE OF THE EXTRAHEPATIC BILE DUCTS

BY

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Closed abdominal injuries that are not rapidly fatal rarely cause damage to the extrahepatic bile ducts. The cases of two children are described in whom, as a result of a traffic accident, there was leakage of bile into the peritoneal cavity, which ceased spontaneously without any local repair at operation.

Case 1

A deaf boy of 5 years was run into by a car in March, 1952. He was struck on the left side and thrown to the side of the road. On admission to the Royal Belfast Hospital for Sick Children he was pale, with a pulse rate of 160 and a blood pressure of 60/30 mm. Hg. There was no superficial bruising. His abdomen was tender and diffusely rigid. X-ray examination of his chest and abdomen revealed nothing abnormal. After a blood transfusion his general condition greatly improved.

At laparotomy five hours after the injury about 15 oz. (430 ml.) of blood was evacuated from the abdominal cavity. The only other abnormality discovered was a large haematoma distending the right half of the lesser omentum in its free margin; neither the spleen nor the liver had been torn. As bleeding had already ceased nothing further was done and the abdomen was closed without drainage.

His condition was satisfactory until the eighth post-operative day, when a faint tinge of jaundice appeared; it progressed steadily and was accompanied by increased bile pigment in the urine and absence of stercobilin from the faeces. At the same time the abdomen became so distended with fluid that between the fourth and eighth post-operative weeks it was aspirated four times, in all about 7 pints (4 litres) of heavily bile-stained but uninfected fluid being removed. By the end of the eighth post-operative week the abdominal swelling had subsided, the jaundice had gone, the excessive bile pigment had disappeared from the urine, and normal pigmentation had returned to the faeces. Throughout these eight weeks he made no complaint of abdominal discomfort, had a moderate appetite, and never had any abdominal tenderness or rigidity other than in the operation wound. When last seen (January, 1956) he was in excellent health.

Various investigations were undertaken. The liver-function tests showed no abnormality: bromsulphthalein test, 1% retention after 45 minutes; total serum proteins, 7.2 g. per 100 ml. (albumin 5.3 g., globulin 1.9 g.); serum alkaline phosphatase, 6.9 King-Armstrong units; serum bilirubin, 0.2 mg. per 100 ml. The blood picture was normal: Hb, 11.9 g. per 100 ml.; white cells, 9,520 per c.mm.; platelets, 253,000 per c.mm. "Biligradin" visualization of the biliary tract showed no abnormality.

Comment.—The injury damaged some part of the extrahepatic biliary system which, for a while, allowed all or almost all the bile it transmitted to leak into the peritoneal cavity, from which it was aspirated or absorbed. The absence of stercobilin from the faeces suggests that for probably about six weeks the bile was all either diverted or obstructed. With no operative treatment the biliary passages re-established their continuity.

Case 2

A boy aged 6 years was admitted to hospital on December 10, 1953, after being hit by a car. On admission he was severely shocked, showing signs of internal haemorrhage from a closed abdominal injury. A radiograph of the chest

and abdomen showed no abnormality. After blood transfusion his general condition greatly improved.

At laparotomy through an upper midline incision six hours after the injury a considerable amount of blood was found in the abdominal cavity. As the spleen was found to be torn, splenectomy was performed. A tear of the liver 2 in. (5 cm.) long and $\frac{1}{4}$ in. (6 mm.) deep was found in the groove for the falciform ligament. A large haematoma, as in the previous case, distended the right half of the lesser omentum and there was a tear in the centre portion of the lesser omentum (see Fig.). A retro-peritoneal haematoma was present, extending over the pancreas and the left kidney. Haemostasis was secured and the abdomen was closed with drainage.

Diagram showing haematoma in the right half of the lesser omentum and a tear in its central portion (Case 2).

The general condition remained good, but within two days a biliary fistula formed at the drainage site.

After draining profusely for about three weeks it dried up spontaneously. The faeces remained normal, no excess bile pigment appeared in the urine, and there was no sign of jaundice. The abdomen did not distend.

The patient has remained a healthy schoolboy with no abnormality detectable on physical examination. Biligradin x-ray films show no abnormality of the biliary tract.

Discussion

Injury to the extrahepatic ducts is a rare surgical problem, probably because the associated injury to neighbouring structures causes early death. Fewer than 100 cases were recorded in the last century (Mason, Sidbury, and Guiang, 1954). The present two cases are the only ones in the records of the Royal Belfast Hospital for Sick Children for the last 25 years.

The extrahepatic ducts can be injured by direct violence from crushing against the vertebral column, but our first case and that described by Benson and Prust (1953) both received blows on the left side. Possibly the injury was caused by indirect violence as a result of sudden stretching of the structures in the right (free) border of the lesser omentum following flexion of the trunk to the left.

Both cases presented with signs of intraperitoneal haemorrhage, which before operation was thought to be due to rupture of the spleen or liver. In each a large haematoma completely obscured the anatomy in the region of the free border of the lesser omentum, and in neither was it thought advisable to disturb it. It may be that in each case the presence of the haematoma prevented the escape of bile at the time of laparotomy and that only as the haematoma was absorbed was bile able to leak out. Another possibility is that the wall of the duct sloughed later.

The escape of sterile hepatic-duct bile into the peritoneal cavity does little harm (Harkins, Harmon, and Hudson, 1936), causing an exudation of some fluid and a slight rise in pulse and temperature. Both of our cases had post-operative escape of bile into the peritoneal cavity without any general systemic upset. The drain in Case 2 allowed the bile to escape, preventing abdominal distension. In this case also a small tear was present in the liver which could have allowed the escape of bile; but since the discharge was so copious and prolonged, and since the haematoma in the

lesser omentum was exactly similar to that in our previous case, we feel that an extrahepatic duct must have been torn.

A partial or complete tear may occur in the extrahepatic ducts which may or may not be obvious at the time of operation. Many forms of surgical treatment have been advocated. Waugh (1916) had a case, very similar to our first, in which two laparotomies were carried out for upper abdominal distension and signs of obstructive jaundice and in which the condition suddenly cleared up spontaneously. Benson and Prust (1953) treated a case successfully by marsupialization and drainage of a false cyst of biliary ascitic fluid which had formed. Gross (1953) had two cases; one was treated successfully by simple drainage from the site of the injury, while in the other an attempt was made at primary repair. Stenosis of the common bile duct, however, developed, necessitating cholecysto-duodenostomy, which led to cholangitis, cirrhosis, bleeding oesophageal varices, and death. Mason *et al.* (1954) had a case which developed stenosis requiring cholecysto-duodenostomy even though no attempt at repair had been made at the primary operation. Hicken and Stevenson (1948) advocated a cholecystostomy to decompress the biliary system, and suggested that cholangiograms could be taken later to demonstrate healing of the tear and also to make sure that any associated traumatic pancreatitis which might obstruct the lower end of the common bile duct had settled before removing the tube.

It is quite clear that injuries to the extrahepatic ducts often heal spontaneously without the development of stenosis, and it is possible that an attempt to repair a recently traumatized duct may increase the likelihood of stenosis. Simple abdominal drainage, and possibly cholecystostomy, should be performed initially; if stenosis develops it can be treated later.

Summary

Two cases of rupture of the extrahepatic bile ducts are described in which the lesion was not recognized at operation. Biliary ascites with minimal systemic upset developed in one, necessitating frequent aspiration. In the other a drainage tube allowed the bile to escape externally. Spontaneous healing of the fistula occurred in both.

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The General Register Office's analysis of the occupations of persons in England and Wales included in the 1951 Census has been published as *Census 1951, England and Wales, Occupational Tables* (H.M.S.O., price seven guineas). It is based on the full figures, thus replacing the results of the 1% sample published in 1952. The findings are compared with those of the 1931 Census. Owing to the difference in school-leaving age at the times of the Censuses, the 1931 occupational figures include some 285,000 children under 15, while the 1951 figures relate to those over that age. In 1951 14 million of the 16 million males were gainfully occupied, and 6½ million of the 18 million females. Of the occupied men, 29% were under 30 and only 4% over 65; of the occupied women, 44% were under 30 and 5% over 60. In 1951 there were 11 million married women, of whom 22% were gainfully occupied compared with 10% in 1931. The two commonest occupations for the married women were as charwomen and clerks—149,000 of each.

THE ANTIBACTERIAL ACTIVITY OF CHLOROPHYLL

BY

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Numerous reports have been published describing the successful treatment of chronic infected wounds with water-soluble chlorophyll preparations. In many cases healing has been induced where there had been no response to conventional treatment. Bowers (1947) treated 400 various surgical cases with water-soluble chlorophyll and noticed that infected wounds became free from suppuration and odour within two or three days. Combes, Zuckerman, and Kern (1952) produced a similar reduction in suppuration in secondarily infected ulcers, contact dermatitis, and pemphigus. Carpenter (1949) observed an early eradication of infection and early healing in 127 cases of suppurative osteomyelitis and chronic ulcers: the healthy appearance of granulation tissue under chlorophyll therapy was stressed.

Whereas chlorophyll derivatives in wound healing are generally regarded as promoters of healthy granulation, some clinical reports suggested that they have antibacterial properties. Smith (1944) observed *in vitro* bacteriostasis of staphylococci, streptococci, and the anaerobic spore-bearers, while Nevin and Bibby (1954) showed that chlorophyll inhibited the growth of staphylococci, streptococci, and lactobacilli.

The present experiments were designed to investigate further, by *in vitro* methods, the antibacterial activity of a chlorophyll preparation.

Material and Methods

The water-soluble chlorophyll preparation used throughout these experiments was sodium potassium copper chlorophyllin (which is the base of "chloresium" preparations) kindly supplied by Rystan Company, New York. A fresh 10% solution was prepared daily in sterile distilled water, and dilutions of this used in all experiments.

The sensitivity of various organisms to chlorophyll was determined, using a plate method modified from that described by May and Morley (1952). Levinthal agar was used throughout. All organisms were grown in nutrient broth for five hours and the standard inoculum was one loopful, approximately 10^8 organisms. Plates were incubated aerobically for 16 hours at 37° C. The highest concentration of chlorophyll incorporated in solid media was 1/100. This was governed by the solubility of the preparation; a 10% solution was the maximum concentration possible.

Chlorophyll sensitivity was also determined by making bacterial counts of organisms growing in fluid media. Growth curves were plotted by the method of Miles, Misra, and Irwin (1938), with organisms grown in nutrient broth containing dilutions of chlorophyll.

Results

Sensitivity of Various Organisms to Sodium Potassium Copper Chlorophyllin.—The results of the plate method are shown in Table I. Chlorophyll was found to inhibit the growth of some Gram-positive bacteria, but had no effect on the Gram-negative organisms tested. No change in antibacterial properties was produced by heating the chlorophyll at 100° C. for one hour. The presence of 10% horse serum in the medium did not affect the inhibitory level. Since *Staph. aureus* is a common wound contaminant it was chosen as the test organism for all further experiments.