

Leukaemia is a hard nut to crack, and we shall have to wait for further fundamental scientific discoveries before we can greatly modify its frequency and mortality. In the meantime current interest in the incidence of leukaemia and in new forms of therapy can contribute significantly to the welfare of the unfortunate victims of the disease. My experience of therapeutic trials is that they arouse an enthusiasm for treatment which might otherwise be lacking and produce an improvement in results quite apart from the specific remedy. Indeed, as in the famous Hawthorne experiment at the Bell Telephone Works, community studies on the incidence and treatment of disease may sometimes have side-effects which are just as important as the original aim of the investigation.

Summary

Acute leukaemia is becoming commoner than chronic leukaemia, and chronic lymphatic leukaemia commoner than chronic myeloid leukaemia.

Important factors in the increase in the incidence of leukaemia in Western Europe, North America, and Australasia, and in the higher incidence of leukaemia in these countries than in Asia and Africa, are greater availability of medical care with consequent improvements in diagnosis and ageing of the population, leukaemia being more frequent in later life. It is nevertheless unlikely that these factors account for the whole of the increase, and the search for aetiological factors in leukaemia associated with the rise in the standard of living should continue.

Man-made ionizing radiations such as x rays can induce leukaemia, but there is no evidence that they can account for the considerable increase in notifications of leukaemia in the later age groups, which is largely of the chronic lymphatic type, whereas leukaemia after irradiation has so far been predominantly myeloid.

The risks of irradiation may be greater in the foetus than in the adult, and stringent precautions should be taken when x-raying pregnant women. These risks should be carefully balanced against the reduction in maternal mortality, stillbirths, and perinatal deaths which can be secured by the intelligent application of radiography.

Our recently discovered ability to provoke remissions in acute leukaemia, and the accelerating development of powerful chemotherapeutic remedies and new methods of administering ionizing radiations, have made it essential to organize therapeutic trials in leukaemia. Owing to the spontaneous variations in the course of the disease large numbers of cases are required for valid trials, which must therefore be organized on a co-operative basis.

Although we shall have to wait for further fundamental scientific discoveries before we can greatly modify the frequency and mortality of leukaemia, there is no doubt that current interest in the incidence of leukaemia and in new forms of therapy has contributed materially to the welfare of the unfortunate victims of the disease.

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TREATMENT OF STONE IN THE COMMON BILE DUCT

BY

JOHN HOSFORD, M.S., F.R.C.S.

Surgeon, St. Bartholomew's Hospital, London

There are few conditions so disappointing to patients and their doctors as a recurrence of biliary colic following an operation on the biliary tract. I am concerned not so much with the case in which there has been a simple cholecystectomy for stones and a stone has been overlooked in an unopened common duct, as with the case in which there has been a careful exploration of the duct and removal of stones or mud, and at a later date colic has occurred. There is no doubt that surgeons open the common duct much more often than they used to, perhaps because it is easier owing to better anaesthesia and the better general condition of patients, and perhaps owing to information gained from experience and possibly also from cholangiography.

When small stones or biliary mud have been sought and found it is easy to leave some more behind in the lower part of the duct or even in the upper part, be the search ever so careful. They may later pass into the duodenum, though they are more likely to remain in the duct and increase in size or amount and cause further trouble. This may take the form of pain and/or jaundice, or it may only show as recurring attacks of "chills" due to cholangitis. To repeat the operation of exploration and evacuation of the common duct alone is neither sound nor satisfactory, and it is wise to establish some larger opening from the common duct instead of the small lumen at Oddi's sphincter. This may be made at the lower end by some form of sphincterotomy (perhaps combined with a long-armed T-tube) or plastic operation on the duct, or it may be made higher up by a new anastomosis between the common duct and the duodenum. One of the purposes of putting forward this brief communication is to make a plea for the wider use of the latter operation—choledochoduodenostomy. Most surgeons will have done this operation a number of times, some very readily, others less readily, being uncertain of the later results. There are several points connected with the operation about which one may be anxious: whether duodenal contents will get into the common duct and cause infection or other trouble; whether stones or debris may collect in the part of the duct distal to the stoma and set up inflammatory changes or obstruct the main duct of the pancreas; or whether, indeed, the stoma may close.

I have been so well satisfied with the results of the operation over a period of some years that it seemed worth while making a few remarks about it. These are based on an experience of 21 cases.

The subject of division or injury of the ducts is not considered here, but only cases in which the duct is still intact but obstructed from within. Nor do I propose to argue here whether stones and mud found in the duct at a second operation were necessarily overlooked at the first, or whether they had formed since then. In all probability the correct answer is that it is sometimes one and sometimes the other.

It is not possible to give exact indications for the operation, but it is hoped that from the following account of one's experience and cases the place and usefulness of the operation may be gathered.

At first I did a choledochoduodenostomy only when there had been a previous operation and when the obstruction had recurred owing to biliary mud or sand; but since finding how good the results are I have done it as a first operation for common-duct stones when these were associated with much mud or sand, and particularly when the duct was thickened and somewhat rigid from inflammation as well as dilated from obstruction.

I have been most gratified with the singular freedom from symptoms these patients have afterwards. There is a free way between the duodenum and the common duct, as can be shown by a barium meal being seen to enter the biliary tree. A plain x-ray film of the region in many of these cases after operation shows the common duct, and sometimes branches of the hepatic duct as well, outlined by air. A "biligrafin" x-ray film does not show up the ducts, probably because it passes through them too quickly, but one can see the dye in the duodenum. I imagine that, provided fluid and solid particles can get out of the common duct as easily as they can get in, it does no harm and neither obstruction nor liver infection occurs: certainly the patients remain in good health without pain or jaundice or fever. The first part of the duodenum is probably sterile in healthy people on a normal diet.

Technique

There are certain points about the technique of the operation which I think are worth mentioning.

The common duct is approached by whatever route the surgeon favours, and this may, of course, be very difficult if there have been several previous operations on the duct. I usually use a modified Kocher's subcostal incision or a paramedian, and approach the duct from the antero-lateral aspect. I have no experience of the postero-lateral approach through the bed of the tenth rib, which is advocated by some surgeons in cases that are likely to prove difficult. If the common duct is largely covered over by the duodenum, as is sometimes the case in a virgin operation and frequently so in a second operation, the first part of the duodenum must be mobilized by careful dissection and drawn downwards, and the blood vessels which are usually present ligated and divided. If it is the type of case in which it is thought that choledochoduodenostomy may be required the duct is opened by the usual vertical incision, but this should be low down very close to the point where the duct passes behind the duodenum.

When the duct has been fully explored, and if it has been decided to do a choledochoduodenostomy, a vertical incision is made in the duodenum as shown in Fig. 1, the upper end of the incision being very close to the lower end of the incision in the common duct. If the edges of the opening in the common duct are held gently apart by stay sutures the anastomosis, which is done with interrupted sutures of fine catgut, is not difficult. The first suture joins the lower end of the incision in the duct to the upper end of the incision in the duodenum. Sutures are then put in on each side alternately from below upwards, each being

tied as it is put in and so arranged that the cut edges are inverted as shown in Fig. 2. The stoma is about 2 cm. in length, and six or seven sutures are placed on each side. A few reinforcing sutures are put in on each side through any

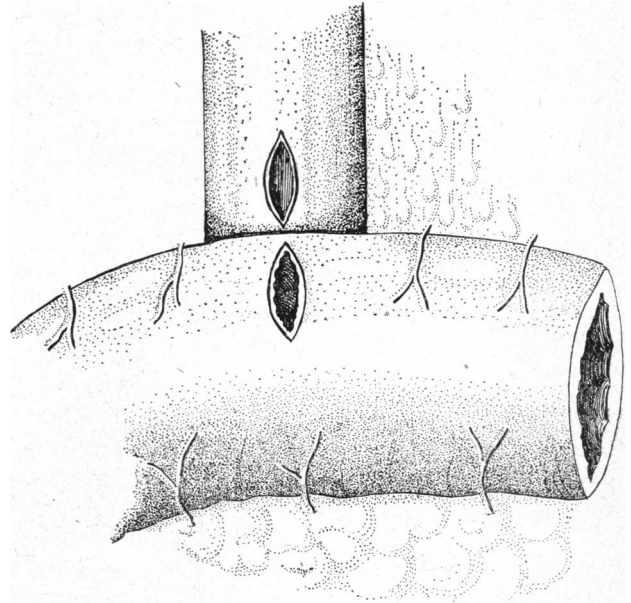


FIG. 1.—The vertical incisions in the common bile-duct and duodenum for a choledochoduodenostomy.

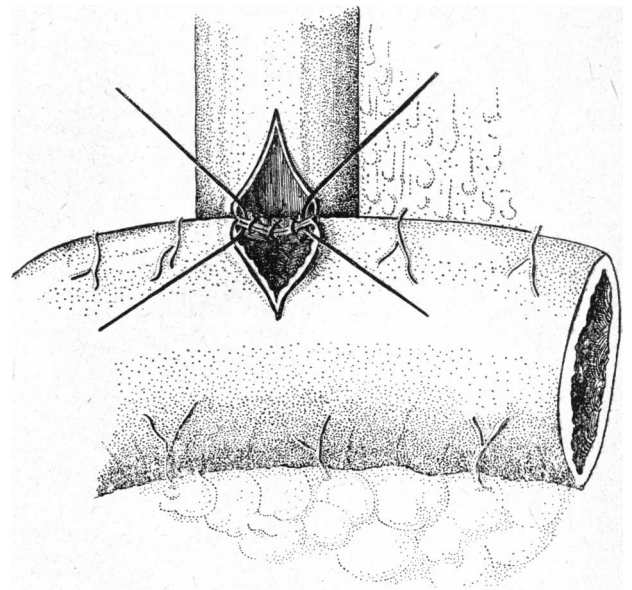


FIG. 2.—The first five catgut sutures placed in making the anastomosis.

conveniently placed tissue. A corrugated rubber drain is introduced through a stab wound down to the site of the anastomosis.

Most of the descriptions of this operation are of a horizontal stoma, the opening being placed transversely in the common duct, but I prefer the vertical stoma described above and have found it very satisfactory from the technical point of view as well as functioning well. What is more, when the operation is begun a decision on whether an anastomosis will be done or whether the duct will be closed or drained has not always been made, and the usual vertical stoma for the exploration of the duct can be used for the anastomosis provided it has been placed far enough down the duct adjacent to the duodenum.

Case Reports

Five out of the 21 cases are described. They have been chosen to illustrate different typical points: in three there had been previous operations on the biliary tract, and in two it was the first operation. The ages are those at the time of the choledochoduodenostomy.

Case A.—A housewife, aged 64, began to have attacks of biliary colic in 1930. In 1932 she was operated on elsewhere, but apparently it was possible to remove only a part of the gall-bladder, with stones in it, owing to extensive adhesions and inflammation. In 1939 she had attacks of jaundice and pain. At operation in November, 1940, the remains of the gall-bladder were removed and the common duct was opened. It was dilated, and stones and much mud were removed. A choledochoduodenostomy was performed. She had no further trouble until 1944, when she developed a carcinoma of the stomach which a colleague removed, doing a Billroth-I type of operation. She lived for another ten years, dying in 1954 with metastases in the liver at the age

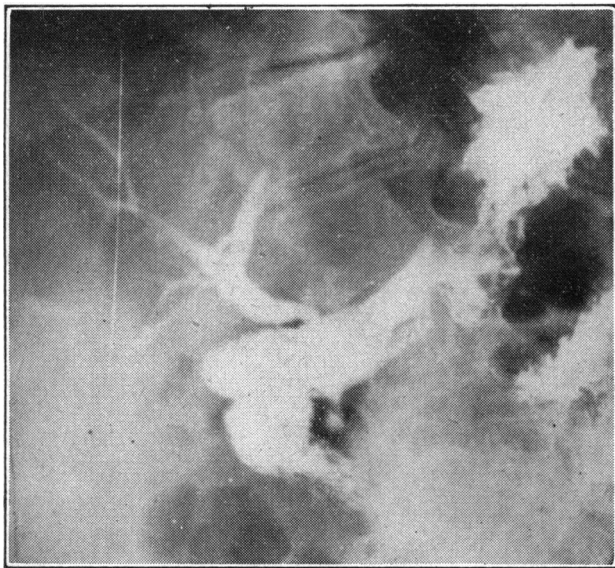


FIG. 3.—Case A. Radiograph following a barium meal 11 years after choledochoduodenostomy. Barium is clearly seen in the common bile-duct and smaller ducts higher up.

of 78. During the 14 years she lived after the choledochoduodenostomy she had no symptoms referable to the biliary system, and a barium meal examination 11 years after the operation showed that barium very readily entered the common duct (Fig. 3).

Case B.—A man aged 46, the manager of an English firm in Lisbon, had had occasional attacks of pain in the upper abdomen for three years; they were never very severe, but on one occasion had been accompanied by a shiver. There had never been any jaundice. He was a very fit man, and nothing abnormal was found on examination. Cholecystograms in 1947 and 1950 showed no filling of the gall-bladder, but in the 1950 films air could be seen in the bile passages in the liver, and a tentative diagnosis of a fistula between the gall-bladder and duodenum was made. Operation was performed in November, 1950. A dense mass of adhesions surrounded the gall-bladder and common duct. A fistula found between the shrivelled gall-bladder and duodenum was divided and the opening in the duodenum closed. The common duct was much dilated and thickened, and was filled with a soft stone about 1.5 by 3 cm. The lower part of the duct immediately distal to the stone was contracted. As this part had so thick and rigid a wall, and the upper dilated part was also thick and rigid from chronic inflammation, it was thought wise to do a choledochoduodenostomy. The patient made an uninterrupted recovery, and in 1955 he

wrote from Lisbon saying, "Since my operation I have enjoyed perfect health so far as my digestive organs are concerned."

This is an example of a choledochoduodenostomy being done at a first operation on the biliary passages. The large mass of soft stone in the duct had been able to form quite quietly, as there was an adequate escape for the bile through the gall-bladder into the duodenum.

Case C.—A very remarkable man of 87, a doctor of science who worked six days a week as a research chemist, was first seen in 1954. The history was that he had had an attack of obstructive jaundice in 1934 for which a cholecystostomy was performed. He remained well until 1953, when he had attacks of biliary colic and nausea. A cholecystectomy was performed elsewhere. The lower end of the common duct was said to be stenosed. In 1954 the pain recurred and he became jaundiced. At operation in February, 1954, a grossly dilated and thickened common duct was found to contain biliary mud and small stones. As the duct was large and thickened and it was the third operation on his biliary tract a choledochoduodenostomy was performed. His recovery was interrupted by a severe chest infection, but he got perfectly fit and returned to his full work six days a week. He has remained in excellent health, but as he is now in his 91st year he works only five days a week. In 1956 he enjoyed to the full the good fare provided on a Mediterranean cruise.

Case D.—A housewife of 72 began to have attacks of biliary colic, vomiting, and jaundice in 1949. In 1951 at operation a macroscopically normal gall-bladder without stones in it was removed. Several stones and some mud were removed from the common duct, which was then drained by a T-tube. She remained well until 1954, when there was a recurrence of pain and jaundice. At operation in August, 1955, the common bile-duct was so dilated that it admitted the thumb. A large stone and some mud were removed from the duct and a choledochoduodenostomy was performed. Apart from a mild infection of the wound with a coliform bacillus there was an uninterrupted recovery. She has remained well and free from symptoms since the last operation.

Case E.—A man aged 82, a retired confectioner, had an attack of mild upper abdominal pain followed by jaundice in January, 1955. In March, 1955, there was a return of the jaundice but no pain. A biligrafin x-ray film showed a very dilated common duct with filling defects in it. In April, 1955, at operation the gall-bladder was found to be small and to contain a few stones, and was removed. The common bile-duct was grossly dilated and had a thick wall; it contained much biliary mud and stones. A choledochoduodenostomy was performed. There was a clostridium infection of the outer end of the wound which cleared up well with penicillin. He has remained in good health apart from spinal arthritis, an old trouble of his.

This was a case in which it was thought right and proper to do a choledochoduodenostomy at the first operation, in view of the patient's age and the very dilated and thickened condition of the duct.

Results

A choledochoduodenostomy has been performed on 21 patients (12 men and 9 women) for obstruction of the common bile-duct by stone or biliary mud. In all the cases the duct was dilated, and in most of them it was thickened and rigid. Sixteen of the patients had had one or more previous operations on the biliary system, but in five cases there had been no previous operation. One patient died from a massive pulmonary embolus on the fourth day after the operation: the other patients all left hospital well recovered from the operation. One, aged 73, died suddenly from coronary thrombosis five months after the operation. Most of the patients were rather old, the average age being 66. Two men were over 80, one being a remarkably sprightly doctor of science who was 87 at the time of the operation (Case C) and another was 82 (Case E). The youngest was aged

46 (Case B). As the majority of the patients were in an old age group it is not surprising that three more have died, 15 years, 4 years, and 2 years respectively after the operation, apparently from conditions unassociated with it.

There were no particular complications in the post-operative period. In four of the cases there was some infection of the abdominal wound. In one the organism was a clostridium: the patient was not ill with it, but it delayed healing of the wound by about 10 days.

In none of the cases was there any apparent leakage at the anastomosis.

I have been a little surprised at the freedom from symptoms shown by these patients since operation. None has had jaundice or chills. A few have had some abdominal discomfort occasionally, and one man who had had four operations in all had a severe pain lasting three to four hours ("just like my old pain") 16 months after his choledochoduodenostomy. Three patients noticed a slight dragging feeling in the right hypochondrium after a big meal: whether this was due to distension of the common duct, to a pull on the anchored duodenum, or to adhesions it is impossible to say.

There are no apparent digestive or duodenal symptoms following this operation. Three patients said their motions were looser than previously.

In a number of cases, post-operatively, air can be seen in a large part of the biliary passages. A barium meal can be seen to go into the ducts for a considerable distance, but it soon comes out again. In one of the patients, who had a barium-meal examination post-operatively, the radiologist made the interesting observation: "Barium meal: in the erect film the biliary tract is outlined by air. As soon as the patient was placed in the supine position, the barium refluxed up the bile duct, which is rather dilated." One wonders whether this observation by the radiologist should prompt us to advise patients who have had a choledochoduodenostomy not to lie down after a meal until sufficient time has elapsed to allow the stomach to empty. I have not done so. Another thought that has passed through my mind is whether mud or stone forms in the duct distal to the anastomosis or whether food collects there. I do not know the answer to this; but trouble, so far as fresh symptoms are concerned, does not seem to arise.

Conclusions and Summary

A vertical, supraduodenal choledochoduodenostomy is an operation which gives good results with a surprising freedom from symptoms afterwards.

It is very valuable in cases in which there are recurrent stones or biliary mud in a thickened, dilated common bile duct when previous operations have been done.

It is also probably sound practice to do the operation in any patient in whom the duct, in addition to being dilated from obstruction by stones, is thickened and rigid from chronic inflammation, even though no previous operation has been done. It is not advised when the duct appears healthy, even though it contains stones.

Twenty-one cases in which this operation has been performed for stone are referred to.

Some points in the technique of the operation are mentioned.

The results and post-operative radiographic appearances are discussed.

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MASS SPECTROMETRY APPLIED TO CLINICAL PRACTICE AND RESEARCH

BY

K. T. FOWLER,* M.Sc.

Physicist, Biophysics Laboratory, Postgraduate Medical School of London, London, W.12

AND

P. HUGH-JONES, M.D., M.R.C.P.

Lecturer in Medicine, Postgraduate Medical School of London, London, W.12; Member of External Staff, Medical Research Council

Defects in the function of many organs in the body may be detected by chemical analysis of blood or of secretions, such as gastric or intestinal contents, faeces, or urine. The collection of specimens for such analyses can be done by nurses or technicians, and their analysis is usually accepted as a routine by departments of clinical chemistry.

The situation is quite different in testing lung function. Impairment of the lungs' action as a bellows can be assessed from study of their ventilatory reserve by measuring the maximum breathing capacity either directly, by asking the patient to hyperventilate maximally for a given period of time, or indirectly from a spirometric tracing of a single forced expiration. This measurement is relatively simple and is becoming an accepted clinical investigation; nevertheless it requires trained observers. But the study of defects in pulmonary gas exchange usually demands analysis of expired gases. The taking of gas samples for such analysis, either at a specific time in the breathing cycle or from a collection of gas expired over even a short period of time, requires intricate or bulky apparatus, while the established methods of chemical analysis of the gases so collected are tedious, time-consuming, and beyond the routine capacity of many laboratories. Before most of the tests of defects in gas exchange can be accepted as part of routine clinical study simpler and more rapid techniques of gas sampling and analysis are needed.

Automatic gas-analysers such as the infra-red analyser for carbon dioxide or carbon monoxide, the spectrophotometric nitrogen analyser, the para-magnetic oxygen analyser, the katharometer for helium or nitrous oxide, etc., have simplified some of these tests sufficiently for them to be performed routinely in specialized laboratories. But advances have been limited, and the problems of gas sampling have remained because none of these instruments, except the nitrogen meter and some forms of infra-red carbon dioxide analyser, can continuously record the changes in gas concentration occurring within the breathing cycle. Their response time is too slow and the gas flow required for their operation is too large a fraction of the total breath expired. Moreover, each instrument can estimate only one gas, whereas simultaneous analyses of several gases is required for many purposes.

It has long been realized by workers seeking new methods of gas analysis that the mass spectrometer is a versatile instrument, theoretically capable of overcoming

*Working with the aid of a grant from the Medical Research Council.