Observations

ON

SURGICAL DISEASES OF THE BILIARY TRACT*

BY

D. P. D. WILKIE, M.Ch., F.R.C.S.

PROFESSOR OF SURGERY IN THE UNIVERSITY OF EDINBURGH

Much interest has been aroused of late years in the changing incidence of certain diseases. Chlorosis and muco-membranous colitis are now seldom met with. Streptococcal infections, on the other hand, would seem to be on the increase. Peptic ulcer and biliary disease have assumed increasingly prominent places in the list of diagnosed diseases. It is doubtful, however, whether there has been a real increase in the prevalence of biliary infections and gall-stone formation; it is more probable that a growing appreciation of the significance of such disease, and a recognition of the symptoms to which it gives rise, have focused the attention of the medical profession and of the public on these very prevalent maladies.

In the great majority of cases the disease appears to start in the gall-bladder and to affect the ducts as a sequel. We now know that certain types of gall-stone may form as the result of disordered metabolism and, possibly, of dyskinesia of the biliary passages independent of recognizable bacterial infection—for example, the single cholesterol stone and the multiple pure pigment stones. Sooner or later infection is superadded, more especially if the outlet from the gall-bladder becomes occluded by a stone. Infection of the gall-bladder is very common, and is often followed by gall-stone formation. The infection is usually intramural in type, and is probably blood-borne. Certain bacteria have a predilection for the gall-bladder—namely, the streptococcus, *B. coli*, and *B. welchii*, in order of frequency, the latter two particularly in acute infections associated with blockage of the cystic duct.

Apart from the symptoms caused by the local pathology, gall-bladder disease is of importance by virtue of the many and varied complications which may result from it. Those due to the presence of stones include empyema of the gall-bladder from obstruction of its duct, arrest of a stone in the common bile duct with its resultant changes, carcinoma of the gall-bladder, and intestinal obstruction due to arrest of a large stone which has ulcerated through into the duodenum.

The grave interference with health, to which a stone in the common bile duct may give rise, need not be emphasized. The prevalence of carcinoma of the gall-bladder has, I believe, however, been under-estimated. Out of a total of 987 operations on the biliary tract I have encountered carcinoma of the gall-bladder in thirty-one cases, and in every case there were gall-stones present. In two cases, in which a previous cholecystostomy had been performed for acute disease, and in which gall-stones had been removed, I found at the second operation a recurrence of gall-stones and, in addition, carcinoma of the gall-bladder wall.

Many complications depend on the infection of the gall-bladder wall and not on the presence of stones. Chronic pancreatitis is a not uncommon complication. Certain cases of hepatic cirrhosis have cleared up after removal of an infected gall-bladder. Much more important, however, are the distant toxic effects on heart muscle, joints, intermuscular fibrous tissues, and kidneys. The proof of the relationship has been the striking improvement which has resulted in a large number of cases of disease of the above-mentioned tissues following the removal of a chronically infected gall-bladder.

Surgery of the gall-bladder may therefore have one or more of three main indications.

1. To deal with an organ which is giving rise to troublesome local symptoms.
2. To remove a focus of infection causing metastatic trouble in distant organs and tissues.
3. To remove a diseased organ which is potentially malignant.

DIAGNOSIS

Where typical biliary colic has occurred repeatedly diagnosis presents little difficulty. When chronic dyspepsia of a flatulent type is the main complaint our suspicions turn to the gall-bladder. We may find an intolerance to cooked fats, a history of ache in the right shoulder-blade, and, on examination, a definite subcostal tenderness, and a tender spot over the ninth intercostal nerve in the scapular line.

In the great majority of cases of gall-bladder disease we can, from a careful clinical examination, come to an accurate diagnosis. In a certain number of cases symptoms referable to the gall-bladder are complained of and no organic disease, but merely a dysfunction of the organ, is present. Newman has lately focused attention on these cases, so carefully studied by Westphal. All surgeons must acknowledge that on not a few occasions, after making a confident diagnosis of organic biliary disease, they have exposed a gall-bladder showing no evidence of infection and devoid of stones. The use of cholecystography and of the duodenal tube has greatly reduced the number of such mistakes.

Schmieden has devoted much attention to the so-called "stasis gall-bladder" which may give rise to attacks of pain resembling biliary colic, and may be due either to mechanical kinking of the cystic duct or to spasm of the gall-bladder neck or of the sphincter of Oddi, the result of a disturbance of the sympathetic nervous system. In all such cases medical treatment should be given a prolonged trial before surgical intervention is considered.

We must remember also that in the female duodenal ulcer may simulate biliary disease closely, hence the importance of employing the special diagnostic methods as adjuvants. A dye test, followed by a barium meal, will give evidence as to whether the gall-bladder is functioning, and may show up translucent stones; the barium meal may show definite deformity of the duodenal cap, indicating ulcer, and this, with a normal gall-bladder shadow, may modify the original diagnosis.

My experience is that, in the female, gall-bladder disease is now frequently diagnosed where the seat of trouble is in the duodenum, there being a widespread impression that whereas cholecystitis is a frequent ailment in the female, duodenal ulcer is rare. This is not the case. My own figures for the past twelve years for female patients are: cholecystitis and gall-stone cases 747, duodenal ulcer 202 (a ratio of 3.6 to 1). In over 10 per cent. of the duodenal ulcer cases the primary diagnosis had been cholecystitis.

It must always be borne in mind that biliary lesions are not uncommonly associated with disease in the appendix and, although less frequently, with peptic ulcer. In quite an appreciable number of cases all three lesions may be present and active—the abdominal triad. The clinical picture in such cases may be confusing if the association be not borne in mind. I have had to deal with thirty-one cases in which all three lesions were present.

INDICATIONS FOR OPERATION

Recurring biliary colic is perhaps the most frequent incentive to seek surgical relief. It may be the only symptom, as in cases of the single cholesterol stone, but more commonly there is accompanying dyspepsia of a

[3799]

* Read in opening a discussion in the Section of Surgery at the Annual Meeting of the British Medical Association, Dublin, 1933.

flatulent type and persistent subcostal uneasiness. Radiological investigation demonstrating the presence of calculi or of a non-functioning gall-bladder is a necessary prelude to operation in this group of cases.

Chronic dyspepsia is now recognized to be due more frequently to biliary disease than to any other single cause. The chief complaint is flatulence and bloating, coming on very early after meals, greatly aggravated by fried and greasy foods, and sometimes accompanied by a dull, aching pain in the right scapular region. Such chronic dyspepsia may, or may not, be punctuated by attacks of biliary colic. Such a history should suggest a purposive examination for evidence of gall-bladder disease, and, if this be positive, operative intervention should be considered.

Acute Obstructive Cholecystitis.—The characteristic clinical picture in the case where the gall-bladder is infected and its outlet obstructed is familiar to all. The fever, dirty tongue, the catch in the breathing, the boarded and tender upper right quadrant of the abdomen, and the faint icteric tinge, all proclaim the diagnosis. In the majority of cases an expectant attitude is justified until the acute symptoms have subsided. This takes on an average a week to ten days. Operation should then be undertaken and should be cholecystectomy. In certain cases, and particularly in elderly subjects, if symptoms show no signs of subsiding within forty-eight hours of the onset of the attack, operation should not be delayed. In such cases, under "twilight sleep" and local anaesthesia, the gall-bladder should be exposed, opened, the obstructing stone dislodged, and drainage established. Cholecystectomy during this acute toxic phase, with its associated hepatitis, is by no means free from risk. In quite a high percentage of such cases *B. welchii* is the infecting organism.

Stone in the Common Bile Duct.—This should be regarded as one of the complications of gall-stone disease. The clinical picture is a very variable one. Where the typical "Charcot syndrome," with its recurring colic, with rigors, jaundice, and loss of weight, is present, diagnosis is easy. In some cases, however, no history of typical biliary colic is obtainable. Jaundice may be so slight as to have escaped notice, and vague discomfort with dyspepsia and loss of weight may be the only symptoms. In other cases, following relatively mild pain, a progressive jaundice may develop, suggesting rather an obstruction of the duct by malignant disease. Wherever there is a reasonable suspicion of stone in the duct operation should be advised. Delay invariably leads to serious, and sometimes irretrievable, damage to liver and pancreas. In approximately 20 per cent. of the cases on which I have operated for stone in the common duct a previous operation for gall-stones had been performed, usually through an inadequate incision. No operation on the biliary tract, with the exception of the emergency operation for fulminating, obstructive cholecystitis, should be considered complete which does not expose the common bile duct. If the latter be dilated or thick-walled it should be first punctured with a fine needle, and if the bile show turbidity the duct should be opened and explored. Repeatedly I have discovered one or more small calculi at the lower end of the duct, concealed by some thickening of the head of the pancreas.

DISTANT TOXIC EFFECTS

In some cases the extirpation of an infected gall-bladder may be called for because of symptoms of secondary mischief elsewhere.

Cardiac Symptoms.—In many cases of gall-bladder disease breathlessness, palpitation, and cardiac arrhythmia are present. In some cases the cardiac disturbances would appear to be reflex in origin; in others, in obese and

flabby subjects, a fat-laden heart may account for the symptoms, but in a few cases a definite toxic myocarditis is almost certainly present. In a number of cases, where the factor of obesity was not present, I have removed an infected gall-bladder which was causing relatively little in the way of local symptoms, but was associated with marked evidence of myocarditis. The results in these cases have been most gratifying, and in three cases the patients have been restored from chronic invalidism to a life of activity.

Articular Manifestations.—In some cases of so-called rheumatoid arthritis a diseased gall-bladder may be the focus of infection. In a few cases I have seen a remarkable disappearance of joint symptoms after the removal of a chronically inflamed gall-bladder. The association is not a very common one, but is sufficiently well established to warrant an investigation of gall-bladder function in cases of rheumatoid arthritis where other efforts to find an infective focus have failed.

Fibrositis.—In a follow-up of cases after cholecystectomy a striking feature is the number of patients who volunteer the information that the most gratifying result of the operation has been the betterment in their "rheumatism." This has usually been of the fibrositic type. Complaint of recurring fibrositis may therefore be one of the factors which weigh in favour of operation in a patient in whom the local biliary symptoms may not, of themselves, seem clearly to demand it.

Renal Disease.—A causal relationship between gall-bladder infection and nephrosis or nephritis is not generally conceded. In a few cases, however, the association would appear to be undoubted. Following one case, diagnosed as nephrosis, with pronounced albuminuria and general anasarca, which was associated with a suppurative cholecystitis, and which resisted all treatment until cholecystectomy was performed, the albuminuria and anasarca disappearing rapidly after operation, I have operated on three patients in whom marked albuminuria was the outstanding symptom. In two of these cases the renal condition improved rapidly after the removal of the infected gall-bladder; in the third case the improvement was only temporary. In all four cases a streptococcal infection of the gall-bladder was present.

Carcinoma of the Gall-Bladder.—This is one of the most serious complications of gall-stones, and is usually fatal in spite of operation. I have met with thirty-one cases of carcinoma of the gall-bladder. In only five of these was the disease operable, and in all fatal recurrence took place within two years. In all thirty-one cases gall-stones were present, and, from the histories, appeared to have antedated the malignant disease, in most cases by many years. A timely cholecystectomy might have anticipated the onset of malignancy. This consideration should be kept in mind when gall-stones have been diagnosed and the question of operation is under discussion.

PREPARATION FOR OPERATION

If biliary surgery is to be made safe for the patient strict attention to preparatory treatment is imperative. Many of the subjects are obese, flabby, and breathless, and a course of dieting and training is required to tone them up for operation. In the stout female a three-months course of dieting and daily outdoor exercise will usually reduce her weight by two stone, and render operation relatively easy and safe. If dental sepsis be present it is attended to during this period. Where stone in the duct is diagnosed, and cholangitis is present, a course of urotropine will diminish infection. If jaundice is moderate or slight and has followed a rigor and febrile attack, it is well to wait until it has, in part at least, subsided. This period can be usefully employed by restoring the body fluid reserve and supplying glucose. There is little

danger of haemorrhage following operation in a case of waning jaundice. When the jaundice is progressive and evidence of hepatic insufficiency is present, generous supplies of fluid and glucose, preliminary injections of calcium chloride and sodium citrate, and a blood transfusion are called for. If biliary obstruction be complete and the jaundice is daily becoming more intense the preparation must needs be short and intensive.

OPERATION

The best anaesthetic, in my experience, is gas and oxygen, supplemented by ether and combined with local anaesthesia of the abdominal wall. Spinal anaesthesia, although giving perfect relaxation, is not without danger in biliary surgery.

The main desideratum is free exposure, so that the whole pathology may be assessed and dealt with under full vision. For the average case the oblique subcostal incision gives easiest access. A complete exploration of the biliary tract, of the stomach and duodenum, and of the colon and appendix should be made. When the disease is limited to the gall-bladder cholecystectomy is the operation of choice, for the reasons already referred to.

The cystic duct and artery should be ligated separately and in continuity, well away from the common bile duct and the right hepatic artery. Injury to the latter is the most serious mistake which can be made. When stone in the common duct is present, the intensity of jaundice will determine the operative procedure. There are very few stones which cannot be safely removed by forceps through an opening in the supraduodenal portion of the duct. If there has been complete obstruction, associated with deep jaundice and severe backward pressure on the liver, particularly if the duct be distended with colourless fluid—white bile—and the stone be firmly impacted, discretion will dictate simple drainage of the duct, leaving the removal of the stone to a second operation, when jaundice is relieved and hepatic function restored.

In all cases in which stones have been removed from the common duct, drainage of the duct should be established. The gall-bladder should be removed unless this addition to the essential part of the operation seems to add appreciably to the risk—for example, when marked jaundice is present. When there is pronounced thickening of the head of the pancreas, and the gall-bladder is not sclerosed and contains bile, it is good practice to anastomose the gall-bladder to the duodenum after draining the common duct.

The most difficult decision to make is when, in a patient who has had recurring attacks of colic and in whom a dye test has given no gall-bladder shadow, a distended gall-bladder, showing no gross evidence of inflammation and containing no stones, is exposed. The surgeon is tempted to compromise by draining the gall-bladder in such cases. This practice is, in my experience, valueless. If no other pathological condition, such as an inflamed appendix or a duodenal ulcer, be disclosed it is wiser to remove the gall-bladder. It will frequently be found to be the seat of early cholesterosis. In several instances complete freedom from symptoms has followed cholecystectomy in this type of case.

POST-OPERATIVE TREATMENT

The post-operative course following cholecystectomy is usually uneventful, except that vomiting is more frequent than after most abdominal operations. When it does occur fluid and glucose should be given in plentiful amount by rectum. Chest complications are relatively rare, particularly if an oblique or transverse abdominal incision be used and CO₂ inhalations be given at the conclusion of the operation and at intervals during the first few hours thereafter.

The jaundiced and cholaemic patient requires especial care. Large quantities of fluid and glucose are essential. Where liver function is flagging heat applied by a diathermy apparatus through the lower thoracic region will sometimes promote hepatic activity. The tendency to capillary oozing in the intensely jaundiced patient is best dealt with by small, repeated blood transfusions, and by calcium chloride.

When external drainage of the common bile duct has been established in common duct cases the tube should be clipped for the space of one hour several times a day. This improves digestion and prevents silting of biliary sand in the lower part of the common bile duct.

As pulmonary embolism is the complication most to be feared, active movements of the limbs should be encouraged from the day of operation in all cases.

OPERATIVE MORTALITY

The death rate of operations on the biliary tract depends largely on the presence of complicating factors, such as intense jaundice or subacute pancreatitis, but also on the care in selection and preparation of patients, and on gentle handling and avoidance of injury to hepatic ducts and vessels, obtained by free exposure and full visualization of the operative field.

The chastening exercise of reviewing the causes of death in the fatal cases in one's practice has convinced me that, while some cases were forlorn hopes, in quite a number death was due to avoidable mistakes in judgement, in preparation of the patient, in choice of anaesthetic, and in technique. For example, death resulted in one instance where cholecystectomy was superadded to an intestinal resection, clearly a mistake in judgement. In one case, in which a small fibrosed gall-bladder was removed with difficulty, the right hepatic artery was inadvertently ligated. In one case haemorrhage was the cause of death; a small lateral wound having been made in the cystic artery proximal to the ligature. One patient died of cardiac failure with sudden fall of blood pressure under a spinal anaesthetic.

The cheerful side of the picture, however, is to discover that with increasing experience the death rate has steadily diminished. Thus in the six-year period 1921-7 there were 187 cholecystectomies with six deaths, whilst in the six-year period 1927-33 there were 341 cholecystectomies with five deaths, or 1.4 per cent.

When we come to consider cases with stone in the common duct the operative risk is considerably greater, no matter how careful the preparation. Thus of 130 cases in my practice there were twelve deaths, or a mortality of 9.2 per cent. In many cases the patients had been allowed to drag on for months with jaundice, accompanied by rigors and loss of weight, and were therefore poor subjects for surgery. In eight of the twelve fatal cases the common duct was distended with white bile. In some of them it would undoubtedly have been wiser merely to open and drain the duct. Even then it is questionable whether the cholaemia would have been survived. These must be regarded as neglected cases, of grave import, and are in a separate category from that of the slightly jaundiced patient in whom, with adequate preparation and gas-and-oxygen anaesthesia, operation has a mortality rate hardly exceeding that of cholecystectomy.

Where stone in the duct is diagnosed timely operation is imperative and is not dangerous.

LATE RESULTS

The late results of cholecystectomy for gall-stones are disappointing. Whilst many patients regain good health, some have recurrent mucocele of the gall-bladder from a small stone or stones having been left in the cystic duct; I have operated on twelve such cases. In a number of

patients—cured of their colic—indigestion, flatulence, and occasional subcostal aching remain. Recurrence of stone occurs in at least 7 per cent., and malignant disease may supervene as in two of my cases.

After cholecystectomy the results are good in 70 per cent. of cases. In general terms it may be stated that the grosser the pathology the better the result after operation. The most gratifying results of all are found after cholecystectomy for subacute obstructive cholecystitis. Over 90 per cent. of patients in this group express themselves as cured. Flatulence and an intolerance of cooked fats remain after operation in approximately 20 per cent. of patients. A few patients complain of occasional attacks of diarrhoea. Improvement in general health and energy, and freedom from former rheumatic pains, are the common tribute of the majority of patients.

The most striking improvement occurs in patients from whom stones have been removed from the common bile duct. From a life of semi-invalidism they are usually restored to robust health. However, in a few cases, where a subacute pancreatitis is present or where cirrhotic changes in the liver have developed, improvement after operation is slow, incomplete, and disappointing.

I shall refer but briefly to the reconstructive surgery of the common bile duct, as my experience of it has been

relatively small. It is a tribute to biliary surgery in this country that I have had to deal with only three cases of fistula from, or stenosis of, the common duct due to operative trauma. In all three cases the first operation had obviously been performed through an inadequate incision, and the cystic duct must have been clamped blindly. The moral is that unless the surgeon is prepared to expose the parts fully and to assess and deal with the whole pathology present he had better not embark on biliary operations.

SUMMARY

1. Surgery has a wide field of usefulness in diseases of the biliary tract.
2. With modern methods of diagnosis biliary disease can be detected in its early and curable stage.
3. Surgery, when timely, is curative and safe.
4. Free access with complete assessment of pathology is the watchword of biliary surgery.
5. Biliary disease has manifold and serious complications. In late and complicated cases only by great care in the preparation of patients for operation, by a minimum of anaesthetic poisoning, and by gentle and restrained surgery can intervention be made reasonably safe.
6. The late results of biliary surgery are, with a few exceptions, extremely good.

SOME EXPERIENCES OF SYMPATHECTOMY IN ANTERIOR POLIOMYELITIS

BY

E. D. TELFORD, M.A., B.Ch.Camb., F.R.C.S.

PROFESSOR OF SYSTEMATIC SURGERY, UNIVERSITY OF MANCHESTER

AND

J. S. B. STOPFORD, M.D., F.R.S.

PROFESSOR OF ANATOMY, UNIVERSITY OF MANCHESTER

(With Special Plate)

The unfortunate victim of severe acute anterior poliomyelitis has not only to contend with his paralysis, but may suffer much distress from coldness of the affected limbs, with persistent and severe chilblains. From these causes he may be incapacitated during long periods, especially in the winter months. One of us (E. D. T.) has charge of a very large number of these cases in a cripples' day-school, and the inquiry on which this paper is based was undertaken in the attempt to discover any measure which might help to diminish the distress from which these patients suffer.

It is necessary in the first instance to try to understand why the limb of old anterior poliomyelitis is blue and cold. In this matter we found little help from the existing literature; the condition, so far as we have been able to find, has been tacitly accepted without inquiry or explanation. It seems evident that the direct cause of the blueness, coldness, and other vascular disturbance is the fact that not only is a smaller amount of blood entering the limb, but it is leaving the limb less readily than in a normal extremity. The diminished inflow is a later development, and, in our view, the primary circulatory defect is impairment of the venous drainage. The blueness is the result of the presence of dilated capillaries and venules containing venous blood, and is secondary to the slow return of blood by the veins. Pressure of the finger produces a blanched area, which on release of the pressure quickly fills up from all sides. This appearance has been very aptly described by Krogh as a "subcutaneous lake of blue ink."

For the purpose of investigation a number of patients were selected in whom the paralysis of the lower limbs was strictly unilateral. By this means a sound limb and

a paralysed one could be tested and the results compared in the same patient. When both lower extremities of such a patient are baked in a radiant heat bath and the surface temperature recorded during the process, it will be found that the paralysed limb "heats up" more quickly than does the healthy one. If both limbs are exposed for twenty minutes to a temperature of 50° C. and are then allowed to cool at ordinary room temperature, say 22° C., it is found that the paralysed limb will cool much more slowly than the healthy one. The following is a typical example taken from a series.

A boy, aged 12 years, who had had acute anterior poliomyelitis since the age of 5, had total paralysis of the right lower extremity, the left limb being normal. The surface temperatures taken in a room at 22° C. were: right foot 27° C., left foot 31° C., a difference of 4° C. Both limbs were baked for twenty minutes at 50° C. and then removed from the machine. Five minutes later, the room being still at 22° C., the temperature of the right foot was 31.3° C. and of the left 34.3° C.: difference 3° C. When examined twenty minutes after removal from the machine the temperature of the right foot was 28.9° C. and of the left 30.6° C., the difference then being 1.7° C. These figures show that the temperature of the normal limb at the end of twenty minutes had actually fallen 0.4° C. below the pre-baking temperature, while that of the paralysed limb was still 1.9° C. higher than it was before baking.

These observations would indicate that less blood is flowing through the paralysed limb than through the normal limb in the same time. It is as if two radiator shells had been heated to the same temperature and a current of fluid then passed through each radiator, the fluid being at equal temperatures but passing at different rates. That radiator in which the current was slower would cool less quickly.

ARTERIAL DEFECT IN THE PARALYSED LIMB

Direct evidence that a lesser quantity of blood does reach a paralysed limb is strikingly afforded by observations we have made on the main arterial trunks during the operation of lumbar sympathectomy in these patients. The main arteries in a limb severely paralysed for a considerable period will be found to be very much smaller in calibre. In a girl of 22, who was suffering from a total but strictly unilateral palsy of one lower extremity, dating from the age of 18 months, we found, during the per-