An Address on SOME ASPECTS OF GALL-BLADDER DISEASE.

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(With Special Plate.)

DURING the past few years the importance of gall-bladder disease has become more and more fully recognized. There is still, however, a widespread belief that gall-stones constitute the important, if not the essential, element in such disease, and a clinical diagnosis of cholecystitis is confined by many to those acute attacks of obstructive cholecystitis which are apt to supervene when a gall-stone becomes impacted in the cystic duct or the neck of the gall-bladder. Many years ago Moynihan drew attention to a group of symptoms which he termed the inaugural symptoms of gall-stones. These symptoms—flatulence, nausea, epigastric discomfort, etc.—he showed were frequently present for a long period before attacks of colic proclaimed in classical terms the presence of one or more calculi. We now know that these inaugural symptoms are those of chronic cholecystitis, which may or may not go on to stone formation.

Gall-stones are so common, so many people harbour them for years and die with them, without apparently suffering any very serious trouble, that many medical men are inclined to regard lightly such evidence of biliary disease, and to encourage an expectant attitude unless intolerable attacks of colic render a patient's life a burden.

The more I see of biliary disease, the more convinced I become that it is practically never harmless, and that, after years of bearable discomfort, many patients eventually succumb from disease which is either directly or indirectly due to long-standing biliary infection. This is particularly true of patients in comfortable financial circumstances, for they tend to spend years in trying "cures" which those of the hospital class, fortunately for themselves, cannot afford. It is only right to state that the responsibility for the failure to deal in a timely or an adequate manner with this common disease rests mainly with those whose duty it is to teach the medical undergraduate. Such conflicting views have been expressed, not only in regard to the frequency and importance of the condition, but also in regard to the nature of the infection, that no clear picture of the disease is held, and uncertainty here, as elsewhere, leads to empiricism, and thus to indefinite delay.

NATURE OF GALL-BLADDER INFECTIONS.

Certain organisms can grow in bile, notably the *Bacillus coli* and the typhoid bacillus. These two organisms have, on many occasions, been recovered from inflamed gall-bladders, particularly during acute attacks, and there is still a widely prevalent belief that one or other of them plays the leading part in the etiology of cholecystitis. This view, which I hope to show is entirely erroneous, has encouraged the belief that agents which stimulate a flow of bile to wash out the gall-bladder, or are excreted in the bile and may possibly disinfect it, are of value in the treatment of cholecystitis.

It is now some years since Rosenow reported his remarkable series of observations and experiments on cholecystitis. From the walls of a large number of diseased gall-bladders he was able to cultivate a streptococcus which, on injection into animals, appeared to have a selective affinity for the gall-bladder. Rosenow's results were received with scepticism, and many authorities, failing to find in the bile or in portions of the walls of obviously diseased gall-bladders the streptococcus which he described, disregarded his work, and have based their opinions and their teaching

on the types of organism which they have, in their own experience, been able to cultivate in cholecystitis cases. It is a significant fact, however, that so many observers have failed to grow any bacteria from either the bile or the gall-bladder wall in a large proportion of their cases of cholecystitis.

In my own experience I was impressed by the fact that, whilst the bile and gall-bladder wall proved so often to be sterile on culture, yet stained sections of the wall revealed the presence of streptococci in the submucous coat. There evidently was present an intramural infection by a streptococcus which did not grow readily on most media.

Illingworth, working in my clinic, was able to show that, using Rosenow's special medium, streptococci could be grown from the wall of the gall-bladder in quite a large percentage of cases in which the bile was sterile. He further showed that organisms of the *coli* group are relatively infrequent except in acute suppurative cases.

This work has been carried a step further by Dr. A. L. Wilkie, who has shown that cholecystitis is almost invariably an intramural streptococcal infection, and that Rosenow's contention of a selective affinity of this organism for the gall-bladder in experimental animals is strikingly true. Wilkie has shown that in over 85 per cent. of cases of chronic cholecystitis, usually associated with gall-stones, the streptococcus can be recovered in pure culture from the cystic lymph gland through which the lymph from the gall-bladder drains. In a smaller percentage of cases he has grown the same organism from the submucous coats* of the gall-bladder if no bile has been allowed to come in contact with the tissue taken for culture. He has brought to light the illuminating and remarkable fact that bile inhibits the growth of this streptococcus. Hence, when a clipping of the whole thickness of the gall-bladder wall is taken for culture, the bile adhering to the mucous coat prevents the growth of the streptococcus present in the submucosa. This fact accounts for the widespread failure to confirm Rosenow's findings.

Even Judd, working under the most favourable conditions, got a positive result in cultures of the gall-bladder wall in only 29 out of 100 cases, and in only 5 out of 22 specimens of strawberry gall-bladder. In only 7 per cent. of his cases of cholecystitis was a positive culture obtained from the bile (3 streptococci, 3 spore-bearing bacilli). In no case were typhoid bacilli found, although in 21 cases there was an antecedent history of typhoid fever. *B. coli* was conspicuous by its absence in the whole series. In only 2 cases out of 52 did Wilkie find the *B. coli*, and in both an acute obstructive cholecystitis was present. It was, therefore, probably a secondary infection.

Following the injection of a suspension of streptococci, obtained from a human gall-bladder, into the ear vein of a rabbit, Wilkie found that the animal developed a chronic progressive cholecystitis, whether the cystic duct was patent or was ligated. The organism evidently reaches the gall-bladder by the blood stream, causes an intramural infection, the bile remaining sterile, and from the gall-bladder wall the organisms are absorbed by the lymphatics. Hence the importance of the gall-bladder as a nidus of focal infection.

Medical treatment of cholecystitis, to be rational, therefore, must be aimed at this intramural streptococcus, attacking it through the blood stream—for example, by vaccine or by some agent which is absorbed by the gall-bladder and passes through its wall; but so far we know of no such agent. Drugs which merely disinfect the bile cannot be expected to have any real value, as the bile, in the vast majority of chronic cases, is sterile.

The necessity for surgical treatment in chronic cases becomes obvious, and this treatment should consist in removing the diseased wall where the infection is located, not merely in draining the lumen of the gall-bladder.

RELATIONSHIP OF CHOLECYSTITIS TO GALL-STONES.

Whilst infection of the gall-bladder and gall-stones are usually found together, and whilst most evidence points to the infection as the primary factor, yet we have always

* As Halpert has shown, the gall-bladder has no true submucous coat such as is found in the stomach and intestine. The term is used for convenience to indicate the coats outside the lining mucous membrane.

* The address was illustrated with lantern slides

believed that there are two types of gall-stone which are metabolic in origin—namely, the single pure cholesterol stone and the multiple pure pigment calculi. The former, found often in an apparently normal gall-bladder, is apt to be associated clinically with intermittent afebrile attacks of biliary colic in an otherwise healthy individual; the latter, also found in a gall-bladder showing no patent signs of inflammatory disease, and due to excess of pigment in the bile, are also liable to cause colic, but no ill health.

In the light, however, of the work on the bacteriology of the gall-bladder quoted above we may have to revise our ideas as to the aseptic origin of both these types of stone. This much is certain, that in several cases with a single cholesterol stone and a very slightly thickened gall-bladder a streptococcus has been grown from the wall of the latter. Also, in one case of single cholesterol stone, Illingworth isolated a streptococcus from the centre of the calculus.

The origin of the multiple faceted calculi, of mixed cholesterol and bilirubin composition, probably dates from an acute attack of obstructive cholecystitis, when the cystic duct was occluded, either by a single cholesterol stone or merely by inflammatory oedema. The inflammatory exudate within the gall-bladder in such cases provides abundant material for the nuclei of stones, which, in their subsequent growth, reproduce in their strata the history of the successive steps in the gall-bladder pathology.

CHOLESTEROSIS AND THE MULTIPLE MULBERRY STONE.

Many surgeons, among whom Moynihan and W. J. Mayo were the first, have drawn attention to a curious condition of the mucous membrane of the gall-bladder in cases in which no gross disease was evident from without, where small white specks project from the villi, giving an appearance somewhat resembling the surface of a strawberry. This condition, which is not uncommon, has been found where no stones were present, but also in association with several, usually mulberry-shaped, calculi. Boyd has described, and has illustrated very beautifully, the nature of this lipid deposit in the cells of the mucosa of the gall-bladder and in the subepithelial layer, and has shown how small lipid-laden papillomata may form and possibly become shed off into the lumen of the organ. Mentzer has reported similar observations. Boyd believes that cholesterol is absorbed from the bile by the mucous membrane of the gall-bladder, and, when there is disease in the wall, the paths of absorption are partially obstructed and cholesterol esters accumulate in the cells of the mucous membrane and in those of the underlying stroma.

Our observations, in the many cases of cholesterosis of the gall-bladder which we have encountered, entirely confirm those of Boyd, and in several the various stages between punctiform lipid deposits, lipid-laden papillomata, and mulberry cholesterol calculi have been present in the same specimen. Illingworth has repeated Boyd's histological investigations (Figs. 1 to 6). Further, Wilkie has shown that in the submucosa and in the cystic gland in every case examined a streptococcus was present.

The multiple mulberry cholesterol stone is thus of septic origin, and the phases of its development are as follows:

1. Intramural streptococcal infection of the gall-bladder.
2. Lipoid accumulation in the mucosa and subepithelial layer.
3. Formation of lipid papillomata.
4. Shedding off of these to form the nuclei round which cholesterol is deposited.

THE CALCIUM STONE OF THE CLOSED GALL-BLADDER.

Occasionally we meet with cases where gall-stones composed mainly of calcium, in the form of carbonate, are shown up readily by x rays as dense shadows. In such cases it is found that the gall-bladder wall shows signs of chronic inflammation and that the cystic duct is obstructed (Figs. 7 and 8). In this connexion the experimental work of A. L. Wilkie is of interest. He found that in the cholecystitis produced in rabbits by intravenous injections of streptococci calculi were common. In cases where the

cystic duct was patent cholesterol was the main, if not the only, constituent; in those in which the cystic duct had been ligated calcium was the main constituent.

SYMPTOMATOLOGY OF CHOLECYSTITIS.

The onset of symptoms is so gradual that it is often very difficult for the patient to give a precise date to the beginning of the trouble. A tendency to flatulence coming on immediately after eating, often indeed during a meal, a feeling of constriction and oppression, causing a desire to loosen the clothing, a sense that the patient has eaten too much, even after a small meal—these symptoms, so common among the middle-aged female population, are, in the majority of instances, due to cholecystitis. A sense of nausea and desire to be sick, coming on at irregular times, sometimes accompanied by an aching under the right costal margin and in the right scapular region, an aggravation of these symptoms by any exposure to cold or chill, with, in many cases, the appearance of a faint tinge of yellow in the skin or a noticeable muddiness of the complexion, are symptoms often attributed to "liver," but due usually to a slight exacerbation of a chronic inflammatory process in the gall-bladder. Actual vomiting is not infrequent at such times, and articles of diet, such as potatoes and all fatty foods, are avoided as they are found to aggravate the discomforts from which the patient suffers. Sometimes the patient complains of flatulence, the onset of which is delayed for an hour after food, is accompanied by "acidity" with heartburn and waterbrash, and a gnawing epigastric pain, almost suggestive of duodenal ulcer, but differing in two respects—namely, in the comparative failure to get relief by eating more, and the absence of the periodicity so characteristic of ulcer.

It is, however, by no means easy in some cases in stout females to diagnose, from a clinical history and physical examination alone, duodenal ulcer from cholecystitis. Under the term "cholecysto-duodenal syndrome" I have described a clinical picture, almost indistinguishable from that of cholecystitis, which is presented by quite a large group of female patients suffering from duodenal ulcer. By special investigation, however, the two conditions can be readily and surely distinguished, even when both are present, which is by no means rare.

When definite attacks of colic have occurred, if they have been of the real agonizing type, one may be sure that one or more gall-stones are present. Attacks of colic simulating somewhat closely the true variety due to stone are, however, sometimes apparently caused by interference with the emptying of the gall-bladder, due to kinking at the neck. The removal of such a gall-bladder, which is always thickened but contains no stone, has, in numerous instances, led to a cessation of the colic-like attacks.

I need only mention the attacks of acute obstructive cholecystitis when, with acute pain accompanied by vomiting, a coated tongue, often some shivering and rise of temperature, with marked tenderness in the right hypochondrium and a catch in the breath, the picture of a stone impacted in the neck of the gall-bladder, which is inflamed and tensely distended, is clear and unmistakable. It is in these attacks that we get the secondary pulmonary signs of dullness with crepitations and even friction at the base of the right lung, due to the rigid right half of the diaphragm. These signs must be regarded as an integral part of the clinical picture of acute cholecystitis, and must not be allowed to divert attention from the true seat of infection. Examination of patients with the x-ray screen during such an acute attack has shown quite clearly an immobile right cupola of the diaphragm, with consequent impaired expansion at the lower lobe of the right lung.

The association of cholecystitis with appendicitis must ever be kept in mind. The two conditions in a chronic phase are frequently encountered together. I have on two occasions, however, had to deal with acute suppurative lesions of both appendix and gall-bladder, occurring simultaneously in the same patient. There is much to be said for the view that inflammatory disease of the appendix and gall-bladder represent not consecutive but simultaneous blood-borne infections, usually of streptococcal type.

SPECIAL METHODS OF DIAGNOSIS.

Use of the Duodenal Tube.

Much was hoped from what is commonly known as the Meltzer-Lyon test, whereby bile is withdrawn from the duodenum by means of the duodenal tube after the introduction of magnesium sulphate. There can be no question that in cases of cholangitis and in advanced cholecystitis, particularly if the large septic type of stone be present, very definite and valuable information may thus be obtained. In quite a large proportion of cases of cholecystitis, however, we find at operation that the bile in the gall-bladder is normal in appearance and is sterile on culture, and, withdrawn by the duodenal tube, could not possibly have indicated the intramural infection present in the submucous layer of the gall-bladder. The results, reported by certain observers, of bile infected by *B. coli* being recovered by the duodenal tube in a large proportion of cases of cholecystitis, are quite out of keeping with our operative experience.

Cholecystography.

Since the introduction of pyelography in the diagnosis of renal disease there has been no advance so striking or so helpful in visceral diagnosis as the method devised and elaborated by Graham and Cole of obtaining shadow-graphs of the gall-bladder by the use of an opaque dye. Whether the dye be given intravenously or by the mouth the results, if interpreted intelligently, are of the greatest help in diagnosis. If a dose of not more than 3 grams intravenously, or 4.5 grams by the mouth, be used, no untoward effects are produced, and the functional capacity of the gall-bladder can be gauged with a fair degree of accuracy.

From an experience of more than 200 cases I can state without hesitation that it transcends all other methods of diagnosis, and gives reliable data in over 90 per cent. of cases. It is of especial value if used in conjunction with a barium meal, as recommended by Dr. Woodburn Morison, for then it may, as it has done in five of my cases, reveal a normal gall-bladder and a deformed duodenal cap in a patient presenting the cholecysto-duodenal syndrome.

The dye test is seen to greatest advantage in cases where cholesterol calculi are present in a gall-bladder with patent cystic duct. Then the negative shadows cast by the calculi enable not only a positive diagnosis of gall-stones to be made, but give accurate information as to the type and number of calculi present. Defective concentration of the dye and poor definition of the outline of the gall-bladder indicate cholecystitis. We have found, however, in a few cases in which the clinical history has pointed to cholecystitis, that the gall-bladder shadow appeared to be practically normal, yet at operation a gall-bladder with opacity of its wall and with an enlarged cystic gland was found, and from both gall-bladder wall and from the gland we were able to cultivate a streptococcus. This simply means that, in the early stages of a chronic cholecystitis, the gall-bladder function is maintained at a sufficiently high level to allow of an almost normal concentration of the dye. Whilst the test is, therefore, of the utmost value, it is not infallible and must be used, as must all such tests, as one of many means of clinical investigation.

TREATMENT OF GALL-BLADDER INFECTIONS.

In this, as in all other diseases, we must, before considering the question of surgical intervention, assess as accurately as may be the chances of a natural cure and those offered by more conservative forms of treatment. In regard to spontaneous recovery from cholecystitis it is impossible to obtain accurate data. We are here dealing with a very chronic low-grade infection, the tendency of which is undoubtedly to persist and occasionally to flare up. The very long histories given by so many patients coming to operation indicate that, once established, the disease tends to be slowly progressive, and that in the diseased organ, crippled by fibrosis, gall-stone formation is more than likely. We know, further, that once stones have formed the chance of spontaneous cure has gone. Only the smallest gall-stones can pass down the ducts. Biliary colic, formerly thought to be due to the passage of a

stone, we now know to be due, in the vast majority of cases, to the temporary impaction of a stone in the neck of the gall-bladder. The almost total lack of a muscular coat in the bile ducts is sufficient evidence that colic is not due to spasm of the ducts.

Can we, then, by treatment influence the gall-bladder infection or prevent the formation of stones? A primary source of infection in the teeth or tonsils should be searched for, and, if found, dealt with. There is now a certain amount of reliable evidence that where there is infection of the bile passages by *B. coli* the administration of very large doses of hexamine will influence the course of the infection in a favourable manner. In several cases of chronic cholangitis I have seen undoubted, if temporary, benefit follow the administration of this drug. In the majority of cases of cholecystitis, however, we are not concerned with a catarrhal *B. coli* infection of the passages, but with an intramural streptococcal infection of the gall-bladder, and I know of no drug which will influence this. The use of suitable stock streptococcal vaccines may prove to be of value, and this would certainly appear to be the most rational line of medical treatment.

To prevent the formation of gall-stones any measure which favours emptying of the gall-bladder and diminishes stasis should be of help. Regular muscular exercise, which has been neglected by so many of the patients suffering from this disease, must be insisted on. Fat must not be excluded from the diet, as we now know that it is the one substance which without doubt causes the gall-bladder to contract; hence the discomfort following its ingestion in patients who already have gall-stones. Large quantities of bland fluid should be taken, finishing at night with a tumbler of hot water with some baking soda. Every morning a small dose of magnesium sulphate or sodium phosphate is taken to promote a flow of bile.

It is doubtful, as McNec has shown, whether we can influence the cholesterol content of the blood or bile by avoidance of articles of diet rich in this substance—such as egg-yolk, sweetbread, etc. We err, however, on the right side in excluding them. Ox-bile, sodium oleate, and sodium salicylate, given separately or together, as in the popular preparation felamine, may, by promoting a flow of bile, help to diminish stasis.

We are, however, faced with the problem that, when once firmly established, infection of the gall-bladder is highly resistant to cure by other than surgical means. If, therefore, symptoms persist or recur in spite of the measures recommended above, operation should be undertaken before secondary changes in other organs or acute complications supervene.

Operative Treatment.

I do not propose to discuss any technical points in regard to operation, but merely to review the principles which should guide such treatment and the results which may be expected. In the first place, it is obvious that, as the disease is almost invariably intramural, removal of the gall-bladder rather than drainage is the rational treatment. Only where the general condition of the patient or local technical difficulties make the operation of cholecystectomy one fraught with a sensibly greater risk should cholecystostomy be performed. In my experience the removal of a diseased gall-bladder is not followed by any untoward symptoms. On the other hand, simple drainage of the gall-bladder, whilst giving temporary relief, is very frequently followed by recurrence of symptoms, and sometimes by recurrence of gall-stones; hence the impression in some minds that gall-bladder operations are not followed by permanent relief. Free exposure that will allow of adequate investigation of the ducts is a *sine qua non*, as the failure to recognize a floating stone in the common bile duct is one of the most fertile causes of recurrence of symptoms after operation. The stomach and duodenum must be examined to exclude coincident ulcer, as, if present, this can usually be dealt with at the same time.

SOME LESSONS FROM 452 BILIARY OPERATIONS.

During the past seven years I have operated on 452 cases of disease of the biliary passages. On reviewing these cases certain significant and interesting points are brought out. First in importance, perhaps, is the fact

that in 15 cases malignant disease of the gall-bladder was found. The average age of the patients in this group was 64, and in all a long-standing history of gall-bladder disease was given. In every case gall-stones were present and there was evidence of old-standing cholecystitis. In only one of these cases was the disease removable, and in that one fatal recurrence took place two years later. The risk of malignant disease is therefore no small one, and is a strong point in favour of timely operation.

In 6 cases the operation was carried out for acute haemorrhagic or gangrenous pancreatitis. In 5 of these cases, which were all fatal, a long-standing history of cholecystitis and gall-stones was given. The average age of the patients in this group was 60 years. In 3 cases (jaundiced patients) an irremovable carcinoma of the common bile duct was found, and in 7 a carcinoma of the head of the pancreas. In all of these 10 cases a palliative cholecyst-enterostomy was performed. Excluding these 31 cases (25 malignant and 6 acute pancreatitis) there remain 421 cases, of which 367 were cases of cholecystitis, with or without cholelithiasis. The sex ratio was 91 males and 306 females, and the average age at operation was 50 years. The disease was found with equal frequency in hospital and private practice (213 hospital, 184 private cases).

Several striking differences were noted in the two social classes, however. In the first place, there was a much larger percentage of male cases in private practice—30 per cent. to 17.3 in hospital practice—due, no doubt, to the sedentary occupation in the former. Secondly, the average age at operation in private cases was 54, in hospital cases 46.5, and the length of history corresponded to this age difference—that is, expectant and medical treatment was persisted with much longer in those in better financial circumstances. The most notable difference, however, was in the operative mortality, which in private cases was 6 per cent. and in hospital cases 1.4 per cent. This pronounced difference was attributable to the secondary changes and complications which had developed in many of the former; thus in the fatal group there were examples of subacute pancreatitis, 2 cases; cholecystitis with cirrhosis of liver, 2 cases; bleeding duodenal or gastric ulcer, 2 cases. Furthermore, the incidence of carcinoma of the gall-bladder in private was exactly double that in hospital practice, and as in many of these cases the patient survived the operation for only a few weeks or months the penalty of delay becomes the more evident.

It must be clearly understood that it is the age and severity of the disease, and not the age of the patient, which is the important factor in prognosis as regards operation. In my experience elderly patients stand operation on the biliary passages very well, provided none of the more dangerous complications have arisen. Thus among the 74 patients in this series who were over 60 years of age at operation only 5 died (6.7 per cent.), and among the 15 patients over 70 years of age there was but one death.

In dealing with elderly or bronchitic patients the advantages of local anaesthesia, aided by twilight sleep, cannot be too strongly emphasized. On numerous occasions I have removed the gall-bladder and stones from the common duct under such anaesthesia without the patient being conscious of the operation.

A large proportion of patients suffering from gall-bladder disease are grossly obese, and their muscles, including heart muscle, are flabby and in poor condition. It is a wise plan, and one which we practise regularly, to put these patients on a preliminary course of exercises for three months, that they may get into training for the operative ordeal. The remarkable improvement in general tone with loss of weight which results makes the operation both easier and safer.

Cholecystectomy was performed in 253 cases, cholecystostomy in 144. In the earlier years of the period under review cholecystostomy was the commoner operation, but in the past three years it has been almost entirely replaced by cholecystectomy, with no increase in operative mortality and a vast improvement as regards the diminution of post-operative morbidity.

In 257 cases calculi were present in the gall-bladder, in 140 cases cholecystitis without stone. The improvement in health following cholecystectomy in the 76 cases of the

latter group in which this operation was performed was, almost without exception, gratifying; in the 64 cases in which drainage of the gall-bladder was practised the improvement following the operation was, in many cases, only temporary.

Common Duct Stones.

In 47 cases—that is, 18 per cent. of the cases of cholelithiasis—one or more stones were found and were removed from the common duct. In the majority of patients in this group the history of recurring jaundice with colic, rigors, and loss of weight left no doubt as to the presence of a stone in the duct. In a third of the patients in this group, however, the history did not present anything approaching the typical Charcot syndrome, the stones being of the silent, floating type. Without adequate exposure and careful exploration they might readily have been missed, and indeed in 9 cases a previous operation for gall-stones had been performed.

When the patient, at the time of operation, was not deeply jaundiced the gall-bladder was removed. When the patient was jaundiced, or otherwise very ill, it was drained. There were three deaths in this group—a mortality of just over 6 per cent. The improvement in health, and rapid gain in weight, following a successful operation for stone in the common duct are remarkable.

CONCLUSIONS.

Infection of the gall-bladder is probably the commonest of all abdominal maladies, particularly among persons of sedentary habits.

It is usually an intramural blood-borne streptococcal infection, and is frequently associated with the formation of gall-stones.

If neglected serious, and often fatal, complications may ensue.

When firmly established the disease can only be cured by radical surgery.

In the absence of secondary changes and complications, such as malignant disease, pancreatitis, hepatic cirrhosis, and insufficiency or toxic myocarditis, operation has a low mortality and the results, as regards subsequent health, are very good.

Elderly patients may be safely operated on under twilight sleep and local anaesthesia.

I wish to express my thanks to Mr. J. J. M. Shaw for the specimen depicted in Fig. 5; to Mr. C. F. W. Illingworth for his help in the investigation of the cases of cholesterosis, and to Dr. A. L. Wilkie, whose remarkable work forms the basis of our present attitude towards cholecystitis.

THE X-RAY DIAGNOSIS OF PATHOLOGICAL CONDITIONS OF THE GALL-BLADDER.

BY

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(With Special Plate.)

FIVE years ago the generally accepted opinion of physicians and surgeons was that a report on the x-ray examination of the gall-bladder was of no value. This was due to the fact that though Beck (1899) had demonstrated the shadows of gall-stones on radiographs, most radiologists were of the opinion that it was a rare and chance finding.

Thurstan Holland and Robert Knox in this country, Pfahler, Case, Cole, George, and Leonard in America, and Haenisch in Germany, who carefully studied the problem, came to the conclusion that gall-stones could be demonstrated in a fairly large percentage of cases, and that the percentage of correct x-ray diagnoses of gall-stones grows in proportion to the intensity of the interest, the more careful attention, the refinement of the technique, the study of the establishment of a diagnosis, the training of the eyes, and the improvement which comes of constant use and experience. (An account of the earlier work on gall-bladder radiography was given in a previous paper.¹)

The number of radiologists who hold this opinion is steadily growing. My own experience is that about 30 per

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FIG. 1.—Gall-bladder showing generalized cholesterosis.

FIG. 2.—Naked-eye appearance of villi laden with lipid.

FIG. 3.—Section of gall-bladder stained with haematoxylin and eosin; pale areas of lipid under epithelial coat.

FIG. 4.—Section stained with scharlach red, showing accumulation of lipid.

FIG. 5.—Gall-bladder the seat of chronic cholecystitis and cholesterosis, several lipid papillomata, and two cholesterol stones.

FIG. 6.—Radiogram showing shadows of calcium stones in gall-bladder.

FIG. 7.—Gall-bladder after removal, showing stone occluding cystic duct and multiple calcium stones.