Observations on the Duodenal Tube in the Diagnosis and Treatment of Biliary Diseases.

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In 1917 Metzler reaffirmed his "law of contrary innervation" and his conviction that disturbance of this law was of great pathological significance. He demonstrated it particularly in regard to the physiological function of the gall bladder in promoting an interrupted flow of bile into the intestine. He further suggested instances where suspension of the physiological process might give rise to pathological sequelae. He drew attention to the musculature of the gall bladder, which on contraction empties its viscus of its fluid contents. The antagonist of this musculature is the circular muscle of Oddi, which is situated at the termination of the common bile duct, thus closing the papilla of Vater at its duodenal entrance. In conformity with the "law of contrary innervation" the muscle of the gall bladder and an inhibition of the tonus of Oddi's muscle. The vasodilatation, seems to be a motor fibre for the sphincter of the common duct and inhibitory nerve fibres for the gall bladder. Furthermore, so the adherent innervations show the character of contrary innervation. For instance, stimulation of the vasa of Oddi give simultaneously a contraction of the gall bladder and an inhibition of the sphincter muscle.

There are numerous suggestions in physiological experiments that variations in diastasis may influence this coordination of gall-bladder and sphincter muscle action. Sometimes this influence may be for good and sometimes for evil. Host first demonstrated the fact that the injection of peptone or albumooses into the duodenum was followed by the prompt discharge of bile into the stomach. If this was due to a reflex act which caused the simultaneous relaxation of the sphincter of Oddi and the contraction of the gall bladder. In a footnote to his communicaton Meltzer records his observation that the application of a 25 per cent. solution of magnesium sulphate "to the mucosa produces a completely local relaxation of the intestinal wall." Such a result is not obtained if the salt passes through the stomach. He therefore made the suggestion that the local application of a 25 per cent. solution of magnesium sulphate by means of the duodenal tube might relax the sphincter of the common duct and permit the ejection of bile and perhaps even the removal of a calculus of moderate size wedged in the duct in front of the papilla of Vater.

The development of the use of the duodenal tube by Einhorn and other workers stimulated investigation, and many observations were made upon the normal and pathological character of the duodenal tube. In particular, the observations were directed to the character and digestive power of the pancreatic and hepatic secretions. Attempts to increase the flow of these fluids, except by means of the so-called chologastic administered by mouth, were not undertaken until Lyon's* applied observations of Metzler in regard to the local duodenal action of magnesium sulphate on the gall bladder and bile-duct sphincter. Lyon's experiments were entirely successful and established the basis for extended investigation into the contents of the gall bladder in health and disease. He further developed the technique in order that the gall bladder might be evacuated of its fluid contents whenever considered advisable if such evacuation were mechanically possible.

Methods.

The patient should fast for at least six hours before the duodenal tube is introduced. The tube is passed between the first mark (6 cm.) and the stomach contents are then aspirated by means of a glass syringe. If the stomach be normal, they will be found to consist of slightly opaque acid fluid with flakes of mucus; this is quite typical of the resting gastric juice. It is well to examine this material, when obtained, as to its colour and acidity, for it may be used to determine this thus be obtained. The stomach is then washed out with 30 c.c. of tepid water, which is introduced by syringe and withdrawn. This repeated process need not be prolonged if the tube appears not to be placed on the right side in the recumbent position. The duodenal tube is then passed to the second mark (55 cm.) and the process of washing and evacuation repeated two or three times. The tube is finally introduced to the third mark (60 cm.), where it is allowed to remain. The patient is then recumbent on the right side with the abdomen inclining towards the bed, although it is not found advisable that he should lie too flat on the abdomen. It is important that the patient should be made as comfortable as possible for the procedure of fatigue may be avoided. The patient remains in this position for about half an hour, when a small sample of the contents of the gut is removed for examination. If the end of the tube be in the duodenum the fluid withdrawn may be scanty, alkaline or neutral, and sometimes more or less bile-tinged. If it contain free hydrochloric acid (indicated with Congo red paper) it may be presumed that it has not yet passed the papilla or that it is just within the duodenum. Each fifteen minutes following a small sample of the contents is obtained for examination. When these samples are alkaline or perhaps slightly bile-stained it may be concluded that the end of the tube is well into the duodenum. Thus is taken from the patient for a few hours, but otherwise better. In a certain number of cases it may be impossible to obtain an alkaline or neutral sample. If the duodenal tube in the duodenum has been examined a high degree of bile-staining may be found. When this is the case the duodenal tube is withdrawn, and the patient is then examined for the contents of the bile; if a sample of bile is obtained the duodenal tube is again introduced.

When it has been decided that the tube is in the duodenum 30 c.c. of a 25 to 50 per cent. solution of magnesium sulphate is injected through it. This is allowed to remain for five minutes, when a small sample of the contents of the tube is withdrawn. If the procedure has been successful the fluid will be found to be deeply bile-stained, and if the withdrawal be continued at intervals almost pure bile may be obtained. If diagnosis be principal point in view the bile may be withdrawn in fractional amounts and placed in numbered test tubes and subsequently examined when the procedure has been completed. It, however, drainage or thorough evacuation of the gall bladder be the primary object, then persistent withdrawal of the bile (if bile is not required for other purposes) the solution of magnesium sulphate and bile) of the duodenum may be allowed to pass down the bowel. In these circumstances care must be taken not to introduce too much magnesium sulphate, as violent peristaltic events may then result.

In the practice of a busy practitioner, where a nurse skilled in the procedure is not available, or in the wards of a hospital where a number of patients are treated each day by this method, there is then no time to observe the steps outlined above too be too time-consuming. The following plan may therefore be adopted. The patient has passed the night before to the 80 cm. mark, a spring clip being attached to the free end in order to prevent leakage, and pinned to the netherdress. The patient is then instructed to sleep on the right side. If there be restlessness and diffi-

culty in sleeping, 1 gram of sodium or potassium bromide, or an equivalent amount of some mild hypnotic in solution, may be introduced into the stomach through the tube, which may be repeated until the patient is soundly asleep. The dough is centimetres of air. A good night's rest is thus usually obtained. At a convenient hour in the morning a small sample of fluid is withdrawn. Only exceptionally does this fail to give positive evidence of coming from the duodenum. The magnesium sulphate may then be introduced. When the tube has been determined that the bile is flowing freely the tube may be removed, and after half an hour the patient may have the table removed, indicated under the circumstances of the condition irrespective of the duodenal tube having been introduced.

* Sherrington has termed this "reciprocal innervation.”
The importance of this direct method of investigating the character and flow of bile can hardly be overestimated in pathological conditions of the liver, the gall bladder, and their ducts.

Abnormalities of the Bile.

Lyon has drawn attention to the difference in the character of the bile during the two periods of the physiological drainage of the bile ducts and gall bladder. The first bile which appears is of a light golden colour and as a rule quite transparent. This is followed by a much larger quantity of darker greenish bile, which is more concentrated and frequently quite viscid. Finally a small quantity of much paler and thinner bile is obtained. Lyon considers that these three types of bile are at the time of drainage in three more or less separate portions of the biliary tract. The first bile is the true bile, and probably the cystic duct (10 to 20 c.c.m.), is the first bile to appear. There is then a short transition flow of bile, which rapidly becomes darker until the darker bile is obtained. (This may amount to between 30 and 150 c.c.m.) Finally a small amount of light yellow bile is obtained, which flows slowly and steadily. It has been suggested that this bile is identical with that which flows normally from the liver and is stored in the gall bladder, where it becomes concentrated during the period of physiological biliary stasis. It must always be remembered that normally the bile does not enter the duodenum in a continuous stream but intermittently when the appropriate stimulus is in operation. This stimulus is normally the production of gastric chyme—this chyme contains with proteoses, mucus, biliary acids, and peptones. As will be mentioned later the character and periodicity of diet may have an important bearing on biliary affections.

Abnormal, microscopical, and, if indicated, chemical examination of the different succeeding and continuous aspirations of bile may give much valuable information as to the site and character of the pathological process. It has been found to be extremely difficult to diagnose abnormal expansion of the duodenal passage (independent of the gall bladder) by an examination of the first samples of bile obtained. If they are found to be abnormal it cannot be definitely stated that this bile has not been produced by the rest of the organs of the liver and the gall bladder and may be the site of the pathological condition. This difficulty, however, does not arise if the first portion of the bile is healthy and the second portion (dark green and more viscid) be definitely abnormal, although the final portion is again found to be normal. Under such conditions it may be definitely affirmed that the pathological lesion is situated in the gall bladder. Furthermore, if the whole of the bile—even the last portions—be abnormal, it may be assumed that the process has either taken place in the hepatic duct or above, or that it has extended upwards into these channels. In such cases this may be taken as definite evidence of an extensive cholangitis, and even hepatic abscess be diagnostic.

If the first portion of the bile be abnormal it may be assumed that the lesion is confined to the common duct.

The various indications of abnormal conditions in the biliary passages must be distinguished from coincidences due to other causes. Increased viscosity and turbidity, presence of flakes of biliary-stained mucus, pus cells, large numbers of degenerated epithelial cells and pathological micro-organisms, such as streptococci, B. typhosus, large numbers of B. coli. Small gritty particles of material which may chemically be identified as biliary sand, and even definite gall stones of considerable size, have been obtained. The diagnosis of the local lesion will depend upon the degree and character of the abnormality of the bile. If there be numerous pus cells, with or without numerous micro-organisms, it may be safely inferred that the condition is of an active inflammatory character. This is usually associated with a systematic reaction. A chronic suppuration of the gall bladder may, however, exist without pronounced symptoms provided the medium of biliary drainage be present. Such a degree of drainage, however, may not be sufficient to prevent the development of chronic symptoms of intoxication.

Abnormalities of Biliary Drainage.

Evidence of partial or complete mechanical obstruction due to gall stones, adhesions, neoplasms, and other conditions is frequently found. The causes of pathological stasis or partial obstruction are of great importance in the production of immediate symptoms or future complications. But there are other less obvious conditions which are of even greater importance. Meltzer has quite clearly pointed out the pathological sequence of events which may follow upon the opening of the biliary system. It is to be feared that biliary passages are of normal vitality. In such soil microorganisms seldom find a favourable habitat for their growth and invasion. If, however, abnormal conditions arise which lower the vitality of the passages, or in any manner impede the habit of the organisms for their growth, then pathological processes are apt to arise.

As has been stated previously, the evacuation of the gall bladder is an intermittent act depending upon initiation of a definite reflex by suitable stimuli. In order that this physiological function may operate properly two things are necessary—first, a properly balanced nervous path for such a reflex, and secondly, a proper stimulus. This physiological reflex is initiated by the control of the sphincter by the vagus nerve (with proteoses, mucus, biliary acids, and peptones) which is present when it be remembered that the vagus contains motor fibres for the sphincter of the common duct and inhibitory fibres of the gall bladder. It is thus conceivable, and indeed probable, that certain stimuli are more or less efficient in producing or at least rendering more difficult the action of the proper stimulus even if it be normally operative. The emotional and other states which are conducive to the disturbance of many physiological reflexes need not be discussed at present. The various stimuli which may initiate this reflex are as yet fully understood, but that they are intimately connected with the processes of normal digestion there is good reason to believe. Bruno has shown that during the fasting stage no water is allowed the duodenum (the last portion of the alimentary canal) enters the stomach after a meal is ejected into the duodenum. Rost has shown that if the gall bladder be absent the bile enters the duodenum in a continuous stream. He has further demonstrated in a healthy dog with the gall bladder removed in operation that injection of alburnoses, peptones, and other products of protein digestion into the duodenum immediately initiates a flow of bile from the papilla of Vater. He has proved that this flow of bile is produced by the reflex act of simultaneous contraction of the gall bladder and relaxation of the sphincter of Oddi. These observations would indicate that the gastric contents furnish the normal stimulus for this reflex. This, however, is not entirely true. Oddi and his followers have concluded that the spasm which is produced by the duodenal contents stimulates the contraction of the sphincter of Oddi. The resistance which this spasm of the sphincter muscle affords to the flow of bile may be judged from experiments. Archibald found that this was 180 to 330 mm. of water force fluid through the sphincter, but when the duodenal mucous membrane was drenched with 15 per cent. solution of hydrochloric acid it took 330 to 800 mm. of pressure to water to produce the same result.

We are therefore faced with certain facts which may indicate how a deleterious action upon the normal physiological flow of bile may be brought about—how, in other words, biliary stagnation is naturally produced and the resistance of the sphincter of Oddi is increased. But it is well to recognize the influences which biliary stagnation has in predisposing to biliary disease. Whether this be due to the resistance of the sphincter or providing a suitable habitat for the growth of pathological microorganisms, or in both ways, is not as yet clear.

In addition to the pathological processes which may be produced in the biliary system by a disturbance of the reflex
ejection of bile we have to consider the very important pathological condition which may be initiated in the pancreas. The observation of Opis4 that the impaction of a small stone in the ampulla of Vater could give rise to acute haemorrhagic pancreatic necrosis has been repeatedly confirmed. Opis and Wirsung have since made out a thesis stating that this lesion is reflexly sequential upon the regurgitation of bile into the pancreas through the duct of Wirsung. Archibald has pursued this subject further, and has shown that such regurgitation of fluid can be accomplished by producing a spasm of the sphincter of Oddi rather than by the presence of an intrabiliary calculus. Further, he has demonstrated that acute haemorrhagic necrosis of the pancreas may be produced in this manner,5 whether the pancreatic lesion be acute or chronic depends upon the circumstances. But the fact seems now quite evident that biliary stasis is frequently a most important factor in producing these lesions.

Functional Biliary Stasis.

It is not the purpose of this communication to discuss biliary stasis caused by gross mechanical lesions, but to deal chiefly with the physiology of a condition of functional character—a stasis which is present before structural changes of an obstructive type are evident. Meitler has pointed out the possibility that by some strong mental excitement

"tonic contraction of the sphincter of the common duct, at a period of demands for discharge, does not become relaxed while the gall bladder contraction within the usual normal limits, this would result in abnormal stasis within the biliary ducts which ultimately caused an obstruction. Or both this form of the abnormal discharge of the gall bladder and of the sphincter are abnormally strongly contracted, which would lead to biliary colic with consequent pain and even shock without the presence of calculous conditions or of calculi, at least not in the first few attacks of comparatively short duration."

In addition to the possible action of powerful emotion in producing a functional biliary stasis there must be considered the probable result of a deficiency of the proper stimulus. It has been pointed out that the products of normal gastric protein digestion play a prominent part in supplying such stimulation.424 This being the case, it will be readily appreciated how important it may be that a properly balanced diet should contain a certain amount of protein. Meitler has particularly emphasized the possible dangers in this regard of a purely vegetable diet. A diet may contain sufficient calories but may not be properly balanced in so far as diet may thus produce a pathological stasis of a functional character.

The manner in which the contents of the stomach, apart from the products of digestion, influence the biliary function has already been suggested. If the duodenal contents be kept away from the physiological relaxation of the sphincter the stasis will not take place. Thus it will be seen that gastric hyperacidity may possibly exercise an important influence in producing a certain degree of functional biliary stasis.

The association of gastric hyperacidity with biliary lesions in general assumes an additional importance when considered from this point of view. It has been recognized for some time that lesions of the gall bladder are frequently accompanied by signs and symptoms of gastric hyperacidity. It has even been held by some that the hyperacidity has been reflexly produced by the cholelithiasis. Little or no evidence has been advanced in support of this view except the observation that the two conditions are frequently associated. In view of the present experimental observations it would be more consonant with the facts to suggest that biliary stasis and subsequent gall-stone formation might be the result rather than the cause of hyperacidity.

The influence of functional biliary stasis upon the formation of gall stones is probably very important. Two outstanding factors in the production of gall stones are recognized—bacterial invasion and biliary stasis. In regard to the physiology of gall stones, Mayo-Robin2 makes the following statement:

"Anything, therefore, which causes stagnation of bile may dispose to gall stones; on the other hand, whatever leads to a regular emptying of the bile passages will tend to clear out such debris and prevent the occurrence of conditions of irritation, crystals and mucus, and thus to prevent the formation of gall stones. Among the remotest causes we must consider age, sex, habits, dress, diet, diabetic conditions, and disease."

In regard to the diet he makes the following interesting observations:

"If the supply of nitrogen in the food be limited, the bile salts will be diminished and cholelithiasis may be precipitated. This may serve to explain the presence of gall stones in gouty persons who come under our observation. The larger consumption of farinaceous food in Germany may also serve to explain the greater prevalence of gall stones there than in this country where most enter into the manufacture of diabetes, in which nitrogenous food is prescribed, gall stones are rarely found."

Since Gallippe7 in 1886 first demonstrated the presence of bacteria in biliary calculi much attention has been paid to the possible rôle of an organism in causing these lesions. To substantiate the view that bacterial infection of the bile passages is the chief cause of the origin of gall stones, as has been pointed out above, normal bile frequently contains pathogenic micro-organisms. The numerous routes which have been suggested whereby they may reach the bile need not be discussed in detail. It will be sufficient to mention the two main ones—namely, an ascending infection by way of the bile ducts and infection through the liver from the portal or systemic blood stream. In such circumstances it is not surprising that cholelithiasis is a common condition. In fact it might be expected to be much more frequent than it is. It has already been stated that the two most important factors in preventing this pathological state are the absence of organisms in biliary passages, a healthy mucous membrane and efficient biliary drainage, while biliary stasis in itself may lead to a lowering of the resistance of the biliary mucous membrane. An ascending infection is frequently followed by others. It is quite readily seen that there is the case when it is realized that biliary inflammation leads to a prolonged partial stasis and the stasis perpetuates the favourable habitat for the growth of micro-organisms. In this manner a vicious circle is established. It is quite evident from these observations and experimental facts that biliary stasis and any abnormal conditions which tend to promote it or to perpetuate it are probably the most important factors in the etiology of the more common biliary lesions.

The initial form of stasis in all these circumstances is most probably of a functional nature resulting either from a spasm of the gall-duod -stent or prolonged absence of the proper stimulus in sufficient strength.

Treatment of Bilary Lesions.

Apart from its value as a diagnostic measure, the use of the duodenal tube as outlined lends itself to treatment. In conditions where there is biliary stasis independent of complete obstruction it is advisable to promote the even and efficient emptying of the gall bladder and passages. This is of particular importance when the stasis is associated with some chronic inflammatory process. If cholelithiasis be present, aspiration should be good reason for procedure and possible much in the way of amelioration may be expected. This hope is especially warranted when it is realized that in practically every case of cholelithiasis a chronic infection of the bile passages is present, which infection is both chronic and is perpetuated by biliary stasis in the manner of a vicious circle. The claims of operation versus duodenal tube drainage need not be considered. The indications for either therapeutic measure are quite clearly to be distinguished. It may be observed, however, that in the use of the duodenal tube no physiological organization is disturbed in so far as present knowledge goes. In the case of operation this cannot be conceded. After cholecystectomy the physiological flow of bile is interrupted and it is probable that bile stasis is not necessary or not. This may be harmless, but at any rate is not physiological, and it is possible that the presence of large quantities of bile in the intestines when it is not needed may exert some deleterious influence. Furthermore, it has been established that the bile is more concentrated in the gall bladder than in the hepatic ducts, and that bile salts are absorbed from the intestine to be stored again in the gall bladder, so that a collection of concentrated bile may take place when necessary. Without the gall bladder most any of these physiological processes may be carried out. In the case of cholecystectomy not only is the gall bladder physiologically eliminated but an open door for infection from the bowel into the bile passages is left. This objection has been established. However, in spite of all these objections, and apart from the risk attending any major operation, it is sometimes imperative and therefore must be undertaken. But there are many instances in which operation is not

* It is probable that there are other physiological stimuli which as yet have not been demonstrated.

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indicated, in fact the risk of the cure may be greater than that of the disease; in addition there are conditions where operation as a therapeutic measure would be useless.

**Catarhal Jaundice.**

The prolonged course of catarhal jaundice is well known, and anything which would shorten it would be welcomed. It is frequently associated with systemic infections or obvious infections of the digestive tract from the teeth to the duodenum. In fact, catarhal jaundice is a result of an infection of a greater or lesser part of the biliary passages. Therefore there are present in this condition the two fundamental facts of jaundice and infection, most likely to produce biliary mischief. The longer the stasis remains in whole or in part the greater will be the liability to future trouble. The indication, therefore, is to re-establish efficient biliary drainage and possibly, as a measure in a series of cases of catarhal jaundice occurring during an influenza epidemic in the United States navy reduced the average duration of the jaundice by 50 per cent. In those cases treated by the expectant measures the average duration was thirty-five days, while in those cases treated with the duodenal tube the duration was seventeen days.

**Cholecystitis and Cholangitis.**

The probable vicious circle established by biliary stasis and cholecystitis has already been referred to. The treatment of severe supplicative or gangrenous cholecystitis by operation is well recognized, but there are many degrees of less severe attacks which the use of the duodenal tube is especially indicated. The complete evacuation of the gall bladder at frequent intervals (twenty-four hours) promotes free drainage and conduces to the more rapid resolution of the morbidity. This method also helps to move slow colicules of pus, cholesterol, precipitated bile salts, mucus, and bacteria which are so prone to form the nucleus of a gall stone. The chances of the infection spreading to distant radicles of the biliary tract and into the pancreas are also diminished. Even where surgical drainage of the gall bladder has been instituted it may be demonstrated by the duodenal tube that the infection is persistent, and that much can be done to hasten resolution by duodenal drainage.

**Cholelithiasis.**

Instances have been reported where small faceted gall stones have been evacuated with the bile on the use of the duodenal tube, but must be acknowledged that such instances are rare. It is not at all uncommon, however, to find biliary sand, which represents the early stages of the formation of gall stones, in the evacuated bile even where the presence of larger gall stones is not diagnosed and definitely considered.

There is no reason to believe that through duodenal drainage the extraction of gall stones from the gall bladder can be brought about. Where small stones have been found in instances of jaundice examined in the ampulla of Vater. In so far as cholecystolithiasis is concerned there is no evidence to indicate that duodenal drainage can replace operative procedure. There is, however, much to recommend the employment of both measures.

Numerous cases of cholelithiasis are met with where an operation would be attended by considerable risk or might be absolutely contraindicated. In these circumstances much relief may be obtained by the use of the duodenal tube. In fact it may be demonstrated that many attacks of so-called stone gall stones are in reality periods of acute exacerbations of cholecystitis and cholangitis plus cholelithiasis. In such cases the periodic use of the duodenal tube may in great part clear up the cholecystitis and thus obviate the recurrent attacks of cholecystitis.

The following reports may serve to demonstrate the value of this plan of duodenal drainage of the biliary tract:

**Case I.**

J. M., female, aged 30; married, no children. Duration of illness four years. Four years past the patient found the right shoulder and the epigastrum radiating to the right shoulder. The attack lasted for some hours and was associated with vomiting. Similar attacks occurred during the next three weeks. There was then free of attacks for three and a half years. Eight weeks before coming under observation the attacks of pain with gradual onset recurring about every three years and occurring about two to three days. Otherwise the patient was free of symptoms. On examination, there was acute tenderness and rigidity over the gall bladder, very slight jaundice and glycosuria with minute traces of bile in the urine. The stools were not clay-colored.

Treatment with the duodenal tube showed the bile to be viscid, turbid, and of a dark greenish colour. On examination many epithelial cells and leucocytes were found. Repeated biliary draining relieved all the symptoms, the bile became quite clear and of light greenish colour, and the glycosuria disappeared.

This appeared to be a case of recurring choleclithiasis with biliary stasis and associated glycosuria. It was thought probable that the glycosuria could be accounted for by the secondary pancreatitis resulting from chronic biliary stasis. A complication without jaundice occurred and she did not return although the patient was on a full diet and had a high carbohydrate tolerance.

**Case II.**

C. C., female, aged 64; married, twenty-one pregnancies. During the last ten years the patient had suffered from periodical attacks of indigestion and colic, and occasionally of jaundice, brought on by vomiting. The pain was never extremely severe, came on gradually, and usually lasted for some days, being in the upper right quadrant of the abdomen and radiating to the right, shoulder-blade and shoulder. It lasted from seven to ten days and was not severe enough to prevent her working. There was slight jaundice and a trace of bile in the urine. The stools were not clay-coloured. The duodenal tube was passed and a large quantity of dark turdy bile was removed. The injection of magnesium sulphate. This greatly relieved the pain, and, after resting the drainage was discontinued and the patient entirely disappeared. This treatment was carried out twice a week, until the bile became a clear golden colour and the patient was completely relieved of all her discomfort.

This appeared to be a case of mild cholecystitis with considerable biliary stasis which was relieved by the use of the duodenal tube.

**Case III.**

E. G., male, aged 70; married, seven children. In 1913 the patient began to suffer from attacks of indigestion, which gradually became less severe under treatment. In 1918 she had her first attack of abdominal pain. This was of very acute onset and extremely severe, associated with tenderness and rigidity in the right upper quadrant of the abdomen, radiating to the back and the right shoulder. It was associated with jaundice and clay-coloured stools. These attacks recurred at irregular intervals of a few weeks. Sometimes the onset was very acute and at other times very gradual. The gall bladder was always distended and palpable during the attacks. X-ray examination revealed the presence of a single large stone situated in the gall bladder. The diagnosis of cholelithiasis was made with no difficulty and for various reasons an operation was considered inadvisable. It was decided to attempt to drain the gall bladder by means of the duodenal tube. This was accomplished on the 8th of January, 1920. Since then the patient did not suffer any inconvenience on the introduction of the tube. During the first six months the bile contained a light coloured turbid, viscid bile was obtained, which contained many leucocytes and bacteria of the B. coli group. The biliary drainage was of a mucoid, semi-fluid nature, and was of a very pale greenish colour, being much less viscid and clearer. As the bile improved in appearance the intervals between the biliary drainage were increased and it was only on rare occasions that the tube was used. Since then the patient has been completely free from attacks of pain, and can now tell by the onset of symptoms of general depression and abdominal discomfort when a biliary drainage is necessary.

There seems little doubt that this is a case of cholelithiasis with associated cholecystitis, the main symptoms being due to cholelithiasis and associated jaundice and jaundice being referred to the ducts. That biliary stasis contributed to the exacerbation of these symptoms there seems little doubt. The risks
of operation in this case would be considerable owing to the frailty of the patient's general condition and her inability to accomplish much exertion on account of the cardiac condition.

These are but examples of certain classes of cases in which biliary drainage by the duodenal tube has given satisfactory results. There was no doubt in my mind that there was a field of usefulness for it, and more extended experience will probably give indications for its further development.

References


An Address

THE SPREAD, PROBABLE MODE OF INFECTION, AND PROPHYLAXIS OF LEPROSY.

BY SIR LEONARD ROGERS, M.D., F.R.C.P., F.R.S., I.M.S.(RET.).

From the time of Moses the control of leprosy has been one of the most difficult medical problems of world-wide importance. The reasons for this are: (a) for although the discovery of the lepra bacillus the disease is now nearly universally acknowledged to be a communicable one, yet, owing to the failure hitherto to cultivate or inoculate the organism with any degree of certainty, we are still very ignorant regarding the precise manner in which the bacilli are passed from one case to another; while in the absence of any reliable method of treatment it has hitherto nearly always proved impossible to detect and segregate the early but infective stage of the disease. In view of the increased powers in the latter direction which the recent progress in the treatment of leprosy has placed in our hands, I propose briefly to review the problem in the light of a study I have recently made of the literature, more especially of the last sixty years.

The Spread of Leprosy over the World.

The following is briefly the history of the spread of leprosy over the world. Historical data show it to have been present in Egypt and India about 1600 to 1550 B.C., and in China about 200 B.C., while in Europe it was unknown to Hippocrates 400 B.C.; but Aristotle described it in 345 B.C. as a rare disease, so it was probably introduced by the invasion of Darius, taking some time to become sufficiently to attract attention. Italy was free until the return of Pompey's soldiers from the East in 62 B.C.; Galen wrote of it in Germany in a.D. 180, and it gradually spread over all Europe by the eighteenth and nineteenth centuries, when deficient with respect to the number of lepers.

The communicability of leprosy, and the communicability of leprosy, has greatly increased in Europe, becoming a scourge in the twelfth and thirteenth centuries. France alone having two thousand leper hospitals and England some two hundred, this being the first great effort to control leprosy by segregation, to which the rapid decline of the disease in the latter part of the fourteenth century is attributed by most authorities, assisted in England by the famine of 1315-16 and the black death of 1349, which are believed to have caused a loss of two-thirds of the population. Some tropical and sub-tropical writers have questioned the prophylactic value of the mediaeval leper hospitals on the ground that the isolation was not sufficiently complete to stamp out a contagious disease, but in view of the prolonged close house contact usually necessary to allow of infection of leprosy, as I shall show presently, they must have been of great use, and it is worthy of note that the disease died down most rapidly in just those countries where segregation was most stringently enforced, while leprosy reappeared to this day in England and the north of South America, although in these countries where these measures were not much used, such as Norway, Spain, Portugal, Greece, Turkey, and parts of Russia.

Very soon after leprosy began to decline in Europe it spread to the south and east, the northern and Pacific Islands, India, and Mexico, being carried by infected early Portuguese and Spanish invaders, and later also spread widely by negro slaves from Africa, and Chinese and Indian immigrants after the emancipation of the slaves; and it is interesting to note that all the evidence points to the aboriginal American Indians having been free from leprosy, while those who have always kept aloof from intercourse with Europeans still remain so. Lastly, leprosy spread to Asia, and it is probable that in the second half of last century, becoming prevalent in the Sandwich Islands in 1853, in New Caledonia in 1865—then the latter outbreak certainly and the former probably beginning with the immigrant Chinese, and it is probable that these islands were invaded by in the second half of last century. Thus the whole history is of a communicable disease slowly creeping over the world, although it was not until the appointing of the discoveries of the origin of the disease were seriously questioned and its communicability gradually became generally recognized, being materially hastened by Hansen's discovery of the lepra bacillus in 1874.


Perhaps the most remarkable feature of the history of leprosy is the almost complete replacement of the world-wide contagious theory of its origin by the hereditary theory of its causation during the nineteenth century, largely based on the book of Daniellens and Boeck of 1848, who looked on the occurrence of a second or tertiary stage in four generations of a family—including collateral descent and ascertained of whether the parent was diseased before or after the birth of a child—as evidence of hereditary causation, and completely ignored the possibility of family or household infection; such a theory was greatly strengthened by the absence of spontaneous origin. The absence of hereditary propagation of leprosy in the descendants of Scandinavian lepers living under far more favourable hygienic conditions after migrating to the United States of America; the frequency of infection in leprous tropical climates of Europe free from all hereditary taint; the spread of epidemic leprosy in Oceania too far to be entirely accounted for by heredity; and the rapid loss of sexual powers of adult male lepers and want of development of such powers in their male children, have already greatly shaken the hereditary theory before Hansen's discovery finally established the infective theory of the disease, although the precise mode of communicability still remains undeveloped and has to be discussed in the light of recorded cases.

The Communicability of Leprosy.

As the result of an analysis of answers to questions sent to a number of medical men in leprosy countries in 1862 the Royal College of Physicians of London reported leprosy "not to be contagious or communicable to healthy persons by proximity or contact with the diseased," and that there was therefore no justification for segregation measures. As the result of the Smithsonian Institute conference of 1874, stopping all action in that direction and urged the repeal of all laws empowering isolation of lepers. Yet Dr. N. C. Macnamara, I.M.S., with great experience of leprosy came to the conclusion that the case had not been made clear. During the last quarter of a century reports from India, constituting a large majority of the total reports received by the College, further opposition to whose view was soon forthcoming from actual workers in the tropics. Thus, Dr. Janet Andere recorded a number of infections in 1869: all the thirteen doctors reporting to the British Guiana Leprosy Commission of 1875 favoured contagion; W. Munro collected many cases and stated the whole case in favour of contagion in 1877-79; Brosses, with long experience in equatorial Africa, recorded that contagion was of importance in the tropics; and, in 1879, and hills of British Guiana, in an important work on leprosy (1881), found evidence of contagion in 67 per cent. of 139 cases without heredity which he closely investigated. In 1876 Hansen refuted the hereditary theory in Norway and supported the communicability of the disease and in the next decade Vitalis, Bocq, Leloir, and Besnier took the same view in France, and, with the exception of the Indian Leprosy Commission of 1891, to which a strong antimutationist was sent, who had Hansen's views were repudiated by the London Leprosy Investigation Committee who appointed them, every important leprosy conference of the last three decades has endorsed the communicability of leprosy. Similarly the conference of the British Leprosy Research Commission of 1874, at which the view expressed by Sir Jonathan Hutchinson's view, first put forward in 1863, that leprosy was a "fish-eater's goitre"—but subsequently repeatedly modified until "commensal communicability," apart altogether from fish diet, was acknowledged—is also a prebacterial theory of only historical interest.