

FIBROSIS OF THE SPHINCTER OF ODDI*

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OBSTRUCTION TO THE free flow of bile through the lower end of the common duct due to lesions of the ampulla, the papilla of Vater and the sphincter of Oddi occurs in a sufficient number of patients to make this a problem of real clinical importance. This obstruction can occur with or without pathologic conditions elsewhere in the extrahepatic biliary tract, but is usually encountered in patients with gallstones. This intermittent or persistent obstruction is responsible for an appreciable number of the unsatisfactory results following cholecystectomy for cholelithiasis. It is the purpose of this paper to discuss only one group of these failures after operations on the biliary tract. The discussion will be confined to those patients who were found to have fibrosis of the sphincter of Oddi, or those with stricture of the papilla of Vater. This limitation is done in the interest of clarity, since a discussion of obstruction of the various structures at the lower end of the entrance of the biliary tract into the duodenum raises many complicated problems, including the treatment of benign and malignant tumors as well as pancreatitis. This problem is presented from the standpoint of the findings that may be encountered more commonly in primary or secondary operations upon the biliary tract. Most of the experiences which will be reported deal with secondary operations in our own cases as well as those referred to us for treatment

following cholecystectomy and choledochostomy. From this experience, we believe it is possible to reduce the number of secondary operations if the possibility of fibrosis is considered sufficiently at the initial operative procedure, and we wish to point out the frequency with which this condition is encountered, as well as the means of its recognition at the initial procedure.

In several communications from this clinic,^{6, 8, 12, 13, 19-21, 23, 29} the indications and incidence of common duct exploration in patients having surgical procedures on the gallbladder have been presented. For the purposes of this discussion it is sufficient to state from these previous reports that slightly less than half of all patients operated on here for cholelithiasis have exploration of the common bile duct, and approximately 20 per cent of all patients are found to have stones in the common bile duct. In addition, this high rate of exploration of the common duct has led to the discovery of an appreciable number of obstructions at the ampulla of Vater, many of which had not been suspected preoperatively. This is obviously the time to discover them and not at some subsequent operation made necessary by the recurrence or persistence of symptoms. The indications for exploration of the common duct are not part of this paper, but we would re-emphasize that frequent exploration will be necessary if benign obstructions of the ampulla are not to be missed.

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HISTORY

In 1901, Opie²⁷ demonstrated that obstruction at the lower end of the common bile duct by stone could produce acute pancreatitis. Archibald, in 1913² and again in 1919,³ drew attention to the role of spasm of the sphincter of Oddi produced by mechanical or chemical stimuli and related production of this finding to the pancreatitis. He reported eight patients treated by transduodenal sphincterotomy. Berg,⁴ as early as 1922, suggested that biliary stasis might be the result of a functioning disorder of the sphincter of Oddi and was able to demonstrate hypertrophy of this muscle in an individual who had biliary obstruction without other findings in the biliary tract. In many reports in the literature dealing with surgery of the biliary tract, particularly in those concerned with postoperative results, mention has been made of spasm, narrowing and fibrosis of the sphincter as a cause of persisting symptoms, but few reports have had more than a cursory interest in this problem. McGowan, Butsch and Walters,²⁵ in 1936, demonstrated that the pressure in the common bile duct recorded through an implanted T tube following cholecystectomy could be raised by administration of morphine sulfate as high as 160 mm. of water. They showed that each rise of intraductal pressure was associated with an attack of pain similar to that experienced by the patient previous to cholecystectomy.

Branch, Bailey and Zollinger,⁵ in an experimental study on dogs to determine the effect of forcible dilatation of the papilla of Vater, found that a certain amount of scarring occurs in the region of the ampulla after extensive dilatation. This was moderate to marked in one-half of the dogs. The resulting dilatation of the hepatic ducts following this dilatation was lessened if the common bile duct was drained. Furthermore, they found that the dilatation produced did not result in permanent enlarge-

ment of the papilla. Allen and Wallace,¹ in a paper before this Association in 1939, reported that careful dilatation of the papilla to a size less than the diameter of the common duct was a safe procedure and that serious ascending infection early or late did not follow instrumentation of this type. Contrary to the experimental work, they concluded that late cicatricial constriction did not occur. They doubted the persistence of dilatation in the average case but believed that in large ducts with dilatation up to 1 cm. or more, the sphincteric action is probably lost. The introduction earlier of the Bâkes dilators to this country by Chute and Allen greatly aided in the demonstration and treatment of fibrosis of the sphincter. Soon after their introduction, their employment became routine in all common duct explorations in this clinic, and experiences with this form of exploration and treatment were reported by Doctor Lahey.

Following the use of forcible dilatation for fibrosis of the sphincter, we introduced the use of the long T tube⁷ to maintain the permanence of the dilatation and recommended that the papilla be kept open by this means for many months. Since that time it has been used routinely in our clinic where forcible dilatation of the sphincter or sphincterotomy has been employed.

Strode²⁸ pointed out that gallbladder colic could occur without stones in the biliary tract which he attributed to obstruction at the ampulla. He reported two patients who had persistent colic following removal of the gallbladder, one of whom had also had a choledochostomy. Both patients were relieved by transduodenal division of the sphincter. Gordon-Taylor,¹⁸ in a discussion of the sphincter mechanism, reporting anatomical studies, found no evidence of circular fibers, but demonstrated both longitudinal and oblique muscle fibers of the sphincter and concluded that a special intrinsic sphincter exists. Doubilet followed

269 cases after cholecystectomy and found it necessary to re-explore 20 for persistent pain, and stricture of the ampulla was found in two of these. Colp¹⁵ in a discussion of this problem believed that if patients continue to have pain following cholecystectomy, and exploration of the upper abdomen and common bile duct was negative, symptoms probably were due to interference with the sphincteric mechanism, caused by hypertrophy, stenosis or inflammation of the papilla of Vater. He suggested that choledochoduodenostomy be done for organic stenosis, but that a division of the sphincter be done for spasm; he reported eight cases so treated and followed for two to eight years, with six having obtained satisfactory relief.

Doubilet and Mulholland,^{16, 17} in two reports, related obstruction of the sphincter and lower end of the common duct to spasm; they showed this could result in the development of pancreatitis, and recommended sphincterotomy. They were less concerned with the influence of the sphincter on the function and production of symptoms in the biliary tract. They showed that dogs sacrificed at the end of two years after sphincterotomy still had an incompetent sphincter. Mahorner,²⁴ in a paper before this Association in 1949, reported 16 cases of obstruction of the lower end of the common duct, caused by stones in 11 cases and stenosis of the ampulla in four, which was demonstrated only by transduodenal exploration. In two instances he noted that dilators passed from above had made a false opening in the mucosa of the duodenum. He recommended duodenotomy in any patient in whom the patency of the ampulla could not be demonstrated from exploration of the common duct. Trommald and Seabrook³⁰ reported eight patients in whom they demonstrated obstruction at the ampulla due to fibrosis that was relieved by sphincterotomy. Cole and Grove¹⁴ recently reported two patients with

stenosis of the sphincter treated by sphincterotomy with satisfactory results.

ETIOLOGY

The pathogenesis of fibrosis of the sphincter of Oddi and papilla of Vater is not fully understood. Unquestionably, long-standing spasm from any cause may be an important factor in its development. It may be similar to the development of fibrosis of the anal sphincter, which does result from long-standing spasm and abnormal function. Infection in the biliary tract and of the mucosa of the duodenum, as well as in the head of the pancreas, may be responsible. The frequent association of stone in the common duct with this finding indicates that irritation and associated infection and spasm of the muscle may lead to fibrosis. This is not true of all cases associated with stones, since pre-existing spasm or obstruction in this region may lead to reformation of stones in the common duct. In the latter group the fibrosis is responsible for the formation of stones, rather than the reverse. During an operative exploration it is frequently impossible to determine whether one is dealing with spasm or fibrosis. In those cases in which sphincterotomy is done, however, a definite, hard, fibrous area or a fibrous band in which muscle fibers may be determined by biopsy, can definitely be shown.

OBSTRUCTION OF THE DISTAL COMMON DUCT

At the time of exploration of the common duct, either in a primary or a secondary operation, it is essential to demonstrate the patency and size of the sphincter and papilla. In the routine case this will be done by means of graduated dilators (Bâkes). Patency can usually be demonstrated by the tactile sensation of passage of the bulbous tip through this area, but not infrequently the probe may be considered to be passed through the papilla and the in-

dentation of the anterior wall of the duodenum may even be observed, without actual passage of the probe through the papilla. Under these circumstances, if any doubt exists, it is best to visualize the papilla by opening the duodenum by a longitudinal incision. Inability to get through the ampulla and papilla may be due to any one of a number of conditions, as shown in Table I. The first five of these are pertinent to this discussion.

The role of the sphincteric mechanism in the production of pancreatitis and the surgical treatment of such cases have been fully reported by Doubilet and Mulholland. Cattell and Warren¹¹ have recently reported the choice of therapeutic procedures in the treatment of chronic relapsing pancreatitis, including sphincterotomy for this condition. Premalignant lesions of the papilla causing obstruction in the ampulla were likewise reported from this clinic.¹⁰ In an earlier paper before this Association we reported on our experience in the treatment of malignant lesions of the periampullary area, and evaluated the results.⁹ These three causes of obstruction to the common bile duct will be excluded from this paper.

SURGICAL APPROACH

Different methods are available as aids to the discovery of obstruction to the lower end of the common duct: (1) manometric pressure studies, (2) cholangiography, (3) operative exploration of the common bile duct and (4) transduodenal exploration. Manometric studies have been extensively used by Mallet-Guy and others who have utilized them to direct the operative procedure. We have not employed this method. Similarly, cholangiography has had wide use and was recently reported by Mixter.²⁶ This has been used in a limited number of our cases as we have depended chiefly upon mechanical means of exploration of the common bile duct.

At the time of common duct exploration, if a probe cannot be passed through the sphincter of Oddi, the cause of this obstruction must be demonstrated. The incision in the common bile duct must be large enough to permit the passage of instruments. The duodenum and head of the pancreas should be freed and elevated to change the direction of the common bile duct. This frequently leads to the successful passage of a probe and avoids the sacculation at the lower end of the common duct as well as the uneven course of the common duct through the pancreas. At times, a fine probe may be passed through, but difficulty will be experienced in passing graduated dilators. If a 3 mm. dilator cannot be passed easily through the ampulla, probably fibrosis of the sphincter or stricture of the papilla is present. Under these circumstances a transduodenal exploration should be carried out, permitting exploration from each end.

With the demonstration of this form of obstruction, one of two types of correction can be employed, depending upon the degree and extent of the obstruction. The majority can be relieved by forcible dilatation from above by means of graduated dilators. Under these circumstances, with avulsion and dilatation of the muscle fibers, the patency should be maintained by means of an indwelling tube and we employ the long T tube, passing it through the ampulla into the duodenum routinely. The second method of correction consists of division of the mucosa of the papilla and division of the sphincter muscle through the transduodenal approach. This may be accomplished by the sphincterotome through the common duct, but if this is used, it should be done under direct vision. The use of the Lahey grooved catheter, recently reported,²² is quite effective. The method of treatment employed in the cases to be reported was direct incision of the sphincter, with or without suture of the mucosa. In all of our

sphincterotomies, we have used the long T tube.

Following common duct exploration in which no obstruction is demonstrable at the ampulla, a short-armed T tube is placed in the common duct and removed in from eight to 12 days. If definite fibrosis or stricture is present and the obstruction is overcome by forcible dilatation and avulsion of the fibers, a long T tube is always used and left in place for a minimum of six months. In many patients it has been left for at least a year. During this time the T tube is irrigated twice daily with normal saline solution and a cholagogue given for the entire period that the tube is left in place. When the long T tube is implanted at the time of sphincterotomy, it is left in usually for a shorter period of time of from two to six months, depending on the size of the common duct and intraductal findings.

Doubilet and Mulholland, in their sphincterotomies for pancreatitis, believe that a tube through the ampulla is unnecessary, even for the immediate postoperative period. In our own experience, we have not encountered any increase in complications as a result of the tube implantation, but in many cases, the lumen of the tube does become encrusted with sediment in time in spite of any precautions. The use of the indwelling T tube is the best assurance of maintaining patency of the sphincter and papilla, and the need for it is suggested by the experimental work of Zollinger. Forcible dilatation of the ampulla and sphincterotomy are followed by submucosal hemorrhage, edema, fibroblastic proliferation and later, fibrosis. Theoretically, the tube must be left until absorption of the scar has occurred and smooth mucosa healing has resulted.

CLINICAL DATA

For the purpose of this report we have taken a selected group of patients with

fibrosis of the sphincter or stricture of the papilla, operated on for this condition over a period of 15 years. Only those cases have been selected where no doubt existed as to the presence of a localized narrowing at the sphincter level or at the papilla. We have not included patients with pancreatitis. After a careful study of the histories of a much larger group in whom the possibility of fibrosis was considered either preoperatively or at the time of operation, we have selected 49 cases in which there could be no question of the finding of fibrosis. Those cases in which the diagnosis was not substantiated, was indefinite or was questioned by the operating surgeon, were excluded. A satisfactory result was to be expected in these doubtful cases and it was believed that their inclusion would put too favorable a light on the problem. Because of our interest in this problem over many years, the diagnosis is frequently considered, particularly in those patients who have recurrent symptoms after gallbladder surgery.

Of the 49 cases, 14 were males and 35 females, which is the usual sex incidence of cholelithiasis. The age of the patients ranged from 29 to 73 years, but 31 patients, or approximately two-thirds, were between the ages of 30 and 50.

The symptoms encountered in this selected group of cases included all of those commonly associated with calculi in the biliary tract. The most conspicuous clinical feature was the occurrence of intermittent attacks of severe, right upper quadrant or upper abdominal pain, with the typical radiation to the back and to the shoulder. These attacks were frequently associated with anorexia, nausea and vomiting. Forty-two of the 49 patients complained of these typical attacks which usually required a hypodermic injection for relief. Characteristically, these attacks had been present for a long period of time.

Twenty-seven patients gave a history of intermittent or persisting jaundice following

their attacks of abdominal pain. Seven patients gave a history of chills and fever. Appreciable weight loss was a prominent finding.

Thirty-two patients had had previous cholecystectomy without relief of symptoms and in several instances the frequency and the severity of the attacks were not modified by the previous operation. Several patients had had choledochostomy performed at the time of cholecystectomy, and in six of these a common duct stone had been removed previously, yet this did not result in relief of pain. In some of the patients who had choledochostomy, a normal cholangiogram had been demonstrated postoperatively.

Of the 32 patients who had had previous surgical procedures on the biliary tract, common duct stones were present in 13 at the time fibrosis was discovered. In six of these, as mentioned above, one or more common duct stones had previously been removed. It is impossible to determine in these 13 cases whether they were retained common duct stones or they had formed as a result of the obstruction.

Seventeen patients had moderate to marked dilatation of the common duct. It is recognized that common duct dilatation is a frequent finding following cholecystectomy, and since 32 patients had had this operation performed, it may have been a factor in the production of dilatation. The fact that only 17 patients had had an appreciable common duct dilatation out of 49 in whom fibrosis was demonstrated illustrates clearly that this finding can be present in the absence of common duct dilatation and in the absence of jaundice. In the entire group, other pathology of the biliary tract was encountered that may have at least partially been responsible for the symptoms. Two patients were found to have impacted cystic duct stones. Two patients had partial strictures of the common duct in addition to fibrosis of the sphincter. One had an aber-

rant vessel across the termination of the common duct and duodenum, and severe ulcerative colitis was present in one.

With the demonstration of fibrosis of the sphincter, the operative procedures carried out in these 49 cases were as follows: forcible dilatation of the sphincter was performed in 35 patients, and in these a long T tube was inserted. Transduodenal sphincterotomy was performed in ten, and in each of these the long T tube was utilized. Dilatation of the sphincter with implantation of a short T tube was carried out in three patients. These three procedures were performed previous to the introduction of the long T tube, and it is of interest to note that one was a failure and two patients had only partial relief. In the final patient, choledochoduodenostomy was performed since previous subtotal gastrectomy had been carried out. There was no operative mortality in this group. Only two subsequent deaths have occurred, one a year later from chronic relapsing pancreatitis and pancreatolithiasis and a second death from carcinoma of the common duct.

Seventeen patients have been followed from three to 12 years and 13 of these were completely relieved of symptoms. Two had been improved but experienced occasional mild attacks; one was a failure. One patient died of carcinoma of the common duct, determined by subsequent exploration.

Twelve cases were followed from one to three years; ten patients were relieved and two were improved. Eight cases were followed for six months to one year with five patients being relieved, two improved and one patient died as the result of chronic relapsing pancreatitis. Ten cases were followed for less than six months and in two, no follow-up data were available. Of the 37 cases followed for six months or more, 28 patients had complete relief of symptoms, six were improved, one was a failure and two were dead.

CASE REPORTS

Case 1.—A 66-year-old man had a short history of upper abdominal symptoms, followed by jaundice. Cholecystograms showed the presence of gallstones and in March, 1939, cholecystectomy and choledochostomy were performed, with removal of his gallbladder and common duct stones. He was relieved of symptoms for a short time, following which he had attacks of pain with chills and fever. He was operated on in June, 1939, at which time a choledochostomy was done and a common duct stone removed. Shortly afterward jaundice again recurred, with chills and fever, and he was admitted to the clinic in December, 1940.

At this third operation common duct stones were found with marked dilatation of the common duct, and a marked fibrosis of the sphincter of Oddi was demonstrated. A transduodenal sphincterotomy was performed and a long T tube was inserted. He was completely relieved of symptoms; the T tube was left in place for 27 months and was removed in March, 1942. He has remained well for 10½ years since the last operative procedure.

Comment. This patient had two previous operations, with removal of stones from the common duct. A third operation was required because of an unrecognized fibrosis of the sphincter of Oddi.

Case 2.—A 48-year-old nun was first seen in the clinic in August, 1940, with a history of having had cholecystectomy 10 years previously. She complained of intermittent attacks of right upper quadrant pain, extending to her back, with jaundice following each attack of pain, which was associated with anorexia, nausea and vomiting. The serum bilirubin was 0.8 mg. per 100 cc.; biliary drainage was negative for stones. She was operated on in May, 1941. The common duct was found to be dilated but no stones were present. A stricture of the papilla of Vater was found and dilated, following which a T tube was inserted and was removed 2½ months after operation. She has been completely relieved of symptoms.

Comment. This patient had persisting attacks of pain following cholecystectomy. On exploration, the common duct was dilated; no stones were present. There was a stricture of the papilla and symptoms were relieved by dilatation.

Case 3.—A 48-year-old woman was first seen in February, 1948, because of attacks of right upper

quadrant pain intermittently for 20 years. Eight years previously a cholecystectomy had been done for gallstones. Since cholecystectomy, for the 8 year period, she had had the same type of attacks as prior to the removal of her gallbladder; these attacks occurred 3 to 8 months apart, without warning. After full studies, all of which were normal, a diagnosis was made of common duct stones.

Operation was performed in March, 1948. A dilated cystic duct stump was found; the common duct was dilated to twice normal size and a soft stone was removed from the ampulla. The ampulla was dilated up to a number 7 Bâkes dilator after removal of the stone, and a short T tube was inserted. A cholangiogram done on the eleventh postoperative day showed the normal passage of the radiopaque material into the duodenum and no evidence of retained stones. The T tube was removed on the twelfth day, and following its removal she had a severe attack of pain. Relief was obtained with nitroglycerine and demerol.

Following her discharge from the hospital the patient had almost daily pain with no interval of freedom longer than 3 days. She was readmitted to the hospital in 8 weeks and a diagnosis made of fibrosis of the ampulla of Vater. Operation was performed May 6. On exploration of the common duct, a saccular dilatation immediately proximal to the ampulla of Vater was found, from which debris was removed. Since it was not possible definitely to demonstrate a probe passing through the papilla, duodenotomy was performed and a fine probe inserted in a retrograde direction, demonstrating fibrosis of the sphincter. The sphincter was first dilated and then incised and a long T tube inserted.

The patient made a good recovery from operation. The T tube was removed 9 months later and she has had no attacks of pain or other symptoms in the 4½ year period since operation.

Comment. This patient at a second operation had removal of common duct stone and dilatation of the sphincter with the insertion of a short T tube. Recurrence of symptoms required sphincterotomy.

Case 4.—A 33-year-old physician was first seen in July, 1944, stating that since 1939 he had had intermittent attacks of gallbladder colic. Gallstones were demonstrated, and in June, 1943, a cholecystectomy and choledochostomy had been performed. The T tube was left in the duct for 10 days and when a cholangiogram was done prior to its removal, it reproduced his previous attacks of pain. Since operation he had had intermittent attacks of colic similar to those prior to cholecystectomy. After study, a preoperative diagnosis was

made of recurrent common duct stones and spasm of the sphincter of Oddi.

Operation was performed in July, 1944, and on exploration of the common duct, no stones were found. A probe could not be inserted through the ampulla. Transduodenal exploration was done and the ampulla identified by the injection of saline solution through the common duct. Sphincterotomy was then carried out, suturing the edges of the mucosa, following which a long T tube was inserted through the ampulla. The T tube was left in place for one year. This patient has had complete relief of symptoms for 8 years.

Comment. This physician had recurrence or persistence of pain after cholecystectomy and choledochostomy. Pain was reproduced by cholangiography. Symptoms were due to fibrosis of the sphincter, with other pathology.

Case 5.—A 53-year-old woman was first seen at the clinic in August, 1948, with a 28-year history of attacks of epigastric pain, worse after the ingestion of fat. Two years previously, cholecystectomy and choledochostomy had been performed; stones were removed with the gallbladder and from the common duct. Eight months previous to admission, painless jaundice had developed, fluctuating in intensity, with severe pruritus. She gave a history of having drained bile from her wound for one year following the cholecystectomy.

Liver function tests showed a severe degree of hepatic damage. The serum bilirubin was 4.1 mg. per 100 cc.

On August 11, 1948, operation was carried out. The common duct was dilated to 2 cm. in diameter, but a probe could not be passed through the ampulla. Because of the patient's poor condition and bad liver function, the operation was terminated after choledochostomy and short T tube drainage, yet a stricture of the ampulla and cirrhosis of the liver were evident. There was copious drainage from the T tube and a marked electrolyte imbalance, which was difficult to control.

Re-operation was performed September 10, at which time a remnant of the ampulla of the gallbladder attached to a patent cystic duct was found. A 2 cm. stone was impacted in the ampulla of Vater. Choledochostomy was performed and the stone removed, but a probe could not be passed through the ampulla. Duodenotomy with sphincterotomy was carried out and a long T tube implanted. The T tube was left in place for a period of one year and no symptoms followed its removal. She has been well for the 4 years since operation.

Comment. This patient had a 28-year history of disease of the biliary tract unrelieved by cholecystectomy and choledochostomy. Sphincterotomy was followed by complete relief.

Case 6.—A 51-year-old man developed painless jaundice in August, 1946, and was operated upon in September and found to have gallstones. The gallbladder was removed, the common duct explored and no stones were encountered. A probe could be passed through the ampulla. T tube drainage of the common duct was carried out during his hospital admission. Following operation, jaundice disappeared but his urine remained dark and the stools light and subsequently itching with jaundice developed, which persisted. Liver function tests were negative; the serum bilirubin was 1.5 mg. per 100 cc.; the bromsulphalein retention was 40 per cent. He was re-operated upon on September 17, 1947, and cirrhosis of the liver and portal hypertension were demonstrated. The common duct was not dilated but contained considerable debris. No definite stones were present. The ampulla was contracted but was dilated up to a number 8 dilator and a long T tube was passed through the ampulla. His condition improved and 3 months later the T tube was removed. In March, 1948, 6 months after operation, his symptoms returned and he also noted intermittent chills and fever. The bilirubin was found to be 3 mg. per 100 cc. He was considered to have a recurrence of fibrosis of the ampulla of Vater because of too short a period of drainage, and was advised to return for sphincterotomy. This has not been performed.

Comment. An unsatisfactory result in this case was due to inadequate treatment of fibrosis and an insufficient period of drainage.

SUMMARY

Fibrosis of the sphincter of Oddi may be responsible for some of the symptoms in patients with cholelithiasis. It can best be demonstrated during exploration of the common duct. It may be overlooked unless broad indications for choledochostomy are used.

Unrecognized fibrosis of the sphincter or stricture of the papilla may be responsible for recurrence or persistence of symptoms

following cholecystectomy and may lead to the necessity of a secondary operation.

Repeated operations for common duct stones are frequently required because of fibrosis of the sphincter.

Fibrosis of the sphincter should be suspected when difficulty is experienced in probing the lower end of the common duct. Inability to get the probe through the ampulla may be due to a number of reasons, one of which is this lesion.

Fibrosis can be relieved by forcible dilatation or by transduodenal sphincterotomy. The patency of the ampulla should be maintained by the insertion of a long T tube which is passed into the duodenum and kept in place for several months.

An analysis of 49 cases of fibrosis of the sphincter of Oddi or stricture of the papilla of Vater is presented. Complete relief of symptoms was obtained in 90 per cent. Illustrative case histories are briefly reported.

TABLE I.—*Causes of Obstruction at the Ampulla of Vater.*

1. Common duct stone.
2. Stricture of papilla of Vater.
3. Saccular dilatation of terminal common duct.
4. Devious course of common duct through pancreas.
5. Fibrosis of sphincter of Oddi.
6. Pancreatitis.
7. Penetrating duodenal ulcer.
8. Papilloma of papilla of Vater.
9. Carcinoma of periampullary area.

BIBLIOGRAPHY

- 1 Allen, A. W., and R. H. Wallace: Surgical Management of Stone in Common Bile Duct. *Ann. Surg.*, 111: 838, 1940.
- 2 Archibald, E.: Ideas Concerning the Causation of Some Cases of Pancreatitis. *Canad. J. Med. and Surg.*, 33: 263, 1913.
- 3 ———: Experimental Production of Pancreatitis in Animals as the Result of the Resistance of the Common Duct Sphincter. *Surg., Gynec. and Obst.*, 28: 529, 1919.
- 4 Berg, J.: Studies on Function of Biliary Ducts. *Acta. chir. Scandinav.*, Supp. 2, pp. 1-185, 1922.

- 5 Branch, C. D., O. T. Bailey and R. Zollinger: Consequences of Instrumental Dilatation of Papilla of Vater; Experimental Study. *Arch. Surg.*, 28: 358, 1939.
- 6 Cattell, R. B.: End Results of Surgery of the Biliary Tract. *Ann. Surg.*, 89: 930, 1929.
- 7 Cattell, R. B.: A New Type of T-tube for Surgery of the Biliary Tract. *Lahey Clin. Bull.*, 4: 197, 1946.
- 8 Cattell, R. B., and E. D. Kiefer: Failure After Cholecystectomy. *J. A. M. A.*, 93: 1270, 1929.
- 9 Cattell, R. B., and L. J. Pyrtek: An Appraisal of Pancreatoduodenal Resection: a Follow-up Study of 61 Cases. *Ann. Surg.*, 129: 840, 1949.
- 10 ———: Premalignant Lesions of the Ampulla of Vater. *Surg., Gynec. and Obst.*, 90: 21, 1950.
- 11 Cattell, R. B., and K. W. Warren: The Choice of Therapeutic Measures in the Management of Chronic Relapsing Pancreatitis and Pancreatolithiasis. *Gastroenterol.*, 20: 1, 1952.
- 12 Colcock, B. P.: Choledochostomy; Its Place in Surgery of Biliary Tract. *Surg. Clin. N. Amer.*, 28: 641, 1948.
- 13 ———: Operative Procedures on the Gallbladder and Common Duct. *Surg. Clin. N. Amer.*, 29: 805, 1949.
- 14 Cole, W. H., and W. J. Grove: Persistence of Symptoms Following Cholecystectomy with Special Reference to Anomalies of the Ampulla of Vater. *Ann. Surg.*, 136: 73, 1952.
- 15 Colp, R.: Treatment of Postoperative Biliary Dyskinesia; Report of 8 Cases of Endocholedochal Sphincterotomy. *Gastroenterol.*, 7: 414, 1946.
- 16 Doubilet, H., and J. H. Mulholland: Surgical Treatment of Recurrent Acute Pancreatitis by Endocholedochal Sphincterotomy. *Surg., Gynec. and Obst.*, 86: 295, 1948.
- 17 ———: Recurrent Acute Pancreatitis; Observations on Etiology and Surgical Treatment. *Ann. Surg.*, 128: 609, 1948.
- 18 Gordon-Taylor, G.: Sphincter Mechanism of Lower End of Bile Duct (Hunterian Lecture). *Brit. M. J.*, 2: 149, 1942.
- 19 Lahey, F. H.: The Incidence and Management of Stones in the Common and Hepatic Ducts. *Ann. Surg.*, 98: 644, 1933.
- 20 ———: Common and Hepatic Duct Stones. *Am. J. Surg.*, 40: 209, 1938.
- 21 ———: The Technic of Cholecystectomy and Choledochostomy. *Surg., Clin. N. Amer.*, 19: 597, 1939.
- 22 ———: A Split, Solid, Tube-like Catheter to Aid in Cutting the Sphincter of Oddi Trans-

- duodenally. *Surg., Gynec. and Obst.*, **95**: 524, 1952.
- ²³ Lahey, F. H., and N. W. Swinton: Stones in the Common and Hepatic Bile Ducts. *New Eng. J. Med.*, **213**: 1275, 1935.
- ²⁴ Mahorner, H.: Combined Supraduodenal and Transduodenal Exploration of Common Bile Duct. *Ann. Surg.*, **129**: 766, 1949.
- ²⁵ McGowan, J. M., W. L. Butsch and W. Walters: Pressure in the Common Bile Duct of Man; Its Relation to Pain Following Cholecystectomy. *J. A. M. A.*, **106**: 2227, 1936.
- ²⁶ Mixter, C. G., L. Hermanson and L. Segal: Operative Cholangiography. *Ann. Surg.*, **134**: 346, 1951.
- ²⁷ Opie, E. L.: The Etiology of Acute Hemorrhagic Pancreatitis. *Johns Hopkins Hosp. Bull.*, **12**: 182, 1901.
- ²⁸ Strode, J. E.: Biliary Dyskinesia from Surgical Viewpoint. *Ann. Surg.*, **117**: 198, 1943.
- ²⁹ Swinton, N. W.: Cholecystectomy and Choledochostomy. *Surg. Clin. N. Amer.*, **22**: 761, 1942.
- ³⁰ Trommald, J. P., and D. B. Seabrook: Benign Fibrosis of Sphincter of Oddi; Report of 8 Cases. *West. J. Surg.*, **58**: 89, 1950.