

STRICTURES OF THE COMMON DUCT*

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ALTHOUGH THERE HAS BEEN GREAT IMPROVEMENT in the results following repair of strictures of the common duct during recent years, the outcome is far from that desired. Since the results are by no means perfect, and since such a large percentage of strictures are caused by operative trauma, meticulous attention must be paid to the technic of operations on the biliary tract in the prevention of these lesions.

ETIOLOGY OF STRICTURES OF THE COMMON DUCT

In our series of 49 patients, operative trauma could be identified as the direct cause of the stricture in 65 per cent (Table I). In this group jaundice or a biliary fistula developed in one to three days following an operation on the biliary tract (usually cholecystectomy).

Numerous mechanisms in production of operative trauma are possible (Fig. 1). Perhaps the most common is excision of a mobile common duct which is placed under tension by traction on the gallbladder; the common duct is erroneously identified as part of the cystic and a portion excised. Another common mechanism is ligation of a portion or all of the duct with a bleeding vessel. It is possible that when considerable effort is made to ligate the cystic duct close to the common, the latter structure may be damaged. Occasionally, the duct is damaged during gastrectomy or traumatized sufficiently during choledochostomy to result in stricture formation; however, in our series none of the strictures could be attributed to either of these two causes.

In 11 patients, or 23 per cent of our series, an interval of three months to six years lapsed following the operation on the biliary tract before evidence of the stricture developed. The mechanism in production of these delayed strictures is poorly understood, but the authors agree with the original contention of Judd¹, that a gradual obliterative cholangitis does occur and appears to be related primarily to inflammation. There are several possible causes of this inflammatory process in the wall of the common duct. The authors believe that a collection of bile overlying the common duct is a common cause of delayed formation of a stricture. A small abscess might produce a stenosis in the same manner. On other occasions neither of these two mechanisms appear to exert a role in production of the stricture. We

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have had the same experience noted by Judd years ago, that a common duct observed at one operation was relatively normal in size, but at another operation several months later had stenosed down to a mere fibrous cord.

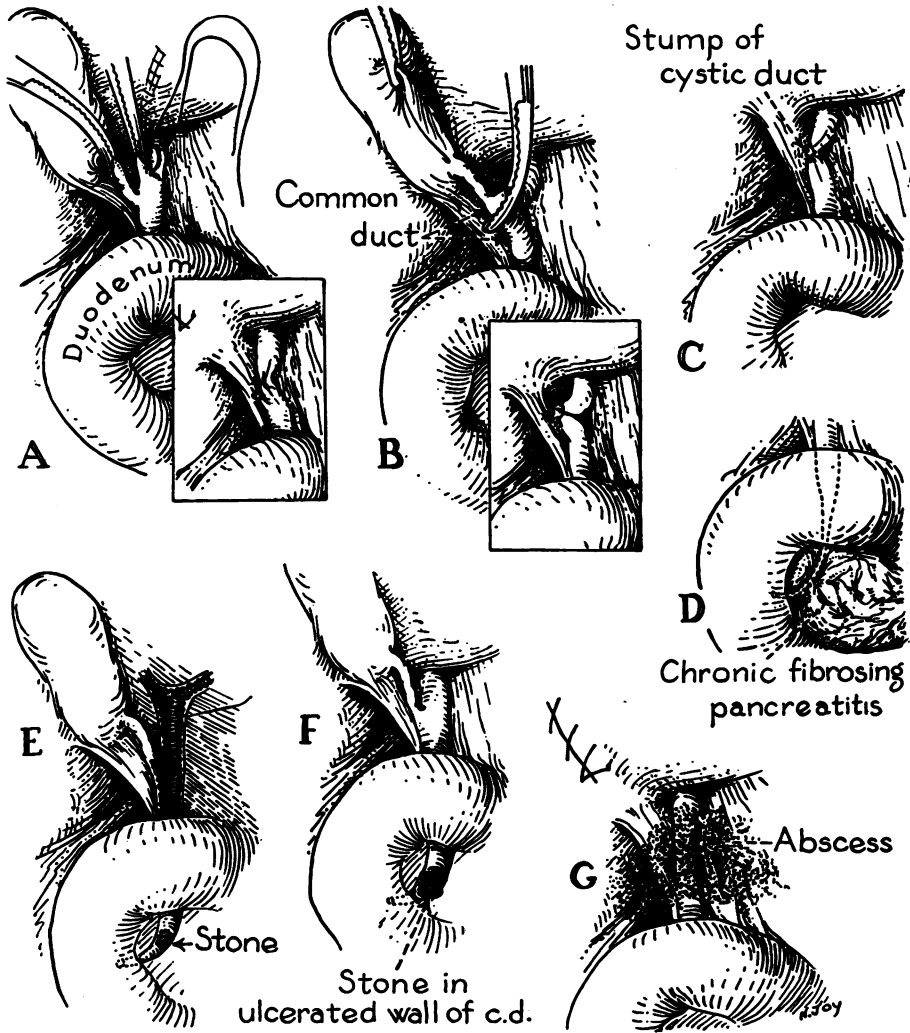


FIG. 1.—Mechanisms in production of stricture of the common duct; (A) transfixion with a needle; (B) ligation with the cystic duct; (C) ligation of the cystic duct too close to the common; (D) diffuse sclerosing pancreatitis; (E) cholangitis; (F) ulceration of the wall by stone; (G) abscess or local collection of bile. (From Cole, Ireneus and Reynolds, in *Strictures of the Common Duct*, Interscience Publishing Co., New York. In Press.)

Large masses of catgut and ligated tissue left adjacent to the common duct at the time of cholecystectomy might act as the source of an inflammatory process. On some occasions pylephlebitis appears to be the cause of the inflammatory stenosis. We have had four patients in our series of patients

with stricture who had pylephlebitis; it seems possible that this lesion may have been the primary etiologic factor in the production of stricture in these cases, primarily by contact infection.

In five patients, or 10 per cent of the series, the stricture was due to chronic pancreatitis of the diffuse fibrosing type. In two of these the obstruction was not complete.

Other factors such as pancreatic cysts, ulceration due to gall stones, etc., exist, but are relatively uncommon.

PREVENTION OF STRICTURES

Numerous measures can be utilized in operations on the biliary tract to prevent trauma to the common duct. If particular attention is paid to these

TABLE I.—*Causes of Benign Strictures of the Common Bile Duct (In Our Series of 49 Patients*)*

	<i>No. of Cases</i>	<i>Per Cent</i>
1. Operative trauma (none following choledochostomy or gastrectomy)	32	65
2. Inflammation (some possibly related to trauma)	11	23
3. Chronic pancreatitis	5	10
4. Pancreatic cyst	1	2
Total	49	100

*Only 4 patients (excluding the pancreatitis cases) were jaundiced before the original operation.

prophylactic measures the incidence of trauma will be diminished. Space does not permit detailed discussion of the measures, but they will be enumerated briefly below.

1. Maintain carefulness, and refrain from hurry while dissecting structures near the common duct.
2. Obtain good exposure of the region about the common duct with a long incision. The incision may be oblique, transverse or longitudinal, but should be of sufficient length to give adequate exposure.
3. Obtain adequate relaxation with the proper anesthetic. Ether is an adequate anesthetic in obtaining this relaxation, but cyclopropane and curare are likewise effective.
4. Isolate the junction of the common duct and the cystic duct before ligating the latter structure.
5. Ligate no artery until it is proven that it enters the gallbladder.
6. Ligate the cystic duct and artery separately.
7. Cut no structure until it is identified.
8. Ligate the cystic duct at least 1/2 inch from the common duct. This distance will protect the common duct and likewise prevent reformation of a bulbous tip.

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9. Control hemorrhage by pressure with the index finger of the left hand in the foramen of Winslow against the thumb, so the bleeding point can be controlled by compressing the hepatic artery. By gradual release of compression the bleeding point can be identified and caught accurately with an artery forcep.
10. If adhesions are dense around the common duct, start dissection at the fundus of the gallbladder and ligate the duct or ampulla high.
11. Eradicate gallbladder disease early before massive inflammation takes place.
12. Be familiar with the abnormal anatomy as well as the "normal". The anatomy of the biliary tract is so varied that we can identify no position of the various structures as normal. Normal can only be considered a composite of those types most commonly observed.

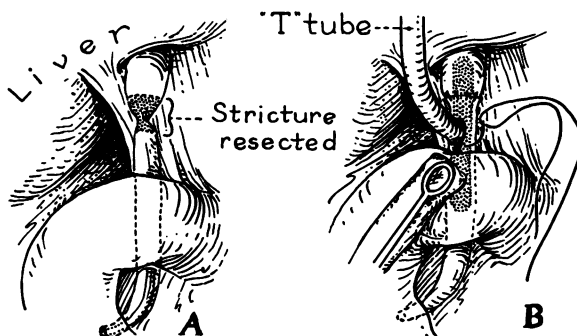


FIG. 2.—Repair of local stricture is best accomplished by resection of the stenosed area and end to end anastomosis. Support of the suture line is necessary for at least 3 months and is best accomplished by the arm of a T tube inserted through an opening $\frac{1}{2}$ inch from the suture line. Every effort should be made to find the distal end of the common duct because the end to end type of repair, as illustrated above, is by far the most successful. (From Cole, Ireneus and Reynolds, in *Strictures of the Common Duct*, Interscience Publishing Co., New York. In press.)

REPAIR OF STRICTURES

Since numerous types of stricture are encountered, numerous operative procedures must be available for the repair. It is now agreed by most surgeons spending considerable thought on repair of strictures of the common duct that the most difficult type to repair from the standpoint of recurrence, is the one occurring at the hilus of the liver. Unfortunately, when a stricture reforms, it is frequently at this point. Therefore, it is the opinion of the authors that the greatest improvement to be obtained in the repair of strictures would be in that group occurring at the hilus. Space does not permit a detailed discussion of the repair of the various types of strictures. Therefore, most of the text dealing with repair of stricture will be devoted to the details of a procedure which the authors have devised for treatment of strictures at the hilus. Other common procedures will be discussed briefly.

1. *Local Strictures.*—When a stricture is localized to a small portion of the common duct and does not involve the hilus of the liver, repair is easily performed by excising the scar at the stricture and performing an end-to-end anastomosis. One layer of sutures is adequate for end-to-end repair. Non-absorbable material is preferred but it must be placed carefully so that none projects into the lumen lest it act as a nidus for precipitation of cholesterol and bile salts. Some type of support must be furnished the suture line. The authors prefer a T-tube which is inserted through an opening at least $\frac{1}{2}$ inch distal to the suture line, because insertion of the tube through the suture line tends to encourage recurrence of the stricture. (See Fig. 2.) A Penrose drain is inserted down to the duct as the wound is closed.

2. *Stricture of the Distal End Only.* — Several types of repair are available when the stricture involves the distal end of the common duct. The one preferred by the authors is a side-to-side anastomosis utilizing a longitudinal incision in the common duct as well as in the duodenum (Sanders²). In this anastomosis a double row of sutures is necessary; we prefer interrupted catgut for the inside row and interrupted silk for the outside row.

The common duct can be transplanted into the duodenum; however, the authors have not had very satisfactory results with this type of anastomosis.

When more than 2 or 3 centimeters of common duct are present, the authors are of the opinion that anastomosis of the duct to a functioning loop of intestine can be done without much danger of suppurative cholangitis resulting from reflux of food. There is apparently much less danger of cholangitis from reflux in this type of case than when no common duct is left, because the stump of common duct appears to act as a reservoir protecting the intrahepatic bile ducts.

3. *Stricture of the Proximal Portion of the Common Duct.*—In this type of lesion the repair becomes more difficult. If possible, effort should be made to *find the distal end* of the common duct, as emphasized by Cattell,³ who actually splits the head of the pancreas in an effort to find it. If the distal end can be found, the duodenum and head of the pancreas can almost always be mobilized sufficiently to bring the distal end of the common duct up to meet the hilar duct, even though only a very short stump remains. In this situation, an end-to-end anastomosis is usually performed, as previously described, inserting a T-tube through an opening distal to the suture line so that the suture line may have support for as long as three or four months, thus minimizing the chance of recurrence.

4. *Absence of Entire Duct.* — This type of defect is the most difficult one of all to repair, and in general, results are not as good as in the lesions previously mentioned. The authors agree with Allen⁴ and others that the use of a Roux Y arm of jejunum is superior to

anastomosis of the duct to a functional loop of intestine because reflux of intestinal content is so poorly tolerated by the liver when the stump of duct is so short that food regurgitates readily into the intrahepatic ducts. The authors proved to their own satisfaction that regurgitation of food could be a factor in production of chills and fevers, although stenosis *is the more common factor*. In two patients on whom we anastomosed a loop of jejunum to the hilar duct, the patients continued to have chills and fever which, however, were abolished completely several months later by section of the proximal arm of jejunum, thus preventing regurgitation. In bile duct repair, the credit for the use of the arm of jejunum designated as the Roux Y arm, should actually be given to Monprofit,⁵ who recommended it in 1908.

Use of Mucosal Graft from the End of Jejunum—This procedure is a modification of one recommended several years ago by Hoag.⁶ He suggested the use of a flap of gastric mucosa to be inserted up into the strictured area at the hilus of the liver. In view of the experiments of Price and Lee⁷ showing that gastric secretions can actually digest, or seriously damage normal living tissue, we have modified this procedure by utilizing the end of the Roux Y arm of jejunum in the graft. This operation is designed primarily for strictures at the hilus of the liver, which is mentioned previously, as unquestionably the most difficult ones to repair from the standpoint of freedom from recurrence. After the Roux Y arm is constructed, the serosa and muscularis is separated from the mucosa and submucosa by sharp dissection for a distance of 2 or 3 cm., as illustrated in Fig. 3. This allows procurement of a tube of mucosa which can be inserted up into the strictured area, thus acting as a graft over the scarred area. After 2 or 3 cm. of mucosa are isolated, a portion of the bell end of a catheter (No. 10 to 14) is cut off and anchored with 2 or 3 sutures of interrupted silk or cotton in the lumen of the mucosal tube. It may be necessary to trim a portion of the mucosal tube, as illustrated in Figs. 3e and 3f. The cuff of mucosa is made long enough to extend through the scarred area in the liver up to normal mucosa of the bile duct, and is anchored in position by 2 silk sutures inserted from the outside into the depth of the duct opening, through the cuff of mucosa, and back through the interior of the opening to the exterior. When these sutures are pulled tight, the mucosal cuff is thrust snugly into the opening, thus producing a water tight closure or anastomosis.

At times considerable difficulty will be experienced in finding the dilated duct at the hilus of the liver. On several occasions we have been unable to find any external duct, but have encountered the duct by aspiration, as illustrated in Figure 3a. An opening is made into the duct by incising alongside the needle with a sharp bistoury. This opening is enlarged by blunt or sharp dissection, making effort to locate any adjacent vessels by aspirating around the opening with a hypodermic needle and

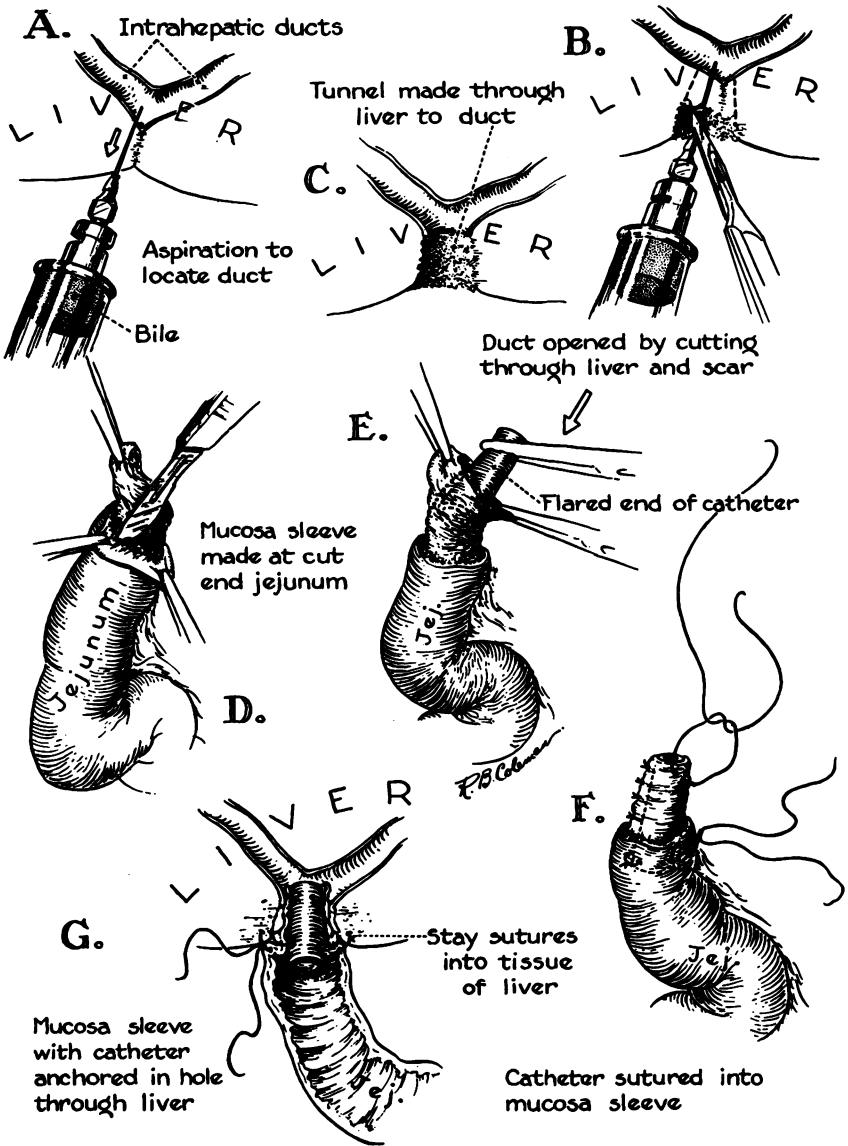


FIG. 3.—Repair of stricture of common duct by preparation of a mucosal tube and the implantation as a graft into the duct opening at the hilus of the liver (modification of Hoag operation). This procedure is most applicable when no stump of duct remains, and scarred liver tissue must be incised to reach the duct. The depth of the scarred area is exaggerated to better illustrate the method. The mucosal tube is pulled into position and held there by two sutures, each of which is inserted from the outside into the depth of the opening, through the mucosal sleeve, and back through the depth of the opening to the outside where the two ends of each suture are tied together. From Cole, in Canadian Med. Assoc. Journ. In press.)

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syringe. The opening so obtained usually extends through scarred liver tissue. In our opinion about the only hope of preventing reformation of a stricture at this point is to fill in the defect with a bridge or graft of mucosa. It would no doubt be satisfactory to insert the entire end of jejunum into the opening, but the opening is usually so small that one can get no more than the thin cuff of mucosa, as described above, in the

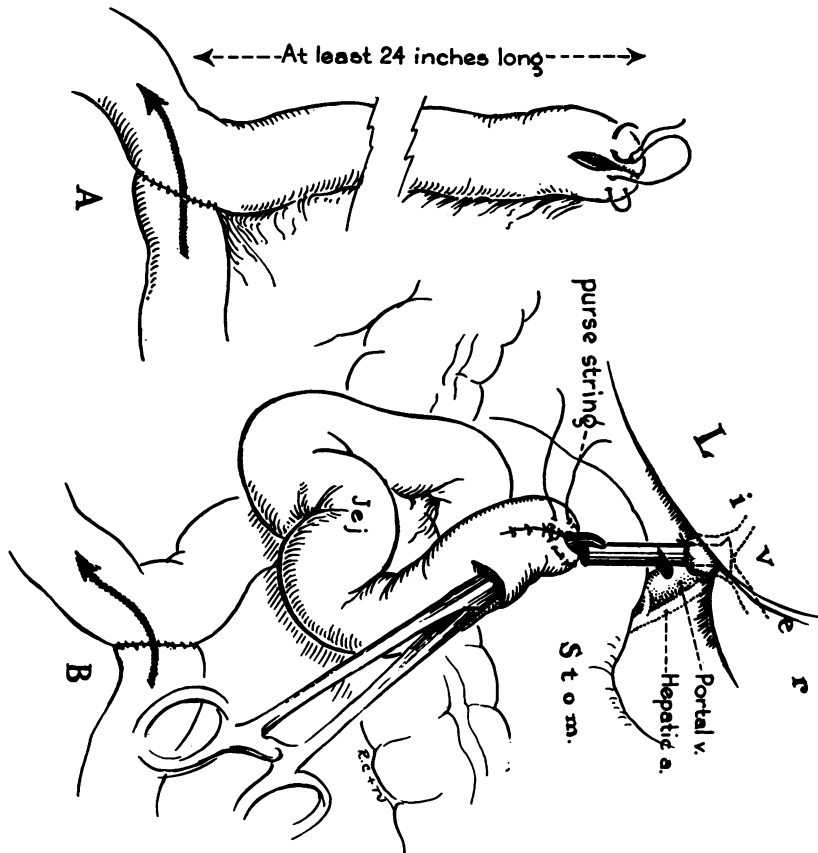


Fig. 4.—When utilizing the Roux Y arm of jejunum to replace the common duct, the ileum is severed about 18 inches from the ligament of Treitz and the proximal end sutured to the distal loop at least 14 inches from the point of severance; the distal end is closed with a continuous suture as shown in A. The end of the vitallium tube is inserted into the end of the intestine, aided by a hemostat through a puncture wound two or three inches from the closed end as shown in B. The end of the Roux Y arm of jejunum is anchored to the liver by interrupted silk sutures. (Modified from Cole, Ireneus and Reynolds, in *Annals of Surgery*, 1945.)

hole and still have room for an adequate lumen. Since this opening at the hilus is usually funnel shaped, even compression is best obtained by utilizing the flared end of the catheter, placing the smaller end upward into the opening. The wall of the jejunum is anchored in position against the hilus of the liver with three or four interrupted sutures of silk or cotton. In our experience the sutures anchoring the tube in the sleeve

of jejunal mucosa will tear out in three or four months, thus allowing the rubber tube to pass.

Use of Vitallium Tube.—The technic using a vitallium tube in the method of repair utilizing the Roux Y arm of jejunum has been described previously by the authors.⁸ The important features in this procedure

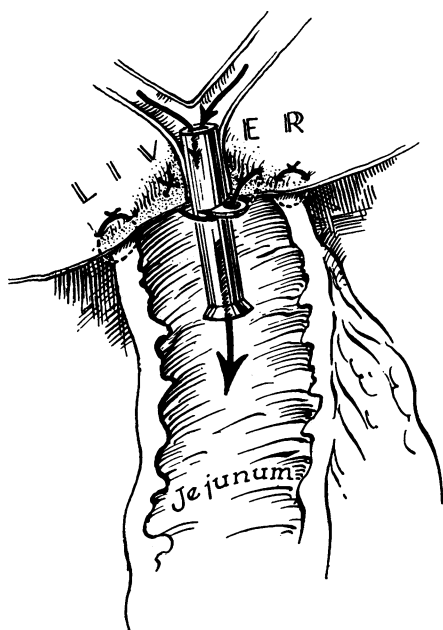


Fig. 5.—An alternate method of suturing the end of the Roux Y arm of jejunum to the hilar duct when the duct protrudes at the hilus is to suture the end of jejunum as near the duct as possible with 4 interrupted silk sutures, without everting or infolding the edge of intestine. In the author's opinion, this type of attachment may minimize recurrence of stricture slightly more than the method illustrated in Fig. 4, although a true mucosa to mucosa anastomosis is not possible with either method. Mucosa to mucosa approximation is possible with the method illustrated in Fig 3, and in the method shown in the above illustration if a wedge of the end of intestine is resected as shown by the dotted line through the mucosa of Fig 3E; the edges on the side of the intestine are then turned in to prevent leakage. The mucosa of the conical shaped end of jejunum thus formed can then be anchored directly to the mucosa of the hilar duct.

consist of anchorage of the vitallium tube (see Fig. 4) in the hilar duct, turning in the end of jejunum, inserting the distal end of the vitallium tube into the arm of jejunum and suturing the end of jejunum to the hilus of the liver. Although we originally inverted the end of the arm of jejunum and anchored the vitallium tube with a purse-string suture, we are more inclined in recent cases, when utilizing the vitallium tube, to anastomose the cut edge of the arm of jejunum to the outside edge of the hilar opening without inversion of the end or formation of a cuff (Fig. 5). In the cases in which we have not anchored the vitallium tube with a purse-string around the neck of the tube we have adopted the principle of anchoring it against the wall of the hilar opening with one silk suture through the flange, and another silk suture around the neck of the tube. Our experience with this type of suture in a few cases indicates that the tube remains in place about three months. In our opinion it is not entirely desirable to have the vitallium tube remain longer than six months because such a high percentage of tubes will block if they remain in position longer than this interval.

Use of a Rubber Catheter.—Use of a rubber catheter to support the suture line when anastomosing the hilar duct to the Roux Y arm of jejunum has previously been described by Allen.⁴ An opening is made

in the catheter to allow bile to drain through the upper end at the hilus downward into the jejunal arm and also to the exterior through the lumen of the catheter. Allen recommends that this catheter be left in place at least three months.

On a few occasions we have utilized a short piece of rubber tube to support the suture line, leaving it in position at the anastomosis but anchoring it in place with a silk suture leading out to the exterior (McArthur⁹). At the end of 3 or 4 months the anchoring suture is cut, thus allowing the rubber tube to pass on out into the intestine.

MISCELLANEOUS TYPES OF REPAIR

We have abandoned the anastomosis of the hilar duct to the duodenum primarily because our results were so poor that other procedures appeared more desirable. We are aware of the fact, however, that a few of our surgical friends are still using this procedure and apparently are having reasonably good results.

Several years ago, we anastomosed a loop of jejunum to the hilar duct in 5 patients, doing an enteroenterostomy between the arms of jejunum about 12 inches from the stoma at the hilus. We have had such poor results with this method that we have abandoned it. We were unable to prevent regurgitation of food up the ascending arm of jejunum into the liver even though a wide enteroenterostomy was performed between the two arms of jejunum. If ample time is taken by the roentgenologist in studying the barium flow in these cases, regurgitation into the intrahepatic ducts will be demonstrable unless folds or valves are made in the ascending arm, as described by us⁸ a few years ago.

Although an anastomosis of the gallbladder to the duodenum or jejunum is a satisfactory operation in patients having inoperable carcinoma of the head of the pancreas, we believe the procedure is not advisable in benign lesions because of the regurgitation of food and intestinal secretions into the gallbladder. If an enteroenterostomy is performed, placing folds or valves in the ascending arm of jejunum will prevent regurgitation (Peterson and Cole¹⁰). If the patient has an inoperable carcinoma, these precautions are probably unnecessary since he will probably die of his carcinoma before the infection becomes serious.

RESULTS

Results of 63 operations performed in 49 patients by us in the past 10 years are summarized in Table II. In 28 patients upon whom we performed an operation suturing the Roux Y arm of jejunum to the hilar duct we had good to excellent results in 78 per cent. In 22 per cent of this group the operation was a failure. Vitallium tubes were used in about 75 per cent of patients having this type of operation. In 4 patients we used a modification of the Hoag procedure, utilizing the

mucosa at the end of the arm of jejunum to graft over the raw area of scarred liver as shown in Figure 3. Good to excellent results were obtained in 3, or 75 per cent of this group. In two of the patients, we were unable to find the dilated duct at the hilus, but encountered it 2 or 3 cm. from the hilus at a depth of 1½ inches from the liver surface. We made an opening alongside our needle spreading the opening by blunt dissection until we were able to insert the mucosal end of the jejunum as a mucosal graft. One patient progressed satisfactorily for 3 months but the stricture recurred shortly after this and she died a few weeks

TABLE II.—*Summary of Results in Repair of Strictures*
(63 Operations in 49 Patients*)

<i>Type of Operation</i>	<i>No. Op.</i>	<i>Results** (Exc. of deaths)</i>	<i>Op. Deaths</i>
Hilar duct to Roux Y (75% vitallium tubes)	28	78 good to exc. 22 failure	0
Hilar duct to mucosal flap jejunum (modified Hoag op.)	4	75% good to exc. 25% failure	0
Repair local stricture	7	86% good to exc. 14% failure	1
Hilar duct to duodenum	7	14% excellent 28% fair 58% failure	0
Miscellaneous types of operations	17	60% good to exc. 40% failure	3
Summary	63		4

OPERATIVE MORTALITY RATE 6%

* Not counting one patient in whom no type of repair was possible because no duct could be found at the hilus.

** In 3 cases less than 1 year has elapsed since repair. One of them is already listed as a failure; the results in the other two (good to excellent) cannot be considered permanent because of the short period since operation.

later. The other patient had recurring attacks of jaundice and chills for a few months, but for the past several months has had no difficulty except for an icteric tint in the sclera. The prognosis in conditions as described in these two patients would obviously be poor regardless as to what operative procedure was utilized. The series is too small to give us an index as to the value of the procedure, but at present we believe it offers the best chance of preventing recurrence when the stricture is located at the hilus.

In 7 patients we repaired a local stricture by excising the scarred area and doing an end-to-end anastomosis or a plastic repair of the Mikulicz type. One of these patients died about 10 days after operation. The remainder had good to excellent results.

On seven occasions we anastomosed the duodenum to the hilar duct. In

only one of these (14 per cent) was the result good or excellent. In 28 per cent results were listed as fair, and in 58 per cent were listed as failure.

In 17 patients we performed miscellaneous types of operations which in general yielded very poor results. Most of these operations were performed before we adopted the procedure utilizing the Roux Y arm of jejunum. In this group of miscellaneous types of repair, results were considered good to excellent in only 60 per cent.

In 1946 Pearse¹¹ summarized the results of numerous surgeons working in this field, and reported that results were considered good in 80.1 per cent of 106 patients in whom a vitallium tube had been implanted in a loop of jejunum for repair of stricture. He reported that in 79 patients the vitallium tube had been used to support a suture line attaching the hilar duct to the duodenum itself; in 42.8 per cent results were considered a failure. We concur in the conclusion that this procedure is undesirable and have used the vitallium tube to support the suture line between the hilar duct and duodenum in only one case. Pearse reported that recurrence of symptoms caused by blocking of the vitallium tube occurred in 11.3 per cent of his combined series.

In our series of 63 operations we had 4 deaths, representing a mortality rate of 6 per cent. Cattell reports an operative mortality rate of 13.8 per cent in 164 operations on 123 patients. Flickinger and Masson reported a mortality rate of 12 per cent in their series of 188 cases.

SUMMARY

In our series of 49 cases of stricture of the common duct we noted that operative trauma was a direct cause of the stricture in 65 per cent. As expected, the best results (86 per cent good to excellent) were obtained in local stricture which was repaired by end-to-end anastomosis. The next best results (78 per cent good to excellent) were obtained in the group having anastomosis of the hilar duct to a Roux Y arm of jejunum.

The most difficult type of stricture for repair is the one in which no duct whatsoever can be found, except at the hilus. In this type of stricture we are convinced that the use of the Roux Y arm of jejunum in bridging the gap represents the best type of operative repair. Although we have had fairly good results with the vitallium tube in supporting the stricture line in such cases, we have recently adopted a new technic, particularly when the stricture is located at the hilus. This method is a modification of the Hoag procedure. Instead of the mucosa of the stomach, we utilize the mucosa of the end of the Roux Y arm of jejunum to act as a graft in covering up the raw area of scarred liver at the hilus. This scarred area at the hilus (present when no stump of duct is found) represents the point where recurrence is most apt to take place. In our opinion, the recurrence rate will be high in those cases unless the area can be covered with a tissue which will minimize scar formation; covering the area with live mucosa of the jejunal arm should offer a better method of eliminating scar forma-

tion, although our series of patients with repair of this type is too small to allow conclusions as to results.

Extreme effort should be made to find the distal stump of common duct which allows end-to-end anastomosis in practically all cases, thus preserving the sphincteric action of the ampulla of Vater.

BIBLIOGRAPHY

- ¹ Judd, E. Starr: Stricture of the Common Duct. *Ann. Surg.*, **74**: 404-410, 1926; and White, Robert B.: Prolonged Drainage of the Common Duct. *Tr. South. Surg. Assn.*, **41**: 159-167, 1928.
- ² Sanders, R. L.: Indications for and Value of Choledochoduodenostomy. *Ann. Surg.*, **123**: 847, 1946.
- ³ Cattell, R. B.: Repair of stricture with Vitallium Tube. *Lahey Clinic Bulletin*, **4**: 98-102, 1945; Benign Strictures of the Biliary Ducts. *J.A.M.A.*, **134**: 235, 1947; personal communication.
- ⁴ Allen, A. W.: A Method of Re-establishing Continuity between the Bile Ducts and the Gastro-intestinal Tract. *Ann. Surg.*, **121**: 412, 1945; personal communication.
- ⁵ Monprofit, A.: Du remplacement du remplacement du choledoque et de l'hepatique par une anse jejunaie. *Cong. Franc. de chir.*, **21**: 206-209, 1908.
- ⁶ Hoag, C. L.: Reconstruction of the Bile Ducts; New Method of Anastomosis. *Surg. Gynec. & Obst.*, **64**: 1051, 1937.
- ⁷ Price, Philip B. and Tunnie F. Lee: The Gastric Digestion of Living Tissue. *Surg. Gynec. & Obst.*, **83**: 61, 1946.
- ⁴ Cole, W. H., C. Ireneus and J. T. Reynolds: The Use of Vitallium Tubes in the Treatment of Strictures of the Common Duct. *Ann. Surg.*, **122**: 490-521, 1945.
- ⁹ McArthur, Lewis L.: Repair of the Common Bile Duct. *Ann. Surg.*, **78**: 120-138, 1923.
- ¹⁰ Peterson, Lawrence and W. H. Cole: Use of Defunctionalized Loop in Jejunal, Biliary and Pancreatic Surgery. *Arch. Surg.* (to be published).
- ¹¹ Pearse, H. E.: Use of Vitallium Tube. *Conn. M. J.* **9**: 507, 1945; Results from using Vitallium Tube in Biliary Surgery, *Ann. Surg.* **124**: 1020, 1946.

DISCUSSION.—DR. ALFRED BLALOCK, Baltimore: Dr. Cole is to be congratulated on his excellent results in this type of difficult surgery. I arise to speak briefly of a method which Dr. William P. Longmire of Baltimore has developed in the laboratory, which has been used by him on several patients. Dr. Longmire would be the first to insist that this method should not be used except in those instances in which the more orthodox procedures, as described by Dr. Cole, have been attempted.

These patients usually have had repeated operations attempted. An incision is made which approaches the left lobe of the liver, thereby avoiding troublesome adhesions which are usually present on the right. Mattress sutures are placed in the left lobe of the liver and a wedge-shaped rather large piece of liver removed until one encounters a dilated duct which is seen at this point. A small area of liver surrounding the duct is removed. One may bring up a loop of jejunum and suture the mesenteric border of the jejunum to the lower edge of this denuded liver segment. An opening is made in the jejunum and an anastomosis is made between this opening and the end of the dilated duct. This shows the completed procedure with the jejunum sutured to the liver.